HOW DOES THE ADDITION OF NURSE PRACTITIONERS TO THE TRAUMA TEAM INFLUENCE THE HOSPITAL LENGTH OF STAY OF ADULT PATIENTS ADMITTED WITH TRAUMATIC INJURY?

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ABSTRACT

Background: The increasing complexity of trauma care and provider shortages have led to the expanded role of nurse practitioners (NPs). While NPs are integrated into various healthcare settings, their influence on length of stay (LOS) for adult trauma patients remains an area of interest, particularly from a qualitative perspective.

Objective: This integrative review explores qualitative findings on how NPs can influence LOS in adult trauma patients, identifying potential contributions such as care coordination, efficiency, and provider workload.

Methods: A systematic search of CINAHL, MEDLINE, and Google Scholar was conducted to identify qualitative studies that examined the impact of NPs on LOS in adult trauma care. Using an integrative review approach, data were analyzed to assess how NPs influence LOS. Key themes were synthesized, LOS outcomes were reported, and the generalizability and applicability of the integrative review findings were discussed.

Results: Findings suggest NPs contribute to reduced LOS by improving care coordination, enhancing multidisciplinary communication, and facilitating discharge planning. However, the extent of their impact remains unclear due to limited evidence.

Conclusion: While NPs are described as valuable members of trauma teams, their specific impact on LOS in adult trauma patients is not well established in the qualitative literature. Further research is needed to explore this relationship and determine whether NP-led interventions can effectively reduce LOS.

Keywords: trauma service, trauma center, trauma centre, trauma unit, nurse practitioner, advance practice nurse, trauma nurse practitioner, length of stay, LOS, impact on length of stay, hospital length of stay**.**

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GLOSSARY OF TERMS

Advanced Practice Nurse (APN): A collective term referring to healthcare professionals with advanced clinical training, including Nurse Practitioners (NPs), Clinical Nurse Specialists (CNSs), Nurse Anesthetists (CRNAs), and Nurse Midwives (NMs) (Canadian Nurses Association, 2021).

American College of Surgeons (ACS): A professional association of surgeons in the USA dedicated to improving the quality of care for surgical patients (American College of Surgeons, 2025).

Emergency Department (ED): A specialized hospital unit that provides immediate medical care to patients experiencing acute illnesses or injuries (Canadian Association of Emergency Physicians, 2023).

Length of Stay (LOS): A patient's total time in the hospital from admission to discharge (Stone, 2022).

Nurse Practitioner (NP): A registered nurse (RN) with advanced clinical training and education, typically at the master's or doctoral level, licensed to assess, diagnose, and manage patient care, including prescribing medications and performing procedures (Canadian Nurses Association, 2025).

Trauma: An agent, force, or mechanism that causes injury (Merriam-Webster Dictionary, 2025)

Trauma Nurse Practitioner (TNP): A specialized NP who provides advanced clinical care within trauma settings, often managing acutely injured patients in collaboration with trauma teams (Eastern Association for the Surgery of Trauma & the Society of Trauma Nurses, 2016).

United States of America (USA): The United States of America is the official name for the country in North America that consists of 50 states and the District of Columbia. It is bordered by Canada in the north and Mexico in the south (Collins Dictionary, 2025).

Like Terms:

Throughout the integrative review, various terms such as Nurse Practitioner (NP), Trauma Nurse Practitioner (TNP), Advanced Practice Nurse (APN) Mid-Level Provider (MLP) and Physician Assistant (PA) were used to describe advanced practice providers in trauma care. While these terms may have slight distinctions, they all refer to clinicians with expanded scopes of practice, including assessment, diagnosis, treatment, and care coordination. For consistency, this paper will use the term NP.

Language Note:

This paper uses gender-neutral language and person-first terminology to promote inclusivity and respect for all individuals. Terms such as "they/them" may be used to refer to individuals of any gender. Additionally, medical and health-related terminology aligns with current professional standards and is used with sensitivity to the experiences of patients and healthcare providers.

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INTRODUCTION

The modern healthcare system faces growing challenges, including an aging population, rapid technological and medical advancements, and increasing societal demands. These pressures contribute to rising healthcare costs, overcrowding, and the ongoing demand for timely, high-quality, and efficient care. Among the innovative responses to these system-level challenges is the integration of Nurse Practitioners (NPs) into diverse care settings, including both primary and acute care.

NPs, equipped with advanced clinical education and training, provide a wide range of healthcare services such as diagnosing and managing acute and chronic conditions, prescribing medications, and performing advanced procedures. Beyond their clinical acumen, NPs play a vital role in enhancing patient outcomes, improving care coordination, and reducing the workload burden on other healthcare providers (NPAC-AIIPC, 2024; College of Registered Nurses of Nova Scotia, 2016).

In trauma care, where time-sensitive interventions and interdisciplinary collaboration are essential, the NP role has received growing recognition. Globally, trauma centers are under pressure to optimize patient flow, address clinician burnout, and reduce hospital length of stay (LOS) without compromising quality of care. When embedded within trauma teams, NPs contribute advanced assessment skills, continuity of care, and streamlined patient management that collectively support improved clinical outcomes. Nonetheless, successful NP integration requires strategic workforce planning, adequate financial investment, and institutional support.

This integrative review focuses on the impact of Nurse Practitioner (NP) involvement on hospital length of stay (LOS) for adult patients admitted with traumatic injuries. LOS is a key indicator of system efficiency and resource utilization, making it a critical outcome

measure in trauma care. By synthesizing evidence from existing studies, this review evaluates whether the integration of NPs is associated with reduced LOS. While hospital length of stay (LOS) remains the primary focus of this review, additional findings related to operational efficiency, team dynamics, and patient outcomes emerged from the literature and will be presented as secondary observations. Identifying these insights, along with existing gaps in the literature, will help inform future research and support policy development regarding NP integration in trauma care systems.

CHAPTER ONE: BACKGROUND

Trauma remains a significant global public health concern, contributing to high morbidity, mortality, and substantial economic burdens on healthcare systems (World Health Organization, 2023). Hospitals and trauma centers face mounting pressures to optimize patient flow and enhance patient outcomes. LOS has become a critical performance indicator in trauma care, reflecting hospital efficiency, quality of care, and patient recovery (Glance et al., 2012). Given the complexity of traumatic injuries and the need for multidisciplinary coordination, reducing LOS while maintaining high-quality care remains a challenge.

This chapter provides an in-depth analysis of trauma care systems and the impact of NPs on LOS in trauma settings. Key areas will be explored, including the burden of traumatic injury, trauma system organization, trauma center designations, and multidisciplinary team composition. The role of NPs within trauma teams will be discussed, highlighting their ability to enhance care coordination, reduce delays in treatment, facilitate early discharge planning, and support provider workload, all of which contribute to shortening hospital LOS.

LOS will be introduced as a key measure of hospital management in trauma care and recovery. As trauma centers continue to seek ways to improve efficiency and quality of care, NPs have become a valuable part of the team. Their ability to deliver specialized, evidence-based care, enhance workflow, and strengthen collaboration among health care providers positions them as essential contributors in trauma care. This discussion highlights the growing presence of NPs in trauma teams and emphasizes their influence on patient outcomes, care coordination, and overall system performance.

Burden of Disease, the Evolution of Care, and the Role of Multidisciplinary Teams

Burden of Traumatic Injury

Injuries remain a significant public health concern, accounting for 4.4 million deaths globally in 2019, representing 8% of all mortality (World Health Organization, 2022). Of these, 3.16 million resulted from unintentional injuries, while 1.25 million were due to violence. Road traffic crashes were the leading cause of injury-related deaths, followed by suicide, homicide, and conflict-related injuries. Additionally, falls contributed to over 684,000 deaths in 2019, emerging as an underrecognized public health issue.

In the United States of America (USA), injury remains the leading cause of death and disability among children and young adults. In 2021, over 306,000 people in the U.S. died from injuries, with unintentional poisonings accounting for one-third of these deaths, followed by suicide (16%), motor-vehicle crashes (15%), and homicide (over 8%). That same year, more than 23 million people were treated for nonfatal injuries in emergency departments. The total lifetime medical and work loss costs of injuries and violence in the U.S. reached $671 billion (Cohen et al., 2024).

The 2024 Parachute Report comprehensively analyzes the economic and societal burden of preventable injuries in Canada, highlighting the substantial costs to the healthcare system and the broader economy. According to the report, preventable injuries result in an annual economic burden of $29.4 billion, including $20.4 billion in direct healthcare costs. In Canada, injuries remain a leading cause of mortality and disability, with 17,475 deaths, 61,400 disabilities, and 231,530 hospitalizations recorded in 2018. The overall injury-related death rate has also risen, reflecting the growing impact of injuries on public health. Falls account for the highest economic cost, followed by transport incidents, suicide and self-harm,

and unintentional poisoning. The Parachute report underscores the urgent need for targeted strategies, investments, and policy interventions to mitigate the long-term consequences of preventable injuries in Canada (Parachute, 2024).

Trauma Systems and Organization

The development of trauma systems in North America has been a progressive journey aimed at improving patient outcomes through organized and regionalized care. The 1966 Accidental Death and Disability report highlighted trauma as a national epidemic, prompting the establishment of EMS systems and paramedic training. Advances in injury prevention, such as seatbelt laws and airbag mandates, further improved survival rates (National Highway Safety Traffic Administration, 1966). The American College of Surgeons (ACS) played a key role in structuring trauma systems, introducing hospital trauma center standards in 1976 when the ACS Committee on Trauma published "Optimal Hospital Resources for Care of the Seriously Injured," which identified criteria for categorizing hospitals based on the level of trauma care they could provide (American College of Surgeons, 2025). This publication set the stage for the components of an optimal trauma system, from prevention to pre-hospital care to acute care, rehabilitation, and research. In 1980, the ACS introduced the Advanced Trauma Life Support (ATLS) program, designed to teach a systematic approach to the immediate management of injured patients (American College of Surgeons, 2025). Since its inception, ATLS has been taught to more than one million doctors in over 80 countries.

In Canada, trauma system development has occurred more gradually. The first trauma unit was established in Ontario in 1967, and by 2010, Canada had 32 trauma centers (Level I and II). Today, approximately 80% of Canadians live within one hour of a major trauma

center, demonstrating significant advancements in trauma accessibility and regionalized care (Lundy et al., 2019).

Trauma Center Designations and Capabilities

The American College of Surgeons (ACS) categorizes trauma centers based on their ability to care for injured patients (American College of Surgeons, 2025). Level I and II centers offer the most comprehensive care for severe and life-threatening injuries, adhering to the same clinical care standards. However, Level I trauma centers carry additional responsibilities, including managing a high volume of trauma cases, maintaining a dedicated critical care service led by a trauma surgeon, supporting medical education, and meeting strict research requirements. In fact, as part of their designation, Level I centers must produce a minimum number of research publications annually, contributing to the advancement of trauma care and evidence-based practice. In contrast, while Level II centers do not have the same academic and research obligations, they still play a critical role by providing essential trauma services, often supplementing Level I centers in urban areas or serving as the highest-level trauma facility in more rural or less populated regions (American College of Surgeons, 2025).

Level III trauma centers are crucial in regions that lack immediate access to Level I or II facilities. These centers provide initial stabilization and treatment of critical injuries while the patient awaits transfer to a higher-level trauma center. They maintain 24/7 surgical availability and implement trauma programs to improve patient care. In even more remote areas, Level IV trauma centers serve as the first point of contact for trauma patients, offering initial emergency care and stabilization before transferring patients to facilities equipped for more advanced treatment. Although these lower-level centers have fewer resources, they are

essential in ensuring that patients in rural and underserved communities receive timely and appropriate trauma care (American College of Surgeons, 2025).

A well-coordinated trauma system is essential for ensuring that patients can receive the right level of care at the most appropriate facility, that critically injured individuals can be stabilized, complex cases can be well-managed, and overall clinical outcomes can be improved (American College of Surgeons, 2018; Lundy et al., 2019; Walter et al., 2012). However, trauma centers are increasingly pressured to maintain high standards of care while improving efficiency, reducing healthcare costs, and minimizing hospital LOS (Reade, 2022). In response to these challenges, trauma centers have implemented various strategies, including optimizing patient flow, leveraging advanced medical technologies, and expanding multidisciplinary trauma teams.

One key development in trauma care has been the growing integration of NPs into trauma teams. NPs play a vital role in enhancing patient outcomes by providing expert care in acute injury management, facilitating care coordination, and ensuring continuity of care (Noffsinger, 2014). Their involvement helps streamline care delivery, reduce provider workload, and improve efficiency within trauma centers. As trauma care systems continue to evolve in the United States of America (USA), the role of NPs is becoming increasingly significant, contributing to improved patient care and operational effectiveness in trauma settings.

Trauma Team Composition and Roles

A trauma team typically includes emergency physicians, trauma surgeons, anesthesiologists, critical care specialists, nurses, respiratory therapists, rehabilitation specialists, and social workers (The Royal Children's Hospital Melbourne, n.d). This

collaboration is essential, as trauma patients often require multi-system management. Physicians and surgeons lead resuscitation and surgical interventions, while nurses and NPs provide continuous assessment, medication administration, and care coordination. Allied health professionals, including physiotherapists, occupational therapists, dietitians, and mental health specialists, contribute to recovery by addressing long-term functional and psychological needs.

The Canadian Nurses Association (2016) defines nurse practitioners as registered nurses with advanced graduate or postgraduate education and clinical experience, enabling them to autonomously diagnose and treat illnesses, order and interpret diagnostic tests, prescribe medications, and perform medical procedures. NPs who specialize in trauma care provide comprehensive management for trauma patients throughout the continuum of injury and recovery. Their responsibilities include trauma assessment and admission, diagnostic interpretation, preoperative and postoperative care, and discharge planning. NPs are involved in daily trauma rounds, adapt and facilitate care plans, coordinate follow-up care, and collaborate closely with multidisciplinary teams, including nurses, other advanced practice providers, therapists, social workers, and physicians. In addition, NPs often perform procedures commonly encountered in trauma care, such as chest tube management, suturing, complex wound care, and ventilator management (Christmas et al., 2005; Hardway et al., 2020; Sise et al., 2011; Society of Trauma Nurses, 2002).

Studies have shown that integrating NPs into trauma care teams improves patient outcomes in several areas. By providing comprehensive assessments and timely interventions, NPs contribute to better clinical decision-making, increased efficiency, and higher patient satisfaction with the care received. The benefits associated with including NPs

in critical care teams first became known in 1990, when Spisso et al. (1990) found that NPs helped to identify complications early, reduced delays in treatment, and lowered the risk of readmissions. More recent research has continued to support these findings. A 2022 scoping review by Bazavluk et al. (2022) examined the role of NPs in Canadian emergency departments and found that their presence led to shorter wait times, decreased LOS, fewer patients leaving without being seen, and improved patient satisfaction (Bazavluk et al., 2022). Such findings highlight the continued value of NPs and their role in improving both care efficiencies and patient outcomes.

Optimizing Trauma Care

The evaluation of trauma care requires monitoring those key outcome measures that reflect patient recovery, system efficiency, and overall care quality. Standardized trauma performance indicators include mortality rates, hospital and ICU LOS, unplanned ICU admissions, and complication rates (Coccolini et al., 2021). Additional metrics, such as time to definitive care, protocol adherence, blood product utilization, and discharge disposition, offer valuable insights into the efficiency and effectiveness of trauma care.

Beyond clinical outcomes, system-level factors, including provider workload, team communication, and resource utilization, also play a crucial role in shaping trauma outcomes. A comprehensive evaluation should consider both modifiable and non-modifiable risk factors. Modifiable factors, such as alcohol use, seat belt and helmet compliance, and timely trauma care, can influence both injury severity and treatment success. In contrast, non-modifiable factors, such as age, gender, and mechanism of injury, help guide individualized care approaches (Coccolini et al., 2021). LOS remains a critical benchmark for trauma system performance, reflecting resource utilization, patient recovery, and hospital efficiency.

Length of Stay in Trauma Care

LOS in trauma care refers to the total number of days a patient remains hospitalized following a traumatic injury and serves as a key indicator of resource utilization, patient recovery, and overall quality of care (Biffl et al., 2021; Stone et al., 2022). Analyzing the various determinants of LOS allows trauma centers to optimize care pathways, minimize complications, and improve patient flow (Moore et al., 2017).

Numerous factors influence the LOS in trauma patients, encompassing both non-modifiable and modifiable determinants. Non-modifiable factors such as age, gender, race, trauma scores, and injury severity influence recovery trajectories, with advanced age and higher Injury Severity Scores (ISS) often associated with prolonged hospitalizations due to the greater complexity of injuries and rehabilitation needs (Biffl et al., 2021; Kashkooe et al., 2020). In contrast, modifiable factors are addressed through coordinated efforts by the trauma team, interdisciplinary care providers, and hospital-based supports. For example, early mobilization, timely surgical intervention, standardized trauma protocols, and effective pain management, typically led by the trauma team and acute care providers, play crucial roles in preventing complications like infections, deep vein thrombosis (DVT), and pressure ulcers (Biffl et al., 2021; Kashkooe et al., 2020). As patients progress toward discharge, allied health professionals and discharge planners support proactive rehabilitation initiation, psychological support, and connection to follow-up care, all of which contribute to reducing LOS and improving outcomes. Clear communication and collaboration between the trauma team and these care partners are essential in ensuring efficient transitions of care.

The complexity of traumatic injuries often necessitates collaboration across multiple healthcare specialties, making multidisciplinary teamwork essential (Backstrom et al., 2023;

Dutton et al., 2003). As patients move through different phases of their trauma recovery, care team composition frequently shifts to ensure access to specialized expertise that is appropriate to each stage. Pre-existing conditions can further predispose trauma patients to complications during the recovery phase, thereby prolonging hospitalization (Bethea et al., 2019). Understanding these factors underscores the importance of a comprehensive, patient-centred approach that integrates multidisciplinary collaboration while addressing modifiable risk factors to optimize patient recovery and reduce LOS.

Timely interventions, effective pain management, early mobilization, and proactive discharge planning have been identified as key strategies for reducing LOS and improving patient outcomes (Biffl et al., 2021). An integrated trauma system supported by a multidisciplinary team is vital for minimizing inefficiencies, reducing treatment delays, and facilitating faster recoveries (American College of Surgeons, 2018).

Innovative approaches continue to evolve to support these goals. Studies have demonstrated that NPs play a crucial role in trauma care by improving continuity of care, facilitating timely interventions, and enhancing patient outcomes (Society of Trauma Nurses, 2002; Christmas et al., 2005; Sise et al., 2011; Hardway et al., 2020). Their contributions strengthen the effectiveness and capacity of multidisciplinary teams and highlight the significance of advanced practice nursing roles in trauma settings (Society of Trauma Nurses, 2002; Christmas et al., 2005; Sise et al., 2011; Hardway et al., 2020). By integrating NPs into trauma care teams and allowing them to use their full scope of practice and by optimizing trauma care delivery, healthcare systems can enhance recovery, reduce LOS, and improve overall trauma patient outcomes.

Existing Evidence on the Impact of NPs on LOS

Several studies have examined the impact of NPs on reducing LOS in trauma care, highlighting their role in improving patient outcomes. A seminal study by Spisso et al. (1990) demonstrated that incorporating NPs into the care of severely injured patients reduced average LOS from 8.10 days to 7.05 days. In contrast, patients who did not receive NP-led care experienced no significant change in LOS. Crawford (2019) completed an integrative review, concluding that NPs are instrumental in mitigating provider shortages and enhancing collaboration within multidisciplinary trauma teams. This strengthened teamwork was linked to better patient outcomes, reduced LOS, and lower healthcare costs. Based on these findings, Crawford recommended that all trauma centers, particularly Level 1 facilities, integrate NPs into their trauma teams to enhance care continuity, improve patient satisfaction, and reduce hospital expenditures.

Reinforcing this growing recognition of the value NPs can bring to the trauma care setting, the ACS updated its *Resources for Optimal Care of the Injured Patient* guidelines in 2022 to formally acknowledge NPs as essential members of trauma care teams. These revised guidelines emphasize the critical role of NPs in comprehensive trauma management, further validating their impact on patient outcomes.

Current evidence suggests that NPs play an important role in trauma care by improving care coordination, enhancing provider collaboration, and contributing to better patient outcomes, including reductions in LOS. Given the growing demand for timely, efficient care in trauma settings, it is important to understand better how NPs impact these outcomes. Therefore, this integrative review will examine how adding NPs to the trauma

team influences the hospital LOS of adult patients admitted with traumatic injury. It will also explore their broader contributions to system efficiency and team performance.

CHAPTER TWO: METHODS

The integrative review aims to answer the following question: How does adding NPs to the trauma team influence the hospital LOS of adult patients admitted with traumatic injuries?

Design

This integrative review follows the methodology in Toronto and Remington's (2020) *A Step-by-Step Guide to Conducting an Integrative Review*. This methodology involves critically evaluating the primary studies conducted on a specific topic and then synthesizing the available data to provide a comprehensive topic overview. The review process also allows the reviewer to uncover gaps in the existing literature and suggest areas for further research. This structured approach ensures both breadth and depth in the analysis, enhancing the review's relevance to clinical practice.

The research question for this review was designed using the Population, Intervention, Outcome (PIO) framework. The population of interest in this review is adult patients admitted with traumatic injury; the intervention of interest is the addition of NPs to the trauma team; and the outcome of interest is hospital LOS for trauma patients. The PIO framework was adapted from the Population, Intervention, Comparator, and Outcome (PICO) framework that is commonly used to develop research questions (Melnyk & Fineout-Overholt, 2022). PIO was selected as the framework for this review rather than PICO because the intended objective is not to compare outcomes with those of another healthcare discipline or patient population; as a result, there is no "Comparator" group within the research question. This framework supports a focused exploration of the NP's contribution to trauma care, particularly in relation to LOS.

Search Methods

Databases

Database searches were conducted on October 14, 2024, using three electronic databases: the Cumulative Index to Nursing and Allied Health Literature (CINAHL) via the Elton B. Stephens Company (EBSCO), Medline, and Google Scholar. These databases were strategically chosen to ensure a comprehensive, high-quality, relevant literature review aligned with the research question. CINAHL and Medline were accessed through the University of Northern British Columbia's (UNBC) online library website. Google Scholar was accessed through the Google search engine on the same date. Other databases, such as Embase and PsycINFO were excluded due to their overlap with Medline and CINAHL and their primary focus on fields outside the scope of the research question.

Rationale for Selecting CINAHL

Although Medline is widely recognized as one of the most comprehensive medical, health, and biomedical sciences databases (Melnyk & Fineout-Overholt, 2022), CINAHL was included due to its distinct focus on nursing and allied health disciplines. Unlike Medline, which indexes biomedical research and physician-led studies, CINAHL provides extensive nursing-specific literature, including qualitative studies, clinical guidelines, and research focused on nursing practice, education, and patient care (EBSCO, 2025). Given the nursing-centered focus of this review, including CINAHL ensured access to a broad scope of nursing and allied health literature that may not be as thoroughly indexed in Medline.

Rationale for Selecting Medline

Medline was chosen due to its comprehensive medical, health, and life sciences literature coverage, making it an essential database for evidence-based practice. It includes a

vast collection of peer-reviewed journal articles, clinical trials, and systematic reviews, which are critical for a rigorous literature review. Medline's indexing system (using Medical Subject Headings [MeSH]) facilitates precise searches, allowing for more structured retrieval of high-quality evidence related to the research question (U.S. National Library of Medicine, 2024).

Rationale for Selecting Google Scholar

Google Scholar was included to capture grey literature and non-indexed publications that may not be available in CINAHL or Medline. While Google Scholar lacks the refined search functionalities of traditional academic databases and includes a mix of peer-reviewed and non-peer-reviewed sources, it can provide access to additional relevant literature, particularly preprints, academic literature not indexed in the academic databases, and those resources housed in institutional repositories (Haddaway et al., 2015).

Google Scholar searches did not yield any unique articles for this integrative review that had not already been found in CINAHL or Medline. However, its inclusion ensured a thorough search process, confirming that the selected databases did indeed cover the relevant literature on this topic.

Search Terms

Collaborating with librarians who are knowledgeable about evidence-based practice and preferably familiar with healthcare resources is crucial when seeking answers to clinical questions (Melnyk & Fineout-Overholt, 2022). An experienced Knowledge Synthesis Librarian from UNBC, who is also a former Registered Nurse, was consulted to ensure comprehensive coverage of the research question population. Her background in both research and clinical practice was especially valuable as it helped to refine the search strategy and ensure that database results were as relevant as possible. Subject headings and key terms

relevant to the research question were used to formulate a comprehensive search strategy within each database. Appendix A provides a detailed summary of the search terms used in each database and in Google Scholar, and they are also summarized in Table 1.

Table 1

Search Strategy Terms for Integrative Review

Variable	Search Terms
Population	trauma service*, trauma centre, trauma center, trauma unit
Intervention	nurse practitioner*, advance* practice nurs*, trauma nurse practitioner
Outcome	length of stay, LOS, impact on length of stay, hospital length of stay

Note. This table demonstrates search terms, including variations in spelling and truncation (*), to capture all relevant literature. LOS = length of stay.

The asterisk (*), or truncation, is used to locate variations of a word by capturing additional letters beyond the root, such as using *injur* to find injury, injuries, or injured. Boolean operators, including AND and OR, were applied to effectively group and refine search terms (Melnyk & Fineout-Overholt, 2022). Appendix B provides a detailed summary of all search strings utilized in the CINAHL and Medline databases.

Inclusion and Exclusion Criteria

Setting appropriate inclusion and exclusion criteria is essential for determining which studies are selected for an integrative review. Inclusion criteria specify characteristics that studies must meet, such as study design, population, and outcomes of interest (Toronto &

Remington, 2020). Exclusion criteria, on the other hand, define factors that disqualify studies, such as populations that do not align with the research question or methodological limitations that could impact the quality of findings (Toronto & Remington, 2020). For example, if the review focuses on adult trauma patients in acute care, studies involving pediatric populations or outpatient settings would be excluded due to differences in care delivery and outcomes. While few studies are without limitations, studies with significant methodological weaknesses, such as poorly defined outcomes, lack of clarity in design, or absence of peer review, may be excluded to maintain the overall quality and credibility of the review. Applying these criteria helps minimize bias, supports the reliability of findings, and ensures that the most relevant and rigorously conducted studies contribute to the evidence base.

The literature search aimed to identify studies examining the role of NPs in trauma care and their impact on LOS for trauma patients. The search strategy was specifically designed to focus on trauma services, trauma centers, and trauma units to ensure relevance to the inpatient setting. The term “trauma” alone was initially considered but was found to yield an excessive number of studies related to psychological trauma rather than physical injury. The UNBC Knowledge Synthesis Librarian assisted in refining the search language to improve specificity and relevance to acute trauma care settings.

Trauma center levels were not included within the search parameters; as a result, all levels were considered in the integrative review. Given the research objective of evaluating the impact that NPs have on LOS in adult trauma populations, studies focused solely on pediatric trauma were excluded. Studies examining a single body system or a highly specialized injury type were also excluded. For example, one study examined NP impact on

LOS in patients with hip fractures, limiting its applicability to the broader trauma population, and it was therefore excluded.

Several studies examined LOS in the emergency department (ED) for trauma patients. Since this review focused on hospital LOS, those studies were excluded. While ED care plays a role in the initial management of trauma patients, it does not encompass the full scope of inpatient treatment, multidisciplinary care, or the ongoing role of NPs in trauma services. Excluding studies that focused on the ED only ensured that the findings remained relevant to hospital-based trauma care, where NPs contribute to patient management beyond the ED setting.

Given the limited number of research studies on this topic, no restrictions were placed on publication date or geographical location during the search. Although no studies in languages other than English were retrieved, any non-English studies would have been excluded to avoid potential translation bias and ensure the accuracy of interpretation. Additionally, qualitative, narrative, and descriptive studies were excluded due to their limited generalizability, ensuring that the review focused on research with broader applicability to trauma populations.

Search Results

A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart was utilized to categorize articles as either included in the review or excluded. Covidence (2025) software was used to facilitate the organization of the review process and assist in developing the PRISMA flowchart. The systematic search initially imported 82 studies, with 48 retrieved from Medline and 34 from CINAHL. No additional studies were

identified through Google Scholar searches. After removing 26 duplicates, 56 studies remained eligible for title and abstract screening.

During the title and abstract screening process, 28 studies were excluded, leaving 28 for full-text review. Of these, 19 were excluded for several reasons. One study was removed for using an excluded comparator group, as it focused on identifying the roles and responsibilities of NPs rather than measuring outcomes. Two studies were excluded due to not meeting the inclusion criteria. For instance, one focused on trauma patients who were either admitted or discharged from the ED within three hours of arrival, and another explored whether standardized patient management protocols would reduce LOS rather than evaluating the effect of NP involvement. Seven studies were excluded due to the use of interventions not relevant to this review. These included studies measuring the satisfaction levels of patients, physicians, and nurses with care provided by NPs rather than examining patient outcomes or length of stay. Five studies were removed based on excluded study designs. Examples include studies that looked at LOS based only on ISS without any connection to provider roles or interventions. Finally, four studies were excluded for focusing on populations outside the scope of this review. These included studies on pediatric trauma patients and others focusing only on specific injuries, such as hip fractures. Ultimately, nine studies met all inclusion and exclusion criteria and formed the integrative review. Appendix C displays the PRISMA flow diagram associated with this review.

Data Analysis and Evaluation

Each article in this integrative review was appraised using the Critical Appraisal Skills Programme (CASP) tools, including the Cohort Study Checklist (Brice, 2024). Each study was reviewed three times by the author. A data extraction table was developed to

document key details, including the study title, country of research, study type, variability tests used, study aims, study dates, trauma center level, study participants, recruitment process, inclusion and exclusion criteria, LOS before and after the intervention, as well as the study's findings, strengths, and limitations. Appendix D provides a detailed summary of the data extraction results for the nine studies included in this integrative review.

CHAPTER THREE: FINDINGS

This integrative review, guided by the question, “How does the addition of nurse practitioners to the trauma team influence the hospital length of stay for adult patients admitted with traumatic injuries?”, revealed that there is limited evidence explicitly addressing the role of NPs in trauma care. This chapter presents the results of the literature search, outlining the study characteristics and reporting the findings on the impact of nurse practitioners on LOS in trauma care.

Study Characteristics

Included Studies

The studies included in this review consistently examined the influence of NPs on LOS, highlighting how LOS reductions can impact patient outcomes and healthcare costs. Although each study was designed differently, common threads emerged regarding the role of NPs in improving efficiency within trauma care settings.

Study Type

All of the studies included in this review were retrospective cohort studies, a design commonly used to analyze historical data and evaluate outcomes (Melnyk & Fineout-Overholt, 2022). Research conducted using cohort studies involves examining characteristics that researchers believe may be related to past outcomes. The outcome has already occurred, so researchers must look further into the past for what might have been relevant and influential to the findings (Melnyk & Fineout-Overholt, 2022). The studies included in this review examined, among other variables, the impact of NPs on LOS, leveraging pre-existing records to identify outcomes over time. This approach allowed researchers to examine

hospital LOS while also analyzing key metrics such as complication rates, patient outcomes, direct costs, and discharge disposition.

Study Period and Location

All studies included in this review were conducted in the USA at Level I trauma centers, where the integration of NPs into trauma services was evaluated. The study periods ranged from two to eight years. One study collected data over two years (Christmas et al., 2005), focusing on early NP integration. Three studies spanned between two and five years (Hiza et al., 2014; Bethea et al., 2019; Holliday et al., 2017), examining various models of NP involvement, including care coordination and expanded trauma team models. The remaining four studies were conducted over more extended periods of six to eight years (Sise et al., 2011; Morris et al., 2012; Gillard et al., 2011; Hardway et al., 2020), allowing for assessment of incremental NP additions, comparisons between NP-led and RR services, and the sustained impact of mid-level provider integration on patient outcomes.

Participant Recruitment

The recruitment processes across the nine included studies demonstrate a consistent and systematic approach to participant selection, primarily leveraging trauma registries and institutional data collection systems. Each study involved more than 1,000 participants, with the smallest study including 1,363 participants (Bethea et al., 2019) and the largest study having 8,904 participants (Sise et al., 2011). On average, the studies included 3,935 participants; however, one study (Christmas et al., 2005) did not report its participant count and was therefore excluded from this calculation. Despite this limitation, the study was included in the integrative review due to the limited research studies available. However, it is important to acknowledge that the lack of reported participant numbers impacts

methodological rigour and limits the study's ability to assess the generalizability and strength of its findings.

Six studies utilized trauma registries as their primary data source: Sise et al. (2011), Morris et al. (2012), Bethea et al. (2019), Holliday et al. (2017), Hardway et al. (2020), and Gillard et al. (2011). Three studies (Christmas et al., 2005; Collins et al., 2014; Hiza et al., 2015) did not specify their data sources, which weakens their methodological rigor regarding replicability and generalizability. While Hiza et al. (2015) identified trauma patients as their population of interest, they did not clarify how those patients were identified or from where their data was obtained. Without transparency regarding the information source, and the number of potential source options available (such as hospital records, trauma registries, and other sources), assessing the reliability and applicability of their findings remains challenging.

Length of Stay Metric

LOS is a critical metric in trauma care, influencing patient outcomes, hospital efficiency, and overall healthcare costs (Coccolini et al., 2021). The reviewed studies consistently highlight the role of NPs in reducing LOS across various trauma settings. While most studies demonstrated statistically significant reductions in LOS, others reported clinically meaningful improvements despite not reaching statistical significance.

Several studies found notable decreases in LOS following NP integration. Hiza et al. (2014) reported a significant reduction in hospital LOS from 13.56 to 7.02 days ($p < 0.001$) among trauma patients under NP-led care. They also noted substantial decreases in LOS for elderly trauma patients and those discharged to rehabilitation facilities ($p = 0.037$ and $p = 0.002$, respectively), although the study did not define the age criteria used to classify

patients as elderly. Similarly, Bethea et al. (2019) observed a decrease in LOS from 5.60 to 4.38 days ($p = 0.048$) for elderly trauma patients managed by NPs compared to those under non-trauma NP-led care without providing a clear definition of "elderly." Collins et al. (2014) demonstrated that adding NPs to the trauma step-down unit decreased trauma service LOS from 6.6 to 6.4 days ($p = 0.023$).

Other studies found minimal changes in LOS but noted benefits in patient care efficiency. Holliday et al. (2017) reported a slight decrease in LOS from 6.92 to 6.88 days ($p = 0.007$) following NP service expansion. However, Hardway et al. (2020) showed an unexpected increase in LOS from 4.80 to 5.97 days ($p = 0.006$) but highlighted concurrent improvements in discharge efficiency and patient outcomes. Gillard et al. (2011) reported a significant reduction in ICU LOS from 4.08 to 3.28 days ($p = 0.019$), but the total hospital LOS decrease from 5.09 to 4.84 days did not reach statistical significance ($p = 0.92$).

Some studies presented their LOS findings in different formats. Christmas et al. (2005) reported statistically significant reductions in ward, Intensive Care Unit (ICU), and overall hospital LOS after NP integration. Still, they presented their results as percentages, noting a 13% decrease in hospital LOS, a 33% reduction in transfer time to the floor, and a 20% decrease in neurotrauma ICU LOS. Morris et al. (2012) compared NP care with RR services, reporting a non-significant reduction in LOS from 7.0 to 6.5 days ($p = 0.17$). However, measured over the duration of the study, they highlighted that NP involvement resulted in over 1,300 fewer patient care days.

Finally, Sise et al. (2011) analyzed LOS over multiple years as NP coverage in their study setting expanded. Initially reported in hours, their data was converted to days for consistency. The study found significant reductions in ICU LOS (1.64 days to 0.975 days;

$p < 0.05$) and hospital LOS, aligning with the broader trend of NPs positively impacting patient throughput and efficiency.

These studies demonstrate that NP involvement in trauma services is associated with meaningful reductions in LOS, improved discharge processes, and enhanced patient flow. While some studies reported only modest changes in LOS, the broader impact of NPs on hospital efficiency, cost savings, and quality of care was evident.

Additional Findings

Beyond LOS reductions, NPs provided additional benefits, including cost savings and improved efficiency. Hiza et al. (2014) estimated an annual cost reduction of $641,476 following NP integration, while Collins et al. (2014) reported a per-patient average savings of $9,111 over the duration of the study, translating to nearly $27.8 million in total hospital savings. Similarly, Bethea et al. (2019) documented an average per-visit cost reduction of $13,000, reinforcing the financial sustainability of NP-led trauma care models.

NPs also played a crucial role in alleviating resident workload while maintaining patient care quality. Christmas et al. (2005) found that NP integration into the trauma team reduced resident work hours from 86 to 79 hours per week, aiding in compliance with the Accreditation Council for Graduate Medical Education (Correa et al., n.d.) duty-hour restrictions. Morris et al. (2012) also showed that patient outcomes in NP-managed units were comparable to those in resident-run units, supporting the idea that NPs can supplement resident education and workload without negatively impacting patient care.

Improved discharge coordination and readmission rates were another key finding. Hardway et al. (2020) found that NP-led trauma teams placed discharge orders earlier and expedited patient transfers to rehabilitation facilities. Holliday et al. (2017) reported that NPs

improved rehabilitation consultation timing and discharge planning. Morris et al. (2012) found no significant difference in 30-day readmission rates between NP-managed and resident-run units, suggesting that NP-led discharge processes did not increase readmissions and instead may have enhanced patient care transitions.

Finally, NP integration was associated with high provider and staff satisfaction levels. Collins et al. (2014) found that 100% of surveyed nurses and physicians agreed that, when NPs were included in the trauma team, hospitals experienced enhanced patient care coordination, improved communication, and smoother hospital workflow. These findings suggest that, beyond improving clinical and financial outcomes, NPs contribute positively to trauma team dynamics and provider satisfaction.

Overall, these findings demonstrate the multifaceted benefits of NPs in trauma care. While LOS reductions were a primary outcome, other advantages included cost savings, improved patient flow, enhanced provider satisfaction, and more efficient discharge coordination.

CHAPTER FOUR: DISCUSSION

The findings from the nine studies reviewed strongly support the integration of NPs into trauma care teams at Level I trauma centers. Across the literature, consistent trends demonstrate reductions in LOS, improvements in care coordination, enhancements in hospital efficiency, and financial benefits linked to NP involvement. These findings have real-world implications, particularly in high-acuity trauma environments where timely care, smooth patient flow, and optimal resource utilization are essential.

The consistent impact of NPs on LOS is clinically significant. Reducing LOS is beneficial for patients, helping decrease the risk of hospital-acquired complications and supporting timely recovery, but it also allows hospitals to free up beds, manage patient volumes more effectively, and reduce healthcare costs. For example, Holliday et al. (2017) showed that expanded NP roles in trauma care contributed to shorter hospital and ICU stays, while Collins et al. (2014) demonstrated improved staff satisfaction and communication when NPs were added to trauma step-down units, reinforcing the value of collaborative, well-coordinated care models.

However, while the evidence is compelling, it is not without limitations. In this chapter, the discussion will explore the validity, credibility, and replicability of the reviewed studies, followed by practical implications for trauma care delivery. Finally, the chapter will conclude by outlining implications for future research, clinical practice, and education.

Validity of Findings

A key strength across the studies reviewed is the consistent use of length of stay (LOS) as a measurable and meaningful outcome to assess the impact of NP integration in trauma care. LOS is widely recognized as an important indicator of hospital efficiency,

resource use, and patient care quality. The studies in this review used large, representative patient populations from Level I trauma centers, enhancing the validity and relevance of their findings in high-acuity environments.

All nine studies included in this review were retrospective cohort studies, as this was the only study design retrieved in the search. While retrospective cohort studies do not carry the same weight as randomized controlled trials, this design was appropriate for examining patient outcomes over time and provided objective, measurable data directly related to the research question.

Several studies demonstrated statistically significant reductions in LOS following NP integration. For example, Holliday et al. (2017) reported shorter hospital, and ICU stays after expanding NP roles. Collins et al. (2014) showed reduced LOS in trauma step-down units with the addition of NPs. Morris et al. (2012) provided particularly strong evidence through the analysis of nearly 4,000 patients, showing that unit-based NPs were associated with decreased LOS compared to traditional resident-run models.

Study durations varied, with some offering short-term assessments over two years (Christmas et al., 2005; Hiza et al., 2015; Collins et al., 2014; Hardway et al., 2020) and others capturing longer-term impacts over three to nine years (Sise et al., 2011; Morris et al., 2012; Bethea et al., 2019; Holliday et al., 2017; Gillard et al., 2011). This range of follow-up periods strengthens the validity of findings by demonstrating both immediate and sustained effects of NP integration on LOS.

While all studies focused on quantitative outcomes, one study (Collins et al., 2014) also included a staff satisfaction survey using a Likert scale to gather physician and nurse perceptions of NP-led trauma care. Although this did not qualify as a mixed-methods study, it

was the only research incorporating provider perspectives alongside patient outcome data, adding valuable context to the observed reductions in LOS.

Despite these strengths, some limitations remain. Most studies were conducted at single institutions, which may limit generalizability to other trauma systems. Although many studies attempted to control for confounding factors such as injury severity, comorbidities, and patient demographics, the methods used to adjust for these factors were not always consistent or clearly reported. Furthermore, the absence of randomized controlled trials (RCT) means that causal relationships cannot be firmly established. Nevertheless, the consistency of findings across multiple large, well-conducted retrospective cohort studies supports the validity of the conclusion that NPs play an important role in reducing LOS in trauma care settings.

Credibility of Findings

Across the reviewed literature, consistent patterns emerged indicating that NP integration into trauma teams is associated with reductions in LOS. Although some studies reported findings that did not reach statistical significance, the overall direction of results across diverse settings and populations suggests a meaningful impact. Several studies employed robust analytic methods, lending credibility to their conclusions, and reported reductions in both LOS and intensive care unit stays.

Additionally, improvements in discharge planning and care coordination were frequently noted, particularly for vulnerable populations such as older adults, though inconsistencies in defining age-related criteria limit comparability across studies.
While the absence of RCTs limits the ability to draw definitive causal inferences, the inclusion of large observational cohort studies with rigorous statistical controls adds strength

to the evidence base. The convergence of findings across multiple studies enhances the credibility of the conclusion that NPs contribute positively to trauma care efficiency. Future research utilizing experimental designs would be valuable in confirming these associations and isolating the specific impact of NP integration within multidisciplinary trauma teams.

Replicability and Generalizability

The consistent reductions in LOS reported across the studies suggest that integrating NPs into trauma care teams is both replicable and adaptable in high-acuity settings. LOS was the primary outcome in all studies, making it a meaningful measure of hospital efficiency and patient flow. For example, Sise et al. (2011) showed that adding NPs to trauma teams led to sustained reductions in LOS, fewer complications, and cost savings, outcomes that other trauma centers could potentially achieve.

However, replicability depends on factors such as institutional culture and the scope of practice granted to NPs. In the USA, where these studies were conducted, NP roles are generally well-supported by legislation and hospital policies. This allows NPs to function to their full scope, independently assessing patients, ordering and interpreting diagnostics, prescribing, performing procedures, and coordinating discharge planning. In trauma settings, where rapid decisions and efficient care transitions are critical to reducing LOS, full scope of practice is essential.

If NP practice is restricted and requires physician approval for every decision or order, it can hinder efficiency, resulting in unnecessary delays in patient assessments, treatment initiation, and discharge planning. These delays can increase LOS and reduce the benefits that NP integration is meant to bring. Trauma environments rely on timely

interventions, early mobilization, and efficient care coordination; restrictions on NP autonomy can undermine these processes and negatively impact patient outcomes.

Institutional culture and scope of practice are closely linked. Organizations that foster collaborative care, support clear role definitions, and encourage NP autonomy are more likely to see positive results. Conversely, hospitals with rigid hierarchies or unclear protocols may limit NP contributions, even when legislation allows full-scope practice.

While the findings from these studies are promising, generalizing them to other healthcare systems, such as Canada's, presents challenges. In Canada, most NP programs focus on primary care, and NP roles in trauma care are uncommon. For Canadian trauma centers to achieve similar reductions in LOS, changes would be needed to support NP practice in acute care, including expanded education opportunities, supportive institutional policies, and a culture that values NP contributions. Without these elements, the positive outcomes seen in the reviewed studies may not be fully replicated, highlighting the importance of aligning practice structures, education, and institutional culture when expanding NP roles in trauma care.

Patient Outcomes

Across the studies, reductions in LOS were associated with improvements in key patient outcomes. Several studies reported fewer complications and smoother transitions of care following NP integration. For example, Holliday et al. (2017) noted that an expanded NP model improved continuity of care for non-critical trauma patients, contributing to better discharge planning and fewer missed injuries. Similarly, Morris et al. (2012) reported fewer complications and more timely discharges in patients managed by NPs compared to those under RR care. While direct mortality outcomes were less frequently reported, studies such

as Hardway et al. (2020) included mortality and readmission rates in their analysis and found no negative impact, suggesting that LOS reductions achieved with NP involvement did not compromise patient safety.

Effect of NP Integration on Length of Stay

LOS was the primary focus of this review, and the central outcome measured across all nine studies. The studies consistently demonstrated that integrating NPs into trauma care teams contributed to reductions in LOS. These reductions were observed across different patient populations, care models, and trauma service structures, highlighting the broad applicability of NP-led interventions.

The studies showed that NP involvement helped address key factors contributing to prolonged hospital stays. By participating in daily trauma rounds, expediting consultations, managing patient flow, and leading discharge planning efforts, NPs helped reduce delays and improve efficiency. For example, expanded NP service models that provided seven-day coverage and included ICU management (Holliday et al., 2017) were associated with significant hospital and ICU LOS decreases. Similarly, Collins et al. (2014) demonstrated that NPs working in trauma step-down units contributed to more timely patient transitions, resulting in shorter stays.

Even studies with large, diverse patient populations, such as Morris et al. (2012), confirmed that patients managed by NPs had shorter LOS than those under traditional RR care models. These findings suggest that NPs consistent presence, clinical expertise, and ability to manage complex care plans play a critical role in moving patients efficiently through the system.

While the magnitude of LOS reduction varied between studies, the direction of impact was consistent, NP integration led to measurable improvements in hospital throughput. This evidence strongly supports the conclusion that NPs are a valuable resource for trauma centers aiming to reduce LOS and optimize patient flow, which has important implications for healthcare systems looking to increase efficiency and capacity.

Healthcare Costs

While healthcare costs were not the primary focus of this review, several studies highlighted cost implications associated with LOS reductions. Shorter hospital stays lead to decreased resource use and lower hospital expenditures. For example, Sise et al. (2011) demonstrated that progressive NP coverage expansion resulted in decreased LOS and measurable cost savings. Christmas et al. (2005) similarly reported reductions in overall hospital costs, correlating with decreased patient days in hospital and ICU settings. Although not all studies directly measured financial outcomes, the consistent reduction in LOS across the literature implies improved hospital efficiency and resource allocation, contributing to cost containment, a key concern for Canadian trauma centers operating within a publicly funded healthcare system.

Implications for Practice

The evidence from this review demonstrates that integrating NPs into trauma care teams can reduce LOS, improve care coordination, and enhance system efficiency. While several Level I trauma centers in Canada already utilize NPs in trauma settings, their roles remain underutilized, and there is substantial opportunity for expansion. Canadian trauma centers, especially those designated as Level II or III, could benefit from adopting similar models.

Level II and III trauma centers often serve as key referral sites or manage trauma patients in smaller or more resource-limited environments. In these settings, where access to around-the-clock specialist support or resident physician coverage may be limited, NPs could help bridge gaps in care. By leading daily trauma rounds, coordinating multidisciplinary care, and facilitating timely discharge planning, NPs could help reduce LOS and improve patient flow outside major urban centers. Supporting NP practice to full scope in these environments would improve patient outcomes and alleviate system strain, particularly in regions facing physician shortages or limited specialist availability.

Implications for Education

The findings of this review highlight a clear need to strengthen trauma-focused education in NP training. In Canada, most NP programs are designed as Family Nurse Practitioner (FNP) programs with a focus on primary care and community health. There are few formal acute care NP programs, and trauma care education is not routinely included in the standard curriculum. Like other specialty areas such as surgery, ICU, or internal medicine, trauma remains a niche role within acute care practice. This presents both a challenge and an opportunity for educational institutions to broaden offerings that prepare NPs for these specialized roles.

Canadian NP programs could benefit from integrating elective or advanced courses in trauma care, including topics such as injury assessment, advanced procedural skills, management of complex trauma patients, and collaborative practice within interdisciplinary teams. Dedicated clinical placements in trauma centers and simulation-based education could further enhance readiness for practice in these environments.

In the USA, NP programs are increasingly expanding to include emergency-certified pathways (ENP), which incorporate trauma and emergency care into their curriculum. This model could inspire Canadian programs to develop similar specialty certification or post-graduate training opportunities in trauma care. By offering trauma-focused subspecialties or advanced certificates, educational programs could help prepare NPs to fill an important gap in acute care services.

Additionally, NP education should incorporate leadership, quality improvement, and health systems education to enable NPs to provide direct trauma care and contribute to trauma program development, protocol optimization, and team education. Embracing this opportunity would ensure NPs are well-positioned to advance trauma care delivery in clinical and leadership capacities.

Implications for Research

The absence of Canadian studies examining the impact of NP integration on LOS in trauma care presents a clear research gap. Future Canadian research should focus on evaluating NP roles in trauma centers, particularly assessing outcomes such as LOS, discharge efficiency, patient safety, and staff satisfaction. Multi-center studies across provinces and research comparing outcomes between centers with and without NP integration would provide valuable data to support policy and practice changes.

Additionally, research should explore the feasibility and effectiveness of NP roles in Level II and III trauma centers, where NPs could help manage lower-acuity trauma patients and support resource-limited settings. Due to Canada's unique funding and healthcare challenges, cost-effectiveness studies in the Canadian healthcare system are needed to show the financial benefits of adding nurse practitioners.

Finally, Canadian research should include qualitative studies to explore the experiences of trauma teams, administrators, and NPs, helping to identify barriers and supports for successful NP integration. This would help guide practice development and inform education and policy, ensuring that any expansion of NP roles in trauma care is supported by evidence and meets the needs of Canadian patients and healthcare systems.

CHAPTER FIVE: CONCLUSION

This integrative review provides compelling evidence that adding NPs to trauma teams positively influences hospital LOS for adult trauma patients. The findings indicate that NPs play a critical role in care coordination, provider support, and discharge efficiency, contributing to reductions in LOS while maintaining or improving patient outcomes. Across the studies analyzed, NP integration was associated with statistically and clinically significant decreases in hospital and ICU LOS and improvements in hospital resource utilization and cost-effectiveness.

Beyond LOS, NPs have been shown to enhance multidisciplinary collaboration, alleviate physician workload, improve patient satisfaction, and contribute to overall system efficiency. Their ability to provide continuity of care, manage discharge planning, and oversee clinical decision-making underscores their value within trauma care settings. However, the studies reviewed primarily focused on Level I trauma centers in the United States, leaving gaps in knowledge regarding the effectiveness of NPs in other healthcare settings, including Level II and III trauma centers, rural hospitals, and Canadian healthcare systems.

While the findings are encouraging, much of the evidence is drawn from retrospective cohort studies, which restricts the ability to determine direct cause-and-effect relationships. Additionally, variability in NP roles, institutional policies, and trauma center structures may influence generalizability. Future research should include RCTs to validate the impact of NPs on LOS further. Expanding research to include diverse healthcare settings, such as Canadian trauma centers, would provide valuable insights into how NP-led models can be adapted to different systems.

Ultimately, this review supports integrating NPs into trauma teams to improve hospital efficiency and patient outcomes. As healthcare systems worldwide continue to grapple with increasing patient volumes, provider shortages, and cost containment pressures, the role of NPs in trauma care remains a promising solution to optimizing patient flow, reducing LOS, and enhancing the overall quality of trauma care delivery.

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Appendix A

Database Search Terms

Search Date	Database	Search terms	Articles retrieved
October 14, 2024	CINAHL	("nurse practitioner*" or "advance* practice nurs*" or "trauma nurse practitioner*") AND ("trauma service*" or "trauma center*" or "trauma centre*" or "trauma unit*") AND ("length of stay" or "los" or "impact on length of stay" or "hospital length of stay")	34
October 14, 2024	Medline	("nurse practitioner*" or "advance* practice nurs*" or "trauma nurse practitioner*") AND ("trauma service*" or "trauma center*" or "trauma centre*" or "trauma unit*") AND ("length of stay" or "los" or "impact on length of stay" or "hospital length of stay")	48
October 14, 2024	Google Scholar	How does the addition of nurse practitioners to the trauma team influence the hospital length of stay of patients admitted with traumatic injury?	0

Appendix B

Database Searches

CINAHL Search

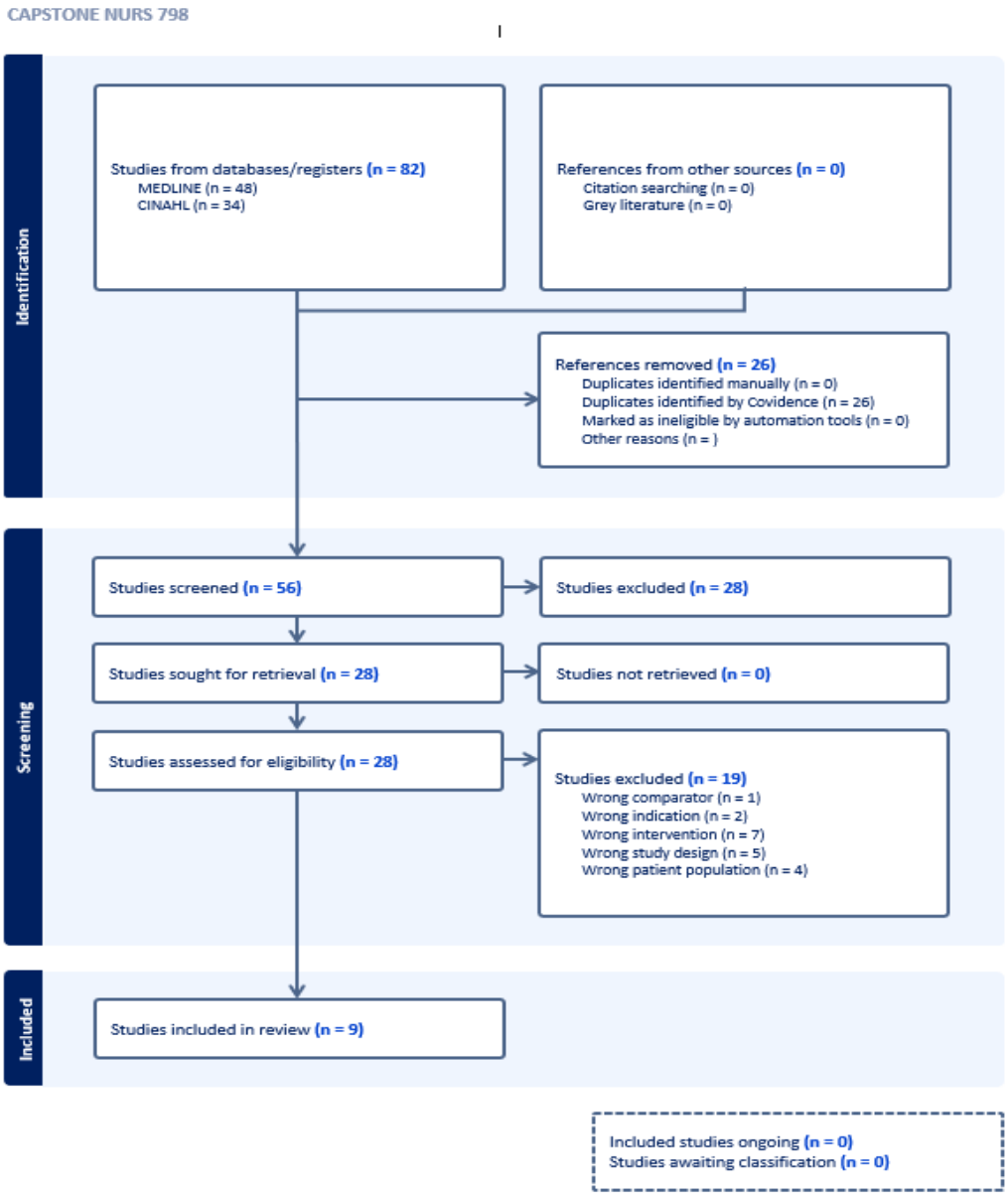
#	Query	Limiters/Expanders	Last Run Via	Results
S4	S1 AND S2 AND S3	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	34
S3	"length of stay" or "los" or "impact on length of stay" or "hospital length of stay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	118,919
S2	"trauma service*" or "trauma center*" or "trauma centre*" or "trauma unit*"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	15,857
S1	"nurse practitioner*" or "advance* practice nurs*" or "trauma nurse practitioner*"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	36,793

Medline Search

#	Query	Limiters/Expanders	Last Run Via	Results
S4	S1 AND S2 AND S3	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE with Full Text	48
S3	"length of stay" or "los" or "impact on length of stay" or "hospital length of stay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE with Full Text	552,056
S2	"trauma service*" or "trauma center*" or "trauma centre*" or "trauma unit*"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE with Full Text	44,555
S1	"nurse practitioner*" or "advance* practice nurs*" or "trauma nurse practitioner*"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - MEDLINE with Full Text	38,141

Appendix C

PRISMA Flowchart



Appendix D

Data Extraction Table

Abbreviations Used Within Tables:

- Abx: Antibiotic
- ACNP: Acute care Nurse Practitioner
- APN: Advanced Practice Nurse
- DVT: Deep Vein Thrombosis
- HLOS: Hospital Length of Stay
- ICU LOS: Intensive Care Unit Length of Stay
- ISS: Injury Severity Score
- LOS: Length of Stay
- MLP: Mid-Level Provider
- NP: Nurse Practitioner
- NTNP: Non-Trauma Nurse Practitioner
- OMF: Oral Maxillofacial
- PA: Physician Assistant
- RR: Resident Run
- Sx: Surgery
- TCU: Trauma Care Unit
- TNP: Trauma Nurse Practitioner
- UBNP: Unit Based Nurse Practitioner
- UTI: Urinary Tract Infection

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Christmas 2005 **Physician extenders impact trauma systems.** United States Retrospective Cohort $p < 0.05$ significant; t-test; chi-squared test; Mean; Standard deviation	Assess the impact of adding physician extenders (NPs) to the trauma service on hospital course and patient outcomes at an academic Level I trauma center	2001-2003 Level n/a Three years: 1 year pre-NP, 1-year transition, 1-year post-NP	n/a n/a n/a n/a	18 (days) 12 (days) n/a	Data collected over 3 years (2001, 2002, 2003), July 2002 added 2 NPs, did not report on # of study participants, p value or actual LOS #s NP role: Daily progress notes, evaluating lab work and radiographic findings, liaison activities, discharge management, follow-up care	3-year prospective data collection for comprehensive assessment. Clear before-and-after comparison with NP integration. Multiple outcome measures (LOS, ICU LOS, mortality, cost). Statistical analysis to determine significance.	Single-institution study, limiting generalizability. Only 2 years of prospective data analyzed. Mortality measure lacks context on complications/errors. No detailed NP role description, limiting applicability. No long-term follow-up on sustainability.
Hiza 2015 **Effect of a Dedicated Orthopaedic Advanced Practice Provider in a Level I**	Adding a single full-time NP to the orthopedic trauma team at a level I trauma center would decrease overall LOS and hospital costs.	Jan 1, 2011 – Feb 28, 2013 Level 1 Two years: 1 year pre-NP, 1-year post-NP	1584 All patients discharged from the orthopedic trauma team Patients who were treated	6.02 (days) 4.91 (days) 0.144	Ortho trauma population, charts reviewed Jan 1, 2011-Dec 31, 2011 (pre-NP) and March 1, 2012-Feb 28, 2013 (post-NP), 2-month gap for	Limited confounding variables. Stable faculty.	Presence of outliers in patient cohorts. Average cost per night may not reflect actual costs.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Trauma Center: Analysis of Length of Stay and Cost. United States Retrospective Cohort Kruskal-Wallis; $p < 0.05$ significant			operatively, nonoperatively Patients who were transferred from other services to the orthopedic trauma team and who were then discharged from the orthopedic trauma - Patients transferred from the trauma service (subgroup analysis exclusion) January 1, 2012, to February 29, 2012, for NP training Patients admitted to other services for which the orthopedic trauma team		NP training, no faulty changes, 713 pts pre-NP, 871 pts post-NP, overall LOS not statistically relevant however relevance in subsets (transfers, rehab, age > 60, abx/wound management)		Limited generalizability to other institutions.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
			acted as a consulting team				
Sise 2011 **Resource commitment to improve outcomes and increase value at a level I trauma center.** United States Retrospective Cohort Pearsons X2; Kruskal-Wallis; Cuzick; Linear regressions; Binary logistic regressions; $p < 0.05$ significant; Mean	Impact of adding advanced practice nurses and creating a dedicated trauma care unit (TCU) on the quality and cost of care at a Level I trauma center.	May 1, 2001 – April 30, 2009 Level 1 Four one-year intervals: pre-NP, initial NP trial, incremental NP additions (5 to 7 days/week)	8904 (pts who survived to discharge) Trauma Registry All patients aged 15 years or older evaluated by the trauma service January 1, 2012, to February 29, 2012, for NP training - Patients admitted to other services for which the orthopedic trauma team acted as a consulting team	0.93 (days) 1.11 (days) **0.001**	Data collected over four 1-year intervals, Year A – no NP, Year B – 2-3 NPS 5/7, Year C - TCU and Year D – CNS and NP 7/7, ICU LOS significantly decreased as well as cost per trauma pt NP role: NP provided continuity of care	Longitudinal design enabled evaluation over time. Dedicated trauma care unit (TCU) and advanced practice nurses (APNs) as a cost-effective quality improvement model. Robust data collection using a trauma registry and financial records.	Retrospective design introduces selection bias and confounding. Single-institution study limits generalizability No control for external changes (e.g., medical technology, care processes). Did not assess patient satisfaction. Lacks details on APN and TCU staff roles, limiting applicability.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Morris 2012 **The influence of unit-based nurse practitioners on hospital outcomes and readmission rates for patients with trauma.** United States Retrospective Cohort t-test; Fisher exact test; Mean; Standard deviation	Analyze patient outcomes and determine if differences exist between patients cared for on the Unit Based NP (UBNP) service and the Resident Run (RR) service.	Jan 1, 2007 – Aug 31, 2010 Level n/a Comparison of UBNP service vs. resident service within the same period	3859 (pts who survived to discharge) Trauma Registry n/a Patients discharged directly from the intensive care unit (ICU) were excluded, 196 deaths	6.5 (days) UBNP 7 (days) RR 0.17	Comparison between care provided by unit-based NPs and resident run services, p value not statistically significant however other metrics were (DVT dx, discharge to home)	Compares outcomes of unit-based nurse practitioners (UBNPs) vs. resident-run (RR) trauma services. Large sample size (3,859 patients). Retrospective database design allows real-world outcome comparison.	Retrospective design may introduce selection bias. Does not account for readmissions to other hospitals. Lacks analysis of temporal relationships between complications. Relies on administrative data, which may miss key details. Does not assess cost-effectiveness of the UBNP model.
Bethea 2019 **Nurse Practitioners' Role in**	Compare outcomes in elderly patients whose care was coordinated by	Dec 2014 – June 2017 Level 1	1363 Trauma Registry	4.38 +/- 3.54 (days) 5.60 +/- 3.98 (days)	Non TNP service cohort made up of hospitalists, orthopedics,	Demonstrates the impact of the TNP model on elderly trauma care.	Selection bias due to retrospective design.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Improving Service for Elderly Trauma Patients. United States Retrospective Cohort $p < 0.05$ significant; t-test; Mann-Whitney U test; chi-squared test; Fisher exact test; Mean; Standard deviation	the TNPs versus non-trauma NPs (NTNPs).	Comparison of trauma NP vs. non-trauma NP services within the same period	65 years or older, ISS 10 or less, admitted to non-critical patient care areas, stay > 24 hrs (LOS) n/a	**0.048**	plastic sx, OMF, and NeuroSx.LOS reported as range, unsure why it wasn't reported as median, TNP higher d/c home % (p value 0.002)	Large sample size. Retrospective cohort design.	Potential for incomplete or inaccurate data. No causal relationship established between NP model and outcomes.
Holliday 2017 **An Outcome Analysis of Nurse Practitioners in Acute Care Trauma Services.** United States	Assess trends in outcomes of patients admitted to trauma services over a period of 3 years that included a year before, a year during, and a year post-	Sept 2012 – Aug 2015 Level 1 Comparison of pre-expansion (2 NPs, 5 days/week) vs. post-	3284 Trauma Registry Admitted to trauma services with a hospital LOS of at least 24 hours	6.92 +/- 8.50 (days) 6.88 +/- 9.13 (days) **0.007**	Pt separated into 3 cohorts: 12 months before NP service, (Sept 2012-Aug 2013), during NP service implementation (Sept 2013-Aug 2014) and 12 months	Comprehensive review of NP involvement in trauma care. Large sample size (3,284 patients). 3-year study period enabling	Retrospective design may introduce selection bias and data quality issues. No control group, limiting causal inference.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Retrospective Cohort Binary logistic regressions; p < 0.05 significant; chi-squared test; Fisher exact test; Mean; Standard deviation; covariance regression	implementation of the NP service model.	expansion (5 NPs, 7 days/week)	n/a		following NP service implementation (Sept 2014-Aug 2015). LOS reported as range, unsure why it wasn't reported as median, also improved outcome in ICU LOS, pneumonia and DVT post implementation	thorough evaluation. Retrospective design allows real-world outcome analysis. Multiple outcome measures (LOS, ICU LOS, rehab consultation timing, complication rates).	Single-institution study reduces generalizability. Potential confounding factors (e.g., policy or procedural changes).
Hardway 2020 **Rate of Nonsurgical Admissions at a Level 1 Trauma Center: Impact of a Trauma Nurse Practitioner Model.** United States	The study endeavours to compare patient outcomes between the TNP and hospitalist service.	Jan 2017 – Aug 2018 Level 1 Comparison of NP-led vs. hospitalist-led models within the same period	1400 Trauma Registry Trauma Registry Patients transferred to other services during their stay	4.80 +/- 3.24 (days) 5.97 +/- 3.59 (days) **0.006**	Pts in TNP group were younger, had less pre-existing conditions. Hospitalist group had higher volume of pts requiring surgical intervention. TNP higher d/c (home or	Demonstrates the positive impact of the TNP model on nonsurgical admissions and patient outcomes. Highlights operational differences between TNP and hospitalist services in a Level 1 trauma setting.	Retrospective design may introduce selection bias. Data reliability depends on accurate past event recording. Hospitalist service lacks a dedicated nursing floor, potentially affecting outcomes.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
Retrospective Cohort Binary logistic regressions; p < 0.05 significant; t-test; Mann-Whitney U test; chi-squared test; Fisher exact test; Mean; Standard deviation; covariance regression					facility) (pvalue 0.001) NP role: Holistic approach, manage trauma pts, daily assessments, discharge pts, consult specialists, coordinate team member, talk to families, educate pts, follow up clinic	Suggests cost-reduction opportunities without compromising quality or outcomes.	Effective communication and teamwork in the TNP model may not be easily replicable elsewhere.
Gillard 2011 **Utilization of PAs and NPs at a level I trauma center: Effects on outcomes.** United States Retrospective Cohort	Analyze the impact of trauma mid-level providers (MLP) on patient care and resource utilization at a level 1 trauma center.	Nov 1, 2003 – May 31, 2006 Level 1 Two periods: pre-MLP (before adding 3 NPs/PAs) vs. post-MLP	2801 Trauma Registry Trauma Registry December 1, 2004, through April 30, 2005 was intentionally excluded to	5.09 +/- .20 (days) 4.84 +/- .20 (days) 0.92	Study cohorts: Pre-MLP 1216 pts (Nov 1, 2003-Nov 30, 2004) and post-MLP 1585 pts (May 1, 2005-May 31, 2006). Dec 1, 2004-Apr 30, 2005 intentionally excluded to provide	Demonstrates a significant reduction in ICU-LOS and UTI incidence in the POST-MLP period. Highlights potential benefits of MLPs in trauma care, including reduced ED dwell times.	Retrospective design may not account for uncontrolled variables. Did not control for changes in nursing practices or guidelines. Stable trauma attending staff may limit variability in outcomes.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
$p < 0.05$ significant; t-test; chi-squared test			provide a stabilization period for the modified clinical practice with new hires		stabilization of clinical practice. Decreased UTI (p-value 0.0001) and decreased ICULOS (p-value 0.019)	Suggests MLPs support junior residents and enhance house staff education.	Lacks data on urinary catheter utilization, which may have influenced UTI reduction.
Collins 2014 **Outcomes of adding acute care nurse practitioners to a Level I trauma service with the goal of decreased length of stay and improved physician and nursing satisfaction.** United States Retrospective Cohort	Using experienced ACNPs on the step-down area would improve throughput and decrease the length of stay (LOS). Adding ACNPs would improve staff satisfaction.	Dec 1, 2010 – June 30, 2012 Level 1 Comparison of pre-NP vs. post-NP in trauma high acuity and ward services	8283 n/a All patients admitted and discharged to the trauma service between December 1, 2010, and June 30, 2012 n/a	6.6 (days) 6.4 (days) **0.023**	Trauma service included trauma ICU, trauma stepdown and trauma ward. HLOS data included all areas. Staff satisfaction showed positive results. Cost savings presented.	Retrospective design enabled analysis of a large dataset and pre/post-ACNP comparisons. Clear hypothesis with well-defined, measurable objectives. Multidisciplinary team approach (ACNPs, attending physicians, nurses) enhanced patient care.	No control group, limiting causal inference. Single-institution study reduces generalizability. Did not account for confounding variables (e.g., policy or procedural changes). Lacked evaluation of direct hospital costs and reimbursements. Reliance on self-reported survey data, introducing potential bias.

Author Title Country Study type Variability Tests	Aim of Study	Study dates Trauma Center Level Comparator	Study participants Recruitment Inclusion Criteria Exclusion Criteria	HLOS: Pre implementation Post implementation P value	Findings	Strengths	Limitations
$p < 0.05$ significant; t-test; Mean							