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Abstract

Practice Problem: Crowding of emergency departments contribute to higher-than-average left without being seen (LWBS) rates. LWBS patients pose risks to the hospital as well as to one's own health.

PICOT: The PICOT question that guided this project was in a pediatric emergency department (P), does implementation of a "Code Lobby Surge" (I), compared to standard care (C), decrease left without being seen rates (O) within eight weeks (T)?

Evidence: Surge interventions and decreasing the visual of crowding have shown to decrease LWBS rates.

Intervention: "Code Lobby Surge" was implemented to decrease LWBS rates and improve throughput within the pediatric emergency department. "Code Lobby Surge" is activated when the wait time for triage is over 30 minutes and the total number of patients pending triage exceeds 10 patients.

Outcome: The intervention decreased LWBS rates by approximately four percent.

Conclusion: "Code Lobby Surge" not only decreased LWBS rates, but also improved throughput of the emergency department. "Cody Lobby Surge" is an effective intervention to mitigate emergency department surges that contribute to LWBS rates.

Implementation of a Code Lobby Surge and the Impact on Left Without Being Seen Rates

The Emergency Department Benchmarking Alliance defines left without being seen as a patient who leaves an emergency department before a medical screening exam (Smalley et al., 2021). The national average left without being seen (LWBS) rate is 2% (Smalley et al., 2021). Hospitals strive to have LWBS rates lower than the national average because the LWBS rate of an emergency department is one indicator that defines the quality of a hospital (Smalley et al., 2021). Every patient that does not have a medical screening exam after arriving to an emergency department poses a risk to the organization. With over half of all the emergency departments in the United States operating at or above capacity, there is potential for increased length of stays which directly impacts LWBS rates (Leggio et al., 2022).

This project aimed to implement a “Code Lobby Surge” in a pediatric emergency department to decrease LWBS rates. Code Lobby Surge was paged out to emergency department staff when there was an influx of patients in triage. This code alerted staff to prioritize discharging patients, fill unoccupied rooms and facilitate admissions to inpatient units. Available staff also reported to the triage area to aid in initial assessment and movement of patients. The pediatric emergency department in which this project took place is located in Orange County, California. The hospital is a not-for-profit organization. The pediatric emergency department is a Level I Trauma Center verified by the American College of Surgeons (ACS) and is also viewed as the pediatric expert in the geographical area. The emergency department had over 100,000 visits in 2022.

Significance of the Practice Problem

LWBS rates not only impact the patients, but also the healthcare system and society. When patients present to the emergency department and leave without being seen there are many consequences. There is a loss of revenue, risk for poor health outcomes, and dissatisfaction among patients (Gorski et al., 2021). When patients delay potential medical care, this may impact a patient's quality of life and increase the patient's risk of morbidity and mortality. LWBS patients are at higher risk for worsening health problems (Zodda & Underwood, 2019). The healthcare system not only loses revenue for each patient that is not seen, but may also lose credibility within quality indicators if LWBS rates are over the national average. The significance to society is that care may cost more on subsequent visits due to care not being initiated at the initial visit.

National, Regional and Local Incidence

LWBS rates are monitored on a national, regional, and local level. The national benchmark for LWBS rates is 2% (Smalley et al., 2021). This benchmark is used as a quality indicator and is reported to entities such as the Centers for Medicare and Medicaid Services (CMS). On a regional level, two hospitals were evaluated, and the average LWBS rate was 2.4% during the evaluation period (Li et al., 2019). This shows that hospitals are not meeting the national benchmark of 2%. The current LWBS rate for the organization in which this project will be implemented is 4.5%.

Financial Impact

Every patient that leaves without a medical screen exam can be viewed as a financial loss for the healthcare organization. The financial impact of each LWBS patient

is a loss of approximately $1,096 (Zodda & Underwood, 2019). This cost represents the medical screening exam and potential treatment. If patients are admitted to the hospital, this approximate cost may be much higher.

Quality, Safety, Legal and Ethical Implications

LWBS rates impact the quality of care provided. When LWBS rates are high, emergency departments may try to implement procedures to improve throughput, such as seeing patients in hallways and chairs versus exam rooms. LWBS rates and the quality of care delivered are impacted when hospitals are overcrowded and waiting rooms are full. Quality of care is impacted by delaying treatment and orders such as antibiotics administration and pain control (McKenna et al., 2019). LWBS rates and poor-quality care can pose a safety issue for organizations and patients. Patients who LWBS may become frustrated and upset, translating to violence toward the staff involved.

In 2014, approximately 2.7 million people presented to the emergency department but left without a medical screening exam (Jesionowski et al., 2019). Every patient not seen is a medicolegal risk due to the fact that every patient not seen may potentially be severely injured or ill (Gorski et al., 2021). Consequently, hospitals have an ethical responsibility to provide adequate resources and staff to support emergency departments to sustain an LWBS rate that is at or below the national benchmark. When LWBS rates are higher than the benchmark, hospitals should reconsider operational practices to ensure throughput is maximized.

PICOT Question

The PICOT question was, in a pediatric emergency department (P), does implementation of a “Code Lobby Surge” (I), compared to standard care (C), decrease left without being seen rates (O) within eight weeks (T)?

Population

The population included patients who presented to a pediatric emergency department; however, there was no limitation on age range because patients cannot be denied care from emergency departments. The majority of the patients who presented to the pediatric emergency department were zero to 18 years old.

Intervention

The intervention included the implementation of a “Code Lobby Surge” that was paged out to emergency department staff when the triage and lobby areas were saturated. This page brought all available resources to the lobby to triage patients, facilitated the movement of patients to treatment areas and expedited pending discharges.

Comparison

The comparison was standard care in which patients were triaged as a triage nurse was available, and patients moved to treatment areas when a treatment area and staff were available. Discharges were completed by the primary nurse or a resource nurse when available.

Outcome

The outcome focused on left without being seen (LWBS) rates. Percentages were measured before and after the intervention.

Time

The LWBS rates were calculated daily by reviewing the pediatric emergency department's daily census. The impact of the intervention was evaluated over eight weeks.

Evidence-Based Practice Framework & Change Theory

The Johns Hopkins evidence-based practice (JHEBP) framework aided in developing and executing this project. Each tool provided in the framework ensured that the literature supported the PICOT question. Most importantly, the Practice Question, Evidence, and Translation (PET) Process Guide determined the need for the proposed practice change. The algorithm provided ensured an actual need for practice change within the proposed organization. The question development tool drove the evidence search and assisted in creating search terms for the project. The JHEBP framework supports and provides tools for the project's research, implementation, and evaluation (Dang et al., 2022).

The change theory that was utilized in the implementation plan is Kotter's 8-Step Change Model. Kotter's 8-Step Change model served as a foundation for the project by creating a step-by-step process that methodically changed practice (Kotter, n.d.). The model collectively identified an issue, built a team of stakeholders, established goals, and ensured the sustainability of the change (Mork et al., 2018). Each step of the model aims to ensure a change is successfully implemented by bringing awareness to the practice problem and engaging stakeholders. This model guided the project by ensuring all necessary steps are taken to ensure a practice change is appropriately vetted versus an anecdotal practice change.

The JHEBP framework and Kotter's 8-Step Change model was applied to the project. As mentioned, the JHEBP framework was used to determine the need for the proposed change and to appraise current research. Applying the framework tools appraised evidence individually with a level and grade. Synthesis and recommendation tools were also used to determine what evidence agrees on to determine the solution to the issue on hand. Kotter's 8-Step Change model was applied by laying the groundwork, creating the team and identifying those involved. The steps helped create attainable goals, address the need to make changes and continue to reassess to ensure the change is sustainable.

Evidence Search Strategy

A comprehensive literature search was performed. The databases utilized in the search strategy include CINAHL Complete, PubMed and ProQuest. Keywords included LWBS, left without being seen, surge capacity and patient flow. The search terms used in all databases were "((LWBS) and (surge capacity)" or "(LWBS) and (patient flow)" or "(left without being seen) and (surge capacity)," or "(left without being seen) and (patient flow))" and emergency department. An abbreviation was used for left without being seen (LWBS). No alternative spellings were used.

Filters applicable for all databases includes selecting English for the language and a publication date within the last 5 years. Inclusion criteria included articles directly related to the emergency department setting. Exclusion criteria eliminated articles that did not address LWBS rates or took place in a setting outside of the emergency department. CINAHL Complete and PubMed did not include additional filters. In the ProQuest database, additional filters were applied. The source type was filtered to

scholarly journals. Subjects included emergency medical care, pediatrics, emergency medical services and children.

Evidence Search Results

The evidence search resulted in 429,805 articles. CINAHL resulted in 56 articles. PubMED resulted in 803 articles. ProQuest resulted in 428,946 articles. The inclusion criteria utilized is discussed in the Evidence Search Strategy. Twenty-four (24) duplicates were removed. The inclusion criteria were applied which resulted 427 articles. Articles were excluded for various reasons that were related to not being relevant to project. Excluded articles were discarded due to discussing inpatient flow versus emergency department, implementation of a provider in triage, utilization of a nurse practitioner and overall analysis of the characteristics of patients who left without being seen. The number of studies that were included in qualitative and quantitative synthesis was 14. PRISMA (Figure 1) is included as a visual reference.

Within the 14 articles, there were nine quantitative studies and five qualitative studies. Majority of the articles were retrospective. There were two quality improvement articles, two quasi-experimental articles and two systematic reviews. The other articles were non-experimental, cross-sectional, prospective and a real time evaluation. John Hopkins EBP Model was utilized to appraise the articles for quality and strength (Dang et al., 2022).

There were three level II sources, seven level III sources and two level V sources. Table 1 illustrates the articles by category and overall quality rating. Tables are also included for primary research and systematic reviews (see appendices). The overall strength of the evidence was grade B.

Themes with Practice Recommendations

A thorough evaluation of the studies is provided in the evidence table in Appendix A. The three themes identified include implementation of a surge intervention, characteristics of LWBS patients and crowding as an indicator for patients to LWBS. Throughout the studies there were similarities, differences, and controversies. Similarities were the patient population studied. Differences between the studies were the practice setting and patient population. Studies included adult and pediatric patients and were not specially in a pediatric hospital. Controversies included the use of a provider in triage for patients.

Surge Intervention

The first theme within the research was implementation of a surge intervention. Multiple studies have demonstrated that a surge intervention decreases LWBS rates (De Leon et al., 2020; Ioannides et al., 2018; Patey et al., 2019; Vashi et al., 2019). De Leon et al. (2020) initiated an additional patient area for low acuity patients. Another variation of the surge intervention includes ensuring all ED beds are occupied by patients, increasing resources, defining roles and oversight of bed management in the ED (Vashi et al., 2019). Implementing a surge intervention is shown to decrease door to physician assessment (Patey et al., 2019). Lastly, research shows that planning for surge interventions is key (Schmidt et al., 2020). Planning includes analyzing the issue on hand and defining the aim of the intervention.

Characteristics of LWBS Patients

A second theme within the research was the characteristics of LWBS patients including time of day of patient arrivals, age, sex, and acuity level (Almubarak et al.,

2019; Chan et al., 2017; Suastegui et al., 2021). Patients who arrived later in the day were more likely to LWBS (Almubarak et al., 2019; Chan et al., 2017; Suastegui et al., 2021). Patients are also likely to LWBS depending on the acuity level. Patients with lower acuity were more likely to LWBS (Almubarak et al., 2019; Suastegui et al., 2021). Patients who LWBS were at higher risk for readmission or adverse events (Plint et al., 2021). Males present more often than females. Urban and academic hospitals have higher acuity levels, but regional hospitals have shorter wait times (Rosychuk et al., 2020).

Crowding

Crowding influences LWBS rates. Overcrowding is a direct indicator of a higher rate of LWBS (Gorski et al., 2021; Rathley et al., 2020). LWBS rates are likely to increase according to patients' perception of a waiting room that appears to be crowded (Rathley et al., 2020). The intervention will improve flow which can make waiting areas appear less crowded.

Practice Recommendation

The practice recommendation presented with a Johns Hopkins Quality Grade of Level II. The SORT grade is B. The answer to the PICOT question is the implementation of "Code Lobby Surge." Implementing a "Code Lobby Surge" is expected to decrease LWBS rates and improve the safety of patients. The proposed intervention was a combination of what literature supports. Ensuring throughput is optimal in the ED by collectively heightening awareness of patients pending admission or discharge, unoccupied ED beds and where resources are needed was anticipated to decrease LWBS rates.

Setting, Stakeholders, and Systems Change

The setting, stakeholders and systems change for the project were elucidated. The setting was evaluated and was deemed an appropriate location for the proposed change project. The culture and mission of the organization supports the change. The stakeholders were defined as well as how the project will be sustained. The systems change analysis provided a SWOT (strengths, weaknesses, opportunities and threats) and identified the level of change.

Setting

The setting in which the project took place in is a 35-bed pediatric emergency department in an independent pediatric hospital in the southwestern United States. The hospital is a growing organization that has become the pediatric resource for the regional area. The emergency department sees approximately 100,000 patients per year. This annual census mixed with the size of the emergency department can cause an increase for LWBS rates.

The culture of the hospital is to provide health services to patients and families utilizing family-centered and evidence-based care. The mission is to provide excellent healthcare to improve the well-being of pediatric patients and to get pediatric patients back to normal state as soon as possible. The culture and mission of the organization supports change that provides better care to patients.

Stakeholders

There are many stakeholders that have buy-in for this proposed project. Stakeholders within the pediatric emergency department include the staff nurses, support staff including monitor technicians and emergency medical technicians, charge

nurses, mid-level providers and physicians. These roles are important to be included within the stakeholders because of the direct impact of their daily operations.
On a management level, stakeholders include the emergency department nursing manager, nursing director, medical director and chief nursing officer. Having management support helped support on the staff level.

Stakeholder involvement and organizational support were crucial to the sustainability of the problem. More specifically, the support from staff nurses and support staff was the most important. These individuals saw the direct impact of the implementation of “Code Lobby Surge.” Earning buy-in from these roles helped gain champions of the practice recommendation who can further the sustainability of the project.

Systems Change

A SWOT (strengths, weaknesses, opportunities, and threats) analysis was performed. The SWOT analysis is provided in Figure 2.

The level of system change was micro and meso. The change at the micro or unit level, included the implementation of “Code Lobby Surge.” The unit was changed the most due to the implementation of several practice changes that were included within the new surge code. This included immediate bedding of patients, discharging pending discharges, movement of patients to waiting areas and bringing all available staff to triage areas. The change at the meso or hospital level provided a solution to high LWBS rates. The change decreased LWBS rates and ensured hospital benchmarks were met.

Implementation Plan with Timeline and Budget

Three objectives drove the implementation of this project. The goals were created using the SMART format. The goals were as follows. Implementation of “Code Lobby Surge” will be implemented within two weeks of educating staff members within the emergency department. “Code Lobby Surge” will decrease LWBS rates within eight weeks of implementation. Project stakeholders will meet weekly for twelve weeks to discuss project updates. The objectives were met by ensuring the timeline was followed.

Implementation Plan

The Johns Hopkins evidence based practice framework and Kotter’s 8-Step Change model was used to guide the recommended practice change of implementing a “Code Lobby Surge.” The evidence showed that ensuring all ED beds are full and increasing resources to improve flow can impact LWBS rates (Ioannides et al., 2018; Vashi et al., 2019). The practice change involved several moving parts, but the moving parts collaboratively improved practice. Kotter’s 8-Step Change model provided a methodology approach to implementing a successful change (Kotter, n.d.).

Kotter’s 8-Step Change model set the stage in the first step by bringing awareness and creating the urgency for the change followed by steps to a successful change initiative. This involved stating the impetuous for a change and sharing the evidence-based research with the stakeholders who were involved. This also involved collecting baseline data which supported the need for change. The second step was to build a guiding coalition that identified stakeholders and set up weekly meetings. The third step was to form the change with buy-in from the stakeholders. The plan was to implement a “Code Lobby Surge” in the ED when the department was saturated. The

fourth step was to create a volunteer army which involved those outside of stakeholders who were impacted and interested in the change. This involved the staff members who were directly involved in the change. The feedback from these members and support were required for success. The fifth step was to remove any possible barriers. A SWOT was performed in this stage. The sixth step was to create attainable short-term goals. The SMART goals stated are attainable and created small wins for each phase of the practice change. The seventh step was to ensure change is moving forward. Data was collected and shared. Project champions were identified which included charge nurses and lead support staff to sustain the change. The eighth and last step was to make the change part of standard of care by sharing results with stakeholders, staff involved and throughout the organization (Kotter, n.d.).

Interprofessional collaboration was required to implement this project. As mentioned, “Code Lobby Surge” consisted of several changes under one activation. Activation of “Code Lobby Surge” occurred when the time for patients to be triaged was over 30 minutes and there were more than ten patients waiting to be triaged. The changes included ensuring all ED beds were full, admissions and discharges were facilitated and available resources were reallocated to needed areas. This change mostly impacted the nurses, emergency medical technicians and medical providers in the emergency department, however it also impacted inpatient staff as well.

Stakeholder training on the project was provided during shift staff huddles. Huddles occur every day for every shift within the emergency department. The education that was provided is in Appendix E. The majority of changes were focused around the emergency department, but facilitating patients who were admitted impacted

the inpatient staff. The change required effective communication and interprofessional collaboration which was essential to the success of the project. Admitting and discharging patients as well as creating optimal throughput involved all the aforementioned roles.

Risks with this intervention were minimal. The intervention as a whole was a new process, however each aspect of the intervention was performed within the practice setting on a daily basis. A potential risk of the intervention was that stakeholders may face code fatigue which means “Code Lobby Surge” may not have had optimal participation. This risk was minimized by utilizing appropriate activation criteria.

Timeline and Budget

The schedule of activities and budget for the project are included in Appendix C and Figure 2. The timeframe for the change process took into account necessary approvals prior to implementation of the change. The implementation and evaluation phases were eight weeks. There were weekly meetings with the preceptor of the project, stakeholders and project manager. The project manager was the DNP student responsible for this project. The project manager was in charge of assuring the project was following the timeline and making sure the budget was met. The project manager was required to utilize leadership qualities and skills to ensure a successful completion of the project. These skills included communication, time management, transparency, active listening and transformational leadership.

Results

The identified outcome of the PICOT question focused on LWBS rates. The primary focus evaluated the average LWBS percentage per week pre- and post-

intervention. All patients that arrived at the emergency department served as a data point to evaluate LWBS rates during the implementation of Code Lobby Surge. To calculate the LWBS percentage, the number of patients who LWBS was divided by the number of patients who were seen on that day. No patient information was collected as the focus was on numerical metrics.

The effectiveness of the intervention at decreasing the average LWBS rate was determined by the data collected. Data collection occurred each time a “Code Lobby Surge” was triggered and initiated. The data that was collected, in relation to emergency department metrics, included the number of patients who checked in per day, the number of staff on shift per role, and the LWBS rate per day. The data collection tool also captured the average LWBS rate during the eight-week implementation phase. The data collection tool is shown in Table 2.

The integrity of the data source was reliable and consistent. The electronic medical record (EMR) was utilized to collect data related to emergency department visits. The daily staffing sheets were used to collect staffing information. All information collected did not include patient information. Medical records and patient information were not accessed. If data was missing, there was an attempt to complete it. If the information was not available, the information was thrown out. The data was stored on a secured shared drive to ensure confidentiality. All data was collected, analyzed and stored by the project manager.

The comparison data was pre-intervention data. The evaluation included different categories of measures. Measures included an assessment of the outcome and financial benefits of decreasing LWBS rates. An excel spreadsheet was the tool used to

collect data. Table 2 illustrates the benchmarks and types of data that were collected. Table 3 illustrates the aggregate data collected within the implementation phase. This table evaluated if the factors noted played a role in LWBS rates. Appendix D illustrates the pre- and post-intervention average left without being seen rates by week.

Analysis was completed using Intellectus Statistics to complete a paired T-test. This test was used because pre- and post-intervention sample sets were related. A Shapiro-Wilk test was used to determine normal distribution. The assumption was met. An alpha value of 0.05 was used to determine statistical significance. The p value was <.001 indicating statistical significance. Results are shown in Appendix F.

Clinical relevance is equally important compared to statistical significance. Clinical significance is the most important in EBP projects. This is because the intervention proposes a project change that will need to be effective, sustainable, and logical. A decrease in LWBS rates was the anticipated clinically significant change of this project which was shown. The average LWBS rate in the eight weeks prior to intervention implementation was approximately five percent where the average eight weeks post-intervention was approximately one percent. This shows that implementing a Code Lobby Surge decreased the number of patients who LWBS. This means a Code Lobby Surge resulted in more patients being seen when presenting to an emergency department. This project was approved by both the facility site and the University of St. Augustine.

Impact

The goal of the scholarly project was to decrease LWBS rates. Patients who leave without being seen pose a potential medicolegal issue for the organization.

Additionally, and perhaps most importantly, the patient who presented to an emergency department is not being seen by a medical professional. The scholarly project reviewed the literature to ensure a practice change was placed that is backed with evidence.

The project positively modified the workflow of the emergency department. For example, the project highlighted individual tasks that contribute to high left without being seen rates. The department's LWBS rates are not just focused on how many patients are seen, but the bigger picture was addressed. The project shared the importance of throughput within the department by prioritizing admissions and discharges during surge times. It has also enhanced practice by promoting teamwork by bringing resources to areas when needed.

Future implications of this project are important for the department it was implemented in. The project was implemented to be sustainable; however, continued data collection will need to be continued by stakeholders. The data will need to be analyzed to evaluate the sustainability of the intervention over a longer period of time. As a result, the applicability of the intervention can be determined during different times throughout the year. This is important in view of the fact that, historically, emergency departments can predict higher patient volumes based off cyclical cycles such as respiratory and influenza season.

To further improve the practice problem the project needs to be continued to capture the fluctuating patient census. Further improvements should focus on when the LWBS rates are higher to identify any additional barriers contributing to the higher rate. This will also support sustainability because it will engage stakeholders by looking to

further opportunities of improvement. The ongoing evaluation of effectiveness will continue to be the LWBS rates for the department.

Limitations

A limitation of this EBP project is that the intervention of Code Lobby Surge was implemented at a single institution. Additionally, the implementation period could be viewed as brief and limiting, especially because the daily patient census ranged from 250 to 450 patients. There was a decline in the daily patient census during the implementation period.

Dissemination

The results were shared through multiple modalities. The results were shared throughout the organization through a presentation. The stakeholders and staff members who were impacted by this project were invited to this presentation. The results were published to SOAR at the University of Saint Augustine. The process to disseminate the project at the University of Saint Augustine included a submission application and review by librarian. Disseminating the project at the practice change location and at the university level allows for a peer review process and feedback prior to submission of an abstract or article publication.

The topic of this project was most appropriate for professional societies related to emergency departments. The Emergency Nurses Association would be a professional society that could benefit from this project. The presentation could consist of oral presentations at local meeting sand also a poster or oral presentation at the national conference. This topic would also be appropriate to submit for a publication within the Journal of Emergency Nursing. The professional entities mentioned are most

appropriate based off the milieu of those who hold memberships or belong to the entities.

Conclusion

“Code Lobby Surge” optimizes the intake and throughput of the emergency department. Any patient who presents to an emergency department and leaves without being seen poses many risks. These risks include not only legal implications but personal risks to the patients. The goal is to ensure patients who present for medical care are provided the opportunity to receive a timely medical screening exam. The utilization of Johns Hopkins evidence-based practice framework and Kotter’s 8-Step change theory guided this practice change through a literature search and appraisal that supports the evidence-based change to the project implementation. Implementing “Code Lobby Surge” decreased LWBS rates in the pediatric emergency department in which this project was implemented. Implementation of “Code Lobby Surge” should be considered by impacted emergency departments.

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Table 1

Evidence Synthesis

Category	Total # of Sources	Overall Quality Rating
Level I	0	N/A
Level II	3	B, B, B
Level III	7	A, B, B, B, B, B, C
Level IV	0	N/A
Level V	2	B, B

Table 2

Measure and Data

	Variable Name	Variable Description	Data Source	Possible Range of Values	Level of Measurement
Emergency Department					
	Date/Time of “Code Lobby Surge”	Date being evaluated	Staffing sheet	All dates	Ordinal
	Number of patients who check in per day	Number of patients who check in per day	EMR	1-150	Text
	Number of staff on shift	Number of staff members per role per day	Staffing sheet	RN: 0-40 ED tech: 0-40 Monitor tech: 0-6	Nominal
	LWBS rate	Percent of patients who LWBS per day	EMR	0-10%	Ordinal

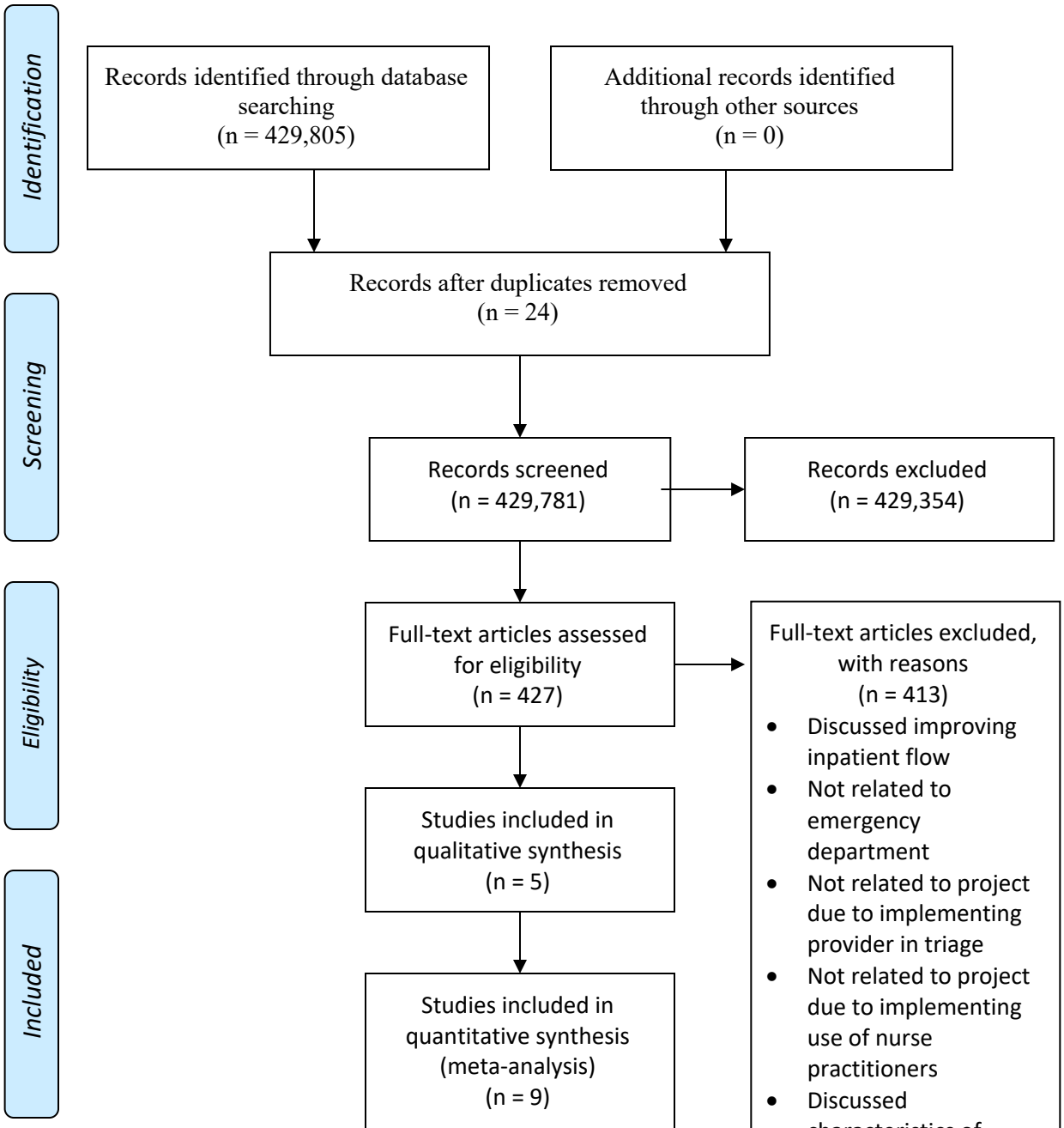
Table 3

Code Lobby Surge (CLS) Results

Date of CLS	Time of CLS	# of patients seen on day of CLS	# of nurses staffed	# of ED techs staffed	# of monitor tech staffed	LWBS rate (%) on day CLS activated
11/21/22	11:43	452	56	22	4	5.3
11/24/22	8:45	366	49	22	3	1.4
11/25/22	11:11	401	48	21	5	4
11/27/22	0:30	391	47	22	4	3.3
11/28/22	8:12	459	46	19	4	6.5
11/29/22	9:41	417	49	25	4	7.9
12/7/22	21:15	342	60	23	4	0.6
12/18/22	0:35	304	58	23	5	0.3
12/29/22	12:12	354	51	22	5	0.8
12/29/22	14:24	354	51	22	5	0.8
12/30/22	23:26	269	53	25	4	0.4
1/14/22	18:21	245	41	20	5	0

Figure 1

PRISMA Literature Search Strategy Diagram



Note. Adapted from Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLOS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Figure 2

SWOT Analysis

Strengths	**Weaknesses**
-Decreased LWBS rates -Improve patient satisfaction -Improve staff satisfaction	-New process change -Process change may create resistance -Education will need to be provided due to current lack of knowledge regarding practice change
Opportunities	**Threats**
-Support from staff -Staff buy-in -Staff recommendations -Meet benchmark for LWBS rates	-Staff resistance -Management resistance -Decrease in patient census therefore new process cannot be truly tested

Figure 3

Budget Table

Expenses		**Revenue**	
Direct		Billing	$0
Salary and benefits	$50/hour x 10 people	Grants	$0
Services	$25/hour x 5	Institutional budget support	$0
Statistician	$50/hour x 5 hours		
Supplies	$250		
Indirect			
Overhead	$75/hour x 5 hours		
Total Expenses	$1500		
Net Balance	-$1500		

Appendix A

Summary of Primary Research Evidence

Citation	Design, Level, Quality Grade	Sample, Sample size	Intervention, Comparison	Theoretical Foundation	Outcome Definition	Usefulness, Results, Key Findings
Patey et al., 2019	Quasi-experimental Interrupted time series Level II Grade B	80,709 patient visits to Carbonear ED	SurgeCon Intervention Pre-data Interrupted time series Segmented time-series model		Pre and post times for PIA, LOS and LWBS	PIA decreased from 104.3 minutes to 42.2 minutes. LOS decreased from 199.4 minutes to 134.4 minutes and LWBS decreased from 12.1% to 4.6% SurgeCon intervention has the ability to improve efficiency in EDs
De Leon et al., 2020	Quality Improvement Level V Grade B	180 patients with low acuity level	Alternate Care Site was implemented when certain indicators were met Pre-data Quality improvement T test for independent samples	Standards for Quality Improvement Reporting Excellence 2.0	Alternate care sites impact on median waiting time, LOS-admissions, LOS-discharges, LWBS, hours per patient visit and patient satisfaction scores	Median waiting times, LOS (both admission and discharge) and LWBS rates decreased. Hours per patient visit and patient satisfaction scores were unchanged.

			Descriptive statistics			
Vashi et al., 2019	Quality Improvement Level V Grade B	Veteran Hospital ED. Approximate ED census of 20,000 annually. ED with 12 acute beds, 4 Fast Track beds and 2 treatment rooms.	Restructured triage (pull to full, increased resources, defined roles, ED bed management) Pre-data Quality improvement Control group was Veteran Hospital ED that did not have interventions implemented Regression-adjusted difference-in-differences approach	LEAN methodology	Pre and post times for door to triage, door to doctor times and LWBS	Door to doctor times decreased by 12 minutes. LWBS rates not significantly changed.
Ioannides et al., 2018	Quasi-experimental Level II Grade B	Urban academic center emergency department with approximate 50 beds	Direct bedding for all Emergency Severity Index level 2 patients Pre-data Control group of nearby affiliate community hospital that did not participate in intervention		Pre and post intervention LWBS times	LWBS rates decreased in all patients and not just higher acuity patients even when the census increased during post intervention

			Difference-in-difference-in-difference analysis			
Suastegui et al., 2021	Nonexperimental study Level III Grade B	Pediatric patients who presented to emergency department	Pediatric patients who did not LWBS Odds ratio		Age, time of arrival and acuity level's impact on LWBS patients	Age, time of arrival and acuity level can help predict if patients are going to LWBS.
Chan et al., 2017	Retrospective cohort study Level III Grade B	British Columbia Children's Hospital ED pediatric visits from January 2008 to December 2012. Approximately 40,000 pediatric visits per year. Patients less than 21 years of age.	Odds of adverse outcome to certain indicators (admission to hospital, admission to PICU, unscheduled return visits, mortality) Odds ratio Multivariable regression		LWBS rate and odds of being admitted to hospital	Lower chance of return visit on days with higher LWBS rates. Increase change of admission when seen during third or fourth quartile mean shift LOS. Correlation between LWBS rate and admission rate.
Rathlev et al., 2020	Cross-sectional study Level III Grade B	Medical center medical-surgical (non-psychiatric) adult ED, 66 licensed bays	Four four-week periods Prediction models Descriptive analyses T-tests Pearson's chi-square		Arrival per hour is the number of patients who arrived. Door to provider time. Number patients in the waiting room. Number of boarding patients is how many patients are waiting for inpatient beds.	LWBS odds increased with the number of patients who are in the waiting room, number of boarding patients, arrival rate and longer door to provider times

			Generalized estimating equations			
Rosychuk & Rowe, 2020	Retrospective cohort study Level III Grade B	Top 15 highest volume ED's in Alberta that take care of pediatric patients	15 different hospital EDs R statistical analyses		Age and gender of patients. Acuity level of patient.	Males presented more often than females. Urban and academic hospitals had higher acuity. Regional hospitals had shorter times than urban and academic hospitals.
Gorski et al., 2021	Retrospective observational study Level III Grade B	Quaternary care children's hospital and trauma center patients 54,890 patient visits	14-month study period Multiple logistic regression		National Emergency Department Overcrowding Risk Score and occupancy rate were used. Occupancy rate was calculated using 15 minute windows and patient arrival time.	LWBS rate was 1.22%. ED overcrowding impacts LWBS risk.
Schmidt et al., 2020	Real-time evaluation Level III Grade C	Children's Hospital Los Angeles	Real-time evaluation of COVID-19 multidisciplinary surge drill	American College of Emergency Physicians COVID-19 surge plan	Supplies and equipment needs were found from planning. Discover information that apply to American College of Emergency Physicians surge plan.	Multidisciplinary planning is required for surge planning. Drill applicable to all types of mass casualty events.
Plint et al., 2021	Prospective cohort study Level II	Patients who presented to Children's Hospital of	Phone call interviews were made to enrolled patients within 3		Outcomes were evaluated over a 1 year period to the patients	Median age was 4.34 years. Majority of the patients were discharged. 1367 patients were enrolled. 33 patients had adverse

	Grade B	Eastern Ontario ED which is a tertiary care free-standing pediatric hospital in Ottawa, Canada who sees approximately 70,000 visits per year	weeks of ED visits. ED visit times varied between 3 time periods. Univariate analysis Multivariate analysis Odds ratio		who presented to the ED to see if time of day, time of year or day of week played part.	event related to ED care. 29 of these events were deemed preventable.
Almubarak et al., 2019	Retrospective cross-sectional study Level III Grade A	Tertiary children's hospital 46,942 visits during study period	None Descriptive statistics Multivariable regression analyses		To determine variations and patterns of EDs to be able to determine need for resources	12% of patients arrived overnight. 42% of patients arrived during the day. 45% of patients arrived during the evening. Patients who arrived overnight had higher acuity. Patients who arrived overnight had different complaints than patients who arrived during the day and evening.

Legend:
PIA: Physician Initial Assessment
LOS: Length of Stay
LWBS: Left without being seen
ED: Emergency department

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**
Tlapa, D., Zepeda-Lugo, C. A., Tortorella, G. L., Baez-Lopez, Y. A., Limon-Romero, J., Alvarado-Iniesta, A., & Rodriguez-Borbon, M. I. (2020). Effects of Lean Healthcare on Patient Flow: A Systematic Review. *Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research*, *23*(	Grade B	What are the effects of lean healthcare on patient flow in ambulatory care? Does waiting time and LOS increase after lean healthcare interventions?	July 2018 to February 2019 PubMed-Medline, Cochrane Library, CINAHL, Web of Science, Scopus and EBSCO. Grey literature on OpenGrey,	Excluded: no intervention, inappropriate outcome, review or opinion letter, lack of data, different study design	LOS for admitted and discharged patients. LWBS rates. Waiting time for appointment. Waiting time for treatment.	Lean healthcare decreases patient waiting time and LOS. Use of lean healthcare can improve throughput.	More research needed including observational studies or randomized controlled studies. Studies can show correlation

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
2), 260–273. https://doi.org/10.1016/j.jval.2019.11.002			Grey Literature Report, Google Scholar and ProQuest. Medical subject headings terms and free text terms related to population, intervention, comparator, outcome and study design.				between lean healthcare and staff satisfaction. Throughput can be impacted through improving process of healthcare.

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
Grant, K. L., Bayley, C. J., Premji, Z., Lang, E., & Innes, G. (2020). Throughput interventions to reduce emergency department crowding: A systematic review. *CJEM*, *22*(6), 864–874. https://doi.org/10.1017/cem.2020.426	Grade B	What is the impact of staffing and process on ED throughput?	Medline, Embase, CINAHL and Cochrane Central Register of Controlled Trials. ED, throughput factors, LOS, LWBS, study desgin	Inclusion: specific patient populations, investigations and POCT, additional staff, split flow or fast track, integrated approaches. Exclusion: Non-throughput interventions, did nto report relevant outcomes, abstract only	Data extraction included title, authors, publication date, design, outcome measures and main results. Meta-analyses performed. Chi-squared statistic and I-squared statistic. Looked to see if study	Fast track and improving process can improve throughput. Flow can be improved by implementing interventions to decrease time to see provider. Focus should be on operational improvement.	Improving front end process (triage) of an ED can improve throughput and impact LWBS rates. More research needs to be done to include randomized trials and quality

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
					interventions use existing ED resources or if use additional resources.		measures of both staff and patient satisfaction.

Legend:

Appendix C

Project Schedule

	NUR7801								NUR7802								NUR7803							
Activity	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
Prepare project proposal	X	X	X	X	X	X	X	X																
Meet with stakeholders			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Handout information and brochures about project										X	X													
Meet with staff involved										X	X	X				X	X	X		X				
Implement practice change											X	X	X	X	X	X	X	X	X					
Collect data including baseline										X	X	X	X	X	X	X	X	X	X					
Calculate statistical significance																				X	X	X		
Share results with stakeholders																			X	X	X	X	X	
Share results with staff involved																						X	X	

Appendix D

Data Collection Tool

LWBS Rates Pre- and Post-Intervention

	Pre-Intervention Average LWBS rate	Post-Intervention Average LWBS rate
Week 1	5.7	2.4
Week 2	5.4	4.4
Week 3	7.3	0.8
Week 4	5.3	0.6
Week 5	4.9	0.2
Week 6	5.3	0.4
Week 7	3.7	0.1
Week 8	5.6	0.3

Appendix E

“Code Lobby Surge” Education for Staff Huddles

Purpose: To decrease left without being seen rates and improve throughput within the emergency department

Activation Criteria:

1. Wait time for triage is over 30 minutes AND
2. Total number of patients pending triage exceeds 10 patients

Practice Change:

1. Pull to full: ensure all emergency departments beds are full regardless if patient is triaged or not
2. Facilitates admission and discharges of patients: Bedside staff (RN and technicians) prioritize tasks related to patients who are pending discharge home or have inpatient bed assigned
3. Available resources: Report to triage area to aid in screening and triage of patients and movement of patients to designated room or waiting area

Appendix F

T-Test Results

Two-Tailed Paired Samples t-Test for the Difference Between Pre and Post

Pre		Post				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
5.40	0.99	1.15	1.50	7.32	< .001	2.59

Note. N = 8. Degrees of Freedom for the *t*-statistic = 7. *d* represents Cohen's *d.*