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Care Coordination of the Geriatric Traumatic Fracture Patient:
A Multimodal Approach to Pain Management

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing
Practice at the University of Kentucky

By

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2021

Abstract

Introduction: Traumatic fractures are increasing in incidence across the country, particularly in the aging population. Geriatric patients who are admitted to the acute care setting for traumatic fractures are a unique population that require acute pain management, while also managing other comorbidities. While there are several guidelines on pain management for patients who are admitted to the acute care setting, there are no specific guidelines on the best practices to manage acute pain in the geriatric traumatic fracture population. Evidence supports a multimodal pain management strategy using pharmacologic and non-pharmacologic means as the best way to care for this population.

Purpose: The purpose of this practice improvement project research study is to develop an educational intervention focused on multimodal pain management of the geriatric patient with traumatic hip or rib fractures and to determine the impact for the advanced practice provider (APP).

Methods: This research focused on two key areas: the APP education/survey data, as well as the patient chart review data. Assessment of APP knowledge and attitudes was obtained through a pre- and post-intervention survey, and APP practices were assessed through a retrospective and prospective chart review of patients who met the inclusion/exclusion criteria.

Results: Questions regarding overall APP knowledge were found to be significant ($p < .001$). Average overall scores of the two groups were 48.89 (SD=15.4) for the pre-intervention group, and 78.57 (SD = 7.6) in the post-intervention group ($p < .001$). Significant differences were found in questions that focused on ideal opioid prescription ($p = .002$), and recommended route of analgesic administration ($p = .006$), as well as questions that focused on nerve blocks ($p = .002$). There was no significant difference in questions regarding knowledge of the importance of pain management ($p = .362$), and non-opioid pharmaceuticals as a first-line treatment (.182). In

comparing NPs and PAs, specifically, PAs performed significantly better than NPs regarding knowledge of analgesic administration in the pre-intervention survey ($p=.023$). However, there was no significant difference between NP and PA knowledge in the post-intervention survey results.

Questions regarding attitudes of the providers in terms of geriatric patients tolerating pain, completing a comprehensive geriatric assessment with admission, and awareness of the trauma blog were not significant. Survey questions specifically regarding attitudes demonstrated that 71% of APPs were aware that epidural nerve blockades were considered the gold standard treatment for pain management in the geriatric traumatic pain management after the intervention was completed. 80% of APPs reported that a standardized order set would be beneficial for pain management in geriatric traumatic fracture population and 90% of APPs felt they consult pain management when necessary.

Survey questions regarding current practices uncovered that 75% of APPs were aware of the trauma blog protocol, but only 30% of APPs reported using the trauma blog protocol when admitting geriatric traumatic fracture patients. 57% of APPs reported that they consult BEERs criteria most or all of the time when admitting geriatric trauma patients. Questions regarding attitudes of the providers in terms of geriatric patients tolerating pain, completing a comprehensive geriatric assessment with admission, and awareness of the trauma blog were not significant.

Data analysis in the patient chart review demonstrated no significant difference between the pre- and post-intervention chart review groups regarding length of stay, ICU days, total number of narcotics prescribed, discharge disposition, nerve block placement, rapid response calls, intubation/reintubation, ICU return rates, falls, pneumonia, or delirium rates (Table 7). There was a significant difference in pressure injury rates, with rates increasing from 1.6% to 8.7% in

the pre- and post-intervention groups, respectively ($p=.026$). 100% of patients received consults with PT/OT within 24-48 hours of admitting a patient in both the pre- and post-intervention patient groups.

Conclusion: In conclusion, an extensive literature review supports a multimodal pain management protocol for the geriatric traumatic fracture population. While knowledge was improved through the educational intervention with the APPs, there was still a lack of improvement in the day-to-day attitudes and practice of the APP. Future research could be done alongside the APPs working for the service line to develop a standardized order set for all patients admitted to the hospital who would qualify for this pain management approach. The order set could also be developed through interprofessional collaboration between the APP, the pain management team, and the anesthesiologists to improve nerve blockade usage in this population. Using these strategies could improve overall patient outcomes in this population, as well as reduce overall hospital costs for the institution.

Keywords: geriatric, traumatic fracture, trauma, pain management, acute care, multimodal

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Dedication

I would like to thank my family for being my soundboard. You have helped me stay sane and most importantly, happy. To my husband, Ryan, thank you is not enough for what you have done for me over the last 3 years and throughout our time together. You have loved and supported me throughout my entire journey as a new nurse, a graduate student, and now as a doctoral candidate. This degree is happening solely because of your support, and for that I will be forever grateful. Finally, for Parker, this is dedicated to you. We cannot wait to meet you.

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Background and Significance

Each year, 150,000 Americans experience low-trauma hip or rib fractures, costing a minimum of \$10 billion (Blume & Curtis, 2011; Judd & Christianson, 2015). As the adult population has aged, it is estimated that in 2020, over 80 million adults were living over the age of 65, accounting for nearly one-fifth of the country's entire population ("Projected Future Growth of Older Population," 2017). Currently, adults over the age of 65 account for 23% of all trauma admissions, with trauma being the fifth leading cause of death in this population (Folbert et al., 2012; Keller, Sciadini, Sinclair, & O'Toole, 2012)

Traumatic fracture patients over the age of 65 have been found to experience significantly worse injuries, longer hospital stays, require greater resources after they are discharged, and have a mortality rate at 3 times higher than the younger population (Keller et al., 2012). Further, as many as 70% of patients over the age of 65 report experiencing persistent pain, and many believe that living with pain is part of the aging process (Abdulla et al., 2013). Persistent, unmanaged pain has been found to cause anxiety, social isolation, immobility, and sleep disturbances (Deng et al., 2018; Kruschinski et al., 2016; Reid, Eccleston, & Pillemer, 2015; Schofield, 2007). Considering the consequences of persistent pain and the common physiological changes related to aging, it is increasingly important to coordinate all aspects of care of patients over the age of 65 admitted with traumatic hip or rib fractures, including appropriate pharmacologic management, physical therapy, occupational therapy, and early pain management consults who experience traumatic fracture (Abdulla et al., 2013).

While pain management protocols have been in place for the traditional trauma patient, providers are missing an opportunity to manage the specific needs of adults over the age of 65 who experience traumatic hip or rib fractures ("Geriatric Trauma Guideline," 2020). Recent

literature has shown that a specialized, multimodal pain management protocol is the most effective way to manage pain in adults over the age of 65 admitted with traumatic hip or rib fractures, compared to the standard care provided to younger patients who are admitted with a traumatic fracture (Makris, Abrams, Gurland, & Reid, 2014; Reid et al., 2015). Despite the evidence, implementation of these practices may not be fully realized by providers. This creates a gap in the practice of the providers caring for these patients, which could be managed through an educational intervention on the best practices for pain management.

Purpose/Objectives

The purpose of this practice improvement project research study is to develop an educational intervention focused on multimodal pain management of the geriatric patient with traumatic hip or rib fractures and to determine the impact for the advanced practice provider (APP). This will be completed by focusing on three key areas: knowledge, attitudes, and practice of the APP. Specifically, this project will focus on the following objectives:

Objective 1: Determine the change in APP knowledge of caring for geriatric traumatic fracture patients following a multimodal pain management educational intervention.

Objective 2: Evaluate current attitudes of the APP toward pain management in the geriatric traumatic fracture population through a pre-survey prior to the intervention.

Objective 3: Assess the change in practice for pain management in the geriatric traumatic fracture population prior to the educational intervention through a pre- and post-intervention survey, as well as a systematic chart review.

Theoretical Framework

The theoretical framework for this intervention is the theory of planned behavior, which reinforces sustained behavioral changes (Ajzen, 1991). This theory highlights three key

elements: the individual's attitude, their subjective norms, and their perceived behavioral control (Ajzen, 1991; Meleis, 2018). To use this theory in practice, facilitators should focus on educating the individual first, to facilitate a change in their attitude. This can then be followed by changing the attitude of the group, which would alter the subjective norm in their practice. Regarding this intervention specifically, focusing on the individual APP's attitude toward pain management in the geriatric traumatic fracture population can ensure that they will "buy-in" to the intervention, leading to a change in practice. Achieving buy-in from the APP will ultimately achieve a level of trust between the APP and the facilitator, which increases trust in the information that is provided to them.

Furthermore, achieving buy-in from the individual APP will facilitate a change in the expected practice of all APPs who work with the trauma/surgical service line, encouraging a long-term change. The goal is to use the theory of planned behavior to empower APPs to align their practice with the current guidelines, so they feel they have control over their practice. This increases the likelihood that APPs will continue to use the intervention throughout their time caring for the geriatric traumatic fracture population.

Review of Literature

Search Strategy

The primary purpose of the literature review was to perform an extensive search of all literature related to the key research question: What are the best practice guidelines for pain management in the geriatric traumatic fracture population? A search for research articles was conducted in PubMed and CINAHL databases. Initially, words such as "geriatric" and "trauma" was performed to search for information related to the primary research topic.

This search initially resulted in 905 articles in PubMed and 406 articles in CINAHL. Articles focusing on chronic pain or outpatient pain management were excluded, as this review is focused on management in the acute care setting. Inclusion criteria included: 1) adults ≥ 65 years old, 2) humans only, and 3) publication within the last 10 years. The following search terms were then placed in the databases in various combinations: *multimodal, physical therapy, modalities, pain management, nonpharmacological, pharmacological, pain/prevention and control, pain/psychology, hip fractures, rib fractures, and fracture*. References in the studies were evaluated for any articles that were relevant to the topic. Practice guidelines were also searched for in the databases, but there were no standard practice guidelines regarding pain management in this population. Ultimately, 40 articles were found to be relevant to the research question.

Summary of the Evidence

Four major themes emerged from the analysis of the literature: 1) appropriate pain assessment, 2) prophylactic pain management using non-opioid analgesia, 3) nerve blockades for pain management in the geriatric traumatic fracture population, and 4) early physical therapy/occupational therapy (PT/OT) consults. All themes related to multimodal pain management for traumatic fractures in the geriatric population, implying that developing a multimodal approach is the best way to manage pain.

Based on the evidence found in the review, the literature supported the primary question. Of the studies of interest, four articles focused on using nerve blocks as the gold standard for pain relief (Abou-Setta et al., 2011; Kuru & Olcar, 2020; Sanzone, 2016; Wardhan, 2013). Four of the studies focused on the benefits of pharmacologic management for traumatic fractures (Booker & Haedtke, 2016; Casey et al., 2017; Cornell, 2013; Mitchell, Majuta, & Mantyh, 2018), and three focused on early mobilization for best long term outcomes for pain management

(Cornell, 2013; Fabi, 2016; Kuru & Olcar, 2020). Two studies focused on pain assessment (Herr & Titler, 2009; Spilman et al., 2014), with an emphasis on whether providers are appropriately assessing pain in the older adult. Of note, only two of the studies focused on total multimodal pain management for the geriatric hip fracture patient (Fabi, 2016; Hutchinson, Jaekel, Lovald, Watson, & Ong, 2019).

Of the studies that focused on nerve blocks, two of the studies reported improved hospital outcomes including reduced length of stay, decreased delirium rates, and better discharge disposition outcomes (Abou-Setta et al., 2011; Mangram et al., 2015). Studies that focused on pharmacologic management unanimously agreed that non-opioid analgesia should be the first line choice before opioids, and one study recommends a scheduled, prophylactic approach rather than breakthrough pain control with analgesic medications, minimizing opioid related adverse events (Cornell, 2013).

Based on the literature mentioned above, there were a variety of recommendations to managing pain in adults over the age of 65 who have experience traumatic hip or rib fractures. However, only two articles focused on a standardize, multimodal approach for pain management, creating a framework for an educational intervention for APPs caring for adults over the age of 65 with traumatic hip or rib fractures (Fabi, 2016; Hutchinson et al., 2019). The information found in the literature review, along with the two articles that focused on a multimodal pain management approach were used as the framework for the educational intervention that was developed for the providers.

Methods

Design

The methodology for this project was based on the hypothesis that implementing a standardized pain management protocol for APPs caring for adults over the age of 65 admitted with a traumatic hip or rib fracture would result in improved patient outcomes and optimal pain management. We approached this goal by focusing on three primary outcomes from the APP: knowledge, attitude, and practice. Success of the intervention was assessed through two methods: a cohort study that focused on an educational intervention for the APPs, as well as a retrospective and prospective chart review on the patients admitted to the trauma/surgical service line before and after the intervention. Success of the intervention was determined by a pre- and post-intervention survey that was supplied to the APP prior to, and immediately after the intervention was completed.

Project Methods

This study focused on two key areas: the APP education/survey data, as well as the patient chart review data. Assessment of APP knowledge and attitudes was obtained through a pre- and post-intervention survey, and APP practices were assessed through a retrospective and prospective chart review of patients who met the inclusion/exclusion criteria.

APP Education and Survey

APPs were initially contacted prior to the educational intervention and were supplied a pre-survey to determine their current knowledge and attitudes toward pain management for adults over the age of 65 who were admitted with traumatic hip or rib fractures. Survey results were collected through REDCap. APPs were then supplied with an educational PowerPoint that included information on the background, significance, and practice recommendations in pain

management, along with a post-intervention survey that was also provided through RedCAP. The educational intervention was based on the best practice pain management strategies that were noted in the literature review, as well as previous guidelines written by Dr. Andrew Bernard of the University of Kentucky trauma/surgical service line ("Geriatric Trauma Guideline," 2020). The intervention was made available to all APPs within the service line.

Patient Chart Review

Patient-specific variables were provided by the Trauma Registrar at the University of Kentucky and reviewed by the primary investigator. Patients admitted between April and October 2020 were assessed in the pre-intervention group, and compared to a post-intervention group, which consisted of patients admitted between November 2020 and February 2021. Inclusion criteria of patients included: adults over the age of 65 years, diagnosis of a traumatic hip/rib fracture, and admission to the trauma/surgical service line. For the purpose of this study, a traumatic fracture is defined as a fracture that is obtained through blunt force or trauma. Exclusion criteria included: patients discharged from the emergency department and patients undergoing hospice or end of life care.

Agency Description

Setting

The study took place at Albert B. Chandler Hospital within the trauma/surgical service (TSS) department. Albert B. Chandler Hospital is a 569-bed acute care medical center, located at the University of Kentucky (UK) in Lexington, Kentucky. It is the only American College of Surgeons verified Level I trauma center in the central and eastern Kentucky region, making it the ideal location to research pain management practices for the geriatric traumatic fracture

population ("Albert B. Chandler Hospital," 2019). The TSS department is located in Pavilion A of the medical center. At the time of the intervention, the department was staffed by nine APPs.

Target Population

The target population was the APPs caring for adults over the age of 65 with an admitting diagnosis of a traumatic rib or hip fracture. The goal was to get all nine APPs caring for this patient population to complete the intervention and pre-/post-surveys. Inclusion criteria for the APP population included: Nurse Practitioner (NP) or Physician's Assistant (PA) who work for TSS.

Mission Statement and Strategic Plan of the Institution

Albert B. Chandler Hospital's mission statement focuses on the pillars of academic health care: research, education, and clinical care ("Mission Statement," 2020). The purpose of this study aligns with the mission of the hospital because it focuses on improving clinical care and patient outcomes, while also implementing an ongoing educational component for the provider that is based on best practices for clinical care. The study also aligns with the institution's strategic plan to enable staff and leadership to serve as ambassadors for patient-centered care ("Strategic Plan," 2020). The intervention provides the tools for providers to reassess their current practices and alter them to provide the best care for their patients.

Description of Stakeholders

There were both internal and external stakeholders involved in this study. Primary internal stakeholders included patients, their families, providers, nursing staff, and hospital administrators. The patients are the most critical stakeholders because they would be the main benefactors of a standardized pain management protocol which could ultimately lead to a reduction in pain and fall rates, improve their mobility, reduce ICU readmission rates, and

influence discharge disposition. Their families are stakeholders because they would benefit from seeing the patients experience adequate pain management. Providers and nursing staff are important stakeholders because they are responsible for prescribing and implementing pain management strategies for patients. Hospital administrators are important stakeholders because they must buy into the study to ensure that it occurs. Hospital administrators also benefit from reduced costs related to inpatient falls, length of stay, and discharge disposition. Insurance companies are an external stakeholder because they are financially impacted by patient outcomes such as discharge disposition, length of stay, and ICU readmission rates.

Barriers/Facilitators to Implementation

A primary barrier to implementation of this study was the timeline of data collection for the trauma/surgical service department. The trauma registrar collects data on patients every two months, limiting the number of patients captured during this investigation. Because of this, the pre-intervention patient group was significantly larger than the post-intervention patient group. Another barrier to study implementation was that the outcome is dependent on how the APP utilizes the information included in the intervention. If the protocol was not implemented appropriately, then the patients did not receive optimal pain management based on best practice guidelines that were provided to the APP. Another barrier is buy-in from the staff. Hospital staff would need to adopt this recommended protocol and change their practice or else it would not be carried out effectively. However, we hoped to avoid this barrier by gaining support from the director of the trauma/surgical service line, who requested that a multimodal pain management protocol be developed for the geriatric traumatic fracture population.

A strong facilitator for this intervention is that the study aligns with the mission of the hospital to bring best practice protocols to the forefront of patient care, ensuring we are

managing patients' pain in the most effective manner possible. This allows us to develop the study alongside the institution's strategic plan, creating a symbiotic relationship between intervention developers and hospital administrators.

Recruitment

APP Education and Survey

At the time of the intervention, University of Kentucky's trauma/surgical service line included nine APPs. Participants were primarily through an email format, sending information to all APPs on the purpose of the study, as well as a pre-intervention survey (Appendix A). This occurred in September of 2020, approximately one month prior to the educational intervention. APPs were then emailed again in October of 2020 with an educational PowerPoint as well as a link to the post-intervention survey to be completed immediately following the PowerPoint. Face-to-face contact with the APPs occurred throughout October to answer questions and re-introduce them to the information. A flier was also placed in the APP workroom with survey QR codes along with a printed copy of the educational PowerPoint (Appendix B).

Patient Chart Review

Patient recruitment was performed retrospectively, after their discharge from the Albert B. Chandler Medical Center. Patients. The retrospective analysis involved an extensive chart review of current prescribing patterns, nerve block utilization, and pain management strategies of the APPs prior to the intervention. The data were initially reviewed for patients who were admitted up to six months prior to the intervention began. A secondary chart review was then completed in the months following to determine the impact of the intervention on patient care from November 2020 to February 2021.

Sample

At the time of the intervention, 9 APPs worked for the trauma/surgical service line and all 9 were given access to the materials. There were 170 patients who qualified for the chart review, 124 in the pre-intervention group, and 46 in the post-intervention group. The discrepancy between the patient's in the pre- and post-intervention groups is due to the limited time constraints of the study and data processing routines of the trauma program registrars.

Procedure

IRB Approval Process

The application for approval of this project was submitted to the University of Kentucky Institutional Review Board (IRB). It was submitted through the University's e-IRB process under IRB #60539. Approval was granted in August 2020.

Evidence-Based Intervention

APPs who qualified for the intervention were recruited through email format with a cover letter, information on the intervention, and links to the survey pre- and post-intervention. Inclusion criteria were APPs, specifically nurse practitioners or physicians' assistants, caring for the adults over the age of 65, who were admitted with a traumatic hip or rib fracture population. Exclusion criteria included APPs who were not a part of the trauma/surgical service line, and residents. The intervention involved a self-guided PowerPoint which highlighted the recommended practices for pain management in the geriatric traumatic fracture population. The intervention focused specifically on the key themes that were uncovered in the literature review, including: recommended pharmacologic prescribing, dosing, and administration, nerve blockades as the gold standard for pain management, daily physical/occupational therapy (PT/OT), and the trauma blog protocol.

Measures and Instruments

RedCAP was used to distribute both the pre- and post-intervention survey. The survey was a combination of true/false, multiple choice, Likert scale, and open response formatted questions. The survey focused on the key themes that were uncovered by the literature review: 1) nerve blockades for pain management in the geriatric traumatic fracture population, 2) prophylactic pain management using non-opioid analgesia, 3) appropriate opioid dosage for pain management, and 4) the importance of appropriate pain management and assessment in the geriatric traumatic fracture population. Education on early mobilization was minimally discussed with the APPs due to the pre-intervention chart review revealing that APPs were already implementing the recommended techniques for this population.

Questions for the survey were developed based on a previously validated tool, “Knowledge and Attitudes Survey Regarding Pain.” This tool was developed by pain experts, using information from the American Pain Society, the World Health Organizations, and the National Comprehensive Cancer Network Pain Guidelines (Ferrell & McCafferey, 2014). Test-retest reliability was assessed ($r > .80$), and internal consistency reliability established (alpha $r > .70$). Permission to adapt the tool for research purposes was granted from the developers themselves, Dr. Betty Ferrell and Dr. Margo McCafferey (Ferrell, 2007; Ferrell & McCafferey, 2014). The pre-survey involved a 21-question survey, and participants were given one month to complete the pre-survey (Appendix D). The post-intervention survey involved 16 questions. Participants were given one month to complete the pre-survey, intervention and post-intervention assessment (Appendix E). Attitude and perception questions were added to the pre-intervention survey, attributing to more questions on the pre-test.

Educational materials were distributed through email and sent on a weekly basis to remind participants to complete the intervention and surveys. The invitation to participate in the intervention, along with the QR codes, was placed in the APP workroom with a printed copy of the PowerPoint presentation (Appendix B). Lastly, the facilitator visited the APP workroom throughout the intervention period to answer any questions participants had.

Data Collection

APP Education and Survey

Survey results were collected anonymously through RedCAP to ensure that participants were protected.

Patient Chart Review

Patient-specific data were initially obtained from the Trauma Registrar. A unique ID for each patient was supplied as well as their admitting medical record number, allowing the primary investigator to use Sunrise Clinical Manager to investigate specific variables that were related to this intervention.

Data Analysis

There were no conflicts of interest in the analysis of the data. All data analyses were conducted using SPSS, version 25, with a significant p-value of $<.05$. Descriptive statistics were used to describe patient demographics of the sample using percentages or means with standard deviation for interval/ratio data. Frequencies with percentages were used for nominal/ordinal data. The differences in variables between APP survey results pre- and post-intervention were compared using chi-square tests for nominal/ordinal data, and independent sample t-tests for the interval/ratio data. An independent sample t-test was performed due to the anonymity of the APP survey results, which prohibited us from comparing specific results of the provider. The data for

the patient chart review were compared in a similar manner using chi-square tests for nominal/ordinal data and the Mann-Whitney U test for skewed distributions of continuous data.

Results

APP Education and Survey

Overall, we had 9 APPs complete the pre-intervention survey, and 7 complete the post-intervention survey. 78% (n=7) of APPs were nurse practitioners, and 22% (n=2) were physician's assistants. Questions regarding overall APP knowledge were found to be significant (Table 3). Average overall scores of the two groups were 48.89 (SD=15.4) for the pre-intervention group, and 78.57 (SD = 7.6) in the post-intervention group ($p < .001$). Significant differences were found in questions that focused on ideal opioid prescription ($p = .002$), and recommended route of analgesic administration ($p = .006$), as well as questions that focused on nerve blocks ($p = .002$). There was no significant difference in questions regarding knowledge of the importance of pain management ($p = .362$), and non-opioid pharmaceuticals as a first-line treatment (.182). In comparing NPs and PAs, specifically, PAs performed significantly better than NPs regarding knowledge of analgesic administration in the pre-intervention survey ($p = .023$) (Table 4). However, there was no significant difference between NP and PA knowledge in the post-intervention survey results (Table 5).

Questions regarding attitudes of the providers in terms of geriatric patients tolerating pain, completing a comprehensive geriatric assessment with admission, and awareness of the trauma blog were not significant (Table 6). Survey questions specifically regarding attitudes demonstrated that 71% of APPs were aware that epidural nerve blockades were considered the gold standard treatment for pain management in the geriatric traumatic pain management after the intervention was completed (Table 6). 80% of APPs reported that a standardized order set

would be beneficial for pain management in geriatric traumatic fracture population and 90% of APPs felt they consult pain management when necessary.

Survey questions regarding current practices uncovered that 75% of APPs were aware of the trauma blog protocol, but only 30% of APPs reported using the trauma blog protocol when admitting geriatric traumatic fracture patients. 57% of APPs reported that they consult BEERS criteria most or all of the time when admitting geriatric trauma patients. Questions regarding attitudes of the providers in terms of geriatric patients tolerating pain, completing a comprehensive geriatric assessment with admission, and awareness of the trauma blog were not significant (Table 6).

Patient Chart Review

The independent chart review revealed 170 patients who qualified: 124 pre-intervention and 46 post-intervention. Overall demographics demonstrated 98% of the patients identified themselves as Caucasian/White and 54% identified themselves as female (Table 1). Incidence of hip fracture rates increased from 25% to 32.6% (Table 2).

Data analysis in the chart review demonstrated no significant difference between the pre- and post-intervention chart review groups regarding length of stay, ICU days, total number of narcotics prescribed, discharge disposition, nerve block placement, rapid response calls, intubation/reintubation, ICU return rates, falls, pneumonia, or delirium rates (Table 7). There was a significant difference in pressure injury rates, with rates increasing from 1.6% to 8.7% in the pre- and post-intervention groups, respectively ($p=.026$). 100% of patients received consults with PT/OT within 24-48 hours of admitting a patient in both the pre- and post-intervention patient groups.

Discussion

Objective 1: Determine the change in APP knowledge of caring for geriatric traumatic fracture patients following a multimodal pain management educational intervention.

Assessing the survey data that was completed by the APPs, the intervention demonstrated a significant difference with questions regarding objective 1, APP knowledge of caring for geriatric traumatic fracture patients following a multimodal pain management educational intervention. This was found to be significant specifically regarding overall knowledge, as well as nerve blockades and pharmacologic administration and management of opioid and non-opioid analgesia. These findings indicate that the intervention was effective in educating APPs on the best practices for pain management regarding nerve blockades as the gold standard treatment, as well as appropriate pharmaceutical selection/administration.

Objective 2: Evaluate current attitudes of the APP toward pain management in the geriatric traumatic fracture population through a pre-survey prior to the intervention.

There was no significant difference in the overall attitudes toward pain management in the geriatric population and using non-opioids as a first-line pharmaceutical for pain management. This is because providers were able to appropriately answer questions regarding this information prior to the intervention, which was also demonstrated in the chart review. Because APPs were already using the best practice recommendations regarding these variables, there was not a gap in practice in these two areas.

Questions regarding APP attitudes toward pain management in this population were not significant, however specific questions demonstrated that APPs believe that the geriatric traumatic fracture population would benefit from a standardized order set upon admission.

Specifically, 71% of APPs were aware that epidural nerve blockades were considered the gold standard treatment for pain management in the geriatric traumatic pain management, but these were not being implemented in their practices. Of note, independent conversations and open response answers provided by the APPs report that there is a barrier to using nerve blockades to their fullest capacity because they must be placed by anesthesia at the request of the pain management team. This is identified as an area for APPs to improve their current practices and perhaps implement an interdisciplinary approach to managing pain in this patient population.

Objective 3: Assess the change in practice for pain management in the geriatric traumatic fracture population prior to the educational intervention through a pre- and post-intervention survey, as well as a systematic chart review.

There was no significant improvement in APP practices before and after the intervention as evidenced by the chart review of patient outcomes (Table 4). One surprising finding was that pressure injury rates increased significantly after the intervention. It is possible that this is related to the increase in hip fracture rates between the pre- and post-intervention groups, which is a more difficult population to mobilize than the rib fracture population (Table 2). All other variables regarding APP practice and patient outcomes were not significant between the pre- and post-intervention groups. This signals that while APP knowledge may have improved, there is a gap in the day-to-day management of this patient population. This could be due to lack of buy-in from APPs, lack of interdisciplinary cooperation from other specialties, or from overall fatigue in the healthcare industry due to the COVID-19 pandemic. It is worth noting that nerve blockade use was approaching significance ($p=.055$), with rates increasing from 8.9% to 19.6% in the pre- and post-intervention groups, respectively. A repeat analysis with a larger sample size in the

future may reveal a significant difference in provider practices regarding nerve blockade placement.

Implications for Future Research

Although there were limitations, the results of this project demonstrated a significant change in APP knowledge regarding best practice pain management for the geriatric traumatic fracture population. This implies that future practice could be impacted through more education on pain management strategies for adults over the age of 65, admitted with a traumatic hip or rib fracture. Future research on expanding specific variables of interest could reveal more information about educating the trauma/surgical service APP, as well as caring for adults over the age of 65 admitted with a traumatic hip or rib fracture. Specific provider variables such as APP years of experience, years working with the trauma/surgical service line, and specific type of certification could help the investigator better understand how to target the intervention for the provider. Information regarding comorbid burden of the patient could help the investigator understand how comorbidities impact variables of interest in the study.

This project could also be expanded through the development and implementation of a standardized order set for all geriatric patients admitted with a traumatic fracture as their primary diagnosis. Education could be expanded to providers in the emergency and anesthesia departments to ensure best practices were implemented from the initial encounter with the patient throughout their hospital course. Coordination with the pain management team on standardizing nerve blocks as a mainstream treatment option for the geriatric traumatic fracture population would likely improve the implementation of this practice.

Limitations

There were limitations to this study and how it was completed. Limitations regarding the APP population include the anonymous nature of the pre- and post-survey results. In order to maintain anonymity for the APP, there was no way to link the individual APP with their survey results, therefore there was no way of determining if knowledge improved for each individual provider. There was also a limitation in the sample size of the APP group. Because there were only nine APPs working for TSS at the time of implementing the intervention, the significant changes were limited. Next, noncompliance and nonparticipation in the entire intervention was a limitation to the study. All nine of the APPs took the pre-intervention survey, but only seven took the post-intervention survey. This could be explained by email fatigue, education fatigue, or overall healthcare fatigue given the timing of the intervention. The intervention was rolled out during the COVID-19 pandemic, which has been a difficult time for all healthcare providers. Educating APPs on new practice strategies during this time could be difficult due to the ever-changing protocols and education they had to keep up with in order to care for their patients during the COVID-19 pandemic. The intervention could be repeated during a time when providers are not already experiencing caregiver fatigue, to determine if an even greater improvement in practice occurred. Another limitation was that the educational materials were not taught to the participants directly. This made it difficult to know if the information was being communicated and absorbed in the way it was intended to be.

In addition to the limitations listed with providers, obtaining data from the trauma registrar limited patient data available to the investigator. Within the trauma/surgical service line, data is obtained in a data dump fashion, with new data obtained every two months. This limited the number of patients who were found to qualify for the post-intervention patient group and no

new qualifying patients were found beyond January 15, 2021. The missing patient data at the completion of the intervention limited the sample size of the post-intervention group, and may have impacted the data analysis between the pre- and post-intervention patient groups. The institution also just went through their reverification process, meaning the trauma registrar did not have the capacity to work on extra projects.

Another limitation of the intervention was the impact of the COVID-19 pandemic on patients who were admitted to the hospital. The disease has impacted those in the geriatric community the most, meaning this segment of the population is likely being more cautious at baseline, leading to the potential to have fewer hospital admissions than usual. The population admitted during the time of the intervention could be impacted due to the urging of disease control centers and government officials to limit travel and activities to stop the spread of COVID-19, reducing those admitted with traumatic fractures.

Conclusion

In conclusion, an extensive literature review supports a multimodal pain management protocol for the geriatric traumatic fracture population. While knowledge was improved through the educational intervention with the APPs, there was still a lack of improvement in the day-to-day attitudes and practice of the APP. Future research could be done alongside the APPs working for the service line to develop a standardized order set for all patients admitted to the hospital who would qualify for this pain management approach. The order set could also be developed through interprofessional collaboration between the APP, the pain management team, and the anesthesiologists to improve nerve blockade usage in this population. Using these strategies could improve overall patient outcomes in this population, as well as reduce overall hospital costs for the institution.

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Table 1

Patient Demographics

	Total n (%) or mean (SD)
Race (Caucasian/White)	167 (98.2%)
Gender (Female)	92 (54.1%)
Age (Median)	77.45 (SD=7.8)

Table 2

Patient Fracture Incidence

	Pre-intervention n (%)	Post-intervention n (%)
Hip	31 (25%)	15 (32.6%)
Rib	89 (71.8%)	29 (63%)
Hip/Rib	3 (2.4%)	2 (4.3%)

Table 3

Objective 1: Provider Knowledge Survey Analysis

	Pre-intervention (n = 9) mean (SD) or %	Post-intervention (n = 7) mean (SD) or %	<i>p- value</i>
Overall Score potential range (0-100)	48.89 (15.4)	78.57 (7.6)	<.001
Recommended Route of Analgesic Administration	33.3%	100%	.006
First-line analgesic	77.8%	71.4%	.771
Ideal Opioid for Pain Management	0%	71.4%	.002
Gold standard for pain management	0%	71.4%	.002
Contraindications for Nerve Blocks	0%	57.1%	.009
Geriatric patients tolerating pain	100%	100%	.362

Note: Significant values were found when $p < .05$.

Table 4

Provider Pre-Intervention Knowledge (NP and PA) Comparison

	Nurse Practitioner (n = 7) mean or %	Physician's Assistant (n = 2) mean or %	<i>p- value</i>
Overall Score potential range (0-100)	54.2%	50%	.358
Recommended Route of Analgesic Administration	14.3%	100%	.023
First-line analgesic	71.4%	100%	.391
Ideal Opioid for Pain Management	0%	0%	-
Gold standard for pain management	0%	0%	-
Contraindications for Nerve Blocks	0%	0%	-
Geriatric patients tolerating pain	85.7%	100%	.321

Note: Significant values were found when $p < .05$.

Table 5

Provider Post-Intervention Knowledge Comparison

	Nurse Practitioner (n = 7) %	Physician's Assistant (n = 2) %	<i>p- value</i>
Overall Score potential range (0-100)	77%	80.7%	-
Recommended Route of Analgesic Administration	100%	100%	-
First-line analgesic	100%	100%	-
Ideal Opioid for Pain Management	0%	0%	-
Gold standard for pain management	75%	66.7%	.809
Contraindications for Nerve Blocks	050%	66.7%	.659
Geriatric patients tolerating pain	100%	100%	-

Note: Significant values were found when $p < .05$.

Table 6

Objective 2: Provider Attitudes Survey Analysis

	Pre-intervention (n = 9) %	Post-intervention (n = 7) %	<i>p- value</i>
Geriatric patients tolerating pain	100%	100%	.362
Completing a CGA with every Admission	88.9%	100%	.362
Awareness of the Trauma Blog Admission Protocol	66.7%	85.7%	.383

Note: Significant values were found when $p < .05$.

Table 7

Objective 3: Provider Practice Patient Chart Review

	Pre-intervention (n = 124) median (IQR) or n (%)	Post-intervention (n = 47) median (IQR) or n (%)	<i>p-value</i>
Length of stay	7.5 (5 - 12)	7.0 (3 - 11)	.14
ICU days	0 (0-3)	0 (0-2.25)	.35
Total # Narcotics	1 (1-2)	1 (.75-2)	.59
Discharge Dispo (home)	47 (37.9%)	14 (30.4%)	.367
Nerve Block	11 (8.9%)	9 (19.6%)	.055
RRT	16 (13.1%)	7 (15.2%)	.724
Intubation	22 (18%)	7 (15.2%)	.667
Reintubation	4 (3.2%)	0 (0%)	.223
ICU Return	13 (10.5%)	3 (6.5%)	.432
Fall	1 (0.8%)	0 (0%)	.541
Pneumonia	3 (2.4%)	2 (4.3%)	.509
Delirium	5 (4%)	2 (4.3%)	.927
Pressure Injury	2 (1.6%)	4 (8.7%)	.026

Note: Significant values were found when $p < .05$.

Appendix A

To the Trauma/Surgical Services APP:

I am contacting you from the University of Kentucky, with permission from Dr. Andrew Bernard in the Trauma/Surgical Service Department, to participate in research being performed on the pain management practices for the geriatric traumatic fracture population. This research is being conducted as part of my doctoral research requirement in the College of Nursing. He has allowed me to contact you because you are considered an advance practice provider caring for geriatric trauma patients in the trauma/surgical service department.

I am inviting you to take part in a 3-part study: a pre-education survey, an educational PowerPoint about the benefits of a multimodal pain management protocol for the geriatric trauma population, and a post-education survey. The survey/questionnaire will take less than 5 minutes to complete following an educational intervention on the best practices for pain management in the geriatric traumatic fracture population. Your response to the survey is anonymous which means no names, IP addresses, email addresses, or any other identifiable information will be collected with the survey responses. We will not know which responses are yours if you choose to participate

Thank you in advance for your assistance with this important project. To ensure your responses/opinions will be included, please submit your responses by **November 1, 2020**. The link to the survey is included below:

If you have questions about the study, please feel free to ask; my contact information is given below. If you have complaints, suggestions, or questions about your rights as a research volunteer, contact the staff in the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at 1-866-400-9428.

A full HIPAA waiver and cover letter is attached to this email for your convenience.

Sincerely,

Alexandra Keough

College of Nursing University of Kentucky

PHONE: 859-806-8512

E-MAIL: allie.milam@uky.edu

Appendix B

To the Trauma/Surgical Services APP:

Please read through the PowerPoint on pain management for the geriatric traumatic fracture patient and complete the pre- and post-surveys if you have not had the opportunity already. This intervention should only take 5 minutes of your time and will help me complete the research component for my DNP coursework.

Steps for completing the intervention are below:

1. Complete pre-intervention survey by scanning the first QR code below.
2. Complete intervention.
3. Complete post-intervention survey by scanning second QR code below.



Best,

Allie Keough, RN, BSN, DNP Candidate
Cell: 859-806-8512



Appendix C

University of Kentucky HIPAA Waiver of Authorization Form

1. The use or disclosure of Protected Health Information (PHI)* involves no more than a minimal risk to the privacy of individuals. Explain why.

Information will be retrospectively analyzed after the patient has been discharged from the facility. There will be no interaction with the patient or alteration in the care they would otherwise receive from UK Healthcare.

The study is a retrospective record review. Every attempt will be made to secure the confidentiality of patient data as described below.

2. Include a detailed list of the PHI to be collected and a list of the source(s) of the PHI.

Age

Race/Ethnicity

Admitting/active diagnoses

A complete list of all variables on which data will be collected follows:

Length of stay

Medication list during stay

Discharge disposition

ICU admission/readmissions

Falls

Delirium

Rapid response calls

Intubation rates

Consults during admission

3. Describe the plan to protect PHI.

The PI who is a DNP student will access each patient record through Sunrise, which is an electronic, secure, encrypted, firewall protected electronic medical record system at UK Healthcare. The medical record number of each patient who meets the study criteria will be linked to a unique study number. During data collection the PI will assess a patient record using the Norton medical record number, assign a unique study number to the patient, abstract the data listed above from the record, and transfer the data to an electronic spread sheet. The data on the spread sheet will be linked only to the patient's unique study number. A cross-walk table will be developed with the patient's unique study number linked to the medical record number. The health information for each patient on the spread sheet will be linked to the patient's unique study number. The crosswalk table and the spread sheet will be stored in separate files on the PI's identity authenticated secure firewall protected research folder at UK Healthcare that is only

accessible to the PI, UK Healthcare Information Services representative(s) and UK College of Nursing Academic Partnership network administrators trained to establish file folder access for the students.

4. Indicate where PHI will be stored.

The crosswalk table and spread sheet described above will be stored for 6 years after study closure in separate files on the PI's identity authenticated secure, firewall protected research folder at the University of Kentucky that is only accessible to the PI, UK Healthcare Information Services representative(s) and UK College of Nursing Academic Partnership network administrators trained to establish file folder access for the students.

Who will have access to the PHI? (Note: researchers must list all of the entities that are able access to the study's PHI such as Office of Research Integrity/Institutional Review Board, UK/Hospital representatives, sponsors, FDA, data safety monitoring boards and any others given authority by law).

The PI, study personnel, UK Healthcare Information Services representative(s), UK College of Nursing Academic Partnership network administrators trained to establish file folder access for the students, and UK's Office of Research Integrity / IRB will have access to the data.

5. All PHI collected during the study will be destroyed at the earliest opportunity consistent with the conduct of research, which is: (explain below). Alternatively, PHI collected during the study will not be destroyed because: (explain below).

The PI will follow UK Healthcare's policies for retention, storage and destruction of the electronic data. This includes retaining the PHI collected during the study for 6 years, but the crosswalk table linking the patient's medical record number to the unique study number will be destroyed when data collection from the patient's electronic record has been completed 6 years after study closure all paper records will be destroyed by the PI using a paper shredder.

If the PI leaves the institution, electronic data will continue to be stored on the PI's identity authenticated secure firewall protected research folder at UK Healthcare that is only accessible UK School of Nursing Academic Partnership network administrators in hard copy, electronically, or a combination of both until eligible for destruction.

6. Please describe the procedure used to destroy PHI collected during the study (electronically, paper, audio/video, photography, other). See above.

7. The research could not practicably be conducted without the waiver because (explain below).

It would be impractical to obtain authorization from the subjects who received care in the past.

8. The research could not practicably be conducted without access to and use of the PHI because (explain).

In order to achieve the study's specific aims and objectives PHI as described above is necessary.

9. The HIPAA regulation requires reasonable efforts to limit PHI to the minimum necessary to accomplish the intended purpose of the use, disclosure or request. Please note that researchers are also accountable for any PHI released under a waiver. Explain why PHI obtained for this study is/are the minimum information needed to meet the research objectives.

The PHI to be collected is the minimum data to achieve the study's specific aims/objective of:

Describe both education and medical interventions for pain management in the geriatric trauma population that involves pharmacologic and non-pharmacologic modalities
Assess the impact of a multimodal pain management protocol on length of stay (LOS)
Assess morphine equivalent (MME) prescribed
Assess patient's discharge disposition after their hospital stay
Assess ICU admission/readmissions
Assess fall rates
Assess delirium rates
Assess rapid response calls
Assess intubation/reintubation rates.
Assess provider's knowledge on pain management practices for the geriatric trauma population.

The information listed in the waiver application is accurate and all research staff** will comply with the HIPAA regulations and the waiver criteria. I assure that PHI obtained as part of this research will not be reused or disclosed to any other person or entity other than those listed on this form, except as required by law. If at any time I want to reuse this information for other purposes or disclose the information to other individuals or entity I will seek approval by the IRB.

Investigator's Name: Alexandra Keough

Date: August 4, 2020

Principal Investigator Signature: Alexandra Keough (electronic signature)

Appendix D

Confidential

Page 1

Knowledge and Attitudes Survey on Geriatric Pain Management

Please complete the survey below to the best of your ability.

Thank you!

True/False - Select the correct answer

- 1) Combining analgesics that work by different mechanisms (e.g., combining an NSAID with an opioid) may result in better pain control with fewer side effects than using a single analgesic agent.
 True
 False
- 2) Elderly patients cannot tolerate opioids for pain relief.
 True
 False
- 3) Completing a comprehensive geriatric assessment (CGA) reduces mortality rates in geriatric patients.
 True
 False
- 4) Patients should be encouraged to endure as much pain as possible before using an opioid.
 True
 False

Multiple choice - select the correct answer.

- 5) The recommended route administration of opioid analgesics for patients with brief, severe pain of sudden onset such as trauma or postoperative pain is
 intravenous
 intramuscular
 subcutaneous
 oral
 rectal
- 6) Contraindications for nerve blocks in geriatric patients include all of the following EXCEPT:
 coagulopathies
 altered mental status
 history of spinal fractures
 fever
- 7) The gold standard for pain management in the geriatric traumatic fracture population is
 Combination of non-opioids and opioids
 Opioids
 Nerve blocks
 IV Acetaminophen
- 8) The ideal opioid for pain management in the geriatric traumatic fracture population should be
 Oxycodone
 Percocet
 Morphine
 Hydromorphone
- 9) Analgesics for post-operative pain should initially be given
 around the clock on a fixed schedule
 only when the patient asks for the medication
 only when the nurse determines that the patient has moderate or greater discomfort
- 10) First line analgesia for geriatric traumatic fracture patient should be
 Oxycodone
 Hydromorphone
 Morphine
 Acetaminophen

02/20/2021 12:14pm

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Please complete the following statements according to your current practice.

- 11) "I complete a comprehensive geriatric assessment (CGA) on geriatric trauma patients..."
 All of the time
 Most of the time
 Some of the time
 Rarely ever
 Never
-
- 12) Do you consult BEERS criteria when prescribing medication for adults over the age of 65?
 Yes
 No
-
- 13) "I consult elder care for assistance in managing the geriatric trauma population..."
 All of the time
 Most of the time
 Some of the time
 Rarely ever
 Never
-
- 14) "I feel that the geriatric traumatic fracture population has had their pain adequately controlled."
 Strongly agree Agree
 Neutral Disagree
 Strongly disagree
-
- 15) "I feel that I use consult services for pain management whenever necessary"
 Strongly agree Agree
 Neutral Disagree
 Strongly disagree
-
- 16) "I am aware of the trauma blog geriatric admission protocol."
 yes no
-
- 17) "I use the trauma blog to guide my admissions of geriatric trauma patients."
 All of the time Most of the time
 Some of the time Rarely ever
 Never
-
- 18) What type of provider are you?
 Nurse Practitioner
 Physician's Assistant
 Other (please specify)
-
- 19) Please share any thoughts or experiences you have had with caring for the geriatric trauma population and their pain management. _____

Appendix E

Confidential

Page 1

Post Education Survey

Please complete the survey below.

Thank you!

Please complete the survey to the best of your ability. I appreciate your participation!

- 1) Combining analgesics that work by different mechanisms (e.g., combining an NSAID with an opioid) may result in better pain control with fewer side effects than using a single analgesic agent. True
 False

- 2) Elderly patients cannot tolerate opioids for pain relief. True
 False

- 3) Completing a comprehensive geriatric assessment (CGA) reduces mortality rates in geriatric patients. True
 False

- 4) Patients should be encouraged to endure as much pain as possible before using an opioid. True
 False

- 5) The recommended route administration of opioid analgesics for patients with brief, severe pain of sudden onset such as trauma or postoperative pain is:
 Intravenous
 Intramuscular
 subcutaneous
 oral
 rectal

- 6) Contraindications for nerve blocks in geriatric patients include all of the following EXCEPT:
 coagulopathies
 altered mental status
 history of spinal fractures
 fever

- 7) According to EAST, the gold standard for pain management in the geriatric traumatic fracture population is:
 Combination non-opioids and opioids
 Opioids
 Nerve blocks
 IV Acetaminophen

- 8) Analgesics for post-operative pain should initially be given
 around the clock on a fixed schedule
 only when the patient asks for the medication
 only when the nurse determines that the patient has moderate or greater discomfort

- 9) First line analgesia for the geriatric traumatic fracture population should be:
 Oxycodone
 Hydromorphone
 Morphine
 Acetaminophen

- 10) "I feel that a standardized order set for pain management in the geriatric traumatic fracture population would be helpful." True
 False

- 11) "I was aware that the recommended pain management protocol for geriatric traumatic fracture patients included the use of epidural nerve blocks." True
 False

-
- 12) "I consult pain management for epidural nerve blocks on my geriatric traumatic fracture patients..."
- All of the time
 - Most of the time
 - Some of the time
 - Rarely ever
 - Never
-
- 13) What type of provider are you?
- Nurse Practitioner
 - Physician's Assistant
 - Other
-
- 14) Please share any thoughts/feelings about what you learned about multimodal pain management for the geriatric traumatic fracture population.
-