

Spring 3-20-2022

Nurse-Driven Protocols for Abdominal Pain in the Emergency Department

Chris Schmidt

University of St. Augustine for Health Sciences, c.schmidt1@usa.edu

DOI: <https://doi.org/10.46409/sr.IKNT3670>



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

Follow this and additional works at: <https://soar.usa.edu/scholprojects>



Part of the [Health and Medical Administration Commons](#), and the [Other Nursing Commons](#)

Recommended Citation

Schmidt, C. (2022). *Nurse-Driven Protocols for Abdominal Pain in the Emergency Department*. [Doctoral project, University of St Augustine for Health Sciences]. SOAR @ USA: Student Scholarly Projects Collection. <https://doi.org/10.46409/sr.IKNT3670>

This Scholarly Project is brought to you for free and open access by the Student Research at SOAR @ USA. It has been accepted for inclusion in Student Scholarly Projects by an authorized administrator of SOAR @ USA. For more information, please contact soar@usa.edu, erobinson@usa.edu.

**Nurse-Driven Protocol for Abdominal Pain in the Emergency
Department**

Christopher E. Schmidt, MSN, APRN, ACNP-BC

School of Nursing, University of St. Augustine for Health Sciences

This Manuscript Partially Fulfills the Requirements for the
Doctor of Nursing Practice Program and is Approved by:

Amy Herrington, DNP, RN, CEN, CNE

Cara Pappas, ND, RN, FNP-BC, ACNP-BC

Approved: March 20, 2022

DocuSign Envelope ID: 2428A7CF-690B-4B69-A964-51A906C904D0

**University of St. Augustine for Health Sciences
DNP Scholarly Project
Signature Form**

Student Last Name: Schmidt	First Name: Christopher	Middle Initial: E
--------------------------------------	-----------------------------------	-----------------------------

E-mail:
cschmidt1@usa.edu

Title of DNP Project:
Nurse-Driven Protocol for Abdominal Pain in the Emergency Department

*My signature confirms I have reviewed and approved this final written DNP Scholarly Project.
DocuSign electronic signature or wet signature required.*

Type Name in Blue Box Below	Signature	Date
DNP Project Primary Faculty: Amy Herrington, DNP, RN, CEN, CNE	 <small>DocuSigned by: 57F7B487C8C3436...</small>	4/4/2022
DNP Project Preceptor: Cara Pappas, ND, RN, FNP-BC, ACNP-BC	 <small>DocuSigned by: 552F308E088E4BD...</small>	4/4/2022
DNP Project Preceptor:		

Abstract

Practice Problem: Emergency department (ED) crowding hinders the opportunity to deliver safe, quality care to abdominal pain patients and detrimentally affects clinical outcomes.

Leadership of a rural community ED recognized a comparable issue introducing a nurse-driven protocol (NDP) to reduce patient length of stay (LOS) and the rate of patients who leave the department prior to physician evaluation.

PICOT: The PICOT question that guided this project was: For adult patients in an emergency department, how does a nurse-driven protocol for abdominal pain compared to no protocol use affect the LOS and left without being seen (LWBS) rate over 10 weeks?

Evidence: Fourteen studies were identified and supported evidence of effective NDP use for reducing the LOS and LWBS rate amongst abdominal pain patients. Improved clinical outcomes, enhanced operational efficiencies, increased patient and staff satisfaction, and NDP utility in multiple disease states were themes recognized in the literature.

Intervention: The evidence based NDP empowered ED nurses to obtain laboratory diagnostic data and implement nursing interventions within a facility approved protocol designed to improve throughput decreasing time from patient presentation to obtaining medical disposition.

Outcome: A pre and post implementation design found a clinically significant mean reduction of 28-minutes in LOS with use of the NDP. Overall LWBS was reduced from 5.2 to 2.3 percent and found to be statistically significant.

Conclusion: Implementation of an ED abdominal pain NDP was effective in decreasing ED LOS and LWBS. Emergency nurses reported a sense of empowerment with use of the NDP.

Nurse-Driven Protocol for Abdominal Pain in the Emergency

Department

Over the past two decades, crowding in emergency departments (ED) has become a serious public health problem throughout the United States and globally (Chang et al., 2018; Dadeh & Phunyanantakorn, 2020; Morley et al., 2018; Yarmohammadian et al., 2017). The Institute of Medicine (2006) recognized ED crowding as a grave risk to the delivery of quality care and promotion of patient safety. Emergency department crowding contributes to prolonged length of stay (LOS), delay in medical diagnosis, treatment and disposition, adverse outcomes, increased mortality, poor quality care, and reduced patient satisfaction (Morely et al., 2018; Yarmohammadian et al., 2017). From the provider perspective, increased nursing workload, burnout, and personnel turnover are associated with ED crowding (Kelly et al., 2021).

Nurse-driven protocols (NDP) offer an economical and patient-centered means to elevate quality ED care delivery (Burgess & Kynoch, 2017). Nurse-driven protocols have demonstrated improved quality in the care of sepsis, chest pain and stroke (Mainali et al., 2017; Moore et al., 2019; Strada et al., 2020; Yang et al., 2019). Abdominal pain is one of the most common complaints assessed in an ED, comprising seven to ten percent of all patient encounters (Cervellin et al., 2016). Prolonged ED LOS is common in patients experiencing abdominal pain, given the time to suitably evaluate and intervene medically (Cleveland Clinic, 2017).

Introduction and safe adoption of an ED NDP for abdominal pain has the potential to decrease patient wait times and time to disposition for this populace specifically, thus improving overall throughput (Aljahmi, 2021; Morse, 2019). The project's purpose provided background data to support adoption of an evidence-based practice (EBP) initiative in decreasing LOS in ED patients with abdominal pain in a rural community hospital. The paper explicitly described the

implementation steps, data analyzed, statistical measures and outcomes sought, in addition, evaluation procedures and mode for disseminating results in improving awareness and further adoption of this strategy.

Significance of the Practice Problem

In 2010, ED visits accounted for an estimated 12.5 percent (\$328.1 billion) of the overall national health expenditure (U.S. Department of Health and Human Services, [HHS], 2021). In 2018, more than 143 million ED visits occurred throughout the United States (HHS, 2021). The volume of ED visits increased by 20 percent over the past two decades. This increase placed overwhelming demand on a system where capacity declined (Centers for Disease Control and Prevention [CDC], 2019). According to the University of North Carolina Cecil G. Sheps Center for Health Services Research (n.d.) more than 180 rural hospitals nationally closed since 2005.

Healthcare quality is negatively impacted by ED crowding (Yarmohammadian et al., 2017). The American College of Emergency Physicians (2019) contends that ED crowding occurs when the requirement for services surpasses a department's accessible resources to provide timely patient care. Multiple factors contribute to crowding throughout the three phases of the ED continuum. Patients may experience delays awaiting ED evaluation (input), incur prolonged LOS in evaluation or treatment due to inefficiencies impacting consultation or turnaround of diagnostics (throughput), or barriers to moving patients requiring hospitalization out of the ED (output) (Morley et al., 2018). The Centers for Medicare and Medicaid Services trend and publicly report both ED patient throughput and data of patients who leave the ED without being seen (LWBS) by a medical provider as measures of quality (CMS, n.d.).

Multiple approaches are proposed to alleviate ED crowding, improve patient throughput, and factors detrimental to patient safety (Burgess & Kynoch, 2017; Chang et al., 2018; Morley et

al., 2018). Strategies such as physician placement in triage, point of care testing, creation of ED observation and fast track units, and NDPs have demonstrated success in reducing patient wait times and LOS (Morely et al., 2018; Strada et al., 2020). The American College of Emergency Physicians and Emergency Nurses Association (2015) endorse the use of standardized nursing protocols as facility-based guidelines developed for specific disease states or chief complaints established to initiate an evaluation before medical provider assessment, writing that "standardized protocols have the potential to reduce variation in care, enhance workflow, improve coordination of care, modify practice through evidence-based care" (p.1). Nurse-driven protocols have been found to improve patient outcomes (Moore et al., 2019). Examples of NDPs comprise individual or grouped interventions to include medication administration, laboratory specimen attainment, radiological imaging, and the initiation of intravenous fluid (Burgess & Kynoch, 2017).

Targeting patient populations with clinical protocols tailored towards the complaint can reduce ED wait times (Burgess & Kynoch, 2017). Abdominal pain is one of the most common diagnoses treated in the ED (HHS, 2021). Consequently, it is also a frequent reason for ED return visits (Allen-Dicker et al., 2015). Given the physiological etiologies requiring contemplation, abdominal pain patients pose a challenge for ED physicians as the diagnosis is predicated on patient history and diagnostic evaluation of clinical laboratory and radiological imaging analysis (Cervellin et al., 2016; Velisarris et al., 2017). An abdominal pain NDP is an appropriate strategy to ED reducing patient LOS and LWBS (Aljhami, 2021; Chong et al., 2019).

Nurse-driven protocols were essential to improving ED throughput in the healthcare facility subject to this EBP project. The institution was a 48-bed community hospital located in Northern Florida. The organization's Board Chairman and leadership were concerned about

prolonged ED wait times which contributed to crowding, poor service reputation, and concern for patient safety, (P. Barbaree, personal communication, July 2, 2021). The Chairman noted an overall LWBS metric for all patients of five (5) percent, which was well above the CMS national benchmark of two (2) percent (Center for Medicare and Medicaid Services, [CMS], n.d.). Throughput metrics were lengthy in comparison to hospitals of the same volume (CMS, n.d.); patient throughput for all patients (ED arrival time to discharge) was 163 minutes, specifically for the estimated 840 abdominal pain patients annually was above four (4) hours or 240 minutes.

Significant cost and potential revenue loss were also attributed to prolonged LOS and LWBS. The Chief Financial Officer identified an average of \$100 in direct ED expense for every hour of care delivered to an abdominal pain patient. Moreover, an average revenue loss of \$827.00 was recorded for each LWBS experienced based on six complaints commonly associated with abdominal pain (D. Faircloth, personal communication, July 30, 2021).

Patient dissatisfaction chronicled by grievances and low patient satisfaction scores were identified by the Risk Manager (D. Seagroves, personal communication, July 2, 2021). The measure “likelihood to recommend,” as captured by Press Ganey patient experience analytics, was 65.32% (5th percentile) July – September 2021, (S. Stewart, personal communication, November 30, 2021) reflecting significant need for improvement.

PICOT Question

The PICOT question that guided this EBP change project was: For adult patients in the emergency department (P), how does a nurse-driven protocol for abdominal pain (I) as compared to no protocol use (C) affect the length of stay and left without being seen rate (O) over 10 weeks? (T). The population was adults presenting to the ED with the complaint of upper or lower abdominal pain who were not pregnant. The intervention was the introduction of an EBP

abdominal pain NDP (Aljahmi, 2021; Douma et al., 2016; Morse, 2019; Zhao, 2017) adopted and validated from the literature, and formally approved by the ED physicians, ED medical director, nurse manager, and the hospital's Medical Executive Committee. The abdominal pain NDP was implemented by the ED nurse 1) either in triage, or 2) ED treatment area for those patients arriving by ambulance. Interventions included laboratory specimen attainment, establishment of peripheral intravenous (IV) access, and placement in a nothing by mouth (NPO) status. For patients complaining of upper abdominal pain, an electrocardiogram and serum troponin level were also obtained. A pre and post evaluation was conducted to associate changes in patient LOS and LWBS rate following abdominal pain NDP usage. Emergency department LOS was described as the time a patient with abdominal pain presented to the ED to disposition, either admission, transfer, or discharge. Length of stay was compared between patients who did not have the NDP initiated and underwent IV access and attainment of lab specimens after physician evaluation, to those experiencing NDP intervention by the ED nurse initially. The overall outcome of ED LOS reduction was expressed as the change in ED LOS post NDP initiation compared to rates before NDP implementation. A decreased LOS of < 240 minutes compared to the >4 hours after 10 weeks was projected (Dadeh & Phunyanantakorn, 2020).

Quality of care was measured assessing the rate of all patient LWBS. Overall, LWBS was identified as an indicator of operational efficiency, patient safety and clinical quality (Aljahmi, 2021), and defined as those patients who left the ED prior to evaluation by a medical provider. Abdominal pain LWBS was described as patients with abdominal pain who left before medical assessment. Patients who did LWBS were often dissatisfied with their ED visit and posed more liability risk for hospitals (Burgess et al., 2018). Abdominal pain NDPs were effective in

reducing both overall LWBS rates and those specific to abdominal pain, minimizing elopement risk in complaints warranting emergency care (Aljahmi, 2021; Begaz et al., 2017).

Training compliance performed prior to NDP implementation, adherence to NDP protocol, and improved nurse satisfaction with NDP use were expected as outcomes. Project duration was ten (10) weeks.

Evidence-Based Practice Framework & Change Theory

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was utilized as the framework to guide this project (Johns Hopkins University, n.d.). The model's three-step process promotes adoption of a practice change suited for the most optimal clinical outcome (Dang & Dearholt, 2017). The first step of practice question development generated clinical inquiry using PICOT methodology as to the current practice affecting ED LOS and examined strategies in the literature found to improve ED LOS for patients with abdominal pain (Dang & Dearholt, 2017). Evidence collection scrutinized the literature leveraging multiple databases to identify the most appropriate option of improving ED LOS for patients with abdominal pain. The final phase of translation into practice occurred when evidence supporting an abdominal pain NDP was critically appraised, synthesized, ranked, and graded according to research type, design style and quality rating with respect to results, sample size, control, and proposed recommendations (Dang & Dearholt, 2017).

Lewin's change theory was selected as the model to support this project. Lewin's model was instrumental to guide change, proposing that human behavior is a dynamic balance of opposing forces (Lewin, 1951). Three stages of change as theorized by Lewin include unfreezing, change, and refreezing (Lewin, 1951). Unfreezing fosters disequilibrium and need for change when introduction of a novel and innovative process garners stakeholder support to

challenge the status quo as an acceptable continued practice (Hussain et al., 2018; Martin, 2017). Moving strives for new equilibrium, fostering different thoughts, opinions, or behaviors, allowing engagement in performing the NDP, knowledge sharing to support improved throughput, and leveraging leaders as change agents to celebrate success as change occurs. Equilibrium is retained in the refreezing stage when the NDP is accepted as the norm or new operating procedure (Hussain et al., 2018).

Evidence Search Strategy

An initial electronic search of the literature comprised the CINAHL Complete, PubMed, ProQuest, and EBSCOhost databases and commenced using the term words “nurse driven protocols in triage” only. A preliminary investigation generated 1669 articles published over the past five (5) years. Google Scholar was leveraged and contained 23 articles in a non-filtered range. Standard search methods were performed using the Medical Subject Heading (MeSH) terms of “nurse driven protocols in triage”, “advanced triage protocols,” “patient throughout,” “abdominal pain,” and “emergency department.” All materials were evaluated for significance to the clinical inquiry, duplication, and written in the English-language. Hand searches were performed reviewing the references lists of several related articles. Non-published dissertations or scholarly projects were also reviewed and considered for inclusion. Excluded articles were those that considered pediatrics and the emergency department; these were considered informational and failed to contribute to the knowledge that would advance exploration of the clinical question or fell outside the identified date range of 2016 to 2021. Titles and abstracts of the 81 articles were carefully reviewed for relevance according to the following inclusion criteria: (a) full text article; (b) qualitative or quantitative methods and (c) addressed subject matter of abdominal pain order sets or protocols, nurse driven, and length of stay in the

emergency department. Additional articles published prior to 2016 were considered for inclusion if they were seminal in nature or contained guidelines frequently cited in the literature driving clinical practice. Fourteen articles were selected for the literature review.

Evidence Search Results

Searches of the CINAHL Complete, PubMed, ProQuest, and EBSCOhost databases yielded 1669 articles. Applying filters using the Boolean Operators, including “AND” to form relevant statements which incorporated NDPs in triage, emergency department, abdominal pain and patient throughput limited results within the ProQuest and CINAHL databases to 61 and 23 citations and articles, respectively. Medical Subject Headings (MeSH) applied in the PubMed database to narrow the publications with (nurse driven protocols in triage AND emergency department AND patient throughput AND abdominal pain) yielded five (5) citations and articles. The results from the inclusion and exclusion criteria produced 14 articles.

The Johns Hopkins Nursing Evidenced Based-Practice (JHNEBP) grading instrument was leveraged to classify articles according to level of evidence and quality (Johns Hopkins University, n.d.). The evidence levels were categorized from Level I to Level V. Quality grades were determined as the following: A representing high-quality; B for good quality; or C as poor quality (Johns Hopkins University, n.d.). Articles encompassed several methodological schemes to include pragmatic randomized, prospective, retrospective, quasi-experimental, case control, systematic review, position statement, and descriptive model in design. Of the 14 qualifying articles evaluated using the JHNEBP tool, five were determined to be level I, seven were level II, one to be level III, and one identified as level IV. Six of the articles were graded as A, five were grade B, and three were grade C. A summary of the search results denoting the study’s strength was created (Appendix A), as well as a systematic review (Appendix B). The Preferred

Reporting Items for Systematic Reviews, and Meta-Analysis (PRISMA), summarizing the results was also developed (Figure 1). It is important to note there is an abundance of literature supporting the use of ED NDPs prior to the selected five-years. Content was scrutinized to draw a relationship to the current period.

Themes with Practice Recommendations

The literature synthesis revealed a sufficient body of evidence supporting the implementation of an abdominal pain ED NDP to impact LOS. Themes of improved patient throughput as evidenced by decreased times to diagnostic results and provider disposition, and operational efficiencies gained to support the clinical outcomes of nurse-patient satisfaction and LWBS rates were discussed. Each topic supported change for decreasing ED LOS in abdominal pain patients.

Abdominal Pain

Abdominal pain may be secondary to gastrointestinal, urological, gynecological, or cardiac etiologies accounting for prolonged LOS (Cervellin et al., 2016). Though up to 30 percent of abdominal pain were found via diagnostic testing to be nonspecific, serious pathophysiology requiring medical or surgical intervention and frequently hospitalization must be contemplated (Cervellin et al., 2016).

The elderly often present with obscure complaints or atypical clinical presentations, thus warranting more comprehensive and time intensive diagnostic evaluation (Lewis et al., 2005). Approximately half of the elderly evaluated for abdominal pain require hospital admission, of which 20 percent mandate surgical intervention (Marco et al., 2005). The elderly are found to have significantly higher mortality and lower diagnostic concordance rates than the younger population (Henden Cam et al., 2018; Lewis et al., 2005).

Abdominal Pain Nurse-Driven Protocol (NDP)

Utilization of an evidence based abdominal pain NDP empowers ED nurses to expeditiously and legally initiate medical interventions in the care of the patient (Morse, 2019; Zhao, 2017). Laboratory diagnostics within the order set (complete blood count, comprehensive metabolic panel, lipase, and coagulation studies) are sensitive and specific in identifying infectious processes or gastrointestinal pathology explicitly (Govender et al., 2021). Radiographic imaging specifically computed tomography (CT) provides the most sensitivity and specificity in patients with acute abdominal etiology; ultrasonography compliments the provider's ability in focally locating origins of abdominal disease (Gans et al., 2015). Determination of pregnancy is essential to differentiate an obstetrical issue from other etiology. (Govender et al., 2021). Given the atypical presentation in some elderly patients with abdominal pain, electrocardiography and serum troponin are necessary to rule out cardiac pathology (Kendall et al., 2017). Diagnostic tests as highlighted above and the nursing interventions of intravenous access and hydration and nothing by mouth (NPO) status are highlighted as abdominal pain NDP components cited in the literature (Aljahmi, 2021; Morse, 2019).

Nurse-Driven Protocols in Triage

An abundance of literature exists to recommend ED NDPs for improving timeliness of care, clinical outcomes, and mortality. Triage based NDPs derived from professional organization consensus statements and clinical practice guidelines for certain patient complaints are advocated to improve overall ED efficiency and compliment other strategies essential to reduce departmental overcrowding (Burgess and Kynoch, 2017; Morley et al., 2017; Retezar et al., 2011; Yarmoheammadian et al., 2017). Multiple studies demonstrated benefit in improving ED clinical outcomes, specifically in the care of chest pain, stroke, and sepsis (Douma et al.,

2016; Mainali et al., 2016; Moore et al., 2019; Yang et al., 2019). Nurse-driven protocols or pathways for analgesia delivery to patients experiencing both traumatic and non-traumatic pain, obtainment of diagnostic imaging, antiemetic medication administration, and nurse initiated intravenous fluid delivery in advance of physician evaluation are well supported in the literature (Barksdale et al., 2016; Burgess & Kynoch, 2017; Ridderikhof et al., 2017).

Patient Throughput Measures

The literature supports opportunities for abdominal pain NDPs to reduce time dedicated to evaluation by a medical provider, time to medical disposition, and overall, ED LOS (Aljahmi, 2021; Begaz et al., 2017; Douma et al., 2016; Retezar et al., 2011). Two level I RCTs of Grade A quality conducted in urban ED settings reported significantly less ED mean times to bed, and total ED LOS utilizing abdominal pain NDPs (Begaz et al., 2017; Douma et al., 2016).

Deployment of NDPs were associated with improved ED patient throughput by decreasing time to patient diagnosis (Stauber, 2013). Begaz et al. (2017) showed more expedient patient care before a patient-provider interaction. Though unable to successfully establish LOS reduction with an abdominal pain NDP, Morse (2019) demonstrated lower “registration to order” and “registration to results” time suggesting the protocol’s benefit in expediting diagnostic results for medical disposition.

Though time to physician or diagnostic results were reduced with NDP use in several studies, some demonstrated higher than expected overall patient LOS (Strada et al., 2020). Factors prolonging ED LOS in abdominal pain patients greater than four hours included age, multiple rounds of diagnostic testing, interdepartmental consultation, and the requirement of ultrasonography (Dadeh & Phuyanantakorn, 2020; Strada et al., 2020).

Improved Outcomes

Left Without Being Seen (LWBS) is an indicator of operational efficiency, patient safety and clinical quality (Aljhami, 2021). Begaz et al. (2017) suggested patients benefiting from NDPs perceived the medical provider possessed the diagnostic data to render a clinical disposition. Once NDPs were initiated, patients were more invested in their care and less likely to LWBS (Begaz et al., 2017). Reducing ED LOS using NDPs promotes efficiencies by increasing capacity for others seeking care (Begaz et al., 2017; Hwang et al., 2016).

Provider-Patient Satisfaction

Evidence suggests NDP use elevates patient and provider satisfaction (Cheung et al., 2002; Douma et al., 2016). Zhao (2017) demonstrated ED patient satisfaction scores greater than ten (10) percent post implementation in patients who benefited from an ED abdominal pain protocol. Empowering nurses to leverage NDPs encouraged autonomy and promoted workplace satisfaction (Barto, 2019). Douma et al. (2016) identified improved nurse satisfaction when identified with their ability to “initiate interventions believed beneficial to the patient” and “confident when protocols chosen were the diagnostic testing commonly ordered by the provider.”

Practice Recommendation

Incorporating an ED abdominal pain NDP was the EBP change project’s strategy for reducing patient wait times and LWBS. Though the quantity of evidence is not substantial, the quality and strength of the evidence supported introduction of an ED nurse initiated abdominal pain pathway with improved patient throughput inclusive of time to diagnostic results, time to provider disposition, and overall decreased ED LOS (Aljahmi, 2021; Begaz et al., 2017; Douma et al., 2016, Stauber, 2013; Strada et al., 2020; Zhao et al., 2017). The change proposal was to

implement an evidence-based abdominal pain NDP (Begaz et al., 2017; Douma et al., 2016) for reducing the operational measures of ED LOS, and patient LWBS.

Setting, Stakeholders, and Systems Change

Understanding the reasons contributing to prolonged LOS and the need for reducing patient throughput within the clinical microsystem were essential to optimal plan development. A strengths, weaknesses, opportunities, and threats (SWOT) analysis was performed to analyze potential concerns which could impede project success (Topor et al., 2018).

Setting

The setting was the 16-bed ED of the rural community hospital. The privately owned, not for profit facility included the specialties of emergency medicine, orthopedics, cardiology, urology, and hospital-based medicine. Total ED volume was 11,000 patient visits annually, of which, seven (7) percent were estimated to be associated with abdominal pain, a statistic found consistent within the literature (Cervellin et al., 2016, Kendall & Moreira, 2020). Core values supporting the hospital's mission "to be the trusted leader delivering quality healthcare services for our community" (Organization ABC, 2021) included Integrity, Compassion, Accountability, Respect and Excellence. The organization's vision was "to grow regional health and wellness services to strengthen our community" (Organization ABC, 2021).

Organizational Need

Formal change was requested by the Board of Trustees to improve patient throughput. Introduction of an EBP NDP for stable adult abdominal pain patients (Aljahmi, 2021; Douma et al., 2016; Morse, 2019) was suggested as the EBP change project. Clinician standardization was evident in the care of chest pain; the ED manager cited practice variability in abdominal pain

patients producing prolonged LOS (E. Lyons, personal communication, July 7, 2021). The ED nurse manager requested opportunity to focus on this patient population specifically.

Several variables contributed to extended ED LOS and higher than accepted LWBS. Varied ED provider practice patterns as reported by the Board Chairman contributed to prolonged wait times. Clinicians were family medicine trained and inconsistently incorporated emergency medicine EBP, such as NDPs (P. Barbaree, personal communication, July 2, 2021). Delays in diagnostic results were frequently experienced as some providers demanded initial evaluation prior to intervention.

Stakeholders and Sustainability

Key stakeholders included the hospital Board of Trustees, administration, ED medical director and nurse manager. An interprofessional team of ED providers, clinical nurses, and leaders supporting ED operations included laboratory, imaging, patient registration, information technology (IT), and quality. Strategies ensuring project sustainability were discussed.

Health care worth is achieved or lost by front-line teams who possess the cognizance of patient need and skill to plan and implement change (Pandhi et al., 2018). Sustainability of the EBP change project was dependent on stakeholder support of the ED medical director and nurse manager. Both leaders possessed the authority and responsibility of endorsing and enforcing the EBP change to ensure compliance and re-directing ED personnel when adherence was suboptimal. The Quality and IT directors were integral to the access and analysis of measures vital to ED operations and patient satisfaction. To gain optimal support, stakeholders who possessed a shared clinical purpose underwent formal education as to the current state and utility of the NDP strategy necessary to promote positive micro system change (O’Leary et al., 2019).

Interprofessional Collaboration

Interprofessional collaboration was paramount for the success of the EBP project. Team members constituted diverse professional disciplines trained to address different patient needs to support practice change (Newhouse & Spring, 2010). Collaboration amongst clinical leaders, IT and quality personnel was required to design and integrate the NDP into current practice.

Strengths, Weaknesses, Opportunities, and Threat (SWOT) Analysis

Identified strengths included leadership support, nursing experience, and the addition of a new ED medical director. Weaknesses of ED crowding, fear of change and loss of community trust affecting service reputation were reported. Opportunities encompassed empowerment and collaboration through NDP use. Threats comprised clinical practice variability and institutional liability secondary to an increased LWBS rate. Highlighted internal organizational issues recognized as strengths and weaknesses, and external factors of opportunities or threats, involving ED NDP use for abdominal pain were used to drive this change project (Table 1.).

System Level Change

Clinical microsystems are the building block of the health system. (Nelson et al., 2002). This EBP project focused within the healthcare microsystem creating opportunities to improve operational efficiencies, patient safety, and unnecessary incurred cost through reduced patient LOS and LWBS. Nelson et al. (2002) advocated clinical microsystems that perform daily work within an organization vary with respect to quality outcomes, safety, and financial performance.

Implementation Plan with Timeline and Budget

Objectives to project measurable outcomes guided the interprofessional team to create initiatives to support change for improving patient throughput, LWBS rates, and staff satisfaction. Lewin's theory of change influenced plan implementation which promoted ED

practice change awareness, introduced change steps, and solidified enthusiasm post implementation necessary to sustain EBP adoption. Budgetary planning was contemplated and entailed an equilibrium of meeting monetary goals safeguarding patients in obtaining high-quality care (Walsh, 2016).

Objectives

The project's objectives aligned with the hospital's vision and mission statement to promote quality healthcare by reducing ED LOS of abdominal pain patients. Objectives included:

- Improve ED personnel and physician adherence in the utility of an EBP abdominal pain NDP for reducing ED patient LOS. The objective was measured evaluating the number of individuals that attended training. The goal was to be 100 percent personnel attendance. Additionally, physician adherence using the NDP was evaluated with a goal of 100%, the objective to be met measuring NDP utilization prior to medical evaluation (Table 3).
- Reduce both overall and abdominal pain patient LWBS rate by ten (10) percent over ten (10) weeks (Table 3). The objective was to be met introducing an abdominal pain NDP to decrease LWBS of patients with abdominal pain, thus improving patient churn (Table 3).
- Reduce ED LOS of abdominal pain patients to < 240 minutes over ten (10) weeks (Table 3). The objective was to be met by introducing an abdominal pain NDP to decrease LOS. The goal was a 10% reduction in ED abdominal pain LOS.
- Reduce overall ED LOS. The objective was to be met by introducing a NDP for patient experience abdominal pain. This would improve ED turnover thereby reducing LOS for all patients. The goal was a 10% reduction in LOS.

- Improve ED nurse satisfaction utilizing abdominal pain NDPs over ten (10) weeks. The objective was to be met in conducting an ED nurse survey, post NDP implementation.
- Reduce facility financial expense and improve revenue capture by decreasing ED LOS and LWBS of abdominal pain patients, respectively. The objectives were to be met by (1) analyzing the time reduction against the cost to care for an abdominal pain patient per hour, and (2) in determining the calculated average revenue captured for an abdominal pain patient multiplied by each LWBS prevented.

Change Model and Practice Change

The JHNEBP model's three-step supported practice change and guided implementation for the most optimal clinical outcome (Dang & Dearholt, 2017). Lewin's theory of change was applied to direct practice change. Lewin's change model advocated unfreezing of a practice, creation of change, and process refreezing to foster an adopted and sustained change (Lewin, 1951). Project tactics in stages of change and proposed by Lewin were outlined (Appendix C).

Unfreezing

To influence change, disequilibrium or the need for transformation must first be demonstrated. Appeal for change was advocated by board leadership due to prolonged patient LOS and poor satisfaction negatively affecting the organization's service reputation. The DNP project lead convened with board, hospital, and ED leadership to better understand the organization's current state. Over a two-month period, the project lead collaborated with the interprofessional team and ED nurses and physicians to discuss the project overview, measures highlighting both prolonged LOS, LWBS rates, and a plan for metrics improvement. Evidence from the literature demonstrating improved patient LOS, quality, and risk mitigation with NDP use was used to develop training supporting need for the evidenced-based NDP (Appendix D).

Change

The change phase comprised planning and implementation stages of the project plan (Lewin, 1951). Following a comprehensive literature review and evaluation of an abdominal pain protocol developed by an affiliated organization, the abdominal pain EBP protocol (Appendix E), was provided for interprofessional team evaluation and approval. The team utilized one month to address the NDP's laboratory tests and nursing interventions, validating components against three (3) EBP tools found in the literature (Aljahmi, 2021; Begaz et al., 2017; Douma et al., 2016) prior to acceptance and forwarding to the Medical Executive Committee (MEC).

The EBP NDP was ratified by the MEC. Following ratification, ED nurses and physicians underwent training two weeks prior to implementation to comprehend protocol utility, population impacted by the NDP, and methodology for data capture. Staff were asked to monitor NDP adherence and communicate barriers impeding usage to the project lead.

Implementation of the abdominal pain NDP began late October immediately following EPRC approval from the University of Saint Augustine and hospital's Board of Trustees and continued for ten weeks. Protocol application commenced upon the presentation of any patient with either upper or lower abdominal pain. Emergency nurses collected laboratory specimens immediately following triage assessment, either at triage or in the ED treatment area. Patients were not sent back to the ED waiting area but bedded immediately following NDP implementation. Of note, initial abdominal pain NDP orientation and re-training was performed several times during the implementation phase due to personnel turnover and arrival of traveler nurses in response to COVID-19. Physician retraining was also conducted when periodic data review demonstrated a possible lack of physician NDP adherence.

Refreezing

Equilibrium is retained and occurs when the NDP is accepted as the norm or new operating procedure (Hussain et al., 2018). The project's key results of decreased LOS, LWBS, and lessons learned were presented to the organization's leadership team in addition, staff members and key stakeholders integral in the utilization of the abdominal pain NDP, one month following the implementation phase. The DNP project lead reinforced to the ED Medical Director the need for physician adherence to NDP utilization in affecting optimal LOS and LWBS reduction and ensure sustainability.

Budget and Resource Needs

The project's budget was associated with labor cost secondary to one (1) hour of personnel training. Total expense to educate seventeen (17) nurses was \$510. Estimated total cost to educate ten (5) participating ED physicians was \$750. A meeting with the organization's leadership was conducted to provide the benefits of LOS reduction, improved outcomes, patient satisfaction and expense justification. Details involving financial costs and potential savings from ED abdominal pain NDP implementation were shared with key stakeholders (Table 2).

Project Lead Role and Leadership Plan

The DNP project lead assumed responsibility for the initiation, planning, coordination, project oversight and closure, when appropriate. The DNP lead fostered key stakeholder collaboration during implementation conducting daily huddles to facilitate feedback as to progress demonstrated with NDP usage. The DNP lead garnered personnel buy-in; project support recognizing plan success depended on personnel enacting innovation identified their work as vital to correcting the problem and sustaining change (French-Bravo & Chow, 2015).

Results

The project's primary objective measured changes in abdominal pain patient ED LOS following NDP implementation over ten (10) weeks, in addition, differences in patients who might LWBS with this complaint. Data collection and the protection of human subjects' procedures were essential to the evaluation. Assessment of pre and post NDP implementation variables were fundamental in determining ED LOS or LWBS. A logic model illustrating inputs, outputs, assumptions, external factors, and outcomes of abdominal pain NDP utilization was developed (Appendix F).

Data Collection

Baseline LOS and LWBS data of stable non-pregnant adults with upper or lower abdominal pain only in the pre and post NDP implementation phases were collected from project participants. To derive ED LOS, data points of time of patient registration to time of disposition, (i.e., time of hospital discharge, transfer, or admission) were collected. Overall LOS and LWBS data were also gained both pre and post NDP implementation.

Further summative project data analyzed included:

1. Percentage of staff undergoing NDP education;
2. Staff adherence to NDP utilization;
3. Staff satisfaction associated with utilization of the abdominal pain NDP;
4. Projected cost savings from reduced LOS; revenue gained in mitigating LWBS.

Data points of ED LOS and LWBS pre NDP implementation were derived manually from ED medical records and provided to the DNP project lead by the ED Nurse Manager. Data points post NDP implementation were recorded by ED shift charge nurses on an internally created data collection tool (DCT) (Appendix G). A manual cross reference of the DCT against

the ED patient log by the ED nurse manager ensured 100% capture of all potential abdominal patients requiring NDP utilization, increasing the validity of the study.

One hundred sixteen (116) participants were identified for inclusion pre NDP implementation; one hundred four (104) participants were recognized for inclusion post implementation, as per the DCT. Exclusion criteria included patients less than 18 years (minor), pregnant females, or patient encounters with incomplete data integral to deriving LOS. Two minor patients were excluded from NDP implementation data; one participant removed secondary to the condition of pregnancy.

Length of stay were evaluated with means, standard deviation, and the t-test for independent samples to compare differences in the dependent variable for the two independent groups. Rates of LWBS were evaluated using a two proportions z-test to examine if a significant difference existed between LWBS rates pre and post NDP implementation. A p value of <0.05 was considered statistically significant. Clinical significance was determined by a reduction in either LOS or LWBS rate, basing outcomes on validity, impact, significance, effect, and confidence. Armijo-Olivo (2018) contends though change may be minimal; it may be meaningful to alter clinical management to affect an outcome.

Categorical Measures

Analyzing the effectiveness of EBP change using outcome, process, and balance measures were paramount to comprehending variables for change (Institute for Healthcare Improvement, 2020). Variables and statistical tests were reflected for each measure (Table 3).

Outcome Measures

The goal of reducing ED LOS of < 240 minutes for abdominal pain patients was postulated. Though the post NDP population reflected a 28-minute reduction in ED LOS

demonstrating utility of tool, (269.06 minutes to 241.06 minutes), the overall average LOS remained above 240 minutes. The ED LOS was not found to be statistically significant between pre and post implementation phases, based on an alpha value of .05, $t(221) = 1.67, p = .097$ (Table 4). A ten (10) percent LWBS rate reduction of the current pre NDP implementation rate was expected. Two instances of LWBS of patients with abdominal pain specifically were identified in the pre NDP implementation phase. No LWBS instances of abdominal pain patients post NDP implementation were identified, demonstrating a 100% reduction in the measure. Overall LWBS of 1,814 ED patients during the pre NDP implementation was 5.2 percent; LWBS of 1,964 ED patients post NDP implementation was reduced to 2.3 percent. The two proportions z -test was found to be statistically significant based on an alpha value of .05, $z = 4.67, p < .001$, 95.00% CI = [.02, .04] (Table 5). Though not an objective of the EBP project, it was noted anecdotally that four (4) patients elected to leave the ED against medical advice (AMA) during the pre-implementation phase; no incidents of AMA were identified during the post NDP implementation phase. Adherence to NDP utilization by the ED nurses was recorded at 85.6%. Several ED nurses indicated MD refusal to use the NDP, insisting their desire to evaluate to patient prior to nurse obtainment of diagnostic tests through the NDP.

Process Measures

The percentage of ED nurses and physicians trained on the new NDP utility was evaluated. A goal of 100% for both groups was achieved (Table 6). With respect to physician adherence, NDP utilization was used 85.6%. This mandated constant re-training to ensure their understanding of EBP protocol's utility in reducing LOS in abdominal pain patients.

Balance Measures

Balance measures included ED staff nurse reporting satisfaction with abdominal pain NDP use (Table 7), as indicated by subjective response to a four-question survey developed by Douma et al., (2016). Permission to use the tool was reflected (Appendix I).

Financial Measures

One half hour (30 minutes) equating to a financial expense of \$50 was estimated to be saved for each of the 104 participants given the recorded mean LOS reduction of 28 minutes. The two (2) prevented LWBS of abdominal pain patients specifically resulted in an additional \$1654.00 of revenue realized during the implementation period.

Protection of Human Rights and Privacy

To protect patient privacy, no PHI was utilized. Each patient who underwent the NDP was de-identified and assigned a number on the evaluation tool. Data were stored on a Microsoft Excel spreadsheet on a password protected computer within the healthcare organization (HCO), accessed by the DNP project only, and secured in a protected location, when not required. At the project's conclusion, all data were disposed of in accordance with HCO policy.

Impact

This EBP initiative was successful in impacting all outcomes addressed in the PICOT. Though ED throughput is affected by a myriad of factors, this EBP project supported the principle that NDPs can be successful in reducing ED LOS for abdominal pain patients and lessening the rate of all ED patients who may LWBS. The mean ED LOS was decreased by 28 minutes (Table 4); overall LWBS found to be statistically significant was reduced to within proximity of the accepted national benchmark of two (2) percent. These measures may suggest improvement of operational efficiencies and demonstrate a higher potential for bed turnover in

the department. The efficiencies gained provide the opportunity for larger numbers of patients to be evaluated and treated in the ED.

From a fiscal standpoint, the ED LOS reduction can be reflected in an estimated \$5,200 cost savings, and an additional \$1,654 of revenue gained in LWBS mitigation during this period. Improved ED LOS may suggest a projected cost benefit of \$26,000 of expense reduction; \$8,270 of revenue from a lower LWBS rate annually (Table 3). The results of improved patient throughput correlated with fiscal efficiencies gained with NDP utilization may warrant further investigation in future studies.

Though observed circumstantially, hospitalizations post implementation increased; AMA incidents were not observed with NDP use. The absence of AMAs post NDP implementation, deserves further scrutiny given the inherent risk and liability placed on hospitals by this group.

Educational to support NDP utility was achieved reflecting 100% attendance of the training sessions by both the physicians and nurses. Funding for future instruction and sustainment of such an initiative is essential, given constant personnel turnover, attributed to issues such as the COVID-19 pandemic.

One important subset of time critical to impacting overall LOS was the time of patient presentation to medical disposition derived by the physician. During the implementation phase the mean time of NDP initiation by the nurse to actual patient disposition reflected 71 minutes. Though not an identified process objective, this finding merits additional investigation to correlate NDP usage with a lower time to disposition metric. The ability to shorten this timeframe specifically has significant potential for reducing the overall ED LOS of the patient and improves the healthcare facility's ability in attaining compliance with a patient throughput

metric deemed by several regulatory agencies as a vital indicator for measuring quality and efficiency within the ED.

The clinical significance as demonstrated by the abdominal pain NDP's use allows for adoption in other EDs by leaders interested in incorporating the tool. Further, the model may be expanded in the implementation of subsequent complaint specific NDPs (e.g., stroke, sepsis, altered mental status, dyspnea) in this ED for adoption and future use. The ED Nurse Manager who has taken a significant stake in the initiative will be instrumental in the project's sustainment, specifically as further NDPs are deployed.

The ED nurses recorded a higher level of empowerment and satisfaction using the NDP, indicating the tool expedited time to medical disposition and decreased LOS. However, the most significant barrier was continued resistance to utilize the NDP by a few ED physicians. Physician adherence to NDP protocol usage was 85.6%. Several nurses annotated ED physicians limited their ability to initiate the NDP indicating desire to evaluate the patient prior to protocol implementation. Emergency medicine trained physicians are exposed to NDPs and their benefit throughout their entire residency, family medicine trained (FM) physicians may only experience them during ED rotations in FM training. Failure of protocol adoption may suggest a lack of trust of the EBP process or desire for personal convenience, rather than acceptance of a foundational practice commonly found in EDs nationally (Brenner et al., 2020). If not properly addressed by ED leadership, this practice could significantly impede sustainment of the current NDP and other NDPs introduced in the future. Further, NDP utilization aids clinicians (hospitalists) in transitioning care to an inpatient setting, ensuring elements of the workup are accomplished, mitigating delay in care.

The EBP project's strengths included significant collaboration amongst the project's interprofessional team and motivation by the ED nurses specifically, to change practice and implement a protocol which improved efficiencies as evidenced by an overall mean LOS reduction of 28 minutes. Formal desire for change, and the commitment of resources from the hospital's Board of Trustees was also a recognized project strength.

Project limitations included a demonstrated resistance by ED physicians, lack of an ED electronic health record (EHR), and constraints created by the COVID-19 pandemic. Constant ED personnel turnover specifically the use of traveler nurses demanded repeated educational training to ensure project understanding. Lack of an EHR required significant time in the manual recording of data of project participants, rather than the ability to derive LOS and LWBS results via electronic data extraction. A recently implemented ED EHR has nullified this limitation.

Dissemination Plan

The project's goal was to introduce a NDP for patients with abdominal pain to decrease ED LOS and LWBS. An evaluation of the project's strengths, weakness, and prospect for NDP reform was dispersed to DNP colleagues for constructive input. Peer comment was gained and incorporated into the manuscript and visual media for formal presentation.

The EBP initiatives' findings influence the CMS public reporting throughput data which can affect the organization's service reputation. As a result, formal presentations to communicate project results, achievements, and recommendations for development of additional complaint specific ED NDPs were presented in PowerPoint format to the hospital's board members, administration, and ED leadership. Presentation posting in the hospital's nursing quality improvement newsletter also served to broaden workforce awareness and further bolster personnel feedback.

In addition to internal dissemination, the initiative was presented as a DNP Scholarly Project at the Inaugural Alpha Alpha Alpha Chapter of Sigma Theta Tau at the USAHS DNP Scholarly Project Symposium, April 16, 2022. A manuscript is to be prepared for submission to the peer reviewed journal, the *Journal of Emergency Nursing*. The journal's distribution extends internationally and affords the opportunity to propagate valid and valuable evidence across a wide audience in support of NDP utilization for improving clinical outcomes. A full text was archived at University of St Augustine for Health Sciences Library, Scholarship and Works Open Access Repository (SOAR), to heighten discoverability of this EBP project.

Conclusion

Emergency department crowding contributes to prolonged LOS negatively impacting quality care and patient safety. This EBP change project strategically introduced and incorporated an abdominal pain NDP which bolstered ED nurse empowerment and decreased both ED wait times and LWBS rates in patients with abdominal pain. Additionally, NDP use was found as a potential means of reducing cost and re-capturing potentially lost revenue for hospitals.

An extensive literature review demonstrated that NDPs are proven to improve provider satisfaction and clinical outcomes through the reduction of ED LOS and LWBS (Aljahmi, 2021; Barto, 2019; Begaz et al., 2017; Douma et al., 2016; Retezar et al., 2011; Zhao, 2017). Lewin's change theory was used to guide the EBP project. The project required no infrastructure changes, elevation in staffing requirements, nor substantial capital resources.

The initiative's demonstrated success if sustained increases the department's potential of the achieving national patient throughput benchmarks. Furthermore, the motivation for change

created amongst staff members opens the door for further adoption of EBP NDPs within this healthcare facility.

References

- Aljahmi, S. (2021). *Advanced triage protocol for patients presenting to the emergency department with abdominal pain*. [Poster session]. Rutgers School of Nursing, DNP Poster Day 2021. <https://nursing.rutgers.edu/dnp-poster-day-2021/>
- Allen-Dicker, J., Berwick, J., Biddick, N., Hill, M., Ronan, M. & Carbo, A. (2015). Cost, frequency of emergency department revisits evaluated. *Journal of Hospital Medicine*, 2015(9). <https://www.the-hospitalist.org/hospitalist/article/122178/cost-frequency-emergency-department-revisits-evaluated>
- American College of Emergency Physicians (2019). *Crowding*. <https://www.acep.org/patient-care/policy-statements/crowding/>
- American College of Emergency Physicians (2015). *Standardizing protocols for optimizing emergency care*. <https://www.acep.org/patient-care/policy-statements/standardized-protocols-for-optimizing-emergency-department-care/>
- Armijo-Olivo S. (2018). The importance of determining the clinical significance of research results in physical therapy clinical research. *Brazilian Journal of Physical Therapy*, 22(3), 175–176. <https://doi.org/10.1016/j.bjpt.2018.02.001>
- Barksdale, A. N., Hackman, J. L., Williams, K., & Gratton, M. C. (2016). ED triage pain protocol reduces time to receiving analgesics in patients with painful conditions. *The American Journal of Emergency Medicine*, 34(12), 2362–2366. <https://doi.org/10.1016/j.ajem.2016.08.051>

- Begaz, T., Elashoff, D., Grogan, T. R., Talan, D. & Taira, B. R. (2017). Initiating diagnostic studies on patients with abdominal pain in the waiting room decreases time spent in the emergency department: A randomized clinical trial. *Annals of Emergency Medicine*, 69(3), 298-307. <https://doi.org/10.1016/j.annemergmed.2016.06.040>
- Brenner, S., Oberaigner, W., & Stummer, H. (2020). In guidelines physicians trust? Physician perspective on adherence to medical guidelines for type 2 diabetes mellitus. *Heliyon*, 6(8), e04803. <https://doi.org/10.1016/j.heliyon.2020.e04803>
- Burgess, L., & Kynoch, K. (2017). Effectiveness of nurse-initiated interventions on patient outcomes in the emergency department: a systematic review protocol. *JBIR Database of Systematic Reviews and Implementation Reports*, 15(4), 873–881. <https://doi.org/10.11124/JBISRIR-2016-003042>
- Center for Medicare and Medicaid Services. (n.d.). *Hospital outpatient quality and reporting program*. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalOutpatientQualityReportingProgram>
- Center for Medicare and Medicaid Services. (n.d.). *Hospital Compare*. <https://www.medicare.gov/care-compare/details/hospital/100106?id=b907d654-786c-4fad-9194-b4b3ff9d48c7&city=Perry&state=FL>
- Cervellin, G., Mora, R., Ticinesi, A., Meschi, T., Comelli, I., Catena, F., & Lippi, G. (2016). Epidemiology and outcomes of acute abdominal pain in a large urban emergency department: Retrospective analysis of 5,340 cases. *Annals of Translational Medicine*, 4(19), 362–362. <https://doi.org/10.21037/atm.2016.09.10>

- Chang, A. M., Cohen, D. J., Lin, A., Augustine, J., Handel, D. A., Howell, E., Kim, H., Pines, J. M., Schuur, J. D., McConnell, K. J., & Sun, B. C. (2018). Hospital strategies for reducing emergency department crowding: A mixed-methods study. *Annals of Emergency Medicine*, 71(4), 497–505.e4. <https://doi.org/10.1016/j.annemergmed.2017.07.022>
- Cheung, W. W., Heeney, L., & Pound, J. L. (2002). An advance triage system. *Accident and Emergency Nursing*, 10(1), 10–16. <https://doi.org/10.1054/aaen.2001.0315>
- Chong, V., Schultz, T. J., & Donnelly, F. (2019). Clinical protocols for adults with acute abdominal pain in Australian emergency departments. *Journal of Evaluation in Clinical Practice*, 25(3), 412–419. <https://doi.org/10.1111/jep.13103>
- Cleveland Clinic. (2017). Abdominal pain in the ED: What's taking so long? *Consult QD*. <https://consultqd.clevelandclinic.org/abdominal-pain-in-the-ed-whats-taking-so-long/>
- Dadeh, A. & Phunyanantakorn, P. (2020). Factors affecting length of stay in the emergency department who presented with abdominal pain. *Emergency Medicine International*, 1-7. <https://doi.org/10.1155/2020/5406516>
- Dang, D., & Dearholt, S. (2017). *Johns Hopkins nursing evidence-based practice: Model and Guidelines*. 3rd ed. Indianapolis, IN: Sigma Theta Tau International
- Douma, M. J., Drake, C. A., O'Dochartaigh, D., & Smith, K. E. (2016). A pragmatic randomized evaluation of a nurse-initiated protocol to improve timeliness of care in an urban emergency department. *Annals of Emergency Medicine*, 68(5), 546–552. <https://doi.org/10.1016/j.annemergmed.2016.06.019>

- Driesen, B., Van Riet, B., Verkerk, L., Bonjer, H. J., Merten, H., & Nanayakkara, P. (2018). Long length of stay at the emergency department is mostly caused by organizational factors outside the influence of the emergency department: A root cause analysis. *PloS one*, 13(9), e0202751. <https://doi.org/10.1371/journal.pone.0202751>
- French-Bravo, M., & Crow, G. (2015). Shared governance: The role of buy-in in bringing about change. *The Online Journal of Issues in Nursing*, 20(2), 8.
- Gans, S. L., Pols, M. A., Stoker, J., Boermeester, M. A., & expert steering group (2015). Guideline for the diagnostic pathway in patients with acute abdominal pain. *Digestive Surgery*, 32(1), 23–31. <https://doi.org/10.1159/000371583>
- Govender, I., Rangiah, S., Bongongo, T., & Mahuma, P. (2021). A primary care approach to abdominal pain in adults. *South African Family Practice: Official Journal of the South African Academy of Family Practice/Primary Care*, 63(1), e1–e5. <https://doi.org/10.4102/safp.v63i1.5280>
- Hagan, T. L., Schmidt, K., Ackison, G. R., Murphy, M., & Jones, J. R. (2017). Not the last word: dissemination strategies for patient-centered research in nursing. *Journal of Research in Nursing*, 22(5), 388–402. <https://doi.org/10.1177/1744987117709516>
- Henden Çam, P., Baydin, A., Yürüker, S., Erenler, A. K., & Şengüldür, E. (2018). Investigation of geriatric patients with abdominal pain admitted to emergency department. *Current Gerontology and Geriatrics Research*, 2018, 9109326.
- Hussain, S. T., Lei, S., Akram, T., Haider, M. J., Hussain, S. H., & Ali, M. (2018). Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organizational change. *Journal of Innovation and Knowledge*, 3(3), 123-127. <https://doi.org/10.1016/j.jik.2016.07.002>

- Hwang, C. W., Payton, T., Weeks, E., & Plourd, M. (2016). Implementing triage standing orders in the emergency department leads to reduced physician to disposition times. *Advances in Emergency Medicine*, 2016, 1-7. <http://dx.doi.org/10.1155/2016/7213625>
- Institute of Medicine. (2006). *Hospital-based emergency care: At the breaking point*. <http://www.nationalacademies.org/hmd/Reports/2006/Hospital-Based-Emergency-Care-At-the-Breaking-Point.aspx>.
- Intellectus Statistics [Online computer software]. (2021). Intellectus Statistics. <https://analyze.intellectusstatistics.com/>
- Johns Hopkins University. (n.d.). *Johns Hopkins Nursing Evidenced Based Practice Model*. https://www.hopkinsmedicine.org/evidence-based-practice/ijhn_2017_ebp.html
- Kelly, L. A., Gee, P. M., & Butler, R. J. (2021). Impact of nurse burnout on organizational and position turnover. *Nursing Outlook*, 69(1), 96–102. <https://doi.org/10.1016/j.outlook.2020.06.008>
- Kendall, J. L., Moreira, M. E., Hockberger, R. S., & Grayzel, J. A. (2017). Evaluation of the adult with abdominal pain in the emergency department - UpToDate. <https://www.uptodate.com/contents/evaluation-of-the-adult-with-abdominal-pain-in-the-emergency-department>
- Lewin, K. (1951). *Field theory in social science: selected theoretical papers* (Edited by Dorwin Cartw). Harper & Row.
- Lewis, L. M., Banet, G. A., Blanda, M., Hustey, F. M., Meldon, S. W., & Gerson, L. W. (2005). Etiology and clinical course of abdominal pain in senior patients: a prospective, multicenter study. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 60(8), 1071–1076. <https://doi.org/10.1093/gerona/60.8.1071>

Mainali, S., Stutzman, S., Sengupta, S., Dirickson, A., Riise, L., Jones, D., Yang, J., & Olson, D.

M. (2017). Feasibility and efficacy of nurse-driven acute stroke care. *Journal of Stroke and Cerebrovascular Diseases: The Official Journal of National Stroke Association*, 26(5), 987–991. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2016.11.007>
<https://doi.org/10.5811/westjem.2016.10.32042>

Marco, C. A., Schoenfeld, C. N., Keyl, P. M., Menkes, E. D., & Doehring, M. C. (1998).

Abdominal pain in geriatric emergency patients: variables associated with adverse outcomes. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine*, 5(12), 1163–1168. <https://doi.org/10.1111/j.1553-2712.1998.tb02689.x>

Martin, B. (2017). Unsticking the status quo: strategic framing effects of managerial mindset, status quo bias, and systemic resistance to change, *Management Research Review*, 40(2), 122-141. <https://ideas.repec.org/a/eme/mrrpps/mrr-08-2015-0183.html>

Moore, W. R., Vermuelen, A., Taylor, R., Kihara, D., & Wahome, E. (2019). Improving 3-hour sepsis bundled care outcomes: Implementation of a nurse-driven sepsis protocol in the emergency department. *Journal of Emergency Nursing*, 45(6), 690–698.
<https://doi.org/10.1016/j.jen.2019.05.005>

Morley, C., Unwin, M., Peterson, G. M., Stankovich, J., & Kinsman, L. (2018). Emergency department crowding: A systematic review of causes, consequences, and solutions. *PloS One*, 13(8), e0203316. <https://doi.org/10.1371/journal.pone.0203316>

Morse, J.A. (2019). *Nurse initiated protocols in the emergency department*. [Doctor of Nursing Practice Scholarly Project, Montana State University].

<https://scholarworks.montana.edu/xmlui/bitstream/handle/1/15549/MorseNurse-InitiatedProtocols2019.pdf?sequence=4&isAllowed=y>

Nelson, E. C., Batalden, P. B., Huber, T. P., Mohr, J. J., Godfrey, M. M., Headrick, L. A., & Wasson, J. H. (2002). Microsystems in health care: Part 1. Learning from high-performing front-line clinical units. *The Joint Commission Journal on Quality Improvement*, 28(9), 472–493. [https://doi.org/10.1016/s1070-3241\(02\)28051-7](https://doi.org/10.1016/s1070-3241(02)28051-7)

Newhouse, R. P., & Spring, B. (2010). Interdisciplinary evidence-based practice: moving from silos to synergy. *Nursing Outlook*, 58(6), 309–317.

<https://doi.org/10.1016/j.outlook.2010.09.001>

O’Leary, K. J., Johnson, J. K., Manojlovich, M., Goldstein, J. D., Lee, J. & Williams, M. (2019). Redesigning systems to improve teamwork and quality for hospitalized patients (RESET): study protocol evaluating the effect of mentored implementation to redesign clinical microsystems. *BMC Health Services Research*, 19(293), 1-11.

<https://doi.org/10.1186/s12913-019-4116-z>

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ; (Clinical research ed.)*. 372, n71. <https://doi.org/10.1136/bmj.n71>

- Pandhi, N., Kraft, S., Berkson, S., Davis, S., Kamnetz, S., Koslov, S., Trowbridge, E., & Caplan, W. (2018). Developing primary care teams prepared to improve quality: a mixed-methods evaluation and lessons learned from implementing a microsystems approach. *BMC Health Services Research*, *18*(1), 847. <https://doi.org/10.1186/s12913-018-3650-4>
- Retezar, R., Bessman, E., Ding, R., Zegar, S. L., McCarthy, M. (2011). The effect of triage diagnostic standing orders on emergency department treatment times. *Annals of Emergency Medicine*, *57*(2), <https://www.annemergmed.com/action/showPdf?pii=S0196-0644%2810%2900486-5>
- Ridderikhof, M. L., Schyns, F. J., Schep, N. W., Lirk, P., Hollmann, M. W., & Goslings, J. C. (2017). Emergency department pain management in adult patients with traumatic injuries before and after implementation of a nurse-initiated pain treatment protocol utilizing fentanyl for severe pain. *The Journal of Emergency Medicine*, *52*(4), 417–425. <https://doi.org/10.1016/j.jemermed.2016.07.015>
- Stauber, M. A. (2013). Advanced nursing interventions and length of stay in the emergency department. *Journal of Emergency Nursing*, *39*(3), 221-225. <https://dx.doi.org/10.1016/j.jen.2012.02.015>
- Strada, A., Bolognesi, N., Manzoli, L., Valpiani, G., Morotti, C., Bravi, F., Bentivegna, R., Forini, E., Pesci, A., Stefanati, A., Di Ruscio, E., & Carradori, T. (2020). Diagnostic anticipation to reduce emergency department length of stay: a retrospective cohort study in Ferrara University hospital, Italy. *BMC Health Services Research*, *20*(1), 1-6. <https://doi.org/10.1186/s12913-020-05472-3>

- Topor, D. R., Dickey, C., Stonestreet, L., Wendt, J., Woolley, A., & Budson, A. (2018). Interprofessional health care education at academic medical centers: Using a SWOT analysis to develop and implement programming. *MedEdPORTAL: The Journal of Teaching and Learning Resources*, 14, 10766. https://doi.org/10.15766/mep_2374-8265.10766
- University of North Carolina Cecil Sheps Center for Health Services Research (n.d.). *180 rural hospital closures since January 2005*. <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>
- U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. (2021, March 2). *Trends in the utilization of emergency department services, 2009-2018*. <https://aspe.hhs.gov/system/files/pdf/265086/ED-report-to-Congress.pdf>
- Velissaris, D., Karanikolas, M., Pantzaris, N., Kipourgos, G., Bampalis, V., Karanikola, K., Fafliora, E., Apostolopoulou, C., & Gogos, C. (2017). Acute abdominal pain assessment in the emergency department: The experience of a Greek university hospital. *Journal of Clinical Medicine Research*, 9(12), 987–993. <https://doi.org/10.14740/jocmr3206w>
<https://scholarworks.montana.edu/xmlui/handle/1/15549>
- Walsh K. (2016). Managing a budget in healthcare professional education. *Annals of Medical and Health Sciences Research*, 6(2), 71–73. <https://doi.org/10.4103/2141-9248.181841>
- Yang, S. J., Franco, T., Wallace, N., Williams, B., & Blackmore, C. (2019). Effectiveness of an interdisciplinary nurse driven in-hospital code stroke protocol in-patient ischemic stroke recognition and management. *Journal of Stroke and Cerebrovascular Diseases*, 28(12), DOI: [10.1016/j.jstrokecerebrovasdis.2019.104398](https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104398)

- Yarmohammadian, M. H., Rezaei, F., Haghshenas, A., & Tavakoli, N. (2017). Overcrowding in emergency departments: A review of strategies to decrease future challenges. *Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences*, 22(23). <https://doi.org/10.4103/1735-1995.200277>
- Zhao, L. (2017). *Advanced triage protocols in the emergency department*. [Doctor of Nursing Practice Scholarly Project, Walden University]. <https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=4752&context=dissertations>

Table 1

Strengths Weakness Opportunities Threats (SWOT) Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Leadership Support ▪ Improved patient satisfaction ▪ Dedicated nursing staff ▪ Longevity of nursing staff ▪ New EM medical director 	<ul style="list-style-type: none"> ▪ ED crowding ▪ Fear or reluctance to change ▪ Community trust ▪ Service reputation ▪ Nursing and provider staff shortages ▪ Lack of familiarity with a NDP
Opportunities	Threats
<ul style="list-style-type: none"> ▪ Empowered Nurses ▪ Utilization of EBP protocols ▪ Interprofessional collaboration ▪ Improved public image ▪ Improved teamwork ▪ Enhanced operational efficiencies 	<ul style="list-style-type: none"> ▪ Variability in clinical practice ▪ Increased liability and risk associated with potential increase in LWBS ▪ Decreased fiscal performance ▪ Poor CMS patient throughput measures ▪ Inability for providers to achieve financial bonus ▪ Rejection by providers

Table 2

Projected Budget

Item	Description	Total	Comments
Salaries for ED RNs (17 RNs)	Expense for education for NDP	\$510	Total projected cost for one hour training per RN. Average rate =\$30
Salaries for ED MDs (5 MDs)	Expense for education for NDP	\$750	Total projected cost for one hour training per MD. Average rate =\$150
Revenue			
Decreased LOS	Amount saved per one hour LOS in ED	\$100.00	Avg. cost/hour for abdominal pain ED eval. = \$600
Decreased LWBS	Amount saved per each LWBS prevented	\$827.00	Avg. revenue lost per LWBS = \$827.00
Cost-Benefit			
	Net benefit from NDP for abdominal pain	1 st year = \$12,500	Estimated savings in first year, post- implementation of ED Abdominal Pain NDP
	Net benefit in prevention of LWBS annually	1 st year = 8,270	

Table 3

Measures, Goals, and Statistical Analysis

Measure	Category	Definition	Goal	Statistical Test/Data Type
ED LOS	Outcome	Length of Stay in the ED from time of registration to final disposition: discharge, transfer, admission	<240 minutes	Continuous data / Unpaired t-test
LWBS	Outcome	Patient left ED without being seen by a provider	10% reduction	Continuous data / Two proportions z-test
Percent of staff to complete NDP education	Process	Percentage of ED personnel to successfully complete NDP education, Numerator: number of ED personnel completing education, denominator: total number of ED personnel		Categorical data / Descriptive
Percentage of Nurses satisfied with NDP use	Balance	Percentage of ED nurses reporting satisfaction using NDP for abdominal pain patients. Numerator: number of nurses to report satisfaction, denominator total number of ED personnel		Categorical data / Descriptive
Cost Measures	Financial	Total number of nursing staff multiplied by hourly rate x 1 hour	\$360.00 with average hourly rate of \$30.00	Continuous data
	Financial	Total number of physicians Multiplied by hourly rate x1 hour	\$750.00 with average hourly rate of \$150.00	Continuous data

Table 4

Two-Tailed Independent Samples t-Test for Overall ED LOS min by Pre-Post Implementation

Variable	Pre		Post		<i>t</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Overall, ED LOS min	269.06	133.97	241.06	115.18	1.67	.097	0.22

Note. N = 223. Degrees of Freedom for the *t*-statistic = 221. *d* represents Cohen's *d*.

Table 5

Two Proportions z-Test for the Difference between LWBS Pre-Post Implementation

Samples	# Of LWBS	Patient Volume	% Of LWBS	SD	SE
Pre NDP	94	1814	.05	0.22	0.005
Post NDP	45	1964	.02	0.15	0.003

Note. $z = 4.67, p < .001, 95.00\% \text{ CI: } [.02, .04]$

Table 6

Frequency Table for Nominal Variables Staff Education

Variable	<i>n</i>	%
Staff		
RN	17	77.27
Physician	5	22.73
Underwent Education		
Yes	22	100.00
No	0	0.00

Note. Due to rounding errors, percentages may not equal 100%.

Table 7

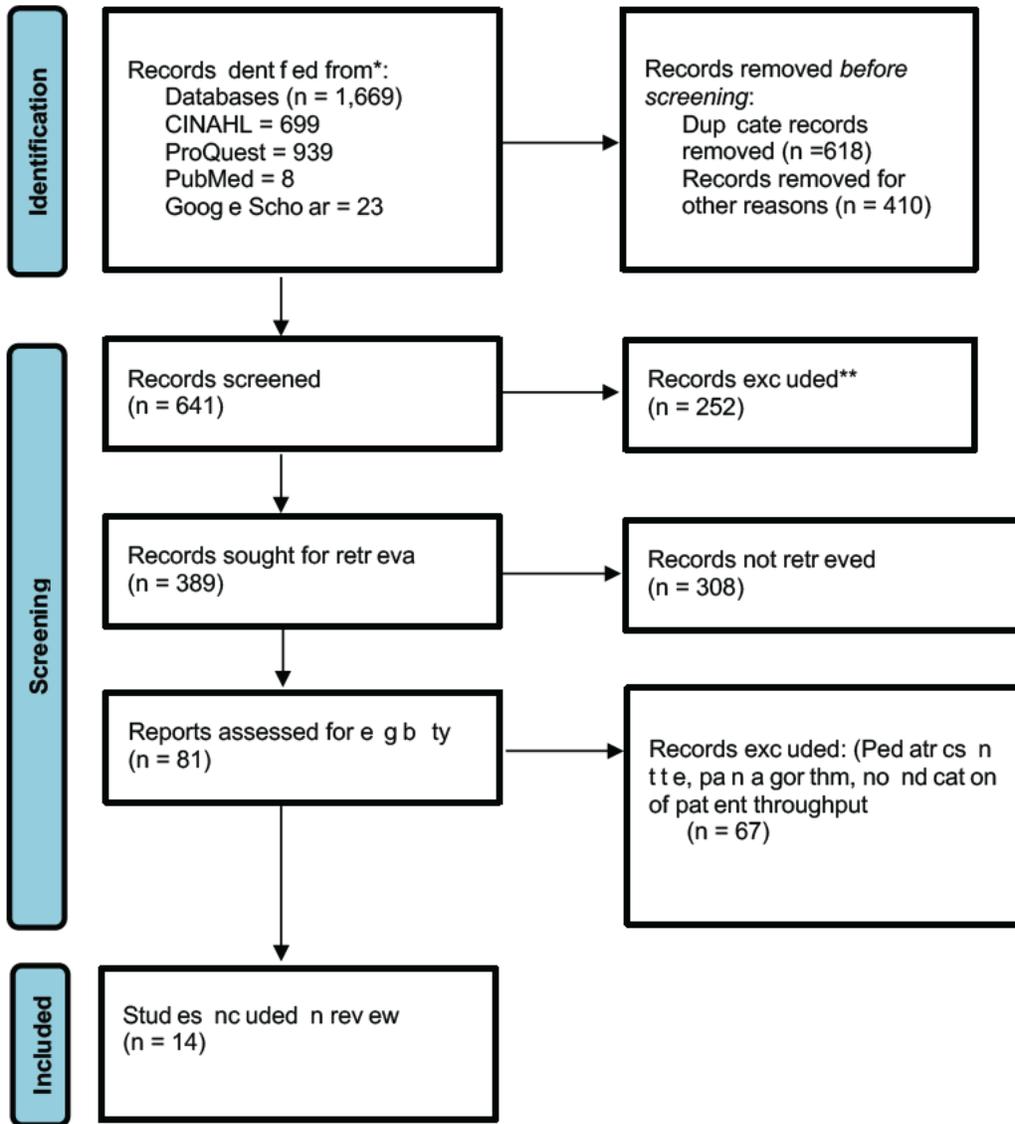
Frequency Table for Nominal Variables Nurse Satisfaction

Variable	<i>n</i>	<i>%</i>
Did use of the Nurse Driven Protocol (NDP) for abdominal pain patients in the Emergency Department provide a sense of empowerment or increase your confidence as a nurse?		
Yes	16	94.12
No	1	5.88
Do you think use of the NDP for abdominal pain patients expedited the delivery of care by providing medical data sooner for the physician to make a medical disposition?		
Yes	17	100.00
Do you believe use of the abdominal pain NDP aided in decreasing their overall length of stay (LOS) in the Emergency Department?		
Yes	17	100.00
Do you trust the patient interventions and diagnostic tests ordered as a component of the Abdominal Pain ED NDP are like tests that would have been ordered following evaluation by the physician?		
Yes	16	94.12
No	1	5.88

Note. Due to rounding errors, percentages may not equal 100%.

Figure 1

PRISMA Summary



From: Page M.J., McKenzie JE, Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*;372:n71. doi: 10.1136/bmj.n71

Appendix A

Primary Research

Citation	Design, Level Quality Grade Johns Hopkins	Sample Sample size	Intervention Comparison (Definitions should include any specific research tools used along with reliability & validity)	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
(Aljahmi, 2020)	Retrospective chart review pre and post one (1) month of advanced triage protocol (ATP) implementation Level II Grade B	ED triage area in urban academic medical center, Northern New Jersey. All stable patients with abd pain complaints pending ED assignment, excluding pregnant patients. 292 (Pre-implementation), 164 (post-implementation)	Comparison of groups without intervention prior to patients undergoing intervention of Abdominal Pain Protocol (standing order sets for upper, lower abdominal pain), Descriptive Statistics - chief complaint, ESI Level, LOS, disposition LOS & LWBS measured with means, SD, Mean Whitney U test	None	Primary: Decrease in LOS in eligible patients by 15%. Decrease in LWBS in eligible patients to 2%	Reduction in LOS and LWBS through ATP use can improve patient flow, patient throughput, safety, quality, and satisfaction. ATP use resulted in 10.7% decrease in mean LOS in eligible patients with abdominal pain (53 min) (p=.012) LWBS rate decreased from 11% to 10.4%, (p=.334)
(Dadeh & Phunyanantakorn, 2020)	Retrospective Cohort Study Level II Grade A	ED located in Thailand annual visits 40,150 Jan 1 2017 – Dec 31, 2017	Comparison of two groups categorized into ED LOS < 4hrs (N=156) and >4 hrs (N=52), to assess differences in terms of physical	None	Primary: Factors affecting ED LOS in patients presenting with ABD pain	Emergency physician should be cognizant of the time required to perform blood and imaging tests and remain competent in performing bedside sonography to lessen ED LOS in ABD pain patients.

		Medical record review of patients > 18 with abdominal pain N=208	assessment time, interdepartmental consultation, ED disposition, final diagnosis, mortality Univariate & multivariate analyses by logistic regression CI 95%, power 80% Pearson's Chi Square test Wilcoxon rank sum test (P<0.05)		Secondary: Final diagnosis, associations between ED LOS and 24-hr, 7-day, 28-day mortality	Factors prolonging ED LOS > 4 hrs in pts with ABD pain include age (odds ratio (OR) 3.17, 95% CI 1.36-7.42), (P < 0.013), multiple rounds of diagnostics (blood tests) (OR 85.6, 95% CI 4.22-1734.6) (P < 0.001), interdepartmental consultation (OR 71.82, 95% CI 5.67-909.51) (P<0.001), need for ultrasonography (OR 8.28, 95% CI 1.84-37.26) (P<0.001)
(Strada et al., 2020)	Retrospective cohort study Level I Grade B	ED of a tertiary care hospital, Northern Italy Patients presenting b/t 0800-2000 with chest pain, abdominal pain, or non-traumatic bleeding. 1547 Intervention group; 1677 control group	Comparison of patients who underwent Diagnostic Anticipation (DA), anticipating ordering of blood tests by nurses at triage, using physician approved algorithm compared to patients who did not undergo intervention ED LOS – multiple regression. Multivariate analysis Fisher's exact test for categorical variables, t-test for continuous variables p<0.05	None	Primary: ED LOS (Time to triage to hospitalization /discharge)	Though DA utilization found to be significant in decreasing ED LOS, additional research required to confirm positive results, explore reasons for detected differences by clinical condition When DA in use, mean ED LOS for chest pain decreased by 18.2 min (p < 0.001), 15.7 min longer for abdominal pain (p=0.41).
(Morse, 2019).	Retrospective chart review approach pre & post 1-month of nurse- initiated protocol implementation Level II Grade C	23 bed Level II Trauma Center South Central Montana N=30 patients age 50 or greater w/ abdominal pain	Comparison of patients selected who underwent abdominal pain ATP to those who did not prior to intervention Descriptive Statistics: Mean Registration to NIP order placement (ROP),	Transformational Leadership Theory	Primary: Registration to order; Registration to results; Registration to disposition	NIP use to initiate diagnostics can decrease specific time periods integral to patient encounter, potential for future implementation 15.7-minute decrease in NIP ROP, (SD 25.5 min) 20.7-minute decrease in RTR (SD 28.4 min)

			<p>Mean Registration to NIP results (RTR),</p> <p>Mean Registration to Disposition (RTD), SD</p>			<p>33.5 min increase in RTD (SD 68.2 min)</p> <p>Overall LOS not decreased, abdominal pain patients admitted required imaging studies contributing to prolonged wait time.</p>
(Begaz et al., 2017).	<p>Prospective RCT</p> <p>Level I Grade A</p>	<p>Tertiary academic ED with affiliated EM residency in Los Angeles County, CA; annual ED volume 55K</p> <p>1,659 non-pregnant adults</p> <p>848 patients RME + WRDT</p> <p>811 patients RME only</p>	<p>Comparison of patients undergoing RME + WRDT to those obtaining RME <u>only</u> over 10-month period</p> <p>Linear & logistic regression models used to compare outcomes between groups</p>	None	<p>Primary: Time to ED bed</p> <p>Secondary: ED LOS, LWBS</p>	<p>Initiating diagnostic testing in ED waiting room useful tool in reducing time spent in an ED bed, ED LOS, and rate of LWBS</p> <p>RME + WRDT demonstrated significantly shorter mean time (31min) to ED bed than RME only (245 min vs. 277 min) (</p> <p>RME + WRDT demonstrated decreased mean total ED LOS than RME (460 min vs 504 min; adjusted diff 42 min, 95% CI)</p> <p>9% of pts undergoing RME+WRDT (78/848) LWBS in comparison to 13% of pts undergoing RME only (103/811) (diff 3.5%; 95% CI 0.5% to 6.5%)</p>
(Zhao, 2017)	<p>Retrospective cohort study</p> <p>Pre & post implementation design</p> <p>Level I Grade A</p>	<p>14 bed ED Southern California, annual ED volume: 26K</p> <p>19,899 ED patients (9,348 pre-implementation group 7/1/15 – 12/31/15); (10,551 post-implementation group</p>	<p>Comparison of patients selected who underwent and abdominal pain protocol to those who did not prior to intervention</p> <p>Descriptive Statistics: Mean, SD; Chi-square t test</p>	Lean Principles	<p>Primary: median time from arrival to discharge, LWBS; ED patient satisfaction</p>	<p>17 min decrease in ED LOS for ESI Level 3 patients (225 min vs 208 min, p=.002)</p> <p>13 min decrease in ED LOS for ESI Level 4 patients (146.5 vs 133.5 min, p=.001)</p> <p>Satisfaction scores increased > 10% post implementation</p>

<p>(Ridderikhof, 2017).</p>	<p>Retrospective comparative Pre – post implementation observational design Level II Grade C</p>	<p>7/1/16-12/31/16) ED of a Dutch Level I Trauma Center N=1,487 patients 512 pre - implementation. 507 patients at 6 mos. 468 at 18 mos.</p>	<p>Evaluate nurse-initiated pain management protocol in adult patients with traumatic injuries in the short- and long-term using fentanyl for severe pain. ED patients participated in three periods (prior to implementation, at 6 months, at 18 months t-test- continuous data Homogeneity of variances- Levene’s test for equality Chi Square – categorical variables Cohen’s K – primary dichotomous outcome Power 80% CI 95%. P<0.05</p>	<p>None</p>	<p>Primary: Frequency of analgesic administration before and at 6 and 18 months after implementation Secondary: Pain awareness, as documented by NRS, occurrence of adverse events, pain treatment after discharge</p>	<p>Application of a nurse-initiated pain management protocol based on NRS scores improves pain awareness and increases analgesic administration in adult patients over time Awareness of pain (NRS) escalated significantly in the short (30% to 51%; p=0.00), long term (56%, p=0.00). Analgesic administration increased at 18 months (29% to 36%; p =0.016) Analgesic administration did not increase at 6 months (33%; p=0.19) Post discharge pain tx increased at 18 months compared to baseline (25% to 33%;; p=0.016), at 6 months (24% to 33%; p=0.004)</p>
<p>(Rim et al., 2019)</p>	<p>Retrospective descriptive study Level Grade</p>	<p>ED in tertiary hospital, Korea 70K annual visits N=573 patients with abdominal pain</p>		<p>None</p>		<p>Triage nurse should consider patient’s age, mode of visitation, route of visitation, assess for presence of tachycardia and diarrhea</p>
<p>(Douma et al., 2016)</p>	<p>Computer randomized, pragmatic, controlled evaluation, blinded study analysis</p>	<p>Medium sized 55-bed western Canadian ED (annual census 75,000)</p>	<p>Comparison of implemented six (6) NIPs suspected fractured hip, chest pain, upper abdominal pain, lower, abdominal pain, and vaginal bleeding during pregnancy (NIP) to no</p>	<p>None</p>	<p>Primary: minutes to Medication diagnostic test (troponin, radiographic imaging), time to treatment, ED LOS</p>	<p>Use of protocols to initiate diagnostics can decrease patient LOS in select patient groups, improve staff satisfaction ED LOS upper ABD pain reduced by 131 min (95% CI 16 to 278 min)</p>

	Level I Grade A	N=143 patients 76 protocol, 67 control	NIP use, obtaining standardized care in the ED. Blind fashion statistical analysis, median outcome times with interquartile ranges, Bonnet and Price method for CIs calculated for intervention, control group			(347 min. intervention vs 478 min. control) ED LOS lower ABD pain reduced by 181 min, (95% CI 1 to 361). (320 min intervention vs 501min. control) Acetaminophen NIP decreased median time to treatment by 186 min Ischemic chest pain lab result time decreased by 114 min Hip fx NIP decreased time to imaging by 257 min Vaginal bleeding reduced LOS by 232 min
(Stauber, 2013)	Retrospective chart review Level II Grade A	Large Midwestern academic medical center ED 243 charts of (adults only with ESI triage level of 3) reviewed, 87 with ANIs, 156 without ANI	Comparison of patients selected who underwent an abdominal pain ANI to those who did not Descriptive Statistics: Mean, SD; Chi-square t test; CI 95% Cohen's d statistic for effect size	None	Primary: reduction in mean time to room (TIR); mean time to disposition (TID) or LOS	ANIs performed at triage associated with improved ED flow by decreasing delays in diagnosis. ANI implementation at triage for ABD decreased mean TIR (332 min [ANI] vs 417 min [no ANI], $t_{202}=3.49$, $P<.01$ (95% CI, 360.75-409.25), but resulted in increased TID (584 min [ANI] vs 478 min [non-ANI], $t_{173} = 3.61$ $P<.01$ (95%CI, 486.26-542.79), medium effect size Reduction of TIR indicates improved efficiency by decreased treatment time for patients with low acuity abdominal pain
(American College of Emergency Physicians, 2015)	Joint ACEP/ENA Position Statement Level IV Grade B	N/A	N/A	None	Standard Protocols for use in the Emergency Department	Standardized protocols have the potential to reduce variation in care, enhance workflow, improve coordination of care, and modify practice through evidence- based care. Informational Only

<p>Retezar, et al., 2011)</p>	<p>Retrospective nested cohort study</p> <p>Level I Grade A</p>	<p>Tertiary academic ED (Jan 2007 – Aug 2009)</p> <p>ED annual visits: 57K</p> <p>N=15,188</p>	<p>Comparison of median treatment times of patients with triage standing orders (partial or full) to those with room orders, for complaint of CP, SOB, ABD pain, genitourinary complaints waiting >15 min</p> <p>Multivariate linear regression Chi Square CI 95%</p>	<p>None</p>	<p>Primary: ED LOS</p> <p>Full ATP versus Partial ATP</p> <p>Full or partial ATP versus No Triage Standing Orders</p>	<p>Median ED LOS 282 min for patients who did not undergo partial or full triage orders compared to 230 min for those patients undergoing partial or full triage.</p> <p>Patients with partial or full triage more acutely ill (44% ESI 2)</p> <p>Diagnostic testing at triage associated with significant reduction in ED LOS (16%) for chest pain, abdominal pain, shortness of breath, genitourinary complaints (95% CI, -18% to -13%).</p> <p>Recommended further eval in other EDs exploring different clinical complaints</p>
<p>Cheung et al., 2002)</p>	<p>Quality Improvement Study Retrospective Chart Review</p> <p>Level III Grade B</p>	<p>ED</p> <p>Random sample - 250 patients</p>	<p>Comparison of ED patients who underwent ATPs for abdominal pain, chest pain, eye trauma, substance abuse, minor trauma, orthopedic trauma, pediatric fever, pediatric emergent versus those undergoing traditional triage only, and LOS post MD assessment)</p>	<p>None</p>	<p>Primary: ED TLOS, LOS Post MD Assessment</p>	<p>Use of ATP reduces patient waiting time LOS by providing the physician laboratory and diagnostic imaging testing at time of evaluation allowing medical decisions to be made promptly.</p> <p>Emergent category: Decreased ED TLOS (40min), and LOS after MD assessment (62 min)</p> <p>Urgent Category: Decreased ED TLOS (74 min), and LOS after MD assessment (89 min)</p>

- Legend:
- ABD Abdominal
 - ACEP American College of Emergency Physicians
 - ANI Advanced Nursing Intervention
 - ATP Advanced Triage Protocol
 - CP Chest Pain
 - DA Diagnostic Anticipation
 - LWBS Left Without Being Seen
 - ED Emergency Department
 - ENA Emergency Nurses Association
 - ESI Emergency Severity Index
 - NDP Nurse Driven Protocol

NIP	Nurse Initiated Protocol
NRS	Numeric Rating Score
RME	Rapid Medical Evaluation
ROP	Registration to NIP order placement
RTD	Registration to Disposition
RTR	Registration to NIP Results
SOB	Shortness of Breath
TID	Time in Department
TIR	Time in Room
WRDT	Waiting Room Diagnostic Tests

Appendix B

Summary of Systematic Reviews (SR)

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
(Burgess et al., 2017)	Level II Grade B	Evaluate effectiveness of NIIs on patient outcomes in the ED	Search for published non-published articles. Three step processes: Initial – Limited search of MEDLINE and CINAHL, analysis of text words in abstract, and index terms described in article. Second – Comprehensive search using all terms across all included databases. Third- search of all incorporates reference lists of articles scrutinize for additional studies. of Find both published and unpublished studies	<u>Inclusion:</u> All studies include patients utilizing EDs for treatment (adult/pediatric); All studies include NIIs in the ED, which address studies analyzing nurse-initiated laboratory attainment/analysis, nurse-initiated medication, nurse initiated intravenous therapy. <u>Exclusion:</u> nurse-initiated radiographic imaging	Data independently extracted by two reviewers included in review using standardized JBI-MAStARI data extraction instrument. Data to include features of intervention, study methods, outcomes of pertinent to the review question, objectives Quantitative data pooled in statistical meta-analysis Review Manager (REVMAN) v.5.3.5 (Copenhagen: The Nordic Cochrane Centre, Cochrane Collaboration, 2014). Effect sizes expressed as odds ratio (for categorical data), weighted mean differences (continuous data), 95% CI Heterogeneity- Chi Square Narrative format statistical pooling, not conducted.	To date, no systematic review conducted to assess directly at effect of NIIs on outcomes of ED waiting times, LOS, pain relief, patient satisfaction, mortality. Past SR related to NII focused only on ED overcrowding, patient flow, ED wait times, interventions to improve pain management.	Review Protocol to better assist investigators in directly correlating NII use to ED wait times, LOS pain relief, patient satisfaction, mortality Study will be integral on addressing key effects of NII on outcomes ED wait times, LOS pain relief, satisfaction, mortality

Citation	Quality Grade	Question	Search Strategy	Inclusion/Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/Implications
(Elder et al., 2015)	Level II Grade C	What are key methods or models of ED care to promote patient throughput and clinical outcomes	Databases: CINAHL, Medline, PubMed, Scopus and Australian Government databases. Reference lists & conference abstracts screened, title & abstract screening according to inclusion criteria Key terms ED flow/ ED congestion, crowding, overcrowding, models of care, physician-assisted triage, medical assessment units, nurse practitioner, did not wait (DNW) and ED LOS Outcomes: ED LOS, LWBS, rate, costs, patient satisfaction, error diversion	<u>Inclusion:</u> Full text in English, Pub dates: 1980-2014 Qualitative, Quantitative, Mixed-method Met NHMRC quality guidelines ED throughput focus <u>Exclusion:</u> Unpublished or ongoing research, Conference abstracts, Pub date outside specified timeframe Care studies Research published other than English Anonymous articles, authorship unclear	Initial search 6987 articles Titles not relevant specific to ED throughput removed N=21 articles: Prospective (n=9), retrospective (n=7), quasi-experimental (n=1), pragmatic randomized (n=1), case cluster (n=1), systematic review (n=1), descriptive (n=1). Most single site studies. Varied sample size 175 – 19,592	LOS outcome most often re-ported. Advanced practice nursing roles, physician assisted triage and MAUs of care positively impact ED throughput Factors to include staffing requirements, patient acuity, hospital operations affect ED throughput	Rigorous study methods to analyze expanded nursing roles essential to produce good quality and recommended

Legend:

- ED Emergency Department
- LOS Length of Stay
- MAU Medical Assistance Unit
- NII Nurse Initiated Intervention

Appendix C

Project Schedule

Activity	NUR7801							NUR7802							NUR7803									
	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
Meet with preceptor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Project approval with Preceptor and Advisor		X																						
Discuss plan with preceptor		X																						
Organizational assessment, literature review		X																						
Identify key stakeholders			X																					
Receive buy-in from ED Nurse Manager, ED Medical Director			X																					
Complete SWOT					X																			
Create data collection tool				X																				
Conduct risk assessment				X																				
Prepare budget					X																			
Prepare project proposal			X	X	X	X	X																	
Complete project proposal								X																
Meet with key stakeholders									X															
Present draft operating procedure for discussion									X															
Finalize operating procedure										X														
Obtain operating procedure approval										X														
Educate workforce on new process										X														
Submit IRB approval from USA									X															
Submit IRB approval from site									X															
Receive IRB approval										X														
Begin project implementation of abdominal pain NDP										X														
Ongoing data collection: LOS, throughput times after starting use of Abdominal pain NDP in ED										X	X	X	X	X	X									
Gather workforce feedback										X	X	X	X	X	X									
Review staff satisfaction										X	X	X	X	X	X									
Analyze data -Comparison of Pre																X	X							

Appendix D

Power Point for Nurse-Provider Education

NURSE DRIVEN PROTOCOLS

UTILITY OF AN EVIDENCE BASED NURSE DRIVEN PROTOCOL FOR ABDOMINAL
PAIN IN THE EMERGENCY DEPARTMENT

OBJECTIVES

- Discuss the key contributors to overcrowding in emergency departments (ED)
- Discuss the hospital's patient throughput measures and their contributions to the current service reputation
- Discuss the significance of nurse driven protocols (NDP) in reducing patient length of stay (LOS) in the Emergency Department
- Identify an evidence-based NDP for the care of the patient with abdominal pain

ISSUE

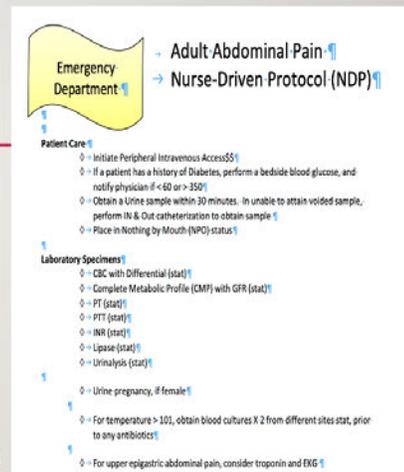
- **ED overcrowding contributes to..**
 - prolonged length of stay (LOS), delay in medical diagnosis, treatment and disposition, adverse outcomes, increased mortality, poor quality care, reduced patient satisfaction
 - increased nursing workload, burnout, and personnel turnover
- **ED crowding:**
 - when requirement for services surpasses the department's accessible resources to provide timely patient care.
- **Abdominal pain**
 - common complaint evaluated in an ED; 7 - 10% of patient visits ([Cervellin et al., 2016](#))
- **Prolonged ED LOS** common in patients experiencing abdominal pain

HOSPITAL CURRENT STATE

- Left Without Being Seen (LWBS) rate 3X greater than national benchmark (2%)
- Patient throughput for abdominal pain patients > 240 minutes
- Overall throughput well above CMS benchmark (> 100 minutes)
- Hospital service reputation poor in the community
- Variability in clinical practice; nurses deterred from initiating NDPs

SOLUTION

- Nurse-driven protocols (NDP)
 - proven success in reducing patient wait times, LOS, LWBS
 - demonstrated improved quality for sepsis, chest pain, stroke
 - Improved staff satisfaction, enhanced Nurse empowerment
 - (Mainali et al., 2017; Moore et al., 2019; Yang et al., 2019; Strada et al., 2020)



KEYPOINTS

- Implement NDP for any patient with complaint of abdominal pain (upper or lower)
- Charge nurse will monitor compliance of NDP utilization every shift
- Staff satisfaction as to NDP utilization to be assessed by project lead
- Project lead will report NDP compliance & patient throughput measures, LWBS rate weekly
 - Overall patient throughput
 - Patient throughput of abdominal pain patients
- Re-education will be done for those who do not utilize NDP

Appendix E

Abdominal Pain Nurse-Driven Protocol

Adult Abdominal Pain Nurse-Driven Protocol (NDP)

Patient Care

- ◇ Initiate Peripheral Intravenous Access
- ◇ If patient has history of Diabetes, perform bedside blood glucose, notify physician if < 60 or > 350
- ◇ Obtain Urine sample within 30 minutes. If unable to attain voided sample, perform IN & Out catheterization
- ◇ Place in Nothing by Mouth (NPO) status

Laboratory Specimens

- ◇ CBC with Differential (stat)
- ◇ Complete Metabolic Profile (CMP) with GFR (stat)
- ◇ PT (stat)
- ◇ PTT (stat)
- ◇ INR (stat)
- ◇ Lipase (stat)
- ◇ Urinalysis (stat)
- ◇ Urine pregnancy, if female
- ◇ For temperature > 101, obtain blood cultures X 2 from different sites stat, prior to any antibiotics
- ◇ For upper epigastric abdominal pain, consider troponin and Electrocardiogram (EKG)

Adopted from: Aljahmi, S. (2021). *Advanced triage protocol for patients presenting to the emergency department with abdominal pain*. [Poster session]. Rutgers School of Nursing, DNP Poster Day 2021. <https://nursing.rutgers.edu/dnp-poster-day-2021/>

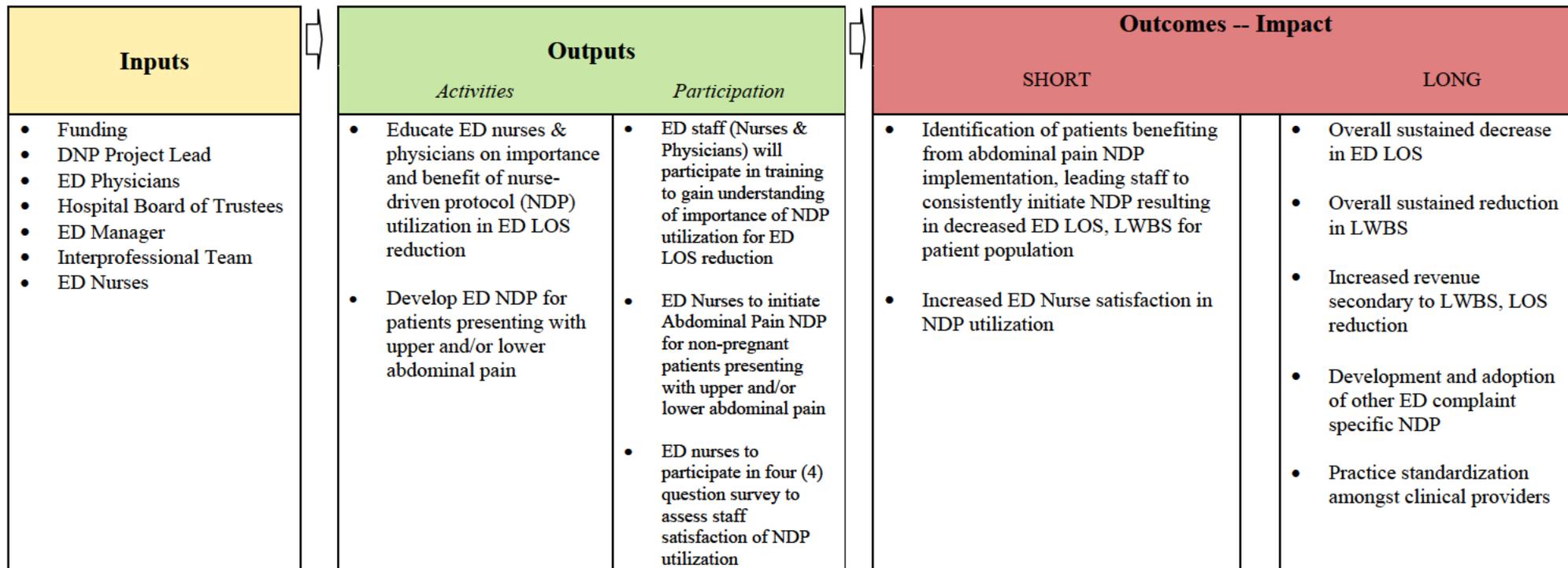
Adopted from: Begaz, T., Elashoff, D., Grogan, T.R., Talan, D. & Taira, B.R. (2017). Initiating diagnostic studies on patients with abdominal pain in the waiting room decreases time spent in the emergency department: A randomized clinical trial. *Annals of Emergency Medicine*, 69(3), 298-307. <https://doi.org/10.1016/j.annemergmed.2016.06.040>

Adopted from: Douma, M. J., Drake, C. A., O'Dochartaigh, D., & Smith, K. E. (2016). A pragmatic randomized evaluation of a nurse-initiated protocol to improve timeliness of care in an urban emergency department. *Annals of Emergency Medicine*, 68(5), 546–552. <https://doi.org/10.1016/j.annemergmed.2016.06.019>

Appendix F

Logic Model

Overarching Goal	For adult patients in the emergency department (P), how does a nurse-driven protocol for abdominal pain (I) compared to no protocol use (C) affect the length of stay (O) over 10 weeks? (T)	Logic Model Date:	10/21/21
-------------------------	--	--------------------------	----------



<p>Assumptions</p> <ul style="list-style-type: none"> ED LOS decreases when ED nurses are empowered to initiate EBP complaint specific diagnostic testing protocols expediting time to results and time to medical decision making on behalf of the ED physician. Left Without Being Seen (LWBS) rates may decrease if patients who undergo NDP utilization perceived care is being expedited
--

<p>External Factors</p> <ul style="list-style-type: none"> Practice variability secondary to traditional practice patterns Overcrowding Staff shortages Lack of inpatient capacity Lack of formal physician acceptance of ED Abdominal Pain NDP

Matthew Douma <Matthew.Douma@albertahealthservices.ca>

Wed 8/18/2021 2:00 PM

To: Christopher E Schmidt

That looks right! I approve. That is appropriate. We used the likert was for overall program evaluation. You're on the right track.

Matt (he/him)

RAH ED CNE

Office 55759

Mobile 780 233 9223

Note: if this matter requires an urgent response, please text/call me at 780 233 9223 and please include my colleagues Shelly Brindza and Chris Picard in your email – thank you!