

# The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings: A Comprehensive Systematic Review

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# Abstract

## Background

There is commonality amongst the definition and characteristics of Nurse Practitioner (NP)/Advanced Practice Nurse (APN) role and practice internationally in terms of education, practice standards and regulation; operationally there is variability. The NP role has been implemented internationally; at least 70 countries are considering some form of APN role.<sup>ICN/APN network 2012 cited in</sup>(1) NPs provide advanced clinical care and were implemented as part of health service reform to improve access and timeliness of healthcare.<sup>(2)</sup> Whilst much has been written on advanced practice nursing roles per se, there has been little focus specifically on the orthopaedic nursing context. This review will focus on orthopaedic nurse practitioners (ONP) in an international context.

## Objective

To appraise and synthesise the best available evidence on the experience and effectiveness of the role and practice of ONPs.

## Inclusion Criteria

### Types of Participants

ONP/APN in acute care or sub-acute orthopaedic settings.

### Types of Interventions

Interventions of ONP specific care.

### Phenomena of Interest

The experience of becoming or being an ONP in relation to role development, role implementation and (ongoing) role evaluation.

### Types of Studies

This comprehensive systematic review looked at both quantitative and qualitative studies together with narrative text and opinion papers. Quantitative study designs included in this review included observational cohort/case control studies and descriptive case report/series. Phenomenology was the qualitative study design included. Mixed method studies were also included in this review.



## Types of Publications

The textual component of this review considered publications of expert opinion, discussion papers, position papers and other relevant text where there existed a particular focus on the 'orthopaedic' aspect of NP practice.

## Types of Outcomes

A range of outcome measures were included but were not limited to primary patient outcomes: occasions of service/numbers seen, length of stay (LOS), wait times, patient satisfaction, readmission, and other patient encounter data or relevant nurse-sensitive outcome data that characterised ONP practice. Secondary and related outcomes data relative to process indicators/outcomes such as: NP satisfaction, key stakeholder (other health professional) satisfaction, knowledge, LOS, cost benefit were considered.

## Search Strategy

Both published and unpublished English language studies were considered from individual database inception and searched up to December 2012. The search was repeated in early 2013 to ensure no recent papers had been published. A three step search strategy was employed for each component of this review.

## Methodological Quality

All retrieved studies and opinion papers were assessed by two independent reviewers using the standardised Joanna Briggs Institute critical appraisal tools. Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

## Data Collection

Quantitative data was extracted using the JBI-MAStARI tool. The data extracted included details about the interventions, populations, study methods and outcomes of significance to the review question.

Qualitative data was extracted using the JBI-QARI tool. The data extracted included details about the methodology, method, phenomena of interest, participants, data analysis and relevant findings.

Textual data was extracted using JBI-NOTARI tool. The data extracted included the type of text,

stated allegiance or position, setting, geographical and cultural influences and messages and conclusions located within the publication.

## Data Analysis/Synthesis

Quantitative data was analysed using JBI-MAStARI. Meta-analysis of the quantitative data was not possible due to a lack of clinical and statistical heterogeneity; findings were presented in narrative format including tables to aid in data representation.

As only one qualitative study was included, meta-synthesis by meta-aggregation was not possible.

Textual data were synthesised using the Joanna Briggs Institute approach of aggregation using JBI-NOTARI.

## Results

A total 31 studies and publications were included in the review.

Nineteen quantitative studies were included, 10 comparable cohort and 9 descriptive studies. Seven broad review outcomes measures were identified: Three of which were patient related (*primary*) outcomes and three nurse related (*secondary*) outcomes. Three sub category patient-related outcomes focussed on (1) specialist care interventions, (2) patient satisfaction/acceptance, (3) wait times and access to care. Another four sub category nurse-related or process-related review outcomes focussed on (4) education, (5) length of stay, (6) other cost-related issues and (7) barriers.

One unpublished qualitative thesis discussed four themes: (1) having knowledge, (2) being in and outside the role, (3) being an advocate and (4) being in control with decision making & anticipation as sub themes. The author concluded that advanced practice is a continuum.

Eleven text and opinion publications were included where 39 conclusions were identified. From these conclusions eight categories emerged and three synthesised findings. The synthesised findings related to 'Duality', 'Role & Relationships' at a personal, organisational and professional level with an emphasis on collaboration, and 'Moving Forward' with an emphasis on resources needed to support the NP in this.

## Conclusions

The findings of this comprehensive review demonstrate the experience and effectiveness of NPs in orthopaedic settings is influenced by multiple factors from within and external to the individual. Overall the results derived from quantitative evidence indicated that NPs in orthopaedic settings provide comparable care when compared to conventional methods of health care delivery. However the results showed better outcomes in specific units where care is led by Clinical Nurse Specialists, NP management of distal radius fracture, and NP screening for developmental hip dysplasia. Decreased length of stay, improved patient wait times & access and patient satisfaction were demonstrated across the evidence, generally. Caution is required however when interpreting the results due to the lower quality of study designs.

The qualitative and textual evidence demonstrated that the role of the ONP is multidimensional with confidence, knowledge and experience as essential elements to deal with complex and challenging situations. The experience of becoming or being an ONP is relational and collaborative at a personal, organisational and professional level. A 'duality' of purpose for ONP's emerged from the textual evidence with interplay between benefits and barriers to ONP practice. Barriers as an outcome emerged from both quantitative and textual evidence. The experience of ONP is characterised by moving forward along a continuum – where the continuum represents the entire journey/career/professional life of the NP. From the comprehensive evidence on the effectiveness and experience of NPs in orthopaedic settings this review identified four 'shared findings' across the evidence base: Acceptance, Collaboration, Education/Knowledge/Experience, Duality.

**Keywords** Orthopaedic nurse practitioner, advanced practice nurse, extended practice, expert nurse, systematic review, effectiveness, experience

## Student Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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# Chapter 1: Introduction

## 1.1 Introduction

This introductory chapter will locate the systematic review within the broad field of study and provide an overview of the methodological underpinnings to this comprehensive systematic review. The introductory chapter explains the structure of the thesis, the context to the review and provides background information about the topic. The systematic review question is presented and key terms listed.

## 1.2 Structure

The thesis consists of four chapters. The first chapter situates the review, presents an 'overview' of the topic and explains the structure of the thesis. Chapters two and three represent the publications: Chapter two comprises a copy of the approved and published protocol within the Joanna Briggs Institute (JBI) library and chapter three comprises the comprehensive systematic review submitted for publication in the Joanna Briggs Institute library. It presents a description of studies along with the results and findings from the review. Both publications are written as per the standards of the journal and presented as standalone publications within this thesis. Chapter four culminates the thesis of work with a discussion of the results and findings from the review with particular reference to implications for practice and ongoing research in the field, and proffers a final conclusion.

## 1.3 Study Aims & Objectives

The purpose of the systematic review was to investigate the impact of orthopaedic nurse practitioners (ONP). The systematic review question addressed "What is the experience and effectiveness of nurse practitioners (NPs) in orthopaedic settings"? Given that the experience and effectiveness of NP's in orthopaedic settings is thought to be similar for NPs in other settings.

The objective of the quantitative component of this review was to synthesise the best available evidence on effectiveness of ONP specific care on patient outcomes and process indicators.

The objective of the qualitative component of this review was to synthesise the best available evidence on the experience of becoming or being an ONP in relation to role development, role implementation and (ongoing) role evaluation.

The objective of the text and opinion component of this review was to synthesise the best available evidence of the contemporary discourse on the effectiveness and experience of NPs in orthopaedic settings.

Further this thesis aims to determine whether the experience and effectiveness of ONP is similar to other advanced practice nurses.

## 1.4 PICO

The PICO is integral in developing a systematic review question. The mnemonic comprises essential elements relevant to the review process: Population being investigated, Intervention of interest, Comparator, and Outcomes of interest to the review. For qualitative reviews the PICO mnemonic covers aspects of Population, the phenomena of Interest, and Context.<sup>(3)</sup> Given this review took a comprehensive approach to reviewing the evidence around the impact of the NP role in orthopaedic settings, aspects of both PICO approaches are presented below.

### 1.4.1 Population/Types of Participants

ONPs, however named, in acute care or sub-acute orthopaedic settings. Given the variability of nomenclature used internationally to describe these roles, the International Council of Nurses (ICN) definition of a NP/APN<sup>(4)</sup> was applied to identifying the population for this review. Nurses practising at this advanced level are further defined by the context in which they practise. This may differ according to their clinical context or country. Thus for the purposes of this review the author designed a Checklist for Critical Appraisal (Appendix 1) as a precursor to the critical appraisal process. It was important to clearly identify not only the population/participants but their practice setting as well. Participants extended to the patients that received ONP care.

### 1.4.2 Types of Interventions/Phenomena of Interest

This review looked at Interventions of ONP specific care and the Phenomenon of Interest was the experience of becoming or being an ONP in relation to role development, role implementation and (ongoing) role evaluation.

Further this review was interested in the opinions on both effectiveness and experience of NPs in orthopaedic settings in relation to the impact of the role.

### 1.4.3 Comparator

From the outset of this review ‘doctor substitution’ or care provided by a nurse other than a NP was considered to be a natural comparator to ONP specific care. The United States in particular uses the term “mid-level provider” to describe a non-physician clinician<sup>(5)</sup> or health professional providing health services to the same patients. The most common of these were “physician assistants” (PA): a healthcare professional that practices medicine within a medical model of care. PAs are not nurses. The role in the United States is nationally certified and state licensed. The physician assistant often practices under the supervision of a doctor.<sup>(6)</sup> It is a term recognisable within the global literature. Other roles revealed through the literature search included but were not limited to physiotherapists/extended scope practitioner, ‘other’ nursing role or advanced practice nurse role; usual, routine care or no care.

### 1.4.4 Outcomes of Interest/Types of Outcomes

A range of outcome measures that emanated from the papers reviewed including but were not limited to primary patient outcomes: occasions of service, clinical accuracy, wait times, patient satisfaction, readmission, and other patient encounter data or relevant nurse-sensitive outcome data that characterised ONP practice. Secondary and related outcomes data relative to process indicators/outcomes such as: NP satisfaction, knowledge, key stakeholder (health professional) satisfaction, barriers to practice, length of stay (LOS), cost benefit were considered.

## 1.5 Context of the review: extant literature

This study will consider the impact of the ONP advanced practice by identifying the best available evidence related to the advanced practice of ONPs. The following papers provide context, begin to pose questions relevant to this thesis of work on the impact of ONPs and suggest a possible future direction.

A search of the Joanna Briggs Institute (JBI) Library of Systematic Reviews, Cochrane Library, PubMed and CINAHL showed there were no existing or systematic reviews underway on this topic relevant to orthopaedic nursing. The JBI undertook a systematic review commissioned by the Department of Health South Australia on Advanced Practice in Nursing and Midwifery and recommended a framework for advanced practice in a report released in early 2008.<sup>(7)</sup> The framework defined advanced practice, levels of advanced practice, scope of practice, credentialing, education, preparation and regulation of advanced practitioners. Additionally this search identified a published systematic review protocol, now report, in the JBI Library of a qualitative systematic

review by Ramis looking broadly at the experience of advanced practice nurses working in acute settings.<sup>(8)</sup> The JBI Library of Systematic Reviews also contains a systematic review examining the effectiveness of NPs in residential aged care.<sup>(9)</sup> Whilst these publications provide valuable context to this review neither specifically examined the clinical practice of ONPs. Little is known about the specialist skills of orthopaedic nurses and the difference they make to patient outcomes. There is, therefore, a need to differentiate what is expected from the different levels of qualified practitioners in orthopaedics.<sup>(10)</sup>

A search of the Cochrane Library revealed a review on the topic of substitution of doctors by nurses in primary care.<sup>(11)</sup> The focus of this particular intervention review was neither specific to NPs nor the acute care setting, but the topic of 'doctor substitution' complements the practice of NPs and as a consideration in the systematic review as a comparator and becomes important to the context of the thesis as NP care continues to be compared to doctor care in the research despite the philosophical and "qualitative" differences in values, knowledge, theories and practice inherent in NP provision of services.<sup>(12)</sup> The review on doctor substitution in primary care showed low to moderate quality evidence that NPs provide equivalent care, with better patient satisfaction and quality of care in the primary care setting.<sup>(13)</sup> 'Usual care' may comprise NP care previously delivered by a doctor, sometimes referred to as 'doctor substitution' or care provided by a nurse other than an ONP, and forms a natural comparator when examining the role and practice of ONPs.

Whilst the search took place several relevant papers emerged to add context to the thesis. The first was an economic examination of the value and potential of NPs in Australia, commissioned by the Australian College of Nurse Practitioners.<sup>(14)</sup> The authors of the paper concluded that NPs provide an essential service that positively impact patient care across settings particularly in terms of wait times, LOS, patient satisfaction, hospital avoidance and hospital productivity. Despite this, the author's claim, NPs are not being used to their best effect, duplication of services and barriers - such as MBS entitlement that relates to billing in Australia, still exist. The authors also highlighted that collaboration with other health professionals is key to successful NP service delivery models but this remains in its infancy in Australia.<sup>(14)(p4-5)</sup>

The second important paper in terms of adding further context to this thesis, commissioned by NSW Ministry of Health, examined the status of NP's in NSW through a rapid review of the literature. The report restates what has been consistently claimed in the international evidence that NP's provide equivalent if not better care than doctors, although they claim the comparison to doctors is unhelpful. They report on a lack of Australian research generally, with existing research



currently focusing on NP's in ED, and mental health and the aged care sector to a lesser extent. There is a glaring absence of research in rural and remote areas and around the effect of NP prescribing and diagnostics on continuity and fragmentation of care. Furthermore there is scarcely anything on the theoretical basis to inform NP practice either within the literature, or assimilating organisational change and implementation science within NP practice.<sup>(12)</sup>

Finally a systematic review on the Cost-Effectiveness of NPs and CNSs confirms that it is possible to undertake an economic evaluation of these roles and RCT is a possible method providing complete reporting of the study method occurs and the criteria on defining the APN roles is transparent.<sup>(15)</sup>

The systematic review aims to capture the impact of ONP roles in its totality. Both in terms of envisioning and establishing the role (input) and in terms of the pragmatic outcomes associated with NP practice (output), in order to: inform the speciality; to develop ONPs of the future; and to meet the needs and expectations of people with musculoskeletal disorders whom as informed consumers will inevitably demand a greater level of specialisation from the entire health workforce. The pivotal papers listed above frame the debate in which the comprehensive review takes place.

In order to situate the study it is necessary to describe the context in which advanced practice takes place.

### 1.5.1 Role and Importance of the NP

The term 'advanced practice' is misunderstood largely because of the haphazard approach to its development at every level: international, national (meaning state-by-state/province/county level) and even at a local level. The International Council of Nurses (ICN) defines an "Advanced Practice Nurse as a Registered Nurse who has acquired the expert knowledge base, complex decision-making skills and clinical competencies for expanded practice, the characteristics of which are shaped by the context and/or country in which s/he is credentialed to practice. A master level degree is recommended for entry level".<sup>(1)(p.1)</sup> The ICN associates the NP role with the APN role, and uses the terms interchangeably. APN has effectively been used as the umbrella term for nurses practising at a higher level (than the registered nurse),<sup>(16)</sup> however countries have interpreted and labelled these roles differently.

The terms NP and APN are used interchangeably within the international literature. There is commonality amongst the definition and characteristics of NP/APN role and practice internationally in terms of education, practice standards and regulation; operationally there is variability.<sup>(17)</sup> Globally, twenty five countries have implemented the NP role. <sup>(18)</sup> Although it is

suggested about 70 countries have a version of the role.<sup>(1)</sup> The majority of countries define the role and competency standards for NPs but not for other advanced practice nursing roles.<sup>(19)</sup> APN roles have developed in response to the changing needs of healthcare, governments, society, demographics, workforce, consumerism, but this has occurred in a disorganised manner which has led to poorly defined roles and titles.<sup>(19)</sup> Whilst there is general agreement internationally on the APN role there is a need to clarify the differences between NP and APN roles<sup>(20)</sup> in order to inform health service decision makers, and inform educators and guide career planning.<sup>(21)</sup>

### 1.5.2 Advanced Nursing Practice

NP roles have emerged in response to areas of unmet healthcare needs in a variety of settings.<sup>(2, 22)</sup> NPs provide essential care delivery and services where often there have been nil previous. The philosophical base to practise is essentially one of caring based on nursing knowledge applied to a biopsychosocial model. APNs are educated to use the biomedical and physical sciences and also apply learning from the social sciences and person-environment interactions to inform [nursing] practice. (Baer 1999 cited in<sup>(23)</sup>) This is philosophically different from a medical approach to care.

NPs are not doctor substitutes, 'mini doctors or maxi nurses'.<sup>(24)</sup> In fact, it is argued that this standpoint undermines the professional identity of APNs and other extended scope practitioners<sup>(23)</sup> and contributes further to the 'professional misunderstandings' that surrounds APN roles.<sup>(25)</sup> Despite this diametrically opposed difference, the international evidence supports NP outcomes on the whole as equal to or better when compared to medical practice, particularly in the area of patient satisfaction.<sup>(12)</sup>

NPs function in an advanced clinical role.<sup>(26)</sup> Some attempts have been made at quantifying the work of NPs. For example, Gardner et al<sup>(2)</sup> in 2010 divided the work of NPs into three domains of practice: direct care, indirect care and service-related activities. Within these domains NPs perform a variety of tasks. Reporting on such activity by way of performance outcome measures is a variable practice amongst NPs however, numbers seen/occasions of service, waiting times, effectiveness of interventions, referral patterns, patient/client satisfaction, clinical quality of care indicators,<sup>(27, 28)</sup> are typical of the data maintained and reported by NPs to either justify their existence, embed their role service wide and/or contribute to workforce planning. Furthermore the ONP must effectively define and characterise the patient population to which they deliver care within the NP's own scope of practice, ultimately to form an 'indicator' for the NP role.

### 1.5.3 International Context

This systematic review focussed on ONPs in an international context. The papers retrieved were predominantly published in the US & Canada, UK and Australia. Whilst there are similarities in role and practice internationally, how the roles are enacted can vary markedly. <sup>(17)</sup>

It is suggested that over 70 countries have implemented a version of advanced practice nursing roles.<sup>(1)</sup> The expanding international literature pertaining to NPs or advanced practice nurses<sup>(4)</sup> resonates with the many challenges faced by these nurses when it comes to role development and role implementation.<sup>(2, 17, 22, 27, 29, 30)</sup> Furthermore there is some evidence to suggest these roles may be effective.<sup>(2, 22, 29, 30)</sup> This becomes increasingly important in a context of building the health workforce of the future: a redefined workforce that must ensure adequate numbers of suitably qualified health workers who provide 'care the first time and every time'.<sup>(31)</sup>

### 1.5.4 US

NPs first evolved in the United States 50 years ago in response to a shortage of primary health care physicians. NPs filled the void by providing access to primary health care services where otherwise there was none. This was often in underprivileged or under serviced areas including inner city areas; other minority populations, the uninsured; rural and remote areas; the more vulnerable populations including the elderly and disabled.<sup>(32)</sup> Since the mid 1960's the United States has really led the way on the development of advanced practice roles, having diversified into four distinct areas: NP, Clinical Nurse Specialist (CNS), certified Nurse Midwife (CNM) and Certified Nurse Anaesthetist (CNA). The roles have proliferated amongst rural populations. NPs comprise one branch of advanced practice nursing in the US.<sup>(33)</sup> There are 180 000 NP's amongst the 230 000 APNs in the US alone.<sup>(34)</sup>

Peculiar to the US context is the development of the 'midlevel provider' or 'non-physician provider'. These terms may encompass: athletic extenders, extended physiotherapists, RN First assistants or physician assistants to name but a few. When these roles populate into the area of orthopaedic clinical care, it is natural corollary to compare the output of these providers. The systematic review sought to include these various roles as a natural comparator to ONP roles. Similarly the work that other nurses do forms a natural comparator with NP practice.

Another unique feature of the US system is how its citizens arrange health insurance and health providers seek reimbursement for services rendered. This policy area has had quite an influence on the development of different roles. Furthermore legislative developments over time have

influenced the pattern of work of health professionals. For example the introduction of the 80 hour work week around 1999 created the impetus for medical staff to reduce their hours and consequently saw an increase in NP hours and opportunity to expand their role.

The influence of state-based legislation, that saw development of NP roles occur at different rates and with different responsibilities, is waning as the United States moves towards national registration. However state based registration is still a feature of NP practice and accounts for some of the legislative differences affecting NPs in the US. This scenario is not unlike that of Australia's federalism.

A landmark report by the US Institute of Medicine in 2011 called for eliminating barriers for advanced practice nurses through local and national policy with implications for workforce relevant to nurse practitioners. The report describes a transformative process within the health care system to provide patient-centred, seamless, affordable, quality care, access to all, evidence based care that leads to improved health outcomes. This report offers a blueprint specifically to nurses to (1) ensure they practice to the full extent of their education and training, (2) improve their education, (3) provide opportunities for nurses to assume leadership positions and to serve as full partners in health care redesign and improvement efforts, and (4) improve data collection for workforce planning and policy making.

The progress of this original report has been recently reviewed. <sup>(4/12/15)(35)</sup>

### 1.5.5 Canada

Canada established the NP role in 1967 and has two areas of advanced nursing practice of NP and clinical nurse specialist with a move towards introducing nurse anaesthetists.<sup>(29)</sup> Canada had 1626 NPs in 2008. (Canadian Institute for Health Information (CIHI) 2010 cited in<sup>(36)</sup>) Whilst only a few years behind the US, Canada has experienced a slower development in their advanced practice roles specifically the NP and Clinical Nurse Specialist roles. The development of these roles has been described as 'sporadic' and at the whim of the changing political health system agenda<sup>(36)</sup> Canada looks to be developing the Certified Nurse Anaesthetist Role currently. The debate within the Canadian literature is mature, considered and eloquent with regard to the impact these roles are having.

### 1.5.6 UK

The NP role was introduced into the United Kingdom over 20 years ago and is much less regulated than North America. Unlike the US and Australia, advanced practice roles in the UK are not

protected titles under legislation so there is no minimum standard of qualifications, experience, education required of the role nor practice standards expected of the role. Implementation of these roles becomes dependent upon local managers<sup>(1)</sup> and allows for proliferation of titles in an unregulated fashion. Despite a robust discussion by and influence of the policies of the UK registering authority - the Royal College of Nursing (RCN) this situation continues.

### 1.5.7 Australia

Australia's progress with NPs is largely informed by the experiences of the United States and to a lesser extent, the United Kingdom.<sup>(17)</sup> For the most part there exists a parallel between the international experience and the Australian experience of NPs.

The local context of the primary reviewer which informs this review is Australian. Australia has mirrored the trends around NP practice found elsewhere. In the last 20 years (post implementation of the 1986 Australian nursing career structure), the debate around advanced nursing practice and NPs, in an Australian context, has developed. The inaugural 'legal & policy' NP framework was developed in New South Wales (NSW) in 1998, with the first Australian NP authorised to practise in NSW in 2000.<sup>7</sup> It is posited that evaluation of emerging roles began to be seen in the research literature from 1990 onwards. In response to a need for creative workforce re-engineering and against a context of limited health resources, NPs in Australia over the last 20 years have emerged as an alternative model of health care delivery. For the last 10 years there has been a proliferation of influential 'reports' written by nurse researchers, generated to review the progress of Australia's NPs, commissioned by the health departments of respective state governments and other service planners to guide health workforce planning.<sup>(2, 17, 26-28, 33, 37)</sup>

The Nursing & Midwifery Board as the peak national nursing body, defines a NP as a Registered Nurse (RN) who is educated and authorised to practice autonomously and collaboratively in an advanced and extended clinical role.<sup>12</sup> The NP Standards for Practice\* encompass four domains: clinical, education, research and leadership and are underpinned by attributes (knowledge, skills & affect). The standards form the minimum standard for a NP across diverse practice settings and patient/client populations. The standards provide a decision making framework for practice and licensure of NPs in Australia. In order for the NP to be endorsed by the Australian Health Practitioner Regulation Agency (AHPRA) to practise as a NP they must have met the National Board's mandatory registration standards and be endorsed to practise by the Nursing and Midwifery Board of Australia (NMBA) as a NP under section 95 of the National Law.<sup>13</sup> The NP's endorsement in Australia is contextualised by their scope of practice, as is the case internationally.

At December 2012 when the search ended, 788 endorsed NPs were nationally registered with AHPRA; 54 of these were endorsed to practise in South Australia.<sup>(38)</sup>14 At January 2014 there were 1000 endorsed Australian NPs.

### 1.5.8 Other Countries

European countries are experiencing similar issues with NP role development. The Nordic countries appear to have supportive and sustainable frameworks. Finland graduated seventeen advanced practice nurses in 2006.<sup>(18)</sup> Nurse leader opinions were sought in one study and they were calling for role clarity, sustainable structures and organisational support systems.<sup>(39)</sup> The APNs themselves reported similar challenges to that reported elsewhere: personal barriers, lack of role definition, hindered role transition. They called for strategic leadership and organisational support and appropriate preparation of the APN to deal with the reported challenges.<sup>(40)</sup> Helsinki, Finland hosted the 2014 ICN INP/APNN conference and the conference manager Anna Suutarla reported “ a lot is happening in the APN profession, and many countries are keen to develop new roles” in the face of ageing populations, chronic diseases, health care system changes and austerity measures”.<sup>(41)</sup>(accessed 5/4/15) Advanced practice roles in The Netherlands, Switzerland and Ireland is well established.<sup>(16)</sup>

Regrettably no New Zealand studies were identified in the search. The NP experience in New Zealand appears to be similar to that of Australia particularly in terms of registration standards. The roles developed around 2000 in response to government policy in primary health.<sup>(16, 42)</sup> However the theoretical underpinnings to advanced practice in New Zealand diverge from some other countries in that advanced practice does not equate with extended practice<sup>(1)</sup> and in New Zealand the accreditation process is long.<sup>(42)</sup>To date New Zealand has 129 NPs registered with only three identifying as NPs with a ‘Surgical’ as their area of practice.<sup>(43)</sup>(personal communication 7/4/15)

Development of advanced practice roles in Asian countries is variable but steady where government commitments to education are in place.<sup>(16)</sup> Taiwan appears to be supporting the nurses to become educated in advanced practice with a focus on research.<sup>(41)</sup>(accessed 5/4/15)

### 1.5.9 Orthopaedic Nursing and Specialism

*'Any specialist area of a profession has to continually define its position to justify and take forward its practice.'*

Peter Davis, 2007 cited in <sup>(10)</sup>(p.43)

Specialism within orthopaedic nursing had its historical roots in the nursing of Dame Agnes Hunt who is considered the founder of orthopaedic nursing. The theatre of war has also had a strong influence on the development of innovation within orthopaedic nursing.

There is some anecdotal evidence to suggest that orthopaedic nursing is a 'specialty under threat' as orthopaedic-specific hospital wards are increasingly being absorbed into general surgical units; a trend observed in the United States in the mid 1990's in response to the American experience of 'downsizing' orthopaedic nursing services.<sup>(44)</sup> Despite a limited evidence base,<sup>(44)</sup> early citations with specific reference to orthopaedic nurses in the American context in particular started to populate the literature on or around this time.

Several proponents of the specialty began to refer to a core nursing skill set that was 'highly orthopaedic' when describing 'specialist' orthopaedic nursing practice.<sup>(10, 45)</sup> One of the first papers that examined orthopaedic nursing's specialty status, identified thirty six "highly orthopaedic" nursing skills, nine borderline orthopaedic nursing activities, four of which related to the professional status of the specialty.<sup>(45)</sup> Since this time there have been a number of nurse commentators that have asserted a specialty of orthopaedic nursing exists.<sup>(10, 44, 46-52)</sup> Further work has shown differences in certain variables (LOS & complications) when patients are 'outlied' or managed in a non-orthopaedic ward environment by non-orthopaedic nurses.<sup>(53)</sup> More recently, the Orthopaedic Nurses Certification Board (ONCB) in the US conducted a role delineation study, that is undertaken every five years, to review the examination content and practice patterns for orthopaedic nurses. The last study identified 95 tasks and 54 knowledge statements for the ONC examination and between 54 and 62 task and knowledge statements respectively for APNs.<sup>(54)</sup> Both this study, and a recent ethnographic study, surveyed orthopaedic nurses and confirmed they believe specific skills and knowledge are required by orthopaedic nurses. McLiesh concludes that the nurses in his study strongly identified with their specialty but that the specialty must continue to evolve and respond to the challenges facing it.<sup>(55)</sup>

### 1.5.10 Advanced Practice in Orthopaedic Nursing

The first Australian ONP was authorised in South Australia in 2005.<sup>15</sup> There are approximately eight endorsed ONPs in Australia authorised to practise in a diverse range of orthopaedic settings that include acute care, community care, outpatient settings, rehabilitation, private practice and rural settings.<sup>(56)</sup> The current scope of practice for Australian ONPs spans the clinical range of trauma, arthroplasty, fragility fracture and ortho-geriatric care, surgical care: spinal/neurology and paediatric care.<sup>(56)</sup> ONPs work within contemporary orthopaedic/musculoskeletal client disease models. These clinical models of care articulate the health care needs of populations living with musculoskeletal conditions, disorders and disease. Osteoarthritis and osteoporosis are 'highly prevalent long term [musculoskeletal] conditions known to predominantly affect the elderly and comprise the most common cause of disability in Australia'.<sup>(57)</sup> Musculoskeletal trauma or injury as a result of an 'external force' such as vehicle accident, a fall, industrial or home environment accident or assault comprises a leading cause of hospital admission that requires orthopaedic management and care.

The ONP is considered a 'pioneer'<sup>(38)</sup> as they fill a 'gap' in clinical need and develop an ONP role. An emerging evidence base suggests that barriers such as a lack of role understanding, lack of 'team' support and a lack of resources at a system, organisational and practice level, constrain NP practice and integration of the role into practice settings.<sup>(26, 28, 56)</sup>

Despite 'in-principle' support for expanded scopes of practice for various health practitioner roles, the observation exists from within the specialty of orthopaedic nursing that progress in establishing the ONP role for this group of specialist clinicians has been slow and their journey has not been difficult.<sup>(56)</sup> The majority of ONPs in Australia at least have emerged from extended practice roles similar to the generally well established experience of other NPs emerging from their own practice interest.<sup>(26, 27)</sup>

### 1.5.11 Domain of Orthopaedic Nursing

This systematic review specifically looked at "NPs in Orthopaedic Settings" and had to consider international variance. The broadest approach possible was taken in the systematic review given the divergent nature of advanced practice internationally, and this review's intent to capture the advanced practice of ONPs in its many forms. The common thread had to be orthopaedic nursing. For example in the US family nurse practitioners (FNP) perform orthopaedic nursing work such as fracture assessment, in a sub-acute setting; which may occur in the 'out-patient' setting of an acute care hospital in Australia. The US has the Registered Nurse First Assistants (RNFA) or Registered



Nurse Assistant-at-Surgery roles which are essentially peri-operative nurses that can range from seeing patients pre-operatively, organising surgical equipment then seeing the patient post-operatively in hospital and for follow up. Similar roles exist in the area of sports medicine. The multiplicity of titles within the UK created some challenges to the review. The role of the Emergency Nurse Practitioner (ENP) is well developed within the UK system and supported in a number of National Health Service (NHS) initiatives. ENPs scope of practice often includes minor injury and fracture management in the emergent setting. Australia seems to be following the UK path of investing in NP's in the emergency setting. These are just a few examples of the diversity within orthopaedic nursing practice at the advanced level that this review needed to encompass.

#### 1.5.12 Workforce and Bone & Joint Health

The impact of workforce imperatives and future workforce needs, in a context of an increasing burden of bone and joint disease is also considered within this thesis.

#### 1.5.13 Bone & Joint Health

Musculoskeletal conditions are: the second largest cause of disability, second only to mental and behavioural disorders; the fourth greatest impact on the health of the world population, considering both death and disability; accounts for 6.8% of disability compared with cardiovascular and circulatory diseases (11.8%), all cancers (7.6%) and mental and behavioural disorders (7.4%). In terms of area of the body the main contributors are low back pain, neck pain, osteoarthritis and 'other' musculoskeletal disorders such as fracture, shoulder disease, gout etc. Osteoarthritis of the knee accounts for 83% of the osteoarthritis total.<sup>(58)</sup> Musculoskeletal conditions are very complex because bone biology is very complex.<sup>(59)</sup> Despite the significant numbers of the population affected by musculoskeletal disorders the specialty research is relatively poorly funded, despite the international recognition that would be expected to flow from the announcement of a 'Decade of Bone and Joint'. In Australia the Commonwealth has declared that musculoskeletal conditions are a National Health priority.<sup>(59)</sup>

#### 1.5.14 Workforce

Both low and high income countries are facing health worker shortages, particularly in rural areas. Mid-level health providers including NPs, are considered a "promising" resource to achieving a country's health goals<sup>(60)</sup> however there is little evidence to support decision makers to "Inform

Policy-Making About Optimizing the Supply, Improving the Distribution, Increasing the Efficiency and Enhancing the Performance of Health Workers” (Human Resources for Health: Evidence from Systematic Reviews of Effects to Inform Policy-Making About Optimizing the Supply, Improving the Distribution, Increasing the Efficiency, and Enhancing the Performance of Health Workers – according to this policy brief prepared for the International Dialogue on Evidence-Informed Action to Achieve Health Goals in Developing Countries).<sup>(61)</sup> Nursing workforce shortages are projected for US, Europe and Australia<sup>(62-64)</sup> and further afield notwithstanding. There are also predictions of a pending maldistribution of medical specialties, and issues related to medical training and a reliance on immigration of health workers that will affect future workforce strategies. Policies to address workforce and workplace productivity, flexibility and retention; geographical distribution; training – planning, organisation, reform and capacity; and immigration are recommended.

## 1.6 Discussion of the methodological basis of the chosen approach to analysis & synthesis

### 1.6.1 Systematic Review Methodology

Systematic review is a way of summarising research evidence, both published and unpublished, on a particular topic, that are assessed for quality, findings (from the individual studies) synthesised then interpreted and summarised according to a ‘protocol’.<sup>(65)</sup> Systematic reviews are considered the highest level of evidence and tops the hierarchy of study designs (JBI); and are generally accepted as the best method of “generating evidence to inform policy and practice”.<sup>(66)</sup> There are different ways of reviewing research: integrative review, umbrella review, rapid review for example. There are different ways of appraising and synthesising evidence for systematic review: A comprehensive systematic review is a systematic review of two or more types of evidence such as quantitative, qualitative and textual evidence; as was the case with this systematic review. Multiple forms of evidence contained within experience, opinion and expertise, inference and deduction and rigorous inquiry lend a breadth of evidence from which comprehensive findings are “... appraised, extracted and synthesised”.<sup>(67, 68)</sup> The aim of which is to arrive at ‘the best available evidence’ on a given topic of study.

### 1.6.2 JBI Approach

The analysis and synthesis of papers included in this review were carried out in accordance with the JBI method of conducting systematic reviews. This was a comprehensive systematic review and included three forms of evidence in order to address the overarching research question.<sup>(3)</sup>

Research that contributes to and supports evidence based practice principles is rapidly evolving and developing at an exponential rate. The Joanna Briggs Collaboration produces systematic reviews that are contained within the JBI database of Systematic Reviews and Implementation Reports (JBISRIR) that investigate the impact of health care interventions. A comprehensive systematic review considers two or more types of evidence.<sup>(3)</sup> Quantitative evidence emerges from research that seeks to explain the relationship between variables, which is usually expressed numerically with statistics. It tends to be associated with the more traditional scientific method and looks at effectiveness. Qualitative evidence emanates from interpretive studies that explore human, cultural or social experience and follow established research methods. Text and Opinion based evidence tends to be of expert opinion that is less 'scientific' than the other forms of evidence but can complement other forms of evidence. Effectiveness is defined as the measure of an effect or outcome of an intervention in clinical practice. Experience is what the intervention or phenomenon of interest means to the individual. The JBI model considers more than this alone when synthesising evidence with its use of the FAME mnemonic. Feasibility incorporates the practicality of an intervention. Appropriateness looks at the fit of an intervention. Meaningfulness and effectiveness relate to the experience and effect respectively of an intervention, and there is scope to look at the economics of an intervention.<sup>(67)</sup>

Amongst the abundance of research and other processes of systematic review, it's important that relevant evidence informs current health practice. The JBI method applies rigour to the review of evidence. A JBI review can comprehensively appraise and synthesise multiple forms of evidence and incorporates this inclusive approach within its methodology. It's the inclusivity of evidence that is central to this review.

The translational cycle is the cornerstone of the JBI methodology which brings together evidence synthesis (evidence based healthcare),<sup>(67)</sup> and implementation or translation science. Pearson et al describes a reliable, transparent and rigorous process of systematically reviewing literature to arrive at findings that form the basis of recommendations arising from the review that can be implemented or applied to a broad range of practice environments.<sup>(69)</sup> Characteristic of JBI reviews are the graded recommendations for policy and practice that accompany all reviews. Further JBI advocates that knowledge translation requires "teaching in clinical leadership as well as the skills and knowledge for translation of evidence in to practice".<sup>(66)</sup> The JBI conceptual framework to facilitate research findings into policy and practice, is diagrammatically represented below.

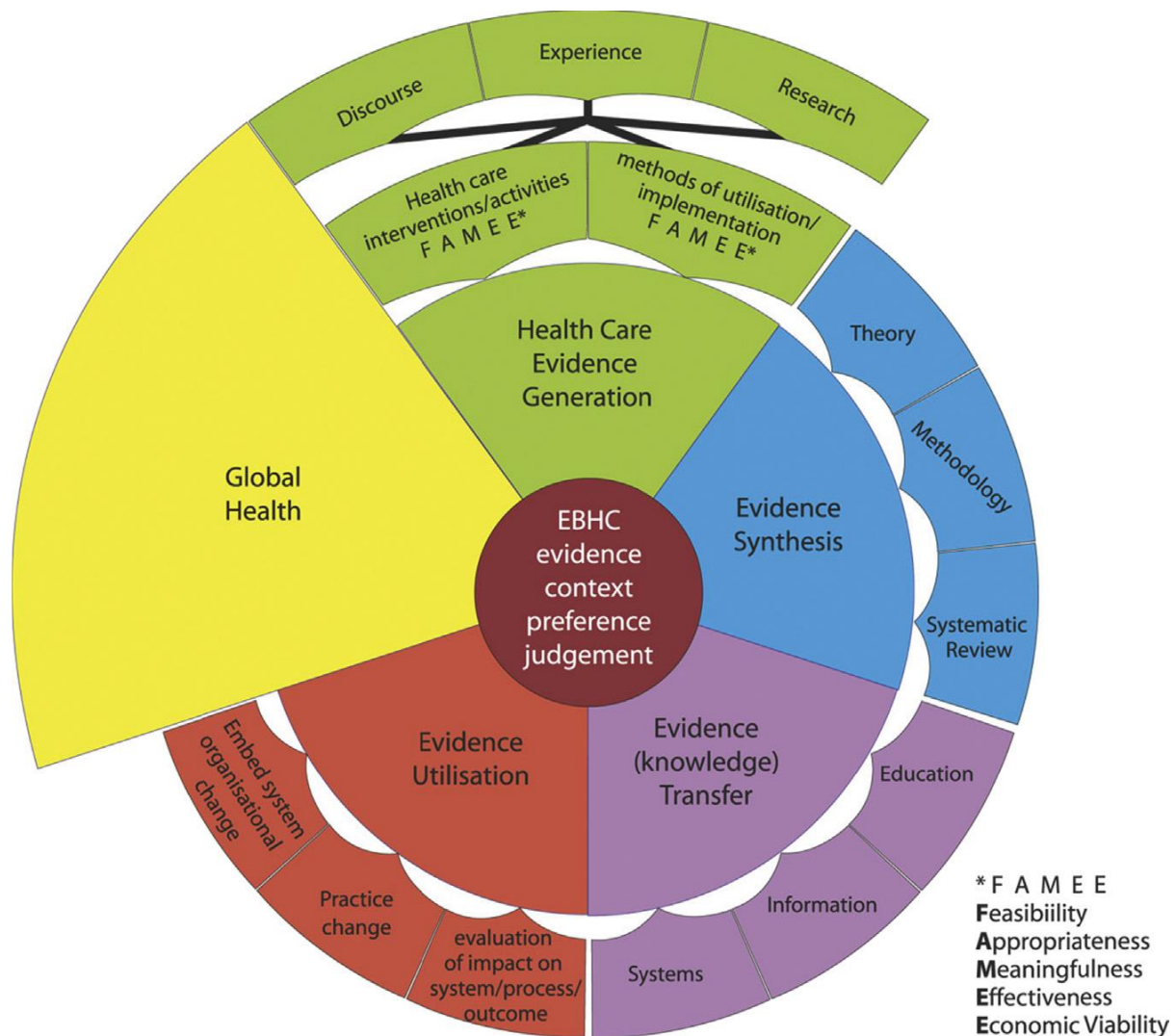


Figure 1. The Joanna Briggs Institute conceptual model for evidence-based health care. (Joanna Briggs Institute, The University of Adelaide, South Australia, Australia)

### 1.6.3 Mixed Methods

Mixed Method Review (MMR) is a systematic review where multiple methods of data are collected from both qualitative and quantitative research studies and synthesised. Mixed method systematic review has emerged where two or more types of evidence are examined within the one review.<sup>(65)</sup> The aim of which is to develop a “fuller picture of an intervention and the way it works”.<sup>(70)</sup> The findings from single method reviews may only investigate part of the phenomenon. Mixed method reviews are a means to overcome this challenge. As JBI advises “ ... including diverse forms of evidence from different types of research, mixed methods reviews attempt to maximize the findings - and the ability of those findings to inform policy and practice.”<sup>(71)</sup> This can benefit nursing research where study outcomes emanate from clinical practice and tend to be ‘mixed’ given the nature of

nursing as both 'an art and a science'. Criticism of the MMR approach has been the poor reporting around how mixed methods research is conducted and reported which must ultimately challenge the integrity of the systematic review.<sup>(72)</sup> The method of MMR is developing.<sup>(71)</sup> However it is thought a range of methods can potentially lead to more comprehensive findings <sup>(Tashakori & Teddlie & Moran-Ellis et al cited in<sup>(72)</sup>)</sup> and this was the aim of the method chosen for this systematic review.

Primary research by mixed method studies are beginning to be used in research of advanced nursing practice; where considering the complexities of "context-bound phenomena with a multiplicity of variables not amenable to control ... and real life situations"<sup>(73)</sup> becomes important. The SCAPE study used mixed methods to look at the impact of specialist & advanced practice of nurses in Ireland, specifically using a case study method. Case study using multiple sources of evidence is thought to bridge paradigms.<sup>(Luck cited in<sup>(73)</sup>p.3)</sup> This study examined the "impact of complex roles and interventions in health care outcomes and service delivery" of the clinical practice of specialist and advanced practice practitioners.<sup>(73)</sup> A mixed method approach in the context of the SCAPE study claimed to "exploit the strengths and compensate for weakness inherent in single designs, generate comprehensive description, produce more convincing results for funders or policy-makers and build methodological expertise".<sup>(74)</sup> The mixed method approach used in the SCAPE study is one example of a methodology investigating advanced practice, and similar to the phenomenon explored in this systematic review. Its use demonstrates congruity between research methodology and the research question and objectives.

#### 1.6.4 Methodology of Included Studies

Three forms of evidence comprised this comprehensive review. Quantitative study designs in this review included observational cohort/case control studies and descriptive case report/series. Phenomenology was the study design used in the included qualitative study. The textual component of this review considered publications of expert opinion, discussion papers, and other types of position papers.<sup>(75)</sup>

Quantitative research draws upon the traditional scientific approach to evidence generation and tends to be more numerical in nature.<sup>(3)</sup> Results were generated from lower level quantitative evidence which comprised the best available evidence from this review. All included quantitative papers were of an observational study design. The observational study design aims to "... summarise associations between variables in order to generate (rather than test) hypotheses".<sup>(3)</sup> There were slightly more analytical studies, attempting to draw associations between variables, than not in the included cohort studies. A cohort study collects data either prospectively or

retrospectively from a population/group that share common characteristics. The advantage of the prospective approach to data collection is the sample population should be more alike therefore making the inferences drawn more reliable; selection bias is minimised. Typically cohorts in these included papers received one of two interventions: often the ONP or equivalent compared against an 'other' or the studies employed a pre-test, post-test design (eg. before guideline, after guideline). One study used a case-control design. The criticism of retrospective designs is that data may have been collected for reasons other than the study question; there is less randomisation that could potentially occur with retrospective designs. Amongst the included quantitative papers, slightly less number of studies used a descriptive design. Descriptive studies generate basic information about a population at a given point in time and sit just below analytic designs in the hierarchy of evidence. Sample size varied across the studies from 12 to hundreds, and 650 000 in one study. The larger the sample the more one is able to generalise about results, but this factor was not the only factor to be considered. Significant amongst the studies was the absence of a control. A lack of a comparator and lack of statistical heterogeneity meant a meta-analysis could not be undertaken.

Qualitative research aims to understand the meaning of a certain [health] experience.<sup>(3)</sup> Phenomenology is the study of lived experience. Hermeneutic phenomenology as informed by Heidegger was chosen for the only included qualitative study to uncover the meaning held within the 'lived experience' of advanced orthopaedic nurses. Language from the nurses' interviews was analysed using the method described by van Manen to arrive at themes from the similarities and differences within the taped interviews. A meta-aggregation could not be performed as only one study was included in this component of the review.

Text and opinion is regarded as a source of evidence in JBI systematic review. For this review experts wrote case studies or expert opinion pieces in peer reviewed journals. Opinion hailed from a stated position of allegiance and was appraised for the soundness and logic of the opinion, the authority and the quality of the opinion.<sup>(3)</sup> Importantly expert opinion underwent explicit critical appraisal as a defining feature of rigour within this form of evidence.<sup>(65)</sup>

Where a meta-analysis or meta-aggregation does not occur within a systematic review a narrative summary is chosen to present the results or findings of the review. Narrative summary in itself can confound the way the findings are interpreted.<sup>(66)</sup> Tables summarising the results from studies are used to assist this understanding.<sup>(66)</sup> Where data is sourced from multiple forms of evidence in a comprehensive review an additional layer of challenge is applied to make sense of the whole. This thesis has provided a section on shared findings across the evidence in the final chapter.

## 1.7 Assumptions, limitations and delimitations

This review is premised on the belief that the role and practice of an ONP is inextricably linked. Where other reviews have looked at one form of evidence,<sup>(8, 32)</sup> this review considered all the best available evidence as it pertains to ONP. An 'all-inclusive' approach to forms of evidence for consideration in this review was required to capture the 'totality' of the ONP's role & practice, within any orthopaedic environment. An orthopaedic setting included a sports medicine clinic, fracture clinic or other 'out-patient' setting, emergency department setting, orthopaedic hospital ward or other hospital ward ie 'in-patient' setting, an orthopaedic office. Advanced practice nurses undertaking 'orthopaedic nursing work' may find themselves practising in any one or more of these environments. Whilst it is acknowledged that peculiarities of context exist internationally, continent by continent, or state by state, there is a sufficient degree of commonality in relation to the effectiveness & experience of ONP practice, which prompted this review to take an international sweep of the literature.

This review has looked at both the processes and outcomes of care of ONP's in an attempt to describe effectiveness, and the experience for ONP's of role development, role implementation and evaluation. Furthermore an analysis of the discourse within text and opinion has been examined for completeness. A comprehensive approach has therefore been chosen to systematically review the evidence as it relates to ONP role and practice in order to gain a "fuller picture" of the interventions and phenomenon associated with ONP role & practice;<sup>(70)</sup> And generate "more comprehensive findings". (Tashakkori & Teddlie & Moran-Ellis et al cited in<sup>(72)</sup>)

## 1.8 Key concepts

There is much ambiguity surrounding the definition of key terms. The following explanations underpin the concepts used in this thesis.

**Nurse Practitioner (NP):** Nurse Practitioner is an expanded form of advanced practice.<sup>(76)</sup> NPs function in an advanced clinical role<sup>(26)</sup> and defined as:

"A Nurse Practitioner/Advanced Practice Nurse is a registered nurse who has acquired the expert knowledge base, complex decision-making skills and clinical competencies for expanded practice, the characteristics of which are shaped by the context and/or country in which s/he is credentialed to practice. A Masters degree is recommended for entry level."<sup>(4)</sup>

**Orthopaedic Nurse Practitioner (ONP):** is therefore defined in accordance with the above, with a specific scope of practice in orthopaedic nursing. There is a level of specialisation within the ONP scope of practice eg. Arthroplasty.

**Advanced Practice Nurse (APN):** Advanced practice nursing as a nurse practitioner is a qualitatively different level of advanced nursing practice to that of the registered nurse due to the additional legislative functions and the regulatory requirements. The requirements include a prescribed educational level, a specified advanced nursing practice experience; and continuing professional development.<sup>(77)</sup>

“ ... advanced practice nursing roles are those in which nurses function at an advanced level of practice. (Bryant-Lukosius et al., 2004, cited in<sup>(1)</sup> p.521) Stasa et al define APN as “the type of practice in defined and regulated APN scopes”; the *level* at which the roles are based.<sup>(1)</sup>

**Advanced Nursing Practice:** Advanced nursing practice as expert practice within a regulated nursing scope; what nurses *do*;<sup>(1)</sup> qualitatively more than expert practice.<sup>(Sutton & Smith, 1995a cited in(75))</sup>

**Expanded or extended practice:** (terms used interchangeably): expertise which stretches beyond the legally recognised scope of practice of the [nursing] profession ... may include areas of practice ... not previously ... in the nursing realm ...<sup>(Nursing Council of New Zealand, 2008b cited in(1))</sup>

**Expert nurse:** (based on Benner’s five levels of competence - novice to expert)<sup>(78)</sup>: incorporates a deep understanding sourced in a breadth of background experience, intuitive grasp on the totality of a situation, superior skills and competencies, specific role functions and interest in clinical outcomes; pattern recognition, harnessing knowledge (specialised, practical, theoretical) and experience; emphasis on the ‘doing’ of nursing and an ‘immersion in practice’.<sup>(75)( p. 11-15)</sup>

**Physician Assistant (PA):** is a nationally certified and state-licensed medical professional. PAs practice on healthcare teams with physicians and other providers. Functions include history taking, examination, diagnose, treat, order and interpret tests, plan care, develop treatment plan, write prescriptions, assist in surgery, follow up care.<sup>(6)</sup>

## 1.9 Chapter Summary

This chapter has introduced relevant topics and issues to situate the comprehensive systematic review at the centre of this thesis. Internationally development of advanced practice roles in nursing has been haphazard. Whether this relates to what these roles are called or what these roles do is unclear. This chapter opens with a discussion on advanced nursing practice, then refines this further by summarising how these roles have emerged in specific countries or regions. Further this chapter expanded on the influences emerging for advanced practice nurses in orthopaedic settings. A precis of the methodological underpinnings to this comprehensive systematic review follows.



The international literature pertaining to NPs or APN resonates with the many challenges faced by these nurses when it comes to role development and role implementation.<sup>(2, 17, 22, 27, 29, 30, 79)</sup> ONPs are similarly affected. There is a body of evidence that suggests the role of the NP and APN may be effective in improving health outcomes.<sup>(2, 22, 29, 30, 32, 80, 81)</sup> This could be helpful in designing the health workforce of the future where it is estimated there will be: a medical shortage and maldistribution of physicians, an aging nursing workforce, citizens living longer due to advances in technology, but likely with the burden of chronic disease.<sup>(8, 62, 64)</sup> The health workforce must redefine itself to ensure adequate numbers of suitably qualified health workers provide 'care the first time and every time'.<sup>(31)</sup> Kitson et al advocates that the Registered Nurse role is pivotal to building the future nursing workforce in order to ensure safe, quality and outcome driven care.<sup>(62)(p.5)</sup> The ICN suggests and recommends the NP role provides one alternative method of health care delivery for the future.<sup>(62)(p.6)</sup> But more needs to be done to achieve this.

This review will examine the role and practice of NPs in orthopaedic settings; specifically to reveal the impact these roles have had and continue to have in terms of experience and effectiveness and potentially offer in the future... Given the breadth of this topic a comprehensive approach has been chosen to systematically review the evidence as it relates to ONP role and practice. This chapter has situated the chapters to follow by providing a background to the review. The initial protocol published in the JBI library follows in the subsequent chapter. Chapter three describes the emerging report submitted to the JBI library for publication. Chapter four concludes the thesis with a discussion on an interpretation of the evidence.

## Chapter 2

Chapter 2 comprises the initial protocol published in the Joanna Briggs Institute Library of Systematic Reviews (JBISRIR). A statement of authorship precedes the copy of the protocol. The protocol outlines the methods of the review.

## 2.1 Statement of Authorship

Statement of Authorship	
Title of Paper	The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings: A Comprehensive Systematic Review - protocol
Publication Status	<input checked="" type="radio"/> Published, <input type="radio"/> Accepted for Publication, <input type="radio"/> Submitted for Publication, <input type="radio"/> Publication style
Publication Details	A protocol published in the Joanna Briggs Institute Library of Systematic Reviews: Vol 10, No 42 Suppl (2012)
<b>Author Contributions</b>	
By signing the Statement of Authorship, each author certifies that their stated contribution to the publication is accurate and that permission is granted for the publication to be included in the candidate's thesis.	
Name of Principal Author (Candidate)	Anita Taylor
Contribution to the Paper	Primary and corresponding author; Conceptualisation, realisation and documentation of the protocol.
Signature	Date 16/4/15
Name of Co-Author	Lynda Staruchowicz
Contribution to the Paper	Secondary reviewer. Listed as co-author.
Signature	Date 16.4.15
Name of Co-Author	
Contribution to the Paper	
Signature	Date
Name of Co-Author	
Contribution to the Paper	
Signature	Date

## 2.2 JBISRIR Protocol

A protocol published in the Joanna Briggs Institute Library of Systematic Reviews: Vol 10, No 42 Suppl (2012)

# **The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings: A Comprehensive Systematic Review**

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## **Review question/objective**

This review asks “What is the experience and effectiveness of nurse practitioners in orthopaedic settings”?

The objective of the quantitative component of this review is to synthesise the best available evidence on effectiveness of orthopaedic nurse practitioner specific care on patient outcomes and process indicators.

The objective of the qualitative component of this review is to synthesise the best available evidence on the experience of becoming or being an orthopaedic nurse practitioner in relation to role development, role implementation and (ongoing) role evaluation.

The objective of the text and opinion component of this review is to synthesise the best available evidence of the contemporary discourse on the effectiveness and experience of nurse practitioners in orthopaedic settings.

## Background

Nurse practitioner roles have emerged in response to areas of unmet healthcare needs in a variety of settings.<sup>1,2</sup> Nurse practitioners first evolved in the United States 40 years ago in response to a shortage of primary health care physicians. Nurse practitioners filled the void by providing access to primary health care services where otherwise there was none. Nurse practitioners comprise one branch of advanced nursing practice in the US along with Nurse Anaesthetists (NA), Clinical Nurse Specialists (CNS) and Nurse Midwives (NM).<sup>3,4</sup> Canada soon followed America's lead by establishing the nurse practitioner role in 1967. Canada has two areas of advanced nursing practice, namely nurse practitioner and clinical nurse specialist; they are moving towards introducing nurse anaesthetists currently.<sup>5</sup> The nurse practitioner role was introduced into the United Kingdom 20 years ago.

There is commonality amongst the definition and characteristics of Nurse Practitioner (NP)/Advanced Practice Nurse (APN) role and practice internationally in terms of education, practice standards and regulation; operationally there is variability however.<sup>6</sup> Australia's progress with nurse practitioners is very much informed by the experiences of the United States and United Kingdom<sup>6</sup> and for the most part there exists a parallel between the international experience and the Australian experience of nurse practitioners.

This review will focus on orthopaedic nurse practitioners in an international context. However the local context of the primary reviewer which informs this review is Australian. Australia has mirrored the trends around nurse practitioner practice found elsewhere. In the last 20 years (post implementation of the 1986 Australian nursing career structure), the debate around advanced nursing practice and nurse practitioners, in an Australian context, has developed. The inaugural 'legal & policy' nurse practitioner framework was developed in New South Wales (NSW) in 1998, with the first Australian nurse practitioner authorised to practise in NSW in 2000.<sup>7</sup> It is posited that evaluation of emerging roles began to be seen in the research literature from 1990 onwards. In response to a need for creative workforce re-engineering and against a context of limited health resources, nurse practitioners in Australia over the last 20 years have emerged as an alternative model of health care delivery. For the last 10 years there has been a proliferation of influential 'reports' written by nurse researchers, generated to review the progress of Australia's nurse practitioners, commissioned by the health departments of respective state governments and other service planners to guide health workforce planning.<sup>2,3,6-11</sup>

In a national context the Australian Nursing & Midwifery Council (ANMC) as the peak national nursing body, defines a nurse practitioner as a Registered Nurse (RN) who is educated and authorised to practice autonomously and collaboratively in an advanced and extended clinical role.<sup>12</sup> The ANMC Competency Standards for the Nurse Practitioner encompass three generic standards which are further defined by nine competencies. The competency standards provide a framework for practice and licensure of nurse practitioners in Australia. In order for the nurse practitioner to be endorsed by the Australian Health Practitioner Regulation Agency (AHPRA) to practise as a nurse practitioner they must have met the competency standards and be endorsed to practise by the Nursing and Midwifery Board of Australia (NMBA) as a nurse practitioner under section 95 of the National Law.<sup>13</sup> The nurse practitioner's

endorsement in Australia is contextualised by their scope of practice, as is the case internationally.

At September 2011, 450 endorsed nurse practitioners were nationally registered with AHPRA<sup>14</sup>; 54 of these were endorsed to practise in South Australia.<sup>14</sup> The first orthopaedic nurse practitioner was authorised in South Australia in 2005.<sup>15</sup> To date there are eight endorsed orthopaedic nurse practitioners in Australia authorised to practise in a diverse range of orthopaedic settings that include acute care, community care, outpatient settings, rehabilitation, private practice and rural settings.<sup>15</sup> The current scope of practice for Australian orthopaedic nurse practitioners spans the clinical range of trauma, arthroplasty, fragility fracture and ortho-geriatric care, surgical care: spinal/neurology and paediatric care.<sup>15</sup> Orthopaedic nurse practitioners work within contemporary orthopaedic/musculoskeletal client disease models. These clinical models of care articulate the health care needs of populations living with musculoskeletal conditions, disorders and disease. Osteoarthritis and osteoporosis are 'highly prevalent long term [musculoskeletal] conditions known to predominantly affect the elderly and comprise the most common cause of disability in Australia'.<sup>16</sup> Musculoskeletal trauma or injury as a result of an 'external force' such as vehicle accident, a fall, industrial or home environment accident or assault comprises a leading cause of hospital admission that requires orthopaedic management and care.

There is some evidence to suggest that orthopaedic nursing is a 'specialty under threat' as orthopaedic-specific hospital wards are increasingly being absorbed into general surgical units; a trend observed in the United States in the mid 1990's in response to the American experience of 'downsizing' orthopaedic nursing services.<sup>17</sup> Despite a limited evidence base<sup>17</sup>, early citations with specific reference to orthopaedic nurses in the American context in particular started to populate the literature on or around this time. Several proponents of the specialty began to refer to a core nursing skill set that was 'highly orthopaedic' when describing 'specialist' orthopaedic nursing practice.<sup>18,19</sup> More recently commentators point to differences in certain variables when patients are 'outlied' or managed in a non-orthopaedic ward environment by non-orthopaedic nurses.<sup>20</sup>

Despite 'in-principle' support for expanded scopes of practice for various health practitioner roles, the observation exists from within the specialty of orthopaedic nursing that progress in establishing the orthopaedic nurse practitioner role for this group of specialist clinicians has been slow and their journey has not been without challenge.<sup>15</sup> The majority of orthopaedic nurse practitioners in Australia at least have emerged from extended practice roles similar to the generally well established experience of other nurse practitioners emerging from their own practice interest.<sup>7,9</sup> The orthopaedic nurse practitioner is considered a 'pioneer'<sup>14</sup> as they fill a 'gap' in clinical need and develop an orthopaedic nurse practitioner role. An emerging evidence base suggests that barriers such as a lack of role understanding, lack of 'team' support and a lack of resources at a system, organisational and practice level, constrain nurse practitioner practice and integration of the role into practice settings.<sup>8,9,15</sup>

Nurse practitioners function in an advanced clinical role.<sup>9</sup> Some attempts have been made at quantifying the work of nurse practitioners. For example, Gardner et al<sup>2</sup> in 2010 divided the work of nurse practitioners into three domains of practice: direct care, indirect care and service-related activities. Within these domains nurse practitioners perform a variety of tasks. Reporting on such activity by way of performance outcome measures is a variable practice amongst nurse practitioners however numbers seen/occasions of service, waiting times, effectiveness of interventions, referral patterns, patient/client satisfaction, clinical quality of care indicators<sup>7,8</sup> are typical of the data maintained and reported by nurse practitioners to either justify their existence, embed their role service wide and/or contribute to workforce planning. Furthermore the orthopaedic nurse practitioner must effectively define and characterise the patient population to which they deliver care within the nurse practitioner's own scope of practice, ultimately to form an 'indicator' for the nurse practitioner role.

The international literature pertaining to nurse practitioners or advanced practice nurses<sup>21</sup> resonates with the many challenges faced by these nurses when it comes to role development and role implementation.<sup>1,2,5,6,7,22</sup> Furthermore there is a body of evidence that validates the effectiveness of these roles.<sup>1,2,5,22</sup> This becomes increasingly important in a context of building the health workforce of the future: a redefined workforce that must ensure adequate numbers of suitably qualified health workers who provide 'care the first time and every time'.<sup>23</sup>

A search of the Joanna Briggs Institute (JBI) Library of Systematic Reviews, Cochrane Library, PubMed and CINAHL has shown there are no existing or systematic reviews underway on this topic. The JBI undertook a systematic review commissioned by the Department of Health South Australia on Advanced Practice in Nursing and Midwifery and recommended a framework for advanced practice in a report released in early 2008.<sup>4</sup> The framework defined advanced practice, levels of advanced practice, scope of practice, credentialing, education, preparation and regulation of advanced practitioners. The search identified a published systematic review protocol in the JBI Library for a qualitative systematic review by Ramis looking broadly at the experience of advanced practice nurses working in acute settings.<sup>24</sup> The JBI Library of Systematic Reviews also contains a systematic review examining the effectiveness of nurse practitioners in residential aged care.<sup>25</sup> Whilst these publications provide valuable context to this review neither specifically examines the clinical practice of orthopaedic nurse practitioners.

Similarly a search of the Cochrane Library revealed a review on the topic of substitution of doctors by nurses in primary care.<sup>26</sup> The focus of this particular intervention review was neither specific to nurse practitioners nor the acute care setting, but the topic of 'doctor substitution' complements the practice of nurse practitioners and may be a consideration in this review. Doctor substitution or care provided by a nurse other than an orthopaedic nurse practitioner is a natural comparator when examining the role and practice of orthopaedic nurse practitioners.

Given the breadth of this topic a comprehensive approach has been chosen to systematically review the evidence as it relates to orthopaedic nurse practitioner role and practice.

## **Inclusion criteria**

### **Types of participants**

Nurse practitioner is an expanded form of advanced practice.<sup>11</sup> For the purpose of this systematic review the International Council of Nurses (ICN) definition<sup>20</sup> of nurse practitioner will apply whereby a Nurse Practitioner/Advanced Practice Nurse is defined as a Registered Nurse with expert knowledge, complex decision making skills and possessing competency for expanded practice. Importantly the practice of nurse practitioner/advanced practice nurse is characterised further by the “context and/or country” that they practice within.<sup>20</sup> Therefore an ‘orthopaedic’ nurse practitioner is defined in accordance with the above definition and with a specific scope of practice (as authorised) within a relevant and specific ‘orthopaedic’ setting.

The quantitative and qualitative components of this review will consider studies that include orthopaedic nurse practitioners in acute care or sub-acute orthopaedic settings.

The textual component of this review will consider publications that pertain to orthopaedic nurse practitioners in acute care or sub-acute orthopaedic settings, where there exists a particular focus on the ‘orthopaedic’ aspect of nurse practitioner practice.

### **Types of intervention(s)/phenomena of interest**

The quantitative component of this review will examine interventions of orthopaedic nurse practitioner specific care.

For this systematic review, orthopaedic nurse practitioner specific care refers to those aspects of care the orthopaedic nurse practitioner is responsible for and/or records as performance outcomes such as: occasions of service/numbers seen; time to and length of nurse practitioner consultation; time to nurse practitioner intervention; referral patterns and other measures of intervention effectiveness.

The qualitative component of the review will examine as phenomena of interest the experience of becoming or being an orthopaedic nurse practitioner in relation to role development, role implementation and (ongoing) role evaluation.

The text and opinion component of the review will examine opinions on the effectiveness and experience of nurse practitioners in orthopaedic settings including role development, implementation and evaluation of nurse practitioners in orthopaedic settings.

### **Types of outcomes**

The quantitative component of this review will consider as primary outcomes the following patient outcomes:

- patients’ level of pain
- pressure injury
- urinary tract infection
- patient satisfaction



- in-hospital patient mortality
- hospital readmission
- patients' health-related quality of life
- functional status
- malnutrition score
- constipation
- wound care/complications
- other clinical complications
- morbidity
- other patient encounter data that characterise orthopaedic nurse practitioner practice
- other relevant nurse-sensitive outcome data

The quantitative component of this review will consider as secondary outcomes the following nurse related outcomes or process indicators/outcomes:

- orthopaedic nurse practitioner satisfaction
- key stakeholder (health professional) satisfaction
- specialised knowledge/skill translation
- hospital length of stay
- cost benefit.

### **Types of studies**

The quantitative component of the review will consider both experimental and observational studies, such as randomised controlled trials (RCTs), analytical and descriptive observational studies (including cross sectional studies) for inclusion.

The qualitative component of the review will consider studies that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, action research and feminist research.

The textual component of the review will consider expert opinion, discussion papers, position papers and other text that discuss or describe the contemporary discourse related to nurse practitioner professional practice. The aspects of text with a particular focus on orthopaedic nurse practitioners will be considered for inclusion in the textual component of the review.

## Search strategy

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilised in this review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Only studies published in English will be considered for inclusion in this review.

Databases will be searched from inception to July 2012, to identify literature for inclusion in this review in order to capture the evolution and journey of the orthopaedic nurse practitioner role in its entirety.

In addition to MEDLINE and CINAHL, the databases to be searched include:

EMBASE, SCOPUS, Informat, PsycINFO, Nursing Consult, Academic Search Premier, Libraries Australia: The National Bibliographic Database, Australia/New Zealand Reference Centre.

Australian Government websites including: Australian Institute for Health and Welfare (AIHW), Department of Health and Ageing, National Health and Medical Research Council (NHMRC).

Other Australian organisational websites such as: Australian Healthcare Reform Alliance

Professional nursing associations for relevant policy and reports, position papers and editorials developed by (Inter)National Nursing Organisations (NNO) such as ICN, ANMC publications, AHPRA, NMBA, RCNA, ANMF, Coalition of National Nursing Organisations; specialist nursing interest groups/organisations with a particular interest in orthopaedic nursing namely ANZONA, NAON, SOTN, CONA and others.

Opinions may be sourced from: public policy documents such as AIHW, other grey literature sources of relevant web based information, theses/systematic review.

The search for unpublished studies will include: ProQuest Dissertations & Theses, Mednar, Conference Proceedings.

Initial keywords/search terms to be used will be:

1. Orthopaedic
2. Orthopedic
3. "orthopedics"[MeSH Term]
4. Musculoskeletal
5. Advanced practice nur\*

6. APN
7. Advanced nur\* practice
8. Nurse Practitioner
9. NP
10. Expanded practice nur\*
11. Extended practice nur\*
12. clinical nurse consultant
13. clinical nurse specialist
14. Effectiveness
15. Experience
16. Meaning
17. Barriers
18. Facilitators
19. Length of stay
20. LOS
21. Quality of life
22. QOL

## **Assessment of methodological quality**

Quantitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

Qualitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix II). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third

reviewer.

Textual papers selected for retrieval will be assessed by two independent reviewers for authenticity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix III). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

## **Data collection**

Quantitative data will be extracted from papers included in the review using the standardised data extraction tool from JBI-MAStARI (Appendix IV). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Qualitative data will be extracted from papers included in the review using the standardised data extraction tool from JBI-QARI (Appendix V).

Textual data will be extracted from papers included in the review using the standardised data extraction tool from JBI-NOTARI (Appendix VI).

## **Data synthesis**

Quantitative papers will, where possible, be pooled in statistical meta-analysis using JBI-MAStARI. All results will be subject to double data entry. Effect sizes expressed as relative risk for cohort studies and odds ratio for case control studies (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. A random effects model will be used and heterogeneity will be assessed statistically using the standard Chi-square test. Whilst it is common convention to use both meta-analysis methods, a random model based on the assumption that variability in effect measures are present in the primary data, will most likely best suit the data expected to be found in the types of studies under review. Where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Where possible, qualitative research findings will be pooled using JBI-QARI. This will involve the aggregation or synthesis of findings to generate a set of statements that represent that aggregation, through assembling the findings rated according to their quality, and categorising these findings on the basis of similarity in meaning. These categories are then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesised findings that can be used as a basis for evidence-based practice. Where pooling is not possible, the findings will be presented in narrative form.

Textual papers will be pooled using JBI-NOTARI. This will involve the aggregation or synthesis of conclusions to generate a set of statements that represent that aggregation, through assembling and categorising these conclusions on the basis of similarity in meaning. These categories are then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesised findings that can be

used as a basis for evidence-based practice. Where textual pooling is not possible, the conclusions will be presented in narrative form.

## **Conflicts of interest**

The author is endorsed as an orthopaedic nurse practitioner and therefore possesses an 'abiding interest' in the practice of orthopaedic nurse practitioners. Given the rigorous process of appraisal, extraction and pooling of data associated with the JBI process of the systematic review of evidence from quantitative, qualitative studies, narrative and text from opinion papers this poses no threat to the review.

## **Acknowledgements**

As this systematic review is submitted in partial fulfilment for the award of Master of Clinical Science, a secondary reviewer will only be used for critical appraisal. Professor Debbie Kralik, Supervisor, Dr Melanie Attard, Supervisor, Ms Lynda Staruchowicz, Secondary Reviewer

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**Appendix I Joanna Briggs Institute MASTARI critical appraisal instruments**

**JBI Critical Appraisal Checklist for Descriptive / Case Series**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include             Exclude             Seek further info

Comments (Including reason for exclusion)

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## JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                   Exclude                   Seek further info.

Comments (Including reason for exclusion)

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**Appendix II Joanna Briggs Institute QARI critical appraisal instrument**

**JBI QARI Critical Appraisal Checklist for Interpretive & Critical Research**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:  Include  Exclude  Seek further info.

Comments (Including reason for exclusion)

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**Appendix III Joanna Briggs Institute NOTARI critical appraisal instrument**

**JBI Critical Appraisal Checklist for Narrative,  
Expert opinion & text**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is the source of the opinion clearly identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Does the source of the opinion have standing in the field of expertise?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are the interests of patients/clients the central focus of the opinion?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the opinion's basis in logic/experience clearly argued?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is the argument developed analytical?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there reference to the extant literature/evidence and any incongruency with it logically defended?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the opinion supported by peers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include             Exclude             Seek further info

Comments (Including reason for exclusion)

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**JBI Data Extraction Form for  
Experimental / Observational Studies**

Reviewer ..... Date .....

Author ..... Year .....

Journal\_ ..... Record Number .....

**Study Method**

RCT                       Quasi-RCT                       Longitudinal

Retrospective                       Observational                       Other

**Participants**

Setting  
\_\_\_\_\_

Population  
\_\_\_\_\_

**Sample size**

Group A \_\_\_\_\_ Group B \_\_\_\_\_

**Interventions**

Intervention A  
\_\_\_\_\_

Intervention B  
\_\_\_\_\_

Authors Conclusions:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewers Conclusions:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Study results**

**Dichotomous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

**Continuous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

**JBI QARI Data Extraction Form for Interpretive & Critical Research**

Reviewer ..... Date .....

Author ..... Year .....

Journal\_ ..... Record Number .....

**Study Description**

Methodology

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Method

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Phenomena of interest

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Setting

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---

Geographical

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---

Cultural

---

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Participants

---

---

Data analysis

---

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Authors Conclusions

---

---

Comments

---

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Complete

Yes

No

Findings	Illustration from Publication (page number)	Evidence		
		Unequivocal	Credible	Unsupported

Extraction of findings complete

Yes

No

**Appendix VI Joanna Briggs Institute NOTARI data extraction instrument**

**JBI Data Extraction for Narrative, Expert opinion & text**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

**Study Description**

Type of Text:

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Those Represented:

---

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Stated Allegiance/ Position:

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Setting

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Geographical

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---

Cultural

---

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Logic of Argument

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Data analysis

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Authors Conclusions

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Reviewers Comments

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Data Extraction Complete

Yes

No



Conclusions	Illustration from Publication (page number)	Evidence		
		Unequivocal	Credible	Unsupported

Include

Yes

No

## Chapter 3

Chapter 3 comprises the comprehensive systematic review submitted for publication with the Joanna Briggs Institute Library of Systematic Reviews (JBISRIR). A statement of authorship precedes the copy of the review. The review presents data extraction and analysis, a discussion, and concludes with Implications for Practice and Research.

### 3.1 Statement of Authorship

## Statement of Authorship

Title of Paper	The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings: A Comprehensive Systematic Review		
Publication Status	<input type="radio"/> Published, <input type="radio"/> Accepted for Publication, <input checked="" type="radio"/> Submitted for Publication, <input type="radio"/> Publication style		
Publication Details	A Comprehensive Systematic Review submitted for publication in the Joanna Briggs Institute Library of Systematic Reviews (JBISIRIR)		

### Author Contributions

By signing the Statement of Authorship, each author certifies that their stated contribution to the publication is accurate and that permission is granted for the publication to be included in the candidate's thesis.

Name of Principal Author (Candidate)	Anita Taylor		
Contribution to the Paper	Primary and corresponding author; Conceptualisation, realisation and documentation of the report.		
Signature		Date	17/4/15

Name of Co-Author	Dr Kylie Porritt		
Contribution to the Paper	Supervised all aspects of report development. Assisted in data interpretation, report preparation and evaluation.		
Signature		Date	17/4/2015

Name of Co-Author	Professor Deb Kralik, in memoriam		
Contribution to the Paper	Supervised early aspects of report development and was pivotal in early theoretical conceptualisation of the work.  Sadly Professor Kralik passed away before this review was completed. RIP.		
Signature		Date	17/4/2015

Name of Co-Author			
Contribution to the Paper			
Signature		Date	

## 3.2 JBISRIR Comprehensive Systematic Review Report

A Comprehensive Systematic Review submitted for publication in the Joanna Briggs Institute Library of Systematic Reviews (JBISRIR)

# The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings: A Comprehensive Systematic Review

## Reviewers

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## Executive Summary

### Background

There is commonality amongst the definition and characteristics of Nurse Practitioner (NP)/Advanced Practice Nurse (APN) role and practice internationally in terms of education, practice standards and regulation; operationally there is variability. The Nurse Practitioner role has been implemented internationally; at least 70 countries are considering some form of APN role.<sup>ICN/APN network 2012 quoted in(1)</sup> Nurse Practitioners provide advanced clinical care and were implemented as part of health service reform to improve access and timeliness of healthcare.<sup>(2)</sup> This review will focus on orthopaedic nurse practitioners in an international context. Whilst much has been written on advanced practice nursing roles per se, little has specifically focused in the orthopaedic nursing context. This review will examine the outcomes associated with the APN/NP role and practice in orthopaedic settings.

## **Objective**

To appraise and synthesise the best available evidence on the experience and effectiveness of the role and practice of orthopaedic nurse practitioners.

## **Inclusion Criteria**

### *Types of Participants*

Orthopaedic Nurse Practitioner/Advanced Practice Nurse in acute care or sub-acute orthopaedic settings.

### *Types of Interventions*

Interventions of orthopaedic nurse practitioner specific care.

### *Phenomena of Interest*

The experience of becoming or being an orthopaedic nurse practitioner in relation to role development, role implementation and (ongoing) role evaluation.

### *Types of Studies*

This comprehensive systematic review looked at both quantitative and qualitative studies together with narrative text and opinion papers. Quantitative study designs included in this review included observational cohort/case control studies and descriptive case report/series. Qualitative study design was phenomenology. Mixed method studies were also included in this review.

### *Types of Publications*

The textual component of this review considered publications of expert opinion, discussion papers, position papers and other relevant text where there existed a particular focus on the 'orthopaedic' aspect of nurse practitioner practice.

### *Types of Outcomes*

A range of outcome measures were included but were not limited to primary patient outcomes: occasions of service/numbers seen, length of stay (LOS), wait times, patient satisfaction, readmission, and other patient encounter data or relevant nurse-sensitive outcome data that characterised orthopaedic nurse practitioner practice. Secondary and related outcomes data relative to process indicators/outcomes such as: NP satisfaction, key stakeholder (other health professional) satisfaction, knowledge, LOS, cost benefit were considered.

## **Search Strategy**

Both published and unpublished English language studies were considered from individual database inception and searched from September 2012 up to and including December 2012. The search was repeated in early 2013 to ensure no recent papers had been published. A three step search strategy was employed for each component of this review.

## **Methodological quality**

All retrieved studies and opinion papers were assessed by two independent reviewers using the standardised Joanna Briggs Institute critical appraisal tools. Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

## Data Collection

Quantitative data was extracted using the JBI-MAStARI tool. The data extracted included details about the interventions, populations, study methods and outcomes of significance to the review question.

Qualitative data was extracted using the JBI-QARI tool. The data extracted included details about the methodology, method, phenomena of interest, participants, data analysis and relevant findings.

Textual data was extracted using JBI-NOTARI tool. The data extracted included the type of text, stated allegiance or position, setting, geographical and cultural influences and messages and conclusions located within the publication.

## Data Analysis/Synthesis

Quantitative data was analysed using JBI-MAStARI. Meta-analysis of the quantitative data was not possible due to a lack of clinical and statistical heterogeneity; findings were presented in narrative format including tables to aid in data representation.

Qualitative data was analysed using JBI-QARI. Meta-synthesis of the qualitative data was not possible due to there being only one study; findings from the paper are presented in narrative format.

Textual data were synthesised using the Joanna Briggs Institute approach of aggregation using JBI-NOTARI.

## Results

A total 31 studies and publications were included in the review.

A total of 19 quantitative studies were included, 10 comparable cohort and 9 descriptive studies. Seven broad review outcomes measures were identified: Three of which were patient related (*primary*) outcomes and three nurse related (*secondary*) outcomes. Three sub category patient-related outcomes focussed on (1) specialist care interventions, (2) patient satisfaction/acceptance, (3) wait times and access to care. Another four sub category nurse-related or process-related review outcomes focussed on (4) education, (5) length of stay, (6) other cost-related issues and (7) barriers.

One unpublished qualitative thesis discussed four themes: (1) having knowledge, (2) being in and outside the role, (3) being an advocate and (4) being in control with decision making & anticipation as sub themes. The author concluded that advanced practice is a continuum.

Eleven text and opinion publications were included where 39 conclusions were identified. From these conclusions eight categories emerged and three synthesised findings: 'Duality', 'Role & Relationships' at a personal, organisational and professional level with an emphasis on collaboration, and 'Moving Forward' with an emphasis on resources needed to support the nurse practitioner in this.

## Conclusions

The findings of this comprehensive review demonstrate the experience and effectiveness of nurse practitioners in orthopaedic settings is influenced by multiple factors from within and external to the individual. Overall the results derived from quantitative evidence indicated that nurse practitioners in orthopaedic settings provide comparable care when compared to conventional methods of health care delivery: generally meaning care delivered by a clinician *other than* an ONP. However the results showed better outcomes in specific units where care is led by Clinical Nurse Specialists, NP management of distal radius fracture, and NP screening for developmental hip dysplasia. Decreased length of stay, improved patient wait times & access and patient satisfaction were demonstrated across the evidence, generally.

The qualitative and textual evidence demonstrated that the role of the ONP is multidimensional with confidence, knowledge and experience as essential elements to deal with complex and challenging situations. The experience of becoming or being an orthopaedic nurse practitioner is relational and collaborative at a personal, organisational and professional level. A 'duality' of purpose for ONP's emerged from the textual evidence with interplay between benefits and barriers to ONP practice. The experience of orthopaedic nurse practitioner is characterised by moving forward along a continuum.

**Keywords** Orthopaedic nurse practitioner, advanced practice nurse, extended practice, expert nurse, systematic review, effectiveness, experience

## Introduction

### Background

Nurse practitioner (NP) roles have emerged internationally in response to areas of unmet healthcare needs in a variety of settings. NPs first evolved in the United States 50 years ago in response to a shortage of primary health care physicians. NPs filled the void by providing access to primary health care services where otherwise there was none. This was often in underprivileged or under serviced areas including inner city areas; other minority populations, the uninsured; rural and remote areas; and the more vulnerable populations including the elderly and disabled.<sup>(82)</sup>

Internationally the definition and function of the NP varies across countries and the title is often used interchangeably with Advanced Practiced Nurse (APN) throughout the literature. There is often commonality between the NP/APN role and how it is practised, specifically in relation to level of education, practice standards and regulation of the role, however variation exists in how these specific roles are 'operationalised'. In the Unites States (US), NPs comprise one branch of advanced practice nursing (APN) along with Nurse Anaesthetists (NA), Clinical Nurse Specialists (CNS) and Nurse Midwives (NM).<sup>(7, 33)</sup> In 2013 it was reported that a total of 180 000 NP's were amongst the 230 000 APNs in the US.<sup>(34)</sup> In Canada the NP role was established in 1967 and in 2008 there were 1626 NPs in this role. (Canadian Institute for Health Information (CIHI) 2010 quoted in <sup>(36)</sup> In Canada the NP role also falls under the broader umbrella of APN which also includes clinical nurse specialists and is moving towards introducing nurse anaesthetists.<sup>(29)</sup> The NP role was introduced into the United Kingdom over 20 years ago and is much less regulated than North America. In the UK the NP is not a legislatively protected title meaning there is no minimum level of education and practice standards expected of the role.<sup>(1)</sup> Local managers have implemented these roles in various ways. Australia's progress with nurse practitioners has been informed by the experiences of the United States and United Kingdom<sup>(17)</sup> and for the most part there exists a parallel between the international experience and the Australian experience of nurse practitioners.

In 2002, the International Council of Nurses (ICN) developed a conceptual definition of NP/APNs. This definition served as a guide informing countries on how the roles could be developed. The definition states:

“A Nurse Practitioner/Advanced Practice Nurse is a registered nurse who has acquired the expert knowledge base, complex decision-making skills and clinical Competencies for expanded practice, the characteristics of which are shaped by the context and/or country in which s/he is credentialed to practice. A Master’s degree is recommended for entry level.”<sup>(83)</sup>

As new NP/APN roles developed over time, the ICN felt it necessary to enhance this definition and in 2009 made recommendations for a required level of education, the nature of practice and regulation of nurse practitioners.<sup>(84)</sup> Often the NP role is discussed within the literature from a broad view of what constitutes as a NP, however in clinical practice NPs often focus on a specialty area such as emergency department, mental health, aged care or orthopaedic NP.

The philosophical base to the NP/APN role is essentially one of caring based on nursing knowledge applied to a biopsychosocial model. Baer 1999 cited by<sup>(23)</sup> NP/APNs are educated to use the biomedical and physical sciences and also apply learning from the social sciences and person-environment interactions to inform [nursing] practice. Baer 1999 cited by<sup>(23)</sup> This is philosophically different from a medical approach to care. It is claimed within the literature that Nurse practitioners are not doctor substitutes, ‘mini doctors or maxi nurses’.<sup>(24)</sup> In fact, it is argued that this may undermine the professional identity of NP/APNs and other extended scope practitioners and may contribute further to [inter] ‘professional misunderstandings’; <sup>(23, 25)</sup> Further NPs provide a service that is qualitatively different to doctors.<sup>(12)</sup>

Globally, at least twenty five countries have implemented the NP role.<sup>(85)</sup> The majority of countries define the role and competency standards for the NPs but not for other APN roles.<sup>(21)</sup> APN roles have developed in response to the changing needs of healthcare, governments, society, demographics, workforce, consumerism, but this has occurred in a disorganised manner which has led to poorly defined roles and titles.<sup>(19)</sup> Whilst there is general agreement internationally on the APN role there is a need to clarify the differences between NP and APN roles<sup>(20)</sup> in order to inform health service decision makers, and inform educators and guide career planning.<sup>(21)</sup>

The international literature pertaining to NP/APNs resonates with the many challenges faced by these nurses when it comes to role development and role implementation.<sup>(2, 17, 22, 29, 30, 79, 86)</sup> There is a body of evidence that suggests the role of the NP and APN may be effective in improving health outcomes.<sup>(2, 13, 22, 29, 30, 32, 80, 81, 87)</sup> This bears relevance for designing the health workforce of the future where it is estimated there will be a medical shortage and maldistribution of physicians, an aging nursing workforce and citizens living longer due to advances in technology, but likely with the burden of chronic disease.<sup>(8, 62)</sup> The health workforce must redefine itself to ensure adequate numbers of suitably qualified health workers are delivering care.<sup>(31)</sup> The Registered Nurse role has been described as pivotal in building the future nursing workforce in order to ensure safe, quality and outcome driven care with further recommendations that the NP role may provide one alternative methods of healthcare delivery for the future .<sup>(62)</sup>

## **Justification for a comprehensive review**

A large number of research studies have been conducted examining the impact and progress of NPs/APNs generally. The existing evidence base surrounding these roles has focussed largely on whether these roles deliver equivalent or better care than routine care. Some studies have specifically



examined the effect of implementing NP/APN roles as a doctor substitute,<sup>(11, 80, 88, 89)</sup> while others have examined the economic benefits of the NP/APN role.<sup>(32, 90, 91)</sup>

In addition to research studies there are a number of broad literature reviews that have been conducted claiming that equivalent care is delivered by nurse practitioners in relation to specific settings such as midwifery,<sup>(88)</sup> acute care/ICU<sup>(92)</sup> and primary care /general practitioner (GP).<sup>(13, 87)</sup>

More recently systematic reviews of the evidence have been conducted. These reviews demonstrated:

- Horrocks et al (2002) Cochrane systematic review of RCT and prospective observational studies found NPs in primary care achieve similar health outcomes, better patient satisfaction and quality of care (low to moderate evidence); longer consultations, more investigations, no difference with prescriptions, return visits or referrals (moderate quality evidence).<sup>(13)</sup>
- A Cochrane review by Laurant et al (2009) looked at substitution of doctors by nurses (practice nurses, NP, CNS, APN) in primary care. Findings suggested that appropriately trained nurses can produce as high quality care as primary care doctors and achieve as good health outcomes. Limitations existed.<sup>(11)</sup>
- Newhouse et al 2011 systematic review of RCT & observational studies between 1990-2008 in US supported “a high level of evidence existed that APRNs provide safe, effective quality care to a number of specific populations in a variety of settings ... and have a significant role in the promotion of health”.<sup>(32)</sup>
- A systematic review in midwifery by Johangten et al, 2012 provided evidence that care by Certified Nurse Midwives (CNM) is safe and effective when quantitatively comparing processes or outcomes of care of CNMs and physicians.<sup>(88)</sup>
- Ramis, 2012 JBI qualitative systematic review examined evidence around the self-reported experience of being an advanced practice registered nurse in Australian acute care palliative and orthopaedic settings. The review extracted 216 findings from 4 studies which formed 18 categories and arrived at six metasyntheses: (1) expert knowledge, (2) confidence, (3) education, (4) relationships, (5) negative experiences and (6) patient centred experience. Furthermore the report concluded that advanced nursing practice in Australia is complex and influenced at a personal and professional level by the organisation and the unpredictable nature of working with people.<sup>(8)</sup>

There are significant studies that have demonstrated equivalent care delivered by nurse practitioners according to setting:

- Kinnersley et al in 2000 confirmed in a RCT of nurse practitioner versus general practitioner care for patients requesting “same day” consultations in primary care in southern UK, that nurse practitioners provided longer consultations, gave more information, and patients were generally more satisfied. Otherwise no differences for a range of other outcomes were shown including resolution of symptoms & concerns and prescribing<sup>(93)</sup>
- A non-randomised study showed a team of ACNP & attending physician produced equivalent care in a subacute ICU when compared to a team of attending physician & critical care/pulmonary fellow.<sup>(92)</sup>

Kleinpell (2005) - A longitudinal study in US ICU showed that over a five year period Acute Care Nurse Practitioners (ACNP) were more autonomous; their role and practice had expanded; trust increased from physicians and staff, and an increase in ACNP confidence, skills & knowledge occurred.<sup>(80)</sup>Or country:

- The SCAPE study (2010), a mixed methods study evaluated Clinical Nurse and Midwife Specialist and Advanced Nurse and Midwife Practitioner Roles in Ireland concluded such roles are “key and influential” and have a “positive” effect on patient/client care, other staff and health services, considerable benefits with no difference in cost of services.<sup>(91)</sup>
- the CIE Responsive patient centred care report, 2013 commissioned by the Australian College of Nurse Practitioners (ACNP) looked at economic value and potential in Australia of NPs and found NPs provide an essential service, positively impact care, decrease wait times & LOS, beneficial patient satisfaction, reduce avoidable hospital readmissions, improve hospital efficiency. Whilst duplication and missed opportunities (outreach services, MBS, collaboration) exist.<sup>(94)</sup>

However a comprehensive and specific review of these advanced roles in orthopaedic nursing has not occurred to date. While the evidence base continues to build around the impact of NP/APN roles, it is important for orthopaedic nurses to understand the implications of these roles within orthopaedic nursing in order to ultimately inform the specialty. As orthopaedic nurse practitioners (ONP) can practise in a variety of clinical settings (emergency department, fracture clinic, orthopaedic hospital wards, primary care settings etc) this review examined all settings where ONPs practice.

The aim of this systematic review is to examine the evidence of the experience and effectiveness of nurse practitioners across international orthopaedic settings.

## **Review Question/Objective**

The objective of this systematic review was to identify, assess and synthesises the best available evidence on the experience and effectiveness of nurse practitioners in orthopaedic settings.

Specifically the quantitative component of this review aimed to synthesise the best available evidence on effectiveness of orthopaedic nurse practitioner specific care on patient outcomes and process indicators.

The qualitative component of this review aimed to synthesise the best available evidence on the experience of becoming or being an orthopaedic nurse practitioner in relation to role development, role implementation and (ongoing) role evaluation.

The text and opinion component of this review aimed to synthesise the best available evidence of the contemporary discourse on the effectiveness and experience of nurse practitioners in orthopaedic settings.

## **Inclusion criteria**

### ***Types of participants***

This review considered studies that included orthopaedic nurse practitioners. For the purpose of this systematic review the International Council of Nurses (ICN) definition of nurse practitioner was applied whereby a Nurse Practitioner/Advanced Practice Nurse is defined as a Registered Nurse with expert knowledge, complex decision making skills and possessing competency for expanded practice. The practice of nurse practitioner/advanced practice nurse is characterised further by the “context and/or country” that they practice within.<sup>(4)</sup> Therefore an ‘orthopaedic’ nurse practitioner is defined in accordance with the above definition and with a specific scope of practice (as authorised) within a relevant and specific ‘orthopaedic’ setting.

### ***Types of Intervention(s)/Phenomena of Interest***

The quantitative component of this review examined interventions of orthopaedic nurse practitioner specific care. For this systematic review, orthopaedic nurse practitioner specific care referred to those

aspects of care the orthopaedic nurse practitioner is responsible for and/or records as performance outcomes such as but not limited to: occasions of service/numbers seen; time to and length of nurse practitioner consultation; time to nurse practitioner intervention; referral patterns and other measures of intervention effectiveness.

The qualitative component of the review examined as a phenomenon of interest the experience of becoming or being an orthopaedic nurse practitioner in relation to role development, role implementation and (ongoing) role evaluation.

The text and opinion component of the review examined opinions on the effectiveness and experience of nurse practitioners in orthopaedic settings including role development, implementation and evaluation of nurse practitioners in orthopaedic settings.

### ***Setting***

The quantitative and qualitative components of this review considered studies that included nurse practitioners in acute care or sub-acute orthopaedic settings. Setting included emergency departments, hospital ward areas, outpatient or ambulatory care departments or primary care settings where orthopaedic care delivered by nurse practitioners was transacted and extended to the international context of Australia, UK and US where a westernised system of healthcare was undertaken.

The textual component of this review considered publications that pertained to orthopaedic nurse practitioners in acute care or sub-acute orthopaedic settings, where there existed a particular focus on the 'orthopaedic' aspect of nurse practitioner practice. Similar setting to the above were employed in this review.

### ***Comparators***

This systematic review considered 'doctor substitution' or care provided by a nurse other than a nurse practitioner as a natural comparator to orthopaedic nurse practitioner specific care. The United States in particular uses the term 'mid-level provider' to describe a non-physician clinician such as 'physician assistant' or nurse practitioner, that is a health professional providing health services to the same patients.<sup>(95)</sup> It was expected physiotherapists, and other extended scope practitioners would be comparators in this review but this was not the case as the studies on these roles did not meet inclusion criteria for the review. One paper on physician assistants was included.

### ***Types of Outcomes***

The quantitative component of this review considered the following patient outcomes: patients' level of pain, pressure injury, urinary tract infection, patient satisfaction, in-hospital patient mortality, hospital readmission, patients' health-related quality of life, functional status, malnutrition score, constipation, wound care/complications, other clinical complications, morbidity, other patient encounter data that characterised orthopaedic nurse practitioner practice and other relevant nurse-sensitive outcome data.

The qualitative and textual component of this review considered nurse related outcomes or process indicators/outcomes: orthopaedic nurse practitioner satisfaction, key stakeholder (health professional) satisfaction, specialised knowledge/skill translation, hospital length of stay, cost benefit.

### ***Types of Studies***

The quantitative component of the review considered both experimental and observational studies, such as randomized controlled trials (RCTs), analytical and descriptive observational studies (including cross sectional studies) for inclusion.

The qualitative component of the review considered studies that focused on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, action research and feminist research.

The textual component of the review considered expert opinion, discussion papers, position papers and other text that discuss or describe the contemporary discourse related to nurse practitioner professional practice. The aspects of text with a particular focus on orthopaedic nurse practitioners were considered for inclusion in the textual component of the review.

## **Search Strategy**

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilised in this review. An initial basic search of Pubmed/MEDLINE and CINAHL was undertaken to test search terms, followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe that particular article. A second search using all identified keywords and index terms was then undertaken across all included databases. Thirdly, the reference list of all identified reports and articles were searched for additional studies. Only studies published in English were considered for inclusion in this review.

International nomenclature associated with advanced practice nursing roles varies dramatically. This aspect of the search proved particularly challenging when agreeing on a set of search terms that would adequately interrogate each database and ultimately yield meaningful articles. Given the indexing idiosyncrasies of each database a 'string search' strategy was used and modified according to each database's sensitivity to the particular search term and developed from: (1) orthop[a]edic (2) nurse practitioner (3) advanced practice nurse and modified according to individual database sensitivity to terms. Grey literature search terms included (1) orthopaedic nurse practitioner OR (2) nurse practitioner OR (3) orthop[a]edic OR (4) nurse. (Refer Appendix I for logic grid and detailed search strategy).

Databases were searched from inception to December 2012, to identify literature for inclusion in this review and allowed the evolution and journey of the orthopaedic nurse practitioner role to be captured. Citations began to proliferate within the literature around the mid 1980's. It was deemed reasonable to look for studies from database inception as it was anticipated this would capture the beginnings of the nurse practitioner movement. The search for relevant papers was conducted between September 2012 and December 2012. The search was repeated in early 2013 to ensure no recent papers had been published.

In addition to PubMed/MEDLINE and CINAHL, the databases searched included:

EMBASE

PsycINFO

SCOPUS

Informit

Nursing Consult

Academic Search Premier

Australia/New Zealand Reference Centre

Google Scholar

Cochrane Library

Initial keywords were: Orthopaedic, Orthopedic, "orthopedics"[MeSH Term], Musculoskeletal, Advanced practice nur\*, APN, Advanced nur\* practice, Nurse Practitioner, NP, Expanded practice nur\*, Extended practice nur\*, clinical nurse consultant, clinical nurse specialist, Effectiveness, Experience, Meaning, Barriers, Facilitators, Length of stay, LOS, Quality of life, QOL.

## **Methods of the Review**

### **Assessment of methodological quality**

All papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review. In addition to the critical appraisal tool a checklist developed specifically for this review was used on each paper to ensure inclusion and exclusion criteria were being met (Appendix 2). The Joanna Briggs institute standardised critical appraisal instruments were used. Quantitative studies were assessed using the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix 3). Qualitative studies were assessed using Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix 4). Textual and opinion papers were assessed using the Joanna Briggs Institute Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix 5). A third party was required for one paper where disagreement on inclusion arose between the reviewers.<sup>(96)</sup>

### **Data Extraction**

Quantitative data was extracted from studies included in the review using the standardised data extraction tool from JBI-MASARI (Appendix 6). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Qualitative data was extracted from studies included in the review using the standardised data extraction tool from JBI-QARI (Appendix 7). The data extracted included details about the methodology, method, phenomena of interest, participants, data analysis and relevant findings. Textual data was extracted from papers included in the review using the standardised data extraction tool from JBI-NOTARI (Appendix 8). The data extracted included the type of text, stated allegiance or position, setting, geographical and cultural influences and messages and conclusions located within the publication.

### **Data Synthesis**

Clinical and statistical heterogeneity between the studies (specifically in relation to the populations studied and the analysis undertaken) prevented a meta-analysis from being conducted. Quantitative data are presented in narrative form including tables to aid in data presentation. Data reported in narrative format was of dichotomous and continuous in nature.

Qualitative research findings emanated from one study only, therefore pooling of data using JBI-QARI was not required.

Textual papers were pooled using JBI-NOTARI. This involved the aggregation or synthesis of conclusions to generate a set of statements that represented that aggregation, through assembling and categorising these conclusions on the basis of similarity in meaning. These categories were then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesised findings that can be used as a basis for evidence-based practice.

# Results

## Description of studies

The systematic search uncovered 1066 citations of which 663 were duplicates. After removal of duplicates, the title and abstract of 403 citations were assessed for applicability to inclusion criteria. As a result, a total of 335 citations were not selected for full text retrieval. A total of 68 papers were retrieved for critical appraisal. Thirty-nine (39) papers were excluded as either not meeting the quality for inclusion or unable to be retrieved (Appendix 9). Following full text examination thirty one (31) papers were selected for inclusion (Appendix 10). The search process is listed below in Figure 1.

Of the 68 papers assessed for methodological quality two papers employed a mixed methodology with the data contained therein assessed separately using the appropriate JBI critical appraisal processes.

Throughout the critical appraisal process agreement was reached by the reviewers for all papers except for one where third party input was required.<sup>(96)</sup> The included studies comprised:

- 10 cohort studies (6 prospective<sup>(97-102)</sup> & 4 retrospective<sup>(103-106)</sup>) and
- 9 case series (8 prospective<sup>(17, 26, 107-112)</sup> & 1 retrospective<sup>(113)</sup>)
- 1 unpublished thesis<sup>(75)</sup>
- 11 text/opinion papers.<sup>(95, 96, 114-121)</sup>

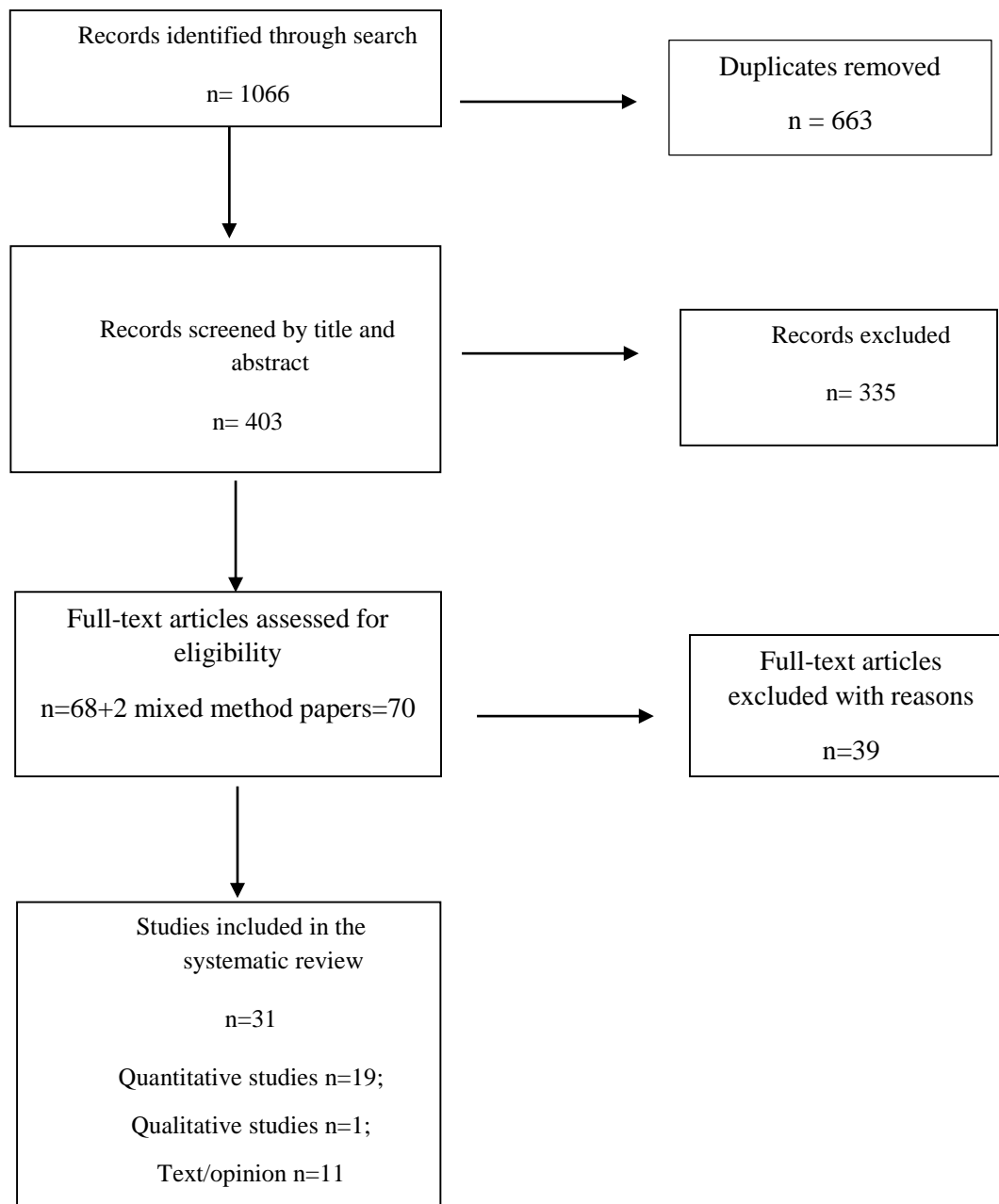


Figure 2: Flow chart illustrating the study assessment & selection process

## Methodological quality and context of included studies

### **Quantitative Evidence**

Nineteen quantitative studies were included in this review: ten comparable cohort studies and nine case series. There was a lack of clinical heterogeneity but similarities occurred in terms of NP practice interventions of orthopaedic nursing care where the studies focussed on NP management of neonatal infants with hip dysplasia, joint arthroplasty patients (THR/TKR), upper limb conditions: forearm fracture in the young, wrist fracture in an older population, carpal tunnel syndrome; non-emergent spinal conditions, osteoporosis, trauma and Emergency Department (ED) care. Studies also focussed on NP practice and compared care from: CNS to routine care, junior nurses with senior nurses, advanced nurse to doctor. Practice functions included pain management, radiology ordering practices and use of teleconsultation and teleradiology, billing practices and other practice patterns.

All of the 19 quantitative papers included in this systematic review received a level 3 and 4 evidence when critiqued for methodological validity.<sup>(3)</sup> Included studies achieved a 'Yes' for at least five of the nine critical appraisal questions, and most papers achieved 'Yes' for seven questions. Agreement was reached on all quantitative papers following discussion between the reviewers (Appendix 11).

### **Qualitative Evidence**

One qualitative paper was selected and critiqued for congruency. The included paper demonstrated a high level of congruency with ten out of a possible ten questions reporting a 'Yes'(Y) for the critical appraisal checklist (Appendix 12). The unpublished research dissertation<sup>(75)</sup> achieved level 3 qualitative evidence rating.<sup>(3)</sup>

### **Text & Opinion Evidence**

A total of eleven text/opinion papers were included in this systematic review; all papers were of level 5 evidence.<sup>(3)</sup> Included papers achieved a 'Yes' (Y) response for at least five items on the critical appraisal checklist when critiqued for authenticity, with the majority gaining 'Yes' for six or seven of the seven questions in total. One paper<sup>(115)</sup> achieved an equivocal assessment (3Y, 3N, 1U - unclear) by the primary reviewer but was included after discussion with the secondary reviewer (Appendix 13). Agreement was reached on all but one paper following discussion by the reviewers. A third reviewer considered the expert opinion paper in question<sup>(96)</sup> and confirmed it met inclusion criteria; the paper proceeded to critical appraisal.

Publication dates for ten of the included papers spanned a twenty year period (1992-2012) with only one paper outside of this range (1982).

An understanding of the context of the included textual papers is important to assist with the interpretation and implementation of findings. The following section describes the context of each of the included papers.

*Garvey, JL & Rottet, S. 1982 Expanding the hospital nursing role: an administrative account, Journal of Nursing Administration, 12(12): pp 30-35.*<sup>(115)</sup>

This paper presented a nurse manager's perspective of an early experience implementing an expanded orthopaedic nursing role. It introduced concepts of: serendipity and expanded roles emerging from the incumbent's practice interest, establishing need and clear expectations, communication of new roles and multi-departmental visibility, the value of a marketing strategy, succession plan, ongoing report back to team, overcome obstacles, positive effects.<sup>(115)</sup>



*Bocchino, CA. 1992 Assistants-at-surgery: recognition of the role of the registered nurse, Orthopaedic Nursing, 11(3): pp41*

This author mounted an argument on behalf of the Registered Nurse First Assistant-at-Surgery (RNFA), an advanced practice role in the US, for a work value case that linked economics with professional role recognition. A debate unique to North America but with broad application in challenging APNs to standardise education, limit variation in practice [of billing practices in US], collect data to support APN cost effectiveness in order to challenge the strength of organised medicine.<sup>(114)</sup>

*Van Keuren, KS. 1982 An Inpatient NP's Perspective on Expanded Roles for Nurses, Nurse Practitioner, 17(12):25-8*

his paper is a published letter to the editor of a nurse practitioner journal, written from the perspective of an inpatient NP commenting on expanded roles and the influences on them that included: collaboration, peer support, role complexity, increased responsibilities, naivety of others about the role, resistance from others, potential for new business opportunities.<sup>(120)</sup>

*Smrcina, C. 1993 Licensure of advanced practice nursing: what's our position? Orthopaedic Nursing, 12(1):pp9-13*

The context of this paper was to frame a position opposing secondary licensure of advanced practitioners as restrictive to the practice of NPs in the US, by the president of NAON in their sponsored journal. The paper outlines the benefits and barriers to practice: physicians, reimbursement practices, poor consumer awareness, limited education opportunities.<sup>(119)</sup>

*Gates, SJ. 1993 Continuity of care: the orthopaedic nurse practitioner in tertiary care, Orthopaedic Nursing 12(5):pp48*

A recommendation to orthopaedic nurses for a model of role development and evaluation (factors, process requirements & strategies) of ONP roles was central to this paper. Features of the role included: collaborative/cooperative model, strong and clear nursing identity, administrative budgetary support, sell the concept, clear NP delineation of role, not trapped as physician extenders in a medical model, functions and responsibilities, success equals acceptance, importance of education.<sup>(116)</sup>

*Dowling, S. 1997 Life can be tough for the inbetweenies, Nursing Times, 93(10):pp27-8*

The paper from the UK, was a career development article written by a university academic that discusses the concept of 'inbetweenness' of the work and behaviour of new professional roles including ONPs. Issues included: work satisfaction, trailblazing as stimulating to the ONP, stress associated when assuming roles previously held by doctors, justify role and function, hostility from other staff groups, professional isolation & blurred professional boundaries, jeopardised careers, complaints and legal implications.<sup>(122)</sup>

*Wakeman, R., Sheard, PD. & Jenner, GH. 2004 Ortho-geriatric liaison--the missing link? Journal Bone & Joint Surgery, 86(5):pp636-8*

A written annotation published in an orthopaedic medical journal supporting the nurse practitioner role in an orthogeriatric model of care, from a medical perspective.<sup>(121)</sup>

*Hooker, RS. 2006 Physician assistants and nurse practitioners: The United States experience, The Medical Journal of Australia, 185(1):pp4-7*

A summary of the United States experience with physician assistants and nurse practitioners published in a broad-reaching Australian medical journal. The article was entitled 'task transfer' and coincided with a

consideration of introducing this category of worker into Australian healthcare. The paper reported PAs and NPs delivered services in US at a productivity level (90%) comparable to that of a traditional doctor.<sup>(95)</sup>

*Lucas, B. 2009 Journal of Orthopaedic Nursing, The Emergence of specialist orthopaedic Nurses and nurse-led pre-operative assessment in the 1990*

This paper, from the UK, provides a historical description of the development of an advanced nurse role in orthopaedic nurse-led pre-operative, joint arthroplasty assessment clinic. The paper acknowledges that expanded roles developed from a number of circumstances such as reduced medical hours, local circumstances and politics.<sup>(118)</sup>

*Schlachta-Fairchild, L., Varghese, SB., Deikman, A. & Castelli, D. 2010 Telehealth and Telenursing Are Live: APN Policy and Practice Implications, The Journal for Nurse Practitioners 6(2):pp98-106*

The authors of this clinical education paper present an authoritative account of telenursing and provides policy considerations and recommendations for practice. The paper provides evidence of APN's conveying caring in telenursing and the importance of patient connectedness.<sup>(96)</sup>

*Judd, J. 2013 Identifying ways to improve the health pathway of a child with a musculoskeletal problem: A comparison of practice of midlevel providers in the United States of America (USA) and the United Kingdom (UK) International Journal of Orthopaedic and Trauma Nursing 17:pp 131-9*

The this paper from the UK describes the study tour observations of a British advanced nurse practitioner from a paediatric musculoskeletal clinic visiting leading centres of paediatric orthopaedic excellence in US. The author comments on doctor substitution, politics and billing, team support, educational preparation as important observations from her visit. The visit allowed the nurse to reflect on the efficacy of her own role.<sup>(117)</sup>

Included papers are listed in Appendix 10.

## **Findings of the Review**

### **Quantitative Findings**

Ten comparable cohort studies<sup>(97-106)</sup> and nine descriptive studies<sup>(17, 26, 107-113)</sup> were included in the systematic review. Due to a lack of clinical and statistical heterogeneity amongst the studies a meta-analysis was unable to be conducted. Findings are presented in narrative format. Included studies examined care pre and post the intervention of ONP care. Comparators included conventional nursing care or routine medical care.

Fifteen studies discussed specialist care interventions related to the ONP in an orthopaedic clinical setting. The patient related outcomes from these studies are presented in terms of the impact of ONP care according to clinical area: joint arthroplasty, radiological assessment, fracture care, osteoporosis, hip dysplasia, spine, carpal tunnel, pain management and trauma. The outcomes reported on include: access & wait times, clinical accuracy, screening rates, treatment initiation & management, surgical outcome, complications, quality of care, satisfaction/acceptance. Nine studies discussed nurse or process related outcomes associated with ONP care. The impact of secondary nurse-related or process (of care) related outcomes focussed on education, cost-related issues such as LOS and barriers to ONP practice.

### **Impact of ONP Care in Joint Arthroplasty:**

*Outcomes: Access & Wait times, Surgical Targets, Quality of Care*

Four studies examined joint arthroplasty patients. Only one of the four studies conducted on joint arthroplasty patients examined ONP assessment. A questionnaire was administered two months apart and the scores compared (refer Table 1).<sup>(101)</sup> The 'pivot nurse' in the outpatient clinic reviewed osteoarthritis sufferers of hip and knee and other elective surgical patients. The pivot nurse (in an 'extended' role) triaged new referrals of THR/TKR patients to the appropriate interdisciplinary health professional. It was extrapolated from 89 patient questionnaires compared to 202 returned questionnaires in the control group, that a clinic with a pivot nurse was more accessible (decreased wait time from 36.21 to 8.17 weeks), provided high quality of care (increase in the score from 5.66% to 16.64% in quality of life years (QALY)) and target surgeries reached (68THR & 108TKR).<sup>(101)</sup> The two surveys relating to patient satisfaction and quality of life administered in this cross sectional, comparative study were well validated. The populations were similar. A reported limitation of the study was the concept of inter-disciplinarity and the difficulty distinguishing the contribution of the pivot nurse in this context. However the results suggested the clinic with the pivot nurse was more effective.

*Table 1: Outcomes of ONP Assessment in Joint Arthroplasty: Access & Wait times, Surgical Targets, Quality of Care*

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Poder <sup>(101)</sup>  Canada	Prospective cross-section comparative study	survey via 2 repeated questionnaire; cost analysis data from admin services	332 TKR/THR patients attending inter-disciplinary outpatient clinic @ 1st clinic	Case study: 89 TKR/THR patients triaged by pivot nurse ↓ inter-d health worker	Case control: 243 TKR/THR patients not triaged – all saw consultant @ 1 <sup>st</sup> clinic	↓ wait time 1 <sup>st</sup> consult (36.21 to 8.17 weeks); ↑ access (4X shorter than control) ↑ pt satisfaction w/ wait 1 <sup>st</sup> apt (2.06vs2.46) ↑pt satisfaction w/clinic (mean1.49vs1.37 (aim closer to 1)) ↑ quality o' care (nil sig Δ QALY: 5.66% to 16.64%) Projected Surgery targets met 2008: 68THR & 108TKR

### *Outcome: Complications*

An unpublished thesis<sup>(106)</sup> compared 2 hospital wards with CNS roles and two units without. The units were comparable as were the patient populations (TKR). Charts of 128 randomly chosen TKR patient were retrospectively analysed. One of the outcome variables in the study examined the number of preventable complications. The complication rate of patients on units with CNS was 9% (n=6) and 26% (n=17) respectively without a CNS. Complications included respiratory infection/pneumonia, deep vein thrombosis, skin breakdown, foot drop/contracture, surgical wound infection. There were eleven cases of 'other' complications of UTI, bleeding, fever, drug overdose seen only on the unit with no CNS. Complication rates were correlated with process of care instruments. As more nursing interventions took place, as on the unit with CNS, complications decreased. This was the case for the process instrument

score for disuse (HRDSI where  $r=-.21, p<.05$ ) and total process instrument scores (TPI where  $r=-.18, p=0.04$ ); but not for the pain score (APPI where correlation coefficient or  $r=-.09, p=.05$ ), that is nursing interventions to decrease post-op pain were not related to the number of complications. Refer Table 2 below for Mean scores. The thesis suggested that less complications on units with CNS may be “indicative of better or more appropriate nursing care” (p58) and quotes Donabedian’s framework for assessment of quality of care using structure, process and outcome variables as a premise to the study; (p.i) TKR patients on units with CNS had better patient outcomes than units without. Supporting the author’s claim that CNS efficacy leads to better patient outcomes, improved quality of care and decreased cost.

Implementation of a pathway for THR/TKR patients reported that a pathway supported by the NP achieved a decrease in LOS, better patient discharge to home without increasing cost, number of complications and patient dissatisfaction. No detailed data on complications nor satisfaction were presented.<sup>(102)</sup> (Table 2)

Table 2: Complications in Joint Arthroplasty

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Wheeler <sup>(106)</sup>  USA	Retro-spective cohort	Chart audit & Investigator-designed process instruments	128 randomly chosen TKR patients	2 orthopaedic unit-based CNS (n=64)	2 orthopaedic units without CNS (n=64)	↓ In-hospital Complications (9% vs 26%)  ↑ Process of Care ‘interventions’: (APPI+HRDSPI=TPI) (MeanTPI:140.44 (SD.9.10)with CNS vs 102.16 (SD.14.49)without CNS
Walter <sup>(102)</sup>  USA	Prospective data collection  consecutive patients - 1 year pre; 3 years post	Patient data forms & hospital’s financial database	1680 THR/TKR patients	.455, per FY 2001-2003 THR/TKR NP supported pathway Post-imp <sup>n</sup>	315(2000) THR/TKR Pre-pathway	NIL ↑ complications NIL ↑ readmissions

#### Outcome: Quality of Care

This same study retrospectively assessed the success of the pathway over a three year implementation period for both THR and TKR patient groups. Pre and post data collection from the groups were compared by independent *t* tests at 95% confidence level and confirmed a percentage level increase in direct discharge to home from 62% to 72%. This minimised burden on the rehabilitation sector, decreased LOS and early discharge meant there were more beds available to admit new patients to sooner. The authors claimed they had “preserved” quality of care through these factors whilst not compromising patient complications, satisfaction or safety.<sup>(102)</sup>

Four studies in total reported on a quality of care outcomes,<sup>(101, 106, 110, 111)</sup> two of which focussed on the joint arthroplasty population and are presented in Table 3.<sup>(101, 106)</sup>

A comparative cohort compared a case study clinic via two survey questionnaires (n=202/243 & n=83/243) with a case control clinic (n=89/89 & n=53/89) trialling a new design of care. A ‘pivot nurse’ triaged patients with elective surgical musculo-skeletal problems to an appropriate health professional (as opposed to the consultant as had been the case previously). Patients were polled at two time points with a specific questionnaire on Quality of Life (SF36v2) including a Quality of Life Years (QALY) component,

scores showed the quality of care remained high in the clinics with or without the pivot nurse but more improvement observed in the pivot nurse clinic. The two population samples were not matched. A difference was recorded in quality of life scores at the outset. Despite this variation, when the questionnaire was re-administered two months later, a positive change which indicated improvement (in mental, physical & QALY scores) in all samples was recorded (increase of 16.6% QALY for the pivot nurse clinic vs 5.66%;  $t$  test  $p^* .120$ ).<sup>(101)</sup> Quality of Life Years (QALY) and a Quality of Life patient satisfaction questionnaire (SF36v2) were well validated tools chosen to measure the effectiveness of a pivot nurse who would triage joint arthroplasty patients to the appropriate health professional for their first clinic appointment. There was no statistically significant change in these scores between the case control and case study clinics. The populations were similar and slight demographic differences were described. Other potential for bias was described. Elective surgery target data was also supplied to add to the quality of care argument. Table 3.<sup>(101)</sup>

An unpublished thesis examined differences in nursing care between two orthopaedic units with CNS and two orthopaedic units without a CNS. TKR patients on units with clinical nurse specialists (CNS) had better patient outcomes than units without. Data was gathered on process variables. Scores from process of care instruments (APPI(pain); HRDSPI(disuse); TPI(sum of both)) for 128 TKR patients were correlated against the number of preventable complications. No relationship existed between the number of complications and pain (APPI score) ( $r=-.09, p>.05$ ) but a significant negative correlation was demonstrated when comparing number of complications against disuse (HRDSI) ( $r=-.21, p=.02$ ), and the total process indicator (TPI) ( $r=-.18, p=.04$ ).<sup>(106)</sup> There were a higher number of process of care interventions (in the first 24 hours) on the units with CNS so it was therefore predicted the higher number of nursing interventions equated to better quality care (quality of care = number of care activities recorded by the nurse). This was tested against data such as complication rate. The process instruments were designed by the researcher and content validity tested by six reviewers. Limitations reported in this study were: unknown aspects of the 4 different units, retrospectivity, the vagrancies of chart audit - for example one unit nursing documentation occurred by exception, samples similar but not all differences known to the researcher, inability to generalise the complication data due to low incidence. Refer Table 3.<sup>(106)</sup>

Table 3: Quality of Care in Joint Arthroplasty

Study	Design	Method	Participant	Interven <sup>n</sup> A	Interven <sup>n</sup> B	Results
Poder <sup>(101)</sup>  Canada	Prospective cross-section comparative study	survey via 2 repeated questionnaire; cost analysis data from admin services	332 TKR/THR patients attending inter-disciplinary outpatient clinic @ 1st clinic	Case study: 89 TKR/THR patients triaged by pivot nurse ↓ inter-d health worker	Case control: 243 TKR/THR patients not triaged – all saw consultant @ 1 <sup>st</sup> clinic	↑ quality of care (nil sig Δ QALY: 58 observations=5.66% to 51 observations=16.64%) Projected Surgery targets met 2008: 68THR & 108TKR
Wheeler <sup>(106)</sup> 1998 USA	retrospective cohort	Chart audit & Investigator-designed process instruments	128 randomly chosen TKR patients	2 orthopaedic unit-based CNS (n=64)	2 orthopaedic units without CNS (n=64)	quality of care = better pt outcomes on units with CNS: ↓ LOS (0.77 vs 1.78) ↓ TLOS +rehab (4.87 vs 6.84) ↓ In-hospital Complications (9% vs 26%) ↑ Process of Care 'interventions': (APPI+HRDSPI=TPI) (140.44 vs 102.16)

### *Outcome: Satisfaction/Acceptance*

Two studies looked at patient satisfaction for joint arthroplasty patients<sup>(101, 107)</sup>; one retrospectively. Refer Table 4.

In a Canadian clinic, 89 patients facing elective surgery answered a set of 25 questions about their satisfaction with the clinic where a 'pivot nurse' triaged their ongoing care. Their responses were compared to 243 patients in a case study clinic without a 'pivot nurse'. The questionnaires were administered at separate time points, two months apart for all patients (unmatched). The simple average difference was reported. Satisfaction with the case control clinic from 60 observations was a mean of 1.37 (where the higher the score is to one, the more the patients are satisfied). This was compared to the case study clinic with 48 observations generating a mean of 1.49. Greater satisfaction with the pivot nurse clinic was obtained with waiting time to first clinic visit: mean 2.06 (where 1=complete satisfaction & 4=complete dissatisfaction) for pivot nurse clinic and mean of 2.46 for case control clinic (t test  $p=*.001$ ). Simple statistical analysis was used for a cross section comparative study of a pivot nurse. Its model of an interdisciplinary musculoskeletal clinic with a pivot nurse triage reported a level of satisfaction with the provided service that remained high. The satisfaction data wasn't fully explained and appeared to support the case control clinic but scores remained high in both clinics. Satisfaction with wait time for first appointment was clearly reported. The study reported on its limitations with the sample populations and the decision not to match patients.<sup>(101)</sup>

For a sample of 50 patients that attended a 24 month joint replacement review with NP, satisfaction with wait time and access was measured. The retrospective review of joint replacement patients explored patient expectations of an NP led review clinic using a well validated tool: the Leeds Satisfaction Questionnaire to describe overall satisfaction with the nurse led clinic. The mean overall score was 3.82 out of 5 (likert scale) indicating 32 patients were "generally satisfied" with NP care. Of the six sub-scales: access to service & continuity of care had the lowest satisfaction mean score; general satisfaction with waiting time, number of patients seen; lower satisfaction scores for comfort of waiting area was recorded; The highest mean score was attributed to technical quality and competence (skill, knowledge, confidence) of the NP; Giving information, empathy and attitude towards patient was high. Patients were satisfied with the NP level of care and expertise and were happy to continue with NP care. The paper didn't provide detail of individual patient satisfaction scores for the 6 subscales of the LSQ: access & continuity of care, waiting time, technical quality & competence, giving information, empathy, attitude. Each area was scored out of 5 using a likert scale: strongly agree to strongly disagree. An overall score 3.82 (n=32) was provided with other narrative data presented.

Access to service and continuity of care ranked the lowest mean patient satisfaction score. Access was defined as: phone advice, contact with NP and access to the Emergency department. It was thought the low score arose from the fact not many patients had sought advice, and the only option on the questionnaire (LSQ) to score this was 'not sure'. There was general satisfaction with waiting time but again this was on the lower side and thought that the ten (10) minute time slots for appointments were often exceeded and contributed to dissatisfaction.<sup>(107)</sup> It's important to note within this study the highest rating for satisfaction was with 'empathy, giving information and attitude toward the patient'.<sup>(107)</sup> Naturally there is a tension between this and the ten minute time allocation NPs get to spend with the patient; an obvious tension exists between these two important elements of care. Results indicated patients wanted to be treated as individuals and rated highly the technical competence of the NP along with provision of information, empathy & attitude. Patients were happy to continue to receive care from the NP. This paper claimed patient acceptance is essential for success of nurse led clinics but cautioned against "interpreting satisfaction based on individual attitudes and perceptions of care". (Linder-Pelz 1982 cited in (107)) This was a

mixed method study; the qualitative data did not meet the standard for inclusion following critical appraisal.<sup>(107)</sup> Table 4 below lists studies reporting on wait times.

Another study in this patient population, whilst claiming unchanged patient satisfaction for 1680 patients following the implementation of a pathway for total joint arthroplasties of hip and knee, did not present data. A Press Ganey survey reported high patient satisfaction rates before and after pathway initiation – little else was presented in the paper regarding patient satisfaction aside from recommending clinical pathways for patients having total joint arthroplasties to amongst other things “ ...[not] compromise patient satisfaction ...”.<sup>(102)(p133)</sup>

Table 4: Satisfaction & Acceptance in Joint Arthroplasty

Study	Design	Method	Participant	Interven <sup>n</sup> A	Interven <sup>n</sup> B	Results
Poder <sup>(101)</sup>  Canada	Prospective, cross-section comparative study	survey via 2 repeated questionnaire; cost analysis data from admin services	332 TKR/THR patients attending inter-disciplinary outpatient clinic @ 1st clinic	Case study: 89 TKR/THR patients triaged by pivot nurse ↓ inter-d health worker	Case control: 243 TKR/THR patients not triaged – all saw consultant @ 1 <sup>st</sup> clinic	↑ pt satisfaction w/ wait 1 <sup>st</sup> appt ↑pt satisfaction w/clinic ↑ access (4X shorter than control)
Flynn <sup>(107)</sup> UK	Multi-method approach – Descriptive Quant data reported	questionnaire (LSQ)	n=32 Joint (hip & knee) replacement	NP led joint replacement review clinic: NP review 24 months post hip & knee replacement surgery		Patient satisfaction with nurse led clinic (mean 3.82/5) Satisfied w/ NP level of care/expertise Patients highly rated technical quality & competence (skill, knowledge, confidence) High satisfaction with information/empathy & attitude to pt General satisfaction w/wait times N° seen comfort waiting area= lower Patients happy to continue w/NP care

### ***Impact of ONP Care in Fracture Care and Management***

Three studies looked at radiological assessment (Table 5).<sup>(97, 99, 113)</sup> Radiological assessment is an integral component of the client assessment framework/tool (client history, physical findings, diagnostic data) in fracture care management used by advanced orthopaedic nurses.

#### ***Outcome: Clinical Accuracy in Radiological Assessment***

A prospective exploratory study found nil significant difference in the XRay ordering practices of Emergency Nurse Practitioner candidates (ENPC) when compared with emergency physicians. The sample reported for this review only used XRay orders for fractures; diagnostic imaging for soft tissue injury were excluded. Data was based on one clinician only and characterising the sample further by orthopaedic injury would have been of some interest.<sup>(97)</sup>

One cohort paper described the use of a template designed to identify distal radius fractures that require manipulation.<sup>(99)</sup> Emergency Nurse Practitioners educated on the use of the template, improved their management of distal radius fracture by 22.3%, after comparing scores attained with and without using the template. This was statistically significant when results were analysed with a paired t test (p>0.01). Junior doctors improved their score by 16.6% after using the template.<sup>(99)</sup>

A simple study retrospectively reviewed hospital records of telemedical referrals by ENP in minor injury service to orthopaedic resident at the local emergency department.<sup>(113)</sup> Accurate teleradiological diagnosis occurred 197/200 times with only three minor diagnostic errors for unnecessary admission to hospital (digital nerve repair, Jones' fracture, Smith's fracture: no cases required surgery) fully explained in the paper. Teleradiological assessment facilitated efficient orthopaedic teleconsultation, appropriate patient management and patient disposition after teleconsultation. The paper concluded that ENP teleconsultation can be safe and effective in a minor injury and treatment service in the UK. The paper reported unnecessary admissions to hospital occurred. The paper could have been improved with the provision of more information.<sup>(113)</sup>

Table 5: Clinical accuracy in radiological assessment in fracture care management

Study	Design	Method	Participant	Interven <sup>n</sup> A	Interven <sup>n</sup> B	Results
Considine <sup>(97)</sup> Australia	Prospective Exploratory design - cohort study	ENP register	83 of 476 ENPC managed patients in ED with fracture(#)	ENP model of care	RAT emergency physician	XR ordering: Nil sig difference btw ENPC & RAT Emerg physician (z=-1.254, N- Ties=77, p=0.210)
Kotnis <sup>(99)</sup> UK	Prospective correlational cohort	Clinical review of XR	N=12 XR of distal radial #	ENP Ax of XR +/- education with template	junior Dr Ax of XR +/- education with template	Improved # management Stat sig (p<0.01) pre& post intervention: (ENP 22.3% & jnr Dr 16.6%)
Tachakra <sup>(113)</sup> UK	Retrospective	independent analysis of hospital records of all telemedical referrals	N=200 tele- consultation via MATS (minor accident and treatment service)	ENP consultation with orthopaedic resident		Teleradiological Dx: 197/200; 3 minor Dx errors Teleconsultation effectiveness : ie ENP efficiency orthopaedic teleconsultation; appropriate pt Mgt or pt disposition after tele- consultation

The relationship between assessment and fracture care and management is contiguous however only 2 included studies examined the relationship between ONP assessment and fracture care management and are detailed in Table 6.<sup>(99)</sup>

*Outcome: Clinical Accuracy in Fracture Care*

A template designed to assist assessment of distal radius xrays in order to determine which fractures required manipulation, as a method of treatment was the independent variable in this simple cohort study. The dependent variable was the XR assessment by the junior doctor and ENP. After education on use of the template there was an improvement in appropriate management by the doctors (16.6%) and the ENP's (22.3%). This was statistically significant for both groups of clinicians following paired *t* analysis to  $p < 0.01$  for 12 radiographs.<sup>(99, 104)</sup> However there were only 12 XRays shown to the 12 ED junior doctors and six ENP's before education and after education on the template. Confounders in this study would extend to the characteristics of the fracture. It wasn't clear who designed the template. Despite the lack of information this short study suggested the template had some effect on patient management of distal radius fracture pertinent to ENP's practice by improving decision making. Emergency Nurse Practitioners educated on the use of the template, improved their management of distal radius fracture by 22.3%, after comparing scores attained with and without using the template. The paper showed how education with, and use of a template, improved the management of distal radius fracture and potentially reduce the number of patents returning to fracture clinic with a distal radius fracture in an unsatisfactory position (based on improved recognition of displacement on the 12 XR's shown to clinicians).<sup>(99)</sup>



Another cohort study based in a level 1 trauma centre in the US looked retrospectively at a consecutive series of 139 paediatric patients treated with closed reduction by a paediatric ONP and orthopaedic resident for closed, diaphyseal forearm fracture of both radius and ulna. Both NPs and orthopaedic attendings received six months “hands-on” supervised teaching in the department prior to performing independent call. The study showed no significant statistical difference between the groups in terms of: use of conscious sedation, cast characteristics/adequacy, total plaster time and length of follow up. The samples were slightly different: Eight NPs treated n=57 and 12 orthopaedic residents treated n=82 patients amounting to 7.1 versus 6.8 fractures per NP and resident respectively. Whilst the NP treated patients who were slightly older and closer to skeletal maturity, the patients seen by residents had significantly higher ulna displacement identified on lateral radiograph at the time of injury. Whilst the intervention rate (both major and minor (11%(NP) vs 2%(Dr)) was not significantly different (P=0.0638) for both groups, the resident-treated group required more minor interventions(35% (NP) vs 48% (Dr);P=0.17) and major interventions(8%(NP) vs 11(Dr); P>0.56) including operative intervention to restore fracture alignment. Patients treated by orthopaedic resident had a higher rate of requiring premedication & molding of plaster later in clinic for loss of position which approached statistical significance (18%(NP) vs 33%(Dr); P=0.052). The results of the study showed a NP trained in orthopaedic fracture care can successfully reduce forearm fractures comparable to that of an orthopaedic resident without an increase in rate of interventions, in a level 1 paediatric trauma hospital. <sup>(104)</sup>

Table 6: Clinical accuracy in fracture care

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Kotnis <sup>(99)</sup> UK	Prospective correlational cohort	Clinical review of XR	12 XR of distal radial #	ENP Ax of XR +/- education with template	junior Dr Ax of XR +/- education with template	Improved # management Stat sig (p<0.01) pre& post intervention: (ENP 22.3% & jnr Dr 16.6%)
Ho <sup>(104)</sup> USA	Consecutive series retrospective	Clinical chart & XR review by author	paediatric patients closed diaphyseal (both bones) forearm fractures	57 treated by NP	82 treated by resident	Nil statistically significant (P=0.05) difference in interventions: -conscious sedation -cast characteristics -fracture characteristics -length of follow up intervention rate (both major and minor (11%(NP) vs 2%(Dr)) not significantly different (P=0.0638) minor interventions(35% (NP) vs 48% (Dr);P=0.17) major interventions(8%(NP) vs 11(Dr); P>0.56) including operative intervention to restore fracture alignment premedication & molding of plaster in clinic for loss of position: approached statistical significance (18%(NP) vs 33%(Dr); P=0.052

*Outcome: Complications & Readmission*

The first of two retrospective cohort studies showed no statistically significant difference in ‘interventions’ between closed diaphyseal paediatric forearm fracture management between NP and resident (mentioned above in Table 6). An increase in the number of interventions, both major and minor was

observed in the n=82 resident managed patients (11%(NP) vs 2%(Dr)) but this was not significantly different (P=0.0638).<sup>(104)</sup> Interventions related to premedication and remodeling for fracture alignment or major interventions such as operative interventions to restore loss of fracture reduction. The sample differences were described: The NP's saw patients closer to skeletal maturity and the residents saw patients with greater ulna displacement which could add to the complexity of the fracture management. The second paper reported 3 minor diagnostic errors and unnecessary hospital admission for patients following teleradiological consultation between ENP and orthopaedic resident. The errors were explained in the paper<sup>(113)</sup> Table 7.

Table 7: Complications & Readmissions in Fracture Care

Study	Design	Methods	Participants	Intervention	Results
Tachakra <sup>(113)</sup>  UK	Retrospective	independent analysis of hospital records of all telemedical referrals	N=200 tele-consultation via MATS (minor accident and treatment service)	ENP consultation with orthopaedic resident	Teleradiological Dx: 197/200; 3 minor Dx errors  Teleconsultation effectiveness : ie ENP efficiency orthopaedic teleconsultation; appropriate pt Mgt or pt disposition after tele-consultation

### ***Impact of ONP Care in Osteoporosis***

Rates of fracture for hip and wrist were measured in two studies<sup>(98, 108)</sup> (Table 8) that focused on screening for osteoporosis: one study was set in the primary care setting and the other in an acute hospital setting.

#### ***Outcome: Screening rates & Treatment Initiation***

In the first study NPs received a monthly electronic report with patient data relevant to osteoporosis risk. The NPs used this information to assist with screening, diagnosing and treating patients at risk of osteoporosis in a selective sample of 650 000 members insured with a Health Maintenance Organisation (HMO) in Southern California, US. To qualify for the prospective observational study patients were aged over 60 years or over 50 years with a fragility fracture, a DXA (dual x-ray absorptiometry) scan or on osteoporosis treatment. Over a six year period the study claims to have increased DXA scans by 263%, increased bone protection by 153% and decreased the predicted hip fracture rate by 38.1% but the baseline hip fracture rate/number is not specified. Given the selective sample as a direct result of the HMO effect (meaning the sample excludes those citizens who are not insured – which tend to be vulnerable members of society with poor health), and lack of explanation of hip fracture rate data used for comparison, extreme caution must be exercised in terms of generalizability of results hailing from this study, despite the large sample<sup>(108)</sup>.

The second prospective paper used the ONP as change agent to drive practice change which in this case was a raft of multifaceted interventions aimed at improving early identification and management of osteoporosis (OP) through: (1) identification risk factors for OP and (2)falls, (3)identification fragility fracture, (4)commence OP protocol, (5)coordinated outpatient OP education & management program, (6)identification & assessment of patients for OP related fragility fracture whilst on the orthopaedic unit, (7)multimodal education sessions in fracture cascade phenomenon achieved via PDSA (Plan, Do, Study, Act) cycle. The final 3rd month audit result (n=31) was compared to pre implementation results (n=62) and showed improved identification of patients with OP fracture (20% to 82%); improved referral for ongoing OP management (17% to 62%) and greater uptake of best practice OP guideline care (19.6% to 84%).<sup>(98)</sup> The results of the second study highlight that using an ONP is an effective approach to

implementing best guidelines & coordinating post-fracture management of osteoporosis. Both studies demonstrated that targeted intervention strategies can be quite effective as part of a coordinated approach to osteoporosis management.<sup>(98)</sup>

Table 8: Osteoporosis Screening and Management

Study	Design	Methods	Participants	Intervention A	Intervention B	Results
Greene & Dell <sup>(108)</sup> USA	Prospective Observational study	Monthly report from Healthy Bones Database EMR	All patients/ members of Kaiser SCAL HMO with one or more risk factors for OP N=650 000	NP as case managers screen for OP from report provided	Pre-NP Coordinator ie nil	↑ DEXA 263% ↑ Bone Protection 153% ↓ expected Hip# rate 38.1%
Kimber <sup>(98)</sup> Australia	Prospective 9 months post - implement <sup>n</sup>	Patient record audit: 2 baseline & 3 post - implement <sup>n</sup>	De-identified patient records wrist # [n=31+31 @baseline; n=31 @ final audit]	Multifaceted (OP) guideline w/ONP Δ champion	Pre-guideline implement <sup>n</sup>	↑ OP screening (20% to 82%) ↑ OP referral for mgt (17% to 62%) ↑ OP Rx per guideline (19.6% - 84%)

### **Impact of ONP Care in Hip Dysplasia**

#### *Outcome: Clinical Accuracy*

Two studies examined neonatal screening for infant hip dysplasia with one paper examining sensitivity in screening and the other patient satisfaction (Table 9).<sup>(100, 110)</sup>

A prospective cohort study demonstrated in-hospital screening/clinical exam, performed by an advanced neonatal nurse practitioner (ANNP), to be significantly more sensitive at detecting hip abnormalities than senior house officers. Caution is required when interpreting the results as the populations between the two hospitals were not the same (higher risk births presented to the SHO hospital) and 10% of the populations did not attend (DNA) the specialist clinics introducing potential bias; There was no difference in the positive predictive value between the groups. The authors report the positive predictive value may have been higher if the 10% of presumably 'normal hips' had attended.<sup>(100)</sup>

#### *Outcome: Satisfaction/Acceptance with Wait times, Quality of service*

In a paediatric clinic for hip dysplasia in infants a twelve question, self-administered tick box questionnaire was developed and instigated to prospectively describe patient satisfaction relating to NP-led care. This descriptive prospective study surveyed 100 patients with suspicion of developmental dysplasia of the hip (DDH) that were referred to a nurse led clinic for care. The study evaluated patient satisfaction and overall quality of the service. Simple percentages were presented with no detail supplied on construct validity or reliability of the questionnaire.<sup>(110)</sup>

Acceptance as exemplified by satisfaction was measured in a simple survey conducted in a paediatric clinic for hip dysplasia in infants on overall quality of a nurse-led clinic. A questionnaire to the families of children with hip dysplasia specifically asked two questions: The first question referred to their overall impression of the service. A return rate of 66% showed that 80% parents were completely satisfied with the service. When parents were asked about the overall quality of service 67% were very satisfied and 33% satisfied. The second question asked if there could have been improvements made. For 80% of parents nothing more could be improved with the clinic and the remaining 20% percent reported improved sign posting and car parking could be made. Whilst these specific issues might not relate to the quality of

the NP service, they are important issues to patients and their families. The study reported that better continuity of care is achieved using partnerships with clinicians and a patient/child/family centred approach to care. As previously mentioned above, this model of care was well accepted overall (67% very satisfied and 33% satisfied). The full questionnaire was included in the paper.<sup>(110)</sup>

Patient satisfaction was thoroughly reviewed in this paper on nurse-led clinic for hip dysplasia. Patient satisfaction with wait times, quality of appointment and service were the subject of a satisfaction survey (n=66) of nurse-led care in a paediatric infant hip dysplasia clinic. 80% of patients were seen within two (2) months (36% within one month and 44% within 1-2 months and 14% within 2-3 months. All results were well within the UK government target of 17 weeks. Only 6% waited longer than 3 months. Over half thought this was as expected (54%) with almost a third of respondents reporting this was better than expected. For waiting at the appointment 67% were seen within 15 minutes of the allocated appointment time and all patients were seen within a 30 minute time frame. Wait times improved ahead of government targets.<sup>(110)</sup>

Table 9: ONP impact in Developmental Dysplasia of the Hip (DDH)

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Lee, TWR <sup>(123)</sup> UK	Cohort Prospective	Standardised proforma [@ clinic to R/V neonatal check]	N=470+7 DDH screening	249 ANNP neonatal hip screening	211 SHO neonatal hip screening	ANNPs ↑ sensitivity than SHOs (96% v 74%); p<0.05) No difference positive predictive value (p<0.05)
Lee, A. <sup>(110)</sup> UK	Descriptive Prospective	Patient (via parent) satisfaction survey	100 infants suspected DDH	Nurse led paediatric clinic: Infant Hip Dysplasia	nil	Overall patient satisfaction/acceptance: 80% parents completely satisfied Acceptance w/model of care: 67% very satisfied; 33% satisfied Wait times: 80% seen in 2 months ( v 17 weeks gov't target) Wait Time @ appointmt 67% seen in 15 mins 100% seen in 30 mins

### **Impact of ONP Care in Spine**

#### *Outcome: Clinical Accuracy*

A descriptive study reporting on the accurate and early assessment of 177 preselected spinal patients in a NP-led spine consultation clinic, found clinically consistent results for diagnosis and management of non-emergent degenerative conditions of the spine (disc herniations, spinal stenosis, degenerative disc disease) when assessed by the nurse practitioner. Using a collaborative framework with a spinal surgeon in a Canadian neuroscience centre, NP clinical diagnosis and management plan were in agreement with those of the surgeon 100% and 95% of the time respectively. Accurate and early assessment facilitated timelier diagnosis and management. Results were presented as simple percentages.<sup>(112)</sup> Table 10

The prospective study did not report on differences in treatment between NP and spinal surgeon for spine consultation in an ambulatory patient setting in Canada. In 5% of the n=177 patients with non-emergent spine related complaints who completed a questionnaire, the NP management plan differed from that of the spinal surgeon: the NP erring on the side of continuing non-surgical management whereas the surgeon recommended early surgical intervention.<sup>(112)</sup> Of the patients assessed by the NP, only 10% were identified as surgical candidates. It is unclear what happened to some sections of the sample. However in

this collaborative clinic the surgeon concurred with the NPs diagnosis 100% of the time and 95% of the time agreed management options. The paper showed NPs can play an effective and efficient role providing specific disease management in a spinal outpatient setting.<sup>(112)</sup>

*Outcome: Satisfaction/Acceptance*

This paper was concerned with NP-led care in a surgical spine consultation clinic<sup>3</sup> This Canadian study used the Consultation Satisfaction Questionnaire (CSQ) originally developed to evaluate patient satisfaction with doctor in general practice, was therefore modified to setting with two additional questions asked about patient preference for consultation with doctor vs. NP. Patient satisfaction (n=177) was 97% with NP consult and 94% with NP exam thoroughness.<sup>(112)</sup>

*Outcome: Wait Times*

Wait times for spinal consultation improved following the implementation of a nurse led clinic. Mean wait times for patients (n=177) awaiting a spine consult for their degenerative spine condition from referral to consultation was twelve (12) weeks for the Nurse Practitioner (range: 9.8-21 weeks) compared with a range of 10-52 weeks wait for conventional clinic. The wait times of patients referred to the NP increased to 16-21 weeks (mean: 18 weeks) toward the end of the two year study from a wait of 5-10 weeks (mean: 7.5weeks) in the first three months of the study. Patients were also asked if they would prefer to be seen by the consultant: 26% said yes they would but 77% of these patients were not willing to wait another 3-4 months to see the spine surgeon directly. High levels of patient satisfaction (consultation 97% & exam 94%) and quality of care were also considerations of this study. Toward the end of the two year study the waiting list to be seen by the NP had increased.<sup>(112)</sup>

Table 10: ONP Care in Spine clinic

Study	Design	Method	Participant	Intervention	Results
Sarro <sup>(112)</sup> Canada	Prospective patient satisfaction & clinical accuracy study	Consultation satisfaction questionnaire (CSQ)	N=177 pre-selected patients with non-emergent degenerative disease of spine	NP led spine consultation ambulatory clinic	Wait times NP 12 weeks (range: 9.8-21) conventional clinic (range: 10-52 weeks ) Wait times - consultant-26% [77% of these not willing to wait another 3-4 mths] Patient satisfaction: NPconsult-97% NP exam -94% clinically consistent Dx & Mgt ie: NP Dx - 100% & NP Mgt - 95%

***Impact of ONP Care in Carpal Tunnel***

Carpal tunnel decompression procedures by a nurse operator were the focus of a prospective case series of 305 patients in a rapid access service. The NP demonstrated comparable outcomes in terms of wait times, surgical outcome, complication rate and quality of care (refer Table 11).

*Outcome: Wait times*

Over a two year period the NP and surgeon reviewed referral letters together and triaged patients accordingly. Patients were assessed in a concomitant clinic by the NP. The NP performed 395 carpal tunnel decompression procedures and continued to provide ongoing assessment in clinic. The NP provided a single practitioner pathway from first clinic appointment to surgery and discharge. The nurse-led service decreased wait times from 105 to 6 weeks; 98.7% of patients reported improvement in signs & symptoms and a complication rate of 2.5% was achieved, which was consistent with national benchmarks. This study reported comparable surgical outcomes suggesting an NP can safely perform

carpal tunnel decompression as an autonomous practitioner practising within a collaborative framework.<sup>(111)</sup>

*Outcome: Surgical outcome & Complication rate*

A prospective study describing the practice of a nurse-led service of carpal tunnel decompression with surgical supervision and collaboration from an orthopaedic consultant specifically reported on the complication rate of 395 carpal tunnel decompressions performed by the NP over a two year period as per Table 11.<sup>(111)</sup> A complication rate of 2.5% was considered acceptable for such problems as superficial wound infection, wound dehiscence, scar sensitivity and hand stiffness, and compared favourably to rates published in the literature (3 citations mentioned). Further the paper reported on ‘surgical outcomes’ measured by a Levine score that comprised 2 separate scores: a symptom severity score and functional score. Scores taken pre-operatively (n=395) 3.3 & 2.9 respectively, at 2 months post operatively (n=395) 1.5 & 1.5 and 6 months post operatively (n=329) 1.5 & 1.4 respectively. It was demonstrated both symptom severity and functional score had decreased post-operatively. Nine cases required direct surgeon input for surgical complications related to surgical approach where there was anatomical variation and once for an inadequate local anaesthetic block.

*Outcome: Quality of Care*

Quality of care was measured in patients with carpal tunnel syndrome. This paper reported on surgical outcome and complication rates as a marker of the standard and quality of care associated with the introduction of a nurse practitioner as operator. Outcome scores before and after surgery were reported. The Levine score, a well validated tool for specific use in carpal tunnel syndrome, captured a symptom severity score: (pre 3.3(n=395), post 1.5(n=395) & 1.5(n=329)) and functional score: (pre 2.9, post 1.5 & 1.4) taken pre-operatively and at two weeks and six months post operatively. Surgical outcome: 1.3% of patients reported no improvement in signs & symptoms; therefore 98.7% did). This compared to published rates. Complication rate: 2.5% was recorded for the 395 procedures performed by the NP over two years and considered comparable to previously published results.<sup>(111)</sup> There was a reduced follow up rate at six months and whilst stated this wasn’t explained in the paper. This did not affect the outcome of the study.<sup>(111)</sup>

*Outcome: Satisfaction/Acceptance*

Subjective data on patient satisfaction with the clinical outcome and pathway of a NP led management of carpal tunnel syndrome was recorded in a study<sup>(111)</sup> authored by an orthopaedic consultant, published in a prestigious orthopaedic medical journal. No patient expressed any concerns about being assessed or treated by a nurse. <sup>(p400)</sup> Minimal subjective data was described in the article apart from this quote. It was noted that this article had been rejected by the same journal initially.

Table 11: ONP Care in Carpal Tunnel

Study	Design	Method	Participant	Intervention	Results
Newey <sup>(111)</sup> UK	Descriptive case series prospective	Supervision/ collaboration w/orthopaedic consultant pre- and post-op Levine scores	N=305 Carpal tunnel syndrome	Nurse-led service with Supervision by orthopaedic consultant	↓ Wait times (105 to 6 wks) Surgical outcome (1.3% reported no improvement in s&s) Complications (2.5%)  Improved wait times standard & quality o’ care maintained

**Impact of ONP Care in Orthopaedic Pain Management**

Only one included study looked at nursing assessment of orthopaedic related pain<sup>(105)</sup>. Table 12

*Outcome: Pain management*

This retrospective role delineation study by the American Society of Pain Management Nurses undertook a practice analysis via survey questionnaire. It compared different pain related activities amongst nursing specialties with further delineation from within the specialty according to level of nurse education preparation. Nurse members of NAON (National Association of Orthopaedic Nurses) self-reported their pain management activities. Of all pain management activities performed by NAON orthopaedic nurses completing the survey, the most frequently performed activity that attracted the highest mean *frequency* were primarily those activities involving pain assessment. Orthopaedic nurses with a diploma or associate degree (n=196) performed significantly more activities in assessment, monitoring and evaluation of patient pain (mean  $4.39 \pm SD 0.6$ ) out of a possible 5; whereas higher educationally prepared nurses with bachelor (n=186) or masters/doctoral degree (n=226) rated therapeutic communication and collaborative/institutional activities as more *important* pain management activities (BSN:  $(4.12 \pm 0.9; p<.05$  vs MSN:  $(4.18 \pm 0.7; p<.01)$ ).<sup>(105)</sup>

This study on pain management by orthopaedic nurses demonstrated how education level influences the way nurses rate the importance of pain related interventions. Lesser qualified nurses spend more time assessing, monitoring, evaluating patient pain whereas higher educated nurses spend more time in communicating with the patient about pain and rate collaborative or institutional activities (policy development and the like) as more important pain-related activities. The study collected questionnaires from a convenience sample of NAON members, whom would be motivated to complete the questionnaire as opposed to observing nurses whilst undertaking pain related activities. Orthopaedic nurses were more involved in patient repositioning, pre-emptive analgesia, applying splints and braces, as pain management activities, more so than other specialty nurse groups.<sup>(105)</sup>

Table 12: ONP Care in Pain Management

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Pellino <sup>(105)</sup>  USA: 49 states	retrospective Role Delineation Study	Survey questionnaire (w/pilot study)	9 nurse specialties: N=756 Dip n=196 BSN n=186 MSN n=226  48 orthopaedic nurses (NAON members) completing pain mgt survey	Masters (MSN) or PhD	Diploma/ Associate Degree(AD) vs Bachelor (BSN)	<u>Activities (nursing interventions assoc with pain management):</u> A <sub>x</sub> /monitor/eval <sup>n</sup> ↓ for BSN & MSN Non- pharmacologic management ↓ for BSN & MSN Therapeutic comm <sup>n</sup> /counsel ↑ for BSN & MSN Collab <sup>n</sup> /institution ↑ for BSN & MSN

**Impact of ONP Care in Trauma**

*Outcome: Complications & Readmission*

In the trauma setting one paper reported on complication data.<sup>(103)</sup> Trauma registry data was interrogated in order to review the impact of CRNP-led discharge round in a level 1 trauma centre. A retrospective review of 20,524 admissions over 6 years at a level one trauma centre in the US, saw data collected at various time points. The data compared the daily multi-disciplinary ward rounds with no one leading the

round versus a fellow/senior resident lead versus ward round led by a trauma nurse practitioner(CRNP). Much data was presented over several time points that compared the rounds previous to fellow led or CRNP led discharge rounds. Patient volume increased and injury severity score (ISS) remained the same but average LOS decreased (9.4 to 8.2days), ICU readmissions decreased (6.4 to 3.3 per 100 patients), hospital readmission decreased (2.6 to 1.1 per 100 admissions), representations to clinic defined as clinic walk-ins decreased (568 to 114 over a year) and deaths decreased (4.6 to 4.2 per 100 discharges). Hospital bypass or the amount of time the centre was unavailable to accept trauma admissions, was virtually eliminated (2.8% to 0.08% of time on bypass). Only two time points were compared: prior to the discharge round and the rounds led by CRNP. Some statements made in the paper were not supported by statistics, however the statistics provided were extensive and suitable for comparison. Appropriate statistical testing was performed. Table 13.

Table 13: Complications in Trauma

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Haan <sup>(103)</sup>  USA	retrospective	Trauma Registry & database queried	20,524 Trauma patients admitted over 6 year period :1998-2004	Discharge rounds run by CRNP	Nil &/or Fellow led Discharge rounds	↑ patient volume (6544 to 7020) same injury severity score (ISS/acuity) ↓ LOS (9.4 to 8.2 days) ↓hospital bypass (2.8% to 0.08%) ↓ Hospital readmission (per 100 discharges: 2.6 to 1.1) ↓ICU readmission (per 100 discharges from ICU: 6.4 to 3.3) ↓ deaths (per 100 admissions: 4.6 to 4.2) ↓clinic walk-ins (568 to 114)

### **Impact of ONP Care on Nurse or Process related Outcomes**

#### *Outcome: Education level*

Education has a pervasive influence when related to advanced nursing practice as it does for nursing practice in general. Patient education is inherent to nursing. There were a number of studies where the NP assumed an educator role or 'change agent' that incorporated responsibility for education of patients or other staff.<sup>(98, 101, 102, 108)</sup> The different educational roles NP's perform would have a bearing on the effectiveness of NPs in orthopaedic settings. Education from medical staff might otherwise manifest itself as a form of collaboration: development of model of care, advice & review, concurrent clinics etc.<sup>(99, 101-103, 111-113)</sup> Education in terms of specialised knowledge/skill transition was as secondary outcome or nurse-related indicator in five studies described below. Table 14.

Education level was borne out as an important NP outcome of interest in four included studies.<sup>(99, 105, 107, 109)</sup> Thirty two patients completed the Leeds Satisfaction Questionnaire (LSQ) aimed at uncovering patient opinion of a NP-led joint replacement review clinic in UK. Whilst attending their yearly clinic review post hip and knee replacement surgery, respondents rated highly the technical quality and competence (skill, knowledge, confidence) of the nurse.<sup>(107)</sup>

An intervention that was delivered to both emergency NPs and junior doctors had twelve doctors and six NPs shown a template designed with 4 elements to assist in radiological analysis and ultimately improve management of distal radius fractures. The education consisted of a five minute tutorial on the template then the clinician applied the template to 12 xrays. All the NPs improved their scores with the template by an average of 22.3%; both groups improved their scores to a statistically significant level ( $p < 0.01$ ) with the doctors average improvement of 16.6%. NPs demonstrated greater sensitivity when learning to use



the template for management of distal radius fracture. When ENPs received education on a template to improve management of distal radius fractures they improved patient management. This study suggests acquired knowledge added to the specialty knowledge of the NP can impact positively on the effectiveness of the NP's patient care.<sup>(99)</sup>

An earlier study undertaken by the American Society of Pain Management Nurses (ASPMN) looked at pain related nursing activities and stratified this to educational preparation: either diploma educated nurses, bachelor, masters-prepared and doctorate-prepared nurses for nine nursing specialties. It appeared the less formally prepared nurses (Diploma n=196) were more likely and frequently prioritised activities around assessment of orthopaedic pain, whereas the higher educationally prepared nurses (BSN n=186; MSN n=226) were predisposed to rate policy development as a more important pain related activity.<sup>(105)</sup> Level of education was considered important in pain management activities. The priority and perspective changed as the nurse became higher educated with an increased focus on supportive strategies at a patient and organisational level.<sup>(105)</sup>

Another role delineation study surveyed nurses in nine specialties who were performing CPT coded services. CPT codes are used in the US to file claims for physician (doctor) payment. This paper showed specialist orthopaedic nurses were performing 129 of at least 493 CPT codes performed by specialist nurses overall. Orthopaedic nurses with BSN preparation performed significantly more of the codes than those with diplomas, as identified by the median (F[3,34]=4.05,p=.01); Education & its relationship to [the amount of] supervision by a physician was reported as a mean response for the specialty of orthopaedics at 2.12 where options range from never = 1 to more than 75% of the time =5.<sup>(109)</sup> As far as billing practices in the US is concerned the higher educated the nurse the more you had to deal with this professional practice issue. This article posed the question around nursing contribution to quality, access and cost through billing practices. Economy of care is a question NP's must consider in the wider scheme of healthcare and this paper looked at multiple nursing specialties in the US in 1993 in an attempt to delineate their role. Quite possibly this is an issue modern NPs in private practice especially need to understand.<sup>(109)</sup>

Education level was described as a demographic characteristic of the institutions that looked at the effectiveness of the CNS role in an unpublished thesis. Whilst the CNS' had similar qualifications and experience, and the units with the CNS had between 50-84% associate nurses there was a difference in the combined percentages of diploma and bachelor educated nurses on the units with CNS (Dip=32% & Bachelor=26% respectively→Total=58% higher educated nurses), versus the units without the CNS (Dip=8% & Bach=71%→Total=79% higher educated nurses). Whilst this is not expanded upon in the results it would not be unusual to see higher educated nurses inspiring other nurses to acquire further nursing education.<sup>(106)</sup>

Table 14: Education as an NP outcome

Study	Design	Method	Participant	Intervention A	Intervention B	Results
Flynn <sup>(107)</sup> UK	Multi-method approach – Descriptive Quant data reported	questionnaire (LSQ)	n=32 Joint (hip & knee) replacement	NP led joint replacement review clinic: NP review 24 months post hip & knee replacement surgery	nil	Satisfied w/ NP level of care/expertise: mean of 3.82/5 on 5 point likert Patients highly rated technical quality & competence (skill, knowledge, confidence) High satisfaction with information/empathy & attitude to pt Patients happy to continue w/NP care
Kotnis <sup>(99)</sup> UK	Prospective correlational	Clinical review of XR	12 XR of distal radial #	ENP Ax of XR +/-	junior Dr Ax of XR	Improved # management

	cohort			education with template	+/- education with template	Stat sig (p<0.01) pre& post intervention: (ENP 22.3% & jnr Dr 16.6%)
Pellino <sup>(105)</sup> USA: 49 states	retrospective Role Delineation Study	Survey questionnaire (w/pilot study)	9 nurse specialties N=756 Dip: 196 BSN: 186 MSN: 226 48 orthopaedic nurses (NAON members) pain mgt survey	Masters (MSN) or PhD	Diploma/ Associate Degree (AD) vs Bachelor (BSN)	<u>Activities (nursing interventions assoc with pain management):</u> A <sub>w</sub> /monitor/eval <sup>n</sup> ↓ for BSN & MSN Non- pharmacologic management ↓ for BSN & MSN Therapeutic comm <sup>n</sup> /counsel ↑ for BSN & MSN Collab <sup>n</sup> /institution ↑ for BSN & MSN
Griffith & Robinson <sup>(109)</sup> USA	Prospective	Current Procedural Terminology (CPT)-coded functions survey questionnaire	39 (NAON) orthopaedic nurses/100 from 9 nursing specialties	110 orthopaedic specific CPT codes & 19 common codes		Education: BSN performed significantly more codes than diplomas, median(F[3,34]=4.05,p=.01 Frequency : 129/493 CPT codes (mean: 38 (29%) of total codes); same code performed by 37 respondents (94.6%) at most Setting: hospitals in larger communities (F[1,36]=6.13,p=.02) as opposed to rural/smaller perform more codes (F[2,35]=6.08,p=.01): and again for rehab (F[1,38]=14.30,p=.00 Supervision by physician: mean response for of 2.12 (range from never (1) to more than 75% of the time (5))

### Outcome: LOS/Cost

Details of Length of Stay (LOS) were reported in three studies<sup>(102, 103, 106)</sup> and expanded upon in Table 15 below. LOS by its very definition infers a cost in terms of occupied bed days. Reporting on LOS data alone can be misleading and oftentimes LOS data in the included studies was accompanied by other data that goes to quality of care.

A retrospective interrogation of a trauma registry in the US concluded a decreased LOS was achieved when comparing discharge rounds led by NP to no lead. The average LOS went from 9.4 days to 8.2 days and for LOS greater than 24 hours 5.3 days to 4.7 days. The study reports that the shorter LOS was maintained with NP led discharge rounds and benefits maintained, because the LOS for two categories were slightly lower for less number of patients with rounds led by fellows and residents (7.5 days LOS and 4.5 for LOS>24hrs). It was reported in the study that the shortened LOS associated with the NP-led rounds was affected by other quality markers that improved over the time periods where no one led the round, to a doctor-led to NP-led discharge rounds. The other markers of quality that provided further context to this study included: patient volume, patient acuity (ISS), hospital readmission, ICU readmission, death, clinic presentations. LOS savings were evident in the discharge trauma rounds led by a CRNP.<sup>(103)</sup>

The average length of stay went from 4.50 days to 3.20 days after the implementation of a NP supported clinical pathway for total joint arthroplasty in a community hospital in USA. This comprised THR: 4.41 days to 3.24 days and TKR: 3.92 days to 2.98 days. Fewer days in hospital freed up beds to admit other

patients sooner that contributed to minimising the cost impact from increased implant costs that occurred during the study period. The study also reported an increase in discharge direct to home (62% to 72%), nil increase in complications or readmission, cost containment whilst maintaining high patient satisfaction before and after pathway initiation. Cost savings were made through LOS in the joint arthroplasty patient population.<sup>(102)</sup>

The unpublished thesis comparing TKR patients on units with (n=64) and without CNS (n=64) compared length of stay (LOS) and total length of stay (TLOS) which included rehabilitation. The mean LOS was 4.50 days compared to 4.72 days and 4.87 TLOS compared to 6.84 days for the CNS units (n=63) versus the non CNS units (n=62) and this was statistically significant for TLOS (p<.01). Length of stay was seen in context with process of care interventions and patient outcomes that equated to CNS efficacy where improved quality of care and decreased cost occurred on orthopaedic units with CNS looking after TKR patients in the US.<sup>(106)</sup>

An exploratory study (described above) on the coding services practices (Current Procedural Terminology (CPT)) of American specialist nurses in 1993, springboards its investigation from “a lack of visibility of nursing within the payment structure and consequently ... policy deliberations on payment.”<sup>(109)</sup> Importantly the study raises the issue of role delineation, payment (in the US) and its relationship to quality, access and cost of care which should consider the contributions of nurses in these deliberations.

Table 15: LOS/Cost

Study	Design	Method	Participant	Interven <sup>n</sup> A	Interven <sup>n</sup> B	Results
Haan <sup>(103)</sup>  USA	retrospective	Trauma Registry & database queried	20,524 Trauma patients admitted over 6 year period :1998-2004	Discharge rounds run by CRNP	Nil &/or Fellow led Discharge rounds	↓ LOS (9.4 to 8.2 days) ↓ hospital bypass (2.8% to 0.08%) ↓ Hospital readmission (per 100 discharges: 2.6 to 1.1) ↓ clinic walk-ins (568 to 114)
Walter <sup>(102)</sup>  USA	Prospective data collection  consecutive patients - 1 year pre; 3 years post	Patient data forms & hospital's financial database	1680 THR/TKR patients	455, per FY 2001-2003 THR/TKR NP supported pathway Post-imp <sup>n</sup>	315(2000) THR/TKR Pre-pathway	↓ LOS: (4.50→3.20 days THR:4.41to3.24; TKR:3.92to2.98) ↑ home discharge (62% to 72%) Cost: minimised impact of ↑ DRG reimbursement 8.68% against a care cost increase of 3.48% (implant cost). 20% savings attributed to fewer days in hospital.
Wheeler <sup>(106)</sup>  USA	retrospective cohort	Chart audit & Investigator-designed process instruments	128 randomly chosen TKR patients	2 orthopaedic unit-based CNS (n=64)	2 orthopaedic units without CNS (n=64)	↓ LOS (4.50 vs 4.72, SD 0.77 vs 1.78 respectively) ↓TLOS +rehab (4.87 vs 6.84, SD 1.43 vs 2.43respectively) ↓ In-hospital Complications (9% vs 26%)

Whilst this review is not an econometric analysis of the evidence it was apparent that cost-benefit was an important outcome of interest to NPs as reported in five studies within this review. Whether it was direct cost savings made, cost minimisation,<sup>(99)</sup> “time saved”<sup>(113)</sup>, surgical targets met<sup>(101)</sup> or better use of resources<sup>(17, 26, 102)</sup> such as the implementation of a cheap strategy (template) to improve patient management;<sup>(99)</sup> ‘economy of care’ as a concept remained a strong influence in within the literature.

*Outcome: Cost as a Barrier*

Two Australian census surveys of NP's run in 2007<sup>(17)</sup> and 2009<sup>(26)</sup> specifically reported on barriers to NP practice and named: a lack of Medicare provider number (ie government reimbursement for NP clinical services rendered in Australia); lack of PBS (Pharmaceutical Benefits Scheme) prescribing facility (government reimbursement for prescriptions written by NPs in Australia); lack of legislative support; lack of ability of NP to write workers compensation certificates (in the case of work injury) or sick certificates (in the case of sickness); lack of organisational support; lack of support from within the nursing profession; restrictions placed by professional indemnity issues as self-reported barriers restricting NP practice in Australia. Limitations for nurse practitioners to prescribe, order tests, write sick and worker's compensation certificates, added to inefficient practices for NPs and showed a lack of support from employers and the nursing profession. The authors reported the NPs themselves perceived many barriers but particularly found the inability to prescribe a large factor in the "underutilisation" of NPs within the Australian workforce. These constraints to NP practice were observed over subsequent census surveys, two years apart, of 202 and 293 Australian NP's respectively (of which a very small number were ONP). Both surveys contributed to the impression at the time that NP's were underutilised in the Australian health workforce.<sup>(17, 26)</sup> Workforce imperatives therefore are an important implication for this review to consider. The two studies are listed in the following Table 16.

Table 16: Barriers to ONP practice

Study	Design	Methods	Participants	Intervention	Results
Gardner et al <sup>(17)</sup> 2009  Australia	Descriptive Observational study   Prospective	National Census survey	202/238 NP's n=2 ONP	Authorised NPs	Self-reported NP practice limitations: ↓ access MBS (93%) ↓ access PBS (92.2%) ↓ lack of legislative support (83.3%) NO workers compensation-(61%) or sick certificates (45.7%) professional indemnity insurance issues (34.1%) lack organisational support (63.7%) lack of support nursing profession (63%)
Middleton & Gardner et al <sup>(26)</sup>  2011  Australia	Descriptive Observational study   Prospective	Second National Census previous instrument (a/a)	285 NPs n=1 ONP	Authorised NPs	Self-reported NP practice limitations: ↓ access MBS (91%)  ↓ access PBS (89.6%)  ↓ lack of legislative support (77.5%)  NO workers compensation (62.1%) or sick certificates (43.1%)  professional indemnity insurance issues (38.6%)  lack organisational support (52.2%)  lack support nursing profession (58.2%)

In a nurse-led spine consultation clinic in Ontario, Canada the NP was unable to bill the patient for the consultation which necessitated a quick face-to-face review by the consultant. This was reported as a limitation to the scope of practice of the NP. Those patients requiring follow-up care were seen by the surgeon for the same reason. The authors reported this as a limitation to the study because they were unable to readminister the questionnaire.<sup>(112)</sup>

### *Outcome: Barriers*

In addition to the above. Barriers were mentioned in several included studies. A restrictive view of NP practice was expressed in one British study where there was “considerable criticism” from various surgical and professional groups objecting to the role of nurse operator performing carpal tunnel decompression<sup>(111)</sup> in which it is stated “surgery is for surgeons and nursing is for nurses”.<sup>(p401)</sup> An Australian study drew attention to the Australian Medical Association (AMA) opposition to NP prescribing: “on the grounds that ‘there is ... no identifiable need’, there are ‘... considerable risks ... associated with prescribing ...’ and ‘the educational preparation of nurse practitioners will be inadequate to ensure safe prescribing’ (97)NP Taskforce, Melbourne 1999, p210) The debate around collaboration can be rewarding and challenging for NPs. In one study, patients had to be seen by both NP and consultant which amounted to ‘double handling’ that infers inefficiency if the patient has to be assessed twice. In this instance it arose from billing practices that required medical officer to review the patient despite agreement with the NP diagnosis at 100% of the time.<sup>(112)</sup> The topic of barriers to NP experience is further elucidated in the following section on qualitative evidence and text and opinion.

## **Qualitative Findings**

One unpublished thesis was included in this component of the review. The unpublished thesis used an Heideggerian hermeneutical phenomenological approach to understand the meaning of advanced practice for a purposive sample of seven expert orthopaedic nurses working in an acute care orthopaedic setting. The author was the eighth participant who conducted the face-to-face, phenomenological interview in which an open-ended question was asked of the nurses to describe a situation in which they believed they performed at an advanced level. The verbatim transcripts formed the basis of textual and thematic analysis informed by van Manen’s method of hermeneutical interpretation for researching lived experience. A concept, meaning and significance emerged of advanced orthopaedic nurse practice, exemplified in the themes: (1) having knowledge, (2) being in and outside the role, (3) being an advocate and (4) being in control (decision making & anticipation).

Having knowledge was considered essential for these nurses: “... where “specific orthopaedic knowledge underpinned the actions of the nurses and also [knowledge] comprised experience, education, intuition, perceptions & impressions; developed through reflection & operationalized through the use of...exemplars” p.114; “... or maybe the potential if we didn't have that orthopaedic knowledge, the potential complications is what I thought of afterwards ... we could have done more damage than good (p.65). Therefore Having Knowledge in whatever form is integral to the concept of advanced practice (p. 97), and seen as being an essential component to practice at an advanced level” (p.118).

Being an advocate held a strong presence in each participant’s description and was expressed in the context of ‘my concern’(p.114) and embodied in the phrase “that’s what I’m here for” (p.120) or “...that’s what we’re here for”(p. 104).

Being in control or managing complex situations where ‘making decisions’ and ‘anticipation’ of needs was expected by the nurses; whilst contextually driven and comprising several attributes (p. 113) some personal: “Each individual participant brought unique personality traits to their situation, which affected their being in control. Naturally the context of the incident determined what degree of control the participant assumed. (p.105-6).Following on from an emergency situation earlier in the shift where Di “took control”(p.106) she reports “...once the patients had settled, visitors gone, things were under control, drug rounds had been done and I knew everything was up to date. Yeah at both ends...”(p.106). Being in control, maintaining control, restoring control is expected from advanced nurses either of themselves or by their colleagues” (p. 121).

Being in the role and outside the role was complex and contextual for the participants. "Being in the Role is associated with 'a strong sense of professionalism (p.100 & 114), responsibility and obligation but also a sense of complexity being in the [advanced practice] role(p.100); And Being Outside the Role challenged collegial and collaborative practice and sometimes was associated with feelings of guilt, misgiving or inner conflict. Both engendered clarity, commitment and a strong sense of self (p114) and was motivated by doing what's best for the patient (p.100); "I felt confident in a way, I mean I knew we were doing stuff that, we weren't really [slight pause] qualified or whatever - for want of a better word, to do but I knew sort of, I had the knowledge and skills so hopefully we could fix it in the end...(p.98). Being in the role and outside the role as a concept differed according to the participant's context" (p.100).

The participants in this study demonstrated a breadth of advanced nursing performance. Some were expert, that is their knowledge gained from experience, meant that they cared for their patient in an expert way. Their advanced practice was in a state of emergence however. The author concluded that advanced practice is a continuum that incorporates specialist, expert and advanced practice (p.vi) where a subtle transition of advanced practice occurs in the context of the patient-nurse relationship (p.121).<sup>(75)</sup>

## **Text & Opinion Review Results**

Eleven papers were included in this component of the review.<sup>(95, 96, 114-121)</sup> Opinions expressed belonged to experts in the field, whom in three articles represented the opinions of their constituency that included the International Council of Nursing (ICN) and National Association of Orthopaedic Nurses (NAON).

Experts ranged from nurse academic/researchers, nurse economists, senior nursing administrators, a medical workforce researcher/commentator and a number of clinicians: one orthopaedic consultant, two orthopaedic APNs from UK and one NP.

Type of text comprised one annotation, one letter to-the-editor, a study report, one continuing education article and the remainder were journal articles. Most journals were peer reviewed and reputable whose readership specifically reached out to orthopaedic consultants/physicians (JBJS), medical staff (MJA), nurse practitioners, orthopaedic nurses and nurse administrators. The career development article published in a nursing "magazine journal", with a large readership, was authored by a nurse academic/researcher and presented a short, balanced argument, with concise referencing. Reference lists were typically short for the included text/opinion papers when compared to quantitative and qualitative studies.

The majority of publications fell within a twenty year date range (1992-2012). One article fell outside of this time period (1982); despite this, the article bore relevance to the issue of implementation of expanded roles in the US in addition to meeting the criteria for inclusion. The majority of articles were based in USA and three from the UK, however two articles described situations in the US whilst being published in British and Australian journals respectively.

Following data extraction from eleven included studies, thirty-nine (39) conclusions arose. After further analysis these conclusions were condensed into eight categories: (1) barriers/obstacles, (2) benefits, (3) serendipity, (4) relationships & collaboration, (5) role, (6) continuum: moving forward, (7) knowledge, education, experience and (8) resources. The eight categories were then analysed to create three synthesised findings, shared with the qualitative literature, under the headings of 'Duality', 'Role & Relationships' and 'Moving Forward along a Continuum' which formed a meta-aggregation. The broad categories with their specific conclusions found within text and opinion papers, combined to form three synthesised findings.

The three synthesised findings are listed below accompanied by illustrations in support of the individual findings.

### **Synthesised Finding 1: Duality**

There is a duality to factors that influence the advanced practice of the Orthopaedic Nurse Practitioner. Barriers, obstacles, benefits and opportunities pose challenges both positive and negative on the development, implementation and evaluation of ONP roles (Table 17).

The categories and key findings relating to the above synthesised finding are now presented with an illustration from relevant text.

**Category:** Barriers/Obstacles. **Conclusion 1:** Communication assisted in overcoming obstacles associated with implementing expanded roles

Illustration: Overcoming the obstacles ...By assessing the organisational environment at the onset of planning(p.34); By planning for proper & timely communication(p.34); We found that communicating this concept to those unfamiliar with the expanded role and encouraging them to accept it was the most challenging aspect of the process(p.32); and the strength of formal & informal communication systems(p.34); We did experience difficulty maintaining momentum during the planning stages, as the plan methodically but sometimes slowly worked its way through various groups for approval, communication, and multiple revisions(p.34).<sup>(115)</sup>

**Category:** Barriers/Obstacles. **Conclusion 2:** Many barriers exist for advanced practice nurses

Illustration: "Barriers to nurses in advanced nursing practice services are many(p.12):Physicians are fearful of the impact of the advanced practice nurse related to patient pools and limited health care dollars. Organized medicine wants to limit the scope of the APN and restrict the level of anticipated reimbursement (p12);Lack of awareness by the consumer related to the scope of practice of the APN is another barrier(p.12); Without reimbursement for the APN by third party payors, the APN cannot survive in the US health care system(p.12); access to orthopaedic nursing specialty advanced practice curricula (p.12); Redefinition of NP vs CNS roles may, however, be indicated(p.12); Limiting practice through [secondary] licensure will only add another barrier to meeting the demands of the orthopaedic population"(p.11).<sup>(119)</sup>

**Category:** Barriers/Obstacles. **Conclusion 3:** NP Recognition as an alternative health care provider of equal worth

Illustration: "Nurses and other nonphysician providers have long argued that they should be paid at the same rate as physicians for similar services of equal worth(p.42); Nursing will continue to fight equal pay for equal service"(p.44);<sup>(114)</sup>

**Category:** Barriers/Obstacles. **Conclusion 4:** NP Roles are under utilised

Illustration: "There are more situations where our specialized roles can be used (p.26); the reasons nurse practitioners are not used more often in the hospital setting are related to naivete(p.26); Resistance may be encountered from individuals simply because there is a lack of awareness regarding NP's capabilities and educational training" (p.26).<sup>(120)</sup>

**Category:** Barriers/Obstacles. **Conclusion 5:** Recognition of the professional role of APN in USA is linked to reimbursement

Illustration: "Restrictive reimbursement policies. ... It is nursing's opinion that this restrictive policy has created a disparity in employment opportunities for RNs seeking work as assistants-at-surgery. Arguing that reimbursement of RN assistants would increase access by offering a cost-effective alternative as well as expand employment opportunities,(p.42); Many members also felt this was a coverage issue, NOT a payment issue (p.44&41)";<sup>(114)</sup>

**Category:** Benefits. **Conclusion 6:** APN nurses provide safe effective and comprehensive care

Illustration: Extensive published data document that nurses in advanced practice provide safe, effective and comprehensive care. The data also show that nurses in advanced practice services are well accepted by patients, that they improve quality of health care in the settings where they practice, and that nurses in advanced practice improve access to health care in many areas(p.12); "... Nurse practitioners provide a more personal kind of care that many patients like and that measurably improves compliance while reducing symptomatic complaints, return visits, and hospitalizations(p.11); Examination of a limited amount of data on patient reported measures of effectiveness indicates that while APN services are less costly, they are not less effective ..."(p.11).(119)

**Category:** Benefits. **Conclusion 7:** APN use of Telenursing improves access to care for patients

Illustration: "These types of carts have become a more practical solution for seeing patients in rural or community health clinics where they lack specialty care(p.103); Videocameras can be used for assessing ... fractures, extremity injuries, or mobility issues ... emergency or trauma patients ... post op surgical wounds ... or store vital signs(p.104); "... easier to take care of more patients in less time"(p.100).(96)

**Category:** Benefits. **Conclusion 8:** Improved team work, rapport and better communication were a beneficial by-products of implementing expanded roles

Illustration: "...nurse-physician rapport & communication increase as each group opens professional boundaries in defining and planning the content of role expansion(p.34); we developed a sense of team spirit"(p.34).(115)

**Category:** Benefits. **Conclusion 9:** Non-physician clinicians (NP&PA) as alternative health care providers

Illustration: "... for patients who presented to a hospital ED and who had no personal physician, care delivered by physicians and NPs showed similar outcomes at 1 year in terms of clinical status and patient satisfaction, ... it does suggest that the roles of NPs are probably undervalued(p.5); NPs & PAs are cost effective, as they have substantially lower salaries than doctors but see a comparable number of patients per specific period(p.5); PAs and NPs are well distributed throughout primary care and specialty care and are more likely than physicians to practice in rural areas and where vulnerable populations exist" (p.4).(95)

**Category:** Benefits. **Conclusion 10:** NP Efficiency

Illustration: "...PAs/NPs generally saw 10% more patients annually in the ambulatory settings than doctors(p.5). NPs have been shown to provide primary care services comparable to physicians in particular settings, as exemplified by the study of Mundinger and colleagues(p.5); The productivity of NPs and PAs, based on traditional Dr services, is comparable, and the range of services approaches 90% of what primary care physicians provide"(p.4).(95)

**Category:** Benefits. **Conclusion 11:** NP Improving Access-to-Care

Illustration: "PAs and NPs are well distributed throughout primary care and specialty care and are more likely than physicians to practice in rural areas and where vulnerable populations exist" (p.4).(95)

**Category:** Benefits. **Conclusion 12:** Role development and expansion is both challenging and rewarding

Illustration: "From a personal perspective, role expansion is both challenging and rewarding. Managing an independent NP clinic for children with musculoskeletal problems requires a skill set that includes advanced musculoskeletal assessment, academic perception and a sound working knowledge of paediatric orthopaedic conditions(124)(p.134); A significant development is the independent patient



diagnosis of fracture type, position and managing an appropriate treatment plan. In-house additional education and hands-on training, has enabled the NP's to diagnose and where necessary manipulate fractures ... The pathway for fracture management in the [nurse led] clinic in the USA is thorough but protracted. It does however, offer the child and family continuity in care and demonstrates the role expansion of NP's in these centres"(p.135);<sup>(117)</sup>

**Category:** Benefits. **Conclusion 13:** The advanced practice orthopaedic nurse improves access-to-care for orthopaedic populations

Illustration: "The advanced practice orthopaedic nurse enhances services to populations in rural and low income areas, managing the homeless or the aged (p10); The demand for advanced orthopaedic nursing practice services is greater in rural populations and in lower income urban populations. ...The patient population in rural areas is at high risk for musculoskeletal trauma and disabling joint and muscle disease. The advanced practice orthopaedic nurse can certainly meet the demand of these populations"(p.11).<sup>(119)</sup>

**Category:** Benefits. **Conclusion 14:** The advanced practice orthopaedic nurse provides 'personal care'

Illustration: 'Nurse practitioners provide a more personal kind of care that many patients like and that measurably improves compliance while reducing symptomatic complaints, return visits, and hospitalizations(p.11); They are bringing the caring element of nursing into clinical medical practice[sic]'(p.11).<sup>(119)</sup>

**Category:** Serendipity. **Conclusion 15:** Local clinical circumstances precede the development of advanced roles within orthopaedic nursing

Illustration: "The reasons for this development are complex and often related to specific circumstances within individual hospitals or services(p.205); As with POA and joint replacement follow-up clinics such services tended to develop on a small scale as a reaction to local circumstance (p.206); A particular focus was within orthopaedic POA clinics but there was also developments within post-operative review clinics and in fracture clinics. Such developments arose from local circumstances and some practitioners experienced difficulty in accessing appropriate and relevant education for their roles"(p.207);<sup>(118)</sup>

**Category:** Serendipity. **Conclusion 16:** NP Roles vary

Illustration: "While many similarities exist ... each position is utilized differently ... [and] these roles vary(p.25); both knowledge and use of nurse practitioners are often based on geographic location. In certain areas of the United States, clinical nurse specialists are used exclusively, while in other areas nurse practitioners are the norm(p.25); we recognise that some of these privileges and options vary depending on location"(p.27).<sup>(120)</sup>

**Category:** Serendipity. **Conclusion 17:** Purposeful rather than serendipitous role expansion is preferred for expanded role development

Illustration: "Too frequently an expanded role for nurses is acquired serendipitously and without recognition or official sanction(p.30). a purposeful attempt to emphasize a nursing (as opposed to mini-physician) identity during role change"(p.31)<sup>(115)</sup>

### ***Synthesised Finding 2: Role & Relationships***

Role and relationships are integral to the experience of the Orthopaedic Nurse Practitioner. The role of the ONP is multidimensional and incorporates: advocacy, coordinating care, being in control of complex situations, challenging and extending professional boundaries. Building and maintaining positive relationships with others remains an important aspect of ONP practice. Collaboration was an important component of this finding. Communication was a theme inherent within several categories. Personal,

professional and organisational circumstances were significant influences upon role development (Table 18).

The categories and key findings relating to the above synthesised finding are now presented with an illustration from relevant text.

**Category:** Relationships &/or Collaboration with others. **Conclusion 18:** Implementation of expanded roles requires establishing the need, formal organisational recognition, discussion, & goal setting

Illustration: " Establish the need (p.30); Formal organisational recognition(p.31); By discussing the concept of the expanded role through formal channels, we were using a marketing strategy(p.31); jointly discussed their shared problem ... a preliminary agreement reached between nursing administration and the orthopaedic physician(p.30); Together they set three goals(p.31);the orthopaedic physician section head ... persistently marketed the expanded nursing role concept to other physicians... the concept received gradual physician acceptance & enthusiasm(p.31); standard definition of what an expanded role entails(p.31); program plan must include protocols to identify nursing actions and an educational program to prepare nurses to assume responsibilities stated in the protocols(p.31); Our [marketing] strategy exposed many key individuals to the program and gained it multidepartmental visibility(p.31);Because of their format, we use the protocols for the expanded role as standards for evaluating care"(p.33).<sup>(115)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 19:** NP may enhance care through collaboration

Illustration: " The interprofessional skill mix provided by PAs and NPs may enhance medical care in comparison with that provided by a doctor alone"(p.4).<sup>(95)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 20:** NP's/PA's assist in maintaining an efficient and quality service when working either alongside a physician or independently

Illustration: "In some of the centres in the USA, the NP's were completely ward based, assuming the role of the intern (senior house officer)(p.137); On the wards and in the ED children receive prompt review by the NP who treats or refers on as required. This releases the residents to meet their training needs in theatres(p.138&136); For the many of the children this process was repeated by the physician whilst the NP typed the notes either on the computer in the room, or back in the office. This format of repeat consultation and examination is valid for complex patients, but in many cases there appeared to be a lack of recognition of the NP's ability or their worth as an independent practitioner"(p.134);<sup>(117)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 21:** NPs convey caring in telenursing through patient connectedness and by possessing personal attributes

Illustration: "Staying connected is the process used by APN's to be with patients beyond the time and space of the virtual visit(p.102); APNs conveyed caring in their telehealth practice by being with their patients. Personifying the images and attributes of the caregiver were identified as antecedents to caring in telehealth. APNs used different strategies to be with their patients before, during, and after the virtual visit to convey caring in their telehealth practice (p.101); Listening and communication were 2 strategies the APNs used to be with their patients during the virtual visit (p.101); The APNs demonstrated their respect for patients by asking their permission and respecting their privacy. For example, one participant said she always asked her patients, "Is it a good time to proceed?" (p.102); The APNs personified their patients' images by stressing their personhood, respecting their individual rights, and considering their emotions and feelings (p.104); APN's are able to convey caring using telehealth technologies, preserving the most enduring core principle of nursing care(p105). APNs identified certain attributes of the caregivers that were necessary to adequately promote caring. APN caregivers were honest, dependable, competent, empowering and intentional"(p.102-3).<sup>(96)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 22:** NPs enhance care as part of a cooperative, multidisciplinary team model

Illustration: "The cornerstone of this [Ortho-geriatric liaison]model is the adoption of nurse practitioners specifically for patients with these fractures(p.637). They maintain communication between the lead clinicians for the patients with fractures of the neck of the femur and the weekly trauma teams. They provide a model of care for those patients which produces many benefits of ward based geriatricians as outlined in the Blue Book. They have between 14 & 20 patients ... and are well placed to identify post-operative complications. They liaise with anaesthetists and microbiologists, spend time with patients and relatives, and co-ordinate the visits and opinions of doctors from other specialities. They also work closely with the discharge coordinators. They meet the educational needs of staff throughout the hospital and provide support to patients on outlying wards (p.637). These nurses play a major part in managing and auditing the care"(p.637).<sup>(121)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 23:** NPs provide a valuable link between the patient and the healthcare system

Illustration: "We believe we provide a valuable link between the patient and the healthcare system(p.26); the nurse practitioner's participation on the orthopaedic team brings a holistic approach to patient care(p.26);Inpatient NPs are more accessible for nursing and ancillary staff, and, most importantly, for patients and families; often NPs act as liaison to consulting and social services, coordinating a patient's total care (p.26); The nurse practitioners work in conjunction with the nursing staff to facilitate patient/case management"(p.26).<sup>(121)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 24:** Selling the Concept to staff assists in overcoming problems associated with NP Role Development

Illustration: "Despite the obvious benefits to the physician staff from this structure, paradoxically one of the initial problems is the selling of the concept to the same staff. Fundamental to the process are careful delineation of the nurse practitioner's responsibilities and functions and then presentation of these to the surgeon in terms of quality care and patient needs(p.49); A similar approach must be made to the orthopaedic staff nurses, both at the bedside and in the operating room(p49); The role of the NP (first assistant) in the operating room must be explained in a non threatening manner to the operating staff. Gaining acceptance of the NP by the operating room staff is the key point here"(p.49).<sup>(116)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 25:** Success of ONP Role Development and Implementation requires clear demonstration of need

Illustration: "... demonstration of need to the administration(p49); selling the concept to the same staff[physician staff](p.49); Essential to the successful implementation of the practice is gaining budgetary support from administration, demonstrating the benefits to the orthopaedic surgeon, and minimizing the perceived threat to staff nurses (bedside & operating room)(p.49); Defining the practice role to all key members through open & ongoing communication is fundamental"(p.49).<sup>(116)</sup>

**Category:** Relationships &/or Collaboration with others. **Conclusion 26:** Successful Implementation of ONP roles: relies on acceptance, strong nursing identity, strong alliances and cooperation

Illustration: "The success of the role is dependent on acceptance(p.66);The hospital-based NPs must be clinical experts and must be very strong in their nursing identity(p.66); The advantage to this model is a strong and clear identity with nursing(p49); This model also allows development of strong alliances with collaborating physicians & staff nurses(p49); The cooperative model has expanded the staff nurse role, providing continuity of care and increasing the satisfaction of all participants"(p.50);<sup>(116)</sup>

**Category:** Role. **Conclusion 27:** Blurred professional boundaries lead to feelings of 'in-between-ness' and professional isolation

Illustration: "Many problems are caused by the 'in-between-ness' of the work and behaviour of nurses in these new professional roles(p.27); Professional boundaries are becoming increasingly blurred as nurses move into areas that were once the domain of others. But this can create confusion amongst patients and colleagues as well as stress for the nurse(p.27); Professional isolation was another major problem which could result from blurred professional boundaries. One nurse explained how she had done her usual routine: 'I am the clinical nurse and I am going to do this, that and the other and then the doctor will come,' to which the patient's husband replied: 'How long have you been qualified as a doctor?(p.28): they [the nurses] talked a lot about the stress of developing their roles in areas previously occupied by doctors(p.28); At the start of their jobs, and whenever they met new staff, they had to justify what they did and work out their professional boundaries with other staff groups who were sometimes hostile.(p.28); One nurse explained: 'I don't really belong anywhere. The ward staff are lovely, but have a completely different shift pattern ... I just find I'm not part of anything, really. I'm sort of part of everything but I haven't got a base.(p.28); Some of the nurses felt that by taking on aspects of doctors' work they had jeopardised their future careers. They had encountered managers who seemed to want to put them down for moving too close to a medical identity"(p.28).<sup>(122)</sup>

**Category:** Role. **Conclusion 28:** NP Hospital Roles

Illustration: "A growing number of NPs and PAs are employed in hospitals ... In some instances, NPs and PAs serve as inpatient specialists or "hospitalists", providing "backfill" for junior hospital doctors"(p.4).<sup>(95)</sup>

**Category:** Role. **Conclusion 29:** Political, workforce & professional (nursing) circumstances influence the emergence of specialist roles within orthopaedic nursing

Illustration: "The stimuli for these developments came from the need to reduce the working hours of medical staff (p.207); The reasons for this development are complex and often related to specific circumstances ... at a wider level two developments within the 1990s provided the opportunity for the development of orthopaedic CNS or NP roles ... the NHS 'New Deal' to reduce junior doctors hours (p.205). There was an increased emphasis on reducing the length of acute inpatient stay which would impact on the acuity and dependency of patients within the orthopaedic and trauma wards and therefore the skills and knowledge required of the orthopaedic nursing staff (p.205); The second change was a professional one with the publication of 'The Scope of Professional Practice(UKCC). This allowed nurses to adjust their scope of practice by taking on new roles or tasks, such as history taking or physical examination, as long as they and their employers were satisfied that it met patients' needs. Together these meant that there was an impetus to develop nursing and other health professional roles ...Orthopaedic nursing seized this opportunity and a number of new roles developed(p.205). from the recognition by the UKCC that nurses could take on advanced roles(p.207).The new Labour government in 1997 set out its plans for the NHS ...and plans for the expansion of nursing roles made clear ... it appeared to herald a new in the development of nursing roles ... including those within orthopaedic nursing"(p.207).<sup>(118)</sup>

**Category:** Role. **Conclusion 30:** Program Evaluation and Organisational Impact of role expansion is important

Illustration: "Data were collected 28 months prior to implementation of the expanded role and 28 months following initiation of the role. The average LOS for the orthopedic patients surveyed decreased by 1.5 days(p.34); The program has enjoyed consistent support from orthopaedic physicians. Several similar expanded role programs using the basic orthopedic program structure have been initiated on various

units within the hospital(p33); we use the protocols for the expanded role as standards for evaluating care”(p.33).<sup>(115)</sup>

**Category:** Role. **Conclusion 31:** The nurse practitioner’s role is multi-faceted

Illustration: "The inpatient nurse practitioner's role is multi-faceted(p.26); There are many aspects of our job that are directly related to nursing. We address psychosocial issues as well as nutritional and rehabilitation needs. Patients' home situations are explored and accessibility viewpoints(p.26); From a surgical point of view, we address weight-bearing status and the need for assistant devices, and coordinate these needs(p.26); One of our priorities is the education of our patients (p.26); assist in the regaining of independence(p.26); technical procedures such as casting patients, suture removal, assessing wounds and discontinuing skeletal and skin traction(p.26); we are fortunate to work in collaboration with physicians, as well as nurses, on research(p.26); we attend grand rounds and fracture rounds(p.26); We precept students (p.26); As nurse practitioners, we also meet on a regular basis to discuss key issues, give each other support and broaden our knowledge base (p.26); it can be an exhilarating and challenging position for the nurse practitioner, allowing for autonomy, direct patient care and a great deal of job satisfaction”(p.26).<sup>(120)</sup>

**Category:** Role. **Conclusion 32:** Variation in Role Implementation and Education exists for RN Assistants-at-Surgery

Illustration: "Data provided by numerous surgical specialties regarding the use of assistants documented the wide variation in their use(p.43); However the variations in our educational base continue to be debated as nursing's greatest inconsistency” (p.44).<sup>(114)</sup>

### ***Synthesised Finding 3: Moving Forward along a Continuum***

The experience of the Orthopaedic Nurse Practitioner is characterised by moving forward along a continuum. Building confidence, knowledge and experience is essential to this. Available resources are required to support the ONP along this continuum (Table 19).

The categories and key findings relating to the above synthesised finding are now presented with an illustration from relevant text.

**Category:** Continuum: ‘moving forward’. **Conclusion 33:** Opportunities for NP practice expansion are emerging

Illustration: " opportunities for alternative practice situations are rapidly becoming available(p.25); We hope our role presents a new dimension of health care for the staff nurse as well(p.26); We would also like to be considered role models and an inspiration for those who are contemplating advancing to expanded role practice(p.26); As nurse practitioners in expanded roles investigate new horizons, the opportunities will multiply. Since we have gained prescription privileges and third party reimbursement, we are noticing changes and exploring new business opportunities with our colleagues(p.26); it is both an exciting and empowering time to be nurse practitioners in expanded roles”(p.27).<sup>(120)</sup>

**Category:** Continuum: ‘moving forward’. **Conclusion 34:** Policy considerations are key to APN use of telenursing

Illustration: " Several key policy issues are critical to enable even further adoption and broader use of telenursing in APN practice (p.103); The APN and facility/organization should jointly identify the patient population that would benefit from the use of telehealth technologies(p.104); knowledge of regulation is imperative”(p.105).<sup>(96)</sup>

**Category:** Knowledge, Education & Experience. **Conclusion 35:** Educational preparation is required for nurses in expanded roles

Illustration: " Program plan must include protocols to identify nursing actions and an educational program to prepare nurses to assume responsibilities stated in the protocols(p.31); Education preparation: before assuming any new responsibilities, each nurse successfully completed a course of instruction"(p.33).<sup>(115)</sup>

**Category:** Knowledge, Education & Experience. **Conclusion 36:** Knowledge and Competence in telenursing is key for APNs using this technology

Illustration: "Ideally APNs should become knowledgeable in the types of telehealth applications offered for remote patient care (p.104); knowledge of regulations is imperative(p.105); Competency in telenursing practice is ultimately the responsibility of the individual professional nurse"(p.105);<sup>(96)</sup>

**Category:** Resources. **Conclusion 37:** Available resources contribute to efficient and streamlined NP led care

Illustration: "There were however, significant differences when comparing the resources available. Administrative and team support was enviable(p.133): efficient computer technology(p.133-4); Whilst not a problem in the ED, insurance cover was challenged for some 'new' patient referrals to clinic and delayed their consultation ...Although thorough, the billing system in the USA appeared to be time consuming and perhaps detrimental in the long term to some patients(p.137): In the USA, the availability of a complete support team whose role it is to make the child's health pathway is streamlined: ... with additional MDT support when required;"(p.138).<sup>(117)</sup>

**Category:** Resources. **Conclusion 38:** Changing professional roles and identities require support frameworks

Illustration: "Some of the key issues that appear relevant to the creation of the robust and safe management framework needed to protect nurses as well as patients as new roles develop (p.27). A variety of initiatives are now under way to inject strategic coherence into the development of nursing roles and to consider what is required for robust yet flexible frameworks within which practice can develop safely without stifling local innovation<sup>1(DOH,1996)</sup>(p.27); The challenge of managing the moving boundaries of our profession is about addressing our changing professional identities and making sure that the correct support frameworks are in place<sup>3</sup>(p.28);A few trusts have found it helpful to set up cross-professional groups to support new posts (p.28); recognise these issues and exhort trusts and national and regional bodies to catch up with the changes occurring at the frontline of clinical care(p28); Better management support is needed;"(p.27).<sup>(122)</sup>

**Category:** Resources. **Conclusion 39:** NP justification for role

Illustration: "Nursing continues to lack hard data that demonstrate their cost-effectiveness and the scope and volume of services provided (p.42); Nurses need to continue to prove their cost effectiveness & worth in these and other services. Data collection becomes the important element(p.44). We will be battling the strength of organized medicine who most assuredly prefers the status quo"(p.70).<sup>(114)</sup>

Below shows the meta view graph from NOTARI .

Table 17: Synthesised Finding 1

Conclusion	Category	Synthesised Finding
Communication assisted in overcoming obstacles associated with implementing expanded roles (C)	<p>___ Barriers/Obstacles</p>	<p>Duality</p> <p>There is a duality to factors that influence the advanced practice of the Orthopaedic Nurse Practitioner. Barriers, obstacles, benefits and opportunities pose challenges both positive and negative on the development, implementation and evaluation of ONP roles.</p>
Many barriers exist for advanced practice nurses (C)		
NP recognition as an alternative health care provider of equal worth (C)		
NP roles are underutilised (C)		
Recognition of the professional role of APN in USA is linked to reimbursement (C)		
APN nurses provide safe effective and comprehensive care (C)	<p>___ Benefits</p>	
APN use of Telenursing improves access to care for patients (C)		
Improved team work, rapport and better communication were a beneficial by-products of implementing expanded roles (C)		
Non-physician clinicians (NP&PA) as alternative health care providers (C)		
NP Efficiency (C)		

NP Improving Access-to-Care (C)

Role development and expansion is both challenging and rewarding (C)

The advanced practice orthopaedic nurse improves access-to-care for orthopaedic populations (C)

The advanced practice orthopaedic nurse provides 'personal care' (C)

Local clinical circumstances precede the development of advanced roles within orthopaedic nursing (C)

NP roles vary (C)

Purposeful rather than serendipitous role expansion is preferred for expanded role development (C)

— Serendipity

Duality cont.



Table 18: Synthesised Finding 2

Conclusion	Category	Synthesised Finding
Implementation of expanded roles requires establishing the need, formal organisational recognition, discussion, & goal setting (C)	Relationships &/or Collaboration with others	<p>Role &amp; Relationships are integral to the Experience of the Orthopaedic Nurse Practitioner.</p> <p>The role of the ONP is multidimensional and incorporates advocacy, being in control of complex situations, challenging and extending professional role boundaries. Building and maintaining positive relationships with others remains an important aspect of ONP practice.</p>
NP may enhance care through collaboration (C)		
NP's/PA's assist in maintaining an efficient and quality service when working either alongside a physician or independently (C)		
NPs convey caring in telenursing through patient connectedness and by possessing personal attributes (C)		
NPs enhance care as part of a cooperative, multidisciplinary team model (C)		
NPs provide a valuable link between the patient and the healthcare system (C)		
Selling the Concept to staff assists in overcoming problems associated with NP Role Development (C)		
Success of ONP Role Development and Implementation requires Clear Demonstration of Need (C)		
Successful Implementation of ONP Role: relies on acceptance, strong nursing identity, strong alliances and cooperation (C)		

Blurred professional boundaries lead to feelings of 'in-between-ness' and professional isolation (C)

NP Hospital Roles (C)

Political, workforce & professional(nursing) circumstances influence the emergence of specialist roles within orthopaedic nursing (C)

Program Evaluation and Organisational Impact of role expansion is important (C)

The nurse practitioner's role is multi-faceted (C)

Variation in Role Implementation and Education exists for RN Assistants-at-Surgery (C)

— Role

Role & Relationships are integral to the Experience of the Orthopaedic Nurse Practitioner. (cont.)

Table 19: Synthesised Finding  
3

Conclusion	Category	Synthesised Finding
Opportunities for NP practice expansion are emerging (C)	Continuum: 'Moving Forward'	<p>The Experience of Orthopaedic Nurse Practitioner is characterised by Moving Forward along a Continuum.</p> <p>Building confidence, knowledge, and experience is essential to this. Available resources are required to support the ONP along this continuum.</p>
Policy considerations are key to APN use of telenursing (C)		
Educational preparation is required for nurses in expanded roles (C)	Knowledge, Education & Experience	
Knowledge and Competence in telenursing is key for APNs using this technology (C)		
Available resources contribute to efficient and streamlined NP led care (C)	Resources	
Changing professional roles & identities require support frameworks (C)		
NP Justification for Role (C)		

## Discussion

Nurse practitioner roles originally emerged in response to areas of unmet healthcare needs in a variety of international settings. Nurse practitioners are registered nurses that perform an advanced clinical role.<sup>(26)</sup> They are formally educated and acquire certain knowledge, skills and competence in order to provide an expanded form of advanced nursing practice<sup>(12)</sup> in accordance with the context/country in which they practice.<sup>(4)</sup> The National Association of Orthopaedic Nurses (NAON) was established in the United States in 1980. From 1990 onwards evaluation of emerging roles began to populate the research literature, including orthopaedic nursing. Healthcare has seen an increase uptake of the nurse practitioner role however the progress for orthopaedic nurse practitioners has been haphazard, slow and not without challenge.

The findings of this comprehensive review present the evidence on the experience and effectiveness of orthopaedic nurse practitioners.

### Overview of quantitative evidence

The quantitative component of the review examined the effectiveness of the ONP in relation to patient outcomes and nurse/process related outcomes. Findings from the quantitative evidence demonstrated that nurse practitioners in orthopaedic settings provide comparable care and at times improved care specifically in units with CNS, for distal radius fracture management, screening for developmental hip dysplasia, decreased complication rates, improving wait times and access to care. High levels of patient satisfaction and patient acceptance were also noted with the ONP. However, these findings need to be cautiously viewed as the results are derived from cohort studies and case series. Selection bias and confounding bias due to an absence of comparison and control must be considered when interpreting the findings. In terms of NP related outcomes level of education influences the effectiveness of the ONP. Professional and organisational barriers hinder the effectiveness of ONPs. The cost-benefit of ONPs was demonstrated through savings in time, LOS, surgical targets, cost minimisation, better resource utilisation and other direct costs. ONPs are effective in the 'economy of care'.

### Overview of qualitative evidence

There had previously been one published systematic review on this topic.<sup>(8)</sup> An unpublished thesis was the only study included in this qualitative review. Themes emerging from this paper supported the findings of textual evidence. However given only one paper was included in this component of the review, a metasynthesis could not be conducted. No further new qualitative evidence was found.

### Overview of evidence of text and opinion

Text and opinion papers provide evidence on the broader nature of ONP that may not be addressed by research studies. There was a wide range of thirty years of publication dates of the papers included in this section, with a ten year hiatus between the first and second papers most likely due to the pioneering concepts put forward in the initial paper. The earlier included papers were predominantly published in the United States. This can logically be explained by the fact that North America was one of the first countries to introduce advanced practice roles; almost twenty years ahead of the rest of the world.

The evidence produced within this section of the review primarily focused on the development and implementation of the expanded role of the ONP. The findings of the review indicate there are many

factors influencing the role of the ONP. These factors include relationships, barriers, politics at a professional and practice level, education, and work value/cost effectiveness.

## **Duality for the ONP**

A notion of duality emerged from the interpretive evidence. Barriers, obstacles, benefits and opportunities pose challenges both positive and negative on the development, implementation and evaluation of ONP roles. For example billing practices that restrict reimbursement for ONP interventions can pose barriers; a lack of consumer, physician and organisational understanding of the NP role can create obstacles for the ONP. Opportunities arise for the ONP to resolve this and in so doing foster an environment of improved communication and collaboration with colleagues, which then becomes a benefit to ONP practice and clinical care.

In other words barriers and obstacles that pose challenges for the NP to overcome, provide reward or benefit once overcome. Negative experiences such as workload related issues become the impetus to pushing professional boundaries. Poor communication precipitates better communication processes that encourages greater collaboration. Frustration from serendipitous role development provides an opportunity to develop an implementation model. Contradictions were reported amongst the evidence that informed this concept of duality where a negative influence could become a positive one for the orthopaedic nurse practitioner.

## **Limitations of the Review**

There are several limitations of this review. This review was undertaken in fulfilment of the requirements for the award of Master of Clinical Science and as such had time constraints imposed. English language studies were only included due to language limitations of the reviewers. Publication dates ranged from database inception to end December 2012. Potentially more recent studies and papers may have been published since this time. For the quantitative evidence a meta-analysis was not possible due to significant clinical and methodological difference between the studies. Therefore, the evidence was presented in narrative form, which only allowed for an overview of the available evidence.

## **Conclusion**

The findings from the different evidence sources in this review complement and support one another in an attempt to contribute to the evidence base on the experience and effectiveness of the nurse practitioner practising in orthopaedic settings. The evidence suggests that the ONP is no different if not better (in some areas) at delivering improved patient outcomes. However due to the limitations of this review and a lack of high quality quantitative studies, interpretation of the results should be viewed cautiously. The findings of the review have also highlighted that the ONP role is complex with many challenging factors influencing the role. It is believed that the findings of this review have been able to produce a deeper understanding on the role of the ONP and can assist in continuing to improve the role in the future.

## **Implications for practice**

Implications for practice are limited due to level of quality of the included papers in this review. Whilst the single qualitative paper comprised level 3 evidence, text and opinion represents level 5.c evidence of expert opinion at best.<sup>(3)</sup>

To overcome inconsistency in nomenclature, scope of practice and professional boundaries for advanced practice roles, a clear and well defined international approach to classification and regulation for the nurse practitioner needs to be developed. (Grade B)

A policy framework may need to consider professional, organisational and political influences on this advanced practice nursing role. This strategy may demonstrate benefit for patients and orthopaedic nurse practitioners alike despite the evidence not being of the highest quality. (Grade B)

### **Implications for research**

This review presented Observational – Descriptive Studies which comprise Level 3 and 4 evidence (level 3.c or 3.e and 4.b or level 4.c, cohort with or without control, cross-sectional study and case series respectively).<sup>(3)</sup> Therefore to strengthen the current evidence based related to the effectiveness of ONP, high quality studies are required particularly randomised control trials. More qualitative research to better understand aspects of organisational culture and the role communication and collaboration plays in acceptance of ONP roles. There needs to be a greater representation of research from other areas of the world, particularly non-English speaking countries.

### **Conflicts of Interest**

The author is endorsed as an orthopaedic nurse practitioner and therefore possesses an 'abiding interest' in the practice of orthopaedic nurse practitioners. Given the rigorous process of appraisal, extraction and pooling of data associated with the JBI process of any systematic review of evidence from quantitative, qualitative studies, narrative and text from opinion papers this poses no threat to the review.

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## Appendix 1 Search Strategy

Due to the international variation in nomenclature describing advanced nursing practice and the varying specificity of individual databases a 'string search' of core key terms was applied to each database and websites. Individual search terms were modified according to the 'indexing language' of the specific database in order to yield the greatest number of citations. Where necessary searches were repeated, in early 2013 to improve sensitivity of terms and as an indicator of reproducibility. The search strategy is represented below.

### Search Terms & Logic Grid

Search Term	Orthopaedic	Nurse Practitioner	Advanced Practice Nurse	Citations
PubMed				6 (28/11/12)
CINAHL				91 (26/9/12)

*Databases were originally tested with the above search terms*

### Revised Logic Grid 28/11/12

'String' Search Term	Headings	Citations (PubMed)
Orthopedic [orthopaedic*, orthope*]		163079
Orthopedic Nursing [nurs*]		1 759
Nurse Practitioner[s]		17 870
Advanced Practice Nursing		4 368
Extended Practice		4 965
Expert Nurse		2 782
Physician Assistant		5 617
Effectiveness		243688
Experience		399127

### Exploded Search Terms: Revised Logic Grid 26/9/12

'String' Search Term	CINAHL Headings	Citations
Orthopedic MW		20 832
Orthopedic Nursing MW		1 983
Nurse Practitioners MW		15 282
Advanced Practice Nursing MW		3 293
Extended Practice MW		42
Expert Nurse MW		1 370
Physician Assistant MW		12
Effectiveness Tx		140 095
Experience Tx		303555

## Grey Literature Search

Grey Literature Search: approx. 79 (Title & Keywords). Search Terms: (1) 'Orthop[a]edic Nurse Practitioners' OR (2) 'Nurse Practitioners' OR (3) 'orthop[a]edic OR (4) 'nurse'

Website	Web Address	Date	Results	Comments
American Association Nurse Practitioners (AANP)	<a href="http://www.aanp.org/">http://www.aanp.org/</a> ; <a href="http://www.aanp.org/international-resources/international-organizations">http://www.aanp.org/international-resources/international-organizations</a> "ONP"	1/4/13	50	<a href="http://www.aanp.org/images/documents/publications/qualityofpractice.pdf">http://www.aanp.org/images/documents/publications/qualityofpractice.pdf</a> position statements incl
American Society for Bone & Mineral Research	<a href="http://www.asbmr.org/Search/SearchResults.aspx?q=116rthopaedic+nurse+practitioner">http://www.asbmr.org/Search/SearchResults.aspx?q=116rthopaedic+nurse+practitioner</a>	26/5	4	nil
An Bord Altanais (Irish Registering Board)	<a href="http://www.nursingboard.ie/en/searchresults.aspx?page=1&amp;query=nurse%20practitioners">http://www.nursingboard.ie/en/searchresults.aspx?page=1&amp;query=nurse%20practitioners</a>	1/4	8	1 cross referenced previously
AOSSM	<a href="http://www.sportsmed.org/">http://www.sportsmed.org/</a>	24/3	5	nil
Arthritis Australia	<a href="http://www.arthritisaustralia.com.au/">http://www.arthritisaustralia.com.au/</a>	23/5	nil	
ABS	<a href="http://www.abs.gov.au/">http://www.abs.gov.au/</a>	23/5	8	nil
ACNP	<a href="http://www.acnp.net.au">http://www.acnp.net.au</a>	26/5	Nil search function	Refer personal email correspondence (n=1)
Australian College of Nursing (CAN); previously RCNA	<a href="http://www.acn.edu.au/">http://www.acn.edu.au/</a> search via <a href="http://www.collegianjournal.com/">http://www.collegianjournal.com/</a>	1/13	16	'NPs' yielded mostly Oz background documents; Imported to Endnote
Australian Govt Health & Aging	<a href="http://www.health.gov.au">http://www.health.gov.au</a>	23/5	178	Nil. Mostly press releases
Australian Sports Commission	<a href="http://www.ausport.gov.au/">http://www.ausport.gov.au/</a>	23/5	nil	
AO	<a href="https://www.aofoundation.org/Structure/Pages/default.aspx">https://www.aofoundation.org/Structure/Pages/default.aspx</a>	1/4	2/48	
AADO	<a href="http://www.aado.org/nurse.htm">http://www.aado.org/nurse.htm</a>	1/4	0	Nil search function
ANF	<a href="http://anf.org.au/">http://anf.org.au/</a>	20/5	7	3 documents saved
Australian Nursing & Midwifery Accreditation Council (ANMAC)	<a href="http://www.anmac.org.au/search/node/nurse%20practitioners">http://www.anmac.org.au/search/node/nurse%20practitioners</a>	20/5	8	nil
ANZHFR	<a href="http://anzhfr.org/">http://anzhfr.org/</a>	24/3 & 26/1	Focus on hip fracture care	3 on nursing care
AIOT	<a href="http://www.aiot.com.au/">http://www.aiot.com.au/</a>	1/4	0	Members only
AOA	<a href="http://www.aoa.org.au/">http://www.aoa.org.au/</a>	1/4	0/2	Nil results for ONP's; 2 for nurse

AOA National Joint Replacement Registry	<a href="https://aoanjrr.dmac.adelaide.edu.au/">https://aoanjrr.dmac.adelaide.edu.au/</a>	26/5	Unable to access	
AMON	<a href="http://www.amon-nurse.com/">http://www.amon-nurse.com/</a>	¼		Couldn't access website
ANZ Newsstand (Proquest)	<a href="http://search.proquest.com/anznews/selecteditems?accountid=133391#mlItem_0">http://search.proquest.com/anznews/selecteditems?accountid=133391#mlItem_0</a>	26/5	141	8
ARCHI	<a href="http://www.archi.net.au/">http://www.archi.net.au/</a>	26/5	2 in Adv Search 35 in general search	1 OP Model of care Workforce link only
Bone & Joint Decade	<a href="http://bjdonline.org/">http://bjdonline.org/</a>	23/5	nil	ONP & NP
NSWONA	<a href="http://www.aona.com.au/">http://www.aona.com.au/</a>	20/5	Nil search function	
BMJ Best Practice	<a href="http://bestpractice.bmj.com/best-practice/search.html">http://bestpractice.bmj.com/best-practice/search.html</a>	26/5	O AND/OR N AND/OR P	Terms too broad
CAAPN Canadian Association of Advanced Practice Nurses	<a href="http://www.caapn.com/">http://www.caapn.com/</a>	19/5		Nil search Fx
COA	<a href="http://www.coa-aco.org/">http://www.coa-aco.org/</a>	24/3	6/11	See docx
CONA	<a href="http://www.cona-nurse.org/">http://www.cona-nurse.org/</a>	24/3		Nil search facility
Cochrane database	<a href="http://onlinelibrary.wiley.com/cochranelibrary/search">http://onlinelibrary.wiley.com/cochranelibrary/search</a>	26/5	4ONP 19 NP	4 to 3 9 to 2
Healio: Orthopedics Today	<a href="http://www.healio.com/orthopedics">http://www.healio.com/orthopedics</a>	26/5	many	2 headlines
ICN/APN	<a href="http://icn-apnetwork.org/">http://icn-apnetwork.org/</a>	31/3	2	n/a
ICON	<a href="http://www.orthopaedicnursing.org/">http://www.orthopaedicnursing.org/</a>	23/5		nil
INMO	<a href="http://www.inmo.ie/DesktopDefault.aspx">http://www.inmo.ie/DesktopDefault.aspx</a>	31/3	1 (ONP) 608 (NP) 647 (orthopaedic)	3 sep docs saved
International Bone & Mineral Society	<a href="http://www.ibmsonline.org">http://www.ibmsonline.org</a>	26/5		Nil search facility
JBI		26/5		1ONP(AT); 6NP; 2 APN; 1 Nurse-led
JBJS	<a href="http://www.boneandjoint.org.uk/search/site/117rthopaed">http://www.boneandjoint.org.uk/search/site/117rthopaed</a>	23/	113	20!

	<a href="#">ic%20nurse%20practitioners</a>	5	ONP	
IOF	<a href="http://www.iofbonehealth.org/search/site/orthopaedic%20nurse%20practitioners">http://www.iofbonehealth.org/search/site/orthopaedic%20nurse%20practitioners</a>	26/5		3 saved (2 articles; 1 position statement)
Medscape Medscape Nurses	<a href="http://search.medscape.com">http://search.medscape.com</a>  <a href="http://search.medscape.com/news-(nursing)search?queryText=orthopaedic+nurse+practitioners=">http://search.medscape.com/news-(nursing)search?queryText=orthopaedic+nurse+practitioners=</a>	26/5	185  123	6
NZONA	<a href="http://nzona.org/">http://nzona.org/</a>	¼/13	0	
NAON	<a href="http://www.orthonurse.org/">http://www.orthonurse.org/</a>	19/5	20	
National Association of Pediatric Nurse Practitioners	<a href="http://www.napnap.org/">http://www.napnap.org/</a>	19/5	19	1 newsletter
National Guideline Clearing House	<a href="http://www.guideline.gov/search/results.aspx?113=650%2c&amp;term=orthopaedic+nurse+practitioner">http://www.guideline.gov/search/results.aspx?113=650%2c&amp;term=orthopaedic+nurse+practitioner</a>	26/5	25	Advanced Search > Keyword: orthopaedic nurse practitioner ClinicalSpecialty: Orthopedic Surgery (2: NICE & SIGN known to me; mostly clinical focus – APN's intended users
National Injury surveillance unit	<a href="http://www.nisu.flinders.edu.au/search.php">http://www.nisu.flinders.edu.au/search.php</a>	26/5	4	nil
NHMRC	<a href="http://www.nhmrc.gov.au/search/node/orthopaedic%20nurse%20practitioner">http://www.nhmrc.gov.au/search/node/orthopaedic%20nurse%20practitioner</a>  NP:	26/5	1/2  1 podcast saved	Australia Department of Health Fellow 2006-2008 Orthopaedic Nurse Practitioner (CK), Orthopaedics, FMC, SA ... NP: <a href="http://www.nhmrc.gov.au/_files_nhmrc/file/media/podcasts/08/10_Jane_Hall2.pdf">http://www.nhmrc.gov.au/_files_nhmrc/file/media/podcasts/08/10_Jane_Hall2.pdf</a>
NARIC Rehab Data	<a href="http://www.naric.com">http://www.naric.com</a>	26/5	2	nil
NPUK (see RCN) Accessed via NAON	<a href="http://www.nursepractitioner.org.uk/">http://www.nursepractitioner.org.uk/</a>	19/5		2 documents saved
NP Association of Ontario	<a href="http://www.caapn.com/">http://www.caapn.com/</a>	19/5	2	Nil selected
NMBA	<a href="http://www.nursingmidwiferyboard.gov.au/">http://www.nursingmidwiferyboard.gov.au/</a>	23/5	364	Broad documents on NP endorsement/practice requirements in Oz. Scope of Practice
ONAVIC	<a href="http://www.onavic.com.au/">http://www.onavic.com.au/</a>	20/5	14 "NP's"	nil
Orthopaedic web links	<a href="http://www.orthopaedicweblinks.com/">http://www.orthopaedicweblinks.com/</a>	23/5	31	nil
Osteoporosis Australia	<a href="http://www.osteoporosis.org.au/search/newest-first/?searchphrase=all&amp;searchword=nurse+practitioner">http://www.osteoporosis.org.au/search/newest-first/?searchphrase=all&amp;searchword=nurse+practitioner</a>	26/5	nil	nil
Royal College of Nursing UK	<a href="http://www.rcn.org.uk/">http://www.rcn.org.uk/</a>	19/5	21,419 (Adv Search)	2 or 3 saved

SAON	<a href="http://www.saon.org/">http://www.saon.org/</a>	20/5	Nil search function	nil
SAHealth	<a href="http://www.sahealth.sa.gov.au">http://www.sahealth.sa.gov.au</a>	26/5	ONP: 65	3
Spinal Cord Injuries Australia	<a href="http://scia.org.au/home">http://scia.org.au/home</a>	26/5	nil	nil
SOTN	<a href="http://www.rcn.org.uk/development/communities/rcn_for_um_communities/orthopaedic_and_trauma">http://www.rcn.org.uk/development/communities/rcn_for_um_communities/orthopaedic_and_trauma</a>	19/5	a/a	
Sports Medicine Australia	<a href="http://sma.org.au/?s=orthopaedic+nurse+practitioner">http://sma.org.au/?s=orthopaedic+nurse+practitioner</a>	26/5	1	nil
Standards Australia	<a href="http://www.standards.org.au">http://www.standards.org.au</a>	26/5	Nil for ONP & NP	
QONSIG	<a href="http://www.qonsig.org/">http://www.qonsig.org/</a>	20/5	Nil search function	nil
ONAWA	<a href="http://www.ona.asn.au/">http://www.ona.asn.au/</a>	20/5	Nil search function	nil
WHO	<a href="http://search.who.int/">http://search.who.int/</a>	26/5	132 (ONP)	2 background PDF on midlevel health worker substitution

## Appendix 2 Checklist for Critical Appraisal

### The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings:

#### A Comprehensive Systematic Review

##### 1. Population

- Orthopaedic Nurse Practitioner/Advanced Practice Nurse/ Extended Practice/ Expert Nurse

##### 2. Setting

- Orthopaedic/Acute Care or Sub Acute settings

##### 3. Intervention: 'ONP-specific care' [choose from the following outcome measures]

- pain
- pressure injury
- UTI
- patient satisfaction
- in-hospital mortality
- hospital readmission
- patients' health-related QOL
- functional status
- malnutrition score
- constipation
- wound care/complications
- other clinical complications
- morbidity
- other patient encounter data that characterise ONP practice:

- 
- other nurse-sensitive outcome data relevant to ONP practice:
- 

- orthopaedic NP satisfaction
- key stakeholder (health professional) satisfaction
- specialised knowledge/skill translation
- hospital LOS
- cost/benefit

##### 4. Comparator (if relevant)

- Dr substitution
- Care provided by a nurse other than ONP
- Physician Assistant

**(a tick at 1, 2 & at least one tick in 3) ACCEPTED**

proceed to Critical Appraisal in CReMS

**REJECTED**



## Appendix 3 JBI MASTARI critical appraisal instrument

### JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                     Exclude                     Seek further info.

Comments (Including reason for exclusion)

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## JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                   Exclude                   Seek further info

Comments (Including reason for exclusion)

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## Appendix 4 JBI QARI critical appraisal instrument

### JBI QARI Critical Appraisal Checklist for Interpretive & Critical Research

Reviewer \_\_\_\_\_ Date \_\_\_\_\_

Author \_\_\_\_\_ Year \_\_\_\_\_ Record Number \_\_\_\_\_

	Yes	No	Unclear	Not Applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:  Include  Exclude  Seek further info.

Comments (Including reason for exclusion)

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## Appendix 5 JBI NOTARI critical appraisal instrument

### JBI Critical Appraisal Checklist for Narrative, Expert opinion & text

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is the source of the opinion clearly identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Does the source of the opinion have standing in the field of expertise?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are the interests of patients/clients the central focus of the opinion?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the opinion's basis in logic/experience clearly argued?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is the argument developed analytical?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there reference to the extant literature/evidence and any incongruency with it logically defended?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the opinion supported by peers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                   Exclude                   Seek further info

Comments (Including reason for exclusion)

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# Appendix 6 JBI MASTARI Data Extraction Tool

## JBI Data Extraction Form for Experimental / Observational Studies

Reviewer ..... Date .....

Author ..... Year .....

Journal ..... Record Number .....

### Study Method

RCT                       Quasi-RCT                       Longitudinal   
Retrospective                       Observational                       Other

### Participants

Setting \_\_\_\_\_

Population \_\_\_\_\_

### Sample size

Group A \_\_\_\_\_ Group B \_\_\_\_\_

### Interventions

Intervention A \_\_\_\_\_

Intervention B \_\_\_\_\_

Authors Conclusions:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewers Conclusions:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Study results**

**Dichotomous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

**Continuous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

## Appendix 7 JBI QARI Data Extraction Tool

### JBI QARI Data Extraction Form for Interpretive & Critical Research

Reviewer ..... Date .....

Author ..... Year .....

Journal ..... Record Number .....

#### Study Description

Methodology

---

Method

---

Phenomena of interest

---

Setting

---

Geographical

---

Cultural

---

Participants

---

Data analysis

---

Authors Conclusions

---

Comments

---

Complete

Yes

No

Findings	Illustration from Publication (page number)	Evidence		
		Unequivocal	Credible	Unsupported

Extraction of findings complete

Yes

No



## Appendix 8 JBI NOTARI Extraction Tool

### JBI Data Extraction for Narrative, Expert opinion & text

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

#### Study Description

Type of Text:

---

---

Those Represented:

---

---

Stated Allegiance/ Position:

---

---

Setting

---

---

Geographical

---

---

Cultural

---

---

Logic of Argument

---

---

Data analysis

---

---

Authors Conclusions

---

---

Reviewers Comments

---

---

Data Extraction Complete

Yes

No

Conclusions	Illustration from Publication (page number)	Evidence		
		Unequivocal	Credible	Unsupported

Include

Yes

No

## Appendix 9 Excluded Studies

### MAStARI

Burke, F. D., Miranda, S. M., Owen, V. M. F., Bradley, M. J., Sinha, S., Rheumatoid hand surgery: Differing perceptions amongst surgeons, rheumatologists and therapists in the UK

**Reason for exclusion: Sound study that confirms stat significance in DIFFERENCE of opinion on Rx of RA Hand. However no link to effectiveness made!**

Cox, S., Mpofo, F., Berg, A., Rode, H., The impact of subspecialty services on health care delivery--a community health centre based study

**Reason for exclusion: Poor quality study due to a lack of information about NP role in this OOH clinic. Focus on role of Paed Surgical consultant despite reference to NP diagnostic efficiency.**

DiFazio, R. and Atkinson, C. C., Extremity fractures in children: when is it an emergency?

**Reason for exclusion: poor quality**

Forster, Faith J., Developing a nurse practitioner role for hip fracture care: A journey of challenges

**Reason for exclusion: poor quality study due to limited explanation & interpretation of data**

Harle, D., Ilyas, S., Darrah, C., Tucker, K., Donell, S., Community-based orthopaedic follow-up. Is it what doctors and patients want?

**Reason for exclusion: Little insight into NP role; poorly constructed & brief questionnaire**

Jackson, R., Advancing nursing practice for orthopaedic outpatients

**Reason for exclusion: Simple audit; Not all outcomes supported by data presented**

Leopold, S. S., Morgan, H. D., Kadel, N. J., Gardner, G. C., Schaad, D. C., Wolf, F. M., Impact of educational intervention on confidence and competence in the performance of a simple surgical task

**Reason for exclusion: Thorough study comparing different method of education. BUT only relevant point: NP less confident & as good with knee injection both before & after education. Ind variable=education & Dep variable=confidence/competence**

Lucas, B., Judgement and decision making in advanced orthopaedic nursing practice related to chronic knee pain

**Reason for exclusion: Interesting article however claims about "judgement & decision making" do not flow from quant data**

Maru, M., Auyeung, J., Irwin, L., Primary total hip replacement follow-up study

**Reason for exclusion: limited information presented therefore inadequate quality of study**

Mikhali, Judy, Miller, William, Wagner, James, Midlevel practitioner role evolution in an American College Of Surgeons-verified trauma surgery service: the 23-year experience at Hurley Medical Center

**Reason for exclusion: poor quality: Review only of MLP "usefulness" not clearly supported**

**by data supplied**

Mooney, N. E., The nurse's role in orthopaedic pain management

**Reason for exclusion: Nil evidence presented. Recommendations for practice only of potential scope for APN/NP in pain management of ortho pt with LBP. Did not flow from case study.**

Pearson, J., Hayes, J., Moore, J., James, A., Jelley, B., Coates, S., Audit: Comparison of patients identified with low trauma fractures by a collaborative fracture liaison service operating in a district general hospital to recognised fracture liaison services

**Reason for exclusion: Simple audit only; scant outcomes reported**

Rymaszewski, L. A., Sharma, S., McGill, P. E., Murdoch, A., Freeman, S., Loh, T., A team approach to musculo-skeletal disorders

**Reason for exclusion: study lacking rigour**

Singh-Ranger, G. and Marathias, A., Comparison of current local practice and the Ottawa Ankle Rules to determine the need for radiography in acute ankle injury

**Reason for exclusion: Effectiveness of applying Ottawa Ankle rules by Drs & NP (n=18); Confusing; More analysis could have been done. NB Clinicians not segregated out in results**

Storch, S. M., Stevens, S. W., Allen, A. M., Orthopedic surgeons' perceptions of athletic trainers as physician extenders

**Reason for exclusion: inadequate rigour applied to this study despite the interesting point that more knowledge an ortho surgeon has about role of ATC the more likely they will employ one. Therefore info on role is important!**

Tachakra, S., Freij, R., Mullett, S., Sivakumar, A., Teleradiology or teleconsultation for emergency nurse practitioners?

**Reason for exclusion: lack of clarity affected the poor quality of this study**

**QARI to update**

Camillo, Patricia, Goodman, Stuart B., Thompson, Patricia, Imrie, Susanna Nemeth, Context and Consequences of Delaying Hip Replacement Surgery: A Case Study

**Reason for exclusion: Poor quality ie not sufficiently congruous**

Drozd, M., Jester, R., Santy, J.r, The inherent components of the orthopaedic nursing role: an exploratory study

**Reason for exclusion: Commentary on generalist specialism in ortho nursing; not specific to NP's. Only relevant data on "specialised skill" ...**

Flynn, S., Nursing effectiveness: An evaluation of patient satisfaction with a nurse led orthopaedic joint replacement review clinic

**Reason for exclusion: multi method approach. Qualitative data is weak from a methodology perspective. Quant data included**

Greenwood, J. and King, M., Some surprising similarities in the clinical reasoning of ?expert? and ?novice? orthopaedic nurses: report of a study using verbal protocols and protocol analyses

**Reason for exclusion: expert & novice ortho nurses subjected to think-aloud techniques to look at clinical reasoning. Flawed method for answering this research question.**

Lucas, B., Developing the role of the nurse in the orthopaedic outpatient and pre-admission assessment settings: a change management project

**Reason for exclusion: congruity of research purpose & results unclear; poor quality**

Ramis, Maryanne. Pearson, Alan. Wu, Chiung-Jung. The Experience of being an advanced practice nurse in Australian acute care settings: a systematic review

**Reason for exclusion: A thorough review of qualitative evidence that reports on 6 meta-syntheses associated with advanced practice in Australian acute care settings. Late exclusion due to a flaw in original protocol excluding evidence form systematic reviews**

## NOTARI

Boddy, Greg, Working with specialist surgeons

**Reason for exclusion: opinion piece only**

Childs, S., Patterson, M., Gates, S. J., The nurse practitioner role

**Reason for exclusion: Nil data presented of effectiveness nor experience on the 3 ONP roles discussed**

Driscoll, J. and Teh, B., The potential of reflective practice to develop individual orthopaedic nurse practitioners and their practice

**Reason for exclusion: clinical development paper on the merit of reflective practice only. Nil new evidence supplied.**

Flasher, Naomi, Developing the scope of practice for rheumatology nurse practitioners

**Reason for exclusion: Career development article that presents a proposed framework & principles for scope of practice & role development for Rheumatology Nurse Practitioner**

Forster, Faith J., Developing a nurse practitioner role for hip fracture care: A journey of challenges

**Reason for exclusion: Poor methodological quality**

Hansen, Erik and Bozic, Kevin, The Impact of Disruptive Innovations in Orthopaedics

**Reason for exclusion: Persuasive & interesting perspective on 'Disruptive Innovations' in orthopaedic care in US. Regarding NPs/PAs all that is raised: \$ and pt satisfaction & neither is critiqued however.**

Hosken, M &, Davis, C , "Them bones, them bones, them thigh bones": setting up an Emergency Nurse

Practitioner Fracture Clinic in a rural setting

**Reason for exclusion: Abstract: Nil evidence or outcomes provided.**

Johnson, Jeffrey P., Preoperative assessment of high-risk orthopedic surgery patients

**Reason for exclusion: Clinical Practice Development article only; nil data presented**

Kimber, Cheryl, Best evidence to improve patient care

**Reason for exclusion: Whilst a good summary of APN in orthopaedic nursing there is minimal evidence presented in any systematic way within this 'career development' article**

Lucas, B., Five years later on you've got the world at your feet, success has been so easy for you (concurrent)

**Reason for exclusion: Outcomes & themes presented; Rejected due to lack of detail on method/process**

McCollum, J., The role and impact of a fracture neck of femur nurse practitioner

**Reason for exclusion: Adds nothing new; nil data presented of any use; Career Development article only: simple role description.**

Paige, C. I., Commentary on Current procedural terminology (CPT) coded services provided by nurse specialists [original article by Griffith H et al appears in IMAGE 1993;25(3):178-86]

**Reason for exclusion: Review of a study on reimbursement policy in US. Editor's comments link cost effectiveness, quality, access with professional standing/"economy of care".**

RCN: SOTN, Preparing for advanced practice

**Reason for exclusion: Simple report of 1991 recommendations with particular focus on education. Nil new evidence presented**

Stone, K. R., The role of the nurse practitioner in the orthopaedic sports medicine surgical practice

**Reason for exclusion: Opinion piece with nil robust evidence provided**

Wade, S., Day in the life. Advance nurse practitioner in trauma and orthopedics

**Reason for exclusion: Author's opinion only; Nil data presented.**

Ward, W. T., Ebersson, C. P., Otis, S. A., Wallace, C. D., Wellisch, M., Warman, J. R., Leitch, K. K., Epps, H. R., Richards, B. S., Pediatric orthopaedic practice management: the role of midlevel providers

**Reason for exclusion: Opinion piece only, slight bias.**

Zychowicz, M., NPs in orthopedics. One nurse practitioner's path

**Reason for exclusion: Opinion piece & role description only; nil other evidence or data presented.**

## Appendix 10 Included Studies

### Quantitative Cohort Studies

Study	Design	Method	Participant	Interven <sup>n</sup> A	Interven <sup>n</sup> B	Results	Outcome
Lee, TWR et al <sup>(123)</sup> 2001 UK	Prospective	Standardised proforma [@ clinic to R/V neonatal check]	N=470+7 DDH screening	249 ANNP neonatal hip screening	211 SHO neonatal hip screening	ANNPs ↑ sensitivity than SHOs (96% v 74%); p<0.05) No difference positive predictive value (p<0.05)	ANNP sig more effective detecting hip abnormalities @ neonatal check
Considine et al <sup>(97)</sup> 2006 Australia	Prospective Exploratory design - cohort study	ENP register	83 of 476 ENPC managed patients in ED with fracture(#)	ENP model of care	RAT emergency physician	XR ordering: Nil sig difference btw ENPC & RAT Emerg physician (z=-1.254, N-Ties=77, p=0.210)	ENP model of care as effective in mgt of # ENPC XR ordering patterns compare to Emergency physicians
Kotnis et al <sup>(99)</sup> 2005 UK	Prospective correlational cohort	Clinical review of XR	12 XR of distal radial #	ENP Ax of XR +/- education with template	junior Dr Ax of XR +/- education with template	Improved # management Stat sig (p<0.01) pre& post intervention: (ENP 22.3% & jnr Dr 16.6%)	ENP improved more than Dr post education with template
Kimber & Grimmer-Somers <sup>(98)</sup> 2009 Australia	Prospective 9 months post -implement <sup>n</sup>	Patient record audit: 2 baseline & 3 post-implement <sup>n</sup>	De-identified patient records wrist # [n=31+31 @baseline; n=31 @ final audit]	Multifaceted (OP) guideline w/ONP Δ champion	Pre-guideline implement <sup>n</sup>	↑ OP screening (20% to 82%) ↑ OP referral for mgt (17% to 62%) ↑ OP Rx per guideline (19.6% -84%)	ONP effective as Δ agent for BP guideline & coord <sup>n</sup> of post# OP mgt
Poder et al <sup>(101)</sup> 2010 Canada	Prospective cross-section comparative study	survey via 2 repeated questionnaire; cost analysis data from admin services	332 pts elective musculo- skeletal problems attending inter-disciplinary outpatient clinic @ 1st clinic	Case study: 89 elective surgical patients triaged by pivot nurse ↓ inter-d health worker	Case control: 243 elective surgical patients not triaged – all saw consultant @ 1 <sup>st</sup> clinic	↓ wait time 1 <sup>st</sup> consult (36.21 to 8.17 weeks); ↑ access (4X shorter than control) ↑ pt satisfaction w/ wait 1 <sup>st</sup> apt (2.06vs2.46) ↑pt satisfaction w/clinic (mean1.49vs1.37 (the higher the score is close to 1, the more pts are satisfied)) ↑ quality o' care (nil sig Δ QALY: 5.66% to 16.64%) Projected Surgery targets met 2008: 68THR & 108TKR	Clinic w/pivot nurse more effective  <i>Difficult to distinguish relative contribu<sup>n</sup> of pivot nurse in context of inter-disciplinarity</i>

Walter et al <sup>(102)</sup> 2006 USA	prospective data collection  consecutive patients - 1 year pre; 3 years post	Patient data forms & hospital's financial database	1680 THR/TKR patients	455, per FY 2001-2003 THR/TKR NP supported pathway Post-imp <sup>n</sup>	315(2000) THR/TKR Pre-pathway	<p>↓ LOS: (4.50→3.20 days THR:4.41to3.24; TKR:3.92to2.98) ↑ home discharge (62% to 72%) Unchanged Pt satisfaction NIL ↑ complications &amp; readmission Cost: minimised impact of ↑ DRG reimbursement 8.68% against a care cost increase of 3.48% (implant cost). 20% savings attributed to fewer days in hospital.</p>	<p>NP support of pathway proved "invaluable"</p> <p>NP supported pathway ↓LOS &amp; fewer days in hospital → freed up beds to admit patients sooner...</p>
Wheeler <sup>(106)</sup> 1998 USA	retrospective cohort	Chart audit & Investigator-designed process instruments	128 randomly chosen TKR patients	2 orthopaedic unit-based CNS (n=64)	2 orthopaedic units without CNS (n=64)	<p>↓ LOS (Mean 4.50 (SD 0.77)withCNS vs Mean 4.72 (SD 1.78)withoutCNS) ↓TLOS +rehab (Mean 4.87 (SD 1.43)with CNS vs Mean 6.84 (SD2.43)withoutCNS) ↓ In-hospital Complications (9% vs 26%) ↑ Process of Care 'interventions': (APPI+HRDSPI=TPI) (MeanTPI:140.44 (SD.9.10)with CNS vs 102.16 (SD.14.49)without CNS)</p>	<p>TKR patient's on units with CNS had better patient outcomes than units without CNS efficacy = patient outcomes → improved quality of care, ↓ cost</p>
Ho & Wilson <sup>(104)</sup> 2010 USA	Consecutive series retrospective	Clinical chart & XR review by author	paediatric patients closed diaphyseal (both bones) forearm fractures	57 treated by NP	82 treated by resident	<p>Nil statistically significant (P=0.05) difference in interventions: -conscious sedation -cast characteristics -fracture characteristics -length of follow up intervention rate (both major and minor (11%(NP) vs 2%(Dr)) not significantly different (P=0.0638) minor interventions(35% (NP) vs 48% (Dr);P=0.17) major interventions(8%(NP) vs 11(Dr); P&gt;0.56) including operative intervention to restore fracture alignment premedication &amp; molding of plaster in clinic for loss of position: approached statistical significance (18%(NP) vs 33%(Dr); P=0.052)</p>	<p>Statistical evidence for comparable care in paediatric ONP's managing paediatric closed diaphyseal (both bones) forearm fractures</p>
Haan et al <sup>(103)</sup>	retrospective	Trauma Registry &	20,524 Trauma patients admitted	Discharge rounds run	Nil &/or Fellow led	<p>↑ patient volume (6544 to 7020)</p>	<p>CRNPs can effectively replace some house staff functions</p>



2007 USA		database queried	over 6 year period :1998-2004	by CRNP	Discharge rounds	<p>same injury severity score (ISS/acuity)</p> <p>↓ LOS (9.4 to 8.2 days)</p> <p>↓hospital bypass (2.8% to 0.08%)</p> <p>↓ Hospital readmission (per 100 discharges: 2.6 to 1.1)</p> <p>↓ICU readmission (per 100 discharges from ICU: 6.4 to 3.3)</p> <p>↓ deaths (per 100 admissions: 4.6 to 4.2)</p> <p>↓clinic walk-ins (568 to 114)</p>	
Pellino et al <sup>(105)</sup> 2002 USA: 49 states	retrospective Role Delineation Study	Survey questionnaire (w/pilot study)	9 nurse specialtiesN=756 Dip: 196 BSN: 186 MSN:226 48 ortho nurses (NAON members) pain mgt survey	Masters (MSN) or PhD	Diploma/ Associate Degree(AD) vs Bachelor (BSN)	<p><u>Activities</u> (nursing interventions associated with pain management)</p> <p>A<sub>x</sub>/monitor/eval<sup>n</sup> ↓ for BSN &amp; MSN</p> <p>Non- pharmacologic management ↓ for BSN &amp; MSN</p> <p>Therapeutic comm<sup>n</sup>/counsel ↑ for BSN &amp; MSN</p> <p>Collab<sup>n</sup>/institution ↑ for BSN &amp; MSN</p>	<p>MSN rate therapeutic comm<sup>n</sup> &amp; collab/Institution activities as more important than other activities;</p> <p>vs</p> <p>Dip/AD frequently perform more A<sub>x</sub>/monitor/eval<sup>n</sup> &amp; non- pharmacologic activities</p>

### Quantitative Descriptive Case Series

Study	Design	Methods	Participants	Intervention	Results	Outcomes
Flynn <sup>(107)</sup> 2005 UK	Multi-method approach – Descriptive Quant data reported	questionnaire (LSQ)	n=32 Joint (hip & knee) replacement	NP led joint replacement review clinic: NP review 24 months post hip & knee replacement surgery	Patient satisfaction with nurse led clinic (mean 3.82/5) Satisfied w/ NP level of care/expertise Patients highly rated technical quality & competence (skill, knowledge, confidence) High satisfaction with information/empathy & attitude to pt General satisfaction w/wait times N° seen comfort waiting area= lower Patients happy to continue w/NP care	Patient satisfaction with ONP led care in joint replacement review clinic  <i>Caution interpreting satisfaction based on the "individuals attitudes and perceptions of care"</i> (Linder-Pelz 1982 in Flynn)  'Patient acceptance' is pivotal
Sarro et al <sup>(112)</sup> 2010 Canada	Prospective patient satisfaction & clinical accuracy study	Consultation satisfaction questionnaire (CSQ)	N=177 pre-selected patients with non-emergent degenerative disease of spine	NP led spine consultation ambulatory clinic	Wait times NP 12 weeks (range: 9.8-21) conventional clinic (range: 10-52 weeks ) Wait times - consultant-26% [77% of these not willing to wait another 3-4 mths] Patient satisfaction: NPconsult-97% NP exam -94% clinically consistent Dx & Mgt ie: NP Dx - 100% & NP Mgt - 95%	NPs can play an effective & efficient role providing patient care in specific disease management in specialty setting  Collaborative model of NP care  Improved patient access  Accurate & early Ax facilitating a timelier Dx & Mgt
Greene & Dell <sup>(108)</sup> 2010 USA	Prospective Observational study	Monthly report from Healthy Bones Database EMR	All patients/ members of Kaiser SCAL HMO with one or more risk factors for OP N=650 000	NP as case managers screen for OP from report provided	↑ DEXA 263% ↑ Bone Protection 153% ↓ expected Hip# rate 38.1%	NPs can perform an effective role in OP disease management  NPs in leadership role in screening, diagnosing and treating patients at risk for OP
Newey et al <sup>(111)</sup> 2006 UK	Descriptive case series prospective	Supervision/ collaboration w/orthopaedic consultant pre- and post-op Levine scores	N=305 Carpal tunnel syndrome	Nurse-led service with Supervision by orthopaedic consultant	↓ Wait times (105 to 6 wks) Surgical outcome (1.3% reported no improvement in s&s) Complications (2.5%) Improved wait times Standard & quality of care maintained	NP safely performs carpal tunnel decompression autonomous ( <i>not independent</i> ) NP role within collaborative framework NP operating provoked criticism from various surgical and professional groups
Lee, A. <sup>(110)</sup> 2005 UK	Descriptive Prospective	Patient (via parent) satisfaction survey	100 infants suspected DDH	Nurse led paediatric clinic: Infant Hip Dysplasia	Overall patient satisfact <sup>n</sup> /acceptance: 80% parents completely satisfied Acceptance w/model of care: 67% very satisfied; 33% satisfied Wait times: 80% seen in 2 months ( v 17 weeks gov't target) Wait Time @ appoint <sup>mt</sup> 67% seen in 15 mins	Effective approach to patient care  Well accepted by patients; timely  Patient satisfaction with wait times, quality of appointment & service.

					100% seen in 30 mins	Benefits: better continuity of care using a patient/child/family centred care approach
Tachakra et al <sup>(113)</sup> 2001 UK	Retrospective	independent analysis of hospital records of all telemedical referrals	N=200 tele-consultation via MATS (minor accident and treatment service)	ENP consultation with orthopaedic resident	Teleradiological Dx: 197/200; 3 minor Dx errors Teleconsultation effectiveness : ie ENP efficiency orthopaedic teleconsultation; appropriate pt Mgt or pt disposition after tele-consultation	Teleconsultations save time. Teleconsultations effective in preventing unnecessary patient transfers to ED Telemedicine supports safe direct admission to hospital ENP Teleconsultation can be safe & effective
Griffith & Robinson <sup>(109)</sup> 1993 USA	Prospective	Current Procedural Terminology (CPT)-coded functions survey questionnaire	39 (NAON) orthopaedic nurses/100 from 9 nursing specialties	110 orthopaedic specific CPT codes & 19 common codes	Education: BSN performed significantly more codes than diplomas, median(F[3,34]=4.05,p=.01 Frequency : 129/493 CPT codes (mean: 38 (29%) of total codes); same code performed by 37 respondents (94.6%) at most Setting: hospitals in larger communities (F[1,36]=6.13,p=.02) as opposed to rural/smaller perform more codes (F[2,35]=6.08,p=.01): and again for rehab (F[1,38]=14.30,p=.00 Supervision by physician: mean response for of 2.12 (range from never (1) to more than 75% of the time (5))	CPT codes are used in the US to file claims for physician payment Role delineation issue Restructure Payment system to improve quality of care, reduce costs and consider the contributions of all health care providers and potentially reduce duplication of service provision
Gardner et al <sup>(17)</sup> 2009 Australia	Descriptive Observational Prospective	National Census survey	202/238 NP's n=2 ONP	Authorised NPs	Self-reported NP practice limitations: ↓ access MBS (93%) ↓ access PBS (92.2%) ↓ lack of legislative support (83.3%) NO workers compensation-(61%) or sick certificates (45.7%) professional indemnity insurance issues (34.1%) lack organisational support (63.7%) lack of support nursing profession (63%)	NP under-utilisation within health care workforce Perceived barriers at local service level & policy/legislative level "restrict" effectiveness of the role
Middleton & Gardner et al <sup>(26)</sup> 2011 Australia	Descriptive Observational Prospective	Second National Census previous instrument (a/a)	285 NPs n=1 ONP	Authorised NPs	Self-reported NP practice limitations: ↓ access MBS (91%) ↓ access PBS (89.6%) ↓ lack of legislative support (77.5%) NO workers compensation-62.1% or sick certificates (43.1%) professional indemnity insurance issues (38.6%) lack organisational support (52.2%) lack support nursing profession (58.2%)	Minimal changes since previous census. Less than satisfactory uptake of NP role Barriers constrain NP role Limitations to NP practice largely outside control of individual affecting NP effectiveness

### Qualitative Studies

Study	Design	Methods	Participants	Phenomenon of Interest	Results	Outcomes
Taylor, A <sup>(75)</sup> 1999 Australia	Hermeneutic Phenomenology	Taped interview Van Manen thematic analysis	7 expert orthopaedic nurses	experience of being an advanced practice nurse in Australian acute care orthopaedic setting	Four themes identified: Having knowledge Being an advocate Being inside and outside the role Being in control (decision making & anticipation as sub-themes)	Advanced practice is part of a continuum Subtle transition occurs in context of the patient-nurse relationship

### Text and Opinion Papers

Study	Type of Text	Methods	Stated Allegiance or Position	Phenomenon of Interest	Results	Outcomes/Conclusions/Concepts
Garvey, JL & Rottet, S. <sup>(115)</sup> US, 1982	Journal of Nursing Administration	report	Nursing administrators account	Implementation process for expanded roles	Establish need & clear expectations Formal organisational recognition Role of the nursing administrator Nursing framework Define the expanded role Educational preparation Implementing the expanded role Program evaluation & organisational impact Overcoming obstacles	Serendipity Multi-departmental visibility Marketing strategy Succession plan NPs emerge from practice interest

Bocchino, CA <sup>(114)</sup> US, 1992	Journal of Orthopaedic Nursing	Report & critique of policy position	NAON position statement by NAON apologist/RN working as Director of Legislative Services for Nursing Economic\$	RN First Assistants-at-surgery (RNFA): recognition of the role of the registered nurse	Recognition of the role of RN as assistant-at-surgery remains an important priority of NAON; Nurses must prove their cost-effectiveness through data collection despite variations in use of these positions & education. There are a number of policy options available.	Work value case mounted; Link between reimbursement & fees (\$) to professional role recognition (political awareness). Implications for practice: more data collection on cost-effectiveness of nurses; "Battle organised medicine who are invested in the status quo".
Van Keuren, KS, <sup>(120)</sup> 1992, US	Journal of Nurse Practitioner	Letter to the editor	Inpatient NP	Perspective/influences on expanded roles for nurses	Collaboration, peer support, role complexity, increased responsibilities, naivety of others, resistance from others, new business opportunities	NPs are a valuable link, are underutilised, opportunities for practice expansion emerging, NP roles vary, multifaceted role
Smrcina, C. <sup>(119)</sup> US, 1993	Journal of Orthopaedic Nursing	position statement	NAON position statement by NAON President	Licensure of advanced practice nursing	Benefits & barriers to practice imposed by secondary licensure of APNs; physician reimbursement practices, poor consumer awareness, limitations to education	NPs provide more personal kind of care Practice limited through secondary licensure Redefine CNS & NP roles & education
Gates, SJ, <sup>(116)</sup> 1993 US	Journal of Orthopaedic Nursing	journal article: Case study	CRNP (ONP) & orthopaedic nurses	collaborative practice model with ONP at its centre	Development & implementation of an orthopaedic collaborative practice model Continuity of care ONP in tertiary care	Success dependent upon: Acceptance Strong & clear nursing identity Collaboration & cooperation Budget support Demonstration of need & demonstrable benefits to Drs from outset open and ongoing communication Potential problems: Selling concept to Drs (benefit too), Clear delineation of NP responsibilities & function, Communicating in terms of quality care

						<p>&amp; patient need Role evaluation. ONP as clinical expert, strong in their nursing identity (not physician extender, not medical model), Education grounded in primary care (US specific).</p>
<p>Dowling, S.<sup>(122)</sup>  UK, 1997</p>	<p>Nursing Times magazine style journal</p>	<p>Career development article</p>	<p>University academic speaking to nurses</p>	<p>'Inbetweenness' of work &amp; behaviour with new professional roles including ONPs</p>	<p>Work satisfaction, trailblazing, stress, justify role &amp; function, hostility from other staff, professional isolation, blurred professional boundaries, jeopardised careers, complaints, legal implications</p>	<p>Changing professional roles &amp; identities require supportive frameworks. Better management support is required for nurses transitioning into new professional roles. Cross professional groups to support these new positions. Planning for new roles needs to occur both at a local and national level to achieve "strategic coherence into the development of new roles"</p>
<p>Wakeman, R., Sheard, PD. &amp; Jenner, GH.<sup>(121)</sup>  UK, 2004</p>	<p>JBJS Journal Bone &amp; Joint Surgery</p>	<p>annotation</p>	<p>Orthopaedic medical perspective</p>	<p>NP role in Ortho-geriatric model of care</p>	<p>A written annotation, in a prestigious medical journal supporting the NP role in an orthogeriatric model of care</p>	<p>Cooperation &amp; collaboration</p>
<p>Hooker, RS.<sup>(95)</sup> Australia, 2006</p>	<p>MJA The Medical Journal of Australia</p>	<p>Journal article on 'task transfer'</p>	<p>Doctors who read this broad reaching medical journal</p>	<p>Physician assistants and nurse practitioners: The US experience</p>	<p>NP &amp; PA productivity comparable to that of a traditional doctor approaching NP/PA can provide 90% range of services of primary care physicians in US</p>	<p>Background information at a time when Australia was considering trialling implementation of these roles</p>
<p>Lucas, B.<sup>(118)</sup> 2009, UK</p>	<p>JOON Journal of Orthopaedic Nursing</p>	<p>Historical perspective article</p>	<p>expert opinion by APN in orthopaedic nursing journal</p>	<p>retrospective review of the development of orthopaedic nursing roles in UK 1990's</p>	<p>The emergence of specialist orthopaedic nurses and nurse-led pre-operative clinics in response to: decreased medical working hours, politics within the profession of</p>	<p>Historical perspective on development of new &amp; specialised orthopaedic nursing roles. Health department policy, nursing's professional body agenda and workforce changes affecting other health professions at a local level cannot be underestimated when it comes to influencing the development of advanced practice nursing roles.</p>

					nursing, politics of the health department	
Schlachta-Fairchild, L., Varghese, SB., Deikman, A. & Castelli, D. <sup>(96)</sup> US, 2010	Journal for Nurse Practitioners	Continuing education article	ICN chairperson of Telenursing Network & CEO of a Telehealth Co APNs	APN role in telenursing	Policy and Practice Implications of Telehealth and Telenursing APN convey caring in telenursing encounters	Importance of patient connectedness to convey caring in telenursing
Judd, J. <sup>(117)</sup> UK, 2013  2012	Journal of Orthopaedic and Trauma Nursing	US Study tour report	APN & orthopaedic nurses	Paediatric, musculo-skeletal clinics in US	Identifying ways to improve the health pathway of a child with a musculoskeletal problem: A comparison of practice of midlevel providers in the USA and UK Observations: Doctor substitution, politics & billing, team support, education	Collaboration of NP/PA with physician maintains an efficient & quality service Resources support contribute to efficient and streamlined NP care Role development & expansion is both challenging & rewarding

## Appendix 11 Critical Appraisal Quantitative evidence

### MASTARI

#### Comparable Cohort / Case Control Studies

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Haan, J. M., Dutton, R. P., Willis, M., Leone, S., Kramer, M. E., Scalea, T. M., 2007	Y	Y	Y	N	Y	Y	N	Y	Y
Ho, C. A. & Wilson, P. L., 2010	Y	Y	Y	Y	Y	Y	N/A	Y	Y
Kimber, Cheryl M & Grimmer-Somers, Karen A, 2009	Y	Y	Y	U	Y	Y	Y	Y	Y
Lee, T. W. R., Skelton, R. E., Skene, C., 2001	Y	Y	Y	Y	Y	Y	Y	Y	Y
Considine, J., Martin, R., Smit, D., Jenkins, J., Winter, C., 2006	Y	Y	Y	Y	Y	Y	N/A	Y	Y
Pellino, T. A., Willens, J., Polomano, R. C., Heye, M., 2002	Y	N	Y	Y	Y	Y	N	Y	Y
Kotnis, R., Waites, M. D., Fayomi, O., Dega, R., 2005	Y	Y	U	N	Y	N/A	N/A	Y	Y
Poder, Thomas G., Bellemare, Christian, Bédard, Suzanne K., He, Jie, Lemieux, Renald, 2010	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wheeler, E., C., 1998	Y	Y	Y	Y	Y	N/A	N/A	Y	Y
Walter, F. L., Bass, N., Bock, G., Markel, D. C.h, 2007	Y	Y	Y	Y	Y	N/A	N/A	Y	Y
%	100.0 0	90.00	90.00	70.00	100.0 0	100.0 0	60.00	100.0 0	100.0 0



**Descriptive / Case Series Studies**

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Newey, M., Clarke, M., Green, T., Kershaw, C., Pathak, P., 2006	Y	Y	Y	Y	N/A	Y	N/A	Y	Y
Gardner, A Gardner, G Middleton, S Della PR, 2009	Y	Y	Y	Y	Y	Y	Y	Y	Y
Middleton S, Gardner A, Gardner, G, Della PR, 2011	Y	Y	Y	Y	Y	Y	N	Y	Y
Flynn, S., 2005	Y	Y	Y	Y	N/A	N/A	N	Y	U
Lee, A., 2005	Y	Y	N/A	Y	N/A	Y	N/A	Y	Y
Griffith, H. M. & Robinson, K. R., 1993	Y	Y	Y	Y	Y	N/A	Y	Y	Y
Greene, D. & Dell, R. M., 2010	Y	Y	N	Y	Y	Y	N	Y	Y
Tachakra,S.,Hollingdale ,J., Uche, C. U., 2001	Y	Y	N	Y	N/A	Y	N/A	Y	Y
Sarro, Angela, Rampersaud, Yoga Raja, Lewis, Stephen, 2010	Y	Y	Y	Y	Y	N/A	N	Y	Y
%	100.0 0	100.0 0	75.00	100.0 0	100.0 0	100.0 0	33.33	100.0 0	88.89

## Appendix 12 Critical Appraisal Qualitative Evidence

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Taylor, A. 1999	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
%	100. 00	100. 00	100. 00	100. 00	100. 00	100. 00	100. 00	100. 00	100. 00	100. 00

## Appendix 13 Critical Appraisal Text/Opinion Evidence

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Garvey, J. L. & Rottet, S., 1982	Y	U	Y	N	N	N	Y
Gates, S. J., 1993	Y	Y	Y	Y	Y	N	U
Schlachta-Fairchild, L., Varghese, S. B., Castelli, D, 2010	Y	Y	Y	Y	Y	Y	Y
Bocchino, C. A., 1992	Y	Y	Y	Y	Y	Y	Y
Lucas, B., 2009	Y	Y	Y	Y	Y	Y	Y
Dowling, S., 1997	Y	Y	Y	Y	Y	Y	U
Smrcina, C., 1993	Y	Y	Y	Y	Y	Y	Y
Van Keuren, K. S., 1992	Y	Y	Y	Y	Y	Y	U
Hooker, Roderick S., 2006	Y	Y	Y	Y	Y	Y	Y
Wakeman, R., Sheard, P. D., Jenner, G. H., 2004	Y	Y	Y	Y	Y	Y	U
Judd, J., 2012	Y	Y	Y	Y	Y	Y	Y
%	100.00	90.91	100.00	90.91	90.91	81.82	63.64

## Chapter 4: Conclusion

### 4.1 Chapter Introduction

This chapter will discuss the implications of the evidence emerging from the comprehensive systematic review and conclude the thesis of work.

### 4.2 Overview of Evidence

This review sought to explore the experience and effectiveness of NPs in orthopaedic settings. The research question is premised on the assumption that NP role and practice are inextricably linked. In order to systematically review the evidence as it relates to ONP role and practice, and synthesise the best available evidence on the effectiveness and experience of NPs in orthopaedic settings, a comprehensive approach was chosen to review the breadth of this topic. Due to the wide variation in nomenclature of these advanced practice roles, a string search strategy was adopted to capture the more commonly used terms. 286 abstracts were retrieved for examination, and 111 papers retrieved for detailed examination following assessment. Exclusions from the review tended to relate to population (not NP/APN) or setting. Thirty one from 68 papers were included in this review of which there were 19 quantitative papers, one qualitative paper and 11 text and opinion papers. Quantitative evidence was presented in a narrative summary as a meta-analysis could not be performed given the lack of heterogeneity amongst the studies. One paper comprised the qualitative evidence therefore a meta-synthesis could not be undertaken; a summary of the paper was provided. A meta-synthesis of the eleven papers of textual evidence took place.

### 4.3 Quantitative Evidence

The highest grade of evidence in the included studies was the prospective cohort studies. Four out of the ten cohort studies were of a retrospective design and there are inherent weaknesses in such studies. The descriptive studies mentioned in chapter three are prone to even greater bias such as selection bias and confounding bias due to an absence of comparison and control and therefore no causal link can be made. There were nine case series papers of which only one was retrospective. It is therefore with caution one must exercise the interpretation of the above results. The evidence base contained within the quantitative component of this review is of a *satisfactory* level, noting: a moderate risk of bias contained within the studies, a good level of consistency in the approach to the clinical questions asked in the papers; moderate to substantial clinical impact (in the absence of anything else) with a good chance of generalisability and applicability within westernised health care systems.<sup>(125)</sup>

The data within the quantitative evidence addressed patient outcomes and process indicators. A total of seven outcomes of interest contributed to the effectiveness of NPs in orthopaedic settings. ONPs provide comparable and better care in units with a CNS,<sup>(106)</sup> for distal radius fracture management,<sup>(99)</sup> screening for developmental dysplasia of the hip,<sup>(32)</sup> and decrease complications.<sup>(103)</sup> High levels of patient satisfaction and patient acceptance<sup>(101, 107, 110, 112)</sup> are associated with ONP roles. ONPs can improve wait times and access to care.<sup>(32, 110-112)</sup> Level of education influences the effectiveness of the ONP.<sup>(99, 105, 107, 109, 126)</sup> The cost-benefit of ONPs was demonstrated through savings in time,<sup>(113)</sup> LOS,<sup>(102, 103, 106)</sup> surgical targets,<sup>(101)</sup> cost minimisation,<sup>(99)</sup> better resource utilisation<sup>(17, 26, 99, 102)</sup> and other direct costs. Professional and organisational barriers hinder the effectiveness of ONPs.<sup>(17, 26, 97, 111, 112)</sup>

The findings within the quantitative evidence of this review highlight how patients may perceive the ONP. The data suggests that patients value the benefit of having a knowledgeable expert deliver care, and how important 'connectedness' is to the patient encounter and the patient's perception of advanced practice. The nature of clinical reasoning of the advanced practitioner becomes important in the context of the patient-nurse relationship, and furthermore the professional competency framework the APN uses to inform that relationship. The findings of this review are consistent with patient support for nurse-led care. The quantitative findings of this comprehensive systematic review suggests ONPs are effective. Barriers and facilitators affect the practice of ONPs.

#### 4.4 Qualitative Evidence

One unpublished thesis comprised the qualitative component of this review.<sup>(75)</sup> Five themes emerged: *being an advocate*, *being in control*, *being in and outside the role*, *having knowledge*, advanced practice is part of a continuum which is subtly realised in the context of the patient-nurse relationship. Advocacy held a strong presence and meant representing the interests of both patients and staff and drew upon relationships and collaboration with others. *Being in control* of complex and challenging situations was expected of these roles and participants described emergency or difficult situations. Participants found challenging and extending professional role boundaries was complex and related to the context in which they found themselves in at the time. Having expert knowledge was considered essential. Building confidence, knowledge, experience and expertise was essential to the role and practice of the ONP, and part of the ONP journey as advanced practice develops. These themes resonated with the other forms of evidence. Role and relationships began to emerge as integral to the experience of the ONP particularly building and maintaining positive relationships with others. The qualitative evidence confirmed the role of the NP is broad, complex and challenging at

times, where role boundaries are sometimes extended. At a personal level knowledge and experience are key to moving forward in the ONP role.

#### 4.5 Evidence from Text & Opinion

The publication dates for papers from text of opinion ranged across thirty years with a ten year hiatus between the first and second papers. North America introduced advanced practice roles twenty years ahead, therefore US citations featured earlier in the evidence base. Common experiences when introducing roles was expected of textual evidence, with some local variation anticipated.

Emerging from text and opinion papers was data that related primarily to the development and implementation of expanded roles. The influences associated with new expanded roles surrounded relationships, barriers, politics at a professional and practice level, education, and work value/cost effectiveness.

It was anticipated a more contemporary context would have been provided through text and opinion, but this did not occur from the evidence that qualified for critical appraisal. The nature of text and opinion is less organised than the quantitative and qualitative paradigms. Rich information was drawn from the discursive evidence that supported evidence drawn from other methodologies, as it related to the role development, implementation and evaluation of ONPs.

Context to the effectiveness and experience of ONP was sought within the discursive evidence. Three synthesised findings emerged from the evidence of text and opinion: (1) Role & Relationships, (2) Duality and (3) Moving Forward. Becoming a NP is relational and collaborative as several of the papers described what was required to introduce these roles<sup>(115, 116, 120, 122)</sup>. Collaboration amongst peers and others is important to the ONP with influences on the role at a personal, professional and organisational level, including resource availability. Positive and negative factors influence the ONP role. Challenges may include barriers and obstacles, benefits and opportunities and all contribute to a 'duality' of circumstances for the development, implementation and evaluation of ONP roles. Barriers and obstacles identified in the textual evidence included: reimbursement, licensure, doctors & patients & organisational misunderstandings, access to education, blurred professional boundaries that lead to feelings of 'in-between-ness and professional isolation. This review highlighted at a personal level there are challenges that the ONP must overcome or acknowledge (duality). Too often APN roles have emerged serendipitously<sup>(91, 118)</sup> from individual or personal circumstances. Purposeful rather than serendipitous role expansion is preferred to advance these roles and succession plan. The practitioner must learn to negotiate a path from serendipity to transition in the role, and along the way they may need to contend with being [in]between competing interests. They may have

to draw upon their tenacity to be a trailblazer and change agent for the future. Above all else they will need to be a skilled communicator. The ONP needs to have an awareness of this in order to prepare themselves and move forward.

The different types of evidence explained above interrelate: particularly amongst the barriers found within quantitative studies and the obstacles articulated within text and opinion; the concept of **duality** and positive and negative experiences seen within text and opinion and the themes emerging from qualitative evidence; and the category of **collaboration** from within the discursive evidence that was reinforced in the theme of role within the qualitative evidence. Common to the evidence was how important **acceptance** and **education** are to the ONP role. The existence of a crossover from within the different forms of evidence supports the premise that role and practice are inextricably linked, and further supports the methodology adopted for this comprehensive systematic review.

#### 4.6 Shared Findings

From the comprehensive evidence on the effectiveness and experience of NPs in orthopaedic settings this review identified four 'shared findings' across the evidence base: Acceptance, Collaboration, Education/Knowledge/Experience, Duality. See over for a diagrammatic representation Figure 4

# The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings

Affected by multiple factors



internal

external

ONP

Multi-dimensional Role

Complex & Challenging situations

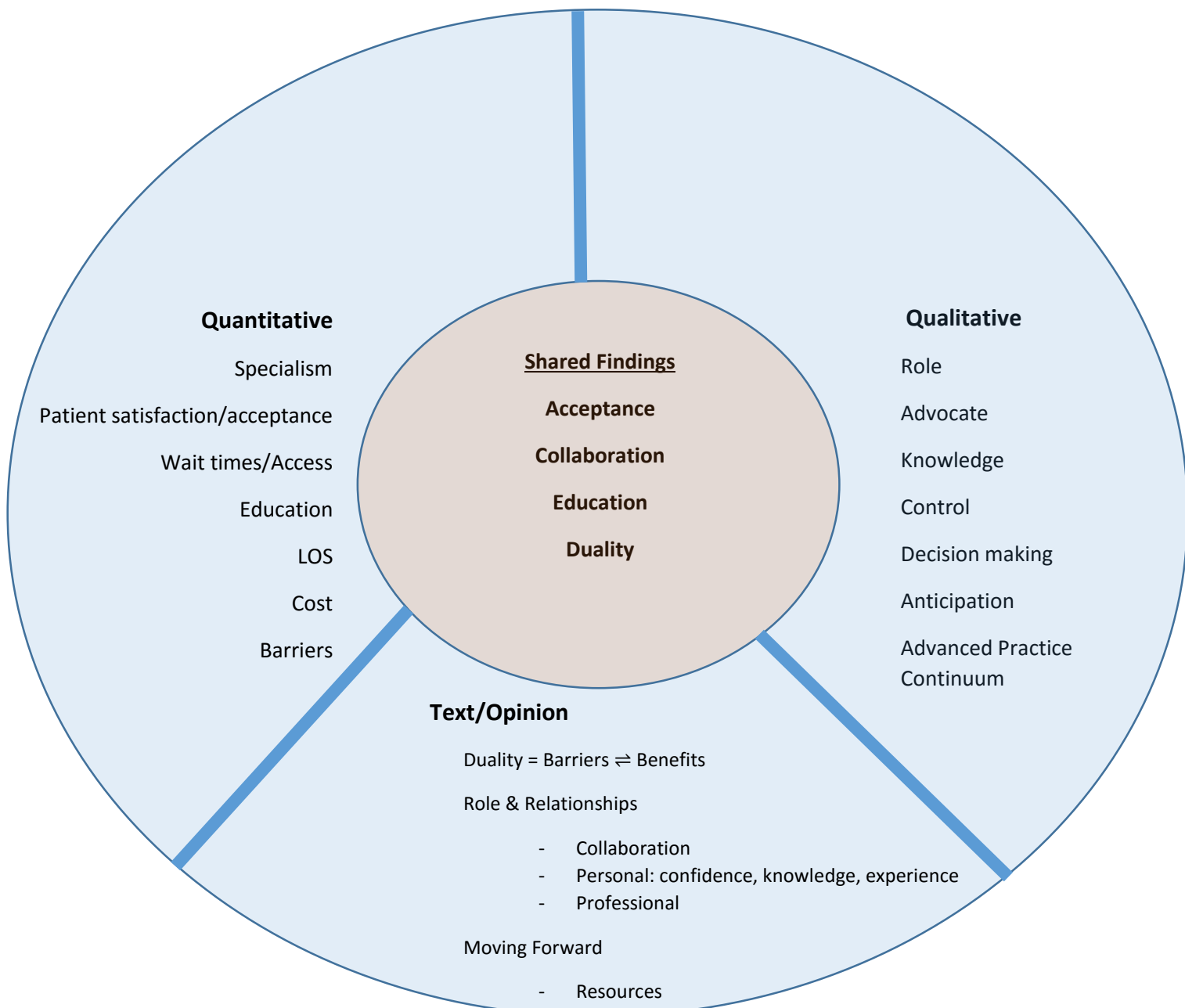


Figure 4: Shared Findings diagram



#### 4.6.1 Shared Finding 1: Acceptance

Acceptance of the NP role by the patient is an important quantitative outcome of interest along with patient satisfaction in four studies. Within qualitative evidence acceptance by the patient manifest in patient advocacy *“that’s what we’re here for”*.<sup>(75)</sup> Acceptance of the NP role by others was an important conclusion reached from text and opinion papers where ‘gaining acceptance’ and achieving ‘success and acceptance’<sup>(116)</sup> related to the category of relationships &/or collaboration with others and the synthesised finding of role and relationships. It is important for the ONP to be grounded in a strong nursing identity<sup>(116)</sup>. Patient connectedness was seen as a version of acceptance within text and opinion particularly in the telenursing environment.<sup>(96)</sup> Similarly APNs were associated with a more ‘personal type of care’.<sup>(119)</sup>

#### 4.6.2 Shared Finding 2: Collaboration

Collaboration was a synthesised finding of text and opinion papers. Collaboration contributed to an understanding of the advanced practice of the ONP. Collaboration was also listed as a category supported by ten findings that ranged from ‘doctor substitution’<sup>(91, 95, 114-116, 120)</sup>, gaining acceptance<sup>(116)</sup>, recognition and reimbursement<sup>(114)</sup>, to strong alliances and a strong nursing identity’<sup>(116)</sup>. Within qualitative evidence collaboration was represented as building and maintaining strong relationships as an important aspect of ONP practice: ‘Being outside the role, stretched the boundaries of collegial and collaborative practice and at times was sometimes associated with feelings of guilt, misgiving or inner conflict’.<sup>(75)p114</sup> Whilst collaboration was a secondary outcome of interest listed in terms of key stakeholder satisfaction it did not emerge from the quantitative evidence as a discrete reportable outcome. There were however ten cohort papers that compared ONP practice to a comparator; several papers described a collaborative model of care that would not have succeeded without formal ‘collaboration’ with medical colleagues.<sup>(101-103, 111-113)</sup>

#### 4.6.3 Shared Finding 3: Education/Knowledge/Experience

Quantitative, qualitative and textual findings supported this shared finding. Education was considered a secondary outcome that was reported in three quantitative papers<sup>(99, 105, 109)</sup> but assumed in several others. ‘*Having knowledge*’ emerged as a theme from the qualitative paper with expert knowledge as essential to ONP role and practice. Building confidence, knowledge and experience were seen as essential to the experience of moving forward as an ONP, where educational preparation and competence contributed to this and resources were required in support.

#### 4.6.4 Shared Finding 4: Duality

A strong representation of evidence existed for this shared finding. Amongst the quantitative studies three papers provided examples of barriers and two studies<sup>(17, 26)</sup> formally reported on the barriers that existed for ONP's at an organisational, financial, professional, political and inter-professional level. When it came to understanding ONP roles four conclusions of 'in-between-ness'<sup>(122)</sup>, 'barriers are many'<sup>(119)</sup>, 'overcome obstacles'<sup>(115)</sup> and 'resistance & naivete' (of others)<sup>(120)</sup> underpinned the category of Barriers/Obstacles and contributed to the synthesised finding 'Duality' within text and opinion data. Within qualitative evidence barriers were conveyed as negative relationships or experiences such as challenging role boundaries that impacted on the experience of the ONP. Figure 4 attempts to represent the relationship between barriers and benefits that affect the ONP. There is movement between the barriers and benefits for ONPs that comprise duality. The symbol  $\rightleftharpoons$  represents a reversible reaction. A dynamic equilibrium is reached once the reversible reaction ceases to change its ratio of reactants and products (read: barriers and benefits for the ONP). I would suggest this relationship is always dynamic in relation to the continuum of advanced practice the ONP inhabits.

### Duality = Barriers $\rightleftharpoons$ Benefits

Figure 5: Duality diagrammatic representation

#### 4.7 Practice, Policy and Political Implications and Implementation to Practice

A strong recommendation is made to support the following recommendations for practice<sup>(3)</sup>:

If ONPs are to reach their potential, the appropriate education to equip potential ONP's of the future must address this. Advocating for the specific needs of the specialty must come from within the "group" that is the cultural group of orthopaedic nurses whom identify themselves as a distinct group that share common beliefs, values and actions.<sup>(55)</sup> There is some work already commenced at an international level looking at advanced practice competencies for orthopaedic nurses by the orthopaedic nursing community (International Collaboration of Orthopaedic Nurses (ICON)). This review adds a perspective to this initiative.

Confusion exists internationally around nomenclature, role, scope of practice and professional boundaries for advanced practice roles and there are calls to clarify classification & regulation.<sup>(42)(p55)</sup>

Desborough asks: “How are nurse practitioners implementing roles? What processes and behaviours are being harnessed to optimise facilitators and negotiate barriers to role implementation?”<sup>(127)(p23)</sup> ONPs must ask the same questions. Desborough contends that efforts need to address: developing clinical practice guidelines, collaborating with the multi-disciplinary team, developing legitimacy and credibility [of the NP], and [have processes for] transitioning to practice. The findings of this systematic review support these types of recommendations.

The NP profession in Australia is relatively young. Advanced clinical roles differ in autonomy and function from one role to the other. Service reform is necessary in order to support the delivery of advanced clinical care. Given the success of the US’s experience with NPs, moving towards a US model where NP’s have articulated and demonstrated a critical role in health care delivery assisted by their number and influence (political & professional organisation and lobbying) is the logical next step for other countries.

This review of evidence has suggested that ONP roles can offer demonstrable benefit to patients, health care, and the ‘economy of care’ in general, as well as future workforce planning in the orthopaedic setting. There needs to be an awareness of the influence ‘the organisation’ has on the practice of ONPs particularly in terms of acceptance by clients and other stakeholders. The policy framework must support collaboration, multi-departmental visibility<sup>(115)</sup> and strategic coherence<sup>(122)(p27)</sup> to create a clear understanding and expectations associated with these roles. Policy at a professional level and executive level is also crucial. A system of mentorship and/or sponsorship, within and across interdisciplinary boundaries, may support the integration of these roles further. The evidence considered by this review has identified the benefits that flow from implementing such roles. Should healthcare organisations continue to implement these roles, then the responsibility to support such roles resides at a professional, political level as well as with the individual ONP.

#### 4.7.1 Translation through Mentorship & Sponsorship

The key to success of translation science is stakeholder awareness, whether this includes the patient, a community, at a professional or policy maker level. Having a good command of internal knowledge (ie. local knowledge and politics), external knowledge (eg. of implementation science), behaviour (local) and organisational change/expertise is essential.<sup>(128)</sup> Beliefs and behaviours are considered to be influential upon the adoption of evidence in to practice<sup>(67, 128)</sup> where the focus of translation science resides. Different approaches to guideline dissemination and implementation strategies abound.<sup>(Cochrane EPOC, Susan Michie ‘Theory to Intention’ 1993, Knowledge to Action cycles cited in<sup>(128)</sup>)</sup> Nursing is centrally placed to make a difference to healthcare

delivery and foster evidenced based practice through the application of evidence in practice at the 'bedside' or "point of care".<sup>(67)</sup>

Mentoring and sponsorship are important support mechanisms to facilitate the advancement of NPs, particularly as they navigate the workplace and identify/create/capitalise on opportunities for growth. Such a framework may assist in knowledge translation. "Mentoring is a relationship which gives people the opportunity to share their professional experience and personal skills and experience, and to grow and develop in the process".<sup>(129)</sup> Mentors provide advice, feedback and coaching. Sponsors are advocates in positions of authority who use their influence intentionally to help others advance.<sup>(<http://www.catalyst.org/knowledge/topics/sponsorshipmentoring> cited in (130))</sup>

#### 4.8 Evidential Base for Nurse Practitioners

Other previously published reviews have demonstrated similar findings that NP care is comparable to physician care, with no differences in health outcomes and often a higher quality of care and high patient satisfaction. The first two reviews considered here are of an economic analysis of the impact of NPs generally.

A systematic review of Advanced Practice Nurse Outcomes 1990-2008 reviewed RCT and observational studies with comparators, across settings to see if APRN outcomes were similar to other providers.<sup>(32)</sup> It concluded APRNs provide safe, quality care: "similar and in some ways better" to specific populations, particularly underserved populations, in different settings. CNS can reduce LOS. APRNs provide effective and high quality care. Partnership with others is important in significantly promoting health, and that evidence-based and collaborative models of care delivery are required to move forward. One paper was shared with this review.<sup>(106)</sup> Results were consistent with the findings of this review.

A recent systematic review of the cost-effectiveness of NPs and CNS<sup>(15)</sup> looked specifically at the quality of the evidence for RCTs and found that almost half of these RCTs showed a low risk of bias, however it noted an "inconsistent use of titles and lack of role clarity" existed and designed their own specific criteria to confirm that the role met the inclusion criteria for the review. This was the approach taken by this review to overcome similar difficulties associated with nomenclature of advanced practice roles (Appendix 1). The authors of the review recommended in order to strengthen the evidence base better reporting of study methods are required and would improve the quality of the studies in the area examining cost effectiveness of NP and CNS roles.

A recent rapid review of the NP literature entitled NPs in NSW 'Gaining Momentum' looked specifically at literature and reviewed: previous literature in the field,<sup>(12)</sup> primary Australian

studies evaluating NPs, and papers that explored an understanding of the NP role through conceptual or theoretical frameworks. It focussed the activities, outcomes and factors influencing successful implementation of NP roles. It alluded to the qualitative difference in philosophies of care between doctors and NPs – a point this review has attempted to make, and reports the “basic contradiction” in the research evidence that comparisons are regularly made this way. It identifies a predominance of research on NPs in the Emergency Department, and to a much lesser extent mental health and aged care only; an absence of research on NPs in rural & remote settings; a lack of theoretical underpinnings to NP practice in the research; little translation of pre-existing research recommendations for “organisational change and implementation science” and no economic evaluation of NPs in Australian studies. This review suggests the future direction for NP outcomes research, a point not lost on this review.

A qualitative review<sup>(8)</sup> looking broadly at advanced practice nurses in the Australian acute care setting, included participants whose role titles included: advanced practice nurse, clinical nurse consultant, clinical nurse specialist, NP, and expert nurse. The phenomenon of interest for the four included studies of the qualitative systematic review was the experience of being an advanced practice nurse in Australian acute care settings. The settings included orthopaedics (and shared the qualitative paper included in this review<sup>(75)</sup>) and palliative care. Six meta-syntheses emerged: (1) expert knowledge, (2) spectrum of work activities, (3) confidence and familiarity, (4) [positive &] negative experiences, (5) relationships and (6) patient-centred experiences where organisational factors impact greatly in a professional and personal sense. The interpretations emanating from the texts resonate with NPs. Moreover it is consistent with the experience of becoming or being a NP in an orthopaedic setting and found to be most consistent with the findings of this review.

The SCAPE Study: Evaluation of Clinical Nurse and Midwife Specialist and Advanced Nurse and Midwife Practitioner Roles in Ireland<sup>(91)</sup> was a large, national, mixed-methods review that made sweeping recommendations for Ireland with resonance across other countries. It concluded it was hard to identify the sole contribution of these roles due to the multidisciplinary nature of the teams the advanced nurse roles were associated with. Not dissimilar to a point made in this systematic review about multi-disciplinarity.<sup>(101)</sup> The advanced nursing roles were “key and influential ... with overall a positive effect on patient/client care, other staff and health services” and other considerable benefits. No difference in cost. Recommendations included expanding the number of roles into chronic disease management and community care where these roles are needed and/or conduct analysis to further see where these roles should be placed, continuing the high standard of approval, accreditation, practitioners and outcomes and the introduction of such roles in general.<sup>p316</sup> Specifically the NPs need support in the research

aspect of their role, continuing to support NPs in multi-d teams, continue to develop the educational preparation alongside role development, expanding prescribing, ionising radiation, workload management.<sup>(summary cited in<sup>(131)</sup>)</sup> Recommendations are in keeping with this review.

Generally speaking this comprehensive systematic review maintains a consistent line of argument with previous reviews and across international settings and adds a perspective unique to NPs in orthopaedic settings not previously discussed. This supports the decision to conduct a comprehensive systematic review as opposed to adding more primary research reaching previously arrived conclusions.

#### 4.9 Implications for Research

There is limited qualitative research undertaken examining ONP role and practice. There is limited evidence available evaluating the economic impact of ONPs, where RCT may offer a plausible method to use. Notwithstanding research is underway which is beginning to explore the next phase of advanced practice. The aim is to articulate and define other advanced practice roles in Australia, other than the NP role, and thereby contextualise the full range of advanced practice nursing from entry level practice.<sup>(132, 133)</sup>

The findings from this research will be able to inform contemporary nursing practice. There is a need to focus less on nomenclature and more on 'action & results' about how NPs (including orthopaedic), make a difference, in order for decision makers to consider how NPs can contribute towards efficient and effective healthcare delivery. There needs to be a greater contribution of nursing research investigating why barriers to NP practice remain in place. It is a matter of engaging the right participant groups such as nursing policy makers, nursing decision makers and managers, health bureaucrats and professional stakeholders.<sup>(134)</sup>

Mixed method studies are beginning to feature more within the evidence base on advanced practice; a consideration for future research. This needs to occur at the specialty level where orthopaedic nurses must feature in the evidence base. The research needs to be of good quality, rigorous and transparent, and includes and supports orthopaedic nurses in lesser-developed countries. Furthermore at a broader level a contemporary definition of NPs must exist as autonomous practitioners that work within a collaborative framework and not one of traditional medical dominance. This review has posited that the NP role is complementary rather than substitutive to the traditional method of delivering healthcare services, whilst steeped in a strong nursing identity. To this end the PubMed [MeSH] definition of NP could be updated.

## 4.11 Conclusion

In terms of the quantitative evidence this comprehensive systematic review asserted ONP's provide comparable care and found better care was demonstrated for patient satisfaction/acceptance, wait times & access to care, specialist care interventions: specifically ONP management of distal radius fracture, developmental dysplasia of the hip (DDH), and where clinical nurse specialists care for knee arthroplasty patients. Further ONPs can influence care in terms of LOS and the economy of care. Education & barriers may influence ONP effectiveness. The quality of evidence was low due to a predominance of observational studies that are inherently vulnerable to confounding variables and no limited ability to draw causation.

The qualitative evidence cited in a recent qualitative review by Ramis suggests the ONP role is multidimensional where confidence, knowledge and experience are essential components for the management of complex and challenging situations encountered by ONPs.<sup>(8)</sup> This comprehensive systematic review showed becoming or being an ONP is relational and collaborative at all levels of ONP interaction. The level 3 qualitative paper included in this review reports that advocacy, role, having knowledge and 'being in and maintaining control' are important elements of the experience of ONPs as they transition along the advanced practice continuum.

The discursive evidence of this comprehensive systematic review suggests a duality to benefits and barriers exist but both experiences are formative to ONP role development, implementation and evaluation. Also that building and maintaining role and relationships with others through collaboration is important. Moving forward was demonstrated in the qualitative evidence and was reiterated in the text and opinion papers.

The findings from the different sources of evidence included in this comprehensive review, each support the other in their attempt to answer the research question of "What is the experience and effectiveness of NPs in orthopaedic settings?" albeit from different perspectives. This can be seen particularly in the aggregative synthesis of conclusions from text and opinion papers and echoed in the findings from the qualitative evidence however there is some commonality and resonance within the narrative summary of quantitative findings also.

The results of this review are consistent with what had previously been suspected for ONPs.

The findings of this comprehensive review demonstrated that the experience and effectiveness of NPs in orthopaedic settings is influenced by multiple factors from within and external to the individual. Quantitative evidence suggests that NPs in orthopaedic settings provide comparable, if not better care than conventional methods of health care delivery in some circumstances, however caution needs to be exerted when interpreting the results. Opinion and text indicated

the ONP role is multidimensional. Confidence, knowledge and experience are essential elements to deal with complex and challenging situations according to qualitative evidence. Furthermore the experience of becoming or being an ONP is relational and collaborative at a personal, organisational and professional level. A strong sense emerged from the evidence of a 'duality' of purpose for ONP's with interplay between benefits and barriers to ONP practice, however the overall impression was one of forward momentum.

#### 4.12 A Final Word

This review has attempted to reveal the impact of advanced practice in the context of orthopaedic nursing practice.

It was anticipated that the experience and effectiveness of NP's in orthopaedic settings is no different from NPs in other settings. Barriers to practice and confusion over role and practice boundaries continue to exist for NPs and by extension, ONPs. Little information exists specifically on the effectiveness and experience of *orthopaedic* nurse practitioners. Orthopaedic nursing needs to be informed if it is to move forward professionally and develop competencies for specialty practice.

#### 4.13 Limitations

This review was undertaken in fulfilment of the requirements for the award of Master of Clinical Science.

Only English Language studies were included.

Publication dates ranged from database inception to end December 2012.

Search terms were challenged by the variation in titles attributed internationally to advanced practice and NP roles.

All of the above could potentially lead to omissions in papers included in this review.

The methodological quality of study design tended to be low which must be considered a limitation of this review.

#### Acknowledgements

It is with sadness that during this review my primary supervisor Professor Deb Kralik died. RIP. I would like to acknowledge the extraordinary efforts of Dr Kylie Porritt in supervision.



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## Appendix 1 Checklist for Critical Appraisal

### The Experience and Effectiveness of Nurse Practitioners in Orthopaedic Settings:

#### A Comprehensive Systematic Review

##### 1. Population

- Orthopaedic Nurse Practitioner/Advanced Practice Nurse/ Extended Practice/ Expert Nurse

##### 2. Setting

- Orthopaedic/Acute Care or Sub Acute settings

##### 3. Intervention: 'ONP-specific care' [choose from the following outcome measures]

- pain
- pressure injury
- UTI
- patient satisfaction
- in-hospital mortality
- hospital readmission
- patients' health-related QOL
- functional status
- malnutrition score
- constipation
- wound care/complications
- other clinical complications
- morbidity
- other patient encounter data that characterise ONP practice:

- 
- other nurse-sensitive outcome data relevant to ONP practice:

- 
- orthopaedic NP satisfaction
  - key stakeholder (health professional) satisfaction
  - specialised knowledge/skill translation
  - hospital LOS
  - cost/benefit

##### 4. Comparitor (if relevant)

- Dr substitution
- Care provided by a nurse other than ONP
- Physician Assistant

**(a tick at 1, 2 & at least one tick in 3) ACCEPTED**

proceed to Critical Appraisal in CReMS

**REJECTED**