Decreasing Bedding Time for Patients Admitted to the Telemetry Unit

by

Bernice Foryoung

Under Supervision of

Bridgitte Gourley, DNP, FNP-BC

Second Reader

Lynn Marie Elizabeth Bullock, DNP, RN, NEA-BC

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Abstract

Problem: Improving care in the Emergency department (ED) is a goal of Healthy

People 2030. One of the objectives of this goal is to reduce wait times in the ED.

Increased wait times have been shown to cause poor patient outcomes and avoidable

medical errors. Several factors affect ED wait times, one of which is a decrease in

patient flow throughout the hospital. A community hospital in Maryland identified an

increase in the time from when admission orders were entered for the telemetry unit to

when patients were bedded.

Purpose: This quality improvement project aimed to implement and evaluate the

effectiveness of a Logistics Management Program (LMP) to decrease the time from

when an admission order was placed to when an adult patient was admitted to a bed in

the telemetry unit from the ED.

Method: The QI project was implemented on a 63-bed Telemetry unit in a small

community hospital. The unit admitted approximately12 adult patients from the ED

each day. The innovation of this project was the implementation of the LMP. It

included the already existing electronic bed board and a Nurse coordinator who

oversaw admissions from the ED to the Telemetry unit. The outcome monitored was

the percentage of patients that were bedded within 90 minutes of the admission order.

Results: The percentage of ED patients admitted and transported to telemetry within 30

minutes increased from 17.9 to 36.6 percent. The percentage of ED patients admitted to

the telemetry unit within 90 minutes of the written admission order increased from 19.7

to 25.1 percent.

Conclusion: During the COVID-19 pandemic, the Logistics Management Program

improved the flow of patients from the ED to a telemetry inpatient unit.

Decreasing Bedding Time for Patients Admitted to the Telemetry Unit

Improving care in the Emergency Department (ED) and hospital is a goal of Healthy

People 2030. One of the objectives of this goal is to reduce the proportion of Emergency

Department visits with longer than recommended wait times (Healthy People,2030). Morley et

al. (2018) found 40 studies that reported the consequences of ED crowding which included,

increased mortality, poor patient outcomes, delay in assessment and care, increase in exposure to

error, increase in readmission rates, increase in inpatient length of stay, and decrease in patient

satisfaction. The Institute of Medicine (IOM) cited admitted patients being held in the

Emergency Department as one of the main causes of crowding in the ED (IOM, 2006a). It called

for improving hospital efficiency and patient flow as one of the solutions to the problem of

crowding in the ED (IOM, 2006b). Today so much emphasis is being placed on improving

patient flow in hospitals. Although the Centers for Medicare and Medicaid Services (CMS)

removed the measure of median time from the decision to admit to the time of departure from the

emergency department for patients admitted to inpatient status from its core measures, programs

like Hospital Compare still use this measure to inform the public about how hospitals perform in

this aspect (CMS, 2018). Since the IOM call to action, several hospitals have tried many

interventions to improve flow.

Some of the interventions that had been used in this community hospital in Maryland

included a telemetry observation unit and an electronic bed board. The 63-bed telemetry unit

added a second charge nurse, but this intervention was also unsuccessful in reducing admission

time.

Before the project, the time from when an admission order was placed for the telemetry

unit to when an adult patient got to the unit was greater than 90 minutes (CMS standard) for

more than 80% of patients. The median time from when an admission order was placed to when

the patient arrived on the unit in 2020 was 181 minutes. In January 2021, the hospital changed its

electronic medical record from Meditech to Epic, this change resulted in an increase in the above

measure to 270 minutes. Measures for ED crowding such as ED length of stay for this hospital

were reported at 228 minutes compared to a nationwide average of 142 minutes, and 213 minutes

for the state (Centers for Medicare and Medicaid Services, 2021).

The purpose of this quality improvement project was to implement and evaluate the

effectiveness of a Logistics Management Program, to decrease the time from when an admission

order was placed to when an adult patient was admitted to a bed on the telemetry unit from the

Emergency Department.

Evidence Review

The focus of this evidence review was on the implementation of a Logistics management

program. The review broadly examined evidence that supported the impact of leadership and

patient flow teams in patient throughput, then it delved into the evidence that supported the use

of a logistics coordinator in patient throughput, and finally, it examined the evidence that guided

the implementation of the LMP. The evidence reviewed is summarized in Table 1 and 2.

The Agency of HealthCare Research and Quality (AHRQ) published a guide for hospitals

in 2012, which was last reviewed in 2018, titled "Improving Patient Flow and Reducing

Emergency Department Crowding: A Guide for Hospitals". This guide suggested evidence-based

solutions with a step-by-step guide and quality improvement examples from participating U.S.

hospitals that hospitals could use. The first step suggested in the guide was the formation of a

patient flow team to include a day-to-day leader, and a senior hospital leader, in addition to staff.

The second piece of evidence to support the impact of leadership was Morley et al. (2018).

Through a systematic review, they identified solutions to patient output from the ED. They

focused on 3 main interventions which included bed management, leadership services/ leadership

support, and other alternative admission policies one of which was providing the ED with extra

leaders during periods of overcrowding. The overall results of these interventions were a

decrease in ED length of stay, boarding time, hours of ambulance diversion and number of

patients who left without being seen (LWBS).

Healy-Rodriguez et al. (2014) in a quasi-experimental study, assessed the use of a

Logistic Management program as an expansion to the bed management process to decrease

Emergency Department Length of Stay (EDLOS), Emergency Department (ED) placement times

and Inpatient Length of Stay (IPLOS). Although the outcome measures for this study were

different from that of this quality improvement project, they are similar in that the outcome

measures are all measures of hospital flow. The study revealed an overall decrease in: ED

Evaluation time 219min (IQR 178min) vs 207min (IQR 171min) P<.001, ED Placement times

219min (IQR,259min) vs 193min (IQR, 158min) P<.001, and IPLOS 3.93days (IQR, 4.9days) vs

3.83days (IQR, 4.7days) P<.001 from 2008 to 2009. With a difference of 0.1 days translating to

1,483 inpatient days for the year 2009.

Cohen et al. (2015) in a quality improvement project implemented a team approach using

microsystems to identify bottlenecks in various flow processes. They then implemented changes,

using a Plan-Do-Study-Act (PDSA)framework, to the process of transferring admitted patients

from the ED to the Medical intensive care unit. They achieved a 48% decrease in transfer times

compared to their goal of 25% and were able to sustain this for 3 years when they stopped

monitoring. Like the AHRQ guide, utilizing patient flow teams was an important factor in

improving flow. The flow team identified bottlenecks in various steps (microsystems) of their flow process and developed practical solutions to them using various PDSA cycles.

Theoretical Framework

The problem of Emergency room overcrowding can best be explained by the General Systems Theory by Ludwig Von Bertalanffy who defined a system as being made up of interrelated parts that function as a whole. Small changes in one part could result in significant changes in other elements, indicating a non-linear relation between elements of a system. The concepts proposed in this theory were open systems view, input-transformation-output, system boundaries, negative entropy, hierarchy, feedback, multiple goal-seeking, and equifinality (Kast & Rosenzweig, 1981). The Emergency Department is an open system where patients come in to be seen for various health emergencies. Factors that affect flow in the ED are grouped under input, throughput, and output. Input factors like a large influx of patients, combined with throughput delays such as delay in radiology or laboratory results and output delays such as delay in moving admitted patients to inpatient beds cause the problem of crowding. If different hospital departments and systems do not interact with each other, this cycle continues to worsen the problem. The Equifinality concept suggests that more favorable outcomes can be achieved with different inputs and internal processes. The concept of equifinality was leveraged by the LMP. The patient flow team, which included the logistics coordinator was to identify blockages in the patient flow process then find practical solutions and protocols that mitigated them. See figure 2

The implementation process framework that was used for the implementation of this project was the conceptual framework of Innovation as used by Helfritch et al., 2007. The Community Hospital where this project was being implemented used electronic bed boards

monitored by the charge nurses of different units for the placement and assignment of patients to

beds. The innovation of this project was the introduction of a Logistics management program

that involved a clinical coordinator and aggressive bed management by a throughput department

rather than the unit charge nurses. This intervention was supported by the director of the unit and

the unit manager, the ED director and manager, the chief nursing officer, several hospital shift

supervisors, and the staff of both the ED and telemetry unit. It was planned that the person hired

for the program will be a registered nurse with previous supervision experience. Unit and ED

nurses were educated about the potential benefits of the program to get their buy-in. The overall

goal of the project was to decrease the time from decision to admit to actual bedding of patient

and therefore decrease ED Length of Stay. With multiple benefits related to patient safety and

patient satisfaction, this project aligned well with the organization's priorities. Champions for the

project were solicited from the telemetry unit, ED, and transportation department. The final step

to jump start the success of the project was ensuring collaboration between the unit staff and ED

staff with the logistics management program. This was required for timely communication about

open beds, roadblocks, and the movement of patients to ready beds.

Methods

The population included were adult patients admitted to the telemetry unit. The

population the hospital serves is very diverse and serves patients from different backgrounds and

patients who are English language learners... The hospital provides various interpreter services to

reduce communication barriers between providers and patients. To meet the goals of the project,

the Logistics Management Program was instituted which was made up of two items: the already

existing electronic bed board and aggressive bed management by a clinical flow coordinator.

The structure measures evaluated included implementing the logistics management program.. This measure was assessed at the start of the project as the entirety of the project depended on it. Secondly, the number of staff educated on the practice change out of the total number of staff. Education of staff was done for 1 month during the first phase of the implementation process. Similarly, the process measure put in place was the number of ED patients admitted to the telemetry unit with assigned ready beds on the unit transported within 30 minutes by the transportation department out of the total number of admitted patients with ready beds. Finally, the outcome measure was the number of patients admitted to a telemetry bed within 90minutes of a written admission order out of the total number of patients admitted daily. This measure was already tracked by the hospital and is endorsed by The National Quality Forum (NQF) until November 2018 and by the Centers for Medicare and Medicaid Services (CMS). Some of the implementation strategies that were utilized were first, getting buy-in from staff and leadership. This was done through multiple presentations to various stakeholders on the project outline that showed evidence that supported the intervention. Secondly, an education module was created and all staff members on the telemetry unit, Emergency department, transportation leadership, and environmental services leadership were educated in one-on-one sessions, staff huddles, or in staff meetings. Roles for various staff members were clearly outlined in the education material. Thirdly, staff feedback was encouraged and sought out through weekly one-on-one check-in sessions with staff. Finally, weekly meetings were held with leadership and the logistics coordinator to seek out areas for improvement.

Data were collected weekly and plotted on a run chart. The data was obtained from a secure database by the QI project leader (QI-PL) who had sole access to the data on a password-protected facility computer. It was then de-identified by coding dates and patient ID using a code

key. The de-identified data was then sent through secure email and stored in a password-protected secured data management spreadsheet on a password-protected computer. The data was then analyzed by the QI project leader and presented to site stakeholders weekly for progress monitoring and reeducation of staff.

Results

A total of 1,485 patients were admitted to the Telemetry unit throughout the project, 454 of which were admitted in August when baseline data were collected. No patient was omitted. 100 percent of unit and ED charge nurses, and leaders received education on the process. The official role of the Logistics flow coordinator as originally intended and designed was not filled until post-intervention week 7. Prior to that, the role was facilitated by the Administrative Nursing Supervisor (ANS), who also had other duties. The flow coordinator worked during peak hours, 11 am to 8 pm, 4 days a week. They did not work on weekends as the need for patient movement was heavier on weekdays when all departments of the hospital were functional. Again, they had to work on Mondays and Fridays to cover for the absent coverage on weekends. Data for the project was however collected every day of the week including the days and hours that were not covered by the flow coordinator as it was found that the work done on the days with coverage affected patient flow during the periods that were not covered. Patient flow to inpatient beds was noted to be faster during the night shifts of covered days.

The results of the project are demonstrated in Figures 3, 4, and 5. The process measure, percent of patients transported to the unit within 30 minutes of a ready bed being assigned, increased from 17.9 percent in August to 36.6 percent in December. While the outcome measure, percent of patients admitted within 90 minutes of a written admission order, increased from 19.6 percent in August to 25 percent in December. The median percent of patients bedded within 90

minutes of admission order increased from 20.3 percent at baseline to 26.3 percent post-implementation of the LMP.

Other benefits that resulted from having a dedicated flow coordinator were better communication between the unit nurses, ED nurses, and hospital leadership. Moreover, the charge nurses on the unit and the ED stated that they were able to better support their nurses as they spent less time going through patient charts and nursing assignments to determine the appropriateness of patients being sent to the unit.

Discussion

The LMP was a timely intervention as it was implemented during the COVID-19 pandemic when it was critical for people in the community to have access to Emergency Services. Compared to December 2019, the region registered four times as many alerts on indicators of hospital crowding in December 2021 as seen in the Maryland Institute for Emergency Medical Service Systems (MIEMSS) data tracking system (MIEMSS, 2022).

The goal of this project was to decrease crowding in the ED by increasing the output rate of admitted patients. The results of the project showed that the LMP resulted in an overall improvement in the percent of patients that were bedded within 90 minutes of a written admission order from the pre-implementation to the post-implementation phase. To improve flow, processes such as timely movement of patients once a bed was assigned were critical. The implementation of the LMP ensured good coordination with the transportation and environmental services departments. This led to an expected increase in the percent of patients that were transported within 30 minutes of an assigned ready bed. Nevertheless, the goal of improving these measures to 100 percent may have been over-ambitious, especially during a co-

occurring pandemic and staff shortage. However, it is even more remarkable that despite the conditions, positive steps were made towards improvement goals.

Healy-Rodriguez et al. (2014) implemented a similar project over one year and compared data from the year before implementing the LMP and during the year when the LMP was in place. They reported ED placement time which was defined as the median minutes it took to place a patient into an inpatient bed after an admission order was written, among other measures. Although the median number of minutes for ED placement decreased from 219 to 193 minutes, the percentage of patients bedded within 120 minutes only increased from 19% to 21%. Thus, the results of the projects compare similarly, with this project showing even better improvement. The outcome measure, percent of patients admitted within 90 minutes of a written admission order, had limited validity in measuring the output rate for admitted patients in the Emergency room. It failed to capture the overall improvement in patient flow as seen in the Healy-Rodriguez project.

There were several limitations to this project. First, the ongoing pandemic led to staffing shortages. The hospital staffing priority was targeted toward patient care hence, there was a lack of a dedicated logistics flow coordinator at the beginning of the project. Secondly, the role of the logistics flow coordinator was later filled by a staff member who had no nursing leadership experience and thus had to be trained on the job. Lastly, there was high nurse turnover throughout the project hence staff that were initially trained fell off and new staff had to be continually trained, along with their additional responsibilities

Conclusion

Emergency Department crowding has implications for access to care for patients that

need Emergency services. The Institute of Medicine called for hospitals to implement

interventions that will improve patient flow (IOM, 2006a). The Logistic Management

Program, using an Electronic Bed board and a flow coordinator, satisfies this requirement

and has been shown in the literature to improve patient flow from the ED to inpatient units.

Given the limitations of this project, it will be premature to conclude that the LMP only

causes a small change in patient boarding times. It will be interesting to monitor the data for

several months as seen in other studies. This Community hospital has already trained and

launched the program in all inpatient units. Again, a job description has been written and

approved for the Logistics flow coordinator and charge nurses of other inpatient units have

received the education material that will help them understand the role of the flow

coordinator.

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chHospital=Bowie+Health+Center+%28UMCRH%29&hdWhichHospitalName=Bowie+

Health+Center+%28UMCRH%29&hdStartDate=2021-12-01&hdEndDate=2021-12-

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tFileName=AlertSummary-RegionV-For-2021-12-01-To-2021-12-31.xls&hdPrint=1

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*. https://doi.org/10.1371/journal.pone.0203316

Table 1

Evidence Review Table

Citation: Healy-Rodriguez, M. A., Freer, C., Pontiggia, L., Wilson, R., Metraux, S., & Lord, L. (2014). Impact of a logistics management program on admitted patient boarders within an emergency department. *Journal of Emergency Nursing*. https://doi.org/10.1016/j.jen.2012.12.008					Level III
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
The purpose of this study was to assess the use of a Logistic Management program (LMP) as an expansion to the bed management process to decrease Emergency Department Length of Stay (EDLOS), Emergency Department (ED) placement times, and Inpatient Length of Stay (IPLOS)	Quasi-experimental before and after implementation of an LMP	**Sample size** 28,684 total participants **Eligibility Criteria** -Patient admitted through the ED only -Patient in admission orders who were discharged prior to accessing an inpatient bed **Excluded** Patient who presented to ED to meet their PCP and were directly admitted without ED processing **Control** 13,852 patients admitted in 2008 **Intervention** 14832 patients admitted in 2009	**Control Process** Historical control process, retrospective data from January 2008 to December 2008 prior to implementation of intervention **Intervention Protocol** Institution of Logistic Management program. **Operationalization** The LMP will be an expansion of the existing bed management process. It will include a logistics manager who is a clinical liaison that will work collaboratively with members of the multidisciplinary team both inpatient and in the ED to eliminate bottlenecks and facilitate patient throughput processes	**ED Evaluation Time** The time from registration to the ED until a provider order for admission is written **ED Placement Time** Time from admission order to discharge from ED and placement in an inpatient bed **ED Length of Stay** ED evaluation plus ED placement time **Inpatient Length of Stay** Time from admission order to discharge from hospital	**Data Analysis** Multivariate linear regression analysis was used to analyze the data. A natural logarithmic transformation of the outcome measures was also computed with a significance level set at p<.05 **Results** **ED Evaluation time** Median for 2008: 219min (IQR 178min) and 2009: 207min (IQR 171min) P<.001 **ED Placement times** 2008: 219min (IQR,259min) 2009:193min (IQR, 158min) P<.001 **IPLOS** 2008: 3.93days (IQR`, 4.9days) 2009: 3.83days (IQR, 4.7days) P<.001

					A difference of 0.1 days translates to 1,483 inpatient days for the year 2009
Citation: 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*. https://doi.org/10.1371/journal.pone.0203316					Level I
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
The purpose of this systematic review was to provide a critical analysis of peer-reviewed research studies that explored the causes, consequences and solutions to Emergency Department overcrowding.	Systematic review of peer reviewed studies	**Search Strategy** PRISMA guidelines were followed. 4 electronic databases, Medline, CINAHL, EMBASE and Web of Science were searched with the following search terms "emergency department" 'accident and emergency', 'ED', 'emergency service' "AND" 'crowding', 'overcrowding', 'utilization', 'congestion' "AND" "OR" 'consequences', 'outcomes', 'harm', 'negative impact', 'mortality', 'causes' 'strategies', 'solutions', 'interventions' **Inclusion Criteria** English language, published between January 2000 to June 2018, full test original research, published in peer reviewed journal,	For the purposes of this Review, interventions included are for the solutions that affect output in the ED -**Bed Management** 4 studies included this intervention. A bed manager was introduced who assessed bed availability in real time and could triage and admit patients. Also, they utilized a bed director who could call in resources to facilitate patient movement -**Leadership programs/ Leadership support** 3 studies examined leadership involvement, collaboration, and support in expediting hospital admissions 2 studies examined the relationship between	-Emergency Department length of stay -Boarding time -Hours of ambulance diversion -Number of patients who Left without being seen (LWBS)	**Bed Management** -For admitted patients there was an average decrease of EDLOS by 98 minutes in one study in addition, there was a reduction in the number of hours the hospital was on alert -Another study resulted in a 21% decrease in EDLOS and 52% decrease in mean boarding time **Leadership programs/leadership support** 2 studies demonstrated a positive correlation between hospital leadership involvement and hospital performance in timed admission targets 1 study demonstrated a 16% increase in the number of admitted patients that were bedded within 6 minutes of the decision to admit, it also reported a decrease in boarding times, LWBS, and

| | | investigating causes and /or consequences, and /or solutions to crowding in the ED **Exclusion Criteria** Studies done in the pediatric ED

-102 studies were included in the review -52 studies investigated solutions to reduce ED overcrowding -40 studies investigated potential consequences of ED overcrowding -14 studies investigated causes of ED overcrowding | leadership involvement and hospital performance

Alternative admission Policies -2 studies implemented a 14-bed monitored unit staffed by the ED -1 study utilized empty bed throughout the hospital in out of hours periods -2 studies provided the ED with extra assistance from hospital leaders and specialist during times of crowding | | hours of ambulance diversion. An Australian study reported a decrease in EDLOS

Alternative admission Policies -The first study reported a significant decrease in LWBS and ambulance diversion times -The second study reported a significant reduction in mean EDLOS - The study that utilized empty beds reported no change in EDLOS for patients eligible for admission under that model when other patients experienced and increase in EDLOS -The later studies also reported a decrease in EDLOS with one maintaining this over 6 years and the other also reporting a decrease in ambulance diversion times |

Citation: Cohen, R. I., Kennedy, H., Amitrano, B., Dillon, M., Guigui, S., & Kanner, A. (2015). A quality improvement project to decrease emergency department and medical intensive care unit transfer times. *Journal of Critical Care*. https://doi.org/10.1016/j.jcrc.2015.07.017					Level IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
The aim of this study was to reduce the transfer time of critically ill patients admitted to the medical intensive care unit (MICU) by 25%	The design of the study was a prospective, observational study assessing pre and post implementation of the quality improvement intervention	**Sample size** -Pre intervention (1 year before) MICU admissions from ED: 865 patients -Post Intervention (1 year after) MICU admissions from ED: 834 patients	Clinical Microsystems approach using Plan-Do- Study-Act model to identify and change causes of delay in both the ED and MICU **Process changes in the ED** -Create position of an ED transfer nurse -ED transfer nurse and MICU charge nurse notified as soon as patient is accepted to MICU -Transfer nurse ensures patient is ready for transfer **Process changes in the MICU** **-**Identify patients for transfer prior to 8am -MICU resident to leave rounds to complete patient transfer -Special needs for patient such as telemetry or dialysis are ascertained, and family is informed	-Overall transfer time measured in hours -Transfer times in the winter months (December to February)- measured in hours	**Data analysis** Sigma plot 12.1 was used for statistical analysis Normally distributed results were expressed as means and standard deviations and nonnormally distributed results were expressed as median and interquartile range **Overall transfer time** -Preintervention Median 4.2 hours (IQR, 3.4-5.7) hours -Postintervention Median 2.2 hours (IQR, 1.4-3.1) hours P<.001 This was a 48% decrease comparred to their goal of 25% There was also a decrease in transfer times in the winter months for 3 years post intervention

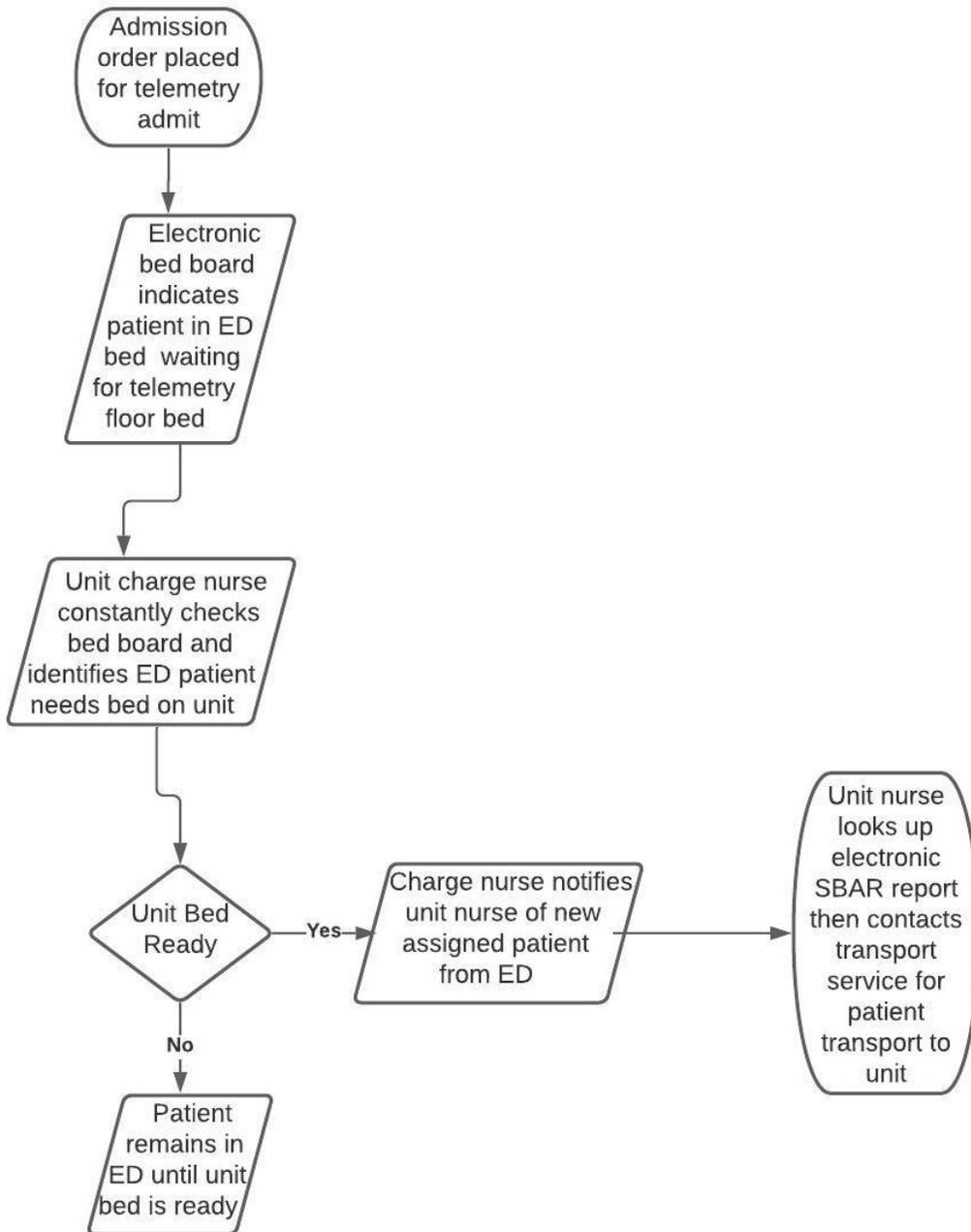|					
			-Partner with transportation supervisor and Environmental services supervisor to priorities MICU transfers and room cleaning, respectively -ED nurse gives report to MICU nurse as soon as patient is accepted		

Table 2

Synthesis Table

Evidence Based Practice Question (PICO): Does a Logistics Management Program; which includes aggressive bed management, and a clinical liaison/coordinator, decrease the time from entering admission orders to bedding adult patients admitted to the telemetry unit from the Emergency Department?			
Level of Evidence	**# Of Studies**	**Summary of Findings**	**Overall Quality**
I	1	Morley et al. (2018), in a systematic review identified causes, consequences and solutions to Emergency Department overcrowding. They divided these based on several phases of the patient process: input, throughput, and output. Based on the focus of this Evidence review, solutions in the output phase were focused on. 3 interventions that were found in the literature search included bed management, leadership services/ leadership support, and other alternative admission policies which included: creating monitored units managed by the ED, using closed beds during out of hour periods and providing the ED with extra leaders during periods of overcrowding. The overall results of these interventions led to decreases in Emergency Department length of stay, Boarding time, Hours of ambulance diversion and Number of patients who Left without being seen (LWBS)	B, this review included 52 studies that analyzed solutions to ED crowding, there were only 4 randomized controlled trials included, the rest of the studies were peer reviewed quantitative, qualitative, and mixed method studies. The search strategy was well defined and reproducible, inclusion and exclusion criteria were clearly stated. The process of review of the articles was also explained and the PRISMA guidelines were followed.
II	1	Healy-Rodriguez et al. (2014) in a quasi-experimental study, assessed the use of a Logistic Management program as an expansion to the bed management process to decrease Emergency Department Length of Stay (EDLOS), Emergency Department (ED) placement times and Inpatient Length of Stay (IPLOS). The study revealed an overall decrease in; ED Evaluation time 219min (IQR 178min) vs 207min (IQR 171min)	B, this was a quasi-experimental study which poses a threat to internal validity due to lack of randomization, there however, was a historical control in this study. A power analysis was not performed, but the sample size was large, n=28,684 and equally distributed between the control and intervention group. Also, there was no significant difference in the demographics of the control and intervention group. Appropriate statistical methods were used for analyzing

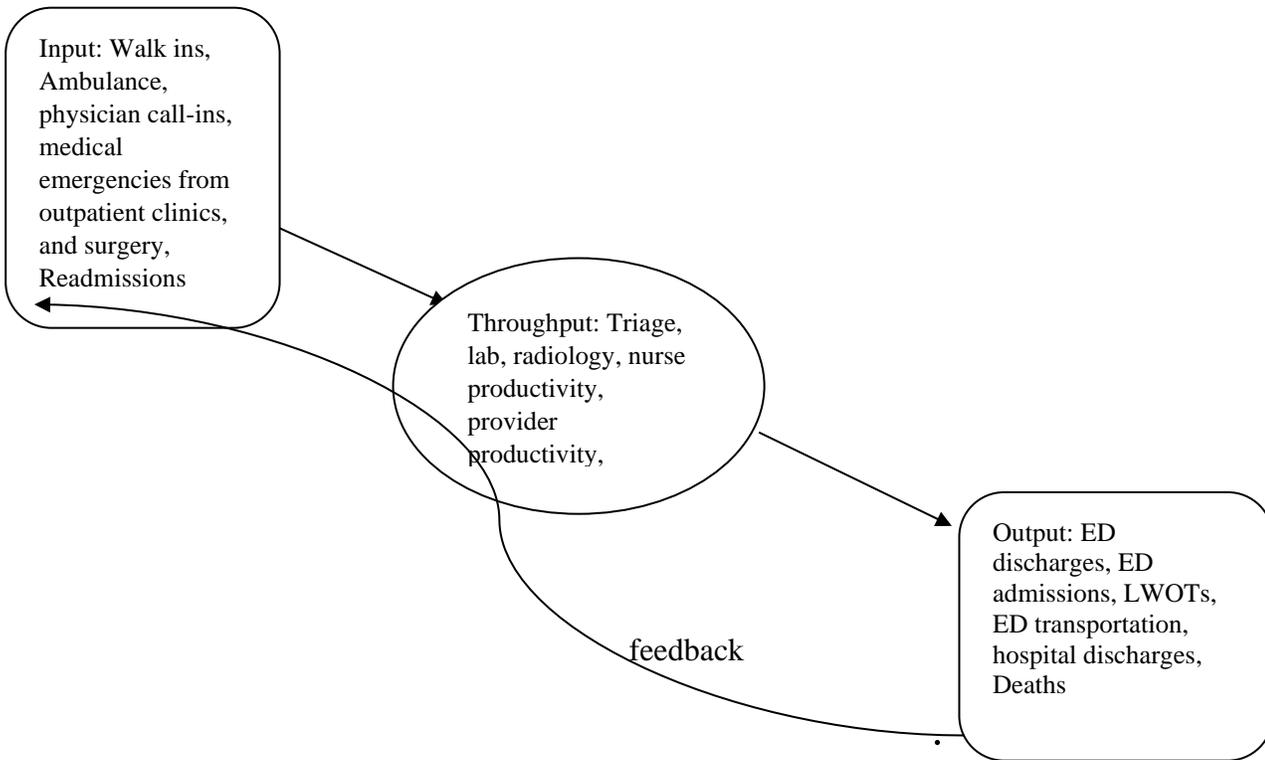|		P<.001, ED Placement times 219min (IQR,259min) vs 193min (IQR, 158min) P<.001, and IPLOS 3.93days (IQR, 4.9days) vs 3.83days (IQR, 4.7days) P<.001 from 2008 to 2009. With a difference of 0.1 days translating to 1,483 inpatient days for the year 2009	results and limitations of the study were discussed which demonstrates credibility of the researchers.
IV	**1**	Cohen et al. (2015) in a quality improvement project implemented a team approach using microsystems to identify bottlenecks and implement changes using PDSA to test changes in the process of transferring admitted patients from the ED to the MICU. They achieved a 48% decrease in transfer times compared to their goal of 25% and were able to sustain this for 3 years when they stopped monitoring	C, Although the results were consistent and sustained over three years, there was small sample size which was also not clearly defined. In the same setting, the same process was trialed for admissions to regular wards, there was a non-significant decrease in transfer time in 1 year and this was not sustained in the subsequent year. Also, the evidence base for the proposed changes were not provided

Figure 1

*Process Flow Map prior to Implementation*

Figure 2

General Systems Theory

Input: Walk ins, Ambulance, physician call-ins, medical emergencies from outpatient clinics, and surgery, Readmissions

Throughput: Triage, lab, radiology, nurse productivity, provider productivity,

Output: ED discharges, ED admissions, LWOTs, ED transportation, hospital discharges, Deaths
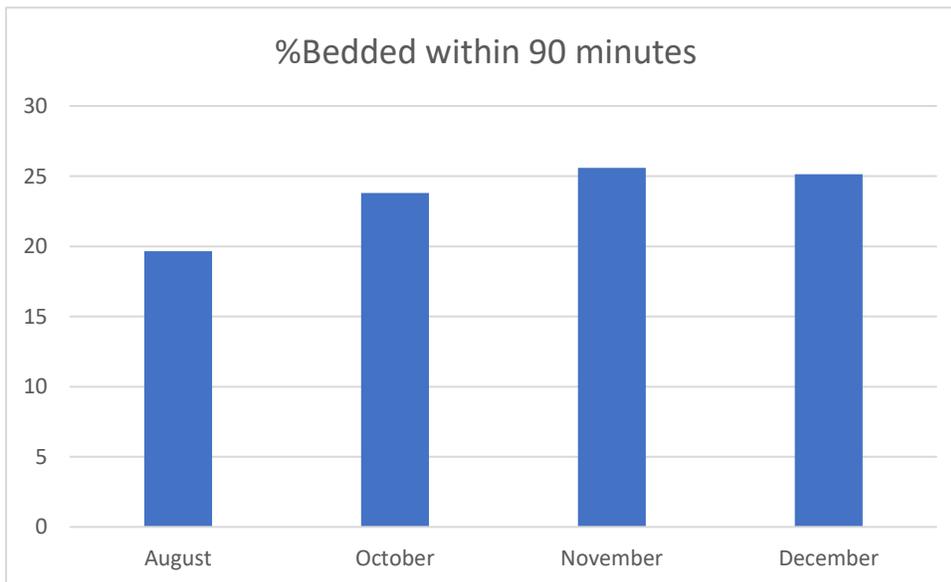
feedback

Figure 3

Monthly Bar Chart of Percent of Patients Transported within 30 minutes of Ready Bed Assignment
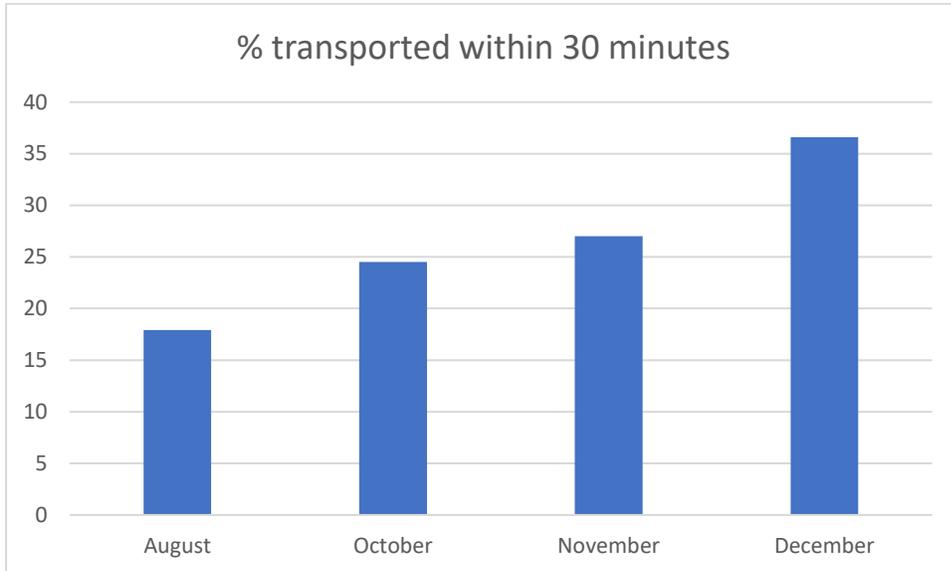
Figure 4

Monthly Bar Chart of Percent of Patients Bedded within 90 Minutes of Written Admission Order

Figure 5

Run chart of Percent of Patients Bedded within 90 Minutes of Written Admission Order

Graph of percent of patients bedded within 90 minutes of Admission orders weekly