THE INFLUENCE OF AN ACUTE PAIN SERVICE ON POSTOPERATIVE PAIN MANAGEMENT IN JORDAN: A COMPARATIVE CASE STUDY

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Abstract

The influence of an Acute Pain Service on postoperative pain management in Jordan: A comparative case study

Background and Aims: Acute pain services (APSs) have developed worldwide to improve the quality of postoperative pain management (POPM). Although there is evidence that APSs can reduce pain and side effects after surgery and improve nurses' knowledge regarding pain management, the processes through which APSs influence these outcomes remains unclear. Previous studies regarding the influence of APSs on these outcomes have reported conflicting findings and there has been little research exploring clinicians' perceptions of the APS, and POPM practice.

The development of a nurse-based, anaesthetist-supervised APS in one of Jordan's hospitals in February 2010 provided an interesting and timely opportunity to investigate the influence of an APS on POPM in Jordan, as compared to a similar hospital that has yet to develop this service. This study seeks to address the gap in our knowledge concerning the impact of an APS on the quality of POPM, the knowledge and attitudes of clinicians relating to pain, and to explore clinicians' views and perceptions of the APS, and current POPM practice.

Methods: A comparative multiple-case (embedded) study was conducted between July 2011 and October 2011 at two hospitals in Jordan (Hospital-A has APS, Hospital-B without APS). The case study utilised a combination of quantitative and qualitative methods. Adult patients who underwent elective major surgery (50 from each hospital) completed the Strategic and Clinical Quality Indicators in Postoperative Pain Management (SCQIPP) questionnaire 24 hours after surgery to examine the quality of POPM in both hospitals. A representative sample of nurses and junior doctors at the two hospitals (89 from hospital-A and 100 from hospital-B) completed the knowledge and attitudes regarding pain (KAP) questionnaire. Documentary evidence including hospital policies and notes of meetings was gathered to illuminate the findings derived from other sources. Finally, a purposeful sample of 25 clinicians (mixture of nurses, anaesthetists & surgeons; 12 from hospital-A and 13 from hospital-B) was interviewed to explore clinicians' views on the APS and current POPM practice.

Results: The total mean SCQIPP scores for hospital-A (57.28) and hospital-B (51.88) did not reach the 'high quality of care' threshold of 63 in either hospital. The findings from clinicians' interviews suggest that the lack of patient involvement, the lack of regular pain assessment, and organisational challenges in both hospitals have prevented the total quality scores from reaching the international standard for 'high quality of care'. Patients in hospital-A reported a significantly higher total SCQIPP scores, and in the subscales of communication and action, ($P< 0.001$) than hospital-B. There was no significant difference in the subscales of trust ($P=0.927$) and environment ($P=0.344$) or in the patient satisfaction scores ($P=0.059$). Patients in hospital-A also reported significantly lower pain intensity scores ($P<0.001$). Patients in hospital-A used significantly more PCA ($P=0.013$) and epidural analgesia ($P<0.001$) whereas patients in hospital-B used significantly more IM analgesia ($P<0.001$). The findings suggest that the provision of patient education and the more robust approach to pain assessment in hospital-A have positively influenced the achievement of higher total quality scores when compared to Hospital-B. The qualitative findings indicate

that the availability of the APS staff 24 hours in hospital-A, the APS's 'round', the specialist pain nurses' 'rapid interventions' and coordination role, and the introduction of PCA and epidural analgesia, were the main activities of the APS that had an impact on the quality of care and patients' experience of pain in hospital-A.

The median total KAP scores for hospital-A (61.6%) and hospital-B (51.5%) did not reach the internationally recognised scores of 80%. A possible explanation is that the short duration of in-service pain education, lack of education sessions, and the reliance of clinicians on their experience, learning from other colleagues or undergraduate courses to learn about pain management are potential explanations for this shortfall. Clinicians in hospital-A had significantly higher KAP scores than hospital-B ($P<0.001$). Ongoing education and training provided by the APS; the quality and content of training on different aspects of pain management, and the development of pain policies were the main activities of the APS that had an impact on the knowledge of clinicians in hospital-A. However, clinicians in both hospitals were found to have misconceptions about the side effects of PCA and epidural analgesia, and the use of placebo and behavioural clues in pain assessment. Moreover, clinicians' interviews indicate that patients refuse to take narcotics because they believe it is Haraam (prohibited) or due to fear of opioid addiction. They also speculate that the presence of relatives (escorts) may lead patients to pretend to be in pain and show Dala' [spoiled] in front of their relatives.

Conclusions: The total quality scores did not reach the internationally recognised standard for high quality pain management in either hospital. The findings suggest that the presence of an APS is associated with better managed pain experience, a higher quality of patient care, an increase in the provision of patient education and an increase in compliance with performing regular pain assessment. To improve the quality of pain management practice, clinicians in hospitals with an APS need to continue their work to promote patient education, regular pain assessment, and pay more attention to interventions promoting patient involvement. Hospitals without access to an APS need to find innovative ways to integrate regular pain assessment, patient involvement, and the provision of patient education into routine clinical practice. They may also need to invest in establishing APSs to introduce advanced pain management modalities into their hospitals effectively and safely.

The findings suggest that the presence of an APS is associated with a higher knowledge and a positive attitude of clinicians regarding pain management. Despite hospital-A outperforming hospital-B on a number of measures, the total knowledge and attitudes scores did not reach the internationally acceptable scores of 80% in either hospital. To improve the knowledge and attitude of clinicians, it is necessary to improve the content, quality and duration of pain education offered at both the undergraduate and professional levels. It should be noted that this study was carried out in Jordan, a middle-income and an Arabic Muslim country and the internationally recognised thresholds could be too high benchmarks to achieve.

In terms of further research, it would be helpful to validate the suggested 'high quality of care' threshold on the SCQIPP questionnaire and explore an adjusted 'high quality of care' threshold for low/middle-income countries that are struggling with limited resources. There is also a need for further research to develop a contemporary

questionnaire to assess clinicians' knowledge and attitudes regarding POPM including the use of advanced pain management techniques. In addition, a further qualitative study with patients and relatives is recommended to understand their religious beliefs concerning the use of opioids, and the role of the religious practices in pain management.

List of Outputs

Posters:

A. Al-Tawafsheh, L. East, N. Allcock (2015) The influence of an Acute Pain Service on the knowledge and attitudes of clinicians about pain management in Jordan: A comparative case study. *British Journal of Pain* 9 (2) suppl 1: page 16. Poster presented at *The British Pain Society-Annual Scientific Meeting*, Glasgow- UK: 21- 23 April 2015

A. Al-Tawafsheh, L. East, N. Allcock (2014) The influence of an Acute Pain Service on the quality of postoperative pain management in Jordan: A comparative case study. *British Journal of Pain* 8 (2) Suppl 1: page 6. Poster presented at *The British Pain Society-Annual Scientific Meeting*, Manchester- UK: 27 April- 1 May 2014

Lectures:

N. Scott and A. Al-Tawafsheh (2015) Is effective and safe postoperative pain management worthwhile. Lecture presented at *The Middle East Forum on Quality and Safety in Healthcare*, Doha- Qatar: 29th- 31st May 2015

A. Al-Tawafsheh (2014) The role of APSs in pain management. Lecture presented at *The First Joint SPIN/HMC Pain Management Symposium*, Doha- Qatar: 25th- 26th January 2014

Dedication

To my father for his endless support

and

In memory of Mum, who died during the course of this study

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List of Abbreviations

AAGBI	Association of Anaesthetists of Great Brittan and Ireland
AHCPR	Agency for Healthcare Policy and Research
ASA	American Society of Anaesthesiologists
CEA	Continuous Epidural Infusion
COX-2	Cyclo- Oxygenase-2
CPNB	Continuous Peripheral Nerve Blocks
CSAG	Clinical Standards Advisory Group
EMRO	Eastern Mediterranean Region Office
ERAS	Enhance Recovery After Surgery
HCAC	Healthcare Accreditation Council
IQR	Interquartile Range
IASP	International Association for the Study of Pain
ICU	Intensive Care Unit
IM	Intramuscular
IV	Intravenous
JCI	Joint Commission International
KAP	Knowledge and Attitudes Survey Regarding Pain
Md	Median
MOH	Ministry of Health
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NRS	Numerical Rating Scale
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
PACU	Post-Anaesthesia Care Unit
PCA	Patient Controlled Analgesia
PCEA	Patient Controlled Epidural Analgesia
POPM	Postoperative Pain Management
RCoA	Royal College of Anaesthetists
RCT	Randomised Control Trial
SCQIPP	Strategic and Clinical Quality Indicators in Postoperative Pain Management
SD	Standard Deviation
VAS	Visual Analogue Scale
VRS	Verbal Rating Scale

Chapter One

1 Introduction and Study Context

"By any reasonable code, freedom from pain should be a basic human right, limited only by our knowledge to achieve it" (Liebeskind & Melzack, 1987)

1.1 Background and significance of the study

Postoperative pain is one of the most common symptoms experienced by patients after surgery (Sloman et al., 2005; Bell and Duffy, 2009). Unrelieved postoperative pain may result in detrimental physiological and psychosocial consequences at an individual and societal level (Brennan et al., 2007). Under-treatment of postoperative pain can have a number of physiological adverse effects such as an increase in heart rate, blood pressure, risk of infection, risk of cardiac ischemia, risk of venous thrombosis disease, and impairments of immune function and wound healing (Wu and Thomsen, 2003; Dunwoody et al., 2008; Macintyre et al., 2010). Severe postoperative pain is also a risk factor for the development of chronic postsurgical pain (Kehlet et al., 2006; Niraj and Rowbotham, 2011). Furthermore, unrelieved postoperative pain can have many psychosocial consequences such as anxiety, sleep deprivation, feeling helplessness, fear and depression, decrease in the quality of life and patient satisfaction, increased hospital length of stay and healthcare resource consumption (Joshi and Ogunnaike, 2005; Ashley and Doraiswami, 2010; Jarrett et al., 2013; Baratta et al., 2014).

To avoid these physiological and psychosocial consequences, effective treatment of postoperative pain is a fundamentally important goal. The Royal College of Surgeons of England and the College of Anaesthetists (1990), in their report "Pain after Surgery", pointed out that postoperative pain management (POPM) is an essential component in the care of postoperative patients, and ineffective pain relief is morally and ethically unacceptable. A number of professional bodies have published recommendations and guidelines to improve the quality of acute pain management including the development of an acute pain services (APSs) in all major hospitals performing surgery (The Royal College of Surgeons of England and the College of

Anaesthetists, 1990; Agency for Healthcare Policy and Research (AHCPR), 1992; International Association for the Study of Pain (IASP), 1992; The Royal College of Anaesthetists (RCoA) & The Pain Society, 2003; American Society of Anaesthesiologists (ASA) Task Force, 2012). This support promoted the development of different models of APSs worldwide with a steady increase in the number of APSs globally. The main APS models vary from the anaesthetist-based APS developed in USA by Ready et al. (1988) to the nurse-based, anaesthetist-supervised model described by Rawal and Berggren (1994) in Europe.

Although APSs have become the mainstream of service provision for POPM worldwide, evidence for their impact on patient outcomes and the knowledge and attitude of clinicians remains inconclusive; while several individual studies have highlighted the positive impact of APSs on patient outcomes, other individual studies have shown no such impact. Moreover, systematic reviews of the impact of APSs have come to very different conclusions; Werner et al's. (2002) review concluded that the implementation of APSs is associated with a significant decrease in postoperative pain ratings and in the incidence of side effects, whilst McDonnell et al. (2003a) concluded that there is insufficient robust research to assess the effectiveness of APS in improving the quality of analgesia and other postoperative outcomes. Similarly, there is inconsistency in the limited research available on the impact of APS on clinician's knowledge and attitudes regarding pain. While many healthcare professionals were satisfied in general with the APSs, there is discrepancy in the literature with the regards to the satisfaction of staff concerning the availability and communication of APSs, with inconsistent views on the impact of APS on clinicians' workload.

However, most of these studies were before-and-after designs with wide variation in the time gap between before and after measurement and variation in design quality. These studies looked at specific outcomes relating to immediate postoperative patients without investigating how patients perceive the overall quality of POPM in a hospital. The majority of studies were quantitative in nature and used a non-validated questionnaire to assess staff perceptions of the APS. No qualitative studies examined the surgeons' and anaesthetists' perceptions about the APSs. In addition, what remains unknown in the literature is exactly how and why an APS achieves these positive

outcomes**.** Moreover, the processes through which the APS influences patient outcomes remains unclear.

In February 2010, a nurse-based, anaesthetist-supervised APS was established in one of Jordan's hospitals. This service is the first of its kind in Jordan. As APSs have long been established in acute care in most developed countries, this new initiative in a middle-income country provided an interesting and timely opportunity to investigate the influence of an APS on POPM. This study set out to compare and contrast pain management in two hospitals, one of which has established an APS and one of which has not, utilising a combination of quantitative and qualitative methods.

1.2 Research aims and objectives

A comparative multiple-case (embedded) study was conducted at two hospitals in Jordan to address the following aims and objectives.

1.2.1 Aims

The overall aim of this study was to investigate the influence of a nurse-based, anaesthetist-supervised APS on POPM in Jordan. In particular, this study seeks to answer the gap in our knowledge concerning the impact of an APS on the quality of POPM, and the knowledge and attitudes of clinicians. The study is designed to explore clinicians' views and perceptions of the APS and current POPM practice in Jordan, and develop a deeper understanding of the influence of an APS on pain management practice. Although the study is based in Jordan, it will contribute to the international evidence on the provision of APSs and POPM practice by shedding light on the processes through which an APS influences POPM of relevance to clinicians, policy-makers, and researchers in the field of APSs and acute pain management.

1.2.2 Objectives

- To investigate the impact of an APS on the quality of POPM, patients' experience of postoperative pain and patients' satisfaction with pain management.
- To investigate the impact of an APS on the knowledge and attitudes of clinicians towards pain management

- To explore anaesthetists, surgeons and nurses' views and perceptions of the APS and current pain management practice in Jordan.
- To understand the processes through which the APS influences POPM practice.
- To generate recommendations to improve POPM in Jordan and worldwide.

1.3 Study Context: Jordan

In case study research, it is important to help the reader understand the phenomenon under study within its real-life context. The aim of this section, therefore, is to provide the reader with a detailed explanation of the setting within which this case study was conducted. The following paragraphs will describe the geographic context, population, healthcare system and POPM in Jordan.

1.3.1 Jordan location and population

The Hashemite Kingdom of Jordan is an Arab Muslim country situated in the Middle East and borders Saudi Arabia, Syria, West Bank (Palestine), Israel and Iraq (Figure 1-1). Jordan is a small country covering an area of 91,971 square kilometres (Government of Jordan, 2014).



Figure 1-1: Map of Jordan

Source: https://www.cia.gov/library/publications/the-world-factbook/geos/jo.html

Jordan has an estimated population of 6.7 million people with 71% living in three main cities; 39% in the capital (Amman), 18% in Irbid and 15% in Zarka (Department of Statistics, 2014). Jordan has a population growth rate of 2.2%, fertility rate of 3.5% and life expectancy at birth is 74 years (Ministry of Health, 2014). Jordan's population is predominately young with 70% of the population under the age of 30 (Eastern Mediterranean Region Office (EMRO), 2006). In 2014, 37.3% of the population were under 15 years, 59.5% were between 15 and 64 years and only 3.2% were over 65 years (Department of Statistics, 2014). The Jordan population is growing rapidly and it is expected to double in the next 20 years (Ajlouni, 2010).

1.3.2 Healthcare in Jordan

The overall healthcare policy is set by the Jordanian High Health Council. The Council also has the role of extending the health services to all citizens, and improving the quality of healthcare services through the national health strategy (EMRO, 2006). The Ministry of health (MOH) is mandated by law to licence, regulate and monitor healthcare professions and institutions in Jordan. Several organisations including the Jordan Medical Council, the Jordan Food and Drug Administration, the Jordanian Nursing Council, and the High Health Council participate with the MOH in monitoring and regulating healthcare policies (EMRO, 2006). The Jordan Food and Drug Administration, established in 2003, is responsible for drug registration, pricing and quality control. The Jordan Drug Policy, established in 2002, to rationalise drug procurement, production, distribution and use (EMRO, 2006). The Jordanian Nursing Council was established in 2002 under the leadership of HRH princes Muna Al-Hussein to set strategic plans and policies for developing the nursing profession in Jordan (Jordanian Nursing Council, 2009).

The healthcare system in Jordan is considered one of the best in the Middle East (Ajlouni, 2010). Jordan has three different healthcare providers; public, private and Non-Government Organisations. The public health services are provided by the MOH, the Royal Medical Services and two university hospitals (High Health Council, 2012). The MOH provides primary, secondary and tertiary services via a network comprising of both health centres and 31 hospitals providing 4783 beds, representing 38.3% of the hospitals bed in the country (Ministry of Health, 2014). The royal medical services

provides secondary and tertiary services in 12 hospitals with 2269 beds which accounts for 18.2% of the hospital beds in Jordan. It provides services to military and security staff and their dependant (High Health Council, 2012; Ministry of Health, 2014). The two university hospitals provide health insurance for the universities' employees and are referral centres with a total of 1100 beds, representing 8.8% of the beds in the country (Ministry of Health, 2014).

The private sector provides primary, secondary and tertiary services via a network of hospitals and private clinics. The private sector has 59 hospitals with 4345 beds representing 34.8% of the hospital beds in Jordan (Ministry of Health, 2014). This is a far higher proportion than in the UK, where private hospitals account for less than 5% of the total beds in the country (Dixon and Robinson, 2002).

Non-Government Organisations in Jordan include the King Hussein Cancer Centre and the United Nation Relief and Welfare Agency for Palestinian Refugees (UNRWA). UNRWA provides primary healthcare to Palestinian refugees and has 24 primary healthcare centres (High Health Council, 2012). The King Hussein Cancer Centre is one of the best comprehensive cancer treatment centres in the Middle East and provides care to patients of all ages and backgrounds (King Hussein Cancer Centre, 2009).

Jordan is categorised as a lower-middle income country with limited natural resources (EMRO, 2006). The total health expenditure in 2012 was estimated at GBP 1.63 billion or GBP 250 per capita. This is equivalent to 7.58% of the country GDP (Ministry of Health, 2014). In 2013, despite the fact that Jordan spends a relatively large amount on healthcare, only 86% of the population was covered by health insurance (High Health Council, 2015). This contrasts with the UK where all citizens are entitled to free healthcare under the National Health Service (Dixon and Robinson, 2002).

In 2012, public funding provided 61.9% of national health financing, whilst the private sector contributed 35.1 % to the fund and the remaining 2.9% was provided by donors (Ministry of Health, 2014). A breakdown of health expenditure shows that 74.2% was spent on curative healthcare, 16.4% on primary care, 7% on administrative costs, 1.5%

on training and 0.9% miscellaneous expenses (High Health Council, 2012). Expenditure on pharmaceuticals is high and accounts for 27.6% of the total national health budget (Ministry of Health, 2014).

1.3.3 Postoperative pain management in Jordan

There is no legislation, national polices or guidelines from Jordanian health organisations or professional bodies regarding POPM (Al-Hassan et al., 1999; Abdalrahim et al., 2008, 2011). In clinical practice, surgeons prescribe analgesics after surgery as part of postoperative care and nurses carry out physician's orders. In the surgical wards, nurses and surgeons evaluate patients' need for pain management as part of their routine round (Abdalrahim et al., 2011; Shoqirat, 2015). This suggests there is a need to pay more attention to POPM given that around 377,930 surgical procedures are performed annually in Jordan (Ministry of Health, 2014).

There has also been little research looking at postoperative pain in Jordan. In a recent audit of 275 patients in a Jordanian university hospital, Massad et al. (2013) found that 19.3% and 29.1% of patients experienced severe pain at rest and movement respectively after surgery. They also found that 55.7% and 59.6% suffered from moderate pain at rest and movement respectively. Paracetamol (42.5%) and IM pethidine (66.9%) were the most common medications received by patients after surgery. More recently, Darawad et al. (2014) recruited 375 patients from five hospitals in Jordan to examine patients' satisfaction with pain management. They found that the mean worst pain experienced by patients was 8.1 (on numerical rating scale (NRS) of 0-10) and the level of current pain was 4.06. Patients' satisfaction with pain management was high (5.11/6). However, this study was conducted in medical, surgical, maternity, and intensive care unit (ICU) units and postoperative patients were not included in the study.

There are many barriers to effective pain management in Jordan. Patients were found to prefer to be in pain to being embarrassed and upsetting nurses asking for pain medications (Shoqirat, 2014). Patients also refuse to take analgesics because of fatalistic beliefs, fear of addiction and side effects, and believe it should be saved for severe pain (Batiha, 2014; Darawad et al., 2014). For clinicians, shortage of staff,

excessive workload, family interference with nurses' pain work, fear of addiction, and the limited role of nurses in pain management of following doctors' order were found to be the main barriers to clinicians' role in pain management (Abdalrahim et al., 2010; Shoqirat, 2015). Another barrier to effective pain management in Jordan is the lack of nurses' knowledge and negative attitudes towards pain management (Abdalrahim et al., 2010; Al Qadire and Al Khalaileh, 2014). This could be related to lack of formal pain education content in undergraduate nursing curricula and lack of in-service education at the hospitals (Al Khalaileh and Al Qadire, 2013).

There are also some limitations on the availability and use of opioid medication in Jordan. The current system for opioid prescribing and dispensing means it takes a long time (up to one hour) to administer the analgesics (Al Qadire and Al Khalaileh, 2014). In addition, although the annual International Narcotics Control Board opioid quota for Jordan increased from 2 kg/year (in 2001) to 7 kg/year in 2004 (Stjernsward et al., 2007), the mean morphine consumption in Jordan of 2.49 mg/capita is still far less than the global mean of 6.27 mg/capita. Nonetheless, this is a higher consumption when compared to other neighbouring countries such as Saudi Arabia (0.78 mg/capita) and Syria (0.038 mg/capita) (University of Wisconsin Pain & Policy Studies Group, 2013).

Overall, this section had described the geographic context, population, healthcare system and POPM practice in Jordan. It provided a detailed explanation of the study setting to help the reader understand the phenomenon under study within its real-life context.

1.4 Structure of the thesis

The remaining elements of this thesis are presented in six further chapters:

Chapter Two reviews the literature in three sections: patients' experience of postoperative pain, treatment of postoperative pain and APSs. Section one presents an overview of key concepts in postoperative pain such as prevalence of pain, the consequences of unrelieved pain, patients' expectation and satisfaction, role of preoperative information and patients' beliefs of postoperative pain. Section two

presents an overview of the role of multimodal analgesia in pain relief, and the effectiveness and safety of advanced pain management modalities in POPM. Section three presents an overview of the prevalence, structure, functions, and the models of APSs. It also offers a review of the impact of APS on patient outcomes and clinicians' knowledge and attitudes towards pain, and the perceptions of staff of the APSs.

Chapter Three describes the methodology and methods of the study. It describes the philosophical assumptions underpinning the study, the justification for the multiple-case study design, the methods used for sampling, data collection and data analysis for both quantitative and qualitative methods. This chapter also discusses the ethical considerations in conducting this study.

Chapter Four presents results related to the first objective of the study, including patient characteristics, the methods and medications used for POPM, and differences between both hospitals in terms of total quality of POPM, pain and satisfaction scores.

Chapter Five reports results related to the second objective of the study. It presents the clinicians demographics and background data, the differences between both hospitals in terms of total and individual knowledge and attitudes scores of clinicians about pain.

Chapter Six presents the findings of clinicians' interviews, the third objective of the study. It includes the main and subthemes identified during the process of data analysis of the interviews and evidence generated from institutional documents.

Chapter Seven, the final chapter of the thesis, discusses the key findings generated from both quantitative and qualitative phases of the study in comparison with the available literature. The chapter also highlights the methodological strengths and limitations of the study and examines the implications for practice, education and future research prior to the final conclusions.

1.5 Conclusion

This chapter has provided an overview of the study background, significance and the aims and objectives of the study, the contextual features of Jordan's healthcare system and POPM, and the structure of the thesis. The next chapter will present a review of the literature concerning patients' experience of postoperative pain, treatment of postoperative pain and APSs.

Chapter Two

2 Literature Review

2.1 Introduction

The aim of this study was to investigate the influence of an APS on POPM. APSs have developed worldwide in response to evidence of poor postoperative pain control in the 1980s with the desire to improve the quality of POPM including advanced pain management techniques (Ready et al., 1988). Therefore, it is important to provide the reader with the background information about patients' experience of postoperative pain and treatment of postoperative pain before discussing a detailed review of the literature about APSs.

This chapter presents a review of the literature in three sections: patients' experience of postoperative pain; treatment of postoperative pain and APSs. The first section presents an overview of the prevalence of postoperative pain, the consequences of unrelieved pain, and patients' expectation and satisfaction of postoperative pain. It also offers a review of the impact of preoperative information on postoperative pain before examining the beliefs of patients of postoperative pain. The second section presents an overview of the effectiveness and safety of advanced pain management modalities for the treatment of postoperative pain. It also presents an overview of the role of multimodal analgesia in POPM. The final section presents an overview of the history and prevalence, structure and functions, and different models of APSs. The review offers a review of the impact of APS on patient outcomes and the knowledge and attitudes of staff towards pain management before examining the perceptions of staff of APS. Each section concludes with a summary of the literature reviewed.

2.2 Search strategy

A number of search strategies were used to identify relevant studies. Electronic databases such as MEDLINE, CINHAL, Cochrane Database of Systematic Reviews, and NUsearch-UK were searched. Websites of relevant healthcare professional bodies such as British Pain Society and Royal College of Anaesthetists were also searched.

Reference lists of identified studies were hand screened for additional relevant studies. A variety of relevant books were identified and reviewed. The following keywords were used in the search: acute pain services, acute pain teams, knowledge and attitude, beliefs and perceptions, quality, postoperative pain, postoperative pain management, epidural analgesia, patient controlled analgesia, peripheral nerve blocks, multimodal analgesia, balanced analgesia, paracetamol, non-steroidal anti-inflammatory drugs, preoperative information, satisfaction, expectations.

Given the wealth of literature on postoperative pain, a complete review of all potential studies was not possible. Therefore, the following inclusion criteria were applied:

- Searches were limited to English language.
- Searches were limited to adult patients.
- For patients' experience of postoperative pain section: searches were limited to studies published after 2000 to provide an up to date literature review. Both prospective and retrospective studies were included.
- For treatment of postoperative pain section: searches were limited to studies published after 2000 to provide an up to date literature review. Only systematic reviews and meta-analyses were included.
- For acute pain service section: searches were limited to studies published after 1988. The year 1988 was marked as important because of the publication of the first study describing an APS. In the sub-sections that assessed the impact of acute pain service on outcomes, knowledge and attitudes, only studies that compared an APS with a control were included to strengthen the evidence review.
- It should be noted that although the initial systematic search and review was completed in 2014, the search for relevant evidence has continued until May 2016.

2.3 Patients' experience of postoperative pain

2.3.1 Introduction

Postoperative pain is one of the most common symptoms experienced by patients after surgery (Sloman et al., 2005; Bell and Duffy, 2009). The IASP defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP, 1979, p. 250). This definition

acknowledges both sensory and emotional dimensions that interact to produce the pain experience. Pain is a subjective experience and cannot be measured objectively like vital signs (Lynch, 2001). The subjectivity of pain is reflected in one of the most widely accepted definitions of pain in nursing introduced by McCaffery (1972, p 8) who defined pain as "whatever the experiencing person says it is, existing whenever he/she says it does". This emphasises the need to accept patients' self-report of pain (Botti et al., 2004) using single dimension pain scales to measure pain intensity with an aim to quantify pain (Cashman, 2010). The following sub-sections will review the phenomenon of postoperative pain from the patients' perspective, beginning with overview of when and where such pain is experienced.

2.3.2 Prevalence of postoperative pain

Pain prevalence among hospitalised patients is considered one of the important indicators of quality healthcare (Melotti et al., 2005). The prevalence of postoperative pain has been explored by many researchers globally using different pain scales and research methods (Tables 2-1 & 2-2). These studies report postoperative pain either as a mean/median (Md) of current, least and worst pain or the percentage of moderate (4-6 on NRS of 0-10) and severe pain (> 7 on NRS of 0-10) at rest or on movement with large differences on the prevalence of pain between studies.

In middle-income countries (Table 2-1), the incidence of severe pain 24 hours after surgery at rest ranged from 9.4% to 19.3%, and on movement, severe pain ranged from 29.1% to 45.8% (Yimyaem et al., 2006; Massad et al., 2013). On the other hand, surveys conducted in high-income countries (Table 2-2) reported a lower incidence of severe pain after surgery at rest which ranged from 2% to 4.2% (Fletcher et al., 2008; Tufano et al., 2012) and on movement 26% of patients experienced severe pain (Moss et al., 2005; Fletcher et al., 2008).

For both middle and high-income countries, the mean pain scores at the time of assessment (first 24 hours after surgery- 'current pain') ranged from 1.8 to 3.8, the mean 'least pain' ranged from 1.77 to 2.3, and the 'worst pain' scores was between 4.2 and 6.46 (Tables 2-1 & 2-2). A recent study from the UK showed that 12.5% of patients experienced severe postoperative pain (Duncan et al., 2014). This is lower

than the level reported by Moss et al.'s (2005) study from the UK where they reported an incidence of 26%. It is also less than that reported in a frequently cited retrospective survey by Apfelbaum et al. (2003) in the US, who found that 39% of patients studied experienced severe to extreme pain after surgery.

Table 2-1: Prevalence of postoperative pain on day one after surgery: Middle-income countries*

Author/Year/ Country	Sample	Instrument	Moderate Pain (%)	Severe Pain (%)	Mean
Vatansever and Akansel (2014)- Turkey	n=113	NRS (0-10) Current pain Least pain Worst pain			 2.5 2.3 6.2
Massad et al. (2013)- Jordan	n=275	VRS and NRS (0-10) At Rest At Movement	 52.7% 59.6%	 19.3% 29.1%	
Jawaid et al. (2009)- Pakistan	n=105	VAS (0-10) At rest At movement			 2.84 4.65
Jain et al. (2008)- India	n=154	NRS (0-10) Average pain Worst pain	 39.7% 38.5%	 9% 15.4%	
Yimyaem et al. (2006)- Thailand	n=1540	NRS (0-10) At rest At movement	 26.5% 30.8%	 9.4% 45.8%	 2.7 5.2
NRS= Numerical Rating Scale			VAS= Visual Analogue Scale		
VRS= Verbal Rating Scale			* http://data.worldbank.org/country		

Table 2-2: Prevalence of postoperative pain on day one after surgery: High-income countries*

Author/Year/ Country	Sample	Instrument	Moderate Pain (%)	Severe Pain (%)	Mean
Rothaug et al. (2013)- 8 European countries and Israel	n=9727	NRS (0-10) Least pain Worst pain			 1.77 5.16
Lorentzen et al. (2012)- Denmark	n=424	NRS (0-10) Current pain Average pain Worst pain	 31.5% 52.9% 51.1%	 0.9% 2.9% 36.5%	 3.31 3.86 6.46
Tufano et al. (2012)- Italy	n=1952	VAS (0-100) At rest	 13%	 2%	
Fletcher et al., (2008)- France	n=1900	NRS (0-10) At Rest At Movement		 4.2% 26.9%	 2.7 4.9

Sommer et al. (2008)- Netherlands	n=1490	VAS (0-100)	25%	5%	
Gunningberg and Idvall (2007)- Sweden	n=121	NRS (0-10) Current pain Worst pain			 1.8 4.2
Dihle et al., (2006a)- Norway	n=102	NRS (0-10) Current pain Average pain Worst pain			 3.8 4.2 6.0
Moss et al., (2005)- UK	n=522	NRS (0-10) At Movement	 34%	 26%	(Md) 5.0
Chung and Lui (2003)- Hong Kong	n=294	NRS (0-10)	24.1%	3.3%	2.0 (Md)
Idvall et al. (2002a)- Sweden	n=198	NRS (0-10) Current pain Least pain Worst pain			 2.5 1.8 5.2
Svensson et al. (2000)- Sweden	n=185	VAS (0-100)	34%	7%	32 = (3.2)

A number of surveys have been conducted to assess the quality of pain relief among patients receiving advanced pain management techniques. In a large survey of 18,925 patients treated by an APS in a university hospital in Germany, Popping et al. (2008a) compared the quality of pain relief using visual analogue scale (VAS) (0-100) between three analgesics techniques (patient controlled epidural analgesia (PCEA), intravenous patient controlled analgesia (IV-PCA) and continuous peripheral nerve blocks (CPNB)). They found that the median pain score at rest on postoperative day 1 in patients who received PCEA was lower (Md=0) compared to patients who received IV-PCA and CPNB (Md=10). Both PCEA and CPNB groups had a lower dynamic pain scores (Md=10) than IV-PCA (Md=30). Moss et al. (2005) reported higher findings in an early survey of 522 patients in fourteen hospitals in the UK using a verbal NRS of 0-10. They found that patients who received epidural analgesia had a lower pain score (median =3.5) compared to patients who used PCA (Md=6) or intramuscular (IM) opioids (Md=5). A similar trend was found in a comprehensive review by Dolin et al. (2002) on the incidence of moderate-severe and severe pain after major surgery for three pain management techniques (I.M, PCA and epidural analgesia). Pooled data on pain scores were obtained from 123 studies that represent the pain experience of a total of 19,909 patients. They found that the incidence of severe pain for I.M, PCA and epidural analgesia within the first 24 hours were 29.1%, 10.4% and 7.8% respectively. The overall incidence of moderate-severe (a mixture of

the three pain management techniques) was 30 % and the overall incidence of severe pain was 11 %.

Overall, the worst pain was most often experienced on the first day after surgery with a reduction in the severity on the following days. There is some evidence to suggest that the prevalence of severe pain at rest is higher in the middle-income countries compared to high-income countries. There is also evidence that the prevalence of severe pain in more recent years has decreased compared to the early 2000s. However, It is worth noting that the studies reviewed above utilised different outcome measures with different cut off points for moderate or severe pain; for example, Sommer et al. (2008) defined an acceptable pain score of <40mm on VAS (0-100), 41-74mm as moderate and 75-100mm as severe while other such as Moss et al. (2005) reported pain scores in groups of 0-4, 5-7, 8-10 on NRS (0-10). Another difficulty in interpreting the prevalence survey is the timing of reporting which vary from few hours after surgery until discharge or retrospective surveys. Furthermore, the surgical procedures vary between studies. Therefore, it is difficult to identify meaningful trends over time or between countries and comparison between studies should be interpreted with caution. Nevertheless, the increase use of epidural analgesia and CPNBs under the supervision of a well-established APS has shown superior pain relief compared to IM analgesia or IV-PCA (this will be explored further in Section 2.4).

2.3.3 Consequences of inadequately treated postoperative pain

Unrelieved acute pain may result in detrimental physiological and psychosocial consequences at an individual and societal level (Brennan et al., 2007). Under-treatment of postoperative pain can have a number of physiological adverse effects. Pain can activate the sympathetic nervous system and cause the release of catecholamines which may increase heart rate and blood pressure (Macintyre and Ready, 2002; Wu and Thomsen, 2003). This activation increases myocardial oxygen consumption and decreases myocardial oxygen supply which may increase the risk of cardiac ischemia (Macintyre et al., 2010). Increased sympathetic activity can also reduce gut motility and contribute to postoperative ileus (Wu and Thomsen, 2003). Severe pain after thoracic and upper abdominal operations decreases the ability to cough, deep breath and cause a reduction in functional residual capacity and lung

volume which may lead to atelectasis, hypoxemia and an increased risk of chest infection (Ashley and Doraiswami, 2010; Macintyre et al., 2010). Pain can also delay mobilisation which can increase the risk of venous thrombosis disease and joint stiffness (Dunwoody et al., 2008; Taylor and Stanbury, 2009). Pain can play a role in the activation of stress response after surgery which can increase the release of catabolic hormones and reduce the release of anabolic hormones. This contributes to the hypercoagulable state after surgery, hyperglycemia, and impairments of immune function and wound healing (Macintyre and Ready, 2002). Furthermore, severe postoperative pain is a risk factor for the development of chronic postsurgical pain (Kehlet et al., 2006; Macrae, 2008; Nikolajsen and Minella, 2009; Niraj and Rowbotham, 2011).

Unrelieved acute pain can have many psychosocial consequences. Inadequately treated acute pain may result in anxiety, sleep deprivation, feeling helplessness, fear and depression (Joshi and Ogunnaike, 2005; Ashley and Doraiswami, 2010). Unrelieved pain can also decrease the quality of life and patient satisfaction with pain management, increase hospital length of stay and healthcare resources consumptions (Breivik and Stubhaug, 2008; Jarrett et al., 2013; Sinatra, 2010; Baratta et al., 2014). Moreover, patients' experience of unrelieved pain will influence their future expectations and experiences of postoperative pain (Warren Stomberg and Oman, 2006; Idvall et al., 2008).

2.3.4 Patients' expectations and actual experiences of postoperative pain

Patients' expectations of postoperative pain may have an effect on the experience of pain after surgery. Patients continue to have low expectations about postoperative pain relief (Carr, 2000; Idvall, 2002; Idvall et al., 2008; Lorentzen et al., 2012; Weiran et al., 2013). In a sample of 112 Swedish patients undergoing hip replacement, Warren Stomberg and Oman (2006) found a significant correlation between patients' pain scores after surgery and their preoperative expectations concerning their pain. Patients who reported a higher pain score after surgery reported that their pain was more than expected. Nimmaanrat et al. (2007) found similar correlation in a prospective sample of 112 Thai women undergoing major gynaecological surgery, where 55% expected severe pain with an expected average pain score of 6.4 on VAS (0-10). The actual

median average pain experienced by patients after surgery was 5.3 with 25% experiencing severe pain. Likewise, Svensson et al. (2001) found a significant correlation between preoperative expectation and actual postoperative pain experience. They found that 91%, of 189 surgical patients expected moderate or severe pain after surgery, and 76% experienced such intensity.

Patients' expectations of postoperative pain may also have an effect on patients' assessment of the quality of pain management. Idvall et al. (2002a) assessed the quality of POPM using the Strategic and Clinical Quality Indicators in Postoperative Pain Management (SCQIPP) questionnaire in 198 Swedish patients after surgery. They found that the mean total SCQIPP score was 58.6 with a range from 2.8 to 4.7 for the individual items. Twenty four percent reported more pain than expected, with these patients demonstrating lower total SCQIPP scores. Equally, Gunningberg and Idvall (2007) found that the mean total SCQIPP score was 61.1 with a range from 3.9-4.8 for the individual items in 121 Swedish patients after surgery. Seventeen percent reported more pain than expected and had a lower total quality score.

Overall, patients have low preoperative expectations about pain relief after surgery. These expectations can influence the actual postoperative pain experience, patients' perceptions of the quality of POPM and patients' satisfaction with pain relief.

2.3.5 Patients' experience of pain and satisfaction

Patients' experience and expectations of postoperative pain may have an effect on their satisfaction with pain management. Svensson et al. (2001) found that age, sex, preoperative expectation of pain relief and actual experience of pain relief after surgery were factors associated with patients' satisfaction with pain management. The probability of not being satisfied was higher in younger, female patients and patients with severe pain. They also found that a higher postoperative pain score was significantly associated with not being satisfied with pain management. Bozimowski (2012) confirmed this possibility in a prospective study of 50 surgical patients in that patient report of a higher pain score was associated with lower levels of satisfaction.

On the other hand, high levels of satisfaction have been reported even by patients who experienced severe pain (Idvall, 2002; Apfelbaum et al., 2003; Nimmaanrat et al., 2007; Weiran et al., 2013). This indicates that pain intensity does not always correlate with patient satisfaction with pain management. Possible explanations for this paradoxical relationship between patient satisfaction and the experience of severe pain are that patients expect some pain after surgery, and patients perceived that staff did care about their pain (Gordon et al., 2002; Idvall, 2002; Bedard et al, 2006; Bozimowski, 2012). This discrepancy in the literature has led to questions about the relevance of patient satisfaction as an outcome measure for pain management (Salomäki et al. 2000; Svensson et al., 2001; Gordon et al., 2002; Carlson et al., 2003; American pain Society, 2005) or as an indicator of effective APSs in hospitals (Karlsten et al., 2005; Jawaid et al., 2009). Indeed, Gordon et al. (2002) argued that providing patients with information about pain management to aid their input into the decision making is more valuable than merely rating their satisfaction with pain relief.

2.3.6 Patient experience of pain and preoperative information

Information about pre and postoperative pain is one of the most frequently requested topics by patients undergoing surgery (Lithner and Zilling, 2000). Providing patients with information about pain management is a quality indicator for effective pain management (Gordon et al., 2002; McNeill et al., 2004; RCoA, 2012), and one of the main functions of the APS (RCoA, 2014). As well as the RCoA, other professional bodies have also supported the provision of preoperative education in clinical practice and recommend providing patients with preoperative information about their treatment options (Macintyre et al., 2010; ASA, 2012; American Pain Society, 2016). Providing patients with preoperative information on different aspects of pain management can facilitate patients in making informed decisions about their treatments (Walker, 2007), and is one of the factors in successful POPM (RCoA, 2012).

The impact of preoperative information on patient experience of pain has been explored in a number of studies. In a randomised controlled trial (RCT), Giraudet-Le Quintrec et al. (2003) compared the efficacy of patient education before total hip arthroplasty with the usual verbal information in 100 patients (intervention group=48; control group= 52). They found that patients in the intervention group experienced

significantly less pain before and after surgery. In another study, Sjoling et al. (2003) examined the impact of preoperative information on pain, anxiety and satisfaction with pain management in 60 patients who underwent total knee arthroplasty in an experimental study with two parallel groups of equal size. They found that postoperative pain declined rapidly in the treatment group, had a significant lower degree of state anxiety and they were more satisfied with their POPM. The latter finding was confirmed in a recent study by Bozimowski (2012) in a prospective study of 50 patients who found that patients who received teaching about pain reported higher satisfaction scores. Niemi-Murola et al. (2007) also found that satisfaction with POPM correlates significantly with received preoperative information and management of pain. In another study, Wong et al. (2010) utilised a quasi-experimental design to assess the effectiveness of a 30-minute educational intervention on pain, anxiety and self-efficacy for 125 patients with musculoskeletal trauma (control, n= 63; experimental, n= 62). They found that the experimental group reported significantly lower pain scores, less anxiety and better self-efficacy up to 7 days during hospitalisation. Recently, Kol et al. (2014) conducted a RCT to investigate the impact of preoperative pain education on 70 patients who underwent thoracotomy (control group= 35, study group=35). It was found that the pain levels and analgesic consumption were significantly lower in the study group.

However, preoperative information has not always been shown to positively affect patients' experience of postoperative pain. Watt-Watson et al (2004a) investigated the influence of preoperative pain education on postoperative outcomes in an RCT of 406 patients who underwent coronary artery bypass graft surgery. Using an 'intention to treat' analysis, they found no significant effects on pain scores between both groups. However, the intervention group (n=202) reported significant reduction in pain-related interference in activities, and fewer concerns about taking analgesics on day 5 than the control group (n=204). In another study, Chumbley et al. (2004) examined the benefits of preoperative information leaflet on 225 patients receiving PCA after major surgery. They found no effects on pain relief or concern about addiction and safety. However, patients in the leaflet group were less confused and became familiar with using PCA more quickly than the control group. Despite the fact that the provision of preoperative information was available to 46-95% of patients in previous studies (Chung and Lui,

2003; Fletcher et al., 2008; Rothaug et al., 2013), many patients were found to have negative beliefs about postoperative pain.

2.3.7 Patients' beliefs about postoperative pain

Patients' beliefs and knowledge about pain relief and pain expectations can be influenced by their past and current experience of pain and information provided to them by staff, relatives or friends (Warren Stomberg and Oman, 2006; Idvall et al., 2008). A number of studies have identified that patients have inadequate knowledge about pain (Carr, 2000; Fletcher et al., 2008; Lorentzen et al., 2012; Weiran et al., 2013). This may explain why patients continue to have low expectations about postoperative pain relief and a high anticipation of experiencing pain after surgery (Carr, 2000; Idvall, 2002; Apfelbaum et al., 2003; Chung and Lui, 2003; Weiran et al., 2013). In a national survey of 250 American patients, Apfelbaum et al. (2003) reported that 75% of patients studied believed that experiencing pain is necessary after surgery. About 59% of patients reported that pain was the symptom of most concerned after surgery. This belief that the pain is to be expected after surgery may have encouraged patients to endure pain, believing it is unnecessary to treat tolerable pain (Idvall et al., 2008; Weiran et al., 2013) and increasing their reluctance to report pain (Middleton, 2004; Carr, 2007).

Patient beliefs and understanding may be a factor that influences patients in reporting their pain. Many people appear to believe that 'good' patients should not talk about pain or distract clinicians from their job (Carr, 2007; Nimmaanrat et al., 2007). Chung and Lui (2003) found that Chinese patients were more reluctant to report pain in public compared to Western patients, and were more driven to appear to be 'good' patients. Similarly, Shoqirat (2014) found that many Jordanian patients prefer to be in pain rather being embarrassed asking for pain medications. Patients also believed that asking for analgesics may upset nurses. Al-Hassan et al. (1999) explained that Jordanian Muslims attribute wellness and illness to the 'will of God'. They value patience and tolerance of pain as evidence of their stronger faith in God. This may lead them to use prayers and religious practices as coping strategies to manage pain, and may also prevent patients from expressing or reporting their pain. More recently, Batiha (2014) found that Jordanian critical care nurses were faced with the patient's

fatalistic beliefs which affected their adherence to pain medications and the reluctance to report pain.

However, reluctance to report pain or request for pain medications is not confined to Jordanian or Chinese culture. Fletcher et al. (2008) found that 94% of 1900 French patients did not request analgesia until they were in severe pain. Equally, Nimmaanrat et al. (2007) reported that 48% of 112 Thai patients requested analgesia only when pain scores were severe and 74% of patients believe that pain medications should be saved until pain gets worse. This indicates that although pain is a universal human experience, there are individual and cultural differences on how patients respond to pain and its treatment.

Another recurrent theme in the literature is patients' refusal to take analgesics because of the fear of addiction and side effects (Apfelbaum et al., 2003; Nimmaanrat et al., 2007; Idvall et al., 2008; Lorentzen et al., 2012; Weiran et al., 2013; Batiha, 2014; Shoqirat, 2014). This fear has led many patients to prefer non-narcotic medications (Apfelbaum et al., 2003), and resulted in the willingness of patients to tolerate pain rather than the side effects of analgesics (Gan et al., 2004; Nimmaanrat et al., 2007; Idvall et al., 2008). This fear has also encouraged patients to use non-pharmacological techniques such as distraction approaches and splints to manage postoperative pain (Santy and Mackintosh, 2001; Idvall et al., 2008).

2.3.8 Summary of Section 2.3 (Patients' experience of postoperative pain)

The prevalence of postoperative pain has been explored by many researchers globally using different pain scales with different definitions of acceptable pain scores, prospective and retrospective design, different sample size and different surgical population. There were large differences in the prevalence of postoperative pain between studies. Therefore, it is difficult to identify meaningful trends over time or between countries and comparison between studies should be interpreted with caution. Nevertheless, there is some evidence to suggest that the prevalence of severe pain at rest is higher in middle-income countries compared to high-income countries. There is also evidence that the prevalence of severe pain in more recent years has decreased compared to the early 2000s.

Unrelieved postoperative pain may result in detrimental physiological and psychosocial consequences at an individual and society level. It may influence patients' satisfaction with POPM and their future postoperative pain experience. Patients who report more pain than they expected are found to rate the quality POPM as lower. The paradox of patients reporting high level of satisfaction while experiencing severe pain is well documented, and can be partially explained by patients' expectation of some degree of pain after surgery.

Providing patients with information about pain management is one of the quality indicators for effective pain management, and one of the main functions of the APS. Preoperative information can reduce postoperative pain and anxiety, and increase patients' satisfaction with their POPM. However, many patients are reluctant to report pain, request pain medications, or refuse to take analgesics because of the fear of addiction and side effects. This fear may lead patients to prefer non-narcotic medications and may affect the adherence to POPM options.

2.4 Management of postoperative pain

2.4.1 Introduction

Understanding patients' experiences is key to effective postoperative pain management, but it is also necessary for clinicians to remain up to date with best practice and new technologies. Effective treatment of postoperative pain is fundamental to the provision of good quality care (McQuay et al., 1997; General Medical Council, 2013), and a number of professional bodies have published recommendations and guidelines to improve the quality of acute pain management. The first recommendations and guidelines were established by the Royal College of Surgeons of England and the College of Anaesthetists (1990) in the UK, the AHCPR (1992) and American Pain Society Quality of Care Task Force (1995, 2005) in the US. Recently the ASA Task Force on Acute Pain Management (2012) has published updated clinical practice guidelines to enhance the effectiveness and safety of acute pain management, including postoperative pain.

The American Pain Society (2005; 2016) and ASA (2012) recommend that traditional practices such as IM injection, pethidine and 'as needed' analgesic administration should be eliminated. They also recommend that multimodal analgesia should be used and, unless contraindicated, patients should receive regular paracetamol or non-steroidal anti-inflammatory drugs (NSAIDs) as part of the multimodal regime. This reflects the recommendation of Gordon et al. (2002) that 'treating pain by route other than IM analgesia' and 'treating pain using multimodal analgesia' should be used as part of standardised quality indicators for acute pain management. The American Pain Society (2016) and ASA Task Force (2012) also recommend the use of advanced POPM techniques such as epidural analgesia, IV-PCA and peripheral nerve blocks under the safe supervision of an APS. The evidence for the efficacy of these techniques will be reviewed in the following sub-sections.

2.4.2 Effectiveness and safety of PCA

PCA is a delivery system that allows a patient to self-administer small doses of analgesic medication to relieve their pain (Momeni et al., 2006). Intravenous PCA is the most commonly used, widely accepted and effective method of delivering opioids

for patients after surgery (Taylor and Stanbury, 2009) which avoids the peaks and troughs of drug levels in the blood associated with IM analgesia (Chumbly and Mountford, 2010). Although many opioids (e.g. fentanyl) have been successfully used for the IV-PCA, morphine is considered the 'gold standard' and most frequently drug used for this modality (Grass, 2005).

There are a number of systematic reviews on the effectiveness of IV-PCA compared with conventional injections of opioids for the treatment of postoperative pain. In a systematic Cochrane review, Hudcova et al. (2006) analysed 53 RCTs and concluded that PCA provided better pain relief and increased patient satisfaction than the intermittent conventional opioids injections (IM, SC, IV). In the PCA group, opioids consumption and incidence of pruritus were higher but there was no difference in the incidence of other side effects or the length of stay. In another quantitative systematic review of 32 randomised trials, Walder et al. (2001) concluded that patients prefer PCA and opioid PCA improved analgesia and reduced the risk of pulmonary complications compared with conventional opioids treatment. There were no differences between both groups in the medications consumption, side effects of opioids or the length of stay. Similarly, Dolin et al. (2002) conducted a comprehensive review and collected pooled data on pain scores within 24 hours after major surgery from 123 studies. They concluded that the mean incidence of 'moderate-severe' and 'severe pain' was lower in the PCA group (35.8% & 10.4%) compared with IM analgesia (67.2% & 29.1%) respectively.

Other systematic reviews have compared the effectiveness of IV-PCA specifically with epidural analgesia in relieving pain after surgery. Wu et al. (2005) performed a meta- analysis of 50 RCTs and concluded that both continuous epidural analgesia (CEA) and PCEA provided significantly superior pain relief (rest and movement) for all types of surgery compared with IV-PCA. The epidural group had significantly lower incidence of nausea and vomiting and sedation, but a higher incidence of urinary retention and pruritus. Likewise, Werawatganon and Charuluxanun (2005) found, in a systematic review of 11 RCTs, that CEA provided significantly better analgesia compared with IV-PCA up to 72 hours in patients who underwent intra-abdominal surgery but had a higher incidence of pruritus. In another systematic review by Dolin et al. (2002) of pooled data from 123 studies on the effectiveness of POPM found that

the use of epidural analgesia resulted in significantly lower incidence of 'moderate-severe' and 'severe pain' (20.9% and 7.8%), compared with IV-PCA (35.8% & 10.4%). Popping et al. (2008a) in a large prospective study of 18,925 patients who underwent major surgery under the care of an APS found that PCEA provided superior analgesia compared to IV-PCA. This data was obtained from the APS database which reflects the routine pain management practice of an APS.

Overall, there is evidence to suggest that IV-PCA is superior to parenteral opioids for pain relief and pulmonary complications. However, epidural analgesia can provide significantly superior analgesia for all types of surgery compared with IV-PCA.

2.4.3 Effectiveness and safety of epidural analgesia

Epidural analgesia is considered the 'gold standard' for POPM (Pennefather et al., 2006). It implies the provision of pain relief by infusion of analgesics into the epidural space via an indwelling catheter. It can be given by CEA or PCEA (Macintyre et al., 2010). Opioids (i.e fentanyl) and local anaesthetics (i.e bupivacaine) are the most commonly used medications for epidural analgesia. It can be given as opioid alone, local anaesthetic alone or in a combination of both drugs. The infusion of a combination of both drugs can provide the best quality of pain relief because they can work synergistically (Wheatly et al., 2001; Pasero, 2003; Ashley and Doraiswami, 2010).

A number of systematic reviews have compared the effectiveness of epidural analgesia with systemic opioid analgesia (IV, SC, and IM) for the treatment of pain for a range of surgeries. A meta-analysis of 100 randomised trials by Block et al. (2003) concluded that epidural analgesia provided significantly better analgesia for all types of surgery and for each day after surgery compared with parenteral opioids regardless of type of assessment (rest or movement), the analgesic drug, and location of catheter placement. The incidence of nausea and vomiting and pruritus were lower in the epidural group. In another meta-analysis of 11 RCTs, Beattie et al. (2001) found that epidural analgesia showed significantly superior analgesia compared to the parenteral forms of analgesia. Similar results have been shown in a number of systematic reviews looking at specific types of surgery. Epidural analgesia has been shown to provide

superior postoperative analgesia than parenteral opioids for patients who underwent open and laparoscopic colorectal surgery (Khan et al., 2013; Marret et al., 2007); elective abdominal aortic surgery (Nishimori et al., 2006, 2012); hip and knee replacement (Choi et al., 2003); and abdominal surgery (Jorgensen et al., 2001). However, the incidence of urinary retention, pruritus and hypotension were more frequent in the epidural analgesia groups (Choi et al., 2003; Marret et al., 2007), and no differences were observed between both groups in the incidence of nausea and vomiting (Jorgensen et al., 2001; Choi et al., 2003; Khan et al., 2013) and respiratory depression (Choi et al., 2003).

A number of systematic reviews have compared the impact of epidural analgesia with systemic opioids analgesia on postoperative morbidity and mortality. In a number of meta-analyses, epidural analgesia compared with the systematic opioids reduced postoperative mortality, myocardial infarction, acute respiratory failure, gastrointestinal complications and renal complications, duration of mechanical ventilation and tracheal intubation, and significantly decreased the risk of supraventricular tachycardia, atrial fibrillation, deep vein thrombosis, atelectasis, pneumonia, and ileus (Beattie et al., 2001; Popping et al., 2008b; Nishimori et al., 2012; Popping et al., 2014). Epidural analgesia also improved the recovery of bowel function, lung function, arterial oxygenation, and reduced the need for reintubation (Popping et al., 2008b; Popping et al., 2014). Systematic reviews in abdominal and colorectal surgery showed that epidural analgesia, compared to systemic opioids, improved return of bowel function (Jorgensen et al., 2001; Khan et al., 2013) and reduced duration of ileus (Marret et al., 2007). However, other systematic reviews did not find differences between epidural analgesia and systemic opioids analgesia on postoperative mortality (Beattie et al., 2001; Nishimori et al., 2012) and the length of stay (Werawatganon and Charuluxanun, 2005; Khan et al., 2013).

2.4.4 Effectiveness and safety of continuous peripheral nerve blocks

CPNB involves the percutaneous insertion of a catheter adjacent to a peripheral nerve followed by continuous infusion of local anaesthetic via the catheter providing postoperative analgesia (Ilfeld, 2011). Ropivacaine and bupivacaine are the most commonly used local anaesthetics for CPNB and it can be administered as boluses or

as continuous infusion via a pump (Xu, 2014). CPNB offer a number of advantages for postoperative analgesia. In two systematic reviews of the literature, CPNB has been shown to reduce dynamic pain scores, opioids side effects, sleep disturbances, decrease of postoperative inflammation of joints, increase of patient satisfaction, restoration of passive joint of motion, decrease in the length of stay and a potential reduction in the incidence of postsurgical chronic pain (Ilfeld, 2011; Aguirre et al., 2012).

There have been several systematic reviews on the effectiveness of CPNB compared to systemic opioids analgesia on POPM. In a systematic review of 19 RCT by Richman et al. (2006) concluded that CPNB analgesia provided superior analgesia compared to systemic opioids regardless of catheter locations and at all times after surgery. A reduction in opioids use and lower incidence of nausea, vomiting, sedation and pruritus were also observed in the CPNB analgesia. Popping et al. (2008a) in a large prospective study of 18,925 patients who underwent major surgery under the care of an APS found that CPNB analgesia provided better pain relief compared to IV-PCA. In another systematic review, Joshi et al. (2008) found that intercostal nerve block and continuous paravertebral block were superior to the systemic opioids analgesia. Paravertebral block reduced the incidence of pulmonary complications compare with systemic analgesia.

A number of systematic reviews have compared the efficacy of paravertebral block and epidural analgesia for patients undergoing thoracotomy. In more recent meta-analysis and systematic review of 12 RCTs, Baidya et al. (2014) found that pain scores at 4-8, 24, and 48 hours after thoracotomy were similar in the paravertebral block and thoracic epidural analgesia groups. Urinary retention and hypotension were more common in the epidural analgesia group. In an updated meta-analysis of 18 RCTs, Ding et al. (2014) concluded that paravertebral block provided comparable postoperative analgesia after thoracotomy compared to epidural analgesia, and the rate of pulmonary complication and morphine use were similar in the first 24 hours after surgery. Paravertebral block reduced significantly the incidence of nausea and vomiting, urinary retention and hypotension. However, a previous met-analysis found that epidural analgesia and paravertebral block provide similar pain relief after thoracotomy, but paravertebral block has fewer side effects and associated with a

reduction in pulmonary complications (Davies et al., 2006). Similar findings have been found in another systematic review by Scarci et al. (2010).

Other systematic reviews have compared the effectiveness of peripheral nerve blocks with systemic opioids analgesia and epidural analgesia after major knee surgery. In more recent systematic review of 23 RCTs, Xu et al. (2014) found that peripheral nerve blocks provided significantly better analgesia compared with systemic analgesia alone at all times periods within 72 hours after knee surgery. In another systematic review and meta-analysis of 8 randomised trials, Fowler et al. (2008) found no significant differences in pain scores, morphine consumption, incidence of nausea and vomiting between peripheral nerve blocks and epidural analgesia after knee surgery. The incidence of hypotension was more frequently among patients who received epidural analgesia. In a recent systematic review, Chan et al. (2014) analysed 45 RCTs that compared femoral nerve block with other forms of analgesia such as IV-PCA and epidural analgesia for patients who underwent total knee replacement surgery. They found that femoral nerve block provided better analgesia than opioids PCA alone, comparable pain relief to epidural analgesia, and less nausea and vomiting and higher patient satisfaction compared with epidural analgesia and PCA alone. Femoral nerve block was also associated with greater knee flexion and lower opioids consumption compared with PCA. To reduce the aforementioned side effects of analgesic agents and enhance pain control after surgery, multimodal analgesia has been recommended (ASA, 2012).

2.4.5 Multimodal analgesia after surgery

Although many of the studies reviewed above have compared and contrasted approaches to pain management, there are many situations in which treatments can be combined. Multimodal or “balanced” analgesia is a strategy that involve the use of more than one class of analgesic agent or modality to enhance analgesia through additive and synergistic effects while reducing the incidence of analgesics’ side effects (Jin and Chung, 2001; Buvanendran and Kroin, 2009; Wu and Raja, 2011). Non-opioid agents are essential components of multimodal analgesia after surgery. Paracetamol and NSAIDs are the most commonly used non-opioid analgesics (Pogatzki-Zahn et al., 2014).

Paracetmol is frequently used in the treatment of postoperative pain as a component of multimodal analgesia (Romsing et al., 2002; Pogatzki-Zahn et al., 2014). Systematic reviews have shown that Paracetamol combined with morphine PCA decreased morphine consumption (opioid sparing effect) but did not reduce the incidence of morphine side effects (Elia et al., 2005; Remy et al., 2005; Maund et al., 2011). In contrast, Apfel et al. (2013), in another recent review showed a significant reduction in postoperative nausea and vomiting when IV paracetaoml given pre surgery or before arrival in the recovery room. In a recent systematic review in orthopaedic surgery, IV-paracetamol reduced significantly postoperative opioid consumption up to 46%, and six out of nine trials reported better analgesia with paracetamol compared to placebo (Jebaraj et al., 2013). Similarly, Tzortzopoulou et al. (2011) found a 30% reduction in opioid consumption in the first 4 hours of IV-paracetamol compared to placebo. Elia et al. (2005) found that the 24 hours opioid requirement was significantly reduced by paracetamol with a mean of 8.3 mg. More recently, Dahl et al. (2014) in a topical review found that paracetamol reduced 24 hours postoperative morphine requirement by 6.3 mg.

The addition of NSAIDs to paracetamol has been shown, in a meta-analysis, to enhance analgesia compared to paracetamol or NSAIDs alone (Hyllested et al., 2002). In an updated systematic review by Ong et al. (2010) revealed that the combination of paracetamol and NSAID was more effective than paracetamol or NSAID alone in 85% and 64% of studies respectively. The pain intensity was 35% and 37.7% less in the studies for the combination than paracetamol and NSAID groups alone respectively. The supplement analgesic requirement was 38.8% and 31.3% less in the studies for the combination versus paracetamol and NSAID groups alone respectively.

NSAIDs may have a significant opioid-sparing effect after major surgical procedures (Buvanendran and Kroin, 2009). A systematic review by Maund et al. (2011) have shown that NSAID or cyclo-oxygenase 2 (COX-2) inhibitors combined with morphine PCA reduced significantly morphine consumption (opioid sparing effect), and NSAID reduced significantly the incidence of nausea and vomiting after surgery but not for Cox-2. Similarly, Marret et al. (2005) in a meta-analysis of 22 RCTs found that the addition of NSAIDs to morphine PCA reduced significantly postoperative nausea and vomiting by 30%, nausea alone by 12%, vomiting alone by 32% and sedation by 29%.

Elia et al. (2005) found that the 24 hours opioid requirement was significantly reduced by NSAID with an average of 10.3 to 19.7 mg and with Cox-2 antagonist by an average of 7.2 to 27.8 mg. In a more recent topical review by Dahl et al. (2014) found that NSAID and Cox-2 inhibitors reduced 24 hours postoperative morphine requirement by 10.2 mg and 10.9 mg respectively with well documented analgesic efficacy.

To facilitate patient's rehabilitation and enhance postoperative recovery may need further multidisciplinary cooperation between anaesthetists, nurses, surgeons, and physiotherapists in the perioperative period (Kehlet and Wilmore, 2002). Such integrated approaches have been named enhanced recovery after surgery (ERAS), fast-track surgery, or accelerated recovery programme. Effective POPM using multimodal analgesia is a necessary part and a prerequisite of ERAS programmes (Kehlet and Wilmore, 2002; Bonnet and Marret, 2007). ERAS programmes represent an expansion of the traditional role of APSs into a collaborative effort in functional recovery (Kehlet and Holte, 2001; Kehlet and Wilmore, 2002; Werner et al., 2002; Kehlet and Dahl, 2003).

It is as we consider the evidence for contemporary best practice in multimodal analgiesia that the significance of the APS begins to emerge. Werner et al. (2002) and Taylor and Stanbury (2009) suggest that the steady increase in the development of APSs has led to an increase in the use of advanced analgesic techniques on surgical wards. The development of APSs may explain why the number of patients with epidural analgesia nursed in surgical wards in the UK increased from 37% in 1997 to 70% in 2004 (Pennefather et al., 2006). Similarly, in a large survey of 18,925 patients treated by an APS in Germany, Popping et al. (2008a) found that 75% of patients received PCEA, 16% received CPNB and 9% received IV-PCA. However, in a survey of 275 patients in a Jordanian hospital without an APS, Massad et al. (2013) found that 66.9% received IM analgesia, 0.01% received epidural analgesia, and none of the patients received IV-PCA. It has been argued that the efficacy and safety of these advanced pain management modalities relies on the supervision of a well-established APS (Viscusi and Schechter, 2006; Ashley and Doraiswami, 2010; Mercadante, 2010; Nielsen et al., 2012).

2.4.6 Summary of Section 2.4 (Management of postoperative pain)

Many recommendation and guidelines have been published to improve the quality of POPM. These guidelines recommend that that multimodal analgesia should be used and, unless contraindicated, patients should receive regular paracetamol or NSAIDs as part of the multimodal regime. They also recommend the use of advanced POPM techniques such as epidural analgesia, IV-PCA and CPNBs under the safe supervision of an APS. The steady increase in the development of APSs has led to an increase in the use of these advanced analgesic techniques on surgical wards. Moreover, the efficacy and safety of these advanced pain management modalities relies on the supervision of a well-established APS. Effective POPM using multimodal analgesia is a prerequisite of contemporary ERAS programmes, calling for an expansion of the traditional role of APSs into a collaborative effort in functional recovery. However, in middle-income countries such as Jordan where the APS has yet to become widely established, there is evidence that contemporary best practice in POPM is not being achieved (Massed et al, 2013).

2.5 Acute pain services

2.5.1 Introduction

As the last section was beginning to argue, contemporary pain management practice has been heavily influenced by the development of the APS. Indeed, APSs emerged in US and Europe in response to evidence of poor postoperative pain control in the 1980s with the desire to improve the quality and safety of POPM. An APS is a specialised multidisciplinary team who assume responsibility for the management of acute pain in a hospital setting. Specialist pain nurses play an important role in all service models alongside anaesthetists, pharmacists and psychologists (The Royal College of Surgeons of England and the Royal College of Anaesthetists, 1990; Breivik, 2002; Werner et al., 2002; McDonnell et al., 2003a; Rawal, 2005). Different American and European APSs models have been described with a steady increase in the number of such services in many hospitals worldwide (Nagi, 2004; Nasir et al., 2011; Van Boekel et al., 2015). The following sub-sections will present an overview of the history and prevalence, structure and functions, and different models of APSs. The review will ascertain the impact of APS on patient outcomes and the knowledge and attitudes of staff towards pain management before examining the perceptions of staff of APS.

2.5.2 Development and prevalence of APSs

Surveys performed in the 1980s showed the incidence of patients experiencing moderate or severe pain after surgery was 37-75% (Cohen, 1980; Donovan, 1987; Owen et al., 1990). This high incidence of postoperative pain coupled with the introduction of advanced pain management modalities led to the establishment of APS to improve the quality of POPM and to manage advanced pain management techniques safely and effectively, with the concept of APS first described in the United States by Ready et al. (1988). In the UK, the Working Party report on 'Pain after Surgery' (The Royal College of Surgeons of England and the College of Anaesthetists, 1990) also highlighted this lack of adequate POPM and made a number of influential recommendations including the development of an APS in all major hospitals performing surgery in the UK. Similar recommendations have been made by many healthcare organisations and professional bodies in Australia (National Health and medical council, 1988), United States (AHCPR, 1992), Hong Kong (HK Hospital

Authority, 1995), Italy (The Italian Society of Anaesthesia Analgesia Resuscitation and Intensive care Medicine- SIAARTI, 2002) and the IASP (IASP, 1992). Since then, the call for APSs has been repeated in many guidelines by a variety of professional bodies (ASA, 1995, 2004, 2012; The Association of Anaesthetists of Great Brittan and Ireland (AAGBI) & The Pain Society, 1997; RCoA & The Pain Society, 2003; AAGBI, 2005, 2010; RCoA, 2009, 2014; American Pain Society, 2016). This support promoted the development of APSs in America (Nasser et al, 2011), Canada (Goldstein et al., 2004a), Europe (Benhamou et al., 2008), Australia and New Zealand (Goucke and Owen, 1993), and Asian countries (Hung et al., 2002; Yao et al., 2006; Jain et al., 2008) with a steady increase in the number of APSs globally.

A survey in Australia and New Zealand showed that 33% of large hospitals had an APS (Goucke and Owen, 1993). In the UK, following the landmark report "Pain after Surgery" (1990) the number of APSs increased dramatically from 2.8 % before 1990 to 44% in 1995 (Harmer et al., 1995; Windsor et al. 1996) with further increase to 88% and 89.4 % in 2000 and 2004 respectively (Clinical Standards Advisory Group (CSAG), 2000; Nagi, 2004). However, the 2010 National Confidential Enquiry into Patient Outcome and Death (NCEPOD) found that 74.6% of hospitals had an APS. Of the 25% of UK hospitals without an APS, the majority were in the independent sector (65%). The previous surveys (CSAG, 2000; Nagi, 2004) did not include the private sector which may explain the difference in the findings of the NCEPOD's survey. Similarly, 71% of the teaching hospitals in the Republic of Ireland had devolved APS (Hu et al, 2007). These figures are comparable to the US where 75% of hospitals had an established APS in 2009 (Nasir et al., 2011), an increase from 42% in 1995 (Warfield and Kahn, 1995). In Canada, the number of APSs in the university-affiliated hospitals has increased from 53% in 1993 (Zimmermann et al., 1993) to 90% in 2004 (Goldstein et al., 2004a). Similar figures have been reported in Hong Kong where 86% of hospitals were running an APS (Hung et al., 2002).

On the other hand, the surveys reveal large variations in the number of APSs in Europe. In a European survey of 105 hospitals from 17 countries, only 34% of hospitals had formal APS (Rawal and Allvin, 1998). In 1999, Stamer et al. (2002) found that 36% of hospitals in Germany have an established APS. Similar figures have

been reported in recent surveys conducted in Italy (Coluzzi et al., 2009) and Denmark (Nielsen et al., 2012) where 42% and 29% of hospitals had established APS respectively, with an increase to 51% in a more recent survey in Italy (Coluzzi et al., 2015). Similarly, in a large survey of 746 hospitals in 7 European countries, it was found that 37% of hospitals had a formal APS with wide variations in the number of APSs, ranging from 21% in Portugal to 73% in Switzerland (Benhamou et al., 2008). In France, APSs were available in only 15% of hospitals (Fletcher et al., 2008). However, a high number of APSs (90%) have been established in many of the hospitals in the Netherlands (Van Boekel et al., 2015). More recently, Erlenwein et al. (2016) found that 81% of hospitals in Germany have an established APS.

Although there is evidence on the development of APSs in some of the middle-income countries such as Egypt (Ayad, 2014) and Jordan (Al-Tawafsheh et al., 2014), and in the high-income countries in the Middle East region such as Saudi Arabia (Anwari et al., 2005), Israel (Barak et al., 2006), there is no data on the prevalence of such services in these countries. Most of these reports were audits of pain management practice under the care of APS or an editorial letter about the Egyptian experience of APS. However, in more recent survey in India, Jain et al. (2015) found that 47% of hospitals established APS. Nevertheless, the response rate in the study is very low (0.04%). It is worth noting that in most surveys reported above, the teaching and university hospitals had organised APSs more frequently than did other hospitals and there were great variations in the structure and functions of APS, as will be discussed in the next sub-section.

2.5.3 Structure and function of APSs

There is a clear consensus that the ultimate goal of the APS is to ensure effective and safe pain relief for all patients with acute pain (Breivik, 2002; McDonnell et al., 2003b; Goldstein et al., 2004b; Rawal, 2005; Macintyre, 2008; RCoA, 2014). To achieve this goal, several authors (Ready et al., 1988; Rawal, 2002; McDonnell et al., 2003a; Backstrom and Rawal, 2008; Upp et al., 2013) and healthcare professional bodies (Pain after Surgery, 1990; AHCPR, 1992; AAGBI & pain society, 1997; RCoA & Pain Society, 2003; AAGBI, 2010; RCoA, 2014) recommend that an APS provision should have the following main components:

- Designated multidisciplinary personnel responsible for the day-to-day organisation of APS and available 24 hours with a minimum of consultant anaesthetist sessions and specialist pain nurses.
- Regular pain assessment, with advice that pain should be regarded as the fifth 'vital sign'.
- Ongoing education and training for healthcare professionals.
- Information and education for patients.
- Protocols and guidelines based on evidence-based practice.
- Liaison with other healthcare teams to achieve preset pain management goals.
- Regular audit of the service and support for research in acute pain management.
- Provision of implementing and supervising advanced pain management techniques such as PCA, epidural and regional analgesia.

Stamer et al. (2002) proposed five quality criteria representing the basic components of an efficient APS. These quality criteria are suggested to improve POPM and include assignment of personnel to POPM; organisation of pain management at night and weekend; written protocols; regular pain assessment at least once a day; and documentation of pain assessment in the patients' chart. Although there is much common ground, there remains a lack of international consensus on the optimal structure or responsibilities of an APS (Rawal and Allvin, 1998; Sanders and Michel, 2002; Gordon et al., 2016). This has resulted in a call for international standards for staffing and facilities of APSs, with clear defined criteria, against which to evaluate and compare the performance of APSs (Harmer, 2001; Rawal, 2002; Sanders and Michel, 2002; Stomberg and Haljamae, 2003).

Many international surveys suggest large degrees of variation in what was thought to constitute an APS (Windsor et al., 1996; Upp et al., 2013; Duncan et al., 2014; Erlenwein et al., 2016). Despite the fact that a multidisciplinary approach is considered essential by many healthcare professional bodies to the successful provision of APS (The Royal College of Surgeons of England and the College of Anaesthetists, 1990; RCoA & Pain Society, 2003; AAGBI, 2010; RCoA, 2014), many surveys suggest significant variability with regard to assigning personnel to the APS. In the UK, the number of hospitals with designated consultant anaesthetist sessions (one session= 4

hours) and specialist pain nurses ranged from 48% and 69% (Sutherland and Michel, 2000) to 93% and 91% respectively (CSAG, 2000). Very few surveys reported the number of other professionals. Nagi (2004) reported that the number of APS with pharmacists was 47%, physiotherapist (12%), psychologists (4.9%), anaesthetists (99%) and pain nurses (91%). Recently, Duncan et al. (2014) established a database named the National Inpatient Pain Study (NIPPS) to understand and reduce the variability of APS provision in the UK. They found that there is a wide variation in the number of pain nurses between hospitals with a range from 1 to 9 nurses and the number of consultant sessions ranged from zero to 5 with 56% providing one session only. Similar variations were also found between countries where the number of APS with anaesthetist sessions ranged from 40% to 100%, the pain nurses (8.1% to 92%) and the pharmacists' involvement ranged from 3% to 33% (Stamer et al., 2002; Hung et al., 2002; Goldstein et al., 2004a; Hu et al., 2007; Nasir et al., 2011; Van Boekel et al., 2015; Erlenwein et al., 2016).

The availability of APS staff around the clock is considered one of the requirements for an efficient APS (Stamer et al., 2002). The surveys of APS showed that only 3-5% of hospitals in Germany (Stamer et al., 2002; Erlenwein et al., 2016) and 5-11% in the UK (The Audit Commission, 1997; Powell et al., 2004) were able to provide a 24-hour cover compared to more recent figures of 26% in the US (Nasir et al., 2011) and 22% in the Netherlands (Van Boekel et al., 2015). Notably, in the majority of hospitals, the on-call anaesthetist was the provider of 'out of hours' services and the 'office hours' model of APS is in operation in most hospitals (Powell et al., 2004; Van Boekel et al., 2015) which may affect the continuity of care. The fact that many patients perceive pain at night as poorly managed (Closs et al., 1999), coupled with the current 'office hours' model of APS suggests this practice is destined to leave many patients in pain (Powell et al., 2004). Despite this Powell et al. (2004) argued that if an APS is well resourced and able to encourage the widespread organisational and attitudinal changes required to overcome barriers to pain management, even the 'office hours' APS would promote and maintain good practice over the 24-hour period. Central to this debate is whether the 'core business' of APS is to provide direct patient care or provide a resource for education and training for clinicians to promote good clinical practice (Rawal, 2005). Counsell et al. (2008) believe that the APS' philosophy should focus

on education and training of staff to disseminate the work of the APS to the ward level.

The APS play a unique role in education and training of staff (RCoA, 2014). However, the surveys conducted show a wide variation in the provision of staff education provided by APSs; the education is less often provided by APSs in Canada (Goldstein et al., 2004a) and the Netherlands (Van Boekel et al., 2015) where 46% and 54% respectively provide such training as compared to the UK (McDonnell et al., 2003b; NCEPOD, 2010), Ireland (Hu et al., 2007) and Hong Kong (Hung et al., 2002) where 83-88% of APSs were reported to provide education and training for staff. Rawal (2005) emphasised that the education and training by APS as well as promotion of good practice based on protocols and guidelines should further optimise POPM and outcomes. Written protocols for POPM is one of the quality criteria of efficient APS as described by Stamer et al. (2002). Whilst this essential element of POPM has been implemented in 100% of the hospitals in Hong Kong (Hung et al., 2002), 97% in the UK (McDonnell et al., 2003b) and the Netherlands (Van Boekel et al., 2015), lower figures have been reported from Germany (62%) (Stamer et al., 2002), US (55%) (Nasir et al., 2011), and India (50%) (Jain et al., 2015). These written pain management protocols should include the minimum requirements of vital signs monitoring and the frequency of pain assessment to standardise pain management practice.

Regular pain assessment is crucial in order to inform acute pain treatment and ensure continuity of care (RCoA, 2012). The majority of hospitals ($\geq$ 97%) with an APS in the UK (McDonnell et al., 2003b), US (Nasier et al., 2011) and the Netherlands (Van Boekel et al., 2015) perform regular pain assessment. In other surveys, pain measurement was routinely performed in 22% of the Hong Kong hospitals (Hung et al., 2002), 40% of Indian hospitals (Jain et al., 2015), 75% of the Canadian hospitals (Goldstein et al., 2004a), and 88% of Germany hospitals (Erlenwein et al., 2016). This wide variation may affect the successful pain management for many patients.

The provision of pre-operative patient information on different aspects of pain management is another factor in successful POPM (RCoA, 2012). Many APSs provided patient information on pain management either verbally or in leaflets. Patient

information was provided by 77% of the UK (CSAG, 2000) and Ireland (Hu et al., 2007) hospitals. Eighty seven percent of the APSs in the Netherlands (Van Boekel et al., 2015) and 95% in Hong Kong (Hung et al., 2002) also provide patient information. The RCoA (2012) suggested that the provision of written patient information on pain management is one of the important quality improvement indicators and should be audited on regular basis.

Whilst audit and research in acute pain management is considered one of the main functions of APS (Ready et al., 1988; The Royal College of Surgeons of England and the Royal College of Anaesthetists, 1990; RCoA, 2014), these activities were inconsistent across APSs. In the UK, 60% (Sutherland and Michel, 2000) to 89% of the APSs were actively involved in audit, 97% undertook audit/research (McDonnell et al., 2003b) and about one- third undertook research in acute pain management. In Denmark, 33% of hospitals were actively engaged in research about POPM. Van Boekel et al. (2015) reported that few APSs in the Netherland participated in pain audit (18%) or research (21%).

There are many reasons for these significant variations in the structure and functions of APSs. Chief among these reasons is the lack of standards for staffing and facilities of APSs (Harmer, 2001; Rawal, 2002; Stomberg and Haljamae, 2003) and the absence of clear definitions of what constitute an APS (Powell et al., 2004; Coluzzi et al., 2009; Van Boekel et al., 2015; Erlenwein et al., 2016). Another possible reason is that some of the APSs have tailored the components of an APS to their local needs (Windsor et al., 1996; Schug, 1998). Indeed, the AAGBI and the Pain Society's guidelines (1997, p. 4) on the provision of pain services stated that there is no definite pattern for the structure or funding of an APS. Each unit must consider its individual requirements and constraints. Another important reason is the lack of funding and resources allocated to APSs (CSAG, 2000; Stamer et al., 2002; Nasir et al., 2011; Erlenwein et al., 2016). In addition, organisational change challenges such as competing clinical agendas, staff shortages, local politics and high workload, along with the lack of a multidisciplinary consensus on the importance of good POPM contribute to the picture of patchy APSs (Powell et al., 2004; Powell et al., 2009). It should be also noted that the retrospective nature of surveys conducted in different countries using non-unified questionnaires and the wide response rates may have

contributed to these variations, as well as the different models of APSs identified in these surveys.

2.5.4 Models of Acute Pain Services

There has been a debate on the ideal model of APS and there are large degrees of variation in what was thought to constitute an APS (Counsell et al., 2008; Upp et al., 2013; Duncan et al., 2014). This is largely to the changing role of the APS over time. The concept of APS, as an acute postoperative pain services, has changed over time and extended to provide a more comprehensive service including the management of acute pain in non-surgical settings, acute on chronic pain, and other major trauma and medical problems (Macintyre, 2008). Therefore, it has been suggested that the term 'in-patient pain service' (Counsell, 2008) or 'acute pain medicine' (Upp et al., 2013; Tighe et al., 2015) is more appropriate title than APS. Changes over time have also seen APS play a major role in the ERAS programme by providing effective multimodal analgesia to reduce the side effects of opioids and facilitate early mobilisation, early oral intake and shorter hospital stay (Kehlet and Dahl, 2003; Bonnet and Marret, 2007; Higgs et al., 2014). Therefore, ERAS programme represent an expansion of the traditional role of APSs and integration of APSs into these perioperative rehabilitation programme has been suggested (Kehlet and Wilmore, 2002; Werner et al., 2002; Kehlet and Dahl, 2003). Others have suggested changing the name of APS to 'surgical rehabilitation services' to reflect the provision of integrated services (Carli and Asenjo, 2003). Furthermore, APSs have moved beyond dealing with POPM and become more involved with outreach critical care services tackling other issues in the postoperative care such as fluid therapy, oxygen therapy, and nausea and vomiting (Counsell, 2001). Story et al. (2006) proposed a team called in-patient management of acute pain and advice on clinical treatment (IMPACT). This team consists of both physician-based critical care outreach and APS teams comprising both anaesthetist and pain nurses. They showed that APS providing critical outreach service may decrease the incidence of adverse events and mortality. Others have established an APS to suit their local needs. Leykin and Pellis (2006) developed a post-anaesthesia care unit (PACU)-based APS model without requiring additional staff. The PACU run by anaesthetist and 3 nurses acts as an APS coordination centre. PACU nurse monitor patients twice daily and report back to the anaesthetist. More

recently, Borracci et al. (2016) developed an anaesthesia-resident APS model in a university hospital in Italy. A resident run the service on daily basis from 8am to 8pm and during night the ICU resident is on call for the APS.

However, the main APS models vary from the anaesthetist-based APS developed in USA by Ready et al. (1988) to the nurse-based, anaesthetist-supervised model described by Rawal and Berggren (1994) in Europe. The anaesthetist-based APS was first established as a multidisciplinary team consisting of staff anaesthetist, anaesthetist resident, pain fellow, pharmacist and a clinical nurse specialist (Ready et al., 1988). It aimed principally to manage postoperative pain using high-tech modalities such PCA and epidural analgesia (Counsell et al., 2008). Daily rounds of all patients receiving high-tech methods are made by the entire team. After normal working hours and on weekends, a pain fellow or anaesthetist resident is on call for the APS. The responsibility for pain management reverts to the surgical team when patients can tolerate oral analgesics (Ready et al., 1988). However, the costs of this US-style APS are high compared to the nurse-based, anaesthetist-supervised model and have been questioned by healthcare funders (Rawal, 2005). In addition, this model usually promotes 'high-tech' pain management and places less attention on improving more simple methods (low-tech) of pain relief such as effective use of systemic opioids (Macintyre and Ready, 2002). Furthermore, only a small number of patients undergoing surgery receive the benefit of the service, and the duration of service provided by the APS to these patients is limited to first few days after surgery (Wong, 2008). It has been argued that an ideal APS should provide optimal pain management for all patients who undergo surgery (Rawal, 1999). Consequently, a 'low-cost' nurse-based, anaesthetist-supervised model has been developed as an alternative to the anaesthetist-based APS model.

The nurse-based, anaesthetist-supervised model described by Rawal and Berggren (1994) is based on the theory that POPM can be improved by providing in-service training for nursing and medical staff, effective use of both low and high techniques modalities. Rawal and Berggren (1994) proposed that regular recording of pain assessment and treatment efficacy 'making pain visible' will lead to better analgesia for all patients. The specialist pain nurse makes daily rounds of all surgical wards providing help with technical problems (PCA and epidural), and refers problem

patients to a designated pain anaesthetist. The pain nurse also provides regular formal and informal education and training for all ward nurses. In this model, the treatment of the individual patient is based on protocols and standard orders. During regular working hours the anaesthetist is available for consultation and on the evening and weekend the anaesthetist is on-call for the service (Rawal and Berggren, 1994). The main advantage of this model is the relatively low cost of $2-3 per patient compared to $200-300 per patient in the American style APS (Rawal, 1997a). Therefore, Rawal (1997b) argued that APS model should be a nurse-based. Nevertheless, not all patients can be treated according to protocol and some need individualised pain treatment (Backstrom and Rawal, 2008). Moreover, Ready (1997), Boezaart et al. (2013) and Upp et al. (2013) argued that anaesthetists are a logical choice to provide pain relief in the postoperative period, as they are familiar with the pharmacology of analgesics, and knowledgeable and skilled in regional analgesia techniques. At the same time, they recognised that a strong collaboration between anaesthetists and nurses is essential for effective management of acute pain.

In the UK and Nordic countries, APSs have been established following two basic models. First, establishing an APS was undertaken by clinicians already involved in chronic pain management. In this model the provision of APS is under the umbrella of a comprehensive pain service with the nurses and doctors providing input into both acute and chronic pain services (Counsell, 2008). In a survey of APS in the UK, 88 % of respondents agreed that the way forward is a comprehensive pain service covering both acute and chronic pain management (Powell et al., 2004). Nonetheless, the integration of APS with chronic pain services may not be appropriate because the practical issues related to POPM are different from chronic pain management. The physicians working in chronic pain management may not be familiar with the day-to-day practical issues of POPM on surgical wards (Rawal, 2005). Moreover, acute and chronic pain services do not sit comfortably together due to the fact that acute pain team work is largely inpatient-based whereas chronic pain team work is based largely in the outpatient setting (Counsell, 2008). The second model, therefore, has been established by clinicians with an interest in improving perioperative care, who see pain management as essential element in patient care during this important period. This model has been developed as a distinct APS separate from the chronic pain team, and in the UK has often been led by a nurse practitioner or clinical nurse specialist

(Counsell, 2008). Nevertheless, the cooperation between acute and chronic pain services remains essential for effective and safe management of complex patients who require input from the chronic pain team (Rawal, 2005; Jack and Baggott, 2010).

Whatever the model chosen, a multidisciplinary approach and effective collaboration among anaesthetists, surgeons, pharmacists, and nurses is seen as essential in the development and successful implementation of APS (Kim and Tobias, 1999; Rawal, 1999; Boezaart et al., 2013; Upp et al., 2013). The role of an anaesthetist varies between APS models; from participating in daily round and having the overall responsibility of APS to a supervisory role where s/he provides leadership and education in acute pain management (Rawal, 1997a; Musclow, 2005; Backstrom and Rawal, 2008; Boezaart et al., 2013). Pharmacists provide an important support for APS in the policies development and in the safe provision of pharmacological management of acute pain (Musclow, 2005; Boezaart et al., 2013; Upp et al., 2013). Specialist pain nurses play an integral role in the development and implementation of APS in all service models alongside anaesthetists, and pharmacists (Gordon et al., 2000; McDonnell et al., 2003a; Engelman et al., 2006). Specialist pain nurses provide leadership through coordination of day-to-day patient management with acute pain and provide an important link between anaesthetists and the ward staff. The specialist pain nurses also provide advice and support in troubleshooting problems on the wards (Park et al., 2000; VanDenKerkhof et al., 2002; Musclow et al., 2002; The AAGBI, 2005, 2010; Sawhney and Sawyer, 2008; Upp et al., 2013). Furthermore, the specialist pain nurses are responsible for formal and informal training in the hospital to ensure safe introduction and implementation of new pain management techniques (Cambitzi, 1996; Kitowski and McNeil, 2002; Sawhney and Sawyer, 2008; RCoA, 2014). Specialist pain nurses also improve collaboration among anaesthetists, ward nurses and surgeons (Rawal, 2002). Likewise, active support and cooperation of surgeons, as major consumers of APS, is crucial for the successful implementation of effective POPM to improve patient's outcomes (Rawal and Berggren, 1994; Goldstein et al., 2004b; Rawal, 2005; Wong, 2008).

2.5.5 The impact of APSs on patient outcomes

As the literature reviewed to date has indicated, implementation of advanced pain management modalities can improve patients' pain relief and reduce postoperative mortality and morbidity (Werner and Nielsen, 2007; Popping et al., 2014). Nevertheless, it is unclear if the APS in and of itself improves outcomes, as systematic reviews and individual studies of the impact of APSs have come to very different conclusions.

Werner et al.'s (2002) systematic review found that implementation of APSs is associated with a significant decrease in postoperative pain ratings and a reduction in the incidence of nausea and vomiting and urinary retention, but the evidence for other benefits is inconclusive. The authors looked at 48 studies containing outcome data including 84,097 postoperative patients. The authors comment, however, that it is difficult to separate the effects of an introduction of APS from the effects of an increased awareness of the importance of postoperative analgesia, improvement in methods of POPM such as PCA and epidural, and improvement in surgical techniques. In this well-argued paper the authors performed a comprehensive review by bringing all these studies together and trying to make sense of the data contained in them.

In another systematic review, McDonnell et al. (2003a) concluded that there is insufficient robust research to assess the effectiveness of APS in improving the quality of analgesia and other postoperative outcomes of adult patients undergoing surgery. Due to large variations in the structure of APSs, coupled with poor quality of study design and most studies being 'before-and-after design' a meta-analysis could not be performed. Similarly, McDonnell et al. (2005) in a retrospective, observational study investigating the relationship between the introduction of APSs and postoperative outcomes, using routine data, concluded that there is no positive evidence supporting the impact of APS on postoperative length of stay or in-patient mortality. Nonetheless, the authors acknowledged that it is possible that APSs do have an impact on the outcomes investigated, but this effect could not be captured in an observational study. In addition, they argue that the strongest evidence regarding the effectiveness of APSs should come from well-designed RCTs. However, it has been argued that the time window for such an approach is well past due to the well-established nature of APSs in

most hospitals and the difficulty of performing a RCT to assess the routine and complex work of an APS (Sauerland et al., 1999; McDonnell et al., 2005).

A number of individual studies have been conducted to examine the impact of an APS on patient outcomes. Many studies, mostly with a before-and-after design, found no positive evidence on patient outcomes after the introduction of APSs (Table 2-3, Appendix 2-1). These studies have shown the lack of impact on pain levels, incidence of side effects, patient satisfaction, mortality, hospital stay and the impact of pain on the activity of daily living. On the other hand, other studies have shown a positive impact after the inception of an APS (Table 2-4, Appendix 2-1). These studies have reported that the presence of an APS reduced pain levels, incidence of side effects, hospital stay, morbidity and mortality, and the impact of pain on the activity of daily living. Individual studies have also reported improvements in patient satisfaction and sleep with an increase in the provision of patient education. How and why an APS achieves these positive outcomes is still unknown. Additionally, the processes through which the APS influences patient outcomes remains unclear (Van Boekel et al., 2015; Gordon et al., 2016). Interestingly, no studies compared the anaesthetist-based APS with the nurse-based/anaesthetist supervised model. As well as the before-and-after design with its recognised limitations, there was a wide variation in the time gap between before and after measurement, and there was variation in design quality between studies. In view of these issues, it is difficult to identify meaningful analysis of the impact of an APS on patient outcomes.

Table 2-3: Studies showed no positive impact of APSs on outcomes

Lack of benefits	References
Pain scores	Pesut B. & Johnson J., 1997; Stacey et al., 1997; Sartain and Barry, 1999 (minor & intermediate)
Incidence of side effects	Gould et al., 1992; Tighe et al., 1998; Sartain and Barry, 1999; Salomäki et al., 2000
Patient satisfaction	Sartain and Barry, 1999; Salomäki et al., 2000;
Length of hospital stay	Sauerland et al., 1999; Stadler et al, 2004; Lee et al, 2010
Mortality	Stadler et al, 2004
Impact of pain on daily living	Salomäki et al., 2000

Table 2-4: Benefits of an Acute Pain Service

Benefit	References
Reduced pain scores	Wheatley et al., 1991; Gould et al., 1992; Coleman and Booker-Milburn, 1996; Gabrielczyk and McGonagle, 1997; Mackintosh and Bowles, 1997; Tsui et al., 1997; Lanigan and Luffingham, 1998; Tighe et al., 1998; Bardiau et al., 1999; Miaskowski et al., 1999; Sartain and Barry, 1999; Sauerland et al., 1999; Salomäki et al., 2000; Bardiau et al., 2003; Stadler et al, 2004; Lee et al, 2010; Buckenmaier et al, 2012
Lower incidence of side effects	Wheatley et al., 1991; Coleman and Booker-Milburn, 1996; Stacey et al., 1997; Lanigan and Luffingham, 1998; Miaskowski et al., 1999; Lee et al, 2010
Shorter hospital stay	Tsui et al., 1997; Miaskowski et al., 1999
Decreased morbidity	Tsui et al., 1997; Stadler et al, 2004; Story et al., 2006
Decreased mortality	Tsui et al., 1997; Story et al., 2006
Reduced impact of pain on activity of daily living	Sauerland et al., 1999; Lee et al, 2010
Improved patient satisfaction	Wheatley et al., 1991; Gould et al., 1992; Coleman and Booker-Milburn, 1996; Gabrielczyk and McGonagle, 1997; Tsui et al., 1997; Tighe et al., 1998; Miaskowski et al., 1999; Sauerland et al., 1999; Buckenmaier et al., 2012
Improved sleep	Tighe et al., 1998; Sauerland et al., 1999
Providing Patient education	Mackintosh and Bowles, 1997; Miaskowski et al., 1999

As above, it could be argued that the improvement in pain relief is due to the advanced analgesic methods used, the use and increasing availability of improved treatment regimens, rather than the presence of the APS *per se* (Counsell et al., 2008). Nevertheless, this is a circular argument in that the introduction of APS has itself led to an increase in the use of advanced pain management modalities in surgical wards (Werner et al., 2002). In some institutions, this widespread use of these advanced methods is only possible because of supervision by an APS (Counsell et al., 2008). Moreover, as Stamer et al. (2002) argue, since no specific quality indicators for APS have been formulated, studies demonstrating advances in POPM depending on APS must be viewed in that light.

2.5.6 Cost-effectiveness of APSs

Cost-effectiveness evaluations of APSs are essential to justify the need for such services in the current economic constraints in healthcare (Werner et al., 2002; Rawal, 2005). Sun et al. (2010), in an editorial review, highlighted many of the challenges in evaluating the cost-effectiveness of APSs. One of the main challenges is the

heterogeneity in the structure and function of APSs across hospitals which makes it difficult to have a conclusive evidence of its cost-effectiveness.

In a systematic review, Lee et al. (2007) found that the cost of APSs for surgical patients from direct and indirect effects were between $2.28 to $5.08/patient/day. They concluded that there was insufficient evidence about the cost-effectiveness or cost-benefits of APS interventions and which model is more cost-effective. They also pointed out that the level of evidence to support the cost-savings of APS intervention was limited to partial economic analysis. The cost savings were based on shorter hospital length of stay, shorter ICU length of stay, decrease nursing time in hospital wards and patients' willingness to pay for PCA at a cost of $10/day for hospitalisation. This is the first systematic review of 10 studies involving 14, 774 patients. The authors acknowledged, however, that there were wide variations in study designs, outcome measures and the methodological quality was poor.

Individual economic evaluations have identified some evidence to support the cost saving associated with APSs (Appendix 2-2). Brodner et al. (2000) have shown that the introduction of PCEA, under the supervision of APS, and as part of the multimodal programme (pain relief, stress reduction, and early extubation) decreased the number of patients who required an ICU stay after surgery. As a result of faster discharge from the ICU, 443 ICU days were saved, corresponding to a net saving of $43/patient. In another study, Tsui et al. (1997) estimated the cost saving from the shorter duration of hospital stay based on calculations before and after the implementation of an APS. The cost saving for the 60 patients who underwent oesophagectomy in the APS group was $9.1/patient. The authors also claimed that the APS reduced hospital costs because patients in the APS-group had a lower incidence of pulmonary and cardiovascular complications and hospital mortality. Tighe et al. (1998) have also shown that the APS saves at least £4.02/patient from the nursing time spent per patient by using time-efficient pain management techniques and this saving is enough to run the APS in their hospital at a cost of £3.5/patient. However, these studies are limited by their partial economic evaluation design and studies with full economic evaluation (assessing both cost-utility and cost-effectiveness analysis) are scarce.

There were only two full economic evaluations in the literature where the cost-utility and cost-effectiveness analysis were described. Stadler et al. (2004) examined the cost-utility and cost-effectiveness of an APS in an observation study utilising before-and-after design. They included 1304 patients in the pre-APS phase and 671 patients in the post-APS phase. The cost-utility analysis (analgesic effectiveness) was measured using the postoperative pain days averted (PPDA) and the cost-effectiveness was measured using the postoperative morbidity, mortality and length of stay. They found that the total cost increased significantly after the inception of an APS ($P<0.001$). There was a minor reduction in the postoperative complications and no changes in the length of stay or hospital mortality. The incremental cost-effectiveness ratio was €350.77/PPDA gained and the authors concluded that the service is cost-effective costing only €19/patient/day. In a more recent study, Lee et al. (2010) assessed the cost-effectiveness ratio of providing high effective pain treatment in a RCT of 199 patients undergoing major surgery under the care of an APS compared to 203 patients in the control group. They found that the APS cost ($48.27) was significantly higher than the control group ($2.65; $P<0.001$). The incremental cost-effectiveness ratio for cost per day with highly effective pain treatment gained was $151(95% CI, $87-546) per patient. They concluded that the APS is cost-effective to provide high effective pain management if the decision makers are willing to pay $546/patient/day. There were no studies however, comparing the anaesthetist-based APS with the nurse-based/anaesthetist supervised model. Nevertheless, Rawal (1997a) estimated the cost of US-style of anaesthetist-based APS between $200 and $300/patient compared to $2-3/patient in the nurse-based/anaesthetist supervised model without conducting a formal cost analysis study. It is noteworthy that the staff cost in most studies contributed to more than 50% of the total APS cost (Badner et al., 1997; Schuster et al., 2004).

It is apparent that there is limited evidence available to draw conclusions on the cost-effectiveness of APS and which model is more cost-effective. This is largely due to the wide variations in the cost estimates between the studies, the different models of APSs, different modalities of pain management (few studies excluded epidural analgesia) and different types of resources were used to calculate the APS cost. Moreover, the indirect benefits of an APS to the organisation, such as spreading good practice, staff and patients satisfaction, and staff education's cost, are difficult to estimate.

2.5.7 The impact of APSs on clinicians' knowledge and attitudes towards pain management

As well as the impact on patient outcomes and service costs, it is important to review the influence on the APS on the practice of their colleagues. The APS plays a unique role in education and training of healthcare professionals concerning pain management (RCoA, 2014). Many studies have shown that healthcare professionals have deficits in knowledge and attitudes toward pain management (Broekmans et al., 2004; Zanolin et al., 2007; Zhang et al., 2008; Al Qadire and Al Khalaileh, 2014), and it is worth noting that none of these studies mentioned the presence of an APS in their institution. Mackintosh and Bowles (2000, p 124) stressed that 'if APSs are to have a long-standing and significant impact on the quality of pain management, they must directly influence the knowledge and beliefs of nurses' because the nurses' knowledge and beliefs about pain are a fundamental part of their ability to assess and manage pain effectively. It is suggested that 91 to 93% of pain nurses provide ongoing education for staff about pain management (VanDenKerkhof et al., 2002; Musclow et al., 2002; Sawhney and Sawyer, 2008), and spend 35 % of their time in education and training of hospital staff (CSAG, 2000). The majority of teaching provided by the pain nurses is performed informally in the clinical areas (92%) and 87.5% performed formally (Cambitzi, 1996). Despite this commitment to education and training and the fact that the teaching of ward nurses by the clinical nurse specialist has led to an increase in the use of advanced analgesic techniques in surgical wards (Ready et al., 1988, Werner et al., 2002), there has been little research looking at the impact of APSs on knowledge and attitudes of clinicians about pain management.

In relation to nursing, Mackintosh and Bowles (2000) examined the effect of an APS on UK nurses' knowledge and beliefs about postoperative pain. They replicated an earlier study which took place before the introduction of the APS. A validated closed–ended questionnaire developed by Davis (1988) was used, which was identical to the tool used in the baseline survey. Sixty three nurses answered the questionnaire (response rate 52.5 %) from the same surgical areas in the hospital covered in the baseline survey. Mackintosh and Bowles reported that there is a trend to suggest that the APS positively influenced the nurses' knowledge and attitudes about pain, but their findings were not statistically significant. However, the design of this study had many

flaws; there was a four year gap between the baseline data and the replication study and a relatively small sample size. In addition, the authors acknowledged that it was impossible to determine if the nurses who participated in the baseline study were the same nurses who responded to the replication study.

In a survey with a larger sample (286) of nurses and midwives in New Zealand, Barton et al. (2004) found that nurses and midwives who were unaware of an APS in their institution had significantly lower scores on knowledge about pain management ($P<0.0001$). In this study, a 29-item questionnaire was adapted from Van Niekerk and Martin (2001), and distributed to all clinical areas in the hospital. Despite the large sample size, there were again limitations in the study design. The authors failed to report the reliability and validity of the questionnaire and it is unclear whether the APS have input in all clinical areas studied. The comparison between the two groups (aware, unaware) indicates that 20% of their staff were unaware of the presence of APS in the hospital. This indicates poor communication of the pain team with the hospital staff.

In contrast, Atkinson et al. (1999) found all surgical nurses surveyed in New Zealand ($n_1=127$ and $n_2=119$) were aware of the presence of APS at their hospital. They conducted two surveys in surgical wards using a 13-items questionnaire. They found that the introduction of APS had changed practice and attitudes regarding POPM, and the members of an APS performed important role models for this change. Moreover, nursing knowledge of advantages and disadvantages of PCA and epidural analgesia was improved in the second survey. The nurses in the second survey felt that PCA and epidural analgesia increased mobilisation and reduced the nursing time spent on delivering the analgesia. The attitude of nurses on the addiction potential of PCA has also changed positively in the second survey. Nevertheless, the two surveys were performed five years apart using a non-validated questionnaire, so the results should be treated with caution.

Similar to nursing, there has been little research looking at the impact of APSs on the attitudes of physicians and no research looking at the impact of APSs on their knowledge about pain management. McLeod et al. (1995) examined the attitudes of 36 nurses and 12 house officer towards PCA in a hospital in Scotland. Staff members

were distributed equally between two units; one with access to an APS and one without. They found that the clinicians with access to an APS were more optimistic about the benefits of PCA than those in the unit without access to an APS; they were also less concerned about the side effects. Only 4.3% of staff on the unit with access to an APS thought that the PCA carried a risk of drug addiction, compared to 55% in the other unit ($P<0.001$). However, this study used a small sample size assessing the perceptions of staff about PCA using a non-validated questionnaire within the same hospital.

In a recent study, Manzoni et al. (2012) assessed doctors and nurses' attitudes towards pain management in Italy using a non-validated questionnaire which was developed by the authors for this study. A small sample of 32 doctors and 63 nurses completed the questionnaire (87% working in units with access to an APS 'APS-group'; and 67% without access to APS 'no-APS'). They found that 68% of staff in the APS-group believed that patients should expect some sort of pain after surgery compared to 81% in the no-APS-group; 31% in the APS-group believed that pain medications are dangerous drugs with many side effects compared to 44% in the no-APS-group. They also found that 67% of staff in the APS-group routinely use the NRS for pain assessment compared to none in the no-APS-group. Interestingly, 9% of the staff in the APS-group have attended pain management courses compared to 33% in the other group. However, 25% of clinicians were unaware of the presence of APS in the hospital and the doctors' specialties were not clear in the study.

It is clear that there is inconsistency in the literature on the impact of APS on clinician's knowledge and attitudes regarding pain. This conflicting evidence is largely due to the poor quality of studies, the wide variability in the time gap between the baseline and the evaluation data and some studies were conducted within the same hospital comparing units with/out access to an APS. Furthermore, no qualitative studies examined the impact of an APS on the healthcare professionals' perceptions towards pain management practice.

2.5.8 Healthcare professionals' perceptions of APSs

Many surveys have assessed healthcare professionals' satisfaction and perceptions of APSs. Libreri (1995) examined nurses' and surgeons' perceptions and satisfaction towards an Australian APS. The 14-item questionnaire was designed by the author and 60 surgeons and 116 nurses completed the survey. She found that the majority of surgeons (90%) and nurses (88%) were either satisfied or would like more involvement by the APS. One third of the surgeons stated that they would prefer the pain service to be managed by the surgical units with APS backup whereas 74% of nurses wanted the department of anaesthesia to manage the service. Three quarters of surgeons and 83% of nurses were satisfied with the efficiency and the APS response. Nevertheless, 50% of surgeons and 74% of nurses stated that the communication needed to be improved between the APS and surgical units and 53% of nurses would like further education. Half of surgeons and nurses indicated that the APS decreased their workload, one third stated no difference and 17% of nurses felt that the workload has increased.

Pesut and Johnson (1997) assessed doctors' and nurses' satisfaction with a Canadian anaesthetist-based APS using a survey and short interviews (5-20 minutes) with 27 nurses guided by open-ended questions. In the survey, 63 nurses and 8 doctors completed the survey giving a response rate of 47%. They found that the mean satisfaction scores ranged from 3.49 to 3.77 (5-points scale) indicating a satisfaction with, techniques and quality of pain management provided by the APS, availability and communication with the APS, and overall satisfaction with the APS. Forty-four percent of nurses indicated that the APS increased their workload; 64% stated that they would like more education in pain management and 59% stated that they were not able to reach the APS at least once in the previous year. In the interview with nurses, the data showed a mixed insight into the availability of the APS; some nurses indicated they appreciated the rapid response of the APS, the regular review of patients' pain by the APS and standardisation of care. However, for some nurses the availability of the APS was a source of concern especially the limited service hours of the APS, and the evening and weekend coverage was provided by an anaesthetist with many responsibilities. Many nurses perceived monitoring patients, troubleshooting pumps, and paperwork required by the APS had increased their workload. Other nurses

commented that the communication between them and the APS did not allow information to flow freely. Moreover, the nurses were in an uncomfortable position due the conflict between surgeons and anaesthetists over the control of pain management. However, the anaesthetists and surgeons were not included in the interviews to understand their views about this claimed conflict as perceived by nurses.

Recently, in a small sample of 35 nurses, 29 doctors and 6 medics at a British Combat Support hospital in Afghanistan, Polomano et al. (2012) examined clinicians' perceptions with the APS using a 15-item questionnaire. They reported that the majority of clinicians agreed or strongly agreed that injured soldiers managed by an APS reported decreased level of pain (65%), obtained better pain relief (74%), and the APS had significant impact on patient outcomes (74%). Nevertheless, 31% believe that the type of analgesia should be decided by the surgical team, and 74% stated that the APS should improve the service by providing education. On a scale of 0-10, clinicians rated how satisfied they were with the APS (mean 7.7), and how beneficial it was for soldiers (7.9). The internal consistency reliability for the questionnaire in this study was 0.82, the face and content validity was obtained by the authors and expert in pain management. However, the questionnaire has not been used in a large sample or in other studies to ascertain this claimed validity and reliability.

In another recent study in Italy, Manzoni et al. (2012) assessed clinicians' perceptions of an APS. A sample of 32 doctors and 63 nurses completed a 38-item questionnaire developed by the authors for this study. It has been reported that 90.5% of clinicians agreed that all hospitals should provide an APS; 79% agreed that the APS improves patient's satisfaction and decrease their pain; 76% stated that POPM should be decided by the anaesthetists and 20% would leave it for the surgeons. Only 21% stated that the APS reduce hospital costs and 64% indicated that the APS should have a dedicated staff 24 hours. However, 25% of clinicians were not aware of the presence of an APS in their hospital.

There were also other studies which looked at the perceptions of a single profession towards an APS. Chan et al. (2008) conducted a study to assess surgeons' attitudes and perceptions towards an APS in Hong Kong. One hundred and four surgeons completed

a 33-item questionnaire developed by the authors. They found that 88% of surgeons agreed that hospitals should have an APS and anaesthetists should be involved in POPM; 67% agreed that patients managed by the APS would experience less pain, 54% thought that the APS had a significant impact on patient outcome, and 85% were satisfied with service. The majority of surgeons agreed that the service could be improved by better teaching for staff (92%), a better referral system (80%), and better communication (74%). One third of the surgeons still wanted to maintain an active role in POPM including the choice of pain treatment modalities and termination of PCA and epidural analgesia. This may suggests a conflict between teams as POPM falls within the remit of APSs. Nevertheless, the authors suggest that since both teams work together on a daily basis, improving relationships between them can benefits both teams and ultimately improve patient care.

In another study with a small sample of 36 nurses in New Zealand, Gleeson and Carryer (2010) examined nurses' satisfaction with the APS using a questionnaire. They reported that 50% of nurses strongly agreed that APS was available when required, and that APS members communicate well with staff. All nurses indicated that the education provided by the APS staff was adequate and were satisfied in general with the APS. Nonetheless, the nurses would like the service to be 24 hours, would like more education and believe that the use of advanced analgesic techniques by the APS increased their work load. The nurses' perceived increase in work load related mainly to increased monitoring, additional syringe and bag changes. Therefore, only 39% would like to see more use of epidural analgesia.

It is clear that many clinicians were satisfied in general with the APSs. They believe also in the value of APS in improving the quality of pain management in a hospital and all hospitals should have an APS. There is discrepancy in the literature with regards the satisfaction of staff about the availability and communication of APSs and many staff would like more education and a 24 hours service. There were divergent views on the impact of APS on clinicians' workload. Similarly, many surgeons would like to manage postoperative pain in the surgical wards leading to a conflict between both teams. Nevertheless, the majority of studies used a non-validated questionnaire to assess staff's perceptions about the APS. Only one study examined the nurses' views

of an anaesthetist-based APS using short interviews. No qualitative studies examined the surgeons and anaesthetists' perceptions of APSs.

2.5.9 Summary of Section 2.5 (Acute pain services)

Different models of APSs have developed worldwide to improve the quality of pain relief in hospitals with steady increase in the number of such services in many hospitals globally with no evidence available on the number of APSs in the Middle East. However, there are variations in the structure and function of APS between and within countries. Although many authors and professional bodies have recommended the main basic components of an APS, there is a lack of international consensus on the optimal structure and functions of an APS. At the least, a multidisciplinary approach and effective collaboration among anaesthetists, surgeons, pharmacists, and nurses is essential in the successful implementation of all APS models.

Many studies have examined the impact of APSs on patient outcomes. Systematic reviews and individual studies of the effectiveness of APS in improving the quality of analgesia and postoperative outcomes of adult patients undergoing surgery have come to very different conclusions. Most of these studies were before-and-after designs with wide variation in the time gap between before and after measurement. Furthermore, these studies looked at specific outcomes in terms of immediate postoperative patients without investigating how patients perceive the overall quality of POPM in the hospital using the SCQIPP questionnaire (Idvall et al., 2002a). In addition, what remains unknown in the literature is exactly how and why an APS achieves these positive outcomes**.** Moreover, the processes through which the APS influences patient outcomes remains unclear.

There has been little research looking at the impact of APSs on knowledge and attitudes of clinicians, and no research looking at the influence of APSs on physicians' knowledge about pain management. There is a clear inconsistency of the benefits of APS on clinician's knowledge and attitudes regarding pain. This conflicting evidence is largely due to the wide variability in the time gap between the baseline and the evaluation data and some studies were conducted within the same hospital comparing units with/out access to an APS. In addition, none of the studies reviewed here used

the well-known knowledge and attitudes survey regarding pain developed by Ferrell and McCaffery (2008) or included qualitative data to enhance our contextual understanding of the impact of an APS on the attitude of staff towards pain management.

Many studies have examined clinicians' satisfaction and perceptions of the APSs. Although many clinicians were satisfied in general with the APSs, there are inconsistent views on the impact of APS on clinicians' workload and the satisfaction of staff about the availability and communication of APSs. Nevertheless, the majority of studies conducted were quantitative in nature and used a non-validated questionnaire to assess clinicians' perceptions about the APS. No qualitative studies examined the surgeons and anaesthetists' perceptions about the APSs. As the dimension 'perception' reflects opinions, experiences and views, they are difficult to capture in a quantitative study. To understand these perceptions in their specific context an interpretive approach is required.

2.5.10 Conclusion

This literature review has shown that there are large differences in the prevalence of postoperative pain between studies, with some evidence to suggest that the prevalence of severe pain is higher in middle-income countries compared to high-income countries. Patients' knowledge, beliefs, and preoperative expectations about pain can influence the actual postoperative pain experience, patients' perceptions of the quality of POPM and patients' satisfaction with pain relief. The literature review has also suggested that the steady increase in the development of APSs has led to an increase in the use of advanced pain management modalities on surgical wards. The efficacy and safety of these contemporary best practices relies on the supervision of a well-established APS calling for an expansion of the traditional role of APSs into a collaborative effort in functional recovery.

Previous research looking at the impact of APSs on patient outcomes and clinicians' knowledge and attitudes concerning pain has come to different conclusions. This conflicting evidence is largely due to the variation in design quality between studies. Most studies were before-and-after designs with wide variation in the time gap

between before and after measurement. None of the studies reviewed here included qualitative data to enhance our contextual understanding of the impact of an APS on patient outcomes and clinicians' knowledge and attitudes towards pain management. Studies of the impact of APSs on patient outcomes looked at specific outcomes among immediate postoperative patients, without investigating how they perceive the overall quality of POPM in a hospital. How and why an APS achieves positive outcomes is still unknown. Additionally, the processes through which the APS influences patient outcomes remains unclear.

Similarly, clinicians have inconsistent views on the impact of APS on clinicians' workload and the satisfaction of staff varies in relation to the availability, communication of APSs and the involvement of surgeons in POPM work. The majority of studies conducted were quantitative in nature and used a non-validated questionnaire to assess clinicians' perceptions of the APS. No qualitative studies examined the surgeons and anaesthetists' views on this important service.

Therefore, this review has exposed gaps in the evidence concerning the influence of an APS on POPM in relation to the quality of POPM, and the knowledge and attitudes of clinicians relating to pain. It has also highlighted a gap in our knowledge of clinicians' views and perceptions of the APS. It is concluded, therefore that there is a rationale for a further study to develop a deeper understanding of the influence of an APS on POPM.

Having outlined some of the key issues in the literature related to the patients' experience of postoperative pain, treatment of postoperative pain and APSs; the next chapter presents an outline of research methodology and methods.

Chapter Three

3 Research Methodology and Methods

3.1 Introduction

The previous chapter has shown that there are gaps in the evidence concerning the influence of an APS on POPM in relation to the quality of POPM, and the knowledge and attitudes of clinicians relating to pain. The chapter also highlighted a gap in our knowledge of clinicians' views and perceptions of the APS, and the current POPM practice in Jordan. Therefore, to answer these questions a comparative case study was designed to examine this influence by comparing and contrasting two hospitals, one of which has established an APS and one of which has not (hospital-A has APS, hospital-B without APS). The design involves two quantitative elements, a qualitative element and a documentary analysis.

This chapter describes the methodology and methods identified to answer the questions raised in the literature review. It starts with describing the philosophical assumptions underpinning the study and the justification for the multiple-case (embedded) study design. The quantitative (patients and clinicians questionnaire) sections describe the methods utilised for sampling, data collection tools and approach, and data analysis. The qualitative section presents the methods used for sampling, data collection and analysis of the qualitative element of the study. The last section of this chapter discusses the ethical considerations for conducting this comparative case study.

3.2 The philosophical assumptions underpinning the study

Doyle et al. (2009) recommended that researchers need to pursue their research in a selected paradigm to guide the research inquiry. A paradigm is a worldview with a set of assumptions concerning ontology, epistemology, axiology, and methodology (Sandelowski, 2000). The quantitative research is based on positivism and qualitative research is based on interpretivism.

3.2.1 Positivism vs interpretivism

Positivists and interpretivists have different views on what constitutes truth and how it is discovered to advance knowledge. An understanding of this debate is important before discussing pragmatism as a middle position philosophy between positivism and interpretivism. Positivists contend that there is one truth, and view reality as something 'out there' waiting to be discovered (Denzin and Lincoln, 2000, Sale et al., 2002). In this paradigm, the researcher is considered independent and can put aside values to avoid bias in a process of a research inquiry (Doyle et al., 2009). Time and context free generalisation are possible and desirable, and real causes of scientific outcomes can be measured validly and reliably (Johnson and Onwuegbuzie, 2004). In this regard, the independent researcher produces objective and a value-free social science (Veenstra, 1999).

However, Howe (1985) argues that no research study is free from value judgments. Similarly, Johnson and Onwuegbuzie (2004) argue that conducting value-free research is a myth due to the fact that many subjective human decisions are made throughout the research process. Furthermore, Bryman (2001) argued that positivist research designs give insufficient attention to a person's lived experience. Others argue that people's experiences are subjective and embedded in specific social and historical contexts (Silverman, 2001), and in order to understand these experiences a qualitative approach is needed.

In contrast, interpretivists believe that there are multiple realities that are constructed and can be altered by the knower. They contend that reality is not something 'out there', but rather something that is local and socially constructed (Denzin and Lincoln, 2000), and that time and context free generalisations are neither desirable nor possible (Johnson and Onwuegbuzie, 2004). Interpretivists argue that multiple interpretations of people experience are possible with the emphasis on process and meaning (Veenstra, 1999; Sale et al., 2002). In this regard, the researcher is subjective, interact with the study phenomenon and makes his/her values explicit (Johnstone, 2004; Doyle et al., 2009).

With this in mind, although quantitative data will shed some light on the impact of an APS on the quality of POPM and the knowledge and attitudes of clinicians about pain in Jordan, I consider an interpretive approach will be required to explore clinicians' perceptions of the APS and current pain management practice in order to reveal and properly understand them in their specific cultural and political contexts. In my view, both quantitative and qualitative approaches are important and useful. Maintaining a balanced position will allow me to mix and match design components that offer the best chance of answering the research questions (Johnson and Onwuegbuzie, 2004).

It could be argued that quantitative and qualitative research cannot be mixed due to different ontological and epistemological assumptions underlying each paradigm (incommensurate) and one researcher cannot hold both a positivist and an interpretivist positions (Sale et al., 2002). Nevertheless, Howe (1988) reject the 'incompatibility thesis' and argued that quantitative and qualitative are compatible at the practice and epistemology levels and researchers can forge ahead with 'what works'. Furthermore, with the widening acceptance and practice of combining quantitative and qualitative methods, especially in healthcare research, it has been suggested that the 'incompatibility thesis' is not a 'warranted assertion' and the historical debate have moved beyond the 'paradigm wars' to how best to combine both approaches (Sandelowski, 2000; Carr, 2008; Scott and Briggs, 2009; Ostlund et al., 2011). Pragmatists also reject the 'false dichotomy' between both paradigms and argue that both approaches should be used to understand social phenomena (Creswell, 1994). Morgan (2007, p 48) views a pragmatic approach as a new guiding paradigm that can act as a basis for supporting work that combines qualitative and quantitative methods. In this view, Pragmatism offers us a middle position philosophy to bridge the gap between positivism and interpretivism and can offer justification for combining quantitative and qualitative approaches.

3.2.2 Pragmatism

Sleeper (1986, p 54) defined pragmatism 'as a philosophy rooted in common sense and dedicated to the transformation of culture, to the resolution of the conflicts that divide us'. It draws on many ideas, including employing 'what works', using diverse approaches, and valuing both objective and subjective knowledge (Creswell and Plano

Clark, 2007). In pragmatism what is true is 'what works' (Benton and Craib, 2001); pragmatists use this criterion to determine which method to use to answer the research question (Mertens, 2005). Similarly, Muncey (2009) asserts that fundamental to pragmatism is the belief that the research questions should be the drive for choosing the research design not a paradigm. For James (1904), pragmatism is a way of dealing with conflict between ideas. It is necessary to work out the practical, concrete consequences of particular versions of the world. If no practical difference can be identified, then it is pointless to engage in debate. Johnson and Onwuegbuzie (2004, P 17) suggest that pragmatism offers an immediate and useful middle position both philosophically and methodologically. It offers a practical and outcome-oriented method of inquiry that is based on action and leads, iteratively, to further action and elimination of doubt. Nonetheless, Lincoln (2010) argues that the mixed methods pragmatists tell us nothing about their ontology, epistemology or axiology position.

With regard to logic and epistemology, the positivists' approach is an objective process of deduction whereas the interpretivists' research is subjective and a process of induction. Pragmatists contend that the inquiry is a process of both induction and deduction and that the researcher may be both objective and subjective in epistemology orientation over the course of the research (Tashakkori and Teddlie, 1998). Equally, Rorty (1999, P. xxvi-xxvii) argues that 'there is no way to divide off the contribution to our knowledge made by the object from the contribution to our knowledge made by our subjectivity… there is no way to divide up the relative amount of subjectivity and of objectivity in a given belief'. Moreover, the pragmatic approach relies on a process of 'abduction' which enables a researcher to move back and forth between both induction and deduction through the process of research (Morgan, 2007). Furthermore, a pragmatic epistemology as proposed by Avis (2003, p. 997) is that there are no epistemological differences between any methods of inquiry, in particular between those concerned with 'factual matters' and the others, which deal with 'subjective human experience'.

With regard to ontology, positivists believe that an objective reality exists and interpretivists believe that multiple subjective realties exist. Pragmatists agree with positivist that there is an external world independent of our minds. On the other hand, pragmatists deny that 'truth' can be determined once and for all. They also are unsure

if one explanation of reality is better than another (Tashakkori and Teddlie, 1998). Moreover, pragmatists recognise the existence and importance of the natural world as well as the social and psychological world (Johnson and Onwuegbuzie, 2004). However, for positivists reality is ready-made, complete and waiting to be discovered; for pragmatists it is always in the making (Baert, 2005). In addition, Pragmatists view current truth as tentative and changing over time. What we obtain on a daily basis in research should be viewed as provisional truths (Johnson and Onwuegbuzie, 2004).

In the same vein, I believe that pragmatism is a useful philosophy for finding feasible solutions to carry out research utilizing both quantitative and qualitative approaches; I also see pragmatism as supporting a middle position between paradigms. Similarly, as a pragmatist I believe that the research questions should be the drive for choosing the research design not a method or paradigm. Both quantitative and qualitative data are required in order to answer the research questions. These beliefs have led me to choose a case study design. In case study research, the researcher selects the methodological position most suited to answer the research questions (Rosenberg and Yates, 2007). This pragmatic, rather than paradigmatic approach is congruent with my beliefs as pragmatist and this will enable me to utilise multiple sources of data to answer the research questions. Luck et al. (2006, p. 108) argue that the case study research offers a 'flexible, pragmatic yet rigorous approach to research that is practical for nursing research as well as offering a bridge across the paradigms'. Yin (2009) adds that certain kinds of case studies such as the embedded-case study designs represent a form of mixed methods research (Yin, 2009). Therefore, a comparative embedded-case study design was used in this study.

3.3 Case study research

Case study is a research strategy or design, making use of methods from the qualitative and quantitative approaches as appropriate in relation to the questions being examined (Pegram, 1999; Bryar, 2000). Case study is useful in complex and dynamic contexts where there are multiple, influencing variables (Fitzgerald, 1999). Yin (2009, p. 18) defines case study as 'an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context especially when the boundaries

between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used'.

Yin (2009) discussed three conditions for the design of case study; (a) 'how' or 'why' questions are being posed, (b) the researcher has little control over actual behavioural events, and (c) the focus is on contemporary phenomenon within a real-life context. This comparative case study sets out with the aim to investigate the influence of an APS on POPM in Jordan, a contemporary phenomenon over which we have no control. Furthermore, it explores 'how' or 'why' questions such as 'how and why does the APS in hospital-A influence the quality of POPM?'; 'why and how might an APS improve patient outcomes?', and 'how do clinicians view the APS and POPM practice in their hospitals?'. Applying Yin's three conditions to this study it appears that the case study design is the most appropriate to answer the research questions, with the potential to choose a single or multiple case design using both qualitative and quantitative methods (Luck et al., 2006).

3.3.1 Types of case study

There are many types of case study research. Case studies are broadly considered quantitative, qualitative or both depending on the purpose, research questions, and design (Jensen and Rodgers, 2001; Luck et al., 2006; Yin, 2009). Stake (1995) identifies three categories of case study; intrinsic, instrumental or collective. The aim of intrinsic case study is to obtain a better understanding of a particular case itself. For an instrumental case study, the aim is to provide insight into a particular phenomenon of interest. In the collective case study, the focus is on studying a number of cases to understand a phenomenon, as is more applicable to this study.

Yin (2009) states that case studies can be exploratory, explanatory or descriptive. Exploratory case studies set out to explore any phenomenon in the data which serves as a point of interest to the investigator. The research questions focus mainly on 'what' questions. The aim of descriptive case studies is to describe the natural phenomena which occur within the data in question. For explanatory case studies, the aim is to examine the data closely in order to explain the phenomena in the data. It is also deployed to explain the causal links in real-life interventions in complex cases. The

focus here mainly on ‘why’ and ‘how’ questions. This explanatory type of case studies is congruent with the aims of this study and is more applicable to this study.

Yin (2009) describes four case study research designs based on a 2x2 matrix (Figure 3-1). The holistic design examines the global nature of the case and involves one main unit of analysis for each case either in a single-case or multiple-case design. The embedded design incorporates subunits of analysis within each individual case either in a single-case or multiple-case design.

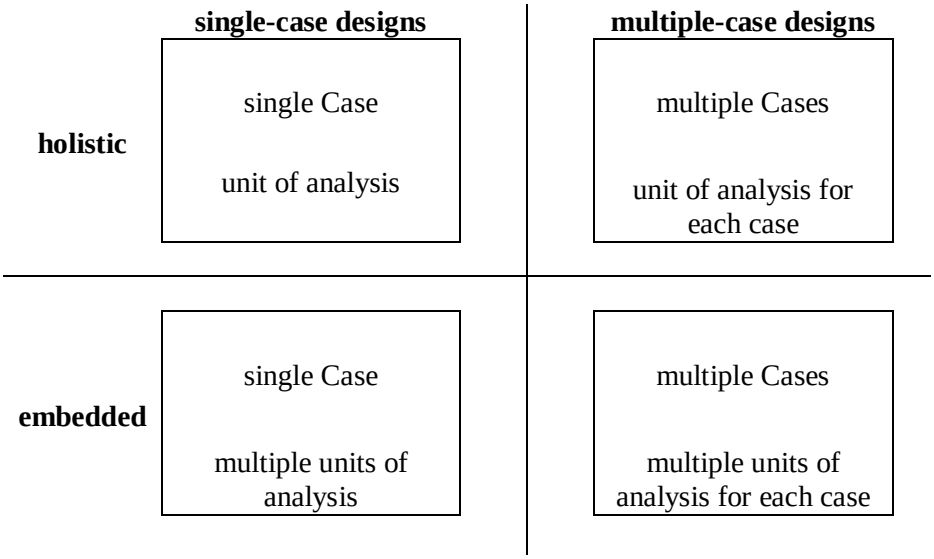


Figure 3-1: Types of designs for case studies

The types of designs used by Yin (2009), especially the multiple-case (embedded) design, reflect the aim of this case study where there were subunits that needed to be examined to understand and explain the phenomenon (the influence of an APS on POPM). According to Yin (2009), the subunits of analysis can add important opportunities for extensive analysis enhancing the insights into the cases. Applied to this research, an explanatory multiple-case (embedded) design was used to compare hospital-A with hospital-B. The two hospitals were chosen as cases to understand the phenomenon. The units of analysis were the two hospitals with multiple subunits within each hospital as the embedded units. The subunits might include outcomes about clinical services (i.e quality of pain management) or hospital staff (i.e knowledge and attitude towards pain and views of clinicians of the APS) (Yin, 2009) (Figure 3-2).

The advantage of choosing a multiple-case approach is that it is considered more convincing and produces more robust results because the use of replication logic in multiple-case studies enhances the strength of the findings (Yin, 2009). Yin (2009, p 54) asserts that "the logic underlying the use of multiple-case studies is the replication, not sampling logic. Each case must be selected so that it either predicts similar results (literal replication) or predicts contrasting results (theoretical replication) based on the initial propositions". The latter is more applicable to this study as it is predicted that there will be differences between both hospitals in relation to the quality of pain management for patients, and the knowledge and attitudes of clinicians relating to pain.

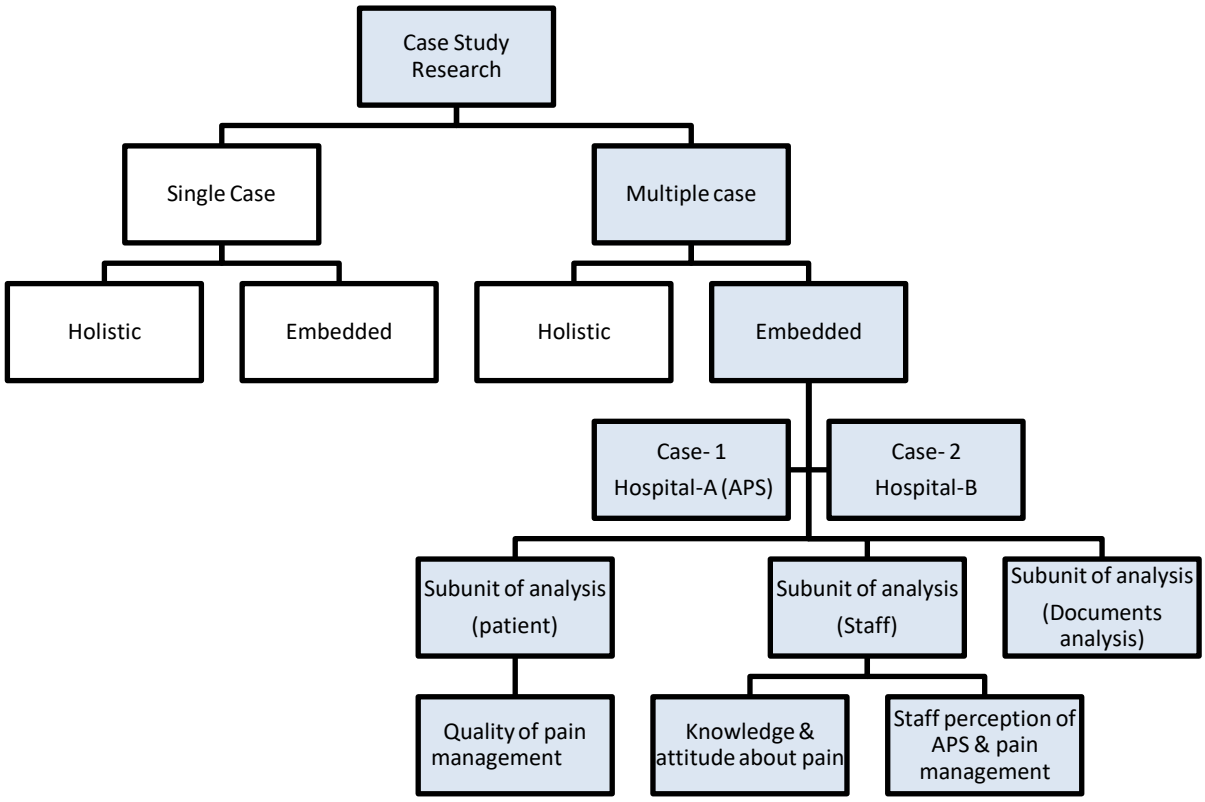


Figure 3-2: Study Design

Some fields used comparative case study as a distinctive form of multiple case studies (Yin, 2009). The aim of the comparative case study is cross-unit comparison as opposed to within unit analysis. It broadens the perspective to include many different entities and offers insight that can be revealed from the comparative analysis (Jensen and Rodgers, 2001). However, Stake (2000) warns that the uniqueness and

complexities will be glossed over with comparison. Nevertheless, the multiple-case (embedded) case study design utilised in this study will allow to tackle the phenomena from different angles to understand its complexities.

Yin (2009) identifies five crucial features of case study design:

- The study's questions.
- Its propositions.
- Its unit(s) of analysis.
- The logic linking the data to the propositions.
- The criteria for interpreting the findings.

Yin (2009) emphasised further that there is a need to define the study questions and the study propositions to ascertain that relevant data to be collected about the case. According to Yin (2009) without the study questions and propositions the researcher will attempt to cover everything about the case. In the current study, the nature of the questions has led to a comparative embedded-case study design as discussed above.

A proposition is similar to a hypothesis that focuses attention to something that should be examined based on the aims and objectives of the study (Yin, 2009). The study propositions help to determine the phenomena and the scope of data collection and analysis about the cases within the time allocated for the study. Clearly, the propositions are useful in guiding the case study data collection and analysis. In this study, the overall theoretical proposition is that the APS will lead to improvement in POPM in Jordan. The specific theoretical propositions are that:

1. The APS will have a positive impact on the quality of POPM, patients' experience of pain and patients' satisfaction with pain management.
2. The APS will have a positive impact on clinician's knowledge and attitude regarding pain.
3. There will be a positive perception among clinicians concerning the APS and pain management practices in Jordan.

In this study, the units of analysis were hospital-A with an APS and hospital-B as a comparator without APS to allow cross-case comparison, with subunits identified

within each case as the embedded units of analysis. Keeping a focus on the three propositions during data collection gave direction to the study and a way of navigating through a large and diverse body of material. Attention was focussed on data that both supported and contradicted the guiding propositions.

3.3.2 Identifying the case

This step is one of the most important aspects of case study research. The case may be simple or complex. The case is specific, purposive, has working parts and is a bounded system (Stake, 2000). For Stake, a hospital or a teacher may be a case but the teaching itself is not as it lacks the specificity and the boundedness. Yin (2009), similarly, defines the case as the primary unit of analysis. The case is an event, entity or a single individual. For Yin a person, a program or an organisation are examples of possible cases. Yin asserts that to justify using a case study method; it is necessary to define a specific, real-life phenomenon, not an abstraction. Yin (2009) warns to avoid cases not easily defined in terms of the beginning or end points of the case. Similarly, Stake (1995) warns the researcher to avoid adopting cases without boundaries stating that these cases are impossible to study.

In this study, both cases were selected from Jordan. Hospital-A is one of the non-governmental, not for profit organizations and was chosen because it has an APS. Hospital-B is one of the teaching hospitals and was chosen as APS is not yet established to allow cross-case comparison.

Hospital-A was founded in 1997 and has around 180 beds including 6 operating rooms with an occupancy rate of 83%. It has around 85 full-time consultants, 97 residents and fellows, and 544 nursing staff. It is one of the best teaching and treatment centres in the Middle East and provides both inpatient and outpatient care. Hospital-A performs many types of surgery including gynaecological, orthopaedic, urological, thoracic and general. It performs around 2600 operation per year with around 25% of operations are classified as major operations. In 2006, the hospital was awarded the Joint Commission International (JCI) accreditation of healthcare organisations and re-accredited in 2009 and 2012 for their high quality of patient care. It was also accredited by the Healthcare Accreditation Council (HCAC) of Jordan in

2009, 2011 and 2015 demonstrating that the hospital applies the national healthcare quality standards for patient care and safety.

In hospital-A, the APS was established in February 2010 and is based on the nurse-based, anaesthetist-supervised model. The APS consists of two anaesthetist consultants, 6 pain nurses, and a specialist anaesthetist (on rotation basis). The APS provide 24 hours cover for acute pain management. Daily morning round of all patients under the care of the APS are made by a consultant anaesthetist, a pain nurse and a specialist anaesthetist. During other time the pain nurses cover the service 24 hours and refer problem patients to the specialist anaesthetist or the consultant if the need arises. The APS review around 267 patients per month with postoperative pain, different type of acute non-surgical pain, and emergency room patients and in-patients referrals for consultations. Of these, around 25 and 31 patients receive IV-PCA and epidural analgesia respectively. The pain nurses also cover the chronic pain clinic from 1400 to 1600 hours, with the availability of a psychologist to support chronic pain patients.

The APS developed pain management policies, PCA and epidural order forms and flow charts, and patient information leaflets about pain management. The APS also provide education and training for staff during the orientation period and on ongoing basis as part of their professional development. The APS perform regular audit of their practice to improve the quality of pain management practice.

The history of interest to improve pain management in hospital-A was started in 2004. During that time, a Canadian group provided pain management training for the staff in the hospital. After that a pain nurse was chosen from the trained group to cover in-patient and chronic pain clinic from 0800 to 1700. However, the pain nurse frequently leaves the hospital, to work overseas, leaving the hospital without a pain nurse. In 2006, the pain management committee was also established to improve pain management standards in the hospital. In 2009, this pain management committee managed to send a head nurse to US for training in pain management for three weeks with the aim to develop the pain nurses team on her return. The head nurse submitted the ‘pain team proposal’ to the hospital administration and it was approved to establish the APS in February 2010. In November 2010, the APS and the pain committee also

organised the first pain management conference in Jordan and soon after conference the pain management committee had their last and final meeting as the APS took the lead for pain management in the hospital.

Hospital-B was founded in 1971 and has around 560 beds with an occupancy rate of 75%. It has around 140 consultants, 165 residents and 800 nursing staff. It is one of the leading teaching hospitals in Jordan and covers all specialities including cancer treatment. It provides a wide range of surgical specialities including gastrointestinal, open heart surgery, urology, gynaecology, orthopaedic and oncology. Hospital-B performs around 1400 operation per month with around 28% of operations are classified as major operations. In 2010, the hospital was awarded the JCI accreditation of healthcare organisations and re-accredited in 2013 for their high quality of patient care. It was also accredited by the HCAC of Jordan in 2009 and 2012 demonstrating that the hospital applies the national healthcare quality standards for patient care and safety.

Although there is not an APS in hospital-B, there is a chronic outpatient pain clinic and an interest to improve pain management in the hospital. The pain management committee was established in 2009. The nursing in-service education department also provides education and training about pain management. The anaesthesia and quality department developed the pain assessment and management policy. However, the pain committee stopped their meetings at the end of 2010.

Both hospitals are tertiary referral centres located in an urban area and known for their high quality of care. The resources, education and training support available to staff and patients in both hospital are similar. There are however, differences between both hospitals. Whilst hospital-A has around 180 beds, hospital-B has around 560 beds; the speciality is also different, hospital-A is specialised in cancer treatment, whereas hospital-B covers a wider range of specialities including cancer treatment. There may also be differences in the conditions and socioeconomic status of the patients as some patients from the neighbouring Middle East countries (especially Gulf region) with higher socioeconomic status are treated in hospital-A. These patients are treated as private patients and can manage to pay the costs associated with the treatment and travel.

3.3.3 Case data

There is no agreed set of methods for case study research. The selection of data collection methods is pragmatically driven to answer the research questions (Luck et al., 2006; Rosenberg and Yates, 2007). It may be a mix of quantitative methods or qualitative or both (Yin, 1999; Jensen and Rodgers, 2001; Luck et al., 2006).

There are many data sources for case study research; examples may include survey, questionnaire, documentation, archival records, physical artefacts, interviews, direct and participant observation (Stake, 1995; Rosenberg and Yates, 2007; Yin, 2009). Yin (2009) contends that the major strength of case study data collection is the use of multiple sources of evidence. He suggests that by using different data collection methods the findings are more convincing and accurate. Furthermore, this will increase the rigour of case study research as it captures information with one method that may be overlooked by another (Giacomini et al., 2000).

Both quantitative and qualitative data were collected in this comparative case study. Data collection was guided by Yin's (2009) recommendations to collect relevant data based on three study propositions within the time allocated for the study. This study adopted the following data collection methods as per the guiding propositions:

- Proposition one: The quality of POPM and patients' experience of POPM; patients questionnaires were used (Quan- 1).
- Proposition two: The knowledge and attitudes of clinicians about pain; Staff questionnaires were used (Quan- 2).
- Proposition three: perceptions of clinicians of the APS and pain management practice; semi-structured interviews were used (Qual- 3).

In addition, different documents were collected from both hospitals to corroborate the evidence gathered from the above sources.

3.3.4 Validity and reliability in case study research

Four tests have been suggested to evaluate the quality of case study research; construct validity; internal validity; external validity and reliability (Yin, 2009). First, to meet the requirements of construct validity, the researcher should identify operational

measures for the concepts in the study. To increase construct validity of a study, Yin (2009) recommends using multiple sources of evidence, member checking, and to maintain a chain of evidence. The chain of evidence allows the reader to follow the source of any evidence from the research questions to case study conclusions.

Second, internal validity is a concern for explanatory or causal case studies that explain causal relationships between variables. Yin (2009) suggests that addressing rival explanations as an analytic strategy is one way of addressing internal validity. By rival explanation Yin means that the results of the study could be related to other influences (confounding factors) besides the intervention in the study.

Third, external validity deals with generalisability of the findings. It is a frequent criticism of case study research that the results cannot be generalised to other population (Jones and Lyons, 2004). Yin (2009) refuted this criticism arguing that case studies, like experiments, are generalisable to theoretical propositions (analytic generalisation) and not to population or enumerate frequencies (statistical generalisation). In analytic generalisation, the aim is to generalise results to broader theory. Yin (2009) suggests using replication logic to increase external validity.

Fourth, reliability means that operations of a study can be repeated with the same results. The aim of reliability is to minimise the errors and biases in case study. A good procedure to increase the reliability of the study is to use case study protocol, establish a chain of evidence and case study database (Yin, 2009).

In this case study, many measures have been applied to enhance the validity and reliability of the study. The study protocol and the comparative multiple-embedded case study design aligned with Yin's (2009) work guided the conduct of this study. Sufficient details have been provided on the methodology, data analysis, findings and interpretation approaches used in this study to enable the reader to make a judgement about the generalisability of the findings to other settings. Multiple sources of data collection based on the study's propositions and replication logic (theoretical replication) were also used in this study. Reliable and validated questionnaires were used to collect the quantitative data. A purposeful sampling strategy was used to select information rich cases in the qualitative element. Moreover, peer checking, rival

explanations, and reflexivity were used during the process of data analysis and interpretation.

3.4 Reflexivity and insider/outsider status

My status as both 'insider' and 'outsider' is influenced by my previous personal and professional experience, motivation and educational background as well as my own Jordanian heritage. However, it is important to note that although I graduated from Jordan with a BSc in nursing and worked as registered nurse in a government hospital from 1993 to 1996, I have never been an employee of hospital-A or hospital-B. I have been working outside Jordan since 1996, including 12 years in the UK (2000-2012). In this regard, participants might have considered me as an 'outsider' – a PhD researcher from a British University. However, due to my clinical experience as specialist pain nurse both in the UK and Qatar (since 2012), coupled with a master's degree in pain management, I consider myself to be both an insider and outsider (Mullings, 1999). Indeed, my previous role as specialist pain nurse in the UK stimulated my interest in the influence of an APS on POPM in my native country of Jordan.

My insider/outsider status meant it was important that I have maintained a degree of self-awareness of my role as a researcher in the process of data collection and analysis (Lambert et al., 2010). Jootun et al (2009) observe that reflecting on the process of data collection and an understanding the influence of the researcher values and preconceptions on the research findings adds credibility to the research. Jootun et al. (2009) also suggested that it is essential for the researcher to enter the research process ignoring preconceptions and beliefs about the phenomenon. However, I do not believe it is possible to entirely ignore my personal and professional experiences, and background knowledge. For this reason, and to minimise this influence as far as possible, I have maintained a degree of self-awareness of my role as a researcher in the process of data collection and analysis.

Many strategies have been employed to promote reflexivity during data collection and analysis to minimise the effect of my role as a researcher on participants' account during the interviews and on the data interpretation. I allowed participants to select the time and location of the interview to lessen the power conferred by my position as a

researcher (Sword, 1999). I explained my role as that of PhD researcher rather than a specialist nurse, reassuring participants of confidentiality, anonymity, and their right to withdrew from the study at any time. This helped participants to become more relaxed during the interview and to speak openly about the research topic (Asselin, 2003). I also attempted to maintain a neutral attitude to participants' information about the phenomena, even when I knew some of the practices would be considered outdated in other contexts. My role was to probe, prompt and encourage the interviewees' opinions of their experience of the APS and pain management practice (Jootun et al., 2009). Furthermore, I maintained an open mind to the data and allowed the transcripts data to dictate the themes during the analysis process, in consultation with my academic supervisors.

3.5 Data collection methods

To answer the research question, four data collection methods were used as outlined in the 'case data' section above. This section describes the sample, data collection instruments, data collection procedure, and data analysis for each element of the study.

3.6 Element- 1: Patient questionnaires (Quan- 1)

The aim of this element was to investigate the impact of an APS on the quality of POPM, patients' experience of postoperative pain and patients' satisfaction with pain management, addressing the first proposition of this case study. To achieve this aim, questionnaires were used to collect the data prospectively from a sample of patients who underwent major surgery in both hospital-A (with APS) and hospital-B (Burns and grove, 2001). Hospital-B was used as a comparison group without an APS.

3.6.1 Sample

The selected sample should represent the target population being studied (Carter, 2000). A nonprobability sampling strategy (convenience sampling) was used in this element of the study because it was not possible to use a randomised sampling strategy to randomise patients into hospital-A and hospital-B in the real-life context. The sample size can be estimated with the use of power analysis (Haber and Singh, 2009a), and the minimum suitable power to use in a study is 80% (Cohen, 1988; Burns and Grove, 2001).

As one of the main functions of the APS is to assist in the effective provision of acute pain relief in the hospital (Macintyre, 2008), the patients' experience of postoperative pain provided the primary outcome measure for this element of the study to calculate the sample size. Pain scores were assessed using the NRS of 0-10, with 0 represents 'no pain' and 10 represent 'the worst pain'. The power analysis revealed that a sample size of 80 (40 from each hospital) was required (Appendix 3-1). This is based on a power of 80%, a significance level of less than 0.05, and a 33% reduction in pain scores using the G*Power 3 software (Faul et al., 2007). The mean pain score (4.65) on NRS and SD (2.41) were taken from Sartain and Barry (1999). A number of studies suggested that a 33% reduction in pain intensity represents the minimum clinically

significant change in acute pain (Farrar et al., 2000; Farrar et al., 2003; Jensen et al., 2003).

It has been suggested however that if the sample size is 100 or more the power is not an issue (Pallant, 2010). For this reason and the potential heterogeneity of the study population, a convenience sample of 100 patients (50 from each hospital) were recruited into the study. Inclusion criteria were designed to assist in sampling potential participants which may help in reducing the heterogeneity of the sample (Burns and grove, 2001).

Inclusion criteria:

- In-patients undergoing elective surgery.
- Patients undergoing major abdominal, thoracic, urological or gynaecological surgery as patients undergoing these major operations would be under the care of an APS (Dolin et al., 2002).
- Age 18 years or over.
- Minimum stay of 30 hours after the surgical procedure.
- Oriented to place and time.

3.6.2 Instruments

Questionnaires are a paper and pencil instrument designed to collect data from participants about knowledge, attitudes, beliefs, feelings and opinions (Burns and Grove, 2001; Whittemore et al., 2009a). Two instruments were used to collect data from the patients:

(a) Patients' demographic data sheet (Appendix 3-2). In this form patients were asked to record a selection of demographic and POPM details. These were gender, age, type of operation performed, medications and pain management methods used after surgery.

(b) The SCQIPP questionnaire (Appendix 3-3) was used in this study with the permission from the author. SCQIPP is an instrument developed specifically to measure the quality of POPM in Sweden. It comprises 14 items in four subscales

(communication- 3 items, action- 4 items, trust- 4 items and environment- 3 items), three questions concerning pain intensity level, and two complementary questions regarding patient satisfaction (Idvall et al., 2002a). The SCQIPP items were assessed by nurses through content validation process as essentials to achieve a high quality of care in POPM in surgical wards (Idvall and Rooke, 1998; Idvall et al., 1999, 2001). The 14 items in SCQIPP were scored on a 5-point scale (1= strongly disagree and 5= strongly agree. The pain intensity level was scored using a NRS of 0-10 (0= no pain and 10= worst pain possible). Satisfaction with pain relief was scored using a NRS of 0-10 (0= very dissatisfied and 10= very satisfied). It takes about 10-15 minutes to complete.

The content, face and construct validity of the SCQIPP has been established (Idvall et al., 1999, 2001, 2002b) and it has good internal consistency with a Cronbach's coefficient alpha of 0.84 suggesting support for the instrument reliability (Idvall et al., 2002b). The SCQIPP questionnaire has been used in other studies with Cronbach's coefficient alpha of 0.88 (Gunninberg and Idval, 2007) and 0.81 (Vatansever and Akansel, 2014) indicating a good reliability for the instrument but none reflects the APS context. In this study, the SCQIPP questionnaire has good internal consistency with a Cronbach's coefficient alpha of 0.727.

The original language of SCQIPP questionnaire is English. In this study, one of the main challenges of using the SCQIPP questionnaire was the translation process into Arabic, so that patients can use it easily. The translation process was undertaken by myself with careful considerations to find equivalent words in Arabic without losing the original meaning. Back-translation was also performed by an expert in translation who is bilingual, ensuring consistency between the English and Arabic versions as suggested by Schaffer and Riordan (2003). Schaffer and Riordan (2003) suggest that careful revision during translation and back-translation are considered among the best practices during translation and it allows experts to examine both versions to establish meaning conformity.

3.6.3 Data collection procedure

Effective recruitment of participants is essential to the success of a study (Burns and Grove, 2001). Before starting data collection I met with the charge nurses/sisters of surgical wards, head of anaesthesia and surgery departments, ethical committee secretaries, and in-service education departments in both hospitals. I explained the aims, objectives of the study and the data collection process, and answered their questions. I also attended handover meetings in the surgical wards to explain the study to the clinicians. I met the directors of nursing in both hospitals; they were supportive of the study and they asked the wards' nurses for their cooperation.

Patients were recruited between July 2011 and October 2011. A research nurse from each hospital was recruited to help with the administration and collection of questionnaires to be able to capture all eligible patients at 24 hours after surgery. Hospital-A, as part of their support for the study, allocated a research nurse to assist with the data collection. With regards to hospital-B, I recruited a research nurse and personally offered a small payment for her time spent on data collection. Patients were identified from the admission list for the surgical wards and theatre list who met the inclusion criteria. Patients were approached by the nurse in charge or their named nurse to take part in the study one day before surgery, where the study package (invitation letter (Appendix 3-4), information sheet (Appendix 3-5), questionnaires (Appendix 3-2 and 3-3) and return envelope) were given. Patients were reminded by the ward nurses that if they wish to participate to complete the questionnaire at 24 hours after surgery as it has been reported that the worst pain was most often experienced on the first day after surgery (Svensson, 2000; Sommer et al., 2008). Some patients received help from a friend or a relative to complete their answers on the questionnaires. The completed questionnaires were collected by the research nurse or the nurses before they finished their shift and the nurses were instructed to put it in a secure box specific for the study. Demographic data were completed from the patient's medical record where a written consent form was obtained from all patients to access these records (Appendix 3-6) as the first few demographic forms received showed that patients did not know the name of some medications used for the treatment of surgical pain. I collected the completed questionnaires from the wards on

daily basis. Consecutive patient recruitment continued until the desired sample size of 100 (50 from each hospital) patients was reached.

Data analysis procedures will be explained in Section 3.9.

3.7 Element- 2: Clinician questionnaires (Quan- 2)

The aim of this element was to investigate the impact of an APS on the knowledge and attitudes of clinicians concerning pain management, addressing the second proposition of this case study. To achieve this aim, questionnaires were used to collect the data from a sample of nurses, anaesthetists and surgeons employed in both hospitals (Burns and Grove, 2001).

3.7.1 Sample

The target population was the nurses, junior anaesthetists and surgeons who are working in the surgical departments, recovery and ICU in both hospitals (Burns and Grove, 2001). A convenience sampling strategy was used to select clinicians (as they will be referred to collectively) from the target population (Haber and Singh, 2009a). The power analysis revealed that a minimum sample size of 76 clinicians (38 from each hospital) was required (Appendix 3-1). This was based on a power of 80%, significance level of less than 0.05, and a 15.6% increase in knowledge scores using the G*Power 3 software (Faul et al., 2007). The mean knowledge score (18.75) and SD (4.48) were taken from a previous RCT (Patiraki et al., 2006).

Many previous studies have used Ferrell and McCaffery's (2008) questionnaire in the evaluation of educational programmes. The increase in knowledge scores varied from 13.3% (Erkes et al., 2001); or 15.6% (Patirakia et al., 2006) to 27% (Zhang et al., 2008), thus the effect size of these educational programmes was high. However, it was not clear whether the effect size of APS on clinicians' knowledge and attitude towards pain management was likely to be of the same magnitude as for the educational programmes evaluated in previous studies. Therefore, for this reason and acknowledging the potential heterogeneity of the study sample, a minimum sample of 100 clinicians (50 from each hospital) was considered appropriate to achieve

sufficient power (Pallant, 2010). Inclusion and exclusion criteria were designed to assist in sampling potential participants which may have helped to reduce the heterogeneity (Burns and Grove, 2001).

Inclusion criteria:

- Qualified nurses and junior anaesthetists and surgeons (residents) with at least 6-months experience in recovery, surgical wards or ICU as they have more contact with the APS and provide POPM care.

Exclusion criteria:

- Consultant anaesthetists and surgeons as they normally delegate to residents to contact the APS for consultation and have less contact with the APS.

It is worth noting that this case study was not investigating the differences in the knowledge and attitude concerning pain management between healthcare professionals groups.

3.7.2 Instruments

Two questionnaires were used to examine clinicians' knowledge and attitude about pain management:

(a) Clinicians' demographic data sheet (Appendix 3-7); in this form clinicians were asked to record a selection of demographic and background details. These were gender, age, professional role, academic qualification, years of experience, current speciality area, and pain management training.

(b) The knowledge and attitudes survey regarding pain (KAP; Appendix 3-8). This instrument is a self-administered survey that comprises 38-items; 22 true/false questions, 14 multiple choice questions and two case studies with two questions each given a total of 40 questions (Ferrell and McCaffery, 2008). It is freely available to use and takes approximately 15-20 minutes to complete.

The KAP instrument was originally developed in 1987 to assess nurses' knowledge and attitudes regarding cancer pain. The tool has undergone several versions and there have been minor edits in version 2008 to assess nurses' knowledge and attitude

regarding cancer and surgical pain. The content of the questionnaire includes aspect on pain assessment, pharmacological and non-pharmacological pain management, and attitude towards pain management (Ferrell and McCaffery, 2008).

Content validity has been established by review of pain experts. Construct validity has been established by comparing scores of nurses at various levels of expertise such as students, oncology nurses, graduate students, and senior pain experts. Test-retest reliability was established (r>0.80) by repeat testing in a continuing education class of 60 staff nurses. Internal consistency reliability was established (Cronbach's alpha r>.70) with items reflecting both knowledge and attitude domains (Ferrell and McCaffery, 2008). This survey has been used in many previous studies with Cronbach's alpha of 0.70 (Zhang et al., 2008) and 0.85 (Rahimi-Madiseh et al., 2010) indicating a good reliability for the instrument but none reflects the APS context. In the current study, the Cronbach's alpha coefficient was 0.615.

The original language of the KAP instrument is English. No translation was performed as all clinicians are able to understand the questionnaire in English (the official language of study in all health sciences in Jordan). However, the names of pain medication normally used in Jordan were added in brackets to the names used in USA such as meperidine (pethidine), and ibuprofen (brufen) to enhance clarity. Three questions were changed slightly to reflect the POPM context. In addition, seven questions were omitted as they are inappropriate for postoperative pain for varies reasons (the drugs are uncommon in Jordan, related to pain in children, cancer pain or drug abuse), reducing the total to 33 questions.

3.7.3 Data collection procedure

Clinicians were recruited between July 2011 and October 2011. The study package (questionnaires (Appendix 3-7 and 3-8), invitation letter (Appendix 3-9), information sheet (Appendix 3-10), and a return envelope) were distributed to all eligible clinicians in their ward and offices by the researcher at the beginning of their duty shift to complete. A total of 145 questionnaires were distributed in hospital-A and 170 questionnaires in hospital-B. Clinicians were instructed to complete the questionnaires as soon as possible and put the completed questionnaires in a secure box specific for

the study. I collected the completed questionnaires from the wards on daily basis. I had planned to send reminder letters (Appendix 3-11) to all eligible clinicians in both hospitals if less than 50 completed questionnaires were received from each hospital. However, this was not required as more than 50 completed questionnaires were received from each hospital.

Data analysis procedures will be explained in Section 3.9.

3.8 Element- 3: Clinician interviews (Qual) and documentary analysis

This element of this case study addressed the third proposition which was designed to explore clinicians' views and perceptions of the APS and current pain management practice. The qualitative data and documentary analysis aimed to provide more contextual information in relation to the findings of the two questionnaire studies, and to develop a deeper understanding of the influence of an APS on pain management practice. The use of qualitative data to explain and provide a greater understanding to the quantitative results in a study is one of the main justifications for combining quantitative and qualitative methods (Sandelowski, 2000; Ritchie, 2003; Onwuegbuzie and Leech, 2005; Bryman, 2006; Carr, 2008).

3.8.1 Sample

A purposeful sampling strategy, and in particular the 'maximum variation approach', was used to recruit clinicians for interview (Patton, 1990). Sandelowski (1995) suggests that maximum variation sampling is one of the most frequently employed types of purposeful sampling and the researcher must decide what kind of variation they want to maximise and when to maximise it. In purposeful sampling, the researcher actively selects the most productive sample to answer the research question (Marshall, 1996). Patton (1990, p 169) pointed out that the power of purposeful sampling lies in selecting information-rich cases, from which the researcher can learn about issues of central importance to the purpose of the research.

As discussed in the previous chapter, the majority of earlier quantitative surveys assessed clinicians' satisfaction and perceptions of APSs used a non-validated questionnaire. Many of these studies found that surgeons would like to manage postoperative pain in the surgical wards, leading to a potential conflict between the APS and surgeons. Only one study examined nurses' views of an APS using short interviews (Pesut and Johnson, 1997). No qualitative studies examined surgeons' and anaesthetists' perceptions of APSs. Therefore, this study sought to more thoroughly explore the perspectives of clinicians who are involved in the management of postoperative pain and who have regular contact with the APS. Utilising this approach of purposely selecting different clinicians with variations in experience, it was anticipated that this would enhance the depth and breadth of our contextual understanding of the influence of an APS on POPM (Morse et al., 2002; Russell and Gregory, 2003).

The original aim was to recruit a minimum of 22 participants (12 from hospital-A and 10 from hospital-B); a mixture of five senior (one doctor and four nurses) and five junior (one doctor and four nurses), with an extra two clinicians (a nurse and an anaesthetist) being from the APS (hospital-A) to understand the history and the implementation process of their team. It was anticipated this sample size would provide sufficient data to adequately answer the research question (Marshall, 1996). However, during the data collection I felt it was important, after a discussion with my supervisors, to interview another three key participants from hospital-B so that a higher degree of saturation might be achieved (Barroso, 2010). Saturating data ensures replication in categories and ensures comprehension and completeness (Morse et al., 2002). Based on this, the interview recruitment process resulted in a sample of 25 participants from both hospitals (12 from hospital-A and 13 from hospital-B; Table 3-1).

Table 3-1: Purposeful sampling strategy

	Number of participants	
Professional Role	**Hospital-A**	**Hospital-B**
Staff Nurse	3	5
Charge/Head Nurse	6	5
Consultant Anaesthetist	1	1
Anaesthesia Specialist/Resident	1	1
Surgery Resident	1	1
Total	**12 ***	**13**
***** including a nurse and an anaesthetist from the APS		

Access to participants is an important consideration when designing data collection methods (Speziale and Carpenter, 2007). In this study, access to potential participants was via an invitation letter attached to the knowledge and attitude questionnaire (Appendix 3-8 and 3-9) where my contact details were provided. Some potential participants who wished to participate in the study contacted me directly to arrange an interview at a time and place of their convenience. Other potential participants returned the slip attached to the questionnaire asking me to call them to arrange an interview. I also attended handover meetings in the wards in both hospitals to explain the study to the clinicians and answered their questions. The consultant anaesthetists received the study package (invitation letter and information sheet) without the questionnaires as they were excluded from the clinicians' questionnaire study.

3.8.2 Qualitative data collection

3.8.2.1 Interviews

Interviews are the most common method of data collection used in qualitative research to explore people's perceptions and opinions on a specific topic (Giacomini et al., 2000; Pontin, 2000). There are three different types of interviews; structured, semi-structured and unstructured interviews (Pontin, 2000). Structured interviews are based on standardised schedule structured in advance to obtain the same sort of information from participants. Unstructured interviews have no predetermined structure of questions or wording to allow participants to talk on issues relevant to them about the topic in focus. Semi-structured interviews lie in the middle position, thus allowing the researcher some choice in selecting questions while supported with a flexible topic guide (Barriball and While, 1994; Pontin, 2000; Pope et al., 2002).

In this study, semi-structured interviews were selected as the most appropriate method for data collection. A semi-structured interview gives interviewer some flexibility in the wording of questions and enables probing for more information and clarification of answers (Barriball and While, 1994). Probing also maximises the potential for interactive opportunities between the participant and interviewer which helps to establish a sense of rapport and reduce the risk of socially desirable answers (Patton, 1990). Nonetheless, in order to ensure that really detailed information is gathered, interview methods require experienced researchers to establish rapport with participants (Pope et al., 2002).

Semi-structured interviews are typically based on a flexible topic guide that provides a flexible structure of open ended questions to explore experiences and attitudes (Pope et al., 2002). The topic guide will maintain a focus, ensure efficient use of interview time, make interviews comprehensive and ensure that all question areas are covered (Hoepfl, 1997; Polit and Beck, 2006). The topic guide for this study was derived from the literature review on APSs and also reflects my own knowledge and experience as a specialist pain nurse (Appendix 3-12).

All of the 25 interviews were face to face and took place at both hospitals. The time and place of interviews were at interviewees' convenience as the setting of an interview affects the content and the more comfortable each participant is, the more likely he or she will share important information (Speziale and Carpenter, 2007; Britten, 2006). Of the 25 interviews, 24 took place either in the seminar rooms or head nurses' offices in both hospitals. One interview (Charge nurse, hospital-B) took place in an empty isolation room as we were moved from the head nurse's office due to the need to conduct an urgent and confidential meeting.

Prior to starting each interview I introduced myself, my role, and thanked participants for taking part in this study. I also explained the aims of the study and participants were offered the opportunity to ask any questions. I checked that participants had read and understood the information sheet, and issues concerning participants' rights, confidentiality and anonymity were explained. Participants were given the option to

conduct the interview in Arabic or English: of the 25 interviews, only two participants chose the English language.

The interviews commenced after a signed informed consent form was obtained (Appendix 3-13). Where possible, the interviews were audio-recorded to ensure that the content of each interview is captured and available to facilitate the analysis process (Pontin, 2000). All participants consented to the audio-recording of their interviews except for one staff nurse from hospital-B, thus taking notes was the way of recording during this interview. The interviews duration ranged from 20 minutes to more than an hour, with an average of around 30 minutes.

All interviews were transcribed verbatim by myself. Of the 25 interviews, 23 were transcribed into Arabic, with the two that were conducted in English transcribed in English. Four written transcripts were fully translated from Arabic into English by myself. In total, there were 6 transcripts in English (3 from each hospital), with each from a different professional group (nurse, anaesthetist and surgeon). My supervisors read these 6 written transcripts in English, thus undertaking a peer review to check and agree the identified themes and the quality of data interpretation as recommended by Pope et al. (2002). Due to time and resources limitations, translation from the remaining 19 Arabic transcripts was performed only for the *quotes* from the interviews, as presented in the qualitative finding chapter.

Along with the procedure for analysing data from the two questionnaires, qualitative data analysis procedures will be explained in the following section (3.9).

3.8.2.2 Documentary analysis

Documentary analysis involves the study of existing documents to understand their content or illuminate deeper meanings on the phenomenon being studied (Ritchie, 2003). Stake (1995) and Yin (2009) stressed that documentary evidence is appropriate to every case study topic. The most important use of documents is to corroborate evidence gathered from other sources. The validity of the documents should be reviewed so as to avoid incorrect data being included in the data (Yin, 2009). In this case study, relevant documents to the study propositions (both in Arabic and English)

were collected during the data collection period. Those documents include pain management guidelines and policies, pain management committee meetings minutes, pain assessment tools, audits and reports, record of education sessions, observation and assessment charts, official publications, patient information leaflets, patient guide, quality booklets, job descriptions, medication prescription charts, and articles written in local newspapers about the hospitals.

These documents enabled me to understand the context of the cases, provide a rich description of the cases and to cross-validate the evidence collected from quantitative and qualitative data. The relevant evidence from these documents is presented in the qualitative data analysis chapter. The permission to access these documents was sought from the director general, director of nursing and the head of anaesthetic departments in both hospitals.

3.9 Data analysis

Although the data collection strategies for the three elements of the case study have been considered independently in the previous sections, it is important to retain the overall integrity of the case study when considering data analysis. In case study research, integrating the analysis of both quantitative and qualitative data is challenging and demanding. Therefore, it is necessary to have an overall analytic strategy to help with analysing the data fairly, consider alternative explanations and produce conclusions (Yin, 2009).

Yin (2009) suggested utilising one or a mixture of analytic strategies and techniques to analyse case study data. In this study, as discussed earlier in this chapter, different data collection methods were used based on the study propositions:

1. For proposition one and two: Patient and clinician questionnaires were used. A descriptive and inferential analyses approach was used to analyse the quantitative data (Donnan, 2000; Whittemore et al., 2009b).
2. For proposition three: Semi-structured interviews were used supported by documentary evidence. The framework analysis approach was used to analyse the qualitative data (Ritchie and Spencer, 2002).

Following the analysis of the three data sets, the findings were synthesised using the analytic techniques recommended for case study research; 'pattern matching', 'explanation building' and the 'rival explanations' approach (Yin, 2009). The pattern matching technique in the form of statistical analysis was used to examine the similarities and differences between both hospitals. Framework analysis was also used to identify patterns in the qualitative data in terms of similarities and divergence in participants' accounts between both hospitals. The explanation building technique was used to explain the patterns identified in both quantitative and qualitative data with a focus, where possible, on providing possible explanations for the findings in the patient and clinician questionnaires. In addition, the rival explanations approach was used to examine other possible influences and to provide alternative explanations for the results. At all times, cross-case synthesis was used to compare the three sets of data collected from a case with an APS (hospital-A) with a comparison case without an APS (hospital-B) to understand the influence of an APS on POPM.

Although synthesis of the findings takes place at the 'case' level, the following two sections discuss the specific procedures for both quantitative and qualitative data analysis in more depth.

3.9.1 Quantitative data analysis (patient and clinician questionnaires)

The Statistical Package for the Social Sciences version-18 (SPSS) was used to perform the statistical data analysis and to display the data in appropriate graphical format. Descriptive and inferential statistics were used to analyse the data (Donnan, 2000). Descriptive statistics in the form of mean, standard deviation, median, range, interquartile range (IQR), and percentages were calculated to summarise, organise and describe the data (Kim and Mallory, 2014). Moreover, the median and IQR was displayed in Box-whisker plot graphs due to the skewed nature of the data. In these types of graphs the minimum and maximum values of the variable under consideration are indicated by the extremities (the whiskers). The median value is indicated by the central horizontal line and the lower and upper quartiles by the corresponding horizontal ends of the box (the 25^{th} and 75^{th} percentiles). The Box- whisker plot as used in this study therefore displays the median and two measures of spread, namely the range and IQR (Campbell and Machin, 2004).

Inferential statistics were used to test the difference between the two hospitals for patient and clinicians questionnaires (Whittemore et al., 2009b). The normal distribution of both patient and clinicians questionnaires was tested before analysing the difference between the two groups and showed that the data were not normally distributed. Therefore, the non-parametric (Mann-Whitney U) test was used to compare the two groups. The Chi-Square test was used for the categorical variables (Anthony, 1999; Pallant, 2010). In all analysis, P- value of <0.05 (two-tailed) was considered statistically significant.

Data from questionnaires were numerically coded and entered into the SPSS software in order to facilitate computer assisted data analysis. Missing data were coded as '999'. Data cleaning was performed prior to the data analysis. Data cleaning involved a series of descriptive statistics on relevant variables in an attempt to check for inaccurate data entry. Data entry errors were corrected by comparing the entered data with that on the original questionnaires.

Total scores were calculated for both SCQIPP and KAP questionnaires. For SCQIPP, The 14 items were scored on a 5-point scale where 1 =strongly disagree and 5 =strongly agree. The total SCQIPP score was summed up for each patient with possible range from 0 to 70. A mean score for SCQIPP which exceeds 4.5 (scale range 1-5) or total score of 63 has been suggested as the level for 'high quality of care' (Idvall et al., 2002a). The KAP survey regarding pain knowledge used in this study consists of 33 questions. Each correct answer was given a score of one and incorrect answer was given a score of zero. Total knowledge score was summed up for each participant with possible range from 0 to 33. The percentage of correct answers was also calculated by dividing the total number of correct answers by the total number of questions (33), with possible range of 0 to 100%. Ferrell and McCaffery (2008) reported that it is helpful to avoid distinguishing between items on the basis of either knowledge or attitudes as many items measure both characteristics. McCaffery and Robinson (2002) suggested that a total score of 80% is 'the minimum acceptable scores'.

3.9.2 Qualitative data analysis

There are many approaches for analysing qualitative data such as narrative analysis, content analysis, grounded theory, framework analysis, conversation analysis and discourse analysis. Each approach has its own focus and aims during the analytical process (Spencer et al., 2003). In this study, interview data was analysed using thematic analysis informed by the framework analysis approach (Ritchie and Spencer, 1994, 2002) because it is systematic, dynamic, comprehensive, allows between and within-cases analysis (Ritchie and Spencer, 1994) offering clarity, an audit trail, transparency and an option for case-based and theme-based analysis (Smith and Frith, 2011; Ward et al, 2013). It also allows the researcher to move back and forth between different levels of analysis stages until a coherent account is developed (Ritchie et al., 2003).

Framework analysis was developed in the 1980s by an independent social research institute in the UK specifically for applied or policy relevant qualitative research (Ritchie and Spencer, 1994, 2002). Although the framework analysis process is similar to thematic analysis, it tends to link the qualitative analysis to findings from quantitative investigation, tends to be more explicit and more strongly informed by a priori reasoning (Pope et al., 2006). Framework analysis has five interconnected stages; familiarisation, identifying a thematic framework, indexing, charting, and mapping and interpretation (Ritchie and Spencer, 1994, 2002).

The five key stages of framework approach were applied to this study as follows:
1- Familiarisation: In this stage, I gained an overview of the collected data and became familiar with their depth and diversity. The aim is to become immersed in the raw data through reading and re-reading of all interview transcripts, listening and re-listening to the audio-recording of the interviews. Having carried out the interviews and transcribed them myself was helpful at this stage to make sense of the data as a whole. During this stage, I noted down key ideas, issues, concepts, recurrent themes from the transcripts by considering each line, phrase or paragraph of the transcripts and using participants' own words whenever possible. Although this process was time consuming, it was a crucial activity at the start of analysis for fuller understanding of

the data (Ritchie and Spencer, 2002; Ritchie et al., 2003; Braun and Clarke, 2006; Ward et al., 2013).

2- Identifying a thematic framework: I used the key issues, concepts, themes that were identified inductively from the immersion in the raw data at the first stage as the basis for constructing the initial thematic framework which I used to sort and reference the data. This was a tentative framework of themes and subthemes for labelling the data into manageable chunks for subsequent exploration and refinement at the later stages of analysis (Ritchie and Spencer, 1994; Pope et al., 2006; Srivastava and Thomon, 2009). At this stage, four themes were identified with 20 subthemes in these, and these formed the initial thematic frameworks.

3- Indexing: I systematically applied the initial framework or index identified in the previous stage to all transcripts by identifying sections or sentences that correspond to a particular subtheme. This process involves reading each printed transcript and annotating the related sub/theme on the margin beside the text and highlighting the corresponding text. I had planned to use the NVivo software for indexing the data but after uploading the transcripts I encountered many technical problems especially with the Arabic transcripts. Thus, I decided to use Microsoft Word and the printed transcripts to index the data. This process allowed me further immersion in the data and helped to refine the draft thematic framework. Refining the framework involves logical thinking, judgments about meaning, connections between ideas, differences and similarities between themes and subthemes (Ritchie and Spencer, 1994). At this stage I recognized that some sub/themes in the draft framework could be adjusted where some could be grouped together and others could be redundant to reflect the data more accurately. The process of framework refinement is subjective and based on different interpretations (Ritchie and Spencer, 1994). However, I maintained an open mind to the data and allowed the transcripts data to dictate the themes refinement. Moreover, my supervisors checked this process of interpretation and offered their constructive feedback.

4- Charting: At this stage the indexed data based on the refined framework are lifted from their original context and placed under appropriate themes and subthemes that have been drawn from the refined framework. I used the thematic approach to organise

the data where under each theme several entries were made from several participants. The same order was maintained where under each theme the entries from hospital-A's participants were made first followed by hospital-B entries. I used the copy and paste method to arrange the summaries of views and the texts keeping the ID number with the original text to trace the source easily without losing the voice of the participants. During this stage the pattern of association within the data started to flourish as a starting point for synthesis and abstraction for the next stage (Ritchie and Spencer, 1994; Ritchie et al., 2003).

5- Mapping and interpretation: At this stage the data have been sorted according to the revised thematic framework to facilitate mapping and interpretation of the data as a whole. Building on the initial patterns, associations and meanings identified on the previous stages, the systematic process of detections, finding associations, providing explanations for the quantitative data, comparing and contrasting the perceptions of clinicians between both cases started with the aim to answer the research questions. This process continued by moving backwards and forwards between the original interview data, interpretations, the quantitative data and the documentary evidence until the whole picture emerged. This process of abduction is aligned with my beliefs as pragmatist that enabled me to move back and forth between the induction and deduction process through the interpretation stage (Tashakkori and Teddlie, 1998; Morgan, 2007). This movement also allowed me to compare the themes and subthemes with the original data and against each other for further refinement of the final thematic framework (Ritchie and Spencer, 1994; Ritchie et al., 2003; Pope et al., 2006). In this stage, the aforementioned analytical strategies and techniques (Yin, 2009) adopted for this case study were used to aid in the interpretation process. To this end, three overarching themes were identified with four subthemes within each theme. The interpretation of these themes is supported by *quotes* to illustrate the analytic points and make sense of the data, and it is presented in the qualitative findings chapter (Braun and Clarke, 2006).

In summary, the study propositions were useful in guiding the case study data analysis. Adopting different analytic strategies and techniques was helpful to integrate the analysis of both quantitative and qualitative data. Using the statistical and framework analysis approaches was useful to identify the similarities and differences between

both hospitals. The explanation building technique was helpful in identifying possible explanations for the quantitative findings as well as highlighting possible rival explanations. Finally, the cross-case synthesis was useful to understand how and why an APS influenced POPM, produce conclusions and to maintain the overall integrity of the case study.

3.10 Ethical considerations

Researchers must ensure that the rights of human subjects are protected to confirm that research is conducted legally and ethically (Morse, 2003; Haber and Singh, 2009b). The rights to informed consent, privacy and dignity, self-determination, and anonymity and confidentiality were respected during the conduct of this study (Haber and Singh, 2009b). The ethical principles of autonomy, beneficence and justice were also maintained (Speziale and Carpenter, 2007).

All potential participants received an information sheet and an invitation letter explaining the aims and objectives of the study, their rights as participants and what is expected from them if willing to take part in the study. They were given an opportunity to ask questions and discuss concerns. This ensured that participants have had sufficient information about the study to enable them to offer informed consent (McHaffie, 2000). For patient questionnaires, written informed consent was obtained from all patients who agreed to take part in the study. For clinician questionnaires, consent was inferred upon returning the questionnaire. With regard to the clinicians' interviews, written informed consent was obtained from all participants before commencing the interviews.

Participants were assured that participation in this study was voluntary and they have the right to withdraw from the study at any time without giving a reason (Burns and Grove, 2001). Participants were also assured that a decision not to take part, or to withdraw from the study, would not affect the benefits to which the participants are due or entitled or patients' standard of care they receive. Although there is no harm or direct benefits from participating in this study, the information gained from this study can be used to improve pain management and services provided for clinicians and patients in both hospitals.

Participants' anonymity and confidentiality were maintained during the conduct of this study (McHaffie, 2000; Burns and grove, 2001). Data collected about participants during the course of this research was kept in secure area and on a password-protected computer and remained strictly confidential. These data can only be accessed by myself and the study's supervisors. For questionnaires, each participant was assigned a study number to facilitate data analysis and maintain anonymity. For interviews, each interviewee was assigned a number, a professional code and a hospital code (i.e HN4A, Head Nurse 4 in hospital-A- Table 3-2) to facilitate comparative data analysis and maintain anonymity. Any information collected about participants and used in reports, publications or conferences was anonymous so participants' names will not be recognized to maintain confidentiality.

Table 3-2: Examples of citation used for the quotes in the qualitative finding chapter

Professional Role/Abbreviations	**Number**	**Hospital**
SN: Staff Nurse	A study number (1-25)	Hospital-A or Hospital-B
CN: Charge Nurse		
HN: Head Nurse		
CA: Consultant Anaesthetist		
AR: Anaesthesia Resident		
SR: Surgery Resident		
Example: HN4A, Head Nurse 4 in hospital-A		

Research involving human subject must be reviewed by local ethics committees to protect participants' right and ensure the research is conducted legally and ethically (McHaffie, 2000; Burns and Grove, 2001). In this study, before starting data collection the ethical approvals were obtained from the local ethics committees of University of Nottingham, Hospital-A and Hospital-B to carry out the study (Appendices 3-14, 3-15 and 3-16).

3.11 Conclusion

This chapter has presented a discussion of the philosophical assumptions underpinning this study and the methods chosen to investigate the influence of a nurse-based, anaesthetist-supervised APS on POPM in Jordan. Following a pragmatic approach, comparative embedded-case study design emerged as the most appropriate research

design to answer the research question. The study propositions guided the types of data collected about the cases. Questionnaires (patient and clinician) and clinician interviews were the primary sources of data collection supported by documentary analysis.

The first element addressed the first proposition of this case study, and was designed to explore the impact of the APS on the quality of POPM, patients' experience of postoperative pain and satisfaction with pain management in a sample of adult patients who underwent major surgery. The second element assessed clinicians' knowledge and attitude concerning pain, thus addressing the second proposition of this case study. For the third proposition, qualitative data was collected to develop an understanding of clinicians' perceptions of the APS and current pain management practice, and, when possible, to provide possible explanations for the quantitative findings.

Different analytic strategies and techniques were adopted to analyse the data as suggested by Yin (2009), including descriptive and inferential statistics and the framework approach.

The following three chapters present the findings, in order, from the patient questionnaires, clinician's questionnaires and the qualitative element. The next chapter, therefore, will begin by presenting the findings of the patient questionnaires.

Chapter Four

4 Patient Questionnaire Results

4.1 Introduction

The previous chapter described the methodology and methods utilised to conduct the case study and explained how the study data was collected and analysed. This chapter presents the results of the first element of the study which was designed to explore the proposition that the APS would have a positive impact on the quality of POPM, patients' experience of postoperative pain and patients' satisfaction with pain management. The sample characteristics are described in the next section. Sections four and five outline the methods and medications used for POPM. The difference between hospital-A and hospital-B in terms of SCQIPP, pain and satisfaction scores is presented in the sixth, seventh, and eighth sections respectively. The last section looks at the patients who experienced pain more than expected.

4.2 Sample description

A total of 113 patients were recruited into the study. Of the 113, 8 patients in hospital-A (with APS) and 5 patients in hospital-B (without-APS) were excluded from the data analysis for various reasons. In hospital-A, two patients were on regular analgesic medication before surgery, two patients were too tired and exhausted to fill the questionnaire, three patients did not return the questionnaire and one patient had undergone a thyroidectomy (neck surgery- exclusion criteria). In hospital-B, three patients completed the questionnaire on day two and two patients did not return the questionnaires. One hundred patients (50 from each hospital) fulfilled the inclusion criteria, completed the questionnaires and have been entered into the study from the surgical departments in the two hospitals.

The demographic details of the sample are listed in Table 4-1. There were 27 female (54 %) in hospital-A, and almost two thirds (n=30) of the sample were female (60%) in hospital-B. In hospital-A, the mean age was 52.2 years, with a standard deviation

(SD) of 12.12 years and the range was from 18 to 71 years. In hospital-B, the mean age was 48.6 years (SD=14.9) with a range of 19 to 79 years.

The distribution of operations is displayed in Table 4-1. In both hospitals the majority of patients underwent abdominal surgery (58% and 56% in hospital-A and B respectively). There was more urological surgery in hospital-B (22%) compared to hospital-A (14%), and more thoracic surgery (10%) in hospital-A than hospital-B (2%), with almost equal number of gynaecological surgeries in both hospitals (18% in Hospital-A vs 20% in hospital-B). The data in Table 4-2 show that there were no statistically significant differences between the two hospitals in age, gender or type of surgery (P>0.05).

Table 4-1: Patients' Characteristics & distribution of operations

		Hospital-A (n=50) n (%)	**Hospital-B** (n=50) n (%)	**P-Value**
Age: Mean (SD)-Years		52.16 (12.12)	48.58 (14.78)	0.135*
	Range	18-71	19-79	
Gender	Male	23 (46%)	20 (40%)	0.686†
	Female	27 (54%)	30 (60%)	
Operations	Abdominal	29 (58%)	28 (56%)	0.305†
	Urological	7 (14%)	11 (22%)	
	Gynaecological	9 (18%)	10 (20%)	
	Thoracic	5 (10%)	1 (2%)	
* Mann-Whitney U Test				† Chi-Square Test
Hospital-A: with APS				Hospital-B: without APS

4.3 Methods of postoperative pain management

The methods of POPM used are displayed in Table 4-2. None of the patients in either group used nerve blocks. Patients in hospital-A used significantly more PCA (P<0.013) and epidural analgesia (P<0.001) whereas patients in hospital-B used significantly more IM analgesia (P<0.001). None of the patients in hospital-B used PCA compared to 6 (12%) of patients in hospital-A. The majority of patients in hospital-A used epidural analgesia (n=38 (76%)), whereas only one patient (2%) used this method in hospital-B. Interestingly, none of the patients used IM analgesia in

hospital-A compared to two thirds (n=32 (64%)) in hospital-B. IV analgesia was used by two thirds (n=32 (64%)) of patients in hospital-B compared to one patient (2%) in hospital-A, and oral analgesia was used equally in both hospitals (n=8 (16%)).

Table 4-2: Methods of postoperative pain management

Methods of postoperative pain management	Hospital-A (n=50) n (%)*	Hospital-B (n=50) n (%)*	P-Value†
Patient controlled analgesia (PCA)	6 (12%)	0 (0%)	0.013
Epidural infusion	38 (76%)	1 (2%)	<0.001
IM analgesia	0 (0%)	32 (64%)	<0.001
Oral analgesia	8 (16%)	8 (16%)	1.00
IV analgesia	1 (2%)	32 (64%)	<0.001
Nerve blocks	0 (0%)	0 (0%)	NA
† Chi-Square Test *NB: %> 100 as some patients used more than one method of analgesia			
Hospital-A: with APS		Hospital-B: without APS	

4.4 Medications used for the treatment of postoperative pain

The medications used for the treatment of postoperative pain are presented in Table 4-3. In hospital-A, it can be seen that 36 patients (72%) used a mixture of fentanyl and bupivacaine in epidural analgesia, and one patient (2%) in hospital-B. For PCA, five patients (10%) used morphine and one patient used hydromorphone, whereas none used PCA in hospital-B. Oral paracetamol was used equally by 7 (14%) patients in both hospitals, but IV paracetamol was used by 29 (58%) patients in hospital-B and by one (2%) patient in hospital-A which explains the high use of IV analgesia as a method for POPM in hospital-B. Oral celecoxib was used by 8 (16%) patients in hospital-A and none of the patients in hospital-B. Interestingly, none of the patients used IM pethidine or IM diclofenac in hospital-A compared to 24 (48%) and 10 (20%) patients in hospital-B respectively.

Table 4-3: Pain medications used for the treatment of postoperative pain

Medications	Hospital-A (n=50) n (%)*	Hospital-B (n=50) n (%)*
Epidural fentanyl & bupivacaine	36 (72%)	1 (2%)
Epidural morphine & bupivacaine	2 (4%)	0 (0%)
PCA morphine	5 (10%)	0 (0%)
PCA hydromorphone	1 (2%)	0 (0%)
IM Pethidine	0 (0%)	24 (48%)
IV Paracetamol	1 (2%)	29 (58%)
Paracetamol oral	7 (14%)	7 (14%)
Morphine IV infusion	0 (0%)	10 (20%)
IM Diclofenac	0 (0%)	10 (20%)
IM Tramadol	0 (0%)	3 (6%)
Tramadol oral	1 (2%)	0 (0%)
Ibuprofen oral	0 (0%)	1 (2%)
Celecoxib oral	8 (16%)	0 (0%)
*NB: % > 100 as some patients used more than one medication		
Hospital-A: with APS		Hospital-B: without APS

4.5 The quality of postoperative pain management

The SCQIPP questionnaire was used to measure the quality of POPM. The normal distribution of the total SCQIPP scores was tested using the Kolmogorov-Smirnov test demonstrating that the data were not normally distributed and were either positively or negatively skewed (Table 4-4). Therefore, the non-parametric (Mann-Whitney U) test was used to compare the two groups. Moreover, the median (Md) and IQR were reported and displayed in Box-whisker plot graphs due to the skewed nature of the data.

Table 4-4: Tests of SCQIPP, pain & satisfaction scores for Normality and Skewness

	Group	Kolmogorov-Smirnov			Skewness	
		Statistic	df	Sig.	Statistic	Std. Error
SCQIPP Total Score	Hospital-A	0.19	50	<0.001	-1.34	0.34
	Hospital-B	0.09	50	0.200	-0.18	0.34
Pain **right** now	Hospital-A	0.17	50	<0.001	1.25	0.34
	Hospital-B	0.11	50	0.190	0.13	0.34
Pain at its **worst** in the past 24 hours	Hospital-A	0.15	50	0.007	0.77	0.34
	Hospital-B	0.24	50	<0.001	-0.94	0.34
Pain at its **least** in the past 24 hours	Hospital-A	0.44	50	<0.001	3.76	0.34
	Hospital-B	0.18	50	<0.001	0.42	0.34
Satisfaction with pain relief	Hospital-A	0.36	50	<0.001	-1.17	0.34
	Hospital-B	0.23	50	<0.001	-0.71	0.34
Hospital-A: with APS				Hospital-B: without APS		

The mean and SD scores for the SCQIPP questionnaire (total scale, subscales, and individual items) are shown in Table 4-5. In hospital-A, the mean total score was 57.28 with SD of 7.28. The mean (SD) of the individual items were between 3.10 (1.16) and 4.62 (0.70). In comparison hospital-B had lower scores; the mean total score was 51.88 with SD of 6.77. The mean (SD) of the individual items were between 1.64 (1.26) and 4.70 (0.51). Although the total SCQIPP scores were not normally distributed, the mean (SD) is reported in Table 4-5 as it has been suggested that a mean score which exceeds 4.5 (scale range 1-5) or total score of 63 (scale range 14-70) indicates a 'high quality of care' (Idvall et al. 2002a). In addition, the mean was reported to enable scores of <4.5 to be identified and to allow comparisons with previous studies. However, the Mann-Whitney U test was used in all the statistical tests and the median was reported.

In this study, the total mean SCQIPP scores did not reach the 'high quality of care' threshold score of 63 in either hospital as proposed by Idvall et al. (2002a). Similarly, the suggested scores representing 'high quality of care' for the subscales (communication (13.5), action (18), trust (18) and environment (13.5)) were not reached (Table 4-5). Nevertheless, the mean 'trust' subscale scores were relatively high in both hospitals (hospital-A=17.52 vs hospital-B=17.70 of a total of 18) which indicates that patients have trust in clinicians' pain management practice. Moreover, of

the 14 items, there were two individual items (item 13 & 14) in both hospitals with a mean score exceeding the high quality of care threshold of 4.5. High quality of care in both hospitals was identified in relation to the statements: "the nurses and doctors have cooperated in treating my pain" and "the nurses believe me when I tell them about my pain". In these two individual items patients' scores were higher in hospital-B compared to hospital-A (Table 4-5).

Idvall et al. (2002a) suggested that the number of patients who scored an item as 1 or 2 (strongly disagree or disagree) could be considered as a measure of 'low quality of care', which indicates an opportunity for improvement. The percentage of patients who scored individual items as 1 or 2 is shown in Table 4-5. The highest percentages were in the subscales of communication and action. It can be seen that 34% of the patients in hospital-A disagreed or strongly disagreed with the statement 'To determine my level of pain, a member of staff asked me to pick a number between 1 and 10 (or make a mark on a straight line) at least once every morning, afternoon, and evening'. This compared to 86% of the patients in hospital-B (item 7). This indicates a lack of regular pain assessment in 34% of the patients in hospital-A and 86% of the patients in hospital-B. However, two thirds of the patients acknowledged that staff asked them about pain assessment on rest and movement (item 6). A lower percentage (18%) of the patients in hospital-A and 72% in Hospital-B disagreed or strongly disagreed with the statement 'Before my operation I was told about the type of pain treatment I would be offered after surgery'. This indicates an absence of preoperative pain management education in 18% of the patients in hospital-A and 72% of the patients in hospital-B (item 1). In addition, the responses to the statement 'After my operation I talked with a nurse about how I wanted my pain to be treated' shows that there was a lack of patient involvement in their POPM in 48% and 68% of respondents in hospital-A and hospital-B respectively (item 2).

Table 4-5: Patients' SCQIPP scores (total, subscales, and individual items scores), and % of patients scoring 1 or 2

Item		Scale range	Hospital A (n=50) Mean	SD	Hospital B (n=50) Mean	SD	Hospital A / B % of patients scoring 1 or 2		Hospital A (n=50) Md	IQR	Hospital B (n=50) Md	IQR
Total SCQIPP Score		14-70	57.28	7.28	51.88	6.77			59	9	51	8
Subscale: Communication		3-15	12.90	2.02	10.84	1.89			13	3	11	2
1	Before my operation I was told about the type of pain treatment I would be offered after surgery	1-5	4.18	1.12	1.90	1.42	18%	72%	5	1	1	2
11	When nurses come on duty, they know 'everything' about how much pain I have had and the pain treatment I have received.	1-5	4.10	1.16	4.28	0.83	14%	2%	5	2	4	1
14	The nurses and doctors have cooperated in treating my pain	1-5	**4.62**	0.70	**4.66**	0.63	8%	8%	5	1	5	1
Subscale: Action		4-20	14.64	3.04	11.48	2.87			14.5	5	11	2
2	After my operation I talked with a nurse about how I wanted my pain to be treated	1-5	3.10	1.16	2.32	1.36	48%	68%	3	2	2	3
3	I received support or help in finding a comfortable position in bed to help avoid pain	1-5	4.18	1.16	4.24	0.94	14%	6%	5	1	4	1
6	The staff asked me about the pain I had when I breathed deeply, sat up, or moved around	1-5	3.76	1.25	3.28	1.50	30%	32%	4	3	4	2

7	To determine my level of pain, a member of staff asked me to pick a number between 1 and 10 (or make a mark on a straight line) at least once every morning, afternoon, and evening	1-5	3.60	1.25	1.64	1.26	34%	86%	4	3	1	1
Subscale: Trust		4-20	17.52	2.65	17.70	2.24			18	3	18	2
5	Even if I did not always ask for it, I was given pain medication	1-5	4.34	1.00	4.38	0.95	18%	16%	5	1	5	1
8	The nurses helped me with pain treatment until I was satisfied with the effects of pain relief	1-5	4.30	0.79	4.32	0.74	4%	2%	4	1	4	1
12	The nurses are knowledgeable about how to relieve my pain	1-5	4.34	0.96	4.30	0.93	8%	6%	5	1	5	1
13	The nurses believe me when I tell them about my pain	1-5	**4.54**	0.84	**4.70**	0.51	14%	2%	5	1	5	1
Subscale: Environment		3-15	12.22	2.58	11.86	2.43			13	3	12	4
4	I was given the opportunity for peace and quiet so I could sleep at night.	1-5	4.12	1.12	3.86	1.39	10%	20%	4.5	1	4	2
9	I have a pleasant room	1-5	4.00	1.03	3.80	1.11	10%	18%	4	2	4	2
10	There have been enough nurses on duty for someone to respond quickly to my request for pain relief	1-5	4.10	1.16	4.20	0.78	16%	2%	5	1	4	1

Hospital-A: with APS Hospital-B: without APS 'High quality of care' (>4.5) in **bold** text

4.5.1 Comparison of SCQIPP scores between Hospital-A and Hospital-B

The total SCQIPP scores for both hospitals are displayed in Box-whisker plot graph as shown in Figure 4-1. It can be seen that patients in hospital-A reported higher quality of POPM with a higher median of 59 with IQR of 9 than hospital-B (Md=51; IQR=8). In hospital-A, the scores were ranged from 35 to 65 with upper quartile of 64 and lower quartile of 55.5 (means 50% of cases scores between 55.5 and 65). In hospital-B the scores were ranged from 31 to 64 with upper quartile of 56.25 and lower quartile of 48. All patients seen as outliers in Figure 4-1 have reported lower scores and were included in the analysis.

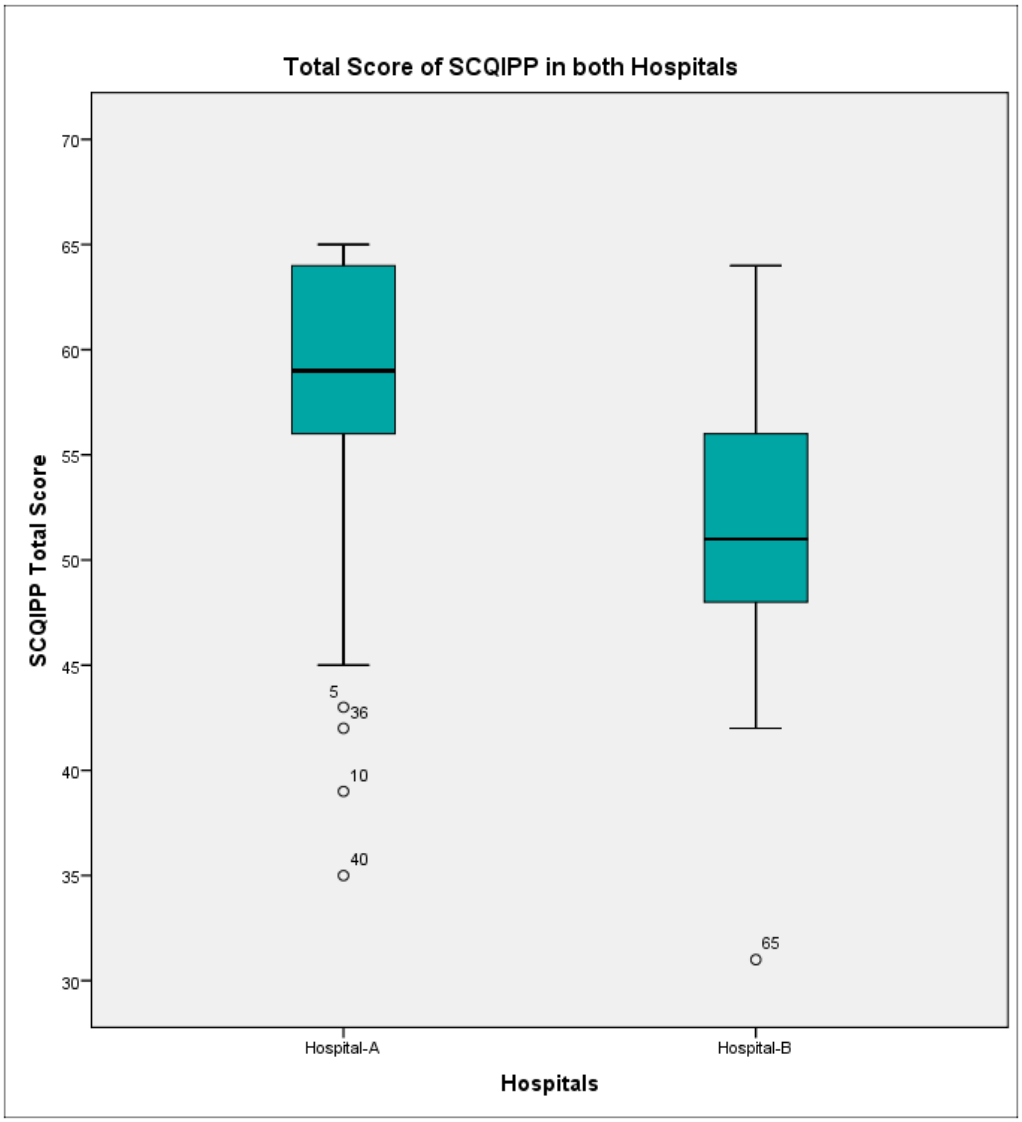


Figure 4-1: Patients' total SCQIPP scores for both hospitals

A Mann-Whitney U test revealed a significant difference in the total SCQIPP scores of hospital-A (Md=59, n=50) and hospital-B (Md=51, n=50), U=662.50, z= -4.06, P< 0.001. In addition, Mann-Whitney U revealed a significant difference in the subscales scores of communication (P<0.001) and action (P<0.001) of both hospitals; patients in hospital-A reported higher scores than hospital-B. Nevertheless, there was no significant difference in the subscales scores of trust (P=0.927) and environment (P=0.344) between both hospitals (Table 4-6).

Table 4-6: Patients' SCQIPP scores (total score and subscales), and P values

Item		Hospital-A (n=50) Median	Hospital-B (n=50) Median	P-Value*	Mann-Whitney U	Z-Value
Total Score		59	51	<0.001	662.50	-4.06
Subscales	Communication	13	11	<0.001	549.00	-4.89
	Action	14.5	11	<0.001	581.50	-4.64
	Trust	18	18	0.927	1237.00	-0.09
	Environment	13	12	0.344	1114.00	-0.95
* Mann-Whitney U Test						
Hospital-A: with APS			Hospital-B: without APS			

4.6 Patients' experience of postoperative pain

Patients' experience of postoperative pain was assessed 24 hours after surgery using the NRS-11, with 0 representing 'no pain' and 10 representing 'the worst pain'. Patients were asked about their worst and least pain levels in the past 24 hours, and pain at the time of completing the questionnaire (right now). The normal distribution of the pain scores (right now, worst, and least) was tested using the Kolmogorov-Smirnov test demonstrating that the data were not normally distributed (Table 4-4). Therefore, the non-parametric (Mann-Whitney U) test was used to compare the two groups.

Patients in hospital-A reported lower pain 'right now' scores at 24 hours after surgery (Md=2; IQR=3) than hospital-B (Md=5; IQR=4). The pain 'right now' scores ranged from 0 to 9 in hospital-A and from 0 to 10 in hospital-B. A Mann-Whitney U test has

shown a significant difference in the pain 'right now' scores of hospital-A (Md=2, n=50) and hospital-B (Md=5, n=50), U=598.00, z= -4.54, P< 0.001 (Table 4-7).

Table 4-7: Patients' pain and satisfaction scores, and P values

		Hospital-A (n=50) Median	**Hospital-B** (n=50) Median	**P-Value***	**Mann-Whitney U**	**Z-Value**
Pain scores	**Worst** in the Past 24 hrs	3	9	<0.001	272.00	-6.79
	Lowest in the Past 24 hrs	0	2	<0.001	522.50	-5.47
	Right now	2	5	<0.001	598.00	-4.54
Satisfaction with pain relief		10	9	0.059	989.00	-1.89
* Mann-Whitney U Test						
Hospital-A: with APS			Hospital-B: without APS			

For the level of pain at its worst in the past 24 hours, patients in hospital-A reported lower 'worst pain' scores in the past 24 hours after surgery (Md=3; IQR=4) than hospital-B (Md=9; IQR=4). In hospital-A, the 'worst pain' scores ranged from 0 to 10 and in hospital-B it ranged from 3 to 10. A Mann-Whitney U test revealed a significant difference in the worst pain scores in the past 24 hours of hospital-A (Md=3, n=50) and hospital-B (Md=9, n=50), U=272.00, z= -6.79, P<0.001 (Table 4-7).

Similarly, in hospital-A patients reported lower pain scores at its least in the past 24 hours after surgery (Md=0; IQR=0) than hospital-B (Md=2; IQR=5). The 'lowest pain' scores ranged from 0 to 7 in hospital-A and from 0 to 8 in hospital-B. A Mann-Whitney U test revealed a significant difference in the lowest pain scores in the past 24 hours of hospital-A (Md=0, n=50) and hospital-B (Md=2, n=50), U=522.50, z= -5.47, P<0.001 (Table 4-7).

4.7 Patients' satisfaction with pain management

Patients' satisfaction with POPM was assessed 24 hours after surgery using a scale from 0 to 10, where 0 represents 'very dissatisfied' and 10 represents 'very satisfied'. Patients were asked about their satisfaction with the pain relief after surgery at the time of completing the questionnaire. The normal distribution of patients' satisfaction

scores was tested using the Kolmogorov-Smirnov test demonstrating that the data were not normally distributed (Table 4-4). Therefore, the non-parametric (Mann-Whitney U) test was used to compare the two groups.

The median patients' satisfaction scores with pain relief showed a high level with scores of 10 (IQR=2) and 9 (IQR=2) for hospital-A and hospital-B respectively. The satisfaction scores were ranged from 5 to 10 in both hospitals. A Mann-Whitney U test revealed no significant difference in the satisfaction scores between hospital-A (Md=10, n=50) and hospital-B (Md=9, n=50), U=989.00, z= -1.89, P= 0.059 (Table 4-7).

4.8 Patients who experienced more pain than expected

Four (8%) patients in hospital-A and 31 (62%) patients in hospital-B reported that they had experienced more pain than expected. A Chi-Square test for independence indicated a significant difference in the proportion of patients who experienced more pain than expected between the two hospitals, χ^2 (1, n=100) =29.71, p<0.001. This means that the proportion of patients who experienced more pain than expected after surgery is significantly higher in hospital-B than hospital-A. This indicates that there is association between the presence of the APS and the patients' expectation about the experience of pain after surgery.

4.9 Conclusion

This chapter has presented the results of the patient questionnaire addressing the first proposition informing this case study. In relation to this proposition, the study has found that the total SCQIPP scores for both hospitals did not reach the proposed 'high quality of care' threshold score of 63. However, patients in hospital-A reported significantly higher total SCQIPP scores, particularly in the subscales of communication and action. There was no significant difference in the subscales of trust and environment or in the patient satisfaction scores. The lack of regular pain assessment, patient involvement, and absence of preoperative pain management education was higher in hospital-B. Patients in hospital-A reported a significantly lower pain intensity scores. The proportion of patients who experienced more pain

than expected after surgery was significantly higher in hospital-B than hospital-A. Finally, patients in hospital-A used significantly more PCA and epidural analgesia whereas patients in hospital-B used significantly more IM analgesia.

Chapter Five

5 Clinician Questionnaire Results

5.1 Introduction

This chapter presents the results of the second element of the case study which was designed to explore the proposition that the APS would have a positive impact on the knowledge and attitudes of clinicians concerning pain management. The sample demographics and background data is described in the next section. The difference between hospital-A and hospital-B in terms of total and individual knowledge and attitudes scores of clinicians about pain management is presented in the fourth section. Section 5.4.2 outline the individual differences in the knowledge and attitude of clinicians related to the principles of pain assessment, multimodal analgesia, appropriate use of opioids, physical dependence, addiction, and tolerance, and cultural and religious beliefs about pain.

5.2 Sample description

A total of 145 questionnaires were distributed in hospital-A, and 96 were returned. Of these, seven questionnaires were excluded from the data analysis for the following reasons; four questionnaires were completed by consultant anaesthetists, one participant had less than six months experience, one questionnaire was completed by an assistant nurse and one by a vascular access devices nurse. In hospital-B, of the 170 questionnaires distributed, 104 completed the questionnaires. Of these, four questionnaires were excluded from the data analysis because they were completed by clinicians with less than six months experience. In all, 89 participants from hospital-A (response rate 61.3%) and 100 from hospital-B (response rate 58.8%) fulfilled the criteria, completed the questionnaires and have been included in the data set for analysis.

The demographic details of the sample are listed in Table 5-1. Almost two thirds (n=63) of the clinicians were male in hospital-A, and around half (n=47) of the sample

were male in hospital-B. In hospital-A, all anaesthetists and surgeons were male and this could explain the high percentage of males in the sample. In hospital-A, the mean age was 27.3 years, with a standard deviation (SD) of 4.6 years, ranging from 22 to 48 years. In hospital-B, the mean age was 28.5 years (SD=5.44), ranging from 22 to 50 years. The data in Table 5-2 show that there was no statistically significant difference between the two hospitals in age of respondents (P=0.082); but a significant difference in gender (P=0.016).

Table 5-1: Clinicians' demographic and background data

Variable		Hospital-A (n=89) n (%)	Hospital-B (n=100) n (%)	P-Value
Gender	Male	63 (71%)	47 (47%)	0.016†
	Female	26 (29%)	53 (53%)	
Age (years)	Mean (SD)	27.3 (4.60)	28.5 (5.44)	0.082*
	Range	22-48	22-50	
	20-29	68 (76%)	68 (68%)	
	30-39	20 (22%)	27 (27%)	
	≥40	1 (1%)	5 (5%)	
	Missing	2 (2.2%)	1 (1%)	
Professional Role	Staff Nurse	54 (61%)	64 (64%)	0.818†
	Charge Nurse	12 (14%)	9 (9%)	
	Head Nurse	2 (2%)	2 (2%)	
	Anaesthetist Specialist/ Resident	6 (7%)	10 (10%)	
	Surgeon Resident	14 (16%)	15 (15%)	
	Missing	1 (1.1%)	0 (0%)	
Qualification	Diploma (Nursing)	1 (1%)	6 (6%)	0.192†
	BSc (Nursing & Medicine)	82 (93%)	90 (90%)	
	MSc (Nursing)	5 (6%)	4 (4%)	
	Missing	1 (1.1%)	0 (0%)	
Speciality	Surgical	44 (49%)	49 (49%)	0.385†
	ICU	36 (40%)	33 (33%)	
	Recovery	3 (3%)	8 (8%)	
	Anaesthesia (recovery &theatre)	6 (7%)	10 (10%)	
Experience	Mean (SD)	4.0 (3.72)	5.4 (5.39)	0.136*
	Range	8 mths-26 yrs	6 mths-30 yrs	
(since graduation)	< 2	30 (34%)	33 (33%)	
	2 - <5	36 (40%)	28 (28%)	
	5 - <10	18 (20%)	21 (21%)	
	≥ 10	5 (6%)	17 (17%)	
	Missing	2 (2.2%)	1 (1%)	

Experience	Mean (SD) Range	2.0 (1.23) 6 mths-7 yrs	3.2 (3.07) 6 mths-15 yrs	0.067*
(current position)	< 2 2 - <5	41 (46%) 45 (51%)	45 (45%) 33 (33%)	
	5 - <10 ≥ 10 Missing	3 (3%) 0 (0%) 2 (2.2%)	17 (17%) 5 (5%) 1 (1%)	
Pain Management Course -Yes -No		34 (38.2%) 55 (61.8%)	31 (31%) 69 (69%)	0.375†
Length of the Training: Mean (SD)		0.91 (2.6)	0.52 (1.23)	0.265*
(Days)	Range 0.25 - 1 > 1 - 2 > 2 Missing	3 hrs- 20 days 21 (62%) 6 (18%) 5 (15%) 2 (2.2%)	2 hrs- 7 days 20 (65%) 5 (16%) 5 (16%) 1 (1%)	
* Mann-Whitney U Test				† Chi-Square Test
Hospital-A- with APS				Hospital-B- without APS

5.2.1 Clinicians' profession, qualification and area of work

The clinicians' professions are displayed in Table 5-1 and Figure 5-1. In both hospitals, around two thirds of clinicians were staff nurses. There were 12 (14%) charge nurses in hospital-A compared to 9 (9%) in hospital-B, with equal numbers of head nurses in both hospitals. There were 10 (10%) anaesthetist residents in hospital-B and 7 (7%) in hospital-A, with almost equal number of surgery residents in both hospitals.

The majority of clinicians held a bachelor's degree in both hospitals, with more nurses holding a diploma degree in hospital-B (n=6) compared to hospital-A (n=1). None of the participants in either group had a PhD degree, with a small and almost equal number of the nurses in both hospitals holding a master's degree (Table 5-1).

The clinicians' clinical practice area is displayed in Table 5-1 and Figure 5-2. Around half of participants were working in the surgical area in both hospitals. There were more clinicians working in ICU in hospital-A (n=36 (40%)) than hospital-B (n=33 (33%)). There were a small number of clinicians (<10) working in recovery or anaesthesia in both hospitals. The data in Table 5-1 show that there were no

statistically significant differences between the two hospitals in clinicians' profession, qualification or area of work (P>0.05).

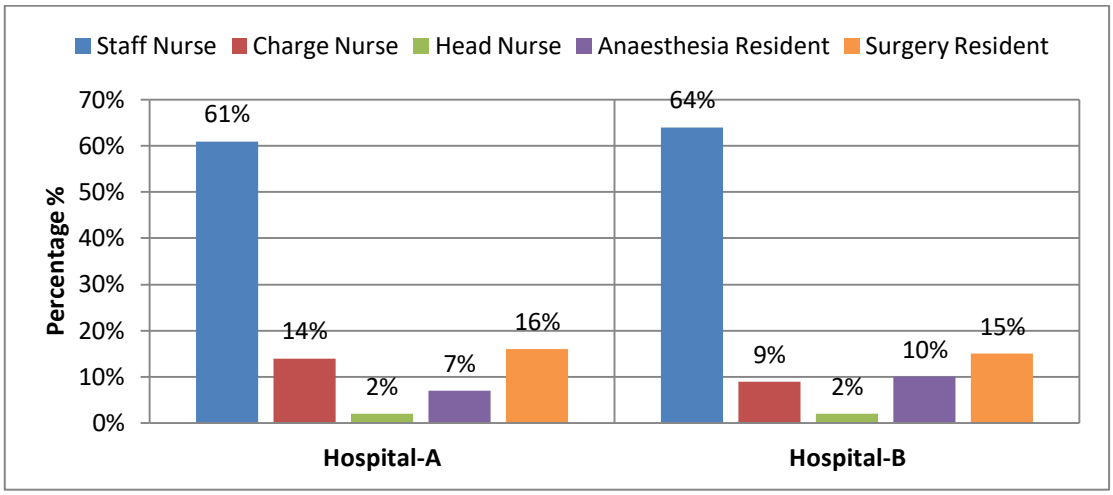


Figure 5-1: Clinicians' profession

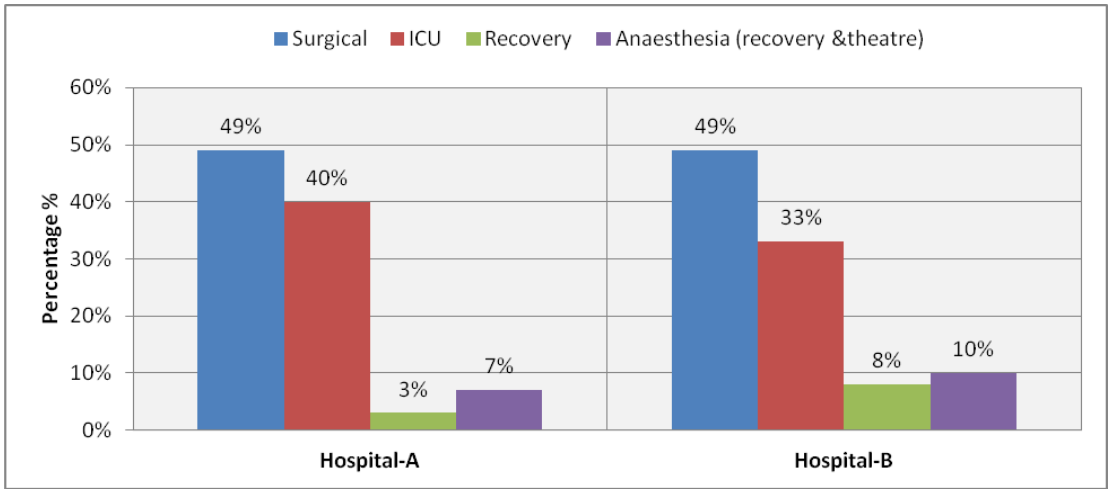


Figure 5-2: Clinicians' clinical practice area

5.2.2 Clinicians' general and current experience

The clinicians' general and current experience is presented in Table 5-1. In hospital-A, the participants' years of general experience ranged from 8 months to 26 years with a mean (SD) of 4.0 (3.72). In comparison, the participants in hospital-B had more years of experience with a mean (SD) of 5.4 (5.39) and ranged from 6 months to 30 years. In hospital-A, the majority of clinicians (n=66 (74%)) had less than 5 years of experience since graduation, while in hospital-B, 61 (61%) had less than 5 years of experience.

In hospital-A, the participants' years of current experience ranged from 6 months to 7 years with a mean (SD) of 2.0 (1.23). In comparison, the participants in hospital-B had more years of experience with a mean (SD) of 3.2 (3.07), ranging from 6 months to 15 years. In hospital-A, the majority of clinicians (n=86 (97%)) had less than 5 years of experience in the current position, while in hospital-B, 78 (78%) clinicians had less than 5 years of experience. In general, therefore, the participants' years of experience were longer in hospital-B. However, Mann-Whitney U test showed no significant differences between the two hospitals in the general or current years of experience (P>0.05).

5.2.3 Pain management education

Thirty four participants (38.2%) in hospital-A and 31 participants (31%) in hospital-B had received pain management training (Table 5-1 & Figure 5-3). Although a similar proportion of clinicians in both hospitals had received pain management training, the mean length of training was longer in hospital-A (0.91 days) compared to hospital-B (0.52). In hospital-A, the length of pain management training ranged from 3 hours to 20 days, while in hospital-B the length of training ranged from 2 hours to 7 days. However, the data in Table 5-2 show that there were no statistically significant differences between the two hospitals in the proportion of clinicians who had pain management training or in the length of training (P>0.05).

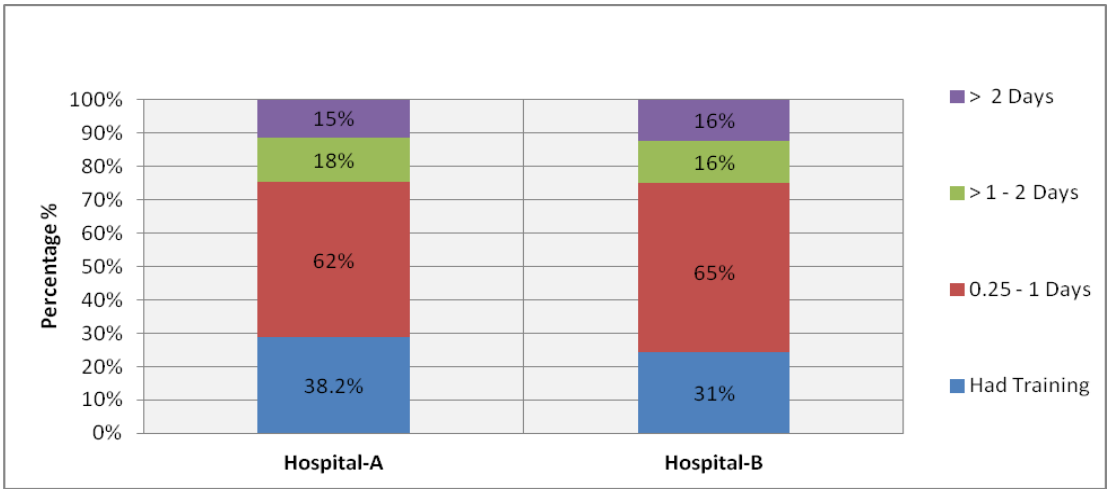


Figure 5-3: Clinicians' pain mangement training

5.3 Knowledge and attitudes of clinicians concerning pain management

The KAP questionnaire was used to measure the knowledge and attitudes of clinicians concerning pain management. The normal distribution of the total KAP scores was tested using the Kolmogorov-Smirnov test demonstrating that the data were not normally distributed for hospital-A (with APS) (Table 5-2). In hospital-B (without-APS), the Kolmogorov-Smirnov test showed that the total KAP scores were normally distributed. However, the data were not normally distributed as a whole for both hospitals. Therefore, the non-parametric (Mann-Whitney U) test was used to compare the two groups. Moreover, the median and IQR were reported and displayed in Box-whisker plot graphs due to the skewed nature of the data. Data were positively skewed for hospital-A, and slightly skewed for hospital-B (Table 5-2).

Table 5-2: Test of KAP scores for Normality and Skewness

		Kolmogorov-Smirnov			**Skewness**	
	Group	Statistic	df	Sig.	Statistic	Std. Error
Total Knowledge & Attitude Scores	Both Hospitals	0.11	189.00	<0.001	0.33	0.18
	Hospital-A	0.14	89.00	<0.001	0.25	0.26
	Hospital-B	0.09	100.00	0.063	0.02	0.24
Hospital-A: with APS					Hospital-B: without APS	

Ferrell and McCaffery (2008) recommended analysing the data in terms of the percentage of complete scores as well as individual items.

5.3.1 Total KAP scores

The total KAP scores did not reach the minimum acceptable score of 80% in either hospital as suggested by McCaffery and Robinson (2002). However, 8 (8.9%) clinicians in hospital-A achieved a total score of more than 80% compared to none in hospital-B. In hospital-A, 40.4% (n=36) of clinicians scored less than 60% compared to 77% (n=77) in hospital-B. Moreover, half of clinicians scored between 60% and 80% in hospital-A compared to 23 (23%) in hospital-B (Figure 5-4).

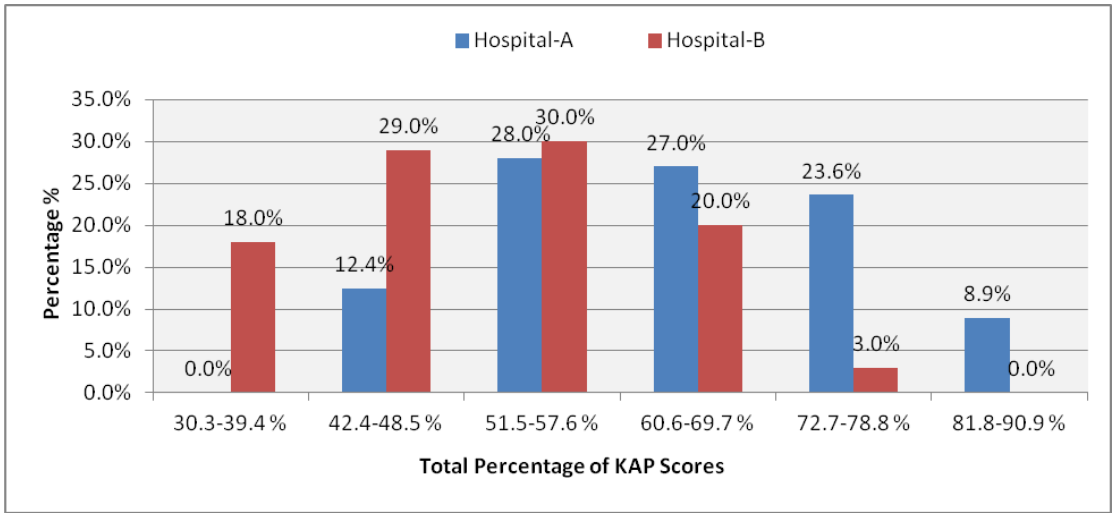


Figure 5-4: Distribution of total percentage of KAP scores

The total KAP scores for both hospitals are displayed in Table 5-3 and Box-whisker plot graph (Figure 5-5). It can be seen that clinicians in hospital-A had higher KAP scores with a median of 20 (60.6%) with IQR of 7 (21.2%) than hospital-B (Md=17 (51.5%); IQR=5 (15.2%). In hospital-A, the total scores ranged from a minimum of 15 (45.5%) to a maximum of 30 (90.9%) with upper quartile of 25 (75.8%) and lower quartile of 18 (54.5%). In hospital-B the scores ranged from a minimum of 10 (30.3%) to a maximum of 25 (75.8) with upper quartile of 19 (57.8%) and lower quartile of 14 (42.4%). A Mann-Whitney U test revealed a significant difference in the total KAP scores of hospital-A (Md=20, n=89) and hospital-B (Md=17, n=100), U=1890.50, z= -6.84, P<0.001 (Table 5-3).

Table 5-3: Clinicians' total KAP scores in both hospitals and the P- Value

		Hospital-A (n=89)	**Hospital-B (n=100)**	**P-Value***	**Mann-Whitney U**	**Z- Value**
Median		20 (60.6%)	17 (51.5%)	<0.001	1890.5	-6.84
IQR		7 (21.2%)	5 (15.2%)			
Minimum		15 (45.5%)	10 (30.3%)			
Maximum		30 (90.9%)	25 (75.8%)			
Percentiles	25th	18 (54.5%)	14 (42.4%)			
	75th	25 (75.8%)	19 (57.6%)			
* Mann-Whitney U Test						
Hospital-A: with-APS			Hospital-B: without-APS			

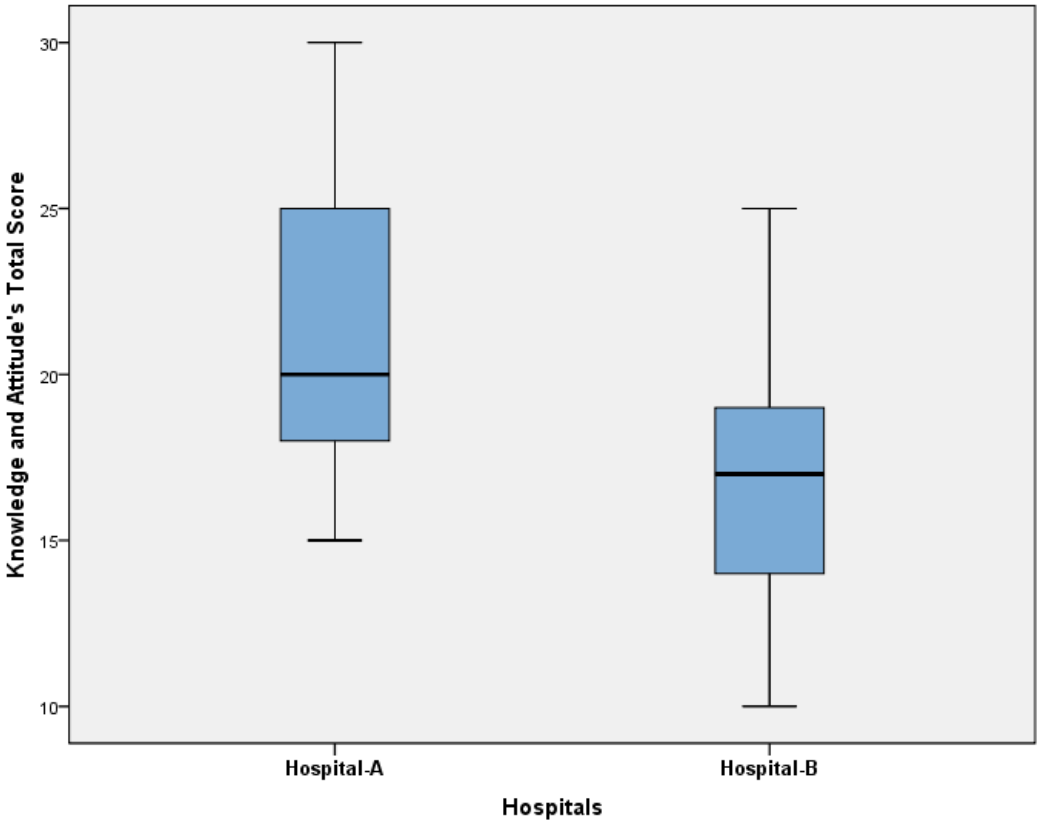


Figure 5-5: Clinicians' total KAP scores in both hospitals

5.3.2 Individual KAP scores

The percentage of correct answers for each individual question is shown in Table 5-4. In keeping with Ferrell and McCaffery's advice (2008), Table 5-4 allows identification of those items with the least and highest number of correct answers. The items with the least number of correct answers can be considered as areas for improvement, and the areas with the most correct answers as existing strengths.

In hospital-A, there were 6 (18.2%) questions that had the highest percentage of correct answers (>80%) compared to none in hospital-B. These questions were number 6 (89.9%), 10 (82%), 13 (84.3%), 19 (96.6%), 25 (94.4%), and 27 (83.1%). The focus of these questions concerned the concept of multimodal analgesia (question-6), the appropriate use of opioid analgesia including the route of administration (questions-

10, 13, 19, 27), and pain assessment (the most accurate judgement of the patient's level of pain (question-25).

There were four questions (12.1%) in hospital-A and eight questions (24.2%) in hospital-B that had the lowest percentage of correct answers (<40%). In hospital-A, these questions were number 3, 23, 30-b and 31-b whereas in hospital-B these questions were 3, 15, 20, 23, 29, 30-a, 30-b, and 31-b. These questions measure knowledge of pain and sleep (question-3); the incidence of respiratory depression (question-23); the choice of appropriate opioid doses that correspond with the pain score for the smiling and grimacing patients in the case studies (questions 30-b and 31-b); use of opioids in the absence of the source of patient's pain (question-15); drug of choice for surgical pain (question-20); addiction (question-29), and the pain score for the smiling patient (question-30-a).

A Chi-Square Test was used to identify significant differences in the correctly answered individual questions between the two hospitals (Table 5-4). There was significant differences in how hospital-A and hospital-B clinicians answered 19 questions (out of 33); hospital-A clinicians answered 18 questions correctly significantly more often than hospital-B clinicians ($p<0.05$), and hospital-B clinicians answered one question correctly significantly more than hospital-A clinicians ($p<0.05$). No significant differences were found in the remaining 14 questions in the questionnaire.

Overall, these items measured the knowledge and attitude of clinicians related to the principles of pain assessment, multimodal analgesia, appropriate use of opioids, cultural and religious beliefs about pain, physical dependence, addiction, and tolerance.

Table 5-4: Clinicians' individual KAP scores, the percentage of correct answers and the P- Value

No		Correct Answer	Hospital		P-Value†
			A With APS (n=89) %	B Without APS (n=100) %	
	True / False Questions				
1	Vital signs are always reliable indicators of the intensity of a patient's pain.	F	53.9%	48.0%	0.415
2	Patients who can be distracted from pain usually do not have severe pain.	F	65.2%	48.0%	0.018†
3	Patients may sleep in spite of severe pain.	T	33.7%	30.0%	0.585
4	Non-steroidal and anti-inflammatory agents (e.g brofen) are NOT effective analgesics for painful orthopaedic surgery.	F	62.9%	45.0%	0.014†
5	Respiratory depression rarely occurs in patients who have been receiving stable doses of opioids over a period of months.	T	68.5%	69.0%	0.946
6	Combining analgesics that work by different mechanisms (e.g. combining an opioid with an NSAID) may result in better pain control with fewer side effects than using a single analgesic agent.	T	89.9%	74.0%	0.005†
7	The usual duration of analgesia of 1-2mg morphine IV is 4-5 hours.	F	57.3%	47.0%	0.157
8	Opioids should not be used in patients with a history of substance abuse.	F	66.3%	49.0%	0.016†
9	Morphine has a dose ceiling (i.e. a dose above which no greater pain relief can be obtained)	F	50.6%	44.0%	0.367
10	Elderly patients cannot tolerate opioids for pain relief.	F	82.0%	78.0%	0.491
11	Patients should be encouraged to endure as much pain as possible before using an opioid.	F	65.2%	55.0%	0.155
12	Patients' spiritual beliefs may lead them to think pain and suffering are necessary.	T	76.4%	75.0%	0.822
13	After an initial dose of opioid analgesic is given, subsequent doses should be adjusted in accordance with the individual patient's response.	T	84.3%	77.0%	0.209
14	Giving patients sterile water by injection (placebo) is a useful test to determine if the pain is real.	F	64.0%	48.0%	0.027†
15	If the source of the patient's pain is unknown, opioids should not be used during the pain evaluation period, as this could mask the ability to correctly diagnose the cause of pain.	F	56.2%	20.0%	<0.001†
16	Anticonvulsant drug such as Gabapentin (Neurontin) produce optimal pain relief after a single dose.	F	71.9%	60.0%	0.085
17	Benzodiazepines are not effective pain relievers unless the pain is due to muscle spasm.	T	66.3%	72.0%	0.396
18	Narcotic/opioid addiction is defined as a chronic neurobiologic disease, characterised by behaviours that include one or more of the following; impaired control over drug use, compulsive use, continued use despite harm, and craving.	T	79.8%	66.0%	0.034†

#	Multiple Choice Questions	√	A	B	P-Value
19	The recommended route administration of opioid analgesic for patients with brief, severe pain of sudden onset such as trauma or post-operative pain is:				
	a. intravenous	**a**	**96.6%**	**73.0%**	**<0.001†**
	b. intramuscular		2.2%	24.0%	
	c. subcutaneous		0.0%	2.0%	
	d. oral		1.1%	1.0%	
20	Which of the following analgesic medications is considered the drug of choice for the treatment of moderate to severe pain after surgery?				
	a. codeine		0.0%	4.0%	
	b. morphine	**b**	**79.8%**	**35.0%**	**<0.001†**
	c. meperidine (Pethidine)		7.9%	55.0%	
	d. tramadol		12.4%	6.0%	
21	Which of the following IV doses of morphine administered over a 4 hour period would be equivalent to 30mg of oral morphine given every 4 hours?				
	a. Morphine 5mg IV		23.6%	28.0%	
	b. Morphine 10mg IV	**b**	**56.2%**	**53.0%**	**0.661**
	c. Morphine 30mg IV		13.5%	11.0%	
	d. Morphine 60mg IV		6.7%	4.0%	
	missing		0.0%	4.0%	
22	Analgesics for post-operative pain should initially be given				
	a. around the clock on a fixed schedule	**a**	**51.7%**	**67.0%**	**0.032†**
	b. only when the patient asks for the medication		40.4%	20.0%	
	c. only when the nurse determines that the patient has moderate or greater discomfort		7.9%	13.0%	
23	A patient with persistent cancer pain has been receiving daily opioid analgesics for 2 months. Yesterday the patient was receiving morphine 200mg/hour intravenously. Today he has been receiving 250mg/hour intravenously. The likelihood of the patient developing clinically significant respiratory depression in the absence of new comorbidity is:				
	a. less than 1%	**a**	**27.0%**	**28.0%**	**0.874**
	b. 1-10%		46.1%	23.0%	
	c. 11-20%		15.7%	18.0%	
	d. 21-40%		5.6%	16.0%	
	e. > 41%		5.6%	13.0%	
	missing		0.0%	2.0%	
24	The most likely reason a patients with pain would request increased doses of pain medication is:				
	a. the patient is experiencing increased pain	**a**	**74.2%**	**62.0%**	**0.074**
	b. the patient is experiencing increased anxiety or depression		10.1%	18.0%	
	c. the patient is requesting more staff attention		6.7%	1.0%	
	d. the patient's requests are related to addiction		9.0%	19.0%	

25	The most accurate judge of the intensity of the patient's pain is:				
	a. the treating physician		0.0%	9.0%	
	b. the patient's primary nurse		4.5%	12.0%	
	c. the patient	**c**	**94.4%**	**75.0%**	**<0.001†**
	d. the pharmacist		0.0%	2.0%	
	e. the patient's spouse or family		1.1%	1.0%	
	missing		0.0%	1.0%	
26	Which of the following describes the best approach for cultural considerations in caring for patients in pain:				
	a. There are no longer cultural influences in Jordan due to the diversity of the population		6.7%	12.0%	
	b. Cultural influences can be determined by an individual's ethnicity.		15.7%	22.0%	
	c. Patients should be individually assessed to determine cultural influences	**c**	**67.4%**	**48.0%**	**0.007†**
	d. Cultural influences can be determined by an individual's socioeconomic status		10.1%	15.0%	
	missing		0.0%	3.0%	
27	The time to peak effect for morphine given IV is:				
	a. 15 min	**a**	**83.1%**	**61.0%**	**0.001†**
	b. 45 min		10.1%	20.0%	
	c. 1 hour		2.2%	13.0%	
	d. 2 hours		4.5%	4.0%	
	missing		0.0%	2.0%	
28	The time to peak effect for morphine given orally is:				
	a. 5 min		2.2%	2.0%	
	b. 30 min		32.6%	39.0%	
	c. 1-2 hours	**c**	**59.6%**	**42.0%**	**0.016†**
	d. 3 hours		5.6%	12.0%	
	missing		0.0%	5.0%	
29	Following abrupt discontinuation of an opioid, physical dependence is manifested by the following:				
	a. Sweating, yawning, diarrhoea and agitation with patients when the opioid is abruptly discontinued	**a**	**44.9%**	**29.0%**	**0.023†**
	b. Impaired control over drug use, compulsive use and craving		11.2%	13.0%	
	c. The need for higher doses to achieve the same effect		6.7%	8.0%	
	d. a and b		37.1%	49.0%	
	missing		0.0%	1.0%	

#	Case Studies Questions	√	A	B	P-Value
30 A	Patient A: Andrew is 25 years old and this is his first day following abdominal surgery. As you enter his room; he smiles at you and continues talking and joking with his visitor. Your assessment reveals the following information: BP = 120/80, HR = 80, R – 18, on a scale of 0 to 10 (0 = no pain discomfort, 10 – worst pain/discomfort) he rates his pain as 8. On the patient's record you must mark his pain on the scale below. Circle the number that represents your assessment of Andrew's pain.				
	0		15.7%	13.0%	
	1		5.6%	4.0%	
	2		6.7%	20.0%	
	3		2.2%	5.0%	
	4		4.5%	3.0%	
	5		3.4%	7.0%	
	6		1.1%	6.0%	
	7		0.0%	2.0%	
	8	**8**	**60.7%**	**34.0%**	**<0.001†**
	9		0.0%	1.0%	
	missing		0.0%	5.0%	
30 B	Your assessment, above, is made two hours after he received morphine 2mg IV. Half hourly ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3mg qlh PRN pain relief". Check the action you will take at this time.				
	1. Administer no morphine at this time		36.0%	55.0%	
	2. Administer morphine 1mg IV now		24.7%	14.0%	
	3. Administer morphine 2mg IV now		21.3%	23.0%	
	4. Administer morphine 3mg IV now	**4**	**18.0%**	**7.0%**	**0.021†**
	missing		0.0%	1.0%	
31 A	Patient B: Robert is 25 years old and this is his first day following abdominal surgery. As you enter the room, he is lying quietly in bed and grimaces as he turns in bed. Your assessment reveals the following information: BP = 120/80, HR = 80, R – 18, on a scale of 0 to 10 (0 = no pain discomfort, 10 – worst pain/discomfort) he rates his pain as 8. On the patient's record you must mark his pain on the scale below. Circle the number that represents your assessment of Robert's pain.				
	0		1.1%	0.0%	
	1		2.2%	1.0%	
	2		1.1%	6.0%	
	3		3.4%	7.0%	
	4		6.7%	11.0%	
	5		4.5%	7.0%	
	6		9.0%	13.0%	
	7		1.1%	8.0%	
	8	**8**	**68.5%**	**41.0%**	**<0.001†**
	9		1.1%	1.0%	
	10		1.1%	0.0%	
	missing		0.0%	5.0%	

31 B	Your assessment, above, is made two hours after he received morphine 2mg IV. Half hourly ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3mg qlh PRN pain relief". 5. Check the action you will take at this time. 6.				
	1. Administer no morphine at this time		23.6%	20.0%	
	2. Administer morphine 1mg IV now		13.5%	32.0%	
	3. Administer morphine 2mg IV now		24.7%	30.0%	
	4. Administer morphine 3mg IV now	**4**	**38.2%**	**17.0%**	**0.001†**
	missing		0.0%	1.0%	
† Chi-Square Test [**†P<0.05]** Correct answers in **bold** text Hospital-A: with APS Hospital-B: without APS					

5.3.2.1 Principles of pain assessment

Many of the KAP survey questions related to clinicians' knowledge concerning pain assessment. In questions number 2, 14, 25, 30-a, and 31-a, clinicians in hospital-A had significantly higher knowledge scores ($P<0.05$) than hospital-B (Table 5-4). Clinicians in hospital-A reported significantly higher knowledge scores than hospital-B about distraction and pain (question-2; 65.2% vs 48%), prohibition of the use of placebo in pain assessment (question-14; 64% vs 48%), and the acceptance of patient's self-report of pain (question-25; 94.4% vs 75%).

In addition, clinicians in hospital-A had significantly higher knowledge and attitude scores than hospital-B ($P<0.05$) on the pain assessment of the two case studies (questions-30-a & 31-a). Around two thirds of clinicians in hospital-A (60.7%) and 34% of clinicians in hospital-B correctly answered and recorded 8 as the level of pain for the smiling and talking patient in the first case study (question-30-a). This part of the case study is designed to test the clinicians' knowledge about the most widely accepted definition of pain in nursing "Pain is whatever the experiencing person says it is, existing whenever s/he says it does" (McCaffery, 1972, p 8). Despite the significant difference in the knowledge scores for this question, this case study (question-30-a) showed that 39.3% of clinicians in hospital-A and a large percentage of clinicians (60%) in hospital-B underestimated the intensity of the patient's pain by recording less than 8. Not surprisingly, more clinicians accepted the report of pain from the grimacing and quietly patient in the second case study (question-31-a), where 68.5% of clinicians in hospital-A and 41% of clinicians in hospital-B correctly answered and

recorded 8 as the level of patient's pain. In addition, a lower percentage of clinicians underestimated the patient's pain compared to the smiling patient (hospital-A, 29.1%; hospital-B, 53%). Thus, clinicians were more likely to underestimate the intensity of pain for the smiling patient. On the other hand, there were no statistically significant differences between the two hospitals (P>0.05) in the clinicians' knowledge and attitude about the effect of sleep (question-3) and vital signs (question-1) on pain assessment.

5.3.2.2 Multimodal analgesia

Questions 4, 6, 16, and 17 were related to the concept of multimodal analgesia and the use of adjuvant drugs in pain management. Clinicians in hospital-A had significantly higher knowledge scores (P<0.05) than hospital-B (Table 5-4) in understanding the benefit of using multimodal analgesia (question-6; 89.9% vs 74%) and non-opioids such as NSAIDs in the treatment of surgical pain (question-4; 62.9% vs 45%). In contrast, there were no statistically significant differences between the two hospitals (P>0.05) in the clinicians' knowledge and attitude about the use of adjuvant drugs in pain management such as gabapentin (question-16) and benzodiazepines (question-17).

5.3.2.3 Appropriate use of analgesics

Questions 7, 9, 13, 19, 20, 21, 22, 27, 28, 30-b, and 31-b were related to the appropriate use of analgesics. Clinicians in hospital-A had significantly higher knowledge scores (P<0.05) than hospital-B (Table 5-4) about the time to peak effect for morphine given intravenously (question-27; 83.1% vs 61%) and orally (question-28; 59.6% vs 42%), the preferred route for the administration of opioids analgesia for patients with severe postoperative pain (question-19; 96.6% vs 73%), and the drug of choice for the treatment of moderate to severe pain after surgery (question-20; 79.8% vs 35%). Surprisingly, there was a great misconception among clinicians in hospital-B that pethidine (as a drug) and intramuscular (as a route) were the preferred choices and were selected by 55% and 24% respectively compared to 7.9% (pethidine), and 2.2% (IM) in hospital-A.

In addition, clinicians in hospital-A had statistically significantly higher knowledge and attitude scores than hospital-B ($P<0.05$) about the appropriate choice of morphine dose for the smiling and grimacing patients in the case studies (questions-30-b & 31-b). This statistical difference however is not a clinically significant difference between both hospitals because the majority of clinicians responded inaccurately to these two questions. Only 18% of clinicians from hospital-A and a very low percentage of clinicians in hospital-B (7%) selecting the correct dose of morphine for the smiling patient (question-30-b). Not surprisingly, clinicians were more likely to increase the morphine dose for the grimacing patient in the second case study, where 38.2% of clinicians in hospital-A and 17% in hospital-B selecting the right answer by increasing the morphine dose to 3mg (question-31-b). As a result it is apparent that under-treatment of pain was more likely for the smiling patient.

On the other hand, clinicians in hospital-B had significantly higher knowledge scores ($P<0.05$) than hospital-A (Table 5-4) about the preferred schedule for analgesics (around the clock) for POPM (question-22; hospital-A=51.7% vs 67%). Nevertheless, there were no statistically significant differences between the two hospitals ($P>0.05$) in the clinicians' knowledge and attitude about the duration of action of morphine (question-7), ceiling dose of morphine (question-9), the concept of morphine equi-analgesia (question-21), and the adjustment of opioid doses in accordance with the patient's response (question-13).

5.3.2.4 Physical dependence, addiction, tolerance, and side effects

Questions 8, 11, 15, 18, 23, 24, and 29 were related to perceptions of clinicians about physical dependence, addiction, tolerance and side effects of opioids. Clinicians in hospital-A had statistically significantly higher knowledge and attitude scores than hospital-B ($P<0.05$) in recognising the right definition of opioid addiction (question-18; 79.8% vs 66%) and physical dependence (question-29; 44.9% vs 29%). Despite this, there was no significant difference between the two hospitals ($P>0.05$) in the answer to the question about the reasons a patient with pain would request increased doses of analgesics (question-24), 9% of clinicians in hospital-A and 19% in hospital-B thought that the patient's request is related to addiction.

Many questions were related to the clinicians' fears of addiction or side effects which have led clinicians to avoid using opioids. Clinicians in hospital-A had statistically significantly higher knowledge scores than hospital-B ($P<0.05$) on the beliefs that opioids maybe be used in patients with a history of substance abuse (question-8; 66.3% vs 49%), and during the pain evaluation period in the absence of patient's pain sources (question-15; 56.2% vs 20%). In contrast, there were no significant differences between the two hospitals ($P>0.05$) in the clinicians' knowledge and attitudes concerning the fear of developing respiratory depression after an increase in morphine dose (question-23), and about the belief that 'patients should be encouraged to endure as much pain as possible before giving opioid medication' (question-11).

5.3.2.5 Cultural and religious beliefs about pain

Questions 12 and 26 were related to the cultural and religious beliefs about pain. Clinicians in hospital-A had significantly higher knowledge scores than hospital-B ($P<0.05$) on the individual assessment of pain to determine cultural influences (question-26; 67.4% vs 48%). On the other hand, there was no significant difference between the two hospitals ($P>0.05$) in the clinicians' knowledge and attitude about the belief that patients' spiritual beliefs may lead them to think pain and suffering are necessary (question-12; 76.4% vs 75%).

5.4 Conclusion

This chapter has presented the results of the clinician questionnaire addressing the second proposition informing this case study. In relation to this proposition, the study has found that the total KAP scores for both hospitals did not reach the 'minimum acceptable scores' of 80%. However, clinicians in hospital-A achieved a significantly higher total KAP score concerning pain management as compared to hospital-B. Clinicians in hospital-A had significantly higher knowledge scores than hospital-B about the acceptance of 'patient's self-report of pain', prohibition use of placebo in pain assessment, benefit of using multimodal analgesia, the preferred route for the administration of opioids, the drug of choice for the treatment of pain after surgery, and the right definition of opioids addiction and physical dependence. On the other hand, clinicians in hospital-B had significantly higher knowledge scores than hospital-

A about the ‘around the clock’ concept as the preferred schedule for analgesics for postoperative pain.

There were no significant differences between the two hospitals in the clinicians’ knowledge and attitude about the effect of sleep and vital signs on pain assessment, the belief that ‘patients should be encouraged to endure pain before giving opioid medication’ and the belief that patients’ spiritual beliefs may lead them to think pain and suffering are necessary.

Having outlined the results from the quantitative element (patient and clinician questionnaire) of this case study, the following chapter presents the findings from the qualitative element of the study.

Chapter Six

6 Qualitative Findings

6.1 Introduction

The previous two chapters presented the analysis and interpretation of patient and clinician questionnaires, addressing the first two propositions of this case study. This chapter presents the results of the final proposition of this study, and was designed to explore the clinicians' views and perceptions of the APS and the current pain management practice supported by evidence gathered from documentary analysis.

As described in chapter three, pattern matching, explanation building and cross-case synthesis techniques (Yin, 2009) are used to analyse case study data. The framework analysis approach (Ritchie and Spencer, 1994, 2002) was used to identify patterns in the qualitative data in terms of the factors that might influence pain management practice, similarities and divergence in participants' accounts between both hospitals. The explanation building technique was used to focus the analysis, where possible, on providing possible explanations for the findings in the patient and clinician survey, presented in chapters four and five. The cross-case synthesis technique was used to compare the three sets of data collected from both cases to develop a deeper understanding of the processes through which the APS influences pain management practice. Three themes emerged from the qualitative data during the process of data analysis and interpretation of 25 semi-structured interviews and evidence generated from institutional documents (Table 6-1)

Table 6-1: Themes and sub-themes

Themes	Sub-themes
6.2 The influence of an APS on the quality of pain management	6.2.1 Coordination and communication
	6.2.2 Standardised pain management practice
	6.2.3 Patient outcomes
	6.2.4 Patient involvement
6.3 The influence of an APS on clinicians' and patients' understanding of pain management	6.3.1 Educating clinicians
	6.3.2 Knowledge and perception concerning pain management among clinicians
	6.3.3 Educating patients
	6.3.4 Perceptions of pain management among patients
6.4 The impact of the organisational context on pain management	6.4.1 Commitment to treat pain
	6.4.2 Management support
	6.4.3 The significance of professional boundaries
	6.4.4 Workload challenges

The first theme explores how the APS has influenced the quality of POPM. The second theme examines how the APS has influenced the clinicians' knowledge and perceptions about pain management through the provision of formal and informal education. The final theme examines how the organisational context influences pain management practice, and explains the role of the APS in 'making pain visible' in an organisation. The following sections present each theme and explain the sub-themes in depth, evidenced by excerpts from the participants' interviews and documentary analysis to provide a contextual account from which the interpretations were made. It can be seen from the following analysis that the themes were interrelated at various points.

6.2 The influence of an APS on the quality of pain management

The first theme to emerge from the data analysis is how the APS influenced the quality of pain management in hospital-A compared to hospital-B, which has yet to develop this service. Four sub-themes were identified through interpretation of the participants' accounts and the hospitals' documents that highlight the influence of an APS on the quality of pain management (Table 6-1), which are explored below in turn.

6.2.1 Coordination and communication

The qualitative data suggested that communication and the coordination of pain management had an impact on the quality of pain management practice. In hospital-A, before the establishment of the APS, participants perceived there to be poor coordination and communication between healthcare professionals concerning pain management. This lack of coordination was one of the main drivers to establish the APS. Participants perceived that the APS has a crucial role in the communication and coordination of pain management in the institution. The coordination by the APS was also seen by a staff nurse as one of the ways to "reach the vision of 'no pain" (SN2A). Interestingly, it is also clear from the nurses' interviews that the pain nurses were key members of the pain team who have the role of coordination and communication with other healthcare professionals and departments, such as anaesthetics and pharmacy. They emphasised that the pain nurses are the first point of contact for them, and this coordinating role is part of the *Pain Nurses' Job Description* document:

> *HN4A: I want a person who can follow with you and become the key person in these aspects. I want a specific person to call and these are the pain nurses in the pain team.*

There are different forms of communication with the APS. Many participants described the APS's round as an important vehicle for communication and discussion between the pain team and other clinicians. It was seen as one of the advantages of the APS and enhanced the relationship of the APS with the hospital clinicians through face-to-face discussion:

> *SR11A: We and the pain team have morning rounds and in the corridor we talk to them and refer patients for consultation. The relationship between us and the pain team is very sociable and friendly... the round is convenient for us and we see it as one of the advantages... as when we see them [APS] in the round face-*

to-face it is easier for communication between us where we talk and discuss about patients.

Another form of communication with the APS is by telephone. The pain nurses' numbers and their duty rota are effectively communicated to the ward nurses by the *APS Poster* document, which is clearly displayed in the wards, showing APS contact numbers. This was seen by the ward nurses as a way of making the communication with the APS easier, which may increase the confidence of the ward nurses in performing their pain management practice, as they can call the APS if the need arises and rely on the APS's quick response to solve patients' pain problems. In addition, the 'pain sheet' is another way of communication with the APS. Many nurses explained the importance of the 'pain sheet' in communicating the patient's pain management status to the pain team so that there is no need for the ward nurses to be present during the APS's round. The *Pain Assessment and Management Flow Sheet* document certainly contains comprehensive information on the pain scores, medication use, methods of pain management, sedation score, and side effects:

SN3A: We use the pain sheet daily. They [APS] started to rely on the pain sheet as it gives them a full picture of what happened on the previous day... when you call them we rely that they can take care of patients' pain and solve the problem quickly... this may increase patients' trust in the nursing care.

The clinicians reported many benefits arising from the coordination of pain management. For ward nurses, the coordinating and communicating role of APS with other healthcare professionals and departments reduced their workload relating to pain management, who therefore have enough time to focus on other aspects of nursing care. This coordination also helped the nurses and made their role in pain management easier due to appropriate follow-up by the pain team and up-to-date handover of the pain management plans. For patients, this coordination and communication, which is available 24 hours, facilitated continuity of care in relation to pain management and therefore improved patients' pain experience through following up patients straight after surgery, and providing medications and analgesia pumps on time. A nurse in hospital-A exemplified how the liaison of the pain team with pharmacy reduces the length of time patients were in pain:

SN10A: In the past, before the development of the APS, patients are sent to the wards without the PCA or epidural pump and we sent the prescription to pharmacy and wait two hours for it to become ready. During these two hours

patients have pain... Currently, the prescription order goes to pharmacy and the patient is still in theatre; so when he finishes the surgery the medication will be ready.

However, one nurse expressed her dissatisfaction with the slow response of the APS at night and claimed that their response during daytime is normally quicker than the night shift due to the absence of hospital management monitoring at night. Another nurse criticised the APS's round due to the fact that they perform the ward round on their own:

SN9A: I have one criticism for them [APS]; they do the round and take actions on their own without the ward staff. If they take the ward nurse/head nurse with them he will have enough information about each patient.

In hospital-B, on the other hand, the need for coordination and adequate communication is still evident, as many nurses expressed their frustration over the lack of coordination between surgeons in relation to pain management. Nurses described how it was difficult to reach the surgical residents to request a review for patients who are in severe pain, for example, when the entire surgical team enter theatre or when the doctors are busy admitting patients in other wards. This situation appears to leave many patients in pain for long periods of time, because the surgeon's response is delayed and the nurses are left waiting for a prescription to be able to give analgesia. The following extract illustrates this experience:

HN21B: One of the things that may prevent your patient to have pain relief in quickest way is the problem in the system; when the surgical team enter theatres, the specialist and his team enter theatre with him and nobody outside. It is difficult to communicate with the surgeons if you need a prescription for your patients who are in pain... We are forced to wait for the resident to come out of theatre or find someone to communicate with the specialist inside theatres.

Inadequate communication between nurses and surgeons is also echoed in an apparent lack of communication between the surgical residents and the specialists. The residents are hesitant and lack the authority to change or prescribe analgesia without the permission of the specialist. This lack of authority can take a lot of nurses' clinical time and may have an effect on the quality of nursing care:

CN17B: Sometimes the resident will ask me to wait until he calls the senior doctors. So I have to wait until he phones me back. If there is delay in his call back then I'm forced to call the seniors in order to perform my duties.

Inadequate communication and coordination was fundamental in the disorganised pain management in the hospital. Doctors prescribe analgesia for all patients, without considering the patients' pain assessment status, to avoid nurses calling them. This situation was described by one nurse as "a game" and "a mess":

> *SN23B: I think it [pain management] is like a game. Residents prescribe analgesia for patients who have pain or not to avoid calling them... I do not feel that there is a red line for pain management here. If patients are nagging, the doctors will tell you to give [analgesia] without limit. I feel pain management here is a mess.*

The above examples illustrate how inadequate communication and lack of coordination between multidisciplinary team members may lead to suboptimal pain management. Therefore, a head nurse suggested establishing a multidisciplinary APS "similar to the CPR team in the hospital with a pager for staff to contact them" (HN16B) to enhance the coordination and communication between nurses and doctors to improve pain management.

However, the perception of suboptimal communication was not universally shared in hospital-B. One nurse reported that the surgical resident's response is good and that particular physician does not ignore nurses' calls to review patients' pain. Another anaesthetist resident believed that the communication between the doctors and ward nurses was good in hospital-B. He believed that the nurses can give analgesia with prior permission from doctors to avoid complications:

> *AR19B: There is very good communication between the two teams and they are extremely cooperative... They have the permission to give simple analgesia and sometimes to give high doses of narcotics. But they need to inform the doctors first because any complications might happen they are going to be at risk.*

It appears from the accounts of clinicians in hospital-A that good communication and coordination is vital for the successful treatment of pain in the hospital. The pain nurses played a major role in providing this coordination and communication, with benefits for patients and clinicians alike. In hospital-B, although a few clinicians suggested the presence of good communication between nurses and doctors, patients and clinicians do not yet enjoy these benefits. This is a possible explanation for the findings from the patient survey which showed that patients in hospital-B exhibited significantly higher pain scores than those in hospital-A. In addition, the findings from

the patient survey showed that patients in hospital-A reported significantly higher scores in the subscale of communication than those in hospital-B.

6.2.2 Standardized pain management practice

The findings from the patient survey discussed in chapter four showed that patients in hospital-A reported a higher total quality score than those in hospital-B. The qualitative data presented here may provide a possible explanation of this finding. Participants' accounts and the documentary analysis suggested that the APS has an impact on the quality of pain management practice through the development of common policies to facilitate the effective and safe utilisation of advanced analgesics techniques. In hospital-A, efforts to improve pain management started in 2006 by establishing a Pain Management Committee, one of whose aims was to develop unified policies, procedures and standards to improve the quality of pain management. Despite the presence of the committee, patients' complaints about pain management were high. Therefore, there was a general agreement to establish the APS to standardise pain management practice. Since the introduction of the APS, policies and protocols have been developed for PCA, epidural analgesia, nursing pain management, the use of controlled drugs in treating pain, morphine infusion and the management of pain in the emergency room. Interview data suggested that there is a high level of compliance with these policies, all of which are accessible via hospital-A's intranet.

Data from the interviews suggested that introducing advanced analgesic techniques to enhance the patients' experience would not be possible without the support of the APS and the underpinning framework of evidence-based policies and procedures. Such work is on-going in hospital-A, with further plans to introduce PCEA as a standard of care supported by the policy and patient information leaflet. Interview participants described how pain management practices have developed over time, moving from the situation in which "putting a patient with epidural on the floor was a bit strange" (CA8A) to the widespread acceptance of such techniques, with up to 80% of patients undergoing major surgery receiving epidural analgesia in surgical wards:

> *SN3A: I did not see the PCA and epidural in any other hospital. People are afraid from these in other hospitals. Here, the patients consider it the first choice for each operation.*

The specialist pain nurses appear to have played a vital role in introducing advanced techniques into the surgical wards and in implementing pain management policies. Many ward nurses acknowledged the contribution of pain nurses in communicating and implementing pain management policies and protocols in the recovery and surgical wards. The documentary analysis also showed that pain nurses were conducting repeated teaching sessions on the nursing pain management policy, with many nurses attending these sessions from the hospital's wards.

Implementing these standards and policies with the support of the APS has had many benefits. The participants' accounts suggested that the presence of the APS and unified policies improved the quality of pain management in hospital-A. They suggested that pain management in their hospital is advanced compared with other hospitals, because the policies cover all aspects of pain management. Furthermore, the availability of policies is a good source of information about pain management for the new clinicians. It may support a change of practice by increasing the clinicians' confidence in their clinical practice decision making. The introduction of such policies and protocols helped many participants to transform their pain management practice by choosing and calculating the right doses of analgesics and "avoiding IM analgesia":

> *AR12A: Before I came here most of my work was on PRN, but after I came here there is follow up from one team and there is policy which made it easier for us. Additionally, the policy equipped us in the same time, based on the type of surgery, on how to give the right analgesia and calculating the right doses.*

However, one head nurse suggested the need to examine the current use of analgesics doses in hospital-A to avoid reaching the maximum doses, with their associated side effects:

> *HN5A: We need to assess the use of our pain medication doses to avoid complications and reaching the highest dose while a patient still in pain... We should increase the doses gradually and more carefully than the current practice.*

In contrast, policies and protocols have not been developed yet for PCA and epidural analgesia in hospital-B. Clinicians still adhere to "doctors' orders" and "non-formal protocols" for each doctor that the nurses know from experience. Following doctors' anecdotal protocols and the lack of PCA and epidural analgesia policies has led to variable standards of pain management practice. Interview participants reported that

IM pethidine and IV paracetamol were the most commonly administered drugs for POPM. They also reported that PCA was not yet available in hospital-B, and IV infusions and epidural analgesics were used only in the ICU, but not in the surgical wards. One of the reasons for these different standards is the inconsistent approach to pain management by different doctors, with anaesthetists in charge of pain management in ICU and surgeons in charge of pain management in the surgical wards.

> *CA24B: Because the ICU is under the supervision of anaesthetists, the patients in ICU don't have problems in pain management... In the surgical floors; the problem is that we don't prescribe the postoperative pain treatment for them as it is written by the surgeons. We have noticed that there are still problems in prescribing the PRN medication.*

Another disadvantage is the lack of awareness among nurses about PCA and epidural analgesia. Four of the nurses had not heard of, or knew little about PCA or epidural analgesia; "I did not encounter or see it [epidural] before" (SN13B). This lack of awareness of PCA and epidural analgesia may explain the widespread use of IM analgesia in 64% of patients in hospital-B, as shown from patient survey data. This widespread use of IM analgesia may have led participants to consider IM pethidine as the gold standard of care for POPM; "the IM [pethidine] is the main method we use for pain management" (SN13B). Furthermore, based on their empirical experience they were satisfied with the use of this drug:

> *SR20B: We give pethidine IM, although there is no contraindication for IV but we like to give IM... 95% of patients are comfortable on pethidine four times or six times daily.*

The above standards of pain management are suboptimal according to contemporary evidence, and appear to leave many patients in pain. A newly appointed anaesthetist reported feeling dissatisfied with the current situation of pain management because patients were complaining, and suggested that hospital-B should "establish a pain team... and introduce different concepts such multimodal analgesia" (CA24B) as the way to improve pain management in the hospital. This situation of suboptimal pain management for many patients led nurses to report feeling helpless to relieve their patients' pain:

> *SN14B: I feel sad; you assess that the patient is in pain and needs pain killer. You give him the prescribed analgesic but he is still in pain. I feel that I'm standing and cannot help him more than what I have done.*

The APS therefore appears to have a crucial role in standardising pain management through the introduction of evidence-based policies to govern pain management practice. The introduction of PCA and epidural analgesia were not possible without the support of the APS. These advanced analgesics techniques are the standard of care for POPM in hospital-A, whereas IM analgesia is the method of choice in hospital-B. This may explain the findings from the patient questionnaires discussed in chapter four, which showed that none of the patients in hospital-B used PCA compared to 12% in hospital-A, and the majority of patients in hospital-A used epidural analgesia (76%), whereas only 2% used this method in hospital-B. Equally, none of the patients received intramuscular pethidine or diclofenac in hospital-A, compared to 48% and 20% of patients (respectively) in hospital-B.

Similarly, this may explain the findings from the clinicians' questionnaires discussed in chapter five, where a significantly higher percentage of clinicians in hospital-A responded correctly that the preferred route for the administration of opioids analgesia is IV, and that the drug of choice for the treatment of moderate to severe pain after surgery is morphine. Equally, more than half of clinicians in hospital-B (55%) compared to 7.9% in hospital-A incorrectly selected pethidine as the drug of choice for the treatment of moderate to severe pain after surgery. As a result, many patients in hospital-B may have experienced suboptimal pain management according to contemporary standards and guidelines.

6.2.3 Patient outcomes

The involvement of the APS with patients' postoperative care in the surgical wards on a daily basis appears to have improved many patient outcomes. With the presence of the pain nurses and their regular 'round', the safety of advanced analgesics techniques has improved. For example, one head nurse suggested that the accidental dislodgement of epidural catheters has decreased. In addition, the interview data suggested that with the involvement of the APS, the patients' pain after surgery is effectively managed compared to other hospitals where many patients still suffer from surgical pain. One reason for improved pain scores could be the daily follow up by the APS and the pain nurses' "rapid interventions" (HN7A), which manage patients' pain effectively and have increased patient satisfaction with pain management. As one anaesthetist said:

AR12A: [my role is] to control the postoperative pain for all patients. You do not see that a patient is suffering pain and calling the assigned nurse like what is in other hospitals where patients are crying of pain. You are in a hospital where some patients' pain is more than other patients' pain, but their pain is well controlled. This is the positive side where you improved the pain after surgery. You have a role in making things organised and patients comfortable and satisfied after surgery.

It therefore appears that the APS has improved pain control and patient safety in hospital-A. This has led to a reduction in patient complaints about pain management and therefore the patients' trust in the nursing care has increased, especially in pain management. This has also helped the ward nurses in discharge planning because of adequate follow-up from the APS. It is certainly part of the *Pain Nurse Job Description* to facilitate patients' discharge planning:

HN4A: I'm reassured as they follow-up their patients in the round, so this will help me in the discharge planning for my patients. All of this will be clear for patients.

However, a head nurse voiced her concerns over the high doses of opioids used by the APS to make patients comfortable. She believed this may compromise patient safety, especially in relation to the respiratory system:

HN5A: "no pain" for patients, this is the main aim in this centre. This reason may have led us to give high doses for patients. In my opinion, I do not like this. I'm surprised that our patients are on high doses of morphine. This may affect their breathing after surgery.

Despite such dissenting voices, the establishment of the APS was perceived as having many benefits also for the clinicians in hospital-A. Participants suggested that the APS is cost effective due to cheap and effective doses that make patients comfortable. The presence of the APS was also perceived to reduce clinicians' workload.

SN9A: with the presence of them [APS] I do not waste my time with a patient; they control the pain... the APS is a specialised team and they knew what they are doing in each step; this is a good thing.

On the other hand, and in contrast to hospital-A, participants in hospital-B expressed their frustration in chasing-up residents and specialists over the phone to review their patients' pain. This inadequate communication, especially at night, sometimes leaves

many patients needlessly in pain because it encourages nurses to choose the perceived "safe" analgesic and avoid strong opioid due to fear from respiratory depression:

> *SN23B: There are doctors who are careless; I called one doctor at night and he did not respond. The patient was in pain but I did not wait for the doctor and I gave her tramadol as she has no problems in breathing. What can I do... you cannot leave the patient in pain, so we gave tramadol as it is safe.*

Similarly, many participants voiced their concern about suboptimal pain management, which leaves many patients crying in pain. This was described by an anaesthetist as akin to the poor status of pain management in the 80s and 90s in the developed countries, before they started to "recognise the pain management as a human right" (CA24B). There are many reasons for this inadequate pain management. For anaesthetists, the surgeons' use of IM pethidine is one of the causes of patients' complaints of pain. Another reason is the lack of authority for anaesthetists to manage surgical pain outside the ICU. Others went on to explain that using pethidine has many side effects, such as nausea and vomiting, and some patients do not tolerate it well and they try to avoid it. The following quote illustrates the challenges to administering effective pain relief in hospital-B:

> *SN25B: We care about the pain management in the hospital and in the unit but it is not a priority, we have interaction with doctors but they give the medication order such as pethidine twice a day and then the patient still crying of pain... I think pain management is better outside.*

However, many participants perceived that pain management was effective in hospital-B, especially in the ICU, due to lack of patients' complaints about pain management:

> *CN15B: Pain management is good especially in the ICU as we have direct interaction with patients and provide them with pain relief... we did not receive complaints from patients about pain management issues.*

It appears therefore from the responses of participants that the daily follow up of patients by the APS has improved the effectiveness and safety of pain relief in hospital-A. This may help to explain the findings from the patient survey which showed that patients in hospital-B had significantly higher pain scores than those in hospital-A. However, it should be noted that the survey questionnaire showed that patients were equally satisfied with the pain management in both hospitals and reported no difference in the overall trust score.

6.2.4 Patient involvement

Patient involvement is one of the essential indicators for achieving high quality POPM (Idvall et al., 1999, 2001). In hospital-A, a large number of participants claimed that they involve their patients in discussion about their pain management and that the patient's decisions are respected. Participants also pointed out that some patients have had previous experience of pain medication, and clinicians listen and follow patients' choices on the best option for them. Another head nurse went on to explain that the APS involve patients in their treatment plan, with the result that patients become "part of the team" (HN4A). In addition, the APS helped clinicians to transform their practice by involving patients in their care:

> *AR12A: When I came here I found everything is accurate; in how you deal with pain, how you explain to patient, how you discuss with the patient to make decision and how to bring the patient with us.*

The *Patients' Guide* and *Patients' Rights* documents in hospital-A indicate that patients have the right to actively participate in decisions about how to manage their pain and the information needed to be able to choose the best available options. Nonetheless, one charge nurse did not consider patient decision making to be practically important, suggesting that the APS explains medications and machines to the patient, but "it is not the patient who has the decision to choose between two analgesics or two machines" (CN10A).

Participants in hospital-B had different views on patient involvement in pain management. Two nurses reported that only the educated patients are involved in pain management plans, but in general the doctors do not involve patients in managing their pain and they often stop the analgesia without informing the patients. Other participants also pointed out that patient involvement does not always happen, but they acknowledged that "it is one of the patients' rights" and they "value the patients' opinion". Equally, the *Quality Booklet* document indicates that one of the patient's rights is to be informed about procedures and treatments and participate in the medical decisions:

> *CN15B: The patient's opinion is important for us. For example, one patient informed us that 'do not give me pethidine after surgery, as one time after I received a dose from it I have had respiratory arrest and had problems'.*

This apparent lack of patients' involvement in hospital-B may have led a staff nurse to suggest "involving patients in their care and develop patients' leaflets to increase the patients' awareness [of their treatments]" (SN18B).

The qualitative data presented above suggest that although the patient involvement in hospital-A is more embedded than in hospital-B, there is a need to improve patient involvement in both hospitals. This may explain the findings from the patient survey, which showed that 48% and 68% of patients in hospital-A and hospital-B respectively perceived a lack of involvement in their POPM.

Theme summary

This theme presented how the APS influenced the quality of POPM in hospital-A. It showed the crucial role of the APS in communication, coordination and standardisation of pain management practice and how these impacted on patient outcomes. The adequate communication and coordination of the APS appeared to have facilitated continuity of care for many patients. It is also helped the clinicians in their role in pain management, reduced their workload and was perceived as cost effective. The APS developed common policies to standardise pain management practice and enhance the quality and safety of advanced analgesics techniques. The introduction of these policies helped many new clinicians to transform their pain management practice and build their confidence in clinical decision making. The presence of the APS, especially pain nurses, and unified policies also appeared to have played a vital role in introducing the PCA and epidural analgesia into the surgical wards as the standard of care for POPM. Despite some concerns over the use of high doses of analgesics by the pain team, the involvement of the APS in patient care appeared to have improved the effectiveness and safety of pain management and reduced patient complaints about pain. This increased the patients' satisfaction with pain management and facilitated discharge planning. Nevertheless, there is a need to improve patients' involvement in their care, the response of APS at night and the involvement of ward nurses in the APS round.

In hospital-B, the inconsistent status of communication and coordination in relation to pain management between doctors and nurses appeared to leave many patients

needlessly in pain, especially at night. This may have led to nurses being unable to help their patients in pain, consequently feeling frustrated. Policies and protocols have not yet been developed for PCA and epidural analgesia, and nurses still adhere to "non-formal" protocols for each doctor. This led to variable standards in pain management practice between the wards and ICU and the widespread use of IM pethidine. Patient involvement is patchy, and it was suggested that educated patients are more likely have the chance to be involved in their care. Therefore, many clinicians were concerned about the suboptimal standards of pain management and perceived the need to establish an APS as the way forward to enhance the coordination and quality of pain management.

6.3 The influence of an APS on clinicians' and patients' understanding of pain management

This theme explains how the APS influenced the education of clinicians and patients concerning pain management. Four sub-themes were identified through the interpretation of the participants' accounts and the hospitals' documents that highlight the influence of an APS on the clinicians' and patients' understanding of pain management (Table 6-1), as explored below in turn.

6.3.1 Educating clinicians

Analysis of the qualitative data suggested that the APS has an impact on educating clinicians about pain management to equip them with the required knowledge and skills to provide high quality care. In hospital-A, an anaesthetist explained that the PCA and epidural analgesia were introduced into the surgical wards through the pain nurse training the ward nurses on these analgesics techniques. This emphasizes the importance of the pain nurses within the APS and the training of ward nurses to support introducing new analgesics techniques. Moreover, ongoing support and training (both formal and informal) for the ward nurses by the APS is vital to provide effective and safe pain management in the wards. Many ward nurses reported that the pain nurses spend enough time with them during the clinical round to explain about pain assessment and management. Participants' accounts suggested also that the APS

provides ongoing follow-up sessions for all the ward nurses on the updated pain policies, and according to the nurses' needs:

> *HN5A: There was a problem in the epidural catheters, so we have asked the pain team to educate the nurses about the doses, site and how to care for epidural. Secondly, when they updated the pain policy for the epidural and PCA, a pain nurse did teaching about the new policy for all the ward nurses in the hospital in different groups.*

Equally, the hospital policy mandates that all new nursing staff in hospital-A should attend the General Nursing Orientation programme, during which documentary analysis indicates that the APS provides a dedicated one-day teaching programme on different aspects of pain management, including pain assessment, pain documentation, PCA, epidural analgesia, pain policies and barriers to effective pain management. This teaching provides basic information about pain management for all new nurses before they start their duties in clinical practice, and it is evidence of the relative importance of pain management in the hospital. Moreover, the APS training activity extends beyond hospital-A to provide teaching at the national and international levels to increase awareness about pain management. A head nurse reported that the APS had conducted three workshops in different hospitals in Jordan with the aim of these hospitals developing an APS in the future.

In contrast, many clinicians expressed that the provision of teaching is short in duration and is not enough to increase their role in pain management. Other clinicians, especially doctors, claimed that they did not attend training at the hospital and relied on their experience, self-education and undergraduate learning about pain management. Therefore, not surprisingly, many doctors suggested providing additional in-service as well as overseas training (specifically in the UK or Canada) to cover their educational needs in order to develop the service further:

> *CA8A: Maybe we need to educate ourselves as anaesthesiologists to become pain medicine physicians and the pain nurses for an advanced education... we are really doing that. We sent a doctor for fellowship in pain medicine to Canada and another doctor is sitting exam for fellowship in interventional pain medicine.*

All new nurses in hospital-B must also attend the General Nursing Orientation programme, but in this case the schedule contains only a one-hour lecture about pain

assessment and management. In addition, there are ongoing teaching sessions about pain management for the ward nurses and the residents in anaesthesia, especially in the ICU. However, many clinicians suggested that the provision of teaching is too short in duration focusing on the principles of pain assessment and management and there was no training on advanced pain management techniques. They also reported that training is not enough to change the attitudes of many clinicians about pain management. This may indicate the need to focus on the content and quality of training to facilitate the introduction of more advanced pain management techniques. In addition, many clinicians claimed that they did not attend training at the hospital and relied on their experience, learning from other colleagues and undergraduate learning about pain management. A number of clinicians therefore suggested providing further teaching for doctors and nurses about the latest evidence on pain management:

> *CN15B: To provide courses for medical and nursing staff about pain assessment and pain medications. In addition, to be up to date in the uses of medications as there are new effective medications. For example, some centre like hospital-A says that we give better medications than you as you still give IM pethidine and we [hospital-A] do not use IM pethidine.*

It appears from the qualitative data that the APS has a major role in educating clinicians about pain management, especially the advanced analgesics techniques and pain policies. The length of training provided in hospital-A is one day, compared to one hour in hospital-B. However, many clinicians, especially doctors, have not attended formal training and would like to receive further training to improve their knowledge about pain management. The findings from the clinician questionnaires also showed that there were no statistically significant differences between the two hospitals in the proportion of clinicians who had pain management training (hospital-A=38.2%; hospital-B=31%) or in the length of training (hospital-A=0.91 days; hospital-B=0.52). However, the informal teaching provided by the pain nurses during the clinical round in Hospital-A was not captured in the clinician questionnaire.

6.3.2 Knowledge and perception concerning pain management among clinicians

Appropriate knowledge about pain assessment and treatment among nurses is one of the essential indicators for achieving high quality POPM (Idvall et al., 1999, 2001). The findings from the clinician questionnaires discussed in chapter five showed that

clinicians in hospital-A had significantly higher total KAP scores, with a median of 60.6%, compared to 51.5% in hospital-B. Participants' accounts discussed here may provide possible explanations for such findings. In hospital-A, many participants appeared to possess sound knowledge about different aspects of pain assessment. Many participants appeared to be in agreement on the value of patient's self-reporting of pain using one of the validated pain scales available within the *Nursing Pain Management Policy* and *Pain Flow Sheet*. In March 2011, a documentary analysis showed that the compliance with pain assessment was 92%:

> *HN7A: We have pain scales; after surgery we use the NRS and the descriptive scale. The descriptive scale is according to the patient's description. If patients cannot tell the level of pain from 0 to 10 then they say mild, moderate, or severe. We have also the coloured visual scale, FLACC, and faces pain scale.*

This is in line with the findings from the patient survey, which showed that only 34% of patients in hospital-A disagreed or strongly disagreed that the staff used a pain scale to assess their pain compared to 86% in hospital-B. In addition, the clinician survey showed that clinicians in hospital-A reported significantly higher knowledge scores than those in hospital-B about the acceptance of patient's self-reporting of pain (94.4% vs 75%), and on pain assessment in the smiling and grimacing case studies (two-thirds in hospital-A compared to one-third in hospital-B). However, a staff nurse in hospital-A seemed uncertain of the legitimacy of patients' self-assessment of pain, as they may pretend to be in pain in front of their escorts[1] (family caregiver). However, she felt compelled to accept patients' self-reporting due to the policies adopted by the hospital:

> *SN9A: We ask the patient; he will not lie and tell you he is in pain if he did not have pain according to the administration... patients also pretend to have pain, especially those who have an escort [family caregiver]; they show Dala' [spoiled/ exaggerate][2] in front of their relatives.*

The APS has also a role in changing clinicians' misperceptions about pain management. Clinicians showed their awareness of the physical and psychological effects of poor pain management, which may create commitments among clinicians to manage pain effectively to avoid these harmful effects. In view of that, many

[1] The escort is normally a member of the family (relative) who stays with the patient in the hospital, especially for the elderly patients.
[2] Dala': means patients are spoiled by their relatives such as overprotecting, showing and exaggerating the pain.

participants believed that the use of opioid in the treatment of acute pain will not cause addiction. Similarly, an anaesthetist who was working in another hospital before moving to hospital-A explained how his perception of pain management has changed from a routine prescription of pethidine to holistic commitment to pain management according to patient needs:

> *AR12A: Only here I knew the holistic approach to pain... My perception of pain has changed and I gained a lot. In other hospitals you will see pethidine, morphine and even oral you will not find it. You are involved in the pain team; you should know the ratios, threshold, cross tolerance and how you change from oral to IV to see the results on your patient.*

Equally, many participants appeared to possess good knowledge about PCA. They perceived that PCA is a good method for the treatment of acute pain because it is easy to use and has a high safety profile. They also reported that patients are comfortable and satisfied with this type of analgesia. However, other clinicians have different opinions about PCA; they appeared to believe that patients may misuse it due to the fear of pain and they may use it more frequently, regardless of their actual level of pain:

> *SN9A: in my opinion, to give it [PCA] for the patient is wrong as he will press the button even if he does not need it.*

Similar to the PCA, many participants appeared to possess sound knowledge about epidural analgesia. They believed it is an effective method for the treatment of acute pain and more potent than PCA, which may provide complete analgesia. Nevertheless, other participants reported that keeping the epidural for seven days is a high-risk strategy that may cause infection and other unwanted side effects. Another surgeon believed that PCA is more convenient than epidural analgesia due to the side effects of epidural:

> *SR11A: The epidural is good but has some side effects. I don't like it as it can cause urinary retention and affects the bowel motility... From the surgical point of you I feel PCA is more convenient.*

Clinicians in hospital-B had different perceptions about pain assessment. Despite using a pain rating scale, many participants relied on patients' behavioural responses to assess pain and they often disbelieved patients' self-reporting of pain. In addition, they believed that patients may lie during pain assessment to receive pethidine, and they

perceived that patients in pain cannot eat, smile, sleep or walk. It therefore appeared that some nurses document in the patients' file what they perceived the pain score to be. This is in line with the findings of the clinician questionnaire, which revealed that a significantly higher percentage of clinicians in hospital-B (52%) believed that patients who can be distracted from pain do not have severe pain, compared to 34.8% in hospital-A:

> *SN14B: pain assessment is according to what patients say; if he is educated or conscious we ask them from 0-10. But in some cases if a patient tells you a level and from your experience and personal evaluation for the patient's surgery and how he looks we may interfere. If he says, while sitting on bed talking, smiling and eating, it is 8 over 10 then I believe it is wrong.*

Furthermore, pain assessment appeared inconsistent in hospital-B. Many participants underestimated patients' pain and perceived that unlike the cancer patients their patients' pain is tolerable and they do not need PCA. Moreover, the In-Service Nursing Education Department chart review audit in February 2010 showed a fluctuation in the completion of pain assessment documentation by nurses. It showed that nurses documented a pain score in 20% of the patients' files in the first week, increasing to 69% and 74% in weeks two and three respectively. This increase in the documentation of pain scores in weeks two and three could be explained by the increased awareness of nurses of the ongoing audit. In addition, participants used placebo to assess pain which may indicates that clinicians still have misperceptions about the use of placebo in pain assessment. This contradicts the *Pain Policy Document*, which prohibits the use of placebo in the diagnosis or treatment of pain.

> *CN17B: There are some patients who are in true pain. But, in the same time, there is another group who are lying and do not have pain... So you will be forced either to monitor these patients or sometimes give something and see if a patient in pain. Instead of giving pethidine, I will ask the doctor to give her placebo... at times we give placebo and you will see the patient is sleeping from placebo. At this time we feel that the patient is lying, is it possible that the placebo made her sleep?*

This may also explain why a significantly higher percentage of clinicians in hospital-B (52%) thought that "a placebo is a useful test to determine if the pain is real" compared to 36% in hospital-A. Although this is statistically significant, and none of the clinicians interviewed in hospital-A reported using placebo, it is a concern that a third of clinicians in hospital-A still believed that placebo can be used in pain

assessment. Furthermore, a disbelief in patients' self-reporting of pain led clinicians in hospital-B to think that patients who request pethidine may have an addiction. Fears related to addiction therefore led some participants to advocate that patients should avoid using analgesia and endure pain as much as possible. Participants' accounts showed that many clinicians still confused addiction with tolerance:

> *CN15B: One of the challenges we are facing is the patients' addiction. We become confused; does the patient has pain and needs narcotics or is it the time for him to feel the euphoric effect of narcotics... Does the patient reached the addiction or do we consider he is not in pain and deal with him in different way?*

This is in line with the findings from the clinician questionnaires, which showed that clinicians in hospital-A had significantly higher knowledge scores than those in hospital-B ($P<0.05$) in recognising the right definition of opioids addiction (question-18; 79.8% vs 66%). However, a staff nurse believed that patients are taking pethidine for the treatment of acute pain, and this short-term use will not cause addiction. In addition, other nurses believed that the patient's self-report of pain is the most accurate judge of the intensity of patients' pain, and suggested not relying on the behavioural pain assessment:

> *HN21B: After this experience, I started to believe a patient if he tells me he is in pain. I started to focus on giving him the analgesia according to the doctors' prescription. Even if he is talking with others, doesn't mean he is not in pain... So, the correct source of pain assessment is the patient himself.*

A common perception among nurses and anaesthetists in hospital-B was that the surgeons lack knowledge about pain management. They perceived that the surgeons are not aware of the WHO recommendations, and that they have limited knowledge about the pathophysiology of pain and the pain medications, because they use IM pethidine and primitive protocols. Indeed, this perceived lack of knowledge of surgeons about pain management was apparent in the accounts of surgeons themselves about their pain management practice. For example, a surgeon in hospital-B relied on vital signs to assess pain, and it appeared that he lacked knowledge about the use of paracetamol as part of multimodal analgesia for POPM. Likewise, a surgeon expressed his worries about using opioids in the treatment of surgical pain before excluding the complications of surgery and identifying the cause of pain. This lack of knowledge

may lead clinicians to leave many patients needlessly in pain during the assessment period without treatment:

> *SR20B: If a patient complains of pain after abdominal surgery you will be afraid about other new problems, you may think of wound infection or problems inside his abdomen and we missed it... Before we give pain medications we need to exclude the complications from surgery, such as wound infection... Normally for major surgery we avoid giving paracetamol because it is antipyretic, we are afraid from temperature.*

This is in line with the findings from the clinician questionnaires, which revealed that clinicians in hospital-A had significantly higher knowledge scores than those in hospital-B on the beliefs that opioids may be used during the pain evaluation period (56.2% vs 20%), and in understanding the benefit of using multimodal analgesia (89.9% vs 74%).

With regard to clinicians' knowledge about PCA, the results are mixed. On the one hand, some clinicians suggested that PCA is a good method for POPM and the patient has the right to use it to control his pain; on the other hand, some perceived that it may cause addiction and patients may misuse it. These perceptions are not surprising however, due to the fact that PCA is not yet available in hospital-B, and these perceptions were gained from a trial use of the machine in the hospital:

> *SN13B: It [PCA] may cause addiction, it is not just pain as he is used to it.*

There was a lack of knowledge and awareness about the use of epidural analgesia in the postoperative period. Participants expressed their worries about using it, preferring morphine and pethidine over epidurals, and they had misperceptions about the possible side effects:

> *SN23B: I have heard, it [epidural] is a good method but I'm not convinced to use it. It has complications such as constant headache for a week, pain in the epidural site, and if it is inserted in the wrong place it may cause paralysis.*

On the other hand, some participants seemed to possess good knowledge about pain management. For example, a resident surgeon acknowledged the harmful effects of un-treated pain on the lungs in surgical patients, and believed it may cause chest infection. A nurse also pointed out that the morphine is better than pethidine for the treatment of surgical pain, but the hospital policy mandates using the latter:

CN22B: We discussed one time that using IV morphine is better than pethidine after surgery. But per the hospital's policy we use pethidine for our patients.

The findings from the qualitative data presented above suggest that the APS had a positive effect on the knowledge and attitude of clinicians concerning pain management. Clinicians in hospital-A possess better knowledge and attitudes than those hospital-B about pain assessment, PCA, epidural analgesia, multimodal analgesia and the use of opioids in the management of acute pain. Participants in hospital-A rely on patient's self-report of pain using pain scales, whereas many clinicians in hospital-B often disbelieve the patients' self-report of pain and rely on other approaches such as behavioural cues, vital signs, or use of placebo. Unlike the majority of clinicians in hospital-B, the majority of participants interviewed from hospital-A do not believe that opioids may cause addiction in treating acute pain. However, participants in both hospitals need to improve their knowledge and attitude about some of the misconceptions about PCA, epidural analgesia, the use of placebo and behavioural cues in pain assessment. Furthermore, participants in hospital-B need to improve their knowledge and attitude about addiction, use of opioids during the pain evaluation period, and multimodal analgesia.

6.3.3 Educating patients

The findings from the patient questionnaire indicated an absence of preoperative pain management education in 18% of patients in hospital-A compared to 72% in hospital-B. Participants' accounts and the documentary analysis confirmed this finding and suggested that the APS has an impact on educating patients about pain management. In hospital-A, the documentary analysis indicates that patient education is part of the pain nurse's *Job Description* as well as part of the *APS Vision*, which states that "APS is a source of information and education about pain management for patients, families and staff". The *Nursing Pain Management Policy* also indicates that patients and families should be educated about pain assessment, treatment plan, side effects, and misconceptions about pain. Indeed, the APS provides teaching for patients in different forms and at different times. Since the introduction of the APS, patient information leaflets in Arabic have been developed for PCA, epidural analgesia, neuropathic pain, acute, chronic, and cancer pain, and POPM. Many participants reported that the APS provides also informal teaching for patients after surgery during their daily round.

Moreover, participants reported that the education of patients about pain starts at the preoperative clinic or on the night of surgery. This teaching involves information about the pain scales, PCA, epidural analgesia and the side effects of medications:

> *CA8A: The education of patients about pain start from the preoperative clinic but we ask our pain nurses, when the patient comes on the same day or they come on the night of surgery, to see all patients who have surgery and educate them about pain management, how to assess pain, about epidural, about PCA and we have brochures in Arabic.*

The benefits of providing information about pain were reported by many nurses, who claimed that the patients' awareness and understanding of their condition as well as adherence to pain management method are much better. The patient education activity is also recorded in a dedicated section for pain management education in the *Patient and Family Education Sheet*:

> *HN1A: The APS will teach patients in a session about how the situation will be after the operation; what pain medications he will have such epidural or PCA. This teaching is before the operation, therefore after surgery the patient's understanding of his condition and the adherence to the pain medication is better.*

In contrast, other nurses in hospital-A claimed that there is still a lack of patient education about PCA and the side effects of epidural analgesia. These participants went on to suggest the need for more education about the pain assessment and analgesics. They also claimed that the education after surgery is better due to the fact that patients before surgery are often anxious.

> *SN9A: They [APS] should teach patients about the pumps they use. They explain before surgery but it is not enough, it should be before and after, as patients are anxious before surgery.*

Contrary to hospital-A, there was a lack in the provision of patient education in hospital-B despite the fact that the *Quality Booklet* document states this is a patient's right. The hospital documents also demonstrate the lack of patient information leaflet provision. This apparent lack of patient information led many participants to suggest providing patient education and teaching about pain:

> *SN18B: The important thing is to explain to patients about the side effects of analgesia if it is used continuously. We may need to do leaflets and involve patients and increase their awareness.*

It appears that the APS had an impact on educating patients about pain management in hospital-A with good benefits, although some participants suggest there is a need for further improvement. APS educational interventions ranged from providing leaflets to teaching patients preoperatively and after surgery. This provision of patient education is not yet systematically available in hospital-B.

6.3.4 Perception of pain management among patients

Participants appeared to believe that patients have different perceptions about opioids and their side effects. In hospital-A, participants suggested that the quality of pain management is good and patients are "far from suffering". However, respondents suggested that many patients fear opioid addiction and other side effects, which may affect their adherence to treatment:

> *HN4A: It [pain management] is hugely different from my previous hospital. You feel that our patients are far from suffering. What we are suffering here is that some patients refuse the pain killers because they have beliefs and fear of addiction and side effects.*

To develop this point, a head nurse perceived that patients' religious beliefs may lead them to think that opioids are *Haraam*[3] (prohibited) in Islamic jurisprudence. She also claimed that although the APS explains the nature of pain management medication to patients and their families, such misperceptions continually abound among patients in ward settings through the patients' escorts (relatives):

> *HN7A: They [APS] educate patients as some patients have beliefs that may prevent proper treatment. For example, a patient thinks the pain killers are "Haraam" [forbidden], as it is a narcotic. She did not ask for any analgesia after surgery, we came back to her few times to convince her that it is a treatment and Halal[3][permissible], and God created the disease and the cure... this is from a religious point.*

Similar to hospital-A, participants in hospital-B pointed out that patients fear opioids and needles, believing the former to be *Haraam*:

[3]Haraam: In Islam means it is not allowed to do something. It is opposite Halal where it is allowed (e.g taking street drugs is Haraam but taking analgesics for treatment is Halal).

SN15B: Some patients believe that these drugs are narcotics and it is "Haraam" to take it. They tell you after surgery "do not give me pethidine, as it is narcotics, and with this medication the man's mind goes and hallucinates".

Participants' accounts suggest that patients in both hospitals fear opioid addiction, side effects and think it is religiously prohibited. However, the provision of education by the APS in different forms is available for patients in hospital-A to explain about these misperceptions.

Theme summary

This theme has presented how the APS influenced clinicians' and patients' understandings of pain management in hospital-A. It showed the crucial role of the APS in educating clinicians, patients and how the education impacted on the clinicians' knowledge and perceptions of pain management. It appeared that the APS provides formal and informal teaching for his clinicians about different aspect of pain management. The provision of this teaching however is limited for many doctors. The ongoing teaching by the APS appeared to have changed the clinicians' misperception about pain management. Clinicians in hospital-A appeared to rely on patient's self-reporting of pain using pain scales. They also appeared to possess better knowledge and attitudes than hospital-B about pain assessment, PCA, epidural analgesia, multimodal analgesia, addiction and the use of opioids in the management of acute pain. Moreover, the ongoing teaching of the ward nurses by the APS appeared to have enhanced the effectiveness and safety of the PCA and epidural analgesia in the surgical wards. Similarly, the APS appeared to have an impact on educating patients, preoperatively and after surgery, about different aspects of pain management with reported benefits. However, there is a need to improve participants' knowledge and attitude about some of the misconceptions about PCA, epidural analgesia, and the use of placebo and behavioural cues in pain assessment.

In hospital-B there is less provision of education for clinicians about pain than in hospital-A, which partly explains clinicians' different perceptions about pain assessment and management. The majority of clinicians in hospital-B appeared to often rely on patients' behavioural responses and the use of placebo in the assessment of pain. They also lacked knowledge about PCA, epidural analgesia and addiction. In

addition, the surgeons appeared to have misperceptions about multimodal analgesia and assessment of pain. Similarly, the provision to educate patients about pain management is not yet available. There is a clear need for patient education as participants' accounts in both hospitals suggest that their patients fear opioid addiction, side effects and think such medication is religiously prohibited.

6.4 The impact of organisational context on pain management

This theme explains how the organisational context may facilitate or hinder the quality of pain management practice in a hospital. Four sub-themes were identified through the interpretation of the participants' accounts and the hospitals' documents that highlight the impact of organisational context on pain management (Table 6-1), as explored below.

6.4.1 Commitment to treat pain

The qualitative data suggest that the commitment of clinicians to treat pain in an organisation may have an effect on pain management practice. In hospital-A, it appears there are many possible driving forces behind clinicians' commitment to make pain visible in the organisation and manage pain effectively. The hospital's slogan of "no pain" or "free of pain" was the ultimate goal for many clinicians to achieve by using different POPM strategies. However, the documentary analysis indicates that "no pain" is not part of hospital-A's vision statement or motto, although it is the logo of the APS. It appears that the APS has influenced the clinicians' adoption of the APS's slogan. The APS's slogan is well adopted by many clinicians and widespread in the hospital, to the extent that many clinicians perceived it to be a hospital motto.

> *SN2A: I have heard about other hospitals, but for this hospital, there is no comparison to other hospitals; the motto here is "no pain" and we use the analgesia in different methods to reach our goal which is "no pain".*

It is not surprising, therefore, that many clinicians in hospital-A are proud of the APS and their hospital. Many participants expressed their pride in what they described as "the only hospital with APS in Jordan". This institutional pride was also emblazoned in the *Patients' Guide* document, and reported in a national newspaper (July, 2011) in

an interview with an anaesthetist who stated that "this APS is the only service of its kind in Jordan".

Another driving force appears to be the consistent belief of hospital administration and clinicians that pain management is a human right for patients which coincides with the *Patients' Rights* document. This document states that patients have the right to appropriate assessment and treatment of pain:

> *CN6A: As nurses, our aim for pain management after surgery was derived from the hospital administration's vision because the nurses and the hospital administration have the same aim; in that patients have the right to be free from pain after surgery, there should be no negligence or failure in pain management.*

For the lead pain nurse, reaching excellence and becoming a unique centre in pain management appeared to be the driving force of her commitment to improve pain management. Indeed, an anaesthetist reported that a common belief among clinicians is that "pain is the fifth vital sign". The documentary analysis indicates that the pain scores are recorded every two hours in hospital-A on the *Pain Assessment and Management Flow Sheet* and the *Daily Nursing Flow Sheet*. He also emphasised that as anaesthetists should have the commitment to treat pain, as explained in the following extract:

> *CA8A: As anaesthesiologists, putting patients into sleep, waking them up from surgical procedures that cause pain, then it is our commitment to take care of the patient after surgery because he is in pain. There are things we adopted from the first day; "pain is the fifth vital sign"... From believing in these two, you are committed to take care of your patients.*

It appears that the APS has led many initiatives in hospital-A which showed their commitment to make pain visible throughout the organisation and nationally. A head nurse reported that there is great interest in pain management in the hospital. For example, the APS supported the "hourly round" initiative, wherein pain assessment is a key element. The *Nursing Hourly Round* leaflet indicates that pain assessment is the first priority in this round. This round is performed by nurses every hour during the day and every two hours at night, whereby nurses check five elements of nursing care prioritised in the following order: pain, need to use toilet, changing position, personal items, and scheduling time for next visit:

HN4A: The presence of APS is essential and helps. The other thing is that the Centre does care about pain. When you say "pain" it causes alarm for all nurses and doctors and this is very important for us. It [pain] is one of the aims of the "hourly round" and one of things we do care about.

Conducting clinical audit appears to be another step to improve pain management practice. The lead pain nurse declared that the APS is performing two ongoing audits to improve the quality of pain management. The first audit is on the nurses' pain management documentation, which may increase the nurses' compliance with the pain assessment using a pain scale. The second audit is on the side effects of epidural analgesia, which may increase the awareness and accountability of clinicians about the safety of epidural analgesia.

The APS also supported an international initiative by participating in the *Global Year Against Pain* initiative, which aims to increase awareness of pain and each year focuses on different aspect of pain that has global implications. This shows the APS commitment to increase the awareness of pain and improve pain management in other hospitals by conducting different workshops:

CA8A: Following the IASP... we celebrated the global year for pain management... and this year it is "the acute pain year". So we did courses about acute pain outside the hospital like X Hospital and Y Hospital.

In hospital-B, on the other hand, there are different driving forces behind the commitment among clinicians. Nurses appeared to believe that one of the driving forces of educating clinicians about pain management is to meet the requirements of the JCI accreditation. They reported that all nurses should have a certificate of training in pain management. The documentary analysis also showed that the Managing Director established the *Pain Management Committee* in 2009, one of whose aims is to achieve the requirements of JCI accreditation. Other nurses also perceived that the driving force behind conducting audits by the quality department on pain assessment documentation is to meet the requirements of the JCI accreditation. One of these requirements is evidence that the organisation supports the patients' right to appropriate assessment and management of pain.

CN17B: The quality department is visiting us from time to time, and the reason for the majority of these visits is for the hospital accreditation, not to improve the pain management. Sometimes they check patients' notes and look at the

vital signs. They check if patients are in pain or not by asking patients about their scores and comparing it with our documentations.

However, an anaesthetist at hospital-B showed his commitment to improve pain management by highlighting the importance of conducting a baseline survey of current pain management practice (Harmer and Davies, 1998; Karlsten et al., 2005). He also perceived the need for an APS and showed his commitment to establish such a service to introduce new concepts in pain management, such as multimodal analgesia. The nursing administration showed another form of commitment to improve pain assessment by considering "pain as the fifth vital sign". The documentary analysis showed that the pain score is documented on the *Patients' Observation Profile* and the *Daily Nursing Assessment Sheet*. Considering pain management is a human right for patients, and feeling empathy with those in pain, are other forms of clinicians commitment to improve pain management and reduce the harmful effects of untreated pain:

HN16B: Anyone who receives a patient in pain will try to reduce the patient's pain level, because you need to consider yourself in his place. You will see how the patient feels; he will be disturbed, annoyed, in severe pain, and blood pressure and heart rate will be high.

It appears that there are different driving forces behind the commitment of clinicians to improve pain management in each hospital. In hospital-A, the APS commitment to treat pain played a role in leading many initiatives to make pain visible and advance pain management practice locally and nationally. The adoption of the "no pain" and "pain as the fifth vital sign" ethos by many clinicians, with the "hourly round" initiative and conducting audits, are examples of how an APS can influence the pain management practice in an institution. In hospital-B, the commitment of clinicians appears to be to achieve and maintain JCI accreditation. However, there are also many individual clinicians who consider "pain as the fifth vital sign" and that pain management is a human right for patients, and they are committed to establish an APS to improve pain management in hospital-B as part of their professional responsibility.

6.4.2 Management support

Participants' accounts and the documentary analysis suggested that management support is one of the requirements to the successful treatment of pain in a hospital. In

hospital-A, training a head nurse in pain management in the US in 2009 was perceived as one form of management support to establish the APS. The hospital and nursing administration also supported the recruitment of the pain nurses into the team in 2010. The documentary analysis showed a clear statement of pride in the *Patients' Guide* about the development of specialist pain nurses in the hospital. The lead consultant anaesthetist also supported the development of this new role, emphasising that the concept of a pain nurse was a novel role in the country, but many doctors were not aware of these roles and there was a need for collaborative work between nurses and doctors to enable the APS to perform their new roles successfully. Moreover, participants perceived that the availability of budget for the APS, and the hospital administration support, were factors in the establishment and success of the APS. Furthermore, since the introduction of the APS, epidural and PCA pumps and many pain medications have been introduced into the hospital, which has been perceived by nurses as another form of management support for the APS. They also believe that the presence of the APS 24 hours a day is a valuable resource and a sign of commitment:

> *SN2A: There is support for the APS. During my three years here; what I have seen is that there were anaesthetists and one pain nurse, then it was developed into two nurses in the team. After that there were anaesthetists, head nurse, and 3-4 pain nurses. Their duty was from 8-4/5pm but with the patients' need, the staff increased to cover both daytime and nights.*

However, some nurses in hospital-A reported a shortage of PCA pumps and a delay in the preparation of the PCA and epidural syringes and non-stock pain medications in the pharmacy. They suggested increasing the number of PCA machines and improving the pharmacy system with regard the preparation of the PCA syringes to avoid delays in getting medications from the pharmacy. Another anaesthetist also reported the lack of clinicians trained in pain management and the limited access to some pain medications which may impact the smooth running of the APS:

> *CA8A: It is a challenge, the presence of qualified pain doctors. We need anaesthesiologists who are sub-specialised in pain medicine and most of the anaesthesiologists in my department are trained in Jordan and the training is limited. They don't have APS or chronic pain rotation and they come out of the residency [programme] without any expertise... also we have limitation on the availability of drugs for pain management. We need all the options regarding opioids... for example, when we asked, hydromorphone for epidural, they brought to us IV hydromorphone which is not preservative free.*

In hospital-B, participants' accounts suggested that the availability of pain medications, pumps and trained doctors and nurses were perceived as forms of management support. Other nurses also indicated that nursing management supports the assessment and re-assessment of pain to improve pain management in the hospital.

> *SN14B: There are unit meetings; during these meetings they [nursing management] focus on the assessment of patient's pain, especially here as a general surgical unit, and to follow-up by re-assessment after giving the analgesia.*

However, many participants voiced concern about the shortage of some pain medications and the lack of ICU and HDU beds for patients receiving epidural analgesia. Moreover, a diligent anaesthetist expressed a lack of optimism about hospital management support. He conducted a baseline survey of the current pain management practice as a pressure tool to seek management support, to show the hospital administration the suboptimal status of pain management and the need to establish an APS:

> *CA24B: In my opinion, the hospital's administration should look at the problems we have. Therefore, as I informed you, I conducted a survey about pain in the hospital. This is my starting point, where I can tell them we have a high incidence of pain in our hospital; most of our patients still taking pethidine, on PRN prescriptions, and we don't have a pain management team. So this evidence I will use to put pressure on the hospital's administration. Without talking to the hospital administration they will not be enthusiastic about pain and I'm not too optimistic. For sure there will be some challenges when we talk with them, as every administration wants to save money. Because this subject needs money, there will be some difficulties facing us.*

The qualitative data presented above suggest that the APS and the pain nurses in hospital-A are well supported by the hospital management in many forms. However, there is a need to increase the number of trained pain clinicians, PCA pumps, and pain medications, and improve the pharmacy system to avoid delays in providing pain medications. In contrast, clinicians in hospital-B, although they have some forms of management support, are not yet fully optimistic about management support with regard to establishing an APS. They are collecting evidence to convince the hospital administration of the need to improve pain management and establish a pain service in the hospital.

6.4.3 The significance of professional boundaries

The level of role clarity and interdisciplinary cooperation may have an effect on the successful implementation of effective pain management. In hospital-A, many participants described how pain management practice had changed over recent years. Before the establishment of the APS, pain management was part of the postoperative care and under the remit of surgeons. Many nurses reported their dissatisfaction with the surgeons' treatment of pain, which was disorganised and resulted in patients being left in pain. They perceived that the surgeons lack experience in pain management:

> *CN10A: It [pain management] was not an organised process. The surgeon prescribes something and the anaesthetist prescribes something else, and anaesthetists were not responsible about pain... We were facing problems, despite patients taking analgesia they were still in pain, as the surgeon does not have enough experience to manage pain.*

Currently, clinicians reported that a multidisciplinary nurse-based, anaesthetist-supervised APS is leading the pain management in the hospital with full authority. The documentary analysis showed that there is a card on the door of each patient's room stating "this patient is under the care of the APS, please call 'APS' before ordering or changing any pain or sedation medication". The APS is also well recognised throughout the hospital and receives many referrals to review patients in acute pain, because they believe that the APS is a specialist team with sound experience in pain management. Referring patients to the APS is reported to have boosted clinicians' satisfaction with the pain management provided by the pain team. An anaesthetist stated that this situation would not be possible without the support of surgeons, which may indicate the importance of this factor in APS success in an organisation. Despite these changes and shifting the accountability of pain management from the surgeons to the APS, the dynamics between multidisciplinary team members were unaffected. It appeared that there is a sense of teamwork and good relationship between the surgeons and the APS; for example, a surgeon confessed:

> *SR11A: For us as surgery, we have chemistry between us and the anaesthesia as we understand each other especially in operating theatres. We have no problems in communication; the relationship is friendly as we normally see the same patients.*

In a similar vein, the ward nurses also have good relationship with the pain team, especially the specialist pain nurses. The ward nurses perceived that the pain nurses have expert knowledge and skills in pain management because they have had courses and training equipping them to treat pain better than the assigned nurse. This was reported to have increased confidence and trust in the pain nurses' ability in pain assessment and management. This may have led the ward nurses to rely on pain nurses in the assessment and management of pain. Therefore, a head nurse voiced concern that this could deskill the ward nurses in the assessment and management of pain, and expressed that the ward nurses should have a role in pain management:

> *HN4A: I always inform my staff that I do not like to withdraw the role of the assigned nurses in pain management. You [nurses] are in a direct contact with the patient; you must assess your patient for pain and you must follow them. It is not enough to inform the APS only, my role is to follow the policy and not to leave my patient. The pain sheet and documentation is for the assigned nurse.*

In contrast to hospital-A, many participants in hospital-B reported that the hospital administration have assigned the surgeons responsibility for POPM in the wards, while anaesthetists are in charge of pain management in the recovery room and the ICU. The *Pain Assessment and Management Policy* also enforced this by stating that the anaesthetist treats only labour pain and patients receiving analgesia through catheters (e.g. epidural) in the ICU. Unsurprisingly therefore a ward nurse considered the anaesthetists as "outsiders". Likewise, the ICU nurses perceived that anaesthetists have better knowledge in pain management than surgeons. Clinicians therefore perceived that the pain management in ICU is of good quality compared to surgical wards:

> *CN15B: The role of anaesthetists in pain management is far better than the surgeons... anaesthetists have better experience in pain because they deal with patients in pain or having surgery. All these things are about pain and the anaesthetists knew it. The surgeons deal with a patient in pain but they care about the operation itself.*

One hospital-B anaesthetist described being enthusiastic to take the lead for pain management in the wards and establish an APS, but he perceived that it is still a challenge to convince the surgeons about this. Moreover, the *Pain Policy* states that the team physician (i.e. surgeon) is in-charge of patients' pain management. This policy may make it even more difficult to convince surgeons. Nonetheless, for a surgeon, creating a pain team seemed to be a difficult concept, but he acknowledged

the experience of anaesthetists and expressed a latent willingness to cooperate with them if his suggestions are followed by the APS:

> *SR20B: Honestly, the idea to divide to different teams is difficult a bit... My goal is bigger than the pain team's goal; as a practice surgeon my goal is the patient, I know the patient, the surgery, the complications and his pain. From my experience I know how the patient pain is; if the score is low or high. The pain team wants to treat pain but I treat the patient as a whole and part of that his pain; this is the difference between us. However, the pain team have more experience in pain management. We may have cooperation between us and we suggest do this and do that; then this is a different issue.*

This apparent lack of role clarity and teamwork in pain management in hospital-B may have affected the nurse-doctor relationship. A nurse reported a lack of confidence in the anaesthetists' skills of inserting epidural catheters. It appeared also that nurses and anaesthetists distrust the surgical residents' knowledge on pain management. Similarly, an anaesthetist appeared to distrust the nurses' knowledge and skills on the assessment and management of pain. Another anaesthetist also believed that the surgical ward nurses are not yet competent in the care of patients receiving epidural analgesia. It is not surprising therefore that many participants were dissatisfied with current pain management practice:

> *CA24B: There have been some cases on epidural analgesia sent to the wards. But we stopped sending such patients to the floor because, you know, when you put a catheter in such place, you need someone who knows how to deal with the catheter correctly; knows how to prepare the medications; knows how to deal with the infusions pumps safely and administer the medications safely. Therefore, I don't think the surgical wards are capable to receive patients on epidural analgesia in the current situation.*

The qualitative data presented above suggest that although the APS takes overall responsibility for pain management in hospital-A, there is a sense of role clarity, teamwork and good relationship between the multidisciplinary team. In hospital-B, however, there is a lack of teamwork and cohesion in the multidisciplinary team. Pain management is under the remit of surgeons in the surgical wards, whereas in the recovery and ICU it is under the care of anaesthetists. The study data also suggest that the anaesthetists need the support of surgeons to be able to establish a successful APS, which has been possible in the case of hospital-A. Interestingly however, the findings from the patient survey in hospital-B are in contrast to some of the participants' views,

which showed that the vast majority of patients agree or strongly agree that "the nurses and doctors have cooperated in treating their pain".

6.4.4 Workload challenges

Participants' accounts suggested that the high workload of both the APS and clinicians may act as a barrier to effective pain management. In hospital-A, a charge nurse reported that the perceived excessive workload of ward nurses may affect their performance of nursing care and may impede effective pain management. Therefore, he believed that the administration developed the APS as part of the solution to this problem. Other nurses perceived that the work overload and shortages of staff among the APS is one of the reasons for their slow response to nurses' requests to review patients in pain. Many nurses therefore recommended increasing the number of pain nurses within the APS to overcome this delay to provide quality pain management.

> *SN2A: The main challenge we may face is the response status of pain nurses or the pain team often is not quick. This problem is due to the large numbers of consultations which increases workload on doctors and nurses in the team. So, you may find a delay in their response.*

Similar to hospital-A, a nurse in hospital-B reported that the work overload prevented her attending a teaching session on pain management. Similarly, nurses perceived that the surgical residents are struggling to meet the demands of their requests to review patients' pain due to the work overload and shortage of staff. This may led to a delay in their response to nurses' request and patchy assessment of pain:

> *SN14B: Surgeons do not ask about pain unless we [nurses] discuss with them about pain; this is due to the shortage of staff. They [residents] are busy and responsible for many patients, more than they can cope with.*

It appears from the study data that excessive workload may act as one of the barriers to provide high quality pain management. However, this is in contrast to the findings from the patient survey in both hospitals, which showed that the majority agree or strongly agree that "there have been enough nurses on duty for someone to respond quickly to my request for pain relief".

Theme summary

This theme has presented how the organisational context facilitated or hindered the quality of pain management practice in both hospitals. It showed how the clinicians' commitment to treat pain, management support, role clarity and interdisciplinary cooperation and workload challenges impacted on the pain management practice. The adoption of the APS's slogan of "no pain" was the ultimate goal for many clinicians to achieve using different POPM strategies. The APS led many initiatives to make pain visible locally and nationally, such as the incorporation of pain assessment in hourly rounds, and entrenching the concept that "pain is the fifth vital sign" and the audit of pain documentation initiatives, which helped in the systematic assessment of pain in hospital settings with many forms of management support. The availability of budget, surgeons' support, recruitment of pain nurses and supporting them in their new roles were considered important factors for the success of the APS. However, there is a need to increase the number of trained pain clinicians, PCA pumps, and pain medications, and improve the pharmacy system to avoid delays in pain medication provision.

Despite shifting the accountability of pain management from the surgeons to the APS, there is a sense of role clarity, teamwork and a good relationship between the multidisciplinary team in hospital-A. The services provided by the APS have also gained the trust and satisfaction of many clinicians. However, the work overload on the APS has impacted on their ability to response in quick way.

In hospital-B, there are many individual clinicians who consider pain management to be a human right for patients. The nursing administration also introduced the "pain is the fifth vital sign" initiative to improve pain assessment in the hospital. However, the commitment of clinicians appears to be based on achieving and maintaining JCI accreditation. Although the availability of pain medication and trained clinicians were perceived as forms of management support, clinicians appeared not yet fully optimistic of the management support and collecting evidence to convince the hospital administration of the need to establish an APS. There is also a lack of teamwork and cohesion between the multidisciplinary team in hospital-B. The pain management is under the care of surgeons in the surgical wards, whereas in the recovery and ICU it is under the care of anaesthetists. However, the surgical residents are struggling to meet

the demands of the nurses' requests to review patients' pain due to the work overload and shortage of staff.

6.5 Conclusion

This chapter has presented the findings of the clinicians' accounts and documentary analysis addressing the third proposition informing this case study. The findings of this case study suggest that the availability of the APS staff around the clock in hospital-A, the daily APS's 'round', the specialist pain nurses' 'rapid interventions' and coordination role , the implementation of quality improvement initiatives by the APS (e.g. the nursing hourly round, clinical audit) under the management support, development of pain management policies, the introduction of PCA and epidural analgesia, the availability of patient education provision, the adoption of the APS's motto of "no pain" and the teamwork were the main activities that had a positive impact on the quality of POPM, patients' experience of pain and patients' satisfaction with pain management in hospital-A. However, the work overload on the APS has impacted on their ability to respond quickly to patient requirements especially at night. There is also a need to improve patients' involvement in their care, the involvement of ward nurses in the APS round, and there is a need to increase the number of trained pain clinicians, PCA pumps, and pain medications.

On the other hand, the findings from hospital-B suggest that the absence of APS provision, disorganised pain management practice and lack of coordination, outdated anecdotal doctors' protocols in the absence of evidenced-based policies, and lack of teamwork with the dispute about responsibility for pain management between anaesthetists and surgeons have led to suboptimal and variable standards in POPM, lack of PCA provision, and the widespread use of IM analgesia. Consequently, many patients in hospital-B suffered from surgical pain needlessly. In addition, the provision of educating patients about pain management is not yet available and patient involvement in their care is patchy. Therefore, many clinicians in hospital-B perceived the need to establish an APS as the way forward to enhance the quality of pain management.

In relation to the clinicians' knowledge and perceptions of pain management, the ongoing education and training provided by the APS in hospital-A, the quality and content of training on different aspect of pain management including PCA and epidural analgesia, the informal teaching provided during the APS's 'round', the development of policies and protocols were the main activities of the APS that had an impact on the knowledge and attitude of clinicians in hospital-A. However, there is a need to improve participants' knowledge and attitudes in hospital-A about some of the misconceptions about PCA, epidural analgesia, and the use of placebo and behavioural clues in pain assessment. In hospital-B, the majority of clinicians appeared to lack the knowledge about PCA, epidural analgesia and addiction, and often rely on the patients' behavioural response and the use of placebo in the assessment of pain. Although, the training of clinicians in hospital-B about pain is much shorter than in hospital-A, the provision of in-service pain education in both hospitals is short in duration and many clinicians relied on their experience and learning from other colleagues. Furthermore, there is a clear need for patient education as participants' accounts in both hospitals suggest that their patients fear opioid addiction, side effects and think such medication is religiously prohibited.

The qualitative findings presented in this chapter have provided a deeper understanding of the influence of an APS on pain management practice and provided possible explanations and greater understanding for the quantitative results presented in chapters four and five. These findings are discussed in the following chapter.

Chapter Seven

7 Discussion and Conclusions

7.1 Introduction

The development of a nurse-based, anaesthetist-supervised APS in one of the hospitals in Jordan provided a unique opportunity to conduct a comparative multiple-case study to investigate the influence of an APS on POPM, as compared to a similar hospital that has yet to develop this service. In particular, this study sought to explore the gap in our knowledge concerning the study theoretical propositions:

1. The APS will have a positive impact on the quality of POPM, patients' experience of pain and patients' satisfaction with pain management.
2. The APS will have a positive impact on clinician's knowledge and attitude regarding pain.
3. There will be a positive perception among clinicians concerning the APS and pain management practices in Jordan.

In relation to these propositions, the findings of this case study can be summarised as follows. First, the study found that patients in hospital-A reported significantly higher total quality scores of POPM than hospital-B and in the subscales of action and communication. Patients in hospital-A also reported significantly lower pain intensity scores than hospital-B. The findings suggest that the provision of patient education and the more robust approach to pain assessment in hospital-A have positively influenced the achievement of higher total quality scores when compared to Hospital-B. The qualitative findings indicate that the availability of the APS staff 24 hours in hospital-A, the daily APS's 'round', the specialist pain nurses' 'rapid interventions' and coordination role, the implementation of quality improvement initiatives by the APS, development of pain management policies, and the introduction of PCA and epidural analgesia, emerged as the main activities of the APS that had an impact on the quality of care and patients' experience of pain in hospital-A. However, the study has found that the total quality scores of POPM did not reach the 'high quality of care' threshold in either hospital. The findings suggest that the lack of patient involvement, the lack of

regular pain assessment, and organisational challenges in both hospitals have prevented the total quality scores from reaching the international standard for 'high quality of care'.

In relation to the second proposition, the study has found that clinicians in hospital-A had significantly higher total knowledge and attitude scores towards pain than hospital-B. In this study, ongoing education and training provided by the APS; the quality and content of training on different aspects of pain management, the informal teaching provided during the APS's 'round', and the development of pain policies, were the main activities of the APS that had an impact on the knowledge and attitude of clinicians in hospital-A. However, this study has found that the total knowledge and attitude scores towards pain did not reach the 'minimum acceptable scores' in either hospital. A possible explanation is that the short duration of in-service pain education, lack of education sessions, and the reliance of clinicians on their experience, learning from other colleagues or undergraduate courses to learn about pain management are potential explanations for this shortfall. Moreover, clinicians, in both hospitals were found to have misconceptions about the side effects of PCA and epidural analgesia, and the use of placebo and behavioural clues in pain assessment. Furthermore, clinicians' interviews indicate that patients refuse to take narcotics because they believe it is Haraam (prohibited) or due to fear of opioid addiction and side effects. The presence of relatives (escorts) may also lead patients to pretend to be in pain and show Dala' ('spoiled' / 'exaggerate') in front of their relatives. It should be noted that the findings related to the third proposition was integrated with the first two propositions and discussed in terms of providing possible and alternative explanations for these propositions.

Having summarised the key findings, the following sections will discuss the findings in more depth with reference to the available literature. The final sections of this chapter highlight the methodological strengths and limitations of the study and review the implications for practice, education and future research.

7.2 The current quality of postoperative pain management practice

Despite the fact that patients in hospital-A reported significantly higher total SCQIPP scores than hospital-B, it is important to note that the total mean SCQIPP scores did not reach the 'high quality of care' threshold of 63 in either hospital (57.28 vs. 51.88) as proposed by Idvall et al. (2002a). It is difficult to compare the results of the present study with previous research due to the fact that no previous studies have used the SCQIPP questionnaire to assess the impact of an APS on the quality of POPM. However, the mean total quality score in hospital-A is consistent with previous studies that examined the quality of POPM using the same questionnaire in Sweden, which revealed a mean of 58.6 (Idvall et al., 2002a) and 61.1 (Gunningberg and Idvall, 2007). In a validation study of the SCQIPP questionnaire, Vatansever and Akansel (2014) reported a lower mean total SCQIPP score (45.8) among Turkish patients.

Many possible factors may have contributed to this finding of not reaching the 'high quality of care' threshold. First, although the qualitative findings suggest that patient involvement in hospital-A is more embedded than in hospital-B, the patient questionnaire showed a lack of patient involvement among 48% and 68% of patients in hospital-A and hospital-B respectively. This finding is higher than a previous finding of Idvall et al. (2002a) who reported a lack of patient involvement among 29.3% of their patients. This lack of patient involvement may have prevented the total quality scores from reaching the 'high quality of care' threshold in both hospitals (Idvall et al., 1999, 2001). The finding from this study and previous studies illustrate the importance of patient involvement to the quality of pain management. To improve the quality of POPM in both hospitals, there is a need to develop strategies to promote patient involvement in their postoperative care.

Second, there was a lack of regular pain assessment using a pain scale among 86% of patients in hospital-B and 34% of patients in hospital-A. Therefore, if one in three patients in hospital-A and 86% of patients in hospital-B were not being regularly assessed, this may well have prevented the SCQIPP scores from reaching the 'high quality of care' threshold in both hospitals. In a previous study by Idvall et al. (2002a), a lack of regular pain assessment was found among 52% of patients, which prevented their total quality scores from reaching the 'high quality of care' threshold. This

illustrates the importance of regular pain assessment using a pain rating scale for the quality of POPM. Indeed, regular assessment of pain using a validated pain rating scale is considered one of the quality indicators for acute pain management (Gordon et al., 2002), and one of the most crucial factors for achieving high quality of care in POPM (Idvall et al., 1999, 2001). Regular assessment of pain has also been recommended, because patients' self-report of pain is the most reliable indicator of the intensity of pain (AHCPR, 1992; American Pain Society, 2005, 2016). Accurate pain assessment is an essential prerequisite of successful pain management (Stomberg & Haljamäe, 2003; Viscusi and Schechter, 2006; Breivik et al., 2008) and the first necessary step to inform acute pain treatment and ensure continuity of care (Taylor and Stanbury, 2009; RCoA, 2012). Previous studies have identified that inadequate pain assessment can lead to a failure in pain management (Dalton et al., 1999; Harmer & Davies 1998). These results together suggest that the quality of pain management can be improved by enhancing the compliance of clinicians with performing regular pain assessment using pain rating scales.

The qualitative findings provided further insights into the finding that neither hospital reached the internationally recognised standard for high quality pain management. The qualitative findings suggest that excessive workload and shortage of staff in both hospitals may act as a barrier to providing high quality pain management. This issue has been identified in previous studies internationally (Schafheutle et al., 2001; Rejeh et al., 2008; Powell et al., 2009; Rejeh et al., 2009), and in Jordan (Abdalrahim et al., 2010; Batiha, 2014; Shoqirat, 2014). In addition, the lack of resources such as PCA pumps, pain medications and qualified pain clinicians in both hospitals are possible barriers to achieving high quality pain management, consistent with the findings of Powell et al. (2009). Moreover, the slow response of the APS at hospital-A and the residents at hospital-B, especially at night, may have contributed to this finding; a concern which has been highlighted in previous studies (Pesut and Johnson, 1997; Gleeson and Carryer, 2010; Manzoni et al., 2012).

Another possible explanation for not reaching the 'high quality of care' threshold in both hospitals is that the threshold of >4.5 (total 63) could be too high benchmark to achieve. In this study, with regard to individual items on the patient questionnaire, 'high quality of care' in both hospitals as measured by a mean score of >4.5 was

identified in only two individual items (item 13 and 14) in both hospitals. These results are lower than previous studies which found 3-5 items exceeded the high quality of care threshold of 4.5 (Idvall et al., 2002a, 2005; Gunningberg & Idvall, 2007; Idvall and Berg, 2008). In this study, higher scoring elements of care were identified in relation to the statement: "the nurses and doctors have cooperated in treating my pain". High quality of care in both hospitals was also identified in relation to the statement: "the nurses believe me when I tell them about my pain". These patient responses are consistent with the findings of previous studies (Idvall et al., 2002a, 2005; Gunningberg & Idvall, 2007), suggesting that patients in this study and more generally have trust in the nurses' pain management practice.

The 'high quality of care' threshold was set at >4.5 under the Swedish healthcare system (Idvall et al., 2002a). Nevertheless, the 'high quality of care' threshold (mean > 4.5 or total of 63) has not yet been validated globally and needs further consideration and caution when interpreting the current study findings. In addition, it has been suggested that a mean score of < 4.0 indicates a 'low quality of care' (Idvall and Berg, 2008). In this study, the 'low quality of care' was identified in three individual items in hospital-A and six items in hospital-B. These results suggest that the mean for the majority of items were between 4 and 4.5; nine items (from a total of 14) in hospital-A and six items in hospital-B.

Therefore, it is reasonable to argue that the threshold of 4.5 (total of 63) is suggested for hospitals in high-income countries and may not yet be achievable for middle-income countries such as Jordan where in the current study the mean for 12 items in both hospitals were below 4.5. As the APS is a recent development, and many hospitals are still without such a service, an adjusted 'high quality of care' threshold should be explored for Jordan and, indeed, for lower income countries that are struggling with limited resources. From these findings, it could be suggested that the adjusted 'high quality of care' for middle-income countries would be between 4.0 and 4.5 thresholds; this needs further validation studies to examine the feasibility of achieving such score.

In summary, the findings of this study suggest that the quality of care did not reach the internationally recognised standard for high quality pain management in both

hospitals. This could be related to organisational barriers, lack of patient involvement and lack of regular pain assessment using a pain rating scale. There is a need to pay more attention to interventions promoting patient involvement, and incorporating regular pain assessment into the routine clinical practice.

7.2.1 The influence of an APS on the quality of postoperative pain management

Despite the fact that SCQIPP scores did not reach the 'high quality of care' threshold of 63 in either hospital, it is important to note that patients in hospital-A reported significantly higher total median SCQIPP scores than hospital-B (59 vs 51) and in the subscales of communication (13 vs. 11) and action (14.5 vs. 11). The significantly higher total quality scores for POPM reported by patients in hospital-A may be related to the significantly higher median scores in the subscales of communication and action. A lower percentage of patients in hospital-A have also scored individual items as 1 or 2 in the subscales of communication and action.

In the subscale of action, the findings showed a lack of regular pain assessment using a pain rating scale in 34% of patients in hospital-A compared to 86% of patients in hospital-B (item-7). However, two thirds of the patients in both hospitals acknowledged that staff asked them about pain assessment (item-6). This may suggest that clinicians in hospital-B did perform pain assessment but without using a pain rating scale, as 86% of patients disagreed or strongly disagreed with the statement about the staff asking them to pick a number between 1 and 10. The mean for performing regular pain assessment using a pain scale was 3.6 in hospital-A and 1.64 in hospital-B. These large differences in pain assessment (3.6 vs 1.64 and 34% vs 86%) between both hospitals may well have positively influenced the achievement of higher total SCQIPP scores in hospital-A when compared to hospital-B. Although there were no previous studies that used the SCQIPP questionnaire in the context of APSs, earlier research studies reported a mean ranged from 2.8 to 3.9 (Idvall et al., 2002a, 2005; Gunningberg & Idvall, 2007; Idvall and Berg, 2008). This suggests that performing regular pain assessment using a pain scale in hospital-B is well below the average mean of published studies internationally.

The qualitative data also suggest that clinicians in hospital-A appeared to rely on patients' self-report of pain using a pain scale whereas many clinicians in hospital-B sometimes doubted patients' self-reports of pain and relied on other approaches such as behavioural cues. One possible explanation could be that many clinicians in hospital-A with sound knowledge on the use of pain scales used them more (Wikstrom et al., 2014). It is also possible that the clinicians in hospital-A used more pain scales due to the higher percentage of patients who used advanced pain management modalities, as this is one of the requirements in PCA and epidural analgesia policies (Schafheutle et al., 2001; Gunningberg and Idvall, 2007).

Another possible explanation of the more robust approach to pain assessment in hospital-A is that the ongoing audit of pain documentation has increased compliance with the use of pain assessment scales (Karlsten et al., 2005; Oakes et al., 2008), and the use of pain scales assisted clinicians to assess pain efficiently and therefore positively influence patient outcomes (Young et al., 2006). This illustrates the important role of APS in improving pain assessment in an institution. Indeed, regular pain assessment and documentation of pain assessment in patients' charts were suggested among the quality criteria that represent the basic components of an efficient APS (Stamer et al., 2002). The documentary analysis in the present study showed that the compliance with pain assessment was 92% in hospital-A compared to 20% in hospital-B, although this percentage increased to 69% and 74% following the second and third weeks of the chart's audit in hospital-B as shown in the documentary analysis. This finding in hospital-A is consistent with the findings from recent surveys which show that the majority of hospitals ($\geq$ 97%) with an APS perform regular pain assessment (McDonnell et al., 2003b; Nasir et al., 2011; Van Boekel et al., 2015). Moreover, Manzoni et al. (2012) in a small sample of 32 doctors and 63 nurses found that 67% of staff in the units with access to an APS routinely use the NRS for pain assessment compared to none in the units with no access to an APS.

In relation to the subscale of communication, the findings of this study indicate an absence of preoperative pain management education among 18% of the patients in hospital-A compared to 72% in hospital-B. This large difference in the provision of patient education (18% vs 72%) between both hospitals may well have positively influenced the achievement of higher total SCQIPP scores in hospital-A when

compared to hospital-B. The qualitative data support this finding and suggest that the provision of patient education in hospital-A is well established compared to hospital-B. The APS provides teaching for patients preoperatively and after surgery and has developed different patients' information leaflets in Arabic about POPM. This may have had an impact on the quality of pain management as providing preoperative information about pain treatment is considered a crucial factor in achieving high quality of care in POPM in surgical wards (Idvall et al., 1999, 2001). This may also illustrate the important role of the APS in providing preoperative education for patients. This finding is similar to that of Miaskowski et al. (1999) which showed that the percentage of patients who received patient education was higher in the APS-group (87% vs. 74.4%). Another study also found a significant increase in the percentage of patients who received pre-operative information in the post-APS-phase (92.4%) compared to 81% in the pre-APS (Mackintosh and Bowles, 1997). Providing patients with information about pain management either verbally or in leaflets is one of the main functions of APSs (RCoA, 2014) with 77%-95% of APSs worldwide providing such education (CSAG, 2000; Hung et al., 2002; Hu et al., 2007; Van Boekel et al., 2015).

Providing patients with information about pain management is one of the quality indicators for effective pain management (Gordon et al., 2002; McNeill et al., 2004; RCoA, 2012), and can facilitate patients in making informed decisions about their treatments (Walker, 2007). In a number of studies of educational interventions, preoperative information has been shown to reduce postoperative pain (Giraudet-Le Quintrec et al., 2003; Sjoling et al., 2003; Wong et al., 2010; Kol et al., 2014) and anxiety (Sjoling et al., 2003; Wong et al., 2010; Guo et al., 2012), improve self-efficacy (Wong et al., 2010) and increase patients' satisfaction with their POPM (Sjoling et al., 2003; Bozimowski , 2012). It is also possible that an improvement in self-efficacy and a reduction in anxiety may improve the quality of POPM and this needs further investigation.

Furthermore, possible explanations for the higher total quality scores in hospital-A compared to hospital-B were apparent in the qualitative findings. Participants perceived that the role of APS in coordination and communication had a positive impact on the quality of pain management. The pain nurses' coordination role and the

APS ‘round’ appeared to enhance the relationship of the pain team with hospital-A clinicians. Havens et al. (2010) found that good relationships and communication between nurses and other healthcare professionals is associated with an enhanced quality of care. Additionally, team work is considered one of the prerequisites for effective POPM (Idvall et al., 1999, 2001; Soderhamn and Idvall, 2003).

In addition, participants’ accounts suggested that the presence of the APS in hospital-A has had an impact on the quality of pain management through the development of common policies to standardise pain management practice, echoing the findings of Harmer and Davies (1998) who found improvement in the quality of postoperative pain relief after the introduction of standard guidelines. These policies in hospital-A were considered a good source of information about pain management for clinicians and provided clinicians with a framework for their clinical practice decision making and implementing evidenced-based practice (Polomano et al., 2008). The American Pain Society (2005) also suggested that evidence-based standards of care can improve the quality of pain management.

The impact of the organisational context also needs considering and may provide alternative explanations for the higher total quality scores in hospital-A when compared to hospital-B. The qualitative findings suggest that there is great interest in pain management, as a priority, in hospital-A where the commitment to treat pain played a role in leading many initiatives to make pain visible and advance pain management practice locally and nationally. Examples of initiatives were clinical audits; ‘pain is the fifth vital sign’; pain management is a human right and participating in the ‘global year against acute pain’. Making pain management an organisational priority can improve pain management practice (Twycross and Dowden, 2010). Furthermore, qualitative findings in hospital-A suggest that the shared vision of ‘no pain’, management support, clinician support (e.g surgeons), commitment to manage pain effectively, and the implementation of quality improvement initiatives (e.g. the nursing hourly round) had an impact on the quality of pain management. These elements have been shown to be crucial to the success of quality improvement efforts to improve care in a hospital setting (Bradley et al., 2001).

On the other hand, there was no significant difference in the subscale scores of trust and environment between both hospitals, despite the higher scores reported by patients in hospital-B in the subscale of trust. The mean for the subscale of 'environment' (12.22 vs. 11.86) is slightly lower than that reported by previous studies (Idvall et al., 2002a, 2005; Gunningberg & Idvall, 2007), which revealed a range between 12.8 and 13.4. The present findings illustrate patients' satisfaction with the allocated rooms and the opportunity to sleep at night in both hospitals. It may also suggest the similarity in the physical settings of the wards between both hospitals. In the subscale of 'trust' the reported mean (17.52 vs. 17.70) is consistent with the findings of previous research (Idvall et al., 2002a, 2005; Gunningberg & Idvall, 2007), which showed a range between 18.1 and 18.3. The findings of this study and previous research suggest that patients have trust in nurses' pain management practice. Additionally it shows the patients' satisfaction with nursing care in both hospitals. Indeed, patients' satisfaction scores with pain relief showed a high level of satisfaction in both hospitals.

Patients' satisfaction with pain management can be influenced by many factors such as effective pain relief (Svensson et al., 2001; Bozimowski, 2012), and providing preoperative information about pain management (Sjoling et al., 2003; Niemi-Murola et al., 2007; Bozimowski, 2012). Although the findings of this study showed that the provision of preoperative information is more embedded in hospital-A and patients in hospital-A reported significantly lower pain intensity scores than hospital-B, there was no significant difference in patients' satisfaction with pain management between both hospitals. These results are similar to some previous reports (Sartain & Barry, 1999; Salomäki et al., 2000), but in contrast to others which demonstrated improvement in patients' satisfaction with pain management who received APS care (Coleman and Booker-Milburn, 1996; Gabrielczyk and McGonagle, 1997; Tsui et al., 1997; Tighe et al., 1998; Miaskowski et al., 1999; Sauerland et al., 1999; Buckenmaier et al, 2012). The findings of this study suggest that the nurses' caring attitude, patients' trust in healthcare professionals' care and the environment of care have had an impact on patients' satisfaction with pain relief.

The findings of the current study indicate that patients' satisfaction with pain management is not an easy construct to measure. Patient satisfaction can be influenced by many different factors such as the efficacy of pain relief, preoperative information,

nurses' caring attitude, trust, and physical environment of care. As pain relief is not the sole factor in measuring patient satisfaction coupled with discrepancy found in the literature and in this study, it is reasonable to question the relevance of patient satisfaction as an outcome measure for pain management (Salomäki et al., 2000; Svensson et al., 2001; Gordon et al., 2002; Carlson et al., 2003) or as an indicator of effective APSs in hospitals (Karlsten et al., 2005; Jawaid et al., 2009). Based on these results altogether including the current study, measurement of patient satisfaction as a sole indication of patients' experience with pain management is not recommended, and there is a need for alternative scoring system that encourages patients to be critical when assessing their satisfaction with pain management.

To conclude, these findings indicate that the significantly higher total quality scores for POPM reported by patients in hospital-A when compared to hospital-B may be related to the more robust approach to pain assessment, the provision of pain education, the availability of the APS, the APS's 'round', the specialist pain nurses' coordination role, the implementation of quality improvement initiatives, and the development of pain management policies in hospital-A. Furthermore, The findings of this study suggest that the nurses' caring attitude, patients' trust in healthcare professionals' care and the environment of care have had an impact on patients' satisfaction with pain relief.

7.2.2 The influence of the APS on patients' experience of postoperative pain

The proportion of patients who experienced 'more pain than expected' after surgery was significantly lower in hospital-A than hospital-B (8% vs. 62%). This may have had an impact on the total SCQIPP scores. This is in line with the findings of Idvall et al. (2002a) and Gunningberg and Idvall (2007) who found that 24% and 17% of their patients who reported 'more pain than expected' had lower total SCQIPP scores. In fact, patients in hospital-A reported significantly lower pain intensity scores (worst, least and 'pain right now'; 3, 0, 2 respectively) than hospital-B (9, 2, 5). These findings are comparable to previous studies (Bardiau et al., 1999; Miaskowski et al., 1999; Sartain and Barry, 1999; Sauerland et al., 1999; Salomäki et al., 2000; Bardiau et al., 2003; Stadler et al, 2004; Lee et al, 2010; Buckenmaier et al, 2012), but in contrast to others which showed no difference in patients' pain score after the

inception of an APS (Pesut B. & Johnson J., 1997; Stacey et al., 1997). The systematic reviews of the impact of APSs have also come to different conclusions. While Werner et al's. (2002) review concluded that the implementation of APSs is associated with a significant decrease in postoperative pain ratings, McDonnell et al. (2003a) concluded that there is insufficient robust research to assess the effectiveness of APS in improving the quality of analgesia after surgery.

The results of the current study could be partially explained by the use of PCA and epidural analgesia in the care of the majority of patients in hospital-A compared to a lack of such modalities in hospital-B. Many systematic reviews on the effectiveness of PCA and epidural analgesia have shown significantly superior pain relief compared with conventional injections (IM, SC, IV) of opioids (Beattie et al., 2001; Jorgensen et al., 2001; Walder et al., 2001; Dolin et al., 2002; Block et al., 2003; Choi et al., 2003; Hudcova et al., 2006; Marret et al., 2007; Nishimori et al., 2012; Khan et al., 2013).

With regard to these findings, it could be argued that the improvement in pain relief in hospital-A is due to the advanced analgesic methods used, the use and increasing availability of improved treatment regimens, rather than the presence of the APS *per se* (Counsell et al., 2008). However, this is a circular argument in that the introduction of the APS has itself led to an increase in the use of advanced analgesic techniques, such as PCA and epidural analgesia in surgical wards (Miaskowski et al., 1999; Sartain & Barry 1999; Werner et al., 2002; Taylor and Stanbury, 2009), and reduce the use of IM analgesia (Coleman and Booker-Milburn, 1996; Mackintosh & Bowles 1997). In fact, similar to the findings of Popping et al. (2008a), the majority of patients in hospital-A received epidural analgesia (76%) compared to 2% in hospital-B. Moreover, none of the patients in hospital-B used PCA compared to 12% in hospital-A. None of the patients in hospital-A received IM pethidine compared to 48% in hospital-B. In a recent audit by Massad et al. (2013) in a university hospital in Jordan showed that 66.9% of patients received IM pethidine, 25.8% received IM diclofenac, 1.5% received epidural analgesia and none of the patients used PCA.

Furthermore, as Stamer et al. (2002) argue, since no specific quality indicators for APS have been formulated, studies demonstrating advances in POPM depending on APS must be viewed in that light. Equally, Rawal (2002) pointed out that selection of an

appropriate organisational structure may be as important to the success of the service as the choice of analgesic modalities. Supported by data from the interviews, the presence of the nurse-based, anaesthetist-supervised APS and pain management policies in hospital-A in this study may well have been fundamental to an increase in the use of PCA and epidural analgesia as a standard of care. On the other hand, participants' accounts in hospital-B suggested that the absence of APS provision, disorganised pain management practice, outdated anecdotal doctors' protocols in the absence of evidenced-based policies, and lack of teamwork with the dispute about responsibility for pain management between anaesthetists and surgeons may have led to variable standards and the widespread use of IM pethidine for POPM (suboptimal according to the American Pain Society (2005) and ASA (2012) recommendations).

Consequently, supported by clinician's views, many patients in hospital-B suffered from surgical pain needlessly. POPM is an essential component to the care of postoperative patients, and ineffective pain relief is morally and ethically unacceptable (The Royal College of Surgeons of England and the College of Anaesthetists, 1990). The Declaration of Montreal also recognised that 'access to pain management is a fundamental human right' (International Pain Summit of IASP, 2011, p. 29). Unrelieved pain may result in detrimental physiological and psychosocial consequences at an individual and societal level (Brennan et al., 2007). The findings of this study suggest that the presence of the APS supported by evidence-based policies and in-service staff education are important factors in introducing and implementing advanced pain management techniques according to recognised international standards.

The availability of APS staff 24 hours a day in hospital-A may provide another possible explanation of the reported low pain scores, compared to hospital-B, as perceived by many clinicians. The availability of APS staff around the clock is one of the proposed five quality criteria for an efficient APS to improve POPM (Stamer et al., 2002). Only few APSs globally (5-26%) were able to provide a 24-hour cover (Audit Commission, 1997; Stamer et al., 2002; Powell et al., 2004; Nasir et al., 2011; Van Boekel et al., 2015). Participants in hospital-A also believed that the availability of the APS 24 hours has facilitated the continuity of care, helped in providing the pain medications and analgesia pumps on time, and therefore improved patients' experience

of pain. Previous studies showed that the majority of hospitals utilised the 'office hours' model of APS (Powell et al., 2004; Van Boekel et al., 2015) which may affect the continuity of care and the effectiveness of pain management at night (Closs et al., 1999; Powell et al., 2004). However, Powell et al. (2004) argued that if an APS is able to encourage the widespread organisational changes required overcoming barriers to pain management, even the 'office hours' APS would promote and maintain good practice over the 24-hour period. Central to this debate is whether the 'core business' of APS is to provide direct patient care or provide a resource for education and training for clinicians to promote good clinical practice (Rawal, 2005). Counsell et al. (2008) believe that the APS' philosophy should focus on education and training of staff to disseminate the work of the APS to the ward level. The findings of this study seemed to put the APS in hospital-A in a neutral position of this debate as they undertake both forms of activity, providing continuous follow up of patient care over the 24-hours period and education and training of clinicians about pain management.

Another possible explanation for the lower pain scores reported in hospital-A might be the perceived role of the APS in improving patients' pain experience through the daily follow up of patients' pain by the APS's 'round' and the pain nurses' "rapid interventions" as well as the good relationship of the APS with the clinicians as claimed by many participants in hospital-A. In contrast, the lack of team work, poor coordination and cooperation of residents with nurses in hospital-B in relation to the delay in prescribing analgesia may have led to suboptimal pain relief for many patients and nurses' frustration towards relieving their patient's pain. These barriers to effective pain management have been reported in previous studies (Van Niekerk and Martin, 2003; Rejeh et al., 2009; Abdalrahim et al., 2010; Batiha, 2014; Shoqirat, 2014). Warren Stomberg and Oman (2006) also found that patients who had waited longer for pain relief had the worst pain after surgery.

A further contributing factor to lower pain scores in hospital-A could be the provision of preoperative information which is in accordance with previous findings (Giraudet-Le Quintrec et al., 2003; Sjoling et al., 2003; Wong et al., 2010; Kol et al., 2014).

In summary, the findings suggest that the significantly lower pain scores experienced by patients in hospital-A compared to hospital-B may be related to the use of PCA and

epidural analgesia in the care of the majority of patients in hospital-A, the daily follow up of patients' pain by the APS's 'round', the pain nurses' "rapid interventions" and the availability of APS staff 24 hours a day. On the other hand, participants' accounts in hospital-B suggested that the absence of APS provision, disorganised pain management practice, outdated anecdotal doctors' protocols in the absence of evidenced-based policies, and lack of teamwork with the dispute about responsibility for pain management between anaesthetists and surgeons may have led to variable standards, the widespread use of IM pethidine for POPM and the experience of higher pain scores among the patients in hospital-B compared to hospital-A.

7.3 Knowledge and attitude of clinicians about pain management

Despite the fact that clinicians in hospital-A had significantly higher KAP scores than hospital-B, it is important to note that the median total KAP scores for hospital-A (61.6%) and hospital-B (51.5%) did not reach the 'minimum acceptable scores' of 80% as suggested by McCaffery and Robinson (2002). However, it is difficult to compare the result of this study with previous research due to the fact that there was no research looking at the influence of APSs on knowledge and attitudes of nurses, surgeons and anaesthetists about pain management reporting a total knowledge score. There are also no studies that used the KAP questionnaire in the context of APSs. However, evidence from other studies show a variety of knowledge and attitudes scores with few studies reporting a score more than 80%, suggesting that knowledge deficit is an international problem or a score of 80% is a high benchmark and difficult to achieve. For example, the knowledge and attitude score was reported as low as 40% in China (Zhang et al., 2008), 45.7%- 48.3% in Jordan (Abdalrahim et al., 2011; Al Qadire and Al Khalaileh, 2014), 52.6% in Italy (Zanolin et al., 2007), and 66.7%-82.1% in the US (Rushton et al., 2003; Burns et al., 2010; Francis and Fitzpatrick, 2013; Jarrett et al., 2013). However, the implementation of pain education programmes improved clinicians' knowledge and attitude scores toward pain management to 75% in Jordan (Abdalrahim et al., 2011), 90% in Italy (Zanolin et al., 2007), and 91.2% in US (Jarrett et al., 2013).

There are many contributing factors for not a achieving a score of 80% in both hospitals in this study. Clinicians' accounts, expressed in interviews, suggested that

the provision of teaching is short in duration, not enough or clinicians did not attend training at their hospitals, and relied on their experience, learning from other colleagues or undergraduate courses about pain management. The fact that some clinicians relied on their knowledge gained from undergraduate courses is a cause of concern as the pain content in undergraduate courses of healthcare sciences is minimal (Watt-Wattson et al., 2004b). In a study conducted in the UK, Briggs et al. (2011) surveyed 19 higher education institutions delivering undergraduate courses across eight health sciences programmes. It was found that the average number of hours of pain content was only 12 hours during the whole undergraduate curricula with nursing and medicine students receiving 10.2 and 13 hours respectively whereas the veterinary science and physiotherapy students received the highest number of hours (27.4 and 37.5 hours respectively). They found also that the pain content was largely fragmented throughout the curricula. Similarly, Watt-Wattson et al. (2009) surveyed pre-licensure/undergraduate pain content of health science faculties in 10 major Canadian universities. The average total hours of pain content were 31 and 16 hours for nursing and medicine students respectively. The veterinary medicine and physiotherapy students again received the highest input (87 and 41 hours respectively). The majority of faculties (67.5%) were unable to identify specific designated hours due to integration of pain content across programmes. In both countries, interprofessional education was minimal and the focus of courses on pain assessment was considerably less compared to neurophysiology and pharmacological management of pain. Likewise, Twycross (2000) found a mean of only 7.22 hours devoted to pain education in pre-registration nursing curricula of 47 institutions in the UK. In Jordan, no studies have reported pain content in the undergraduate courses of health sciences. However, it has been reported, based on experience and opinion, the lack of formal pain education content in undergraduate nursing curricula and student usually receive one hour lecture about pain management (Al-Hassan et al., 1999; Al Khalaileh and Al Qadire, 2013). Therefore, there is a need for studies to examine the content, quality and style of pain education in different undergraduate health sciences schools in Jordan.

Another contributing factor to not a achieving a score of 80% in both hospitals in this study could be related to lack of in-service education and training about pain management in both hospitals as suggested by the findings from clinician

questionnaires and interviews. Consistent with previous studies, many participants in this study therefore suggested the need for more pain education (Chan et al., 2008; Gleeson and Carryer, 2010; Polomano et al., 2012). In addition, even if in-service training sessions were available, excessive workload and shortage of staff meant it was difficult for them to leave the wards to attend the training. The fact that doctors and nurses relied on pain education and training offered by hospitals to enhance their knowledge and skills regarding pain (Coulling, 2005), suggests there is a need to pay more attention to the continuing education programmes about pain management offered at the hospitals.

Therefore, it is not surprising that this study found that many clinicians in both hospitals gained their knowledge about pain management from personal experience and learning from colleagues. These findings were congruent with previous findings (Clarke et al., 1996; Fuller and Connor, 1997; Twycross, 2008) in that nurses learned about pain management on the job by observing their colleagues. This is another cause of concern if new clinicians would simply copy the practice of senior colleagues because if senior staff have poor knowledge and negative attitudes towards pain management, this would adversely affect the junior staff approach to pain management. Therefore, the finding of this study and others (Twycross, 2008) recommend improving the knowledge and attitudes of senior clinicians as a way to cascade sound knowledge and positive attitudes to junior clinicians through role modelling. This approach needs further investigations to assess its impact.

Individual questions scores threw more insight on the differences between both hospitals as well as on possible explanations for the causes of knowledge deficit among clinicians in both hospitals. Overall, these individual items measured the knowledge and attitude of clinicians related to pain assessment, use of placebo in pain management, addiction, and appropriate use of opioids, PCA and epidural analgesia. Clinicians in hospital-A reported significantly higher knowledge scores than hospital-B about the acceptance of 'patient's self-report of pain' (94.4% vs 75%) and on pain assessment in the smiling and grimacing case studies (two thirds in hospital-A compared to a third in hospital-B). These findings were also supported by the qualitative data in that many participants in hospital-A appeared to be in agreement on the value of patient's self-report of pain using validated pain scales while in hospital-B

many participants relied on patients' behavioural responses to assess pain and sometimes doubted the patient's self-report of pain. This is inconsistent with Mackintosh and Bowles (2000) study who reported a lack of difference in the nurses' belief of patient's self-report of pain after the inception of an APS. Despite the principle of patient's self-report of pain being well known and behavioural signs of pain are not an effective alternative to patient' self-assessment of pain (Chung et al., 2001), the findings from hospital-B are concur with previous studies which revealed that nurses often doubted the patient's self-assessment of pain and relied on their own judgments based on nonverbal signs, rather than pain rating scales, to assess patient's pain (Schafheutle et al., 2001; Coulling, 2005; Dihle et al., 2006b; Abdalrahim et al., 2011; Shoqirat, 2014). Furthermore, the findings of the two case studies showed that 39.3% of clinicians in hospital-A and a large percentage of clinicians (60%) in hospital-B underestimated the intensity of the patient's pain. The phenomenon of underrating patient's pain is well reported in the literature (Idvall et al., 2005; Manias et al., 2005; Sloman et al., 2005; Gunningberg & Idvall, 2007; McNamara et al., 2012; Shoqirat, 2014). These results are discouraging because it leads to inaccurate pain assessment, the cornerstone of pain management, and consequently to ineffective treatment of pain.

A significantly higher percentage of clinicians in hospital-B (52%) thought that "a placebo is a useful test to determine if the pain is real" compared to 36% in hospital-A. Consistent with finding of another Jordanian study by Abdalrahim et al. (2010), participants in hospital-B have also used placebo to assess pain. Although none of the clinicians interviewed in hospital-A reported using placebo, it is a concern that 36% of clinicians in hospital-A still believed that placebo can be used in pain assessment. These alarming findings were congruent with two previous studies in Jordan (Abdalrahim et al., 2011; Al Qadire and Al Khalaileh, 2014) and a study in Italy (Zanolin et al., 2008), which revealed that 66%, 47%, 61% respectively, still belief that placebo can be used in pain assessment to determine if the pain is real. Misinterpretation of the placebo-effect in some RCTs may have contributed for some of these unacceptable findings of unethical use of placebo in pain assessment. The use of placebo in approved RCT may be appropriate where patients give informed consent, but using placebo to assess pain is deceiving patients and breaches informed consent requirements (McCaffery and Robinson, 2002). A meta-analysis of 12 studies showed

that the administration of placebo is associated with a decrease in self-assessment of pain, and that the expectation of analgesia induces physiological changes (mediated by endogenous opioids) leading to pain relief (Sauro and Greenberg, 2005). This placebo-effect may provide an explanation to some of participants' account in hospital-B who doubted patient's self-report of pain due to the pain relief achieved by placebo administration.

Consistent with the interview data, clinicians in hospital-A had statistically significantly higher knowledge and attitude scores than hospital-B in recognising the right definition of opioid addiction (79.8% vs 66%). Participants' account in hospital-B showed that many clinicians still confuse addiction with tolerance and fear of addiction influenced their POPM practices such as avoiding using opioids during the pain evaluation period and encouraging patients to avoid using analgesia and endure pain as much as possible. Despite the fact that the incidence of addiction is rare (<1%) when taking opioids for pain relief (McCaffery and Robinson, 2002), fear of addiction is still evident among healthcare professionals (Coulling, 2005; Zanolin et al., 2008; Abdalrahim et al., 2010; McNamara et al., 2012; Al Qadire and Al Khalaileh, 2014; Batiha, 2014). The findings from the present study and others suggest that exaggerated fear of addiction can have negative impact on pain management practice in that clinicians doubt patients' request for analgesia, doctors' reluctant to prescribe opioids, nurses administer the perceived safe doses of opioids and patients' reluctant to take them, leading to under-treatment of pain. Allcock and Toft (2003) suggest that 'opiophobia' is widespread among nurses, patients and the public and one of the resources for this fear about opioids is the erroneous transfer of concerns about the potential additive nature of 'recreational drugs use' to the 'medical use' of opioids.

Clinicians in hospital-A had significantly higher knowledge scores than hospital-B about the drug of choice (79.8% vs 35%) and the preferred route for the administration of opioids analgesia (96.6% vs 73%) after surgery. Furthermore, participants' account in hospital-B suggested lack of awareness and knowledge about PCA, epidural analgesia and the American Pain Society (2005) and ASA (2012) recommendation to avoid using IM injections and pethidine in the treatment of acute pain. This has led to the satisfaction of clinicians in hospital-B with the widespread use of IM pethidine as standard of care. In contrast, clinicians in hospital-A were aware of the advantages and

disadvantages of PCA, epidural analgesia, considered them as the standard of care and avoided the use of IM analgesia as shown in the patient questionnaire results. This is consistent with previous studies on the attitudes of clinicians about PCA and epidural analgesia. McLeod et al. (1995) found that clinicians with access to an APS were more optimistic about the benefits of PCA and less concerned about the side effects, especially addiction, than those in the units without access to an APS. In another study, Atkinson et al. (1999) reported that nursing knowledge of advantages and disadvantages of PCA and epidural infusions was improved after the inception of an APS. One possible explanation for these findings is that knowledge and attitudes of clinicians in both hospitals about the methods of POPM is a mirror of everyday pain management practice, where in hospital-B epidural analgesia and PCA were not used and 64% of patients received IM analgesia. It is also influenced by commitments of clinicians towards pain management, and the presence of evidence-based policies to support clinical practice. It is also possible that some clinicians in hospital-B were unaware of a need to alter or change their outdated pain management practice. Nonetheless, consistent with the findings of Coulling (2005), clinicians in this study, especially doctors in both hospitals, were found to have misconceptions about the side effects of PCA and epidural analgesia. Therefore, in-service education should focus on overcoming these misperceptions to improve the quality of care.

On the other hand, clinicians in hospital-B had significantly higher knowledge scores than hospital-A about the preferred schedule for analgesics (around the clock) for postoperative pain (67% vs 51.7%). Recently, Massad et al. (2013) in a university hospital without an APS in Jordan found that of the 66.9% patients who received IM pethidine, 82.1% was given on regular schedule. One possible interpretation for this finding is that knowledge of clinicians in hospital-B about the preferred regular use of opioids is a reflection of everyday clinical practice, where patients in hospital-B receive IM pethidine on regular basis (4 or 6 hourly) as suggested by the interviews.

However, despite the fact that the total KAP scores for both hospitals did not reach the ‘minimum acceptable scores’ of 80%, it is important to note that clinicians in hospital-A had significantly higher KAP scores with a median of 60.6% than hospital-B (Md=51.5%). This finding is consistent with the finding of Barton et al. (2004) who found that nurses and midwives who were aware of an APS in their institution had

significantly higher scores on knowledge about pain management. However, in Barton et al's (2004) study, physicians were not enrolled, the total knowledge score was not reported, different knowledge questionnaire was used and the study was conducted within the same hospital comparing units who are un/aware of an APS. Thus, it is difficult to compare their findings with the findings of the present study.

There are many possible contributing factors of the current study's findings. The significantly higher total KAP scores reported by clinicians in hospital-A may be related to the education and training provided by the APS. The quantitative data showed that the proportion of clinicians who had pain management training was higher in hospital-A (38.2 vs 31%). The mean length of pain management training was also longer in hospital-A compared to hospital-B (0.91 vs 0.52 days). In a number of studies, pain education programmes has been shown to improve clinicians' knowledge and attitudes regarding pain management (Guardini et al., 2008; Zhang et al., 2008; Abdalrahim et al., 2011; McNamara et al., 2012; Jarrett et al., 2013).

It could be argued however that the higher knowledge scores in hospital-A is not related to the education and training because there were no significant differences between the two hospitals in the proportion of clinicians who had pain management training or in the length of training. Nevertheless, the qualitative findings threw more light on the provision of training in both hospitals. Participants' accounts suggested that the APS provides ongoing follow up sessions for all ward nurses on the updated pain policies and when needed. In addition to that the APS conducted different workshops on pain management and organised the first pain management conference in Jordan as part of their commitment to celebrate the 'global year against acute pain' (IASP, 2010-2011). It is possible that the nurses in hospital-A did not consider these educational activities as pain management training when answering the questionnaire which may explain the lower percentage reported.

Furthermore, commitment of clinicians to improve pain management in hospital-A, feeling of pride of the APS among most clinicians, and their adoption of the APS's motto "no pain" may have motivated clinicians to undertake private study in relation to pain management. The qualitative findings also showed that the length of training provided during the General Nursing Orientation programme in hospital-A is one day

compared to one hour in hospital-B. This may suggests that the quality and content of training can be more important to improve clinicians' knowledge and attitudes regarding pain management than the amount of training. The qualitative data support this potential claim in that the APS in hospital-A provides a dedicated teaching programme over one day on different aspect of pain management including pain assessment, pain documentation, PCA, epidural analgesia, pain policies, and barriers of effective pain management whereas the schedule in hospital-B contains one hour lecture about pain assessment and management. Indeed, the ASA (2012) recommended that the education content should range from basic pain assessment to advanced pain management techniques to ensure that healthcare professionals have the necessary knowledge and skills to provide effective and safe pain management.

Another possible explanation for the higher KAP scores in hospital-A as suggested by the clinicians' accounts is that the informal teaching provided by the specialist pain nurses during the pain team's 'round' may have improved the total KAP scores. Working with the APS has been identified as one of the valuable resources for practice-based learning (Coulling, 2005). This may illustrate the importance of learning in the clinical environment on the application of pain management knowledge in clinical practice (Wilson, 2007), and the important role of APS, especially the specialist pain nurses, as a role model in changing practice and fostering positive attitudes towards pain management (Atkinson et al., 1999). Previous studies have shown that 93% of pain nurses provide ongoing education for staff about pain management (VanDenKerkhof et al., 2002; Musclow et al., 2002; Sawhney and Sawyer, 2008), and spend 35 % of their time in education and training of hospital staff (CSAG, 2000). The majority of teaching provided by the pain nurses is performed informally (92%) in the clinical areas and 87.5% performed formally (Cambitzi, 1996). In a study of 14 hospitals in the UK, Moss et al. (2005) attributed the good overall pain scores in the recovery rooms compared to surgical wards to the efforts made by anaesthetists to educate recovery room nurses, suggesting working alongside experts in pain management can contribute to a positive attitudes to promote effective pain management. The ongoing training and education therefore is essential to maintain knowledge retention and positive attitudes towards pain management as the knowledge gained from the educational programmes may progressively decreases if

follow up courses are not offered regularly (Guardini et al., 2008; McNamara et al., 2012).

Moreover, the participants' accounts suggested that the APS in hospital-A developed policies and protocols on different aspect of pain assessment and management with an easy access via the intranet, and these policies were considered a good source of information about pain management for clinicians. It provided clinicians with a framework for their clinical practice decision making and implementing evidenced-based practice (Polomano et al., 2008). These results together suggest that the ongoing formal and informal education (i.e round) provided by the APS as well as the quality and content of training are important not only to improve the knowledge of clinicians but also to maintain knowledge retention and positive attitudes towards pain management to provide effective and safe pain relief for patients after surgery.

7.3.1 Perception of pain management among patients

It should be noted that patients were not interviewed in this study; perceptions of patients regarding pain management discussed here are the clinicians' perceptions of patients' beliefs. An interesting finding to note from clinicians' interviews was that patients refuse to take narcotics because they believe it is 'Haraam' (prohibited). The 'Haraam' concept was not reported in previous studies. One possible explanation of why patients think taking narcotics is 'Haraam' might be the confusion between the acceptable 'therapeutic' use of opioids and the prohibited 'recreational or illicit' use of opioids. In Islamic culture, the use of street narcotic drugs and alcohol is prohibited (Haraam) and unacceptable as it may lead to subconscious and uncontrolled behaviours. Lovering (2006) found Saudi Muslims were strongly against the use of opioids because of their sedative effect. In the Jordanian community, once somebody is known to be taking these substances they are at risk of being stigmatised and rejected. Therefore, the beliefs of patients in this study may reflect the lack of general public awareness about the medical use of opioids. However, Al Qadire and Al Khalaileh (2014) suggested that in recent years educated people have started to distinguish between people who are on narcotics for medical reasons and others who are using street drugs. Thus, patient education preoperatively is essential to explain

about these misperceptions to promote patients' adherence to pain management medications.

Recently, Batiha (2014) found that Jordanian critical care nurses were faced with the patient's fatalistic beliefs which affected their adherence to pain medications and a reluctance to report pain. This is consistent with clinicians' belief in this study in that 'patients' spiritual beliefs may lead them to think pain and suffering are necessary' (76.4% vs 75%). This might be related to the influence of the Islamic culture. Jordanian Muslims attribute wellness and illness to the will of God. They value patience and tolerance of pain as part of their stronger faith in God (Al-Hassan et al., 1999; Batiha, 2014; Darawad et al., 2014). Enduring pain might be perceived as an opportunity to expiate sins and a means to gain reward in the afterlife (Lovering, 2006; Narayan, 2010; Al Qadire and Al Khalaileh, 2014). Therefore, Muslim patients might use religious practices such as praying and reading from Qur'an during the disease process as coping strategies to manage pain or suffering (Al-Hassan et al., 1999; Al-Hassan and Hweidi, 2004; Forgeron et al., 2005; Omari et al., 2013).

Clinicians' accounts in both hospitals suggest that many patients refused to take opioids due to a fear of opioid addiction and their side effects. Patients' refusal to take analgesics because of the fear of addiction and side effects is a recurrent theme in the literature worldwide (Idvall et al., 2008; Lorentzen et al., 2012; Weiran et al., 2013; Batiha, 2014; Shoqirat, 2014). This fear has increased the willingness of patients to tolerate pain rather than the side effects of analgesics (Gan et al., 2004; Nimmaanrat et al., 2007; Idvall et al., 2008). Similarly, Jordanian patients prefer to be in pain rather being embarrassed by asking for more pain medications which may upset nurses and lead to addiction (Shoqirat (2014), and believe that analgesics should be saved for severe pain (Darawad et al., 2014). The fact that many clinicians in this study, especially in hospital-B, were found to have misconceptions about addiction, coupled with patients' fear of addiction and their religious beliefs about opioids and illness may lead to ineffective pain management. Therefore, the content of patient education preoperatively and staff in-service education about pain management should focus on these important issues to provide culturally sensitive care. There is also a need for further study to explore the perceptions of patients and families about the use of religious practices in pain management.

Another interesting finding was that nurses perceived that these misconceptions on the use of opioids for pain management were quickly transferable from one patient to another through the patients' escorts (relatives/family caregiver). In the context of Jordanian culture, the extended family system is characterised by norms and traditions that encourage strong ties among its members. Family members might participate in the patient's care, seek information or participate in the personal decisions about some aspects of patient's care (Al-Hassan and Hweidi, 2004; Hweidi, 2007; Al Qadire and Al Khalaileh, 2014). Providing support and visiting their loved ones during their hospitalisation, is a social tradition practiced by family members, relatives and friends (Al-Hassan and Hweidi, 2004; Omari et al., 2013). In the present study, nurses reported that the presence of escorts may lead patients to show Dala' ('spoiled'/ 'exaggerate'), and pretend to be in pain in front of their relatives. This has two possible interpretations; first, nurses may have doubted patients' self-reports of pain in front of relatives and believed patients were seeking attention from relatives or nurses. An alternative interpretation would be that patients were really in pain and nurses did not address the patients' need which led patients to act in this way to seek the support of relatives to get pain relief. Abdalrahim et al. (2010) found that Jordanian nurses perceived families as provoking and demanding because they often report to nurses the patients' pain and ask for pain killers on behalf of patients. Nurses thought that the family members want to show their care to their loved ones by focusing on pain. More recently, Shoqirat, (2015) reported that family interferences was perceived as one of the barriers to Jordanian nurses' role in pain management because family members follow nurses asking for injections, act on behalf of their loved ones, and nurses were subjected to verbal abuse from patients' relatives. Therefore, the provision of patients' preoperative education about pain management should extend to include family members to overcome these barriers.

7.4 Strengths and limitations of the study

This study is the first of its kind that aimed to assess the influence of a nurse-based, anaesthetist-supervised APS on POPM in a middle-income country, using a comparative multiple-case (embedded) study design where one hospital has an APS and the other does not. The recent development of the first APS in one of Jordan's hospitals provided a timely opportunity to conduct this study that involves a

comparison hospital that has not yet developed this service. The case study design helped to gain a deeper understanding of the influence of an APS on pain management in a real-life situation using multiple sources of data collection such as patient and clinician questionnaires, clinician interviews and documentary analysis which enhanced the rigour of the study.

In the quantitative element, the study used reliable and validated tools such as the SCQIPP (Idvall et al., 2002a) and the KAP questionnaires (Ferrell and McCaffery, 2008). For the first time, this study used the SCQIPP questionnaire to assess the impact of the APS on the quality of pain management as well as the KAP questionnaire to assess the impact of the APS on the knowledge and attitudes of clinicians towards pain management. The qualitative evaluation explained the results of the patient and clinician questionnaires. Interviews conducted with a purposeful sample of nurses, anaesthetists and surgeons provided greater insight into their perceptions and views of the APS and current pain management practice. The data collected from the documents also supported the evidence gathered from other sources. The research design was robust, the analysis rigorous and some interesting and original findings have emerged in relation to the role of the APS in POPM.

Nevertheless, this study has several limitations that need to be considered. The design employed a convenience sample of patients and clinicians from only two hospitals in Jordan. Patients and clinicians from other Jordanian healthcare institutions may have different perceptions and experiences. This may limit the generalisation of the findings, a frequent criticism of case study research (Jones and Lyons, 2004). Conducting a multi-site RCT would provide the strongest evidence for generalisation regarding the effectiveness of APSs. However, the time window for such an approach is well past due to the inception APSs in most hospitals and the difficulty of performing a RCT to assess the routine work of an APS (Sauerland et al., 1999; McDonnell et al., 2005). In addition, as the design of this study was non-experimental, the intention was not to seek causal inferences or infer cause and effect in the results (Gunningberg and Idvall, 2007; Jarrett et al., 2013). However, sufficient details have been provided on the methodology, data analysis, findings and interpretation approaches used in this study to enable the reader to make a judgement about the generalisability of the findings to other settings.

Another limitation was related to the KAP questionnaire. In the current study, seven questions were omitted as they are inappropriate for POPM context, which might have affected the reliability of the KAP questionnaire. As the questions used in this survey were also based on multiple-choice and true/false, it is possible that clinicians completed some questions correctly by chance. Moreover, although the demographic and background data for clinicians were fairly evenly distributed, there were significantly more male respondents in hospital-A than hospital-B. The studies of Al Khalaileh and Al Qadire (2013) and Al Qadire and Al Khalaileh (2014) indicate that the gender of clinicians does not have an effect on the total knowledge and attitude scores, but this may be a confounding factor in the current study.

A further limitation was that patients completed the questionnaires 24 hours after surgery. As worst pain was most often experienced on the first day after surgery (Svensson, 2000; Sommer et al., 2008) with a reduction in the severity on the following days, it is possible that the difference on pain scores between both hospitals will be reduced from day 2 onwards and this may also affect the total SCQIPP scores. Therefore, future studies may need to examine the impact of APSs on the quality of POPM over the first few days or until discharge. Additionally, the majority of patients in hospital-A received advanced pain management techniques that placed them under the care of the APS. Therefore, other patients who have undergone minor surgeries or who were managed by the team doctor may have different perceptions and experiences.

Finally, I discussed my insider/outsider status in the methodology chapter. Jootun et al (2009) observe that reflecting on the process of data collection and an understanding the influence of the researcher values and preconceptions on the research findings adds credibility to the research. Jootun et al. (2009) also suggested that it is essential for the researcher to enter the research process ignoring the preconceptions beliefs about the phenomenon. However, my previous role as specialist pain nurse in the UK stimulated my interest to assess the influence of an APS on POPM in Jordan. Therefore, I believe it is not possible to ignore my personal and professional experiences, and background knowledge totally from the study. These experiences may have influenced my interpretation of the qualitative data. For this reason, to minimise this influence as far as possible I have maintained a degree of self-awareness

of my role as a researcher in the process of data collection and analysis. Moreover, many strategies were used to promote reflexivity during data collection and analysis to minimise the effect of my role as a researcher on participants' account during the interviews and on the data interpretation. For example, I maintained an open mind to the data and allowed the transcripts data to dictate the themes; and the peer review made by my supervisors to check the identified themes and the quality of data interpretation (details in methodology chapter).

7.5 Implications for practice, education and research

This comparative case study offered a new contribution to current knowledge about the influence of the APS on the quality of POPM and the knowledge and attitudes of clinicians towards pain management in Jordan. The key findings were discussed at the beginning of this chapter. In light of these findings, this section discusses the implications for practice, education and future research in the context of healthcare system in Jordan and globally.

7.5.1 Implications for clinical practice and education

The findings suggest that the presence of an APS is associated with a higher quality of patient care, an increase in the provision of patient education, an increase in compliance with performing regular pain assessment and an increase in the provision of PCA and epidural analgesia. To improve the quality of pain management practice, clinicians in hospitals with an APS need to continue their work to promote patient education, regular pain assessment, and the effectiveness and safety of PCA and epidural analgesia. Hospitals without access to an APS need to find innovative ways to integrate regular pain assessment, and the provision of patient education into routine clinical practice of busy surgical wards. They may also need to invest in establishing APSs to introduce advanced pain management modalities into their hospitals effectively and safely.

The findings also suggest that the lack of patient involvement in both hospitals is one of the elements that prevented the total quality scores from reaching the international standard for 'high quality of care'. To improve the quality of POPM, clinicians and

policy-makers should pay more attention to interventions promoting patient involvement in decision making about different aspects of pain management.

In the context of Jordanian culture, clinicians reported that patients refuse to take narcotics because they believe it is "Haraam" and fear opioid addiction. The relatives have also a role of disseminating these beliefs between patients and family members. Therefore, to provide culturally competent care, clinicians should promote patient and family education and pay more attention on the content of information to cover all aspects of pain management. Moreover, clinicians may involve chaplain services (Imam) to explain about the 'medical use' of opioids as the Imam is fully respected in the Jordanian community. As pain is subjective experience, clinicians are encouraged to provide patients with preoperative information and support their involvement in decisions about the preferred pain treatment option to be able to provide a tailored individualised POPM.

Patient satisfaction with pain management is not an easy construct to measure. The results of this study and previous studies have questioned the relevance of patient satisfaction as an outcome measure for pain management (Svensson et al., 2001; Gordon et al., 2002; Carlson et al., 2003) or as an indicator of effective APSs in hospitals (Karlsten et al., 2005; Jawaid et al., 2009). Therefore, measurement of patient satisfaction as a sole indication of patients' experience with pain management or as their satisfaction with the APS in hospitals should be avoided.

The organisational context may facilitate or hinder the quality of pain management in an institution. For example, the results of this study showed that excessive workload, shortage of staff, lack of recourses, slow response of the APS, and delay in prescribing analgesia may act as barriers to providing high quality pain management. Thus, clinicians, policy-makers and hospital administrators need to find ways to overcome these barriers and improve the working environment to enhance the quality of POPM. On the other hand, the availability of the APS staff 24 hours, the daily APS 'round', the specialist pain nurses' coordination role, team work and good relationship between the multidisciplinary team, management support, commitment to manage pain effectively, and the implementation of quality improvement initiatives, development of pain management policies seem to have positive impact on the quality of pain

management and ‘making pain visible’ locally and nationally. To enhance the quality of POPM, organisations such as hospital-A need to continue their work to promote these activities and other hospitals without an access to an APS need to incorporate these essential elements into their organisation context. Moreover, due to lack of national guidelines or standards for POPM in Jordan, clinicians and policy-makers need to develop national standards and policies relevant for the context of POPM in Jordan to standardise pain management practice and serve as a reference for healthcare organisations.

Another important finding in this study that may have affected the quality of care in POPM is the knowledge of clinicians about pain management. The findings suggest that the presence of an APS is associated with a higher knowledge and a positive attitude of clinicians regarding pain management. Despite hospital-A outperforming hospital-B on a number of measures, the total knowledge and attitudes scores did not reach the internationally acceptable scores of 80% in either hospital. To improve the knowledge and attitude of clinicians, it is necessary to improve the content, quality and duration of pain education offered at both the undergraduate and professional levels. The IASP (2012) curriculum is an important resource to guide higher education institutions and hospitals to develop their courses about pain management. However, education alone does not always change practice and role-modelling and mentorship are required (Finley et al., 2008). The finding of this study and previous studies (Atkinson et al., 1999; Coulling, 2005) support this conclusion in that the APS, especially the specialist pain nurses, were the role-model in changing practice and fostering positive attitudes towards pain management through the pain ‘round’ and informal teaching (practice-based learning). This has important implications for hospitals without access to an APS in that the senior staff should attend more in-depth courses to cascade their sound knowledge and positive attitudes to junior clinicians through role modelling and mentorship.

7.5.2 Implications for future research

This case study identified a number of areas for future research concerning the influence of an APS on POPM in relation to the quality of care and knowledge and attitudes of clinicians towards pain. This comparative case study was conducted in

only two hospitals in Jordan. As APSs may evolve in other healthcare institutions in Jordan such as Ministry of Health, the Royal Medical Services and private hospitals, a replication of this study in these settings is needed. Moreover, further surveys are needed to explore the current prevalence of APSs in Jordan and Middle East. It will be interesting for follow-up studies to explore the barriers that hinder the development of APSs in Jordan.

This is the first study to assess the quality of POPM using the SCQIPP questionnaire in the context of APSs. There is a need for further research to validate the suggested 'high quality of care' threshold for the individual items (>4.5) and total score (63) on the SCQIPP questionnaire. In this study, the score of the majority items of SCQIPP were between 4 and 4.5 with 12 items scored below the suggested 'high quality of care' threshold. Therefore, exploring and validating an adjusted 'high quality of care' threshold for middle-income countries such as Jordan is another priority for future research. Moreover, the good reliability achieved using the Arabic version of SCQIPP questionnaire in this study provides support for its use in further work at the national level and Arabic speaking countries to examine the quality of POPM in these countries. This could provide another opportunity to validate the Arabic version of SCQIPP questionnaire.

In this study, patients completed the questionnaires at 24 hours after surgery. Future studies are recommended to examine the impact of APSs on the quality of POPM over the first few days after surgery or until discharge. In addition, the majority of patients in hospital-A received advanced pain management techniques and this indicate that they were under the care of the APS. Therefore, patients in hospital-A who have undergone minor surgery or who were managed by the team doctor may have different perceptions and experiences, and this need further research to assess their views about the quality of POPM.

Patients were not interviewed in this study as they may not have a full understanding of the new APS's role in hospital-A. As the APS is well established by now there is a need for further study to explore their views of the APS and the services offered to them by the APS such as preoperative clinic, preoperative education, the daily round, and the quality of POPM. In addition, a further qualitative study with patients and

relatives is recommended to allow more in-depth understanding of their religious beliefs (i.e haraam) of opioids, and the role of the religious practices in pain management.

The results of this study and previous studies have questioned the relevance of patient satisfaction as an outcome measure for pain management (Salomäki et al., 2000; Svensson et al., 2001; Gordon et al., 2002; Carlson et al., 2003) or as an indicator of effective APSs in hospitals (Karlsten et al., 2005; Jawaid et al., 2009). Thus, there is a need for scoring system that encourages patients to be critical when assessing their satisfaction with pain management.

This is the first study to assess the knowledge and attitudes of clinicians towards pain management using the KAP questionnaire in the context of APSs. In this study, seven questions were omitted as they were inappropriate for POPM context. In addition, the KAP questionnaire does not contain questions about the advanced pain management techniques. Therefore, there is a need for further research to develop another contemporary questionnaire to assess clinicians' knowledge and attitudes regarding POPM including the use of advanced pain management techniques as subscales (PCA, epidural analgesia, and CPNB).

There are no Jordanian studies that examine pain curricula across health sciences faculties. Thus, future studies are recommended to examine the content, quality and style of pain education in different undergraduate health sciences schools in Jordan. There is also a need for further studies to assess the content and quality of continuing pain education programmes offered for clinicians by the in-service education departments at the hospitals in Jordan. Research into how to integrate interprofessional pain education into Jordanian healthcare system is also encouraged.

7.6 Final conclusions

This thesis has sought to determine the influence of a nurse-based, anaesthetist-supervised APS on POPM in Jordan in relation to the quality of care in POPM and the knowledge and attitude of clinicians regarding pain. It aimed to address a gap in the international evidence as to how and why an APS achieves positive outcomes, and

which activities of the APS influenced outcomes. This has been accomplished by conducting a comparative multiple-case (embedded) study design in real-life situation using both quantitative and qualitative methods.

This study has shown that the total quality scores of POPM did not reach the 'high quality of care' threshold in either hospital. The findings suggest that the lack of patient involvement and the lack of regular pain assessment using a pain rating scale have influenced the total quality scores. The results of patient questionnaire show that there was a lack of patient involvement among half of patients in hospital-A and two thirds of the patients in hospital-B.

It was also shown that there was a lack of regular pain assessment using a pain rating scale among a third of patients in hospital-A and the majority of the patients in hospital-B. Taken together, these findings suggest that patient involvement and regular pain assessment have a role in the quality of POPM. Furthermore, organisational challenges including excessive workload, shortage of staff, lack of recourses (e.g. PCA pumps, pain medications, trained clinicians), slow response of the APS, delay in prescribing analgesia and nurses' frustration and powerlessness towards relieving their patient's pain were key barriers for not achieving 'high quality of care' in both hospitals.

This study has found that patients in hospital-A reported significantly higher total quality scores of POPM than hospital-B and in the subscales of action and communication. The findings suggest that the well-established provision of patient education and more robust approach to pain assessment in hospital-A have positively influenced the achievement of higher total SCQIPP scores in hospital-A when compared to hospital-B. The results of this study indicate an absence of preoperative pain education among 18% of the patients in hospital-A compared to 72% in hospital-B. It was also shown that there was a lack of regular pain assessment using a pain rating scale among 34% of patients in hospital-A and 86% of the patients in hospital-B. These findings suggest that the provision of patient education and regular pain assessment were the key areas in which the APS had an impact. Moreover, the findings of this study suggest that the availability of the APS staff around the clock in hospital-A, the daily APS's 'round', the specialist pain nurses' 'rapid interventions'

and coordination role , the implementation of quality improvement initiatives by the APS (e.g. the nursing hourly round, clinical audit), development of pain management policies, and the introduction of PCA and epidural analgesia were the main activities of the APS that had an impact on the quality of care and patients' experience of pain in hospital-A.

On the other hand, the findings from hospital-B suggest that the absence of APS provision, disorganised pain management practice, outdated anecdotal doctors' protocols in the absence of evidenced-based policies, and lack of teamwork with the dispute about responsibility for pain management between anaesthetists and surgeons have led to suboptimal and variable standards in POPM, lack of PCA provision, and the widespread use of IM analgesia. Consequently, many patients in hospital-B suffered from surgical pain needlessly.

The results of this study show no significant differences in the subscale scores of trust and environment between both hospitals. It also shows a high level of patient satisfaction with pain management with no significant difference between both hospitals. In agreement with previous studies, this study results suggest that patients' satisfaction with pain management is not an easy construct to measure. Patient satisfaction can be influenced by many different factors such as the efficacy of pain relief, preoperative information, nurses' caring attitude, trust, and physical environment of care. Therefore, measurement of patient satisfaction as a sole indication of patients' experience with pain management or as an indicator of effective APSs in hospitals should be avoided.

This study has also shown that the total knowledge and attitude scores towards pain did not reach the 'minimum acceptable scores' of 80% in either hospital. The findings suggest that the provision of in-service pain education is short in duration and not enough, and clinicians relied on their experience, learning from other colleagues or undergraduate courses to learn about pain management. These findings could have influenced the total knowledge and attitude scores of not achieving the 'minimum acceptable scores'.

The study has found that clinicians in hospital-A reported significantly higher knowledge scores than hospital-B about the acceptance of 'patients' self-report of pain'. Clinicians in hospital-B relied on patients' behavioural responses to assess pain and sometimes doubted the patients' self-assessment of pain. However, the findings showed that 39% of clinicians in hospital-A and 60% in hospital-B underestimated the intensity of the patient's pain. These can leads to inaccurate pain assessment and consequently to ineffective treatment of pain. Furthermore, clinicians in hospital-A reported significantly lower percentage than hospital-B about the misconception on the use of placebo in pain assessment. Although none of the clinicians interviewed in hospital-A reported using placebo, it is a concern that 36% of clinicians in hospital-A compared 52% in hospital-B still believed that placebo can be used in pain assessment.

This study has also shown that clinicians in hospital-A had statistically significantly higher knowledge and attitude scores than hospital-B in recognising the right definition of opioids addiction, about the drug of choice, and the preferred route for the administration of opioids analgesia after surgery. In addition, the findings suggest that clinicians in hospital-A were aware of the advantages and disadvantages of PCA, epidural analgesia, and avoided the use of IM analgesia. Nonetheless, clinicians, especially doctors, in both hospitals were found to have misconceptions about the side effects of PCA and epidural analgesia. On the other hand, clinicians in hospital-B had significantly higher knowledge scores than hospital-A about the 'around the clock' concept as the preferred schedule for analgesics for postoperative pain.

In this study, although the total knowledge and attitude scores towards pain did not reach the 'minimum acceptable scores' in either hospital, clinicians in hospital-A had significantly higher total knowledge and attitude scores towards pain than hospital-B. In this study, the ongoing education and training provided by the APS, the quality and content of training on different aspect of pain management including PCA and epidural analgesia, the informal teaching provided during the APS's 'round', and the development of policies and protocols (source of information), were the main activities of the APS that had an impact on the knowledge and attitude of clinicians in hospital-A.

An interesting finding to note from clinicians' interviews was that patients refuse to take narcotics because they believe it is 'haraam' (prohibited) or due to fear of opioids addiction and side effects. These misconceptions on the use of opioids for pain management were quickly transferable from one patient to another through the patients' escorts (relatives). Moreover, in the present study, nurses reported that the presence of relatives (escorts) may lead patients to pretend to be in pain and show Dala' ('spoiled' / 'exaggerate') in front of their relatives.

Finally, the case study design was robust and interesting and original findings have emerged in relation to the impact of the APS in POPM. The evidence generated from this case study explained why and how an APS influenced the quality of care and clinicians' knowledge and attitudes concerning pain management. The main activities of the APS identified in this study could be utilised to form basic international standards on the optimal structure and responsibilities of an APS, against which to evaluate and compare the performance of APSs. I hope that the findings of this thesis will be a valuable resource for clinicians, policy-makers, educationalists and researchers in the field of APSs and acute pain management and facilitate further research into this area. It is also hoped that the findings of this study will help clinicians, policy-makers and hospital administrators to improve the quality of services through expanding the provision of APSs worldwide and ultimately improve patients' experience of postoperative pain. To this end, although part of this thesis has been disseminated at international conferences both in the UK and Qatar as poster presentations, it is hoped that the findings of this study will be published through different professional journals and at local conferences.

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Appendices

Appendix 2-1: The Impact of APSs on Patient Outcomes

No .#	Authors/Year/ Country	APS Structure	Aim	Methods	Sample	Findings	Strengths and Limitations
1	Buckenmaier et al, 2012, British military base- Afghanistan	Anaesthetist -based APS	To assess the impact of an APS on soldiers-reported pain outcomes.	A descriptive observational design. Data collected on pain intensity (0-10) and pain relief (0=no relief- 100%-complete relief) and overall quality of pain control. Data were collected at baseline (within 0-3 hrs- before APS intervention) and after the APS intervention (4-6 hrs after injury) and prior to air evacuation (7-24hrs).	71 combat-soldiers with major combat injuries.	All soldiers received multimodal analgesia. 72% received regional anaesthesia and 16% received epidural analgesia. There was a significant decrease ($p<0.001$) in the post-intervention (Median=4) and prior evacuation (median=2) pain scores from the baseline (median=8). There was significant increase ($p<0.001$) in the perception of pain relief over the three data collection points. Overall quality of pain control was 89% as very good and excellent.	It is a first study to assess the impact of APS on soldiers-reported pain outcomes using real-time data. However, the baseline pain assessment was relied heavily on the soldiers' recall of pain following the injury.
2	Lee et al, 2010, Hong Kong	Nurse-based/ anaesthetist supervised APS	To compare the effects of APS on clinical outcomes.	Randomised controlled trial (RCT). The APS group received PCA and the control group received boluses of opioids IM or IV prescribed by surgeons. Data collected on the quality of recovery scores (0-18), pain intensity, length of stay, and global measure of treatment effectiveness (0=poor, 1, 2, 3, 4= excellent) for 3 days.	199 patients undergoing major surgery allocated to the APS group and 203 allocated to the control group.	On the first day of surgery the APS patients had lower pain scores at rest ($p<0.01$), less interference with daily activity ($p<0.01$), less side effects ($p<0.04$) and better treatment effectiveness ($p<0.001$) than did control group. The proportion of patients with one or more days of highly effective pain management was higher in the APS group ($p<0.01$). There was no difference in quality of recovery scores, pain scores at movement and the duration of hospital stay between the two groups.	This is a well done RCT with 80% power and good outcome measures. However, it was conducted in the same hospital and offering a suboptimal IM analgesia to the control group is ethically questionable. Moreover, there is a possibility of spreading the influence of APS pain management practice into the control group.

3	Story et al. (2006), Australia	APS vs IMPACT Team (Inpatient Management of acute Pain and Advice on Clinical Treatment).	To evaluate whether a combined critical care outreach and APS comprising both medical and nursing staff would decrease the incidence of postoperative serious adverse events and the 30-day mortality.	A prospective, controlled, before-and-after trial with a baseline phase of standard acute pain management followed by the IMPACT phase. The primary endpoint was the incidence of serious adverse events per 100 patients. Data on the 30-day mortality were also collected. The IMPACT team systematically reviewed high-risk postoperative patients for the first three days in the surgical wards.	319 patients were involved in the baseline-phase and 271 patients were involved in the IMPACT-phase.	There was a significant decrease in the incidence of serious adverse events form 23 events per 100 patients during the baseline-phase to 16 events per 100 patients during the IMPACT-phase. The 30-day mortality decreased from 9 % to 3 % (P =0.004). Nonetheless, the IMPACT team found the workload time-consuming and unsustainable beyond the study.	In this recent prospective study the serious adverse events were predefined. Nevertheless, this was a single site study with before-and-after design and the baseline-phase data were collected about 2 years before the IMPACT-phase data.
4	Stadler et al. (2004), Belgium	Nurse-based/ anaesthetist supervised APS	To examine the cost-effectiveness of an APS.	Open-observational study- pre and post design. The pain scores (VAS) was performed every 4 hours for 3 days to measure the analgesics-effectiveness The cost-effectiveness was measured using postoperative morbidity, mortality and duration of hospital stay.	Pre-APS study (n=1304 surgical patients) and post-APS phase (n=671 patients).	VAS decreased significantly in the post-APS group ($p<0.001$). NSAIDs administration increased from 20% to 60%. There was minor reduction in the postoperative complications. No changes in the length of stay or hospital mortality.	The focus of this study was on the economic analysis for an APS However, the authors excluded patients receiving epidural analgesia.
5	Bardiau et al. (2003), Belgium (follow up for Bardiau et al. (1999)	Nurse-based/ anaesthetist supervised APS	To assess if the initial improvement was maintained or expanded by using the quality manual for the previous study (Bardiau et al., 1999)	Same as (Bardiau et al., 1999).	408 patients who have undergone surgery were included in this third survey.	A significant reduction of all pain indicators was observed after APS inception ($P < 0.001$), except for the time of maximum VAS which remained unchanged. Mean VAS scores were 1.5cm, 1.0, 0.8 for the pre, post and third survey respectively. Paracetamol and NSAID consumption increased in the post-APS phase ($P < 0.001$). But morphine use remained stable ($p < 0.223$).	This is a follow up for the previous and the same design was used. The gap between the baseline and third survey is two years.

6	Salomäki et al. (2000), Finland	Nurse-based/ anaesthetist supervised APS	To compare patient's pain intensity scores, treatments and side effects, before and after the introduction of the APS	Before and after study used NRS to assess pain upon deep inspiration, average pain and the worst pain during the first 24-hours on the ward. The impact of pain on daily living (yes/ no), the incidence of side effects and the general satisfaction with pain relief were also evaluated.	200 patients were included in the pre-APS phase and 200 patients were included in the post-APS phase. All patients had major gynaecological surgery.	The number of patients with inadequate pain relief (pain > 3/10) dropped by 64 % after the inception of APS (25 vs 9 %, P < 0.001). The impact of pain on daily living and the incidence of side effects were similar in both groups. 90 % of patients were satisfied with pain relief in both groups.	This is a good study; the sample size was based on 90 % power calculation and 5 % significance. Also there was more than 50 % reduction in the number of the patients having inadequate pain relief and this was considered clinically significant.
7	Bardiau et al. (1999), Belgium	Nurse-based/ anaesthetist supervised APS	To assess the effect of APS inception on postoperative pain 8management	Open, prospective, non-randomised before and after observational study in a general teaching hospital using pain indicators (AUC, mean VAS, VASmax, persistence VAS > 3 and pain duration) as performance measures. Surgical pain on rest was assessed using a visual analogue scale (VAS) every 4 hours for 72 hours in the two phases.	1304 patients who have undergone surgery were included in the pre-APS inception phase and 671 surgical patients were included in the post-APS phase.	A significant reduction of all pain indicators was observed after APS inception (P < 0.0001), except for the time of maximum VAS which remained unchanged. Paracetamol and NSAID consumption increased in the post-APS phase (P < 0.0001). But morphine use decreased significantly (p < 0.038). The PCA use did increase after the APS inception.	The pain indicators used as outcome measures are both valid and reliable. Nevertheless, the authors did not measure pain on movement and patients received epidural analgesia were excluded.
8	Miaskowski et al. (1999), USA	Anaesthetist -based APS	To compare the quality of postoperative pain management provided to patients who were and who were not cared for by APS	A multisite prospective study using the postoperative pain management quality assessment survey to collect the data Data collected within 24-hour following discontinuation of the primary analgesic modality. Pain intensity measured using a 0-10 Numeric Rating Scale (NRS).	A total of 23 hospitals. 12 (52.2 %) of the hospitals with APS. A total of 5837 patients were evaluated and 49 % of the patients were managed by APS.	Patients who received APS care reported: 1- Significantly lower worst pain intensity ratings ((P<.001), 6.8 compared to 7.1). 2- Significantly less pain than expected (P<.001). 2- Significantly less itching, sedation and nausea (P<.001). 3- Were very satisfied with the pain relief after surgery (P<.001). 4- Were discharged significantly sooner ((P<.001), 2.3 ± 5.2 days Vs. 2.8 ± 3.9 days). 5- The percentage of patients who used PCA (89.4% vs 10.6) and epidural analgesia (83.4% vs 16.6) were higher (P<.001). 6- The percentage of patients who received patients education was higher (87% vs 74.4) (P<.001).	This prospective multisite study used large sample size, standard approach for data collection and a control group. However, patients followed by the pain service were younger, and the authors acknowledged that the reduction in pain intensity was small and clinically not significant.

9	Sartain and Barry (1999), Queensland	Anaesthetist -based APS	To evaluate the introduction of APS on postoperative pain management.	A prospective audit in one hospital. Data were collected 24-hours postoperatively. Factors evaluated were pain at rest and movement, the incidence of side effects and overall satisfaction with pain relief. Pain was assessed using NRS and verbal raring scale (VRS, none, mild, moderate, severe or unbearable). Satisfaction was assessed using NRS of 0-10.	305 patients were included in the pre-APS phase and 300 patients were included in the post-APS phase.	In the post APS phase: For major surgery there was a significant improvement in the pain scores at rest (4.65 vs 3.37) and with movement (6.77 vs 6.19) for NRS. For VRS, a significant reduction from 18.2% to 3.5 % at rest and from 50% to 31.3 on movement. There was no significant change in pain scores for intermediate or minor surgery. The use of epidural analgesia increased from 16 patients in the pre-APS to 68 and the use of PCA from 76 to 94 patients. The incidence of adverse effects did not change significantly in the two phases. Patient satisfaction with pain relief was high in both groups (8.72 vs 8.76).	This prospective audit collected data on few outcomes measures using both the VRS and NRS for comparison. Nonetheless, The lack of significance in the pain control for minor and intermediate surgery could be explained by the less involvement of APS with these patients who mostly do not use PCA or epidural infusion.
10	Sauerland et al. (1999), Germany	Surgical-based-APS (Two surgical residents and a pain nurse).	To examine the effect of a surgical-based APS on pain and other related variables.	A prospective comparison study between two hospitals, one with-APS and the other without-APS. VAS (0-100) was used to collect data on pain scores, need for sleep, and appetite. The length of stay was also measured. Data collected on day 3 after surgery.	All consecutive patients from 1995-1997 who have had elective surgery. 179 patients in the APS-group and 319 in the hospital without-APS.	Pain scores at rest (18.8) and movement (42.6) were reduced significantly in the APS-group compared to 43.7 (rest) and 50.8 (movement) in the control group. The need for sleep was reduced significantly in the APS-group. Patients in APS-group gained their appetite quicker and performed their activity of daily life better and had greater satisfaction. No difference in the length of stay.	This is the only study examining the surgical-based APS using a comparative design. The power is 80%. Nevertheless, patients in the APs-group were significantly less co-morbid. No data on the percentage of patients who received PCA. The PCA was used in the ICU only in the control group.
11	Lanigan and Luffingham (1998) UK	APS consists of two acute pain nurses and a consultant anaesthetist	To evaluate the impact of sequential improvement in postoperative pain management by the APS.	A prospective audit of patients receiving PCA and epidural infusion. Pain was assessed 24-hours postoperatively on movement using 0-4 VRS. Sedation score was also recorded. The authors compared the first six months of APS inception with the last six months of the two years period.	1,781 patients who received PCA (1, 247) and epidural infusion (534) analgesia postoperatively.	The percentage of patients with moderate to severe pain on movement at 24-hours were reduced from 35 in the first six months to 11 % in the last six months for PCA, and from 35 to 22 % for epidural infusion. Moderate to severe sedation with PCA reduced from 12 % to 7 % during the audit and with the epidural infusion from 14 % to 5 %.	This long prospective audit used large sample size over 2 years. Nevertheless, there was no comparison group of patients who had pain management without APS. In addition, the authors acknowledged that they did not attempt to perform statistical analysis for various reasons.

12	Tighe et al. (1998), UK	APS consists of acute pain nurse and a consultant anaesthetist	To assess the benefits of introducing an APS into a district general hospital during the first 3 postoperative days.	A retrospective audit of before-APS and a survey for the after-APS in a general hospital. Pain scores and sleep disturbance were assessed using a four-point scale pre and post inception for 3 days after surgery. Data were also collected on nausea, vomiting, sleep, and overall patients' satisfaction with pain relief.	806 patients were included in the pre-APS phase and 712 patients were included in the post-APS phase. All patients underwent in-patient and day case surgeries.	In the post-APS phase there was a significant ($P < 0.0001$; 60% vs 42%) improvement in the number of acceptable pain scores (0 or 1), sleep pattern ($P < 0.05$) and patients satisfaction with pain treatment ($P < 0.01$; 83% vs 96%). Nevertheless, there was no significant change in the incidence of nausea or vomiting.	This audit used large sample size with few outcome measures. However, the data were collected retrospectively. Furthermore, patients' satisfaction depends on many other factors and good analgesia is one factor only.
13	Gabrielczyk and McGonagle (1997)- Letter UK	Nurse-led APS	To examine the efficacy of PCA and IM opioids before and after the appointment of an acute pain nurse on postoperative pain control.	Two surveys four months apart before and after the appointment of an acute pain nurse. Pain scores were assessed on movement or deep breathing using a VAS on the second postoperative day after major intra-abdominal orthopaedic or surgery. Pain relief expectation was also assessed as 'better than expected' or as 'expected'.	A total of 121 patients were selected randomly for the two surveys. Pre-APS (PCA=31 patients, IM=29); In the post-APS (PCA=28; IM=33	For PCA group: In the APS-phase the pain scores of > 6 were decreased from 51 % to 29 %. For the IM group: in the APS-phase the pain scores of > 6 were decreased from 41 % to 27 %. Patients were more satisfied with pain relief in the APS-phase (82 % vs 23% for the PCA group and 76% vs 55% for IM groups.	In this prospective sequential audit the sample was chosen randomly. However, due to the small sample size the authors were unable to perform statistical analysis.
14	Mackintosh and Bowles (1997), UK	Nurse-led APS	To evaluate the impact of creation a nurse-led APS on postoperative pain management.	A prospective, before and after introducing a nurse-led APS study. Pain scores were assessed (48-72 hours postoperatively) using the verbal intensity rating as none, mild, discomfort, severe, horrible, and excruciating. Pain scored as 'worse than discomfort' was considered unacceptable. Data on pre-operative information was recorded.	A random sample of 100 patients who undergone major surgery for the baseline-phase and a random sample of 106 patients from the same ward areas and who had same surgeries for the APS-phase.	Only 4.7% of patients experienced pain worse than discomfort in the post APS-phase as opposed to 15 % in the pre-APS ($P = 0.0099$). There was a significant increase in the use of PCA ($P = 0.00002$) in the APS-phase (78%) compared to 50 % in the pre-APS. There was a significant decrease in the use of IM analgesia ($P = 0.00004$) form 50% in the pre-APS-phase to 22% in post-APS. There was a significant increase in the percentage of patients who received pre-operative information ($P = 0.026$) in the post-APS-phase (92.4%) compared to 81% in the pre-APS.	In this small prospective study the sample was chosen randomly and all patients had same type of surgery. Nonetheless, in this single centre study the baseline data were collected three years before the APS phase.

15	Pesut B. & Johnson J. (1997), Canada	Anaesthetist-based APS	To assess the impact of introducing APS on the pain scores.	Audit chart of pre-APS and post-APS phase. Pain assessed using NRS-11. Data collected for the first 48 hours after surgery from the patient's chart. All patients have had PCA.	Patients who have undergone major abdominal surgery in the pre-APS phase (76 charts) and post-APS (102) phase were included.	There was no significant difference between the two phases. For the pre-APS, mean pain scores in the first 24 hrs was 4.3 and in the 24-48 hrs was 3.0 compared to 4.3 and 3.2 in the post-APS respectively. No significant difference were also found in the percentage of patients who had pain scores >4. In the Pre-APS, the percentage of pain score >4 was 47.1% in the first 24 hrs and 21.8% in the 24-48 hrs period compared with 45.2% and 23.6% in the post-APS phase respectively.	This audit examined one outcome measure only and patients who received epidural were excluded.
16	Stacey et al. (1997), USA	Primary surgeons group and anaesthesia-based APS group.	To evaluate differences in PCA management practices and patient outcomes following surgery between the care of primary surgeons (PS) and APS	A prospective data collection for the PS-group and a retrospective data collection for the APS-group from the same hospital. data were collected on PCA prescription, changes in PCA orders, VAS pain scores, side effects and post-PCA pain management information	39 patients prescribed PCA by PS and a random sample of 39 patients who had PCA treatment under the care of APS the year before the PS took over PCA management in a university medical centre.	APS physicians maintained patients on PCA longer than PS; APS also ordered loading doses, used opioids other than morphine and prescribed continuous infusion ($P<0.05$). In contrast, PS physicians ordered IM medication significantly ($P<0.01$) more often than APS (25.6% vs 5.1%). PS patients were also found to have a significant higher incidence of side effects such as nausea ($P < 0.05$) and urinary retention ($P < 0.01$). However, the pain scores were not significantly ($P>0.05$) different, at day 1, 2, and discontinuation of PCA, between the APS (mean 4.8, 5.1, 3.7) and the PS group (4.7, 4.9, 4.0).	This is a good study. Nonetheless, the sample size is relatively small. Moreover, prior to the data collection for the PS-group education sessions were provided to the surgical and nursing staff, guidelines for PCA prescription were made available. These interventions prior to data collection may benefit the PS-group and may explain the lack of difference in pain scores. Moreover, the benefit of APS in the surgical wards may be still persistent.

17	Tsui et al. (1997), Hong Kong	Anaesthetist -based APS	To examine the influence of postoperative analgesia provided by the APS compared to conventional group on morbidity and mortality after esophagectomy	A prospective sequential study in one hospital. APS-group received either epidural or systematic analgesia (PCA morphine or continuous IV morphine infusion) and the conventional group (Pre-APS) received IM mepridine or morphine every 4-6 hours. Pain was assessed on rest and coughing using the 0-10 NRS in the APS-group only. Overall satisfaction was also assessed in APS-group. Data on respiratory and cardiovascular complication, mortality and length of hospital stay were also collected.	299 patients were under the care of APS (1989-1995) and 279 patients were under the care of conventional group (Pre-APS; 1986-1989). All patients had esophagectomy	APS-group patients who had transthoracic esophagectomy reported a significantly lower incidence of pulmonary complication ($P = 0.002$), cardiac complication ($P < 0.001$), a significant reduction in hospital mortality ($P = 0.038$) and a shorter hospital stay ($P = 0.005$). APS-group also reported satisfactory analgesia (NRS around 0-1 on rest and 0-4 on cough) and 88 % rated a good satisfaction with pain relief. In the APS-group 2 % of patients had respiratory depression, 9 % nausea and 12 % pruritus.	This is an interesting prospective study (APS-group) using important outcome measures. However, there was no comparison in the pain scores and overall satisfaction between the two groups as the conventional group data (no-APS) was collected retrospectively and pain scores were not routinely assessed before the introduction of APS. Moreover, the two groups of patients belong to different time periods which may have affected the results.
18	Coleman and Booker-Milburn, 1996, UK	Nurse-based APS	To examine the influence of an acute pain nurse (APN) on the efficacy and safety of PCA and epidural analgesia.	Pre-APN and post-APN audit of postoperative pain management with PCA and epidural analgesia. Pain scores for first day, satisfaction and side effects were measured. Data collection for two months for each phase.	135 patients were included in the pre-APN phase and 188 patients were included in the post-APN phase. All patients had major surgery.	120 patients received PCA (pre-APN) compared to 147 (post-APN). 26% and 73% rated their pain as severe at rest and movement in the Pre-APN phase compared to 7% and 35% in the post-APN respectively. 68 patients (pre-APN) used PCA <24 hrs compared to 4 (post-APN). The surgical team stopped 21 of these (pre-APN) compared to zero (post-APN). Of these 36% received IM opioids in the pre-APN phase compared to 1.5% (post-APN). 15 patients received epidural analgesia in the pre-APN phase and 41 in the post-APN. Pain was severe in 6.5% in the pre-APN and 12% in the post-APN. The incidence of hypotension decreased from 80% (pre-APN) to 20% (post-APN). Patients' satisfaction increased from 73% to 88% (post-APN). Use of IM analgesia decreased from 26% to 0%.	This audit highlighted the value of specialist pain nurses in the efficacy and safety of PCA and epidural analgesia. However, the baseline data were collected 6 months before appointing the APN.

19	Gould et al. (1992), UK	A Multidisciplinary Team consists of research fellow, two research nurses, a consultant surgeon, three consultant anaesthetists, a pharmacist and senior nursing officer.	To observe the effect of sequential introduction of an APS to the general surgical wards on postoperative pain management in a university hospital.	A prospective sequential study over 7 stages (audit of current practice followed by the sequential introduction of pain assessment charts; algorithm for analgesia; local anaesthetic for wound infiltration; information sheet for patients; and a repeat audit of practice). The main outcome measure was a change in the median VAS 24 hours after surgery for pain during relaxation, movement and on deep inspiration at each. Data about patients' expectation of postoperative pain and the incidence of side effects were also collected.	Data were collected from 2035 patients during the seven stages of the study who had minor, intermediate or major surgery. In stage 1 data on current practice were collected from 213 patients (pre-APS) and in stage 7 data were collected from 219 patients (post-APS).	The introduction of APS led to a significant reduction in median VAS during the study for all types of surgery ($P < 0.0001$ to $P < 0.033$) except for pain on movement in the intermediate surgical procedures ($P < 0.364$). There were no significant differences in the incidence of side effects between each of the stages of the study. Patient satisfaction improved through the study: by stage 7, only 12% complained that their pain was worse than expected compared to 34% in stage 1; also, in stage 7, 67 % of patients said that their pain was better than expected compared to 42 % in stage 1.	In this large study the authors obtained the ethical approval to introduce the sequential changes in 7 stages over 42 week where the new methods of postoperative pain management introduced at each stage were maintained until completion of the study. Nonetheless, patients who were unable to complete the VAS and all patients who had epidural analgesia were excluded from the study.
20	Wheatley et al. (1991) UK	APS consists of an acute pain sister and three consultant anaesthetists	To assess the benefits, risks and resource implications of providing an APS for general surgical wards in a single district general hospital.	A prospective audit of the APS experience in the first year of its inception. Pain scores were assessed by ward nurses 4-hourly on verbal rating scale 0-3 and at 24-hours after surgery by the pain team using VAS 0-10. The incidence of complications and patient satisfaction were also recorded. Data on the incidence of postoperative chest infection in surgical patients were retrospectively collected.	660 patients who had major surgery were treated with PCA (510 patients) or extradural infusion analgesia (150 patients) under the care of APS.	For PCA, 63% of patients scored their pain as mild during the first 24-hours and 11 % complained of severe pain. For extradural infusion, 77% complained of mild pain and 7% of severe pain. The mean VAS was low for both treatment groups (PCA 3.5; extradural infusion 2.2). Eight patients (1.2%) developed potentially serious complications (5 had respiratory depression; 2 had prolonged motor block and one had hypotension). The level of patient satisfaction with pain relief was high (91% with epidural and 96% with PCA). The incidence of postoperative chest infection in surgical patients was significantly reduced in the first year of the APS (1.3 % compared to 0.4 %; $P < 0.01$).	This is the first study in UK to evaluate the outcomes of APS inception. However, the data on postoperative chest infection were collected retrospectively. Moreover, the authors did not collect data on pain scores or the incidence of complications before the inception of APS to compare it with APS data.

Appendix 2-2: Cost effectiveness of APS

No. #	Authors/ Year/ Country	APS Structure	Methods	Sample	Cost Included /Currency	Findings	Strengths and Limitations
1	Lee et al. (2010), Hong Kong	Nurse-based/ anaesthetist supervised APS	Randomised controlled trial (RCT). The APS group received PCA and the control group received boluses of opioids IM or IV. The overall costs of 3 days after surgery were compared between the groups and the cost-effectiveness acceptability curves were drawn to compare the cost-effect relationship between the groups.	199 patients undergoing major surgery allocated to the APS group and 203 allocated to the control group.	The cost of analgesia, PCA pumps, medication to treat side effects and APS staff. The cost sources from the hospital pharmacy and administration (US Dollar- $)	The APS cost ($48.27) was significantly higher than the control group ($2.65), the mean difference was $46 (P<0.001). The incremental cost-effectiveness ratio for cost/ 1day with highly effective treatment gained was $151 (95% CI, $87-$546) per patient. The APS was more cost-effective than control for providing highly effective pain management if the decision maker was willing to pay >$546/patient/day. No difference in the length of stay.	This is a well done RCT with 80% power and clear sources for the estimated costs; for example, medication costs were estimated from pharmacy. However, it was conducted in the same hospital and offering a suboptimal IM analgesia to the control group is ethically questionable.
2	Stadler et al. (2004), Belgium	Nurse-based/ anaesthetist supervised APS	Open-observational study- pre and post design. The pain scores (VAS) was performed every 4 hours for 3 days to measure the analgesics-effectiveness (cost utility analysis) and was expressed as postoperative pain days averted (PPDA) in the two surveys. The cost-effectiveness was measured using postoperative morbidity, mortality and duration of hospital stay.	Pre-APS study (n=1304 surgical patients) and post-APS phase (n=671 patients).	All costs of drugs, disposables and nurses' time were calculated in EURO. (EURO- €)	The total cost increased significantly in the post phase (P<0.001). The incremental cost of pain management after APS amounted to €19/patient/day. The incremental cost-effectiveness ratio is €350.77/PPDA gained. There was minor reduction in the postoperative complications. No changes in the length of stay or hospital mortality.	This is a full economic analysis for an APS with clear sources for the estimated costs. However, the authors excluded patients receiving epidural analgesia.

3	Schuster et al. (2004), Germany	APS consists of a pain nurse and an anaesthesia fellow supervised by anaesthetist.	A retrospective study of patients treated by patient controlled epidural analgesia (PCEA) following major surgeries. Total costs of PCEA were calculated per patient.	A total of 350 patients treated by PCEA from July, 2001-June, 2002	Cost of epidural catheter insertion, material costs and staff costs. (EURO- €)	The average total cost of the APS was €447/patient. Around 51% of the total costs were staff costs of the APS. However, the authors claimed that these costs were only 5% from the total hospital cost for these patients.	The retrospective design is one of the limitations of this study. There is also no comparison group in the study.
4	Shapiro et al. (2003), Israel	Nurse-based/ anaesthetist supervised APS	A prospective nonrandomised study of patients treated by the APS. The costs and pain scores (VAS-100mm) of basic treatment (NSAIDS alone), IV-PCA and epidural morphine were compared.	358 patients recovering from major intra-abdominal surgery who were treated by the APS from September 1999-September 2000.	The costs of the three treatment modalities were calculated for 3 days. The cost of PCA device and the cost of the APS nurse. (US Dollar- $)	Based on three days treatment, the costs of the basic treatment ($9.90) were less than the cost of PCA ($23.90) and epidural groups ($16.10). The time needed to treat and monitor patients was lower in the basic group (19 min./24hr) compared to the PCA (40 min./24hr) and epidural groups (44 min./24hr). The median pain scores were lower in the epidural group (4/100) compared to the basic (23.5/100) and PCA groups (6/100).	This is a prospective study comparing the costs of 3 modalities. It is not clear how to estimate the cost of APS without comparison group. Moreover, the costs of the side effects treatment and disposables were not included.
5	Brodner et al. (2000), Germany	APS consists of a pain nurse and 1.5 physicians.	A prospective study using a computer based documentation system. Cost calculated on the base of reducing the length of stay in the ICU for patients using PCEA as part of multimodal approach compared to the traditional postoperative pain management.	Cost of 2124 patients treated by APS during 1998.	APS cost for staff were €265, 200, cost for drugs, PCEA pumps and disposables were €249, 380. Total of €514, 580. (EURO- €)	Compared with the traditional approach, PCEA as part of multimodal approach supervised by the APS saved 433 ICU days for 356 patients. The costs of these 433 days were €606, 200. Estimated cost saving of €91, 620 (€43/patient).	This is a prospective study using a large sample size. However, the sources of costs data were unclear and the intervention is part of a fast track approach (early extubation, early mobilisation).

6	Salomaki et al. (2000), Finland	Nurse-based/ anaesthetist supervised APS	Pre and post study. The costs of the pain nurse were reported in the study.	200 patients were included in the pre-APS phase and 200 patients were included in the post-APS phase. All patients had major gynaecological surgery.	The costs of the pain nurse. No other costs were reported in the study such as medications and disposable costs. (US Dollar- $)	The costs of the pain nurses were 10/patient.	The costs were reported, anecdotally) in the study without proper estimation and it is not based on the difference of cost before-and after inception of the APS.. The sources of costs data were unclear.
7	Tighe et al. (1998), UK	APS consists of acute pain nurse and a consultant anaesthetist.	Pre and post study. Running costs of the APS were estimated. Follow up patients was for three days.	806 patients were included in the pre-APS phase and 712 patients were included in the post-APS phase.	The costs of PCA systems, printing guidelines were £ 25, 000. Running costs were £35, 000/year for staff, drugs and disposables. (English Pound- £)	Estimated APS cost for the first year was £6.00/patient and £3.5 thereafter. The APS saves 30 min. of nursing time/patient (£4.02) by using time efficient methods of analgesics administration. The authors claimed that the APS is cost-effective.	It is partial economic analysis based on treating around 10, 000/year. It is not based on the difference of cost before-and after inception of the APS.
8	Tsui et al. (1997), Hong Kong	Anaesthetist -based APS	Pre and post deign. APS-group received either epidural or systematic analgesia (PCA morphine or continuous IV morphine infusion) and the conventional group received IM mepridine or morphine every 4-6 hours. Data on the length of hospital stay was collected.	279 patients were under the care of conventional group (Pre-APS). 299 patients (post-APS). All patients had esophagectomy	Daily cost of a bed in the hospital is $400/bed. No other costs were included. (US Dollar- $)	APS-group reported a significantly shorter hospital stay (21.3 days) compared to pre-APS group (28.6) (P= 0.005). Annual cost saving of $200, 000 based on shorter hospital stay for 60 operations /year ($3333/patient/year).	There was a long time gap between before and after measurements (1989-1995). The costs of APS staff, drugs and disposables were not estimated. However, the saving from a shorter hospital stay is an interesting outcome measure.
10	Badner et al. (1997), Canada	Anaesthetist -based APS?	Cross-sectional survey over 4 months for all patients receiving PCA>12hrs. Patients were asked to estimate the cost of PCA and if they are willing to pay.	103 patients treated with PCA under the care of APS.	Costs of physicians, nurses, equipment and pharmacy were estimated based on average duration of therapy for 2.5 days. (CAN Dollar- $)	The cost of PCA is $150/patient. 37% of patients knew the cost of the service with 53% overestimated the cost. 60% of patients were willing to pay a portion of this cost.	The estimated costs were explained clearly in details. However, the APS cost is unclear and there was no comparison group.

11	Breivik et al. (1995), Norway	Nurse-based/ anaesthetist supervised APS	Estimate costs of PCA and epidural analgesia.	Estimated for 1000 patients.	Capital costs of pumps, medications, disposables and staff wages. (US Dollar- $)	The estimated capital, medications and pumps costs were $10-15/patient/day. The estimated staff costs were $15-30/patient/day. The estimated total cost was $25-40/patient/day. If all surgical patients benefit from the APS the real net cost estimates is $2-4.	The APS cost data is unclear. It is an estimated cost of the PCA and epidural analgesia without conducting a study.
12	Breivik et al. (1995), Switzerland	Nurse-based/ anaesthetist supervised APS	Estimate costs of PCA and epidural analgesia.	Estimated for 2000 patients.	Capital costs of pumps, medications, disposables and staff wages. (US Dollar- $)	The estimated capital, medications and pumps costs were $10-15/patient/day. The estimated staff costs were $10-20/patient/day. The estimated total cost was $25-40/patient/day. If all surgical patients benefit from the APS the real net cost estimates is $2-4.	The APS cost data is unclear. It is an estimated cost of the PCA and epidural analgesia without conducting a study.

Patient Appendices

(English)

Appendix 3-1: Power Calculations

Appendix 3-2: Patients' Demographic Data

Appendix 3-3: SCQIPP Questionnaire

Appendix 3-4: Patients' Invitation letter

Appendix 3-5: Patients' Information Sheet

Appendix 3-6: Patients' Consent Form

Appendix 3-1: Power Calculations

A- Sample size- Patient questionnaires

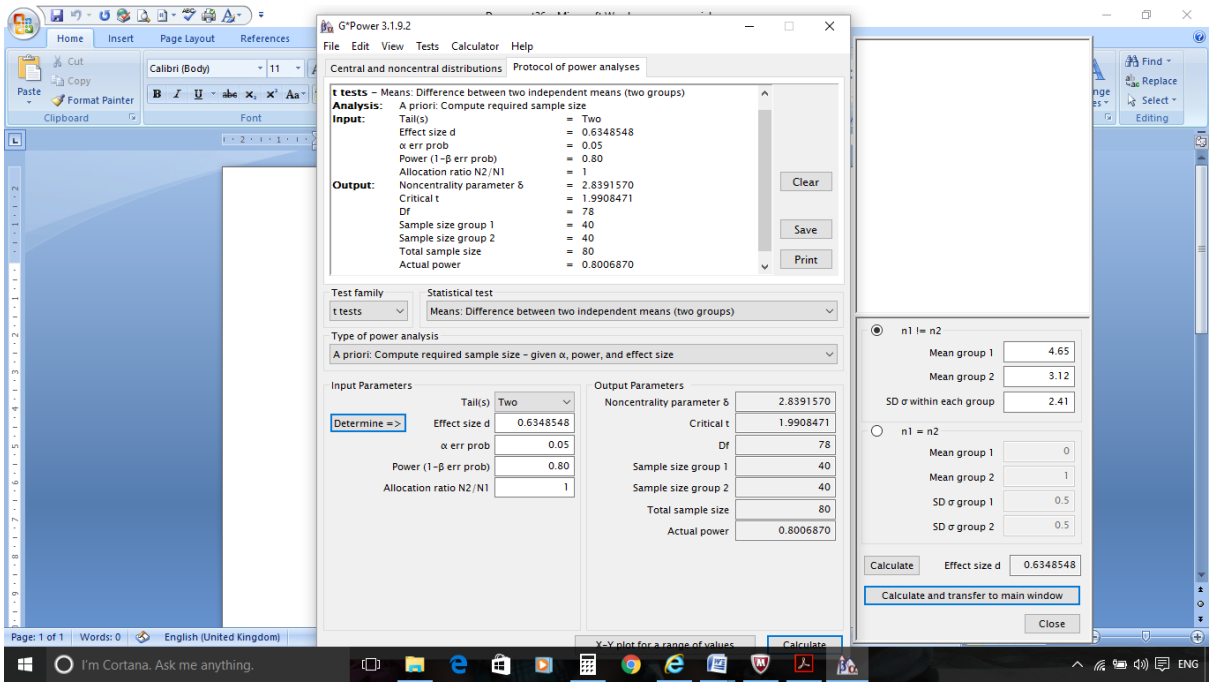
The power analysis revealed that a sample size of 80 (40 from each hospital) was required. This is based on a power of 80%, significance level of less than 0.05, and a 33% reduction in pain scores using the G*Power 3 software (Faul et al., 2007). The mean pain score (4.65) on NRS and SD (2.41) were taken from Sartain and Barry (1999).

Output for the power calculation from G*Power 3 software:

t tests – Means: Difference between two independent means (two groups)

Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	Two
	Effect size d	=	0.6348548
	α err prob	=	0.05
	Power (1−β err prob)	=	0.80
	Allocation ratio N2/N1	=	1
Output:	Noncentrality parameter δ	=	2.8391570
	Critical t	=	1.9908471
	Df	=	78
	Sample size group 1	=	40
	Sample size group 2	=	40
	Total sample size	=	80
	Actual power	=	0.8006870

Screenshot from the G*Power 3 software:



Using the formula from Campbell and Machin (1999) to calculate power:

$n = 2xKx\sigma^2/\partial^2$

K=7.84 from the table

σ is the SD

∂ is the minimum reduction in pain score.

From Sartain and Barry's (1999) study:

Mean	SD	33% reduction from the mean
4.65	2.41	1.53

2x7.849= 15.698

15.698x5.80/2.34

The sample size will be 39 in each group.

B- Sample size- Clinician questionnaires

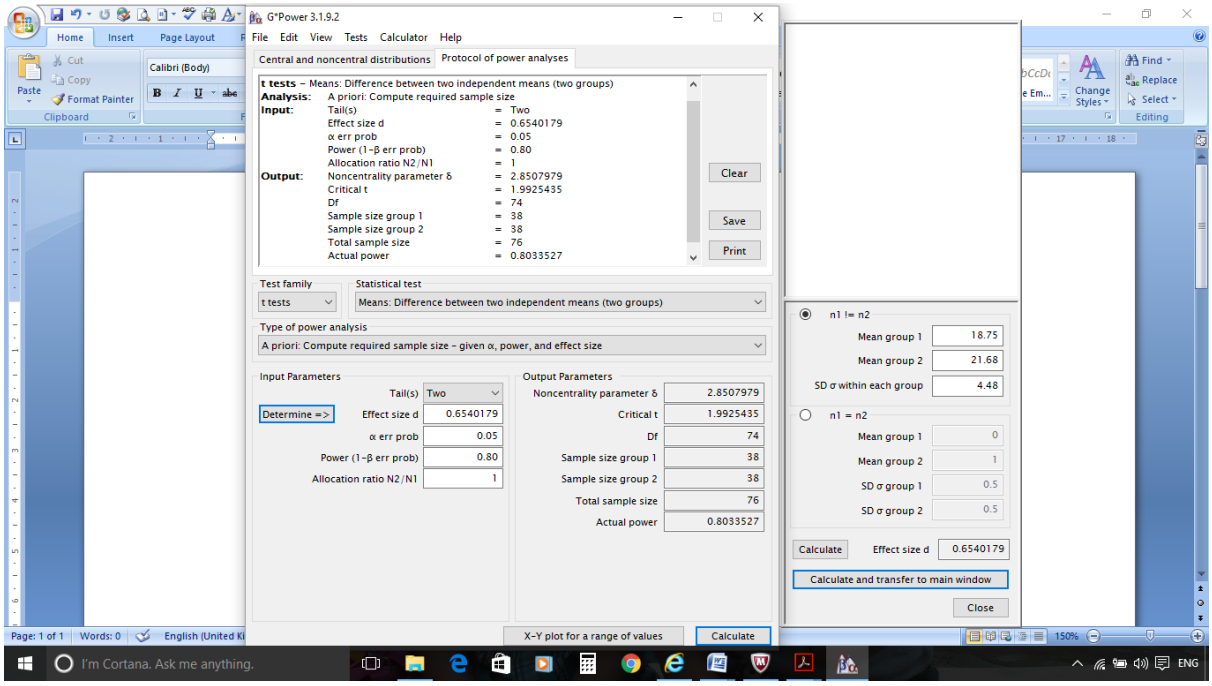
The power analysis revealed that a minimum sample size of 76 clinicians (38 from each hospital) was required. This was based on a power of 80%, a significance level of less than 0.05, and a 15.6% increase in knowledge scores using the G*Power 3 software (Faul et al., 2007). The mean knowledge score (18.75) and SD (4.48) were taken from a previous RCT (Patiraki et al., 2006).

Output for the power calculation from G*Power 3 software:

t tests - Means: Difference between two independent means (two groups)

Analysis:	A priori: Compute required sample size	
Input:	Tail(s)	= Two
	Effect size d	= 0.6540179
	α err prob	= 0.05
	Power (1-β err prob)	= 0.80
	Allocation ratio N2/N1	= 1
Output:	Noncentrality parameter δ	= 2.8507979
	Critical t	= 1.9925435
	Df	= 74
	Sample size group 1	= 38
	Sample size group 2	= 38
	Total sample size	= 76
	Actual power	= 0.8033527

Screenshot from the G*Power 3 software:



Using the formula from Campbell and Machin (1999) to calculate power:

$n = 2xKx\sigma^2/\partial^2$

K=7.84 from the table

σ is the SD

∂ is the increase in knowledge score.

From Patiraki et al.'s (2006) study:

Mean	SD	15.6% increase from the mean
18.75	4.48	2.93

2x7.849= 15.698

15.698x20.07/8.58

The sample size will be 37 in each group.

Appendix 3-2: Patients' Demographic Data

Please answer the following questions

1. Patient name: ……

(Note: this is mentioned in the letter version-1)

2. Are you: Male □ Female □

3. How old are you (years)? …….

4. What operation did you have? ……..

5. How many days since you had your operation……..

6. What method of postoperative pain management did you use?

□ Patient controlled analgesia

□ Epidural infusion

□ Intramuscular opioids

□ Oral analgesia

□ Nerve blocks

7. What pain medications do you take now for the treatment of the surgical pain?

…….

……....

8. If possible,

A. Please tell us what pain medication do you take at home before surgery?

……..

……..

B. How many per day? …….

…….

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Appendix 3-3: SCQIPP Questionnaire (Patients' questionnaire)

Instructions for completing the questionnaire

Thank you for agreeing to fill in this questionnaire.

1. The questionnaire includes two parts. Please try to answer **all** the questions following the instructions for each section.

2. All the information that you provide is completely confidential.

3. Once completed, please return the questionnaire in the **envelope** provided to your **nurse.**

4. If you have any questions, please do not hesitate to contact me.

Thank you very much for your cooperation and assistance

Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
Tel: 00962 775935762

SCQIPP Questionnaire

Below are a few statements about your **pain treatment after surgery**. Please mark the square from 1 to 5 that best describes your opinion about your treatment at this ward on the day/days **following** your operation: 1 = strongly disagree and 5 = strongly agree.

		Strongly Disagree				**Strongly agree**
1.	Before my operation I was told about the type of pain treatment I would be offered after surgery	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
2.	After my operation I talked with a nurse about how I wanted my pain to be treated	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
3.	I received support or help in finding a comfortable position in bed to help avoid pain	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
4.	I was given the opportunity for peace and quiet so I could sleep at night.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
5.	Even if I did not always ask for it, I was given pain medication	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
6.	The staff asked me about the pain I had when I breathed deeply, sat up, or moved around	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
7.	To determine my level of pain, a member of staff asked me to pick a number between 1 and 10 (or make a mark on a straight line) at least once every morning, afternoon, and evening	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
8.	The nurses helped me with pain treatment until I was satisfied with the effects of pain relief	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
9.	I have a pleasant room	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

10.	There have been enough nurses on duty for someone to respond quickly to my request for pain relief	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
11.	When nurses come on duty, they know 'everything' about how much pain I have had and the pain treatment I have received.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
12.	The nurses are knowledgeable about how to relieve my pain	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
13.	The nurses believe me when I tell them about my pain	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
14.	The nurses and doctors have cooperated in treating my pain	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

The questions below concern your **pain after the operation.** Please **mark** the answer that best describes your opinion.

15. Please rate your pain by circling the one number that best describes your pain at its **worst** in the past 24 hours

No pain 0 1 2 3 4 5 6 7 8 9 10 worst pain possible

---

16. Please rate your pain by circling the one number that best describes your pain at its **least** in the past 24 hours.

No pain 0 1 2 3 4 5 6 7 8 9 10 worst pain possible

---

17. Please rate your pain by circling the one number that tells how much pain you have **right now**.

No pain 0 1 2 3 4 5 6 7 8 9 10 worst pain possible

---

18. Did you have more pain after the operation than you expected: Yes☐ No ☐

19. Overall, how **dissatisfied or satisfied** are you **with the pain relief** you received following the operation? Circle a figure from 0 to 10, where 0 = very dissatisfied and 10 = very satisfied

Very dissatisfied 0 1 2 3 4 5 6 7 8 9 10 Very satisfied

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Appendix 3-4: Patients' Invitation Letter

Dear patient,

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

I am currently a PhD student at the University of Nottingham. I am conducting a study as part of my doctoral studies. The aim of this part of the study is to explore patients' experience of postoperative pain.

I am writing to invite you to take part in this study. Your participation in the study is completely voluntary. All the information which is collected about you during the study will be kept strictly confidential. Any information about you will have your name removed so that you cannot be recognised from it. Please be assured that your answers will only be accessed by myself and my supervisors. You will note that I have asked you to record your name. This is to enable me to complete any missing data related to your treatment from your medical records.

Please find enclosed the information sheet and the questionnaire. If you wish to participate in the study, please complete the attached questionnaire 24 hours after your operation. Once completed, please return the questionnaire in the envelope provided to your nurse. By completing and returning the questionnaire you are consenting to take part in the study.

Please do not hesitate to contact me should you have any questions about the research study.

Thank you very much for your time and considering taking part in this research.

Yours faithfully

Atef Al-Tawafsheh, MSc, BSc, RN
PhD student
atefmmt@yahoo.co.uk
Tel: 00962 775935762

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Appendix 3-5: Patients' Information Sheet

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Name of Investigator: Atef Al-Tawafsheh, PhD student, University of Nottingham
Supervisors: Dr. Nick Allcock: Associate Professor, University of Nottingham
Dr. Linda East: Lecturer, University of Nottingham

You have been invited to take part in a research study. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends and relatives if you wish to. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?
I am currently a PhD student at the University of Nottingham. I am conducting a study as part of my doctoral studies. It is important that we are able to manage any pain you may experience following an operation. There are a number of ways that pain can be managed. To support the nurses and doctors caring for you to do this, teams of staff who specialise in pain have been developed. These are called acute pain teams. This study explores how these acute pain teams help staff and patients to manage pain after an operation. What we learn from this study will be used to improve the way these teams work and therefore will help to improve patients pain.

Why have I been chosen?
You have been chosen as you are a patient undergoing surgery. Patients staying 30 hours after an operation may take part in this study. It is anticipated that the study will continue until around 100 patients have been returned their questionnaires.

Do I have to take part?
It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to complete a questionnaire. If you decide to take part you are still free to withdraw at any time and without giving a reason. By completing and returning the questionnaire you are consenting to take part in the study. A decision not to take part, or to withdraw from the study, will not affect the standard of care you receive.

What does the study involve?
If you agree to participate, you will be asked to complete a questionnaire 24 hours after your operation. It will take 10-15 minutes to complete.

What do I have to do?
If you wish to participate in the study, please complete the attached questionnaire 24 hours after your operation. Once completed, please return questionnaire in the

envelope provided to your nurse. By completing and returning the questionnaire you are consenting to take part in the study. Moreover, I may ask you to sign a consent form to allow me to access your personal records to complete any missing data related to your treatment (e.g the operation you had, method of postoperative pain management).

What are the possible disadvantages and risks of taking part?
The questionnaire will take 10-15 minutes from your time to complete. Your participation will remain completely anonymous and taking part will not affect your care in any way.

What if something goes wrong?
In case you have a complaint about any aspect of the study, you can initially approach the lead investigator Atef Al-Tawafsheh at the address below. If you are not satisfied by this, you should then inform your nurse or contact your local Institutional Review Board (Hospital-A; Ms. Xxxx Ext. xxx), and for Hospital-B vice director for administrative affairs Ext xxx. Alternatively, you can contact the Patient Affairs Office (Hospital-A Ext. xxx, Hospital-B Ext. xxx).

Will my taking part in this study be kept confidential?
All the information which is collected about you during the study will be kept on a password protected database and is strictly confidential. Any information about you which leaves the hospital will have your name removed so that you cannot be recognised from it. A participant ID will be assigned to all who wish to participate. Data will only be accessed by myself and my supervisors.

What will happen to the results of the research study?
The study is being conducted as part of a PhD. The results of the study will be included in the final report of a PhD thesis. The results may also be published in a scientific journal or conferences but you will not be identified in any report/publication. A summary of the research findings will also be available to all participants if they wish.

Who is organising and funding the research?
The research is being carried out as part of PhD course and is self-funded.

Who has reviewed the study?
This study has been reviewed by the University of Nottingham Medical School Ethics Committee and approved by the ethics committee at your hospital.

Contact for Further Information
The main person responsible for this study is Atef Al-Tawafsheh, under the supervision of Dr. Nick Allcock and Dr. Linda East (University of Nottingham-UK).

Please do not hesitate to contact me should you have any questions about the research study.

Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
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Thank you very much for taking the time to read this information sheet.

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Appendix 3-6: Patients' Consent Form

Patient ID Number: ……

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Name of researcher: Atef Al-Tawafsheh, PhD student-Nursing studies
Supervisors: Dr. Nick Allcock and Dr. Linda East

Please Initial the Boxes and sign the form.

☐ I confirm that I have read and understand the information sheet dated (22/05/2011 version-2) for the above study.

☐ I authorise the investigators to disclose the results of my participation in the study but it will be made anonymous.

☐ I understand that information about me recorded during the study will be kept in a secure database. Data will be kept for 7 years after the results of this study have been published.

☐ I understand that I am free to withdraw from the study at any time, without having to give a reason for withdrawing.

☐ I voluntarily agree to take part in this study.

☐ I authorise the investigators to access my medical records.

Name of participant: ……Date: …… Signature: ……..

Name of researcher: …….Date: …… Signature:……

Please do not hesitate to contact me should you have any questions about the study.

Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
Tel: 00962 77593576

Patients' Appendices

(Arabic)

Patient Demographic Data

SCQIPP Questionnaire

Patient Invitation letter

Patient Information Sheet

Patient Consent Form

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الطابق (ب) –غرفه 53
مركز كوينز الطبي
الرمز البريدي :NG7 2UH
المملكة المتحدة

Patient Invitation letter

عزيزي المريض/ المريضة

عنوان البحث: تاثير **فريق علاج الالم** على علاج الم ما بعد الجراحه في الاردن .

انا (عاطف الطوافشه) طالب دكتوراة في جامعة نوتنغهام. ان اجراء هذا البحث يعتبر جزء من دراستي للدكتوراة ، وتهدف هذه الدراسة الى معرفة خبرة المريض التي مر بها في علاج الم ما بعد الجراحه.

ادعوكم للمشاركة في هذا البحث ، ان المشاركة فيه اختياري ،علماً بان المعلومات التي ستقدمونها ستعامل بسرية تامة. ان اي معلومة يتم فيها ذكر اسمك سيتم الغاء الاسم بحيث لا يمكن التعرف على المعلومات الشخصية لك، وانني اوكد لك بانه لن يسمح لاي شخص الاطلاع على اجاباتك سوى الباحث ومشرفين رسالة الدكتوراة.
ستلاحظ انني طلبت منك تسجيل اسمك وذلك لاستكمال البيانات الناقصة المتعلقة في علاجك من ملفك الطبي.

ارجوا الاطلاع على معلومات البحث والاستبيان المرفقة. اذا كنت ترغب في المشاركة ارجوا تعبئة الاستبيان المرفق بعد ٢٤ساعه من العملية الجراحية. بعد تعبئة الاستبيان الرجاء وضعه في المغلف المعطى وتسليمه الى الممرض/ الممرضة قبل نهاية الدوام. علما بان الموافقة على المشاركة في هذه الدراسة ستكون بتعبئة واعادة الاستبيان.

الرجاء عدم التردد في الاتصال بي اذا كان لديك اي اسئلة حول البحث.

شاكرا لكم حسن تعاونكم ومساعدتكم.

وتفضلوا بقبول فائق الاحترام

عاطف الطوافشة – طالب دكتوراة
atefmmt@yahoo.co.uk
هاتف : 0775935762

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المملكة المتحدة

Patient Information Sheet

نشرة معلومات للمرضى

عنوان البحث : تاثير **فريق علاج الالم** على علاج الم ما بعد الجراحه في الاردن .

اسم الباحث المسؤول : عاطف الطوافشة – طالب دكتوراة – جامعة نوتنغهام .
المشرفين: الدكتور نيك الكوك – استاذ مشارك – جامعة نوتنغهام
الدكتورة ليندا ايست – استاذ مساعد - جامعة نوتنغهام .

هذه دعوة للاشتراك في البحث ، قبل ان تقرر الرغبة في الاشتراك ، فانه من المهم معرفة اهداف الدراسة ، ارجوا ان تاخذ الوقت الكافي لقراءة المعلومات التالية ومناقشتها مع الاصدقاء او الاقارب اذا كنت ترغب في ذلك . اذا رغبت في اي معلومات اضافية او اذا كانت المعلومات المتوفرة غير كافية ارجوا الاتصال بي .

ما هو الهدف من الدراسة ؟
انا(عاطف الطوافشه) طالب دكتوراة في جامعة نوتنغهام. ان اجراء هذا البحث يعتبر جزء من دراستي للدكتوراة. من المهم ان نكون قادرين على علاج الم ما بعد العملية الجراحية حيث ان هناك عدة طرق لعلاج هذه الالام ، ولمساعدة الممرضين والاطباء على ان يكونوا قادرين على علاج الالم ما بعد الجراحة فقد تكّون فريق متخصص في علاج هذه الالام وهذا الفريق يسمى "فريق علاج الالم". هذه الدراسة تهدف الى معرفة كيف يمكن لهذا الفريق ان يساعد الكادر الطبي والمرضى لعلاج الالم بعد العملية الجراحية . هذه المعلومات ستفيد في تحسين اداء هذا الفريق وبالتالي ستساعد على تحسين علاج المرضى .

لماذا تم اختياري في البحث ؟
تم اختيارك لانك خضعت لعملية جراحية وستقضي مدة لا تقل عن ٣٠ ساعة في المستشفى ومن المتوقع ان تستمر الدراسة الى ان يتم تعبئة مئة استبيان.

هل من الضروري المشاركة في البحث ؟
لك حرية الاختيار في المشاركة او عدمها في البحث , اذا رغبت في المشاركة ساطلب منك تعبئة الاستبيان، حتى لو رغبت في المشاركة وغيرت رايك بعد فترة يمكنك الانسحاب من الدراسة متى شئت دون اعطاء سبب . علماً إن تعبئة واعادة الاستبيان تعبر عن رغبتك في المشاركة في هذا البحث . ان قرارك في عدم المشاركة او الانسحاب من الدراسة لن يؤثر على الرعاية الصحية المقدمة لك.

ماذا يحتوي البحث ؟
اذا وافقت على الاشتراك في البحث ساطلب منك تعبئة الاستبيان بعد ٢٤ساعه من العملية الجراحية ، والاجابة على الاستبيان سيستغرق ١٠-١٥ دقيقة تقريبا .

ماذا علي ان افعل ؟
اذا كنت ترغب في المشاركة ارجوا تعبئة الاستبيان المرفق بعد ٢٤ساعه من العملية الجراحية. بعد تعبئة الاستبيان الرجاء وضعه في المغلف المعطى وتسليمه الى الممرض/ الممرضه قبل نهاية الدوام. وعلاوة على ذلك، قد أطلب منك التوقيع على اقراربالموافقة للسماح لي لاستكمال البيانات الناقصة المتعلقة في علاجك من ملفك الطبي (مثل العمليه الجراحيه، طريقة علاج الالم).

هل هناك مساؤى من المشاركة في البحث ؟
الاجابة على الاستبيان ستستغرق ١٠-١٥ دقيقة تقريبا من وقتك. ان مشاركتك في البحث لن يتم فيها ذكر اسمك ولن تؤثر على الرعاية الصحية المقدمة لك .

ماذا لو حدث خطا ما ؟
اذا كان لديك شكوى حول الدراسة ,يمكنك الاتصال بالباحث عاطف الطوافشة. اذا كنت غير راض عن الحل فعندها يجب ان تخبر الممرض \ الممرضة للاتصال(مستشفى- ا-[redacted] مجلس تقييم الابحاث رقم "[redacted]" او الاتصال بمكتب شؤون المرضى رقم "[redacted]"). مستشفى-ب- للاتصال بنائب المدير للشؤون الإدارية رقم "[redacted]" او الاتصال بمكتب شؤون المرضى رقم "[redacted]".

هل ستعامل معلوماتي بسرية ؟
جميع المعلومات التي سيتم جمعها ستحفظ في حاسوب محمي برقم سري وستعامل بسرية تامة . ان اي معلومة يتم فيها ذكر اسمك سيتم الغاء الاسم بحيث لا يمكن التعرف على المعلومات الشخصية لك . وسيتم تحديد رقم لكل مشترك بحيث يتم التعامل مع الرقم وليست الاسماء علما بان اجاباتك سيتم الاطلاع عليها من قبل الباحث ومشرفين رسالة الدكتوراة فقط .

ماذا سيحدث لنتائج البحث ؟
سيتم كتابة النتائج في رسالة الدكتوراة للباحث , وسيتم ايضا عرض النتائج في المجلات والمؤتمرات العلمية ولكن بدون اسماء حيث لا يمكن التعرف عليك من خلال النتائج .علما بانه يمكنك الاطلاع على ملخص النتائج اذا رغبت بذالك .

من منسق وممول البحث ؟
ان اجراء البحث يعتبر جزء من دراسة الدكتوراة للباحث وبتمويل شخصي منه .

من قام بتقييم ومراجعة البحث ؟
لقد تم تقييم البحث بواسطة لجنة اخلاقيات البحث في كلية الطب بجامعة نوتنغهام في بريطانيا وتم الموافقة عليه من مجلس تقييم الابحاث في هذا المستشفى .

اذا اردت مزيد من المعلومات :
الشخص المسؤول عن هذا البحث هو عاطف الطوافشه تحت اشراف الدكتور نيك الكوك والدكتورة ليندا ايست – جامعة نوتنغهام\ بريطانيا .

الرجاء عدم التردد في الاتصال بي اذا كان لديك اي اسئلة حول البحث.

شاكرا لكم حسن تعاونكم ومساعدتكم.

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المملكة المتحدة

SCQIPP Questionnaire

التعليمات لتعبئة الاستبيان

شكرا على موافقتك لتعبئة الاستبيان.

١. هذا الاستبيان يتكون من جزئين الرجاء الاجابة على **جميع** الاسئلة باتباع التعليمات لكل سؤال.

٢. جميع المعلومات التي ستزودها ستكون سرية للغاية.

٣. بعد تعبئة الاستبيان الرجاء وضعه في **المغلف** المعطى وتسليمه الى الممرض \الممرضة قبل نهاية الدوام.

٤. اذا لديك اية اسئلة الرجاء عدم التردد في الاتصال بي.

شكرا جزيلا لتعاونكم ومساعدتكم

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الاستبيان

فيما يلي عدد من العبارات حول **علاج الم ما بعد العملية الجراحية** . الرجاء وضع اشارة (√) في المربع ١ ـ ٥ الذي يصف رايك حول علاج الالم في هذا القسم في اليوم \ الايام ما **بعد** عمليتك الجراحية .

علما بان : ١ = لا اوافق بشدة
٢ = لا اوافق
٣ = حيادي (لا اوافق \ ولا لا اوافق)
٤ = اوافق
٥ = اوافق بشدة

		١ لا اوافق بشدة	٢ لا اوافق	٣ حيادي (لا اوافق \ ولا لا اوافق)	٤ اوافق	٥ اوافق بشدة
١	قبل العملية لقد تم اخباري عن نوع علاج الالم الذي سيعرض طيً بعد الجراحة.	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٢	بعد العملية الجراحية تحدثت مع الممرض \ الممرضة عن الكيفية التي اريد ان يعالج بها المي.	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٣	تلقيت الدعم او المساعدة من اجل ايجاد وضع مريح في السرير للمساعدة في تجنب الالم .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٤	اعطيت لي الفرصة من الهدوء والامان حتى اتمكن من النوم في الليل .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٥	حتى لو لم اطلب دائما علاج الالم ، لقد اعطيت دواء الالم .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٦	الكادر الصحي سالني عن الالم عند النفس العميق ، الجلوس او عند الحركة .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٧	لتحديد مستوى الالم ، احد الكادر الصحي سالني بان اختار رقم بين ١ – ١٠ (او بوضع علامة على خط مستقيم) على الاقل مره واحده في كل صباح ، بعد الظهر ، وفي المساء .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٨	الممرضين \ الممرضات ساعدوني في علاج الالم الى ان اصبحت راضيا عن مستوى تخفيف الالم .	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥
٩	انا في غرفة لطيفة.	☐ ١	☐ ٢	☐ ٣	☐ ٤	☐ ٥

Patients' Questionnaire
Version 1: 25/04/2011

١٠	كان هناك عدد كافي من الممرضين \ الممرضات على الدوام ، للرد بسرعة على طلبي لتخفيف الالم .	١ ☐	٢ ☐	٣ ☐	٤ ☐	٥ ☐
١١	عندما ياتي الممرضين \ الممرضات على الدوام , يعرفون كل شئ عن مستوى الالم الذي عندي وعن علاج الالم الذي تلقيته .	١ ☐	٢ ☐	٣ ☐	٤ ☐	٥ ☐
١٢	يوجد معلومات لدى الممرضين \ الممرضات عن كيفية تخفيف الالم .	١ ☐	٢ ☐	٣ ☐	٤ ☐	٥ ☐
١٣	الممرضين \ الممرضات يصدقوني عندما اخبرهم عن المي .	١ ☐	٢ ☐	٣ ☐	٤ ☐	٥ ☐
١٤	لقد تعاون الاطباء \ الممرضين \ الممرضات في علاج المي .	١ ☐	٢ ☐	٣ ☐	٤ ☐	٥ ☐

□ الاسئلة التالية تتعلق **بالالم الذي عانيته بعد العملية**. ارجوا وضع **دائرة** حول الرقم الذي يصف رأيك:

١٥ـ ارجوا ان تحدد الالم الذي تعانيه وذلك بوضع **دائرة** على الرقم الذي يصف **اسوء الم عانيته** في ال 24 ساعة الماضية

لا الم ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ ١٠ اسوء الم

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١٦ ـ ارجوا ان تحدد الالم الذي تعانيه وذلك بوضع **دائرة** على الرقم الذي يصف **اقل الم عانيته** في 24 ساعة الماضية

لا الم ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ ١٠ اسوء الم

---

١٧ ـ ـ ارجوا ان تحدد الالم الذي تعانيه وذلك بوضع **دائرة** على الرقم الذي يصف **الالم الذي تعانيه الان**

لا الم ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ ١٠ اسوء الم

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١٨ – هل عانيت من الالم بعد العملية الجراحية اكثر مما كنت تتوقع

☐ نعم ☐ لا

١٩ – بشكل عام , ما هي **درجة الرضى او عدم الرضى** عن مستوى تخفيف **الالم الذي تلقيته بعد العملية** .ضع **دائرة** من :
٠ الى ١٠ حيث ان ٠ تعني عدم الرضا (مستاء جدا) و ١٠ تعني راضي جدا

مستاء جدا ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩ ١٠ راضي جدا
(غير راضي) ----------

Patients' Questionnaire
Version 1: 25/04/2011

Patient Demographic Data

معلومات المريض الشخصية

الرجاء الاجابة على الاسئلة التالية:

١. الاسم:.....

٢. العمر:.....

٣. الجنس: ☐ ذكر ☐ انثى

٤. ما هي العملية التي اجريت لك؟.....

٥. التشخيص؟ .....

٦. كم عدد الايام ما بعد العملية؟.....

٧. ما هي طريقة علاج الالم التي استخدمت بعد العملية؟

☐ التحكم اليدوي للمريض لتسكين الالم

☐ تسكين الالم عن طريق ادوية تعطى في الظهر (ابي ديورال)

☐ تسكين الالم عن طريق ابرة بالعضل

☐ تسكين الالم عن طريق ادوية تؤخذ بالفم

☐ تسكين الالم عن طريق تخدير العصب

٨. ما هي الادوية المسكنة للالم التي تاخذها الان لعلاج الم العمليه الجراحيه؟

.....

.....

٩. من فضلك:

(أ) ما هي الادوية المسكنة للالم التي اخذتها في المنزل قبل العملية ؟

.....

.....

(ب) كم حبة في اليوم.....

شكرا جزيلا لتعاونكم ومساعدتك

The University of Nottingham

School of Nursing, Midwifery and Physiotherapy
B53, B-Floor
Queens Medical Centre
Nottingham
NG7 2UH
United Kingdom

جامعة نوتنغهام
كلية التمريض
الطابق (ب) –غرفه 53
مركز كوينز الطبي
الرمز البريدي :NG7 2UH
المملكة المتحدة

Patient Consent Form

إقرار موافقة المرضى

عنوان البحث : تاثير **فريق علاج الالم** على علاج الم ما بعد الجراحه في الاردن .

اسم الباحث : عاطف الطوافشة – طالب دكتوراة – جامعة نوتنغهام .
المشرفين: الدكتور نيك الكوك – استاذ مشارك – جامعة نوتنغهام
الدكتورة ليندا ايست – استاذ مساعد - جامعة نوتنغهام

الرجاء التوقيع على النموذج.

1- أقر بأنني قد قرأت وفهمت المعلومات المتعلقة بالدراسة المشار إليها أعلاه, مؤرخة (2011/05/22 نسخة - 2)

2- أوافق بان يقوم الباحث بعرض النتائج في المجلات والمؤتمرات العلمية ولكن بدون اسماء.

3- أفهم بان جميع المعلومات التي سيتم جمعها ستحفظ في حاسوب محمي برقم سري وستعامل بسرية تامة. وسيتم الاحتفاظ بالبيانات لمدة 7 سنوات بعد أن يتم نشر نتائج هذه الدراسة.

4- وأفهم بأن لي مطلق الحرية في الانسحاب من الدراسة في أي وقت أشاء دون اعطاء سبب.

5- أوافق على أن يكون هذا الإقرار كمشاركة طوعيه في هذا البحث.

6- أوافق بان يقوم الباحث بالاطلاع على السجلات الطبية الخاصة بي.

اسم المشارك :..... التاريخ :..... التوقيع :.....

اسم الباحث :..... التاريخ :..... التوقيع :.....

في حالة وجود أي استفسار عن الدراسة نرجو الاتصال بالباحث:

عاطف الطوافشة – طالب دكتوراة
atefmmt@yahoo.co.uk
هاتف : 0775935762

شاكرا لكم حسن تعاونكم ومساعدتكم

Clinician Appendices

Appendix 3-7: Clinicians' Demographic Data

Appendix 3-8: Knowledge & Attitude Questionnaire

Appendix 3-9: Clinicians' invitation letter

Appendix 3-10: Clinicians' Information Sheet

Appendix 3-11: Clinicians' Reminder Letter

Appendix 3-12: Interview Guide

Appendix 3-13: Clinicians' Consent Form

Appendix 3-7: Clinicians' Demographic Data

Please answer the following questions

1. Are you: Male □ Female □

2. How old are you (years)? …….

3. What is your current professional role?
□ Staff Nurse
□ Charge Nurse
□ Anaesthetist
□ Surgeon
□ Other/ specify…….

4. What is the highest academic qualification you have?
   □ Diploma □ BSc
   □ MSc □ PhD
   □ MD □ Other/ Please specify ……..

5. What professional qualifications do you have? .....

6. How many years of experience you have since graduation? ……..

7. What area of speciality are you currently working in?
□ Surgical
□ ICU
□ Recovery
□ Other /Please specify……

8. How many years of experience you have in the current position? ……

9. Have you undertaken any pain management courses since qualified?
Yes □ No □
If yes, how long was the course? …….

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Appendix 3-8: Knowledge and Attitude Survey Regarding Pain (Clinicians' questionnaire)

Instructions for completing the questionnaire

Thank you for agreeing to fill in this questionnaire.

1. The questionnaire includes two parts. Please try to answer **all** the questions following the instructions for each section.

2. All the information that you provide is completely confidential.

3. Once completed, please return questionnaire in the **envelope** provided to the **research nurse**, or put it the **study's secured box** in your ward.

4. If you have any questions, please do not hesitate to contact me.

Thank you very much for your cooperation and assistance

Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
Tel: 00962 775935762

Knowledge and Attitude Survey Regarding Pain
True/False – Please circle the correct answer.

T F 1. Vital signs are always reliable indicators of the intensity of a patient's pain

T F 2. Patients who can be distracted from pain usually do not have severe pain

T F 3. Patients may sleep in spite of severe pain.

T F 4. Non-steroidal and anti-inflammatory agents (e.g Ibuprofen (Brofen)) are NOT effective analgesics for painful orthopaedic surgery.

T F 5. Respiratory depression rarely occurs in patients who have been receiving stable doses of opioids over a period of months.

T F 6. Combining analgesics that work by different mechanisms (e.g. combining an opioid with an NSAID) may result in better pain control with fewer side effects than using a single analgesic agent.

T F 7. The usual duration of analgesia of 1-2mg morphine IV is 4-5 hours.

T F 8. Opioids should not be used in patients with a history of substance abuse.

T F 9. Morphine has a dose ceiling (i.e. a dose above which no greater pain relief can be obtained)

T F 10. Elderly patients cannot tolerate opioids for pain relief.

T F 11. Patients should be encouraged to endure as much pain as possible before using an opioid.

T F 12. Patients' spiritual beliefs may lead them to think pain and suffering are necessary

T F 13. After an initial dose of opioid analgesic is given, subsequent doses should be adjusted I accordance with the individual patient's response.

T F 14. Giving patients sterile water by injection (placebo) is a useful test to determine if the pain is real.

T F 15. If the source of the patient's pain is unknown, opioids should not be used during the pain evaluation period, as this could mask the ability to correctly diagnose the cause of pain.

T F 16. Anticonvulsant drug such as Gabapentin (Neurontin) produce optimal pain relief after a single dose

T F 17. Benzodiazepines are not effective pain relievers unless the pain is due to muscle spasm.

T F 18. Narcotic/opioid addiction is defined as a chronic neurobiologic disease, characterised by behaviours that include one or more of the following; impaired control over drug use, compulsive use, continued use despite harm, and craving.

Multiple Choice- Please circle the correct answer

19. The recommended route administration of opioid analgesic for patients with brief, severe pain of sudden onset such as trauma or post-operative pain is:

_____ a. intravenous
_____ b. intramuscular
_____ c. subcutaneous
_____ d. oral
_____ e. rectal

20. Which of the following analgesic medications is considered the drug of choice for the treatment of moderate to severe pain after surgery?

_____ a. codeine
_____ b. morphine
_____ c meperidine (Pethidine)
_____ d. tramadol

21. Which of the following IV doses of morphine administered over a 4 hour period would be equivalent to 30mg of oral morphine given every 4 hours?

_____ a. Morphine 5mg IV
_____ b. Morphine 10mg IV
_____ c. Morphine 30mg IV
_____ d. Morphine 60mg IV

22. Analgesics for post-operative pain should initially be given

_____ a. around the clock on a fixed schedule
_____ b. only when the patient asks for the medication
_____ c. only when the nurse determines that the patient has moderate or greater discomfort

23. A patient with persistent pain has been receiving daily opioid analgesics for 2 months. Yesterday the patient was receiving morphine 200mg/hour intravenously. Today he has been receiving 250mg/hour intravenously. The likelihood of the patient developing clinically significant respiratory depression in the absence of new comorbidity is:

_____ a. less than 1%
_____ b. 1-10%
_____ c. 11-20%
_____ d. 21-40%
_____ e. > 41%

24. The most likely reason a patients with pain would request increased doses of pain medication is:

_____ a. the patient is experiencing increased pain
_____ b. the patient is experiencing increased anxiety or depression
_____ c. the patient is requesting more staff attention
_____ d. the patient's requests are related to addiction

25. The most accurate judge of the intensity of the patient's pain is:
_____ a. the treating physician
_____ b. the patient's primary nurse
_____ c. the patient
_____ d. the pharmacist
_____ e. the patient's spouse or family

26. Which of the following describes the best approach for cultural considerations in caring for patients in pain:
_____ a. There are no longer cultural influences in Jordan due to the diversity of the population
_____ b. Cultural influences can be determined by an individual's ethnicity (e.g., Asians are stoic, Italians are expressive, etc).
_____ c. Patients should be individually assessed to determine cultural influences
_____ d. Cultural influences can be determined by an individual's socioeconomic status

27. The time to peak effect for morphine given IV is:
_____ a. 15 min
_____ b. 45 min
_____ c. 1 hour
_____ d. 2 hours

28. The time to peak effect for morphine given orally is:
_____ a. 5 min
_____ b. 30 min
_____ c. 1-2 hours
_____ d. 3 hours

29. Following abrupt discontinuation of an opioid, physical dependence is manifested by the following:
_____ a. Sweating, yawning, diarrhoea and agitation with patients when the opioid is abruptly discontinued
_____ b. Impaired control over drug use, compulsive use and craving
_____ c. The need for higher doses to achieve the same effect
_____ d. a and b

Case Studies:
Two patient case studies are presented. For each patient you are asked to make decisions about pain and medication.

Directions: Please select **one answer** for each question

30. **Patient A:** Andrew is 25 years old and this is his first day following abdominal surgery. As you enter his room; he smiles at you and continues talking and joking with his visitor. Your assessment reveals the following information: BP = 120/80, HR = 80, R – 18, on a scale of 0 to 10 (0 = no pain discomfort, 10 – worst pain/discomfort) he rates his pain as 8.

A. On the patient's record you must mark his pain on the scale below. Circle the number that represents your assessment of Andrew's pain.

0 1 2 3 4 5 6 7 8 9 10

No pain/discomfort Worst pain/discomfort

B. Your assessment, above, is made two hours after he received morphine 2mg IV. Half hourly ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3mg qlh PRN pain relief". Check the action you will take at this time.

_____ 1. Administer no morphine at this time
_____ 2. Administer morphine 1mg IV now
_____ 3. Administer morphine 2mg IV now
_____ 4. Administer morphine 3mg IV now

31. **Patient B:** Robert is 25 years old and this is his first day following abdominal surgery. As you enter the room, he is lying quietly in bed and grimaces as he turns in bed. Your assessment reveals the following information: BP = 120/80, HR = 80, R – 18, on a scale of 0 to 10 (0 = no pain discomfort, 10 – worst pain/discomfort) he rates his pain as 8.

A. On the patient's record you must mark his pain on the scale below. Circle the number that represents your assessment of Robert's pain.

0 1 2 3 4 5 6 7 8 9 10

No pain/discomfort Worst pain/discomfort

B. Your assessment, above, is made two hours after he received morphine 2mg IV. Half hourly ratings following the injection ranged from 6 to 8 and he had no clinically significant respiratory depression, sedation, or other untoward side effects. He has identified 2/10 as an acceptable level of pain relief. His physician's order for analgesia is "morphine IV 1-3mg qlh PRN pain relief". Check the action you will take at this time.

_____ 1. Administer no morphine at this time
_____ 2. Administer morphine 1mg IV now
_____ 3. Administer morphine 2mg IV now
_____ 4. Administer morphine 3mg IV now

32. If you would like to participate in an interview please answer the interview section below and put it in the study's secure box in your ward:

Interview section:

Please tear here
……..

Interview section:

Thank you very much for your willingness to participate in this study.

Please tick the appropriate box:
□ Yes, I'm willing to participate in an interview.
□ Atef, Please contact me to arrange an interview at a time and place of my convenience.
□ I will contact you to arrange an interview at a time and place of my convenience.

Please answer the following questions

1. What is your current professional role: …….
2. Have you undertaken any pain management courses: Yes □ No □

If yes, how long……..

3. How many years of experience you have in the current position?……

Name: ……..

Telephone No: ……

Address: …….

Email: ……

Signature: ……...

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Appendix 3-9: Clinicians' Invitation Letter

Dear Doctor/ Nurse

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

I am currently a PhD student at the University of Nottingham. I am conducting a study as part of my doctoral studies. The study is designed to compare two hospitals, one of which has established an Acute Pain Team and one of which has not. Staff from two hospitals have been recruited.

I am writing to invite you to take part in this study. Your participation in the study is completely voluntary. All the information which is collected about you during the study will be kept strictly confidential. Any information about you will have your name removed so that you cannot be recognised from it. Please be assured that your answers will only be accessed by myself and my supervisors.

There are two parts to this research. The aim of the first part of the study is to assess the influence of the Acute Pain Team on the knowledge and attitudes of clinicians about pain management. If you wish to participate in this part of the study, please complete the attached questionnaire as soon as possible. Once completed, please return the questionnaire in the envelope provided to the research nurse, or put it the study's secured box in your ward. By completing and returning the questionnaire you are consenting to take part in the study.

The aim of the second part of the study is to explore your views and perceptions regarding Acute Pain Teams and the current practice of postoperative pain management. If you are willing to participate in an interview, please indicate at the end of the questionnaire.

Please do not hesitate to contact me should you have any questions about the research study.

Thank you very much for your time and considering taking part in this research.

Yours faithfully

Atef Al-Tawafsheh, MSc, BSc, RN
PhD student
atefmmt@yahoo.co.uk
Tel: 00962 775935762

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Appendix 3-10: Clinicians' Information Sheet

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Name of Investigator: Atef Al-Tawafsheh, PhD student, University of Nottingham

Supervisors: Dr. Nick Allcock: Associate Professor, University of Nottingham
Dr. Linda East: Lecturer, University of Nottingham

You have been invited to take part in a research study. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends and relatives if you wish to. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?
I am currently a PhD student at the University of Nottingham. I am conducting a study as part of my doctoral studies. The study is designed to compare two hospitals, one of which has established an Acute Pain Team and one of which has not. Staff from two hospitals have been recruited. The aim of this study is to gain a clear understanding of the impact an Acute Pain Team on the quality of postoperative pain management in Jordan. There has been little research that has explored the influence of Acute Pain Team on the knowledge and attitudes of clinicians regarding pain management. The views and perceptions of clinicians about Acute Pain Teams and the current practice of postoperative pain management has also not been widely studied. The information provided by this study will be used to improve pain management in the hospital, and to improve the quality of services for staff and patients.

Why have I been chosen?
You have been chosen as you are a registered nurse or a junior doctor working in this hospital. All Registered nurses/ junior surgeons and anaesthetists with a minimum experience of 6 months in surgical, recovery or ICU wards are eligible to participate in this research. It is expected that the study will last about 3-4 months until a total of 100 staff have been returned the questionnaire and a total of 22 staff have been interviewed.

Do I have to take part?
It is up to you to decide whether or not to take part. If you decide to take part you are still free to withdraw at any time and without giving a reason. By completing and returning the questionnaire you are consenting to take part in the study.

What does the study involve?

If you agree to participate, you will be asked to complete a questionnaire. The questionnaire will take 15-20 minutes to complete. If you do decide to participate in the second part of the study you will take part in one interview with Atef Al-Tawafsheh. The interview will last 45-60 minutes. The interview will be audio-recorded with your permission where you will be asked to sign a consent form. It is anticipated that the study will last about 3-4 months.

What do I have to do?
If you wish to participate in the first part of the study, please complete the attached questionnaire as soon as possible. Once completed, please return questionnaire in the envelope provided to the research nurse, or put it the study's secured box in your ward. If you wish to participate in the second part of the study (interview), please contact me to arrange an interview or complete the interview section in the invitation letter, tear it and put it in the study's secured box for me to contact you to arrange an interview.

What are the possible disadvantages and risks of taking part?
The questionnaire will take 15-20 minutes from your time to complete. An interview will take 45-60 minutes from your time.

What if something goes wrong?
In case you have a complaint about any aspect of the study, you can initially approach the lead investigator Atef Al-Tawafsheh at the address below. If you are not satisfied by this, you should then contact your local Institutional Review Board (Hospital-A; Ms Xxx Ext. xxx), and for Hospital-B vice director for administrative affairs Ext. xxx. Alternatively, you can contact the matron for further advice.

Will my taking part in this study be kept confidential?
All information which is collected about you during the study will be kept on a password protected database and is strictly confidential. Any information about you which leaves the hospital will have your name removed so that you cannot be recognised from it. A participant ID will be assigned to all who wish to participate. Data will only be accessed by myself and my supervisors.

What will happen to the results of the research study?
The study is being conducted as part of a PhD in nursing studies. The results of the study will be included in the final report of a PhD thesis. The results may also be published in a scientific journal or conferences but you will not be identified in any report/publication. A summary of the research findings will also be available to all participants if they wish. Direct quotations from the interview transcripts may be used when the study is published. These will be anonymised before publication.

Who is organising and funding the research?
The research is being carried out as part of PhD course and is self-funded. However, I have received financial help from the University College Hospital.

Who has reviewed the study?
This study has been reviewed by the University of Nottingham Medical School Ethics Committee and approved by the ethics committee at your hospital.

Contact for Further Information

The main person responsible for this study is Atef Al-Tawafsheh, under the supervision of Dr. Nick Allcock and Dr. Linda East (University of Nottingham-UK).

Please do not hesitate to contact me should you have any questions about the research study.

Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
Tel: 00962 775935762

Thank you very much for taking the time to read this information sheet.

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Appendix 3-11: Clinicians' Reminder Letter

Dear Doctor/ Nurse

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Recently I sent you a questionnaire which was part of a research looking at the influence of Acute Pain Team on the knowledge and attitudes of clinicians about pain management. Many staff have already completed and returned this questionnaire, and if you have done so, please accept my sincere thanks.

If you have not returned your questionnaire, I am inviting you again to participate because of the importance that your questionnaire has for helping to get accurate results. Your participation is completely voluntary. All information which is collected about you during the study will be kept strictly confidential. I would like to reassure you that your answers will only be accessed by myself and my supervisors.

I have enclosed another questionnaire in case you have misplaced the original. If you wish to participate, please complete the questionnaire as soon as possible. Once completed, please return questionnaire in the envelope provided to the research nurse, or put it the study's secured box in your ward.

Please do not hesitate to contact me should you have any questions about the research study.

Thank you very much for your time and considering taking part in this research.

Yours faithfully

Atef Al-Tawafsheh, RN BSc MSc
PhD student
atefmmt@yahoo.co.uk
Tel: 00962 775935762

School of Nursing, Midwifery and Physiotherapy
B53, B-Floor
Queens Medical Centre
Nottingham
NG7 2UH
United Kingdom

Appendix 3-12: Interview guide

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Thank you very much for agreeing to participate in this study. My name is Atef Al-Tawafsheh. I am a PhD student at the University of Nottingham-UK. The aim of this interview is to explore your views and perceptions regarding the current practice of postoperative pain management and the Acute Pain Team (for Hospital-A).

Just to remind you that all information you share with me will be kept strictly confidential and anonymous. The interview will be audio-recorded with your permission and last 45-60 minutes. Consent form will be signed.

Personal experience

1. What is your current professional role in this hospital?
2. How long have you held this position?
3. Please can you tell me about your experience in postoperative pain management?
4. Do you feel adequately prepared to manage postoperative pain? How?
5. How do you feel about caring for patients with postoperative pain?

Organisation

6. How do you see the postoperative pain management in your hospital?
    - Why? Examples
7. How do you think the organisation see the postoperative pain management?

Prompts:

- Relative importance of pain management in the hospital
- Current and future prospect on pain management: audit, research?
- Support from administration

8. What do you think of the facilitators/ challenges to postoperative pain

management in this hospital?

Prompts: structure, attitudes, resources?

9. Is there any education or training about pain management available for staff, if so, is it adequate? How frequent? By whom?
10. Can you tell me what methods of pain management do you use in this hospital?
    - What observations do you monitor and by whom?
    - Do you think it is safe to deliver this technique in the wards? What makes it safe?
11. What do you think of PCA, epidural, IM or oral analgesia for postoperative pain management?
12. How do you assess pain after surgery?
13. Can you think of some examples of when it has been hard to manage postoperative pain for some patients?
14. How did you manage this group of patients?

Prompts: Advice/help from APS, Surgeons, Anaesthetists, senior nurses?

15. How do you think the APS/ postoperative pain management could be improved?

Acute Pain Team (APT) -Hospital-A

16. Can you think of some examples of when you have been able to use the Acute Pain Service? Please can you tell me about this experience?

Prompts:

- How well does the APT manage patient's pain?
- How well does the APT respond to your request?
- How involved were patients in their care decisions?

17. How do you think the APT communicates with staff in the hospital?
18. How convenient is the timing of the APT rounds? Availability of APT? Why?
19. Do you think the development of APT changed your role in pain management? How?
20. What do you think the role of APT? Advantages/ disadvantages?
21. Please can you tell me how satisfied/ dissatisfied you are with the APT?

Factors contribute to this?

History and development of APT

22. Please can you tell me about the pain management in this hospital before the development of the APT?
23. What factors led to the development of APT?
24. What resources were required to implant the APT?
25. What challenges were encountered during the initiation of the APT? How resolved?
26. Please can you tell me about the nature and activities of the APT, why this model?

Thank you very much for your cooperation and assistance.

Please do not hesitate to contact me should you have any questions about this study.

General probes:

- Can you give an example of …?
- Could you tell me a bit more about ……..?
- What do you mean by……..?
- How did that make you feel?
- What could have been done differently?

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Participant ID Number: ……

Appendix 3-13: Clinicians' Consent Form

Title of Project: The influence of an Acute Pain Team on postoperative pain management in Jordan.

Name of researcher: Atef Al-Tawafsheh, PhD student-Nursing studies
Supervisors: Dr. Nick Allcock and Dr. Linda East

Before the interview commences, please read this form and sign it indicating that I have explained fully the aims and terms of the interview to you, and you are consenting to be interviewed. The interview will be audio-recorded and transcribed verbatim.

Please Initial the Boxes

☐ I confirm that I have been given a full explanation by the researcher and that I have read and understand the information sheet dated (22/05/2011 version-2) for the above study.

☐ I have been given the opportunity to ask questions and discuss the study with the above investigator and have understood the advice and information given as a result.

☐ I authorise the investigators to disclose the results of my participation in the study but it will be made anonymous.

☐ I understand that information about me recorded during the study will be kept in a secure database. Data will be kept for 7 years after the results of this study have been published.

☐ I understand that I am free to withdraw from the study at any time, without having to give a reason for withdrawing.

☐ I voluntarily agree to take part in this study.

Name of participant: ……Date: …… Signature: …

Name of researcher: ……Date: …… Signature: …

Name and contact of researcher:
Atef Al-Tawafsheh
atefmmt@yahoo.co.uk
Tel: 00962 775935762

Research Ethics Committee Appendices

Appendix 3-14: Ethical Approval- University of Nottingham

Appendix 3-15: Ethical Approval- Hospital-A

Appendix 3-16: Ethical Approval- Hospital-B

Appendix 3-14: Ethical Approval- University of Nottingham

Direct line/e-mail
+44 (0) 115 8231063
Louise.Sabir@nottingham.ac.uk

The University of Nottingham

Faculty of Medicine and Health Sciences

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4th July 2011

Atef Al-Tawafsheh
c/o Dr Nick Allcock
Associate Professor
School of Nursing Midwifery and Physotherapy
B Floor, South Block Link
QMC Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

Dear Atef

Ethics Reference No: E 05 2011 - *Please quote this number on all correspondence*
Study Title: The influence of an Acute Pain Team on postoperative pain management in Jordan: a comparative case study.
Lead Investigator: Dr Nick Allcock, Associate Professor
Co Investigators: Dr Linda East, Lecturer, School of Nursing Midwifery and Physiotherapy,Atef Al-Tawafsheh, PhD Student, School of Nursing Midwifery and Physiotherapy.

Thank you for your letter dated 20th June 2011 responding to the issues raised by the Committee and enclosing the following revised documents:

- Application form dated 14/6/2011
- Research Proposal April 2011
- Appendix 1 Patient's Demographic Data version 2:22/05/2011
- Appendix 2: Patient's Questionnaire version 1: 25/04/2011
- SCQIPP Questionnaire version 1 25/04/2011
- Appendix 3 patient's Invation letter Version 2 22/05/2011
- Appendix 4 Patients Information sheet version 2 22/05/2011
- Appendix 5 Patients Consent Form version 1:22/05/2011
- Appendix 6 Clinicians Demographic Data version 2 22/05/2011
- Appendix 7 Knowledge & Attitude Questionnaire version 2 22/05/2011
- Appendix 8 Clinicians invitation letter version 1 25/04/2011
- Appendix 9 Clinicians Information Sheet version 2 22/05/2011
- Appendix 10 Clinicians reminder letter version 1 25/04/2011
- Appendix 11 Interview Guide version 1: 25/04/2011
- Appendix 12 Clinicians Consent Form version 2 22/05/2011
- Knowledge and Attitude Survey Regarding pain revised version 1 25/04/2011

In addition a letter dated 28th June 2011 was received enclosing the approval letters from Jordan as follows:

- [redacted] Center Institutional Review Board approval letter dated 26/June/2011
- [redacted] Hospital Executive Committee approval letter dated 19/6/2011

These have been reviewed and are satisfactory and the study is approved.

Approval is given on the understanding that the Conditions of Approval set out below are followed.

Conditions of Approval

You must follow the protocol agreed and any changes to the protocol will require prior Ethic's Committee approval.

This study is approved for the period of active recruitment requested. The Committee also provides a further 5 year approval for any necessary work to be performed on the study which may arise in the process of publication and peer review.

You promptly inform the Chairman of the Ethic's Committee of

(i) Deviations from or changes to the protocol which are made to eliminate immediate hazards to the research subjects.

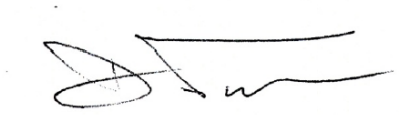
(ii) Any changes that increase the risk to subjects and/or affect significantly the conduct of the research.

(iii) All adverse drug reactions that are both serious and unexpected.

(iv) New information that may affect adversely the safety of the subjects or the conduct of the study.

(v) The attached End of Project Progress Report is completed and returned when the study has finished.

Yours sincerely



Dr David Turner
Acting Chair, Nottingham University Medical School Research Ethics Committee

Appendix 3-15: Ethical Approval- Hospital-A

[redacted] | [redacted] | [redacted]

Institutional Review Board | اللجنة المؤسسية

Date: 26/June/2011

Dear Mr. Atef Al-Tawafsheh and Ms. [redacted]

In reference to the proposal entitled: "The influence of an Acute Pain Team on postoperative pain management in Jordan: A comparative case study" (Proposal #: [redacted]).

You are kindly informed that the IRB has reviewed and approved the following documents:

1. IRB Proposal Submission FORM B
2. English Research Proposal
3. Arabic Patients' Invitation Letter
4. Arabic Patients' Information Sheet
5. Arabic Patients' Consent Form
6. Arabic Patients' Demographic Data Sheet
7. Arabic Patients' SCQIPP Questionnaire
8. English Clinicians' Invitation Letter
9. English Clinicians' Information Sheet
10. English Clinicians' Consent Form
11. English Clinicians' Demographic Data Sheet
12. English Clinicians' "Knowledge and Attitude Survey Regarding Pain" Questionnaire
13. English Clinicians' Reminder Letter
14. English Interview Guide

Kindly Note, that this proposal was expedited from full IRB review

Kindly note that if the study will extend beyond one year you have to submit a renewal form and an interim update on the study. At the end of the study, you are requested to submit end of study report to IRB.

Please inform the IRB office of any publications/ abstracts that may result from this research.

On behalf of all members of [redacted] IRB, I would like to wish you a very successful study.

Dr. [redacted]
Regular Member, Institutional Review Board
[redacted]

[redacted]
IRB Approval Date
26 JUN 2011
IRB Approval Expiration
26/06/2012

Date: 26/June/2011

The IRB consists of members of medical and non medical background including public, lawyers, nurses and pharmacists. It is the policy of the IRB to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the IRB considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the IRB may request the principal investigator to provide an outcomes report, including information on follow up of participants.
[redacted]-IRB is compliant with GCP Guidelines.

Appendix 3-16: Ethical Approval- Hospital-B

[redacted] [redacted] [redacted] مستشفى
[redacted] Hospital

Ref. 10/2011 / 1981
Date: 19 /6/2011

الرقم: _____
التاريخ: _____

Mr. Atef Al. Tawafsheh,

The Executive Committee in its meeting no. (20/2011) dated (7/6/2011) discussed your request to undergo a research titled :

"The influence of an acute pain team on postoperative pain management in Jordan"

The committee decided the **approval** of doing the above titled research, that will be supervised by Dr. [redacted]

With best regards,

Sincerely Yours,

General Director / [redacted] Hospital

Prof. Dr. [redacted]

AA

تلفون [redacted] - فاكس [redacted] - صندوق بريد [redacted] - [redacted] - الأردن
Tel. [redacted] Fax [redacted] - P.O.Box [redacted] - [redacted] - Jordan