Summer 8-7-2018

Optimizing ICU Throughput to Neurology Unit

Mina B. Mai
minabmai@yahoo.com

Optimizing Intensive Care Unit Throughput to Neurology Unit

Mina Mai

University of San Francisco

Optimizing Intensive Care Unit Throughput to Neurology Unit

Abstract

Due to competition for resources in the hospital setting, efficient processes are essential to functioning. One of the critical factors that influence efficient healthcare delivery is throughput, the movement of the patient through the system. Hospitals, therefore, strive to provide the right care to the right patient at the right time both to meet the individualized needs of the patient and to ensure economic viability. The intensive care unit (ICU) in this project specializes in neurological services. When these ICU patients stabilize, they are typically transferred to the neurology unit for continued specialty care. The neurology unit is regularly at capacity and unable to accept stabilized ICU patients. A process to transfer specific neurology patients to our medical-surgical orthopedic unit to decompress the neurology unit and free up beds for stabilized ICU patients was implemented. Outcomes were tracked to evaluate the success of the new process which included boarding time in the ICU, number of neurology patients cared for on the medical-surgical unit, and capacity of the ICU, neurology, and medical-surgical units. The results showed that unit capacity for ICU and neurology unit did not reach full capacity, boarding minutes from ICU to the neurology unit decreased from 5.13 to 4.62 hour, and ICU boarding time was reduced to 51 minutes after the intervention. Conclusions from this work reveal that caring for specific neurology patients on the medical-surgical unit has decreased ICU to neurology boarding time, aided in the ICU and neurology unit remaining below full capacity, and therefore able to admit patients who are needing the appropriate level of care.

Introduction

There is immense competition for resources in a hospital setting. Improving patient throughput is one strategy to provide the right care to the right patient at the right time. The

intensive care unit (ICU) is the admitting unit for patients with critical medical needs. The ability to admit is dependent on bed availability as influenced by discharges and transfers. Depending on bed availability in other units, patients may be held in an ICU setting when they no longer need an ICU level of care, which is an inefficient use of resources (Mathews and Long, 2015; Howell, 2011; Johnson et al., 2013). Optimizing ICU throughput can decrease ICU length of stay and allow for the treatment of more critically ill patients (Reddy et al., 2015). The inability of the ICU to admit patients adversely affects hospital-wide patient throughput, particularly the ED and postoperative units, and is associated with increased mortality in critically ill patients waiting for an ICU bed (Mathews and Long, 2015; Cardoso et al., 2011; Chaflin et al., 2007). As seen in a neurological ICU population, increased emergency department wait times of up to five hours were associated with increased mortality (Morris et al., 2016).

Problem description

When patients with neurological problems are no longer considered critically ill, they are transferred to the neurology unit. The project focus is to optimize throughput of stabilized ICU patients to the neurology unit by creating admitting capability on the neurology unit. While most of the patients have specialized neurological needs, there is a subset of patients who could be transferred to a generalized medical-surgical unit.

Through optimization of ICU throughput, we will be able to meet key provisions of hospital value-based purchasing reimbursement as established by Medicare as part of the Affordable Care Act of 2010, that is based on quality of care and care coordination of patients (Penner, 2017). Providing the highest quality care will decrease hospital-acquired pressure ulcers, falls, clostridium difficile, hospital-acquired pneumonia, and catheter-associated urinary tract infections (Reddy et al, 2015). Improved patient

outcomes are monitored by CMS and play a role in hospital reimbursement. Improving ICU throughput maximizes efficiency, decrease unnecessary hospital costs, promotes optimal ICU utilization, and ensures highest quality of care to more patients.

The ICU has a capacity of 20 licensed beds, budgeted for eleven beds with a 6 to 10-day turnover per bed. The nursing staff is a blend of new hires and travel nurses, as well as nurses that have worked there for 15 to 30 years, or more. There has been a recent transition in management, and three new assistant nurse managers have been hired; one of whom left after three months.

The key stakeholders in this system are nurses, support staff, and physicians. A representative from each discipline was identified with the help of leadership and invited to participate. Stakeholders were selected based on their role as leaders in their respective departments, their understanding of the factors that impact patient flow, and their enthusiasm about addressing this issue. Patient outcomes as described in the literature were shared with the stakeholders as well as the operational picture of the ICU. Stakeholders were asked to share their opinions and ideas, and their contributions were regularly acknowledged.

To learn more about the transfer process from the ICU to the neurology unit ICU staff members were interviewed. Common themes described were: not enough staffed beds in the neurology unit, unavailability of transport staff, neurology unit at capacity, lack of environmental services support in neurology unit, transfer orders written after 11:00 am due to timing of multidisciplinary rounds, and ICU handoff report done twice (phone report and bedside report). These opportunities were recorded and prioritized by the team.

The multidisciplinary team will initially map out the ICU to neurology unit patient transfer process. This visual representation of the transfer process will identify inefficiencies and

barriers, as well as processes that work well. Also, the team will consider information gathered from the staff interviews. The team will then collaborate and agree on three top priorities. The team will meet as a group approximately five times to assess, plan, implement, and evaluate, in addition to ongoing individual work. For example, as identified by staff interviews, the earlier the bed transfer request is put into the system, the less the wait time, therefore, an initial intervention could be to put in the transfer request before multidisciplinary rounds.

There are several potential barriers to change in this setting. As mentioned, this is a blended level of experience unit with new leadership. Some of the nurses and the assistant nurse managers are new to their roles and are learning the systems and processes which may prevent them from understanding the present state and limit their ability to lead change. Hospital staff are continually introduced to new initiatives, some recent examples include the new email software and the electronic medical record update, our interventions may be viewed as another task they have to do if commitment is waning. Lack of effective communication could also be a barrier as this is a multidisciplinary effort that involves other units. Methods of communication differ between disciplines and units. Developing a communication plan is key to people understanding why this initiative was undertaken, the aim, their role, and to give the project visibility. Other potential barriers are leadership support and financial resources.

To address potential barriers related to communication, the team will develop a communication plan including the reasons the initiative was undertaken, the aim, and the key roles. While senior leadership is supportive of improving ICU throughput we understand that if our project needs resources there may be competing needs. We will provide regular project updates and make a financial argument in favor of request for resources.

There are many potential incentives for change in this setting, the first being that patients receive the appropriate level of high-quality care; thus, decrease hospital-acquired pressure ulcers, falls, clostridium difficile, hospital-acquired pneumonia, and catheter-associated urinary tract infections. From a financial perspective, transferring patients who no longer require a critical level of care is a conservation of resources. Effective communication is a cornerstone of this project. Our success in this will likely improve the engagement and satisfaction of the ICU team.

Available knowledge

The PICOT question that guided the search for evidence in this project was: In Intensive Care Unit patients with neurological issues (P), how does throughput with designated time (I) compared to delay in transfer (C) affect optimization (O) by December 2018 (T). A comprehensive electronic search was conducted in September 2016 reviewing evidence that examined the CNL role in acute care hospitals and CNL patient and system outcomes in the following databases: Cochrane Database of Systemic Reviews, CINAHL Complete, Pub Med, Scopus, and Joanna Briggs. These databases were searched using combinations of the following search terms: clinical nurse leader, patient outcomes, outcomes and clinical nurse leader role. Limitations were set to include English only, research, systemic reviews, randomized controlled trials, and publication dates no earlier than 2009. The search yielded 153 articles. Articles were considered for inclusion if they included analysis of both the CNL role and CNL outcomes. Exploratory articles, opinion pieces, and reviews without reference to outcomes of the CNL role were excluded. Seven articles met inclusion and exclusion criteria and were selected for review. The Research Evidence Appraisal Tool (Dearholt & Dang, 2017) was used to appraise the evidence for this review. The appraisal tool (See Appendix A and B) includes criteria to evaluate

the strength and quality of the evidence. See Appendix C of the synthesis of existing literature and evaluation table.

Rationale

Kotter's change theory interspersed with transformational leadership theory will help guide staff and management in accomplishing this change project. In transformational leadership the support of leadership and key stakeholders are crucial to creating change. These leaders will establish high standards and understand the strategic direction of the organization (Boamah et al., 2017). Effective leaders elicit and incorporate the ideas and solutions of frontline staff and acknowledge team members for their contributions. Communication is key to engaging stockholders and formulating a shared vision. A transformational leader is aware of the strengths and weaknesses of staff members and will coach and mentor specific to these individual traits.

In Kotter's view, implementing and sustaining a change will be successful when staff feels empowered, valued, and have a buy-in which can potentially extend the transition beyond the initial goal and secure it as part of the new culture (Nelson et al., 2007). The consistent delay of patient transfers from the ICU to the neurology unit highlights a need to understand the current state, contributing factors, and the impact on the delivery of patient care in the ICU to create a change in environment.

To manage potential barriers, several strategies were utilized. First, the nursing team includes both new and tenured nurses. The new nurses' have the ability to share experiences from outside medical facilities. The nurses seasoned on this unit will be able to share their insights specific to the functioning of this unit and hospital, and can anticipate measures to decrease resistance to the change. The nurse manager has identified her team lead for the project. To reduce staff burnout as to new initiatives the

team worked with unit management and senior leadership to calendar the rollout of our interventions so as to avoid other significant rollouts, as much as possible. Stakeholders in both units are enthusiastic about addressing these issues and understand the factors impacting patient throughput.

Specific project aim

The specific aim of this project is to optimize ICU (5N) patient throughput specifically by reducing to two hours or less the time from when a transfer order to the neurology unit (5S) is written to the time the patient leaves the unit (See Appendix D). This goal will be accomplished by December 2018.

Context

One of the essential components of any health care system is a clinical microsystem (Nelson, Batalden & Godfrey, 2007). An assessment of this ICU microsystem using the Dartmouth Microsystem Assessment Tool (The Dartmouth Institute, 2015) was conducted with data collected between July 2016 – February 2017.

The ICU specializes in neurological services, and patients are transferred from other facilities to receive specialized neurological care. The top ten diagnoses of the patients were neurologic in nature, with brain hemorrhage being the leading diagnosis (10.1%). The major point of entry for admissions were neurosurgery (45.2%), medical-surgical telemetry/oncology (11%), medical-surgical orthopedic (12%), and outpatient clinics (7%). There are five intensivists; three ICU intensivists and two neurosurgery intensivists. Additional members include patient care coordinators, registered nurses (37.5 FTE's with a vacancy of 2.8 FTE's), clinical nurse specialist (.8 FTE), respiratory therapists, social worker, assistant department

managers, unit manager, nutritionists, pharmacists, and occupational therapists. The team also includes unit assistants (1 FTE), and patient care technicians (1 FTE).

The following are used and initiated in caring for the ICU patient: standing orders/critical pathways, rapid response team, bed management rounds, multidisciplinary with family rounding, preceptor/charge role, and discharge goals. Nurse knowledge exchange occurs at change of shift between the incoming and outgoing nurse. A staff meeting is held on a monthly basis to review safety, discuss issues, and gather feedback. An assistant nurse manager huddles staff daily, on all shifts, to keep them abreast of new information, address issues at the moment, and set the tone for a positive shift. Implementation of nurse knowledge exchange (NKE), and auditing medication passages (as per CALNOC guidelines) have both promoted patient safety. The ICU is meeting its budget through a predictive staffing model.

A SWOT analysis was conducted and revealed teamwork and low rates of harm events are strengths in the ICU, while throughput and high risk, low volume, procedures are weaknesses. Threats include unbalanced staffing and throughput. Opportunities include staffing, bed availability, and throughput. Throughput is a common theme throughout the SWOT analysis (See Appendix E). Quality metrics for ICU were obtained from January to July 2017. For this period, there were two falls, one hospital-acquired pressure injury, two clostridium difficile infections, one hospital-acquired pneumonia, and one catheter-acquired urinary tract infection. The ICU is meeting the ambulation unit target of greater than 50%.

The average length of stay in the ICU is between 6 to 10 days. The cost of a 6-day length of ICU stay is approximately $72,000. When a patient is boarded in the ICU awaiting a bed in the neurology unit for two days, the associated cost is $24,000. This cost is a total of $96,00 (See Appendix F, Financial Analysis).

Intervention

Several interventions were considered by the team. The PDSA cycle format (See Appendix G) was used during this phase of the project. Initial consideration was given to hiring an "admit nurse" who would move between the ICU and neurology unit and assist with transfers and admissions. A business plan was presented to the Chief Financial Officer (CFO) which was not approved due to a small return on investment. Attention then turned to the possibility of opening up beds on a currently closed unit which was envisioned as being an "overflow" area for the neurology unit. A business plan was again presented to the CFO. This intervention was also not approved as it was viewed as too complicated and costly. A business plan was prepared and presented with the intent to create a discharge lounge where patients who were medically discharged but were unable to leave the hospital at the time of the discharge order could be transitioned. The CFO also declined this proposal as hospital-wide capacity does not justify the associated expense. Our work thus far has suggested that the most viable intervention is the opportunity to transfer specific neurology patients to our medical-surgical orthopedic unit (7S) with the goal of decompressing the neurology unit and therefore freeing up beds for stabilized ICU patients. We first reviewed bed occupancy rate by unit and found the medical-surgical unit had a significantly lower occupancy rate, by almost 10%, in contrast to the neurology unit (See Appendix H). Input from the critical care team, nursing units, and supporting disciplines culminated in the recommendation that patients with simple laminectomies, simple cervical laminectomies, and subdural evacuation port system(s) would be appropriate to receive care on our medical-surgical unit (7S).

Historically, medical-surgical orthopedic staff were previously trained to care for this patient population, though it was deferred until capacity issues arose, while at the same time, there was resistance from the staff. In December 2017, the nurses were re-trained to care for these patients with the inclusion of caring for post-op day 10 craniotomies awaiting bed placement for rehabilitation. The approximate cost of training was $22,808 (See Appendix I).

The unit began admitting this specific population in January 2018. This intervention has decompressed the neurologic unit affording ICU to admit patients, thus increasing its capacity. If this trend continues, we will look to the possibility of identifying additional patients who have undergone minimally invasive neurological procedures that could receive post-ICU care on the medical-surgical orthopedic unit. This population could include patients that have had TPA embolization, post-stroke, and simple thrombectomies. An educational plan will be developed to both maintain competency in caring for a patient with neurological needs and adding to that foundation to include the above described patient population.

Family of Measures and Measurement Strategy

To gather key stakeholder input, we used face-time to interview staff and leaders. Email and meetings were used to collaborate on and coordinate interventions, and to globally manage the project. The new ICU assistant nurse managers recommended keeping a ledger to track the following item: time of order for transfer, name of ordering physician, time of nursing telephone report, time of patient transfer, time of bedside report, and the reason for any delay. This recommendation for tracking patient transfer is plausible as this process is already in practice on other units. The ICU staff were educated on the intent of the ledger and how to use it. Unit assistant(s) have agreed to maintain the log throughout their shift.

Every week information from the log will be tallied and entered into an excel spreadsheet. Once a week the team will meet to review trends in any delays. A designee then collaborates with the pertinent manager to assess if there are any modifiable factors, and then to formulate a responsive plan.

We used outcome measures to assess our intervention. In addition to the data described above we also tracked the following outcomes: boarding time in the ICU, number of neurology patients cared for on the medical-surgical unit, and capacity of the ICU, neurology, and medical-surgical orthopedic units.

Ethical Considerations

Our work has illustrated we are not always able to provide the appropriate level of care to the patient, at the right time, due to throughput inefficiencies. Continued focus on throughput, management of resources, and understanding of unique patient needs guides us in this work. In alignment with the code of ethics for nurses in advocating for patients, we strive to meet the patient and their family where they are at, regardless of hospital functioning. The project was reviewed by faculty and is determined to qualify as an Evidence-based Change in Practice Project, rather than a Research Project. Institutional review board (IRB) review is not required (See Appendix J, IRB Non-Research Determination Form).

Results (Outcome measure results)

Unit capacity for ICU and neurology unit did not reach full capacity while the medical-surgical unit increased capacity. Current boarding minutes from ICU to the neurology unit have decreased from 5.13 to 4.62 hours (See Appendix K). Our data highlights there has been a reduction of 51 minutes in ICU boarding time since our intervention. Bed occupancy rate and the

number of ICU patient throughput delays to the neurology unit attributed to no available bed capacity have also improved this year (See Appendix L).

Summary

Our group has identified that patients are boarded in the ICU because the neurology unit is either at capacity or is not staffed to take admissions. The team identified a subset of ICU, neurology, and other post-procedure neurology patients appropriate for transfer to the medical-surgical unit. Our intervention has been successful in decreasing ICU boarding time and impacting capacity such that the ICU and neurology unit can admit patients. Specifically, the return of investment (ROI) on this intervention has decreased ICU to neurology unit boarding time by 51 minutes. This reflects cost savings, provision of the appropriate level of care, and allows for care of patients in other departments with critical care. In addition, this intervention has impacted capacity in the ICU and neurology unit such that both units have been able to admit patients, ensuring provision of the appropriate level of care. Our intervention has also created bed availability on the neurology unit which in turn creates bed availability in the ICU. We have also seen an increase in the capacity of our medical-surgical unit which creates financial gains. Given the success of our program it is envisioned additional patient populations will be identified as being appropriate to receive care on the medical-surgical unit.

Conclusion

Our intervention has been successful in decreasing ICU boarding time and impacting capacity to allow the neurology unit and ICU to admit patients. The intervention has saved costs by decreasing ICU boarding time and improved flow such

that the ICU and neurology unit have the ability to admit patients. The intervention can be expanded to consider other patient populations that could be cared for on our medical-surgical unit. Sustainability will include maintaining staff competency and ensuring excellent patient outcomes. We have found that by thoughtful consideration of patient needs we can improve throughput and deliver individualized care.

References

American Association of Colleges of Nursing. (2013). *Competencies and Curricular Expectations for Clinical Nurse Leader Education and Practice*, 1-40. Retrieved from http://www.aacnnursing.org/Portals/42/AcademicNursing/CurriculumGuidelines/CNL-Competencies-October-2013.pdf

American Nurses Association. (2015). *Code of Ethics for Nurses with Interpretive Statements.* Retrieved from https://www.nursingworld.org/practice-policy/nursing-excellence/ethics/code-of-ethics-for-nurses/

Bender, M., Connelly, C. D., Glaser, D., & Brown, C. (2012). Clinical nurse leader impact on microsystem care quality. *Nursing Research, 61(5),* 326-332. https://doi.org/10.1097/NNR.0b013e318265a5b6

Boamah, S. A., Spence Laschinger, H. K., Wong, C., & Clarke, S. (2017). Effect of transformational leadership on job satisfaction and patient safety outcomes. *Nursing Outlook*, 1-10. https://doi.org/doi.org/10.1016/j.outlook.2017/10.004

Butterfield, S. (2013). Too many or too few: who belongs in the ICU? *ACP Hospitalist*. Retrieved from https://acphospitalist.org

Cardoso, L. T., Grion, C. M., Matsuo, T., Anami, E. H., Kauss, I. A., Seko, L., & Bonametti, A. M. (2011). Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study. *Critical Care*. https://doi.org/10. 1186/cc9975

Chalfin, D. B., Trzeciak, S., Likourezos, A., Baumann, B. M., & Dellinger, R. P. (2007). Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Critical Care Medicine, 35,* 1477-1483. https://doi.org/10. 1097/01.CCM.0000266585. 74905.5A

Dang, D., & Dearholt, S. (2017). *Johns Hopkins nursing evidence-based practice: model and guidelines.* 3rd ed. Indianapolis, IN: Sigma Theta Tau International

Harris, J. L., Roussel, L. A., & Thomas, P. L. (2018). *Initiating and sustaining the clinical nurse leader role a practical guide* (3rd ed.). Burlington, MA: Jones & Bartlett Learning.

Howell, M. D. (2011). Managing ICU throughput and understanding ICU census. *Current Opinion Critical Care, 17:* 626-633. https://doi.org/10.1097/MCC.0b013e32934b3e6e

Johnson, D. W., Schmidt, U. H., Bittner, E. A., Christensen, B., Levi, R., & Pino, R. M. (2013). Delay of transfer from the intensive care unit: a prospective observational study of incidence, causes, and financial impact. *BioMed Central, 17 (4): R128*. https://doi.org/10.1186/cc12807

Kibler, J., & Lee, M. (2010). Improving patient transfer between the intensive care unit and the medical/surgical floor of a 200-bed hospital in Southern California. *Journal for Healthcare Quality, 33, No.1,* 68-76. Retrieved from http://www.usfca.edu/library

King, C. R., & Gerard, S. O. (2016). *Clinical Nurse Leader Certification Review* (2nd ed.). New York, NY: Springer Publishing Company, LLC.

L'Ecuyer, K. M., Shatto, B. J., Hoffman, R. L., & Crecelius, M. L. (2016). The certified clinical nurse leader in critical care. *Dimensions of Critical Care Nursing, 35 / No. 5*, 248-254. https://doi.org/10: 1097/DCC.0000000000000202

Lee, J. C., Horst, M., Rogers, A., Rogers, F. B., Wu, D., Evans, T., & Edavettal, M. (2014). Checklist-styled daily sign-out rounds improve hospital throughput in a major trauma center. *The American Surgeon, 80*, 435-440. Retrieved from https://www-ncbi-nlm-nih-gov.ucsf.idm.oclc.org/pubmed/24887721

Matthews, K. S., & Long, E. F. (2015). A conceptual framework for improving critical care patient flow and bed use. *AnnalsATS, 12(6),* 886-894. https://doi.org/10.1513/AnnalsATS.201409-4190C

Morris, N. A., Biffi, A., & Cohen, A. B. (2016). Transfer delays from the neurologic intensive care unit: a prospective cohort study. *The Neurohospitalist, 6(2),* 59-63. https://doi.org/10.1177/1941874415603426

Nelson, E. C., Batalden, P. B., & Godfrey, M. M. (2007). *Quality by design: a clinical microsystems approach* (1st ed.). San Francisco, CA: Jossey-Bass.

Penner, S. J., (2017). *Economics and financial management for nurses and nurse leaders* (3rd edition). New York, NY: Springer Publishing Company, LLC

Reddy, A. J., & Guzman, J. A. (2016). Quality improvement process in a large intensive care unit: structure and outcomes. *American Journal of Medical Quality, 31(6),* 552-558. https://doi.org/10.1177/1062860615593999

Reddy, A. J., Pappas, R., Suri, S., Whinney, C., Yerian, L., & Guzman, J. A. (2015). Impact of throughput optimization on intensive care unit occupancy. *American Journal of Medical Quality, 30(4),* 317-322. https://doi.org/10.1177/1062860614531614

The Dartmouth Institute (2015). Microsystem assessment Tool. Retrieved from: http://www.clinicalmicrosystem.org.

Appendix A

Table 1

Johns Hopkins Nursing Evidence-Based Practice Non-Research Appraisal Tool

Evidence level and quality rating:		_____
Article title:		Number:
Author(s):		Publication date:
Journal:		
Setting:	Sample (composition and size):	
Does this evidence address my EBP question?	❑ Yes	❑ No Do not proceed with appraisal of this evidence.

❑ **Clinical Practice Guidelines LEVEL IV** **Systematically developed recommendations from nationally recognized experts based on research evidence or expert consensus panel** ❑ **Consensus or Position Statement LEVEL IV** **Systematically developed recommendations, based on research and nationally recognized expert opinion, that guide members of a professional organization in decision-making for an issue of concern**		
■ Are the types of evidence included identified?	❑ Yes	❑ No
■ Were appropriate stakeholders involved in the development of recommendations?	❑ Yes	❑ No
■ Are groups to which recommendations apply and do not apply clearly stated?	❑ Yes	❑ No
■ Have potential biases been eliminated?	❑ Yes	❑ No
■ Does each recommendation have an identified level of evidence stated?	❑ Yes	❑ No
■ Are recommendations clear?	❑ Yes	❑ No
Complete the corresponding quality rating section.		

❑ **Literature review LEVEL V** **Summary of selected published literature including scientific and nonscientific such as reports of organizational experience and opinions of experts** ❑ **Integrative review LEVEL V** **Summary of research evidence and theoretical literature; analyzes, compares themes, notes gaps in the selected literature**		
■ Is subject matter to be reviewed clearly stated?	❑ Yes	❑ No
■ Is literature relevant and up-to-date (most sources are within the past five years or classic)?	❑ Yes	❑ No
■ Of the literature reviewed, is there a meaningful analysis of the conclusions across the articles included in the review?	❑ Yes	❑ No
■ Are gaps in the literature identified?	❑ Yes	❑ No
■ Are recommendations made for future practice or study?	❑ Yes	❑ No
Complete the corresponding quality rating.		
❑ **Expert opinion LEVEL V** **Opinion of one or more individuals based on clinical expertise**		
■ Has the individual published or presented on the topic?	❑ Yes	❑ No
■ Is the author's opinion based on scientific evidence?	❑ Yes	❑ No
■ Is the author's opinion clearly stated?	❑ Yes	❑ No
■ Are potential biases acknowledged?	❑ Yes	❑ No
Complete the corresponding quality rating.		

Setting	**Sample Composition/Size**		
■ Was the aim of the project clearly stated?	❑ Yes	❑ No	
■ Was the method fully described?	❑ Yes	❑ No	
■ Were process or outcome measures identified?	❑ Yes	❑ No	
■ Were results fully described?	❑ Yes	❑ No	
■ Was interpretation clear and appropriate?	❑ Yes	❑ No	
■ Are components of cost/benefit or cost effectiveness analysis described?	❑ Yes	❑ No	❑ N/A
Complete the corresponding quality rating.			

❑ **Case report LEVEL V** **In-depth look at a person or group or another social unit**		
■ Is the purpose of the case report clearly stated?	❑ Yes	❑ No
■ Is the case report clearly presented?	❑ Yes	❑ No
■ Are the findings of the case report supported by relevant theory or research?	❑ Yes	❑ No
■ Are the recommendations clearly stated and linked to the findings?	❑ Yes	❑ No

Complete the corresponding quality rating.		
Community standard, clinician experience, or consumer preference LEVEL V ❑ **Community standard:** Current practice for comparable settings in the community ❑ **Clinician experience:** Knowledge gained through practice experience ❑ **Consumer preference:** Knowledge gained through life experience		
Information Source(s)	**Number of Sources**	
■ Source of information has credible experience.	❑ Yes	❑ No
■ Opinions are clearly stated.	❑ Yes	❑ No ❑ N/A
■ Evidence obtained is consistent.	❑ Yes	❑ No ❑ N/A
Findings That Help You Answer the EBP Question		

Quality Rating for Clinical Practice Guidelines, Consensus, or Position Statements (Level IV)

A. **High quality**
Material officially sponsored by a professional, public, or private organization or a government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise clearly evident; developed or revised within the past five years.

B. **Good quality**
Material officially sponsored by a professional, public, or private organization or a government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise clearly evident; developed or revised within the past five years.

C. **Low quality or major flaw**
Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of included studies; insufficient evidence with inconsistent results; conclusions cannot be drawn; not revised within the past five years.

Quality Rating for Organizational Experience (Level V)

A. **High quality**
Clear aims and objectives; consistent results across multiple settings; formal quality improvement or financial evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence.

B. **Good quality**
Clear aims and objectives; formal quality improvement or financial evaluation methods used; consistent results in a single setting; reasonably consistent recommendations with some reference to scientific evidence.

C. **Low quality or major flaws**
Unclear or missing aims and objectives; inconsistent results; poorly defined quality; improvement/financial analysis method; recommendations cannot be made.

Quality Rating for Case Report, Integrative Review, Literature Review, Expert Opinion, Community Standard, Clinician Experience, Consumer Preference (Level V)

A. **High quality**
Expertise is clearly evident, draws definitive conclusions, and provides scientific rationale; thought leader in the field.

B. **Good quality**
Expertise appears to be credible, draws fairly definitive conclusions, and provides logical argument for opinions.

C. **Low quality or major flaws**
Expertise is not discernable or is dubious; conclusions cannot be drawn.

Appendix B

Table 2

Johns Hopkins Nursing Evidence-Based Practice Research Appraisal Tool

Evidence level and quality rating:		_____
Article title:		Number:
Author(s):		Publication date:
Journal:		
Setting:	Sample (composition and size):	
Does this evidence address my EBP question?	❑ Yes	❑ No Do not proceed with appraisal of this evidence.

Is this study:

- **QuaNtitative** (collection, analysis, and reporting of numerical data)

  Measurable data (how many; how much; or how often) used to formulate facts, uncover patterns in research, and generalize results from a larger sample population; provides observed effects of a

  program, problem, or condition, measured precisely, rather than through researcher interpretation of data. Common methods are surveys, face-to-face structured interviews, observations, and reviews of records or documents. Statistical tests are used in data analysis.

  Go to **Section I: QuaNtitative**

- **QuaLitative** (collection, analysis, and reporting of narrative data)

  Rich narrative documents are used for uncovering themes; describes a problem or condition from the point of view of those experiencing it. Common methods are focus groups, individual interviews (unstructured or semistructured), and participation/observations. Sample sizes are small and are determined when data saturation is achieved. Data saturation is reached when the researcher identifies that no new themes emerge and redundancy is occurring. Synthesis is used in data analysis. Often a starting point for studies when little research exists; may use results to design empirical studies. The researcher describes, analyzes, and interprets reports, descriptions, and observations from participants.

  Go to Section II: QuaLitative

- Mixed methods (results reported both numerically and narratively)

  Both quaNtitative and quaLitative methods are used in the study design. Using both approaches, in combination, provides a better understanding of research problems than using either approach alone. Sample sizes vary based on methods used. Data collection involves collecting and analyzing

  both quaNtitative and quaLitative data in a single study or series of studies. Interpretation is continual and can influence stages in the research process.

Go to **Section I** for QuaNtitative components and **Section II** for QuaLitative components

Section I: QuaNtitative

Level of Evidence (Study Design)

A. Is this a report of a single research study?		❑ Yes	❑ No Go to B.
1. Was there manipulation of an independent variable?		❑ Yes	❑ No
2. Was there a control group?		❑ Yes	❑ No
3. Were study participants randomly assigned to the intervention and control groups?		❑ Yes	❑ No
If Yes to questions 1, 2, and 3, this is a randomized controlled trial (RCT) or experimental study. If Yes to questions 1 and 2 and No to question 3, *or* Yes to question 1 and No to questions 2 and 3, this is quasi-experimental (some degree of investigator control, some manipulation of an independent variable, lacks random assignment to groups, and may have a control group). If No to questions 1, 2, and 3, this is nonexperimental (no manipulation of independent variable; can be descriptive, comparative, or correlational; often uses secondary data).	❑ LEVEL I ❑ LEVEL II ❑ LEVEL III		
Study Findings That Help Answer the EBP Question			

Complete the Appraisal of QuaNtitative Research Studies section.

B. Is this a summary of multiple sources of research evidence?		❑ Yes Continue	❑ No Go to Appendix F
1. Does it employ a comprehensive search strategy and rigorous appraisal method? If this study includes research, nonresearch, and experiential evidence, it is an integrative review. See Appendix F.		❑ Yes	❑ No Go to Appendix F

2. For systematic reviews and systematic reviews with meta-analysis (see descriptions below): a. Are all studies included RCTs? b. Are the studies a combination of RCTs and quasi-experimental, or quasi-experimental only? c. Are the studies a combination of RCTs, quasi-experimental, and nonexperimental, or non-experimental only? A systematic review employs a search strategy and a rigorous appraisal method, but does not generate an effect size. A meta-analysis, or systematic review with meta-analysis, combines and analyzes results from studies to generate a new statistic: the effect size.	❑ Level I ❑ Level II ❑ Level III		
Study Findings That Help Answer the EBP Question			
Complete the Appraisal of Systematic Review (With or Without a Meta-Analysis) section.			
Appraisal of QuaNtitative Research Studies			
Does the researcher identify what is known and not known about the problem and how the study will address any gaps in knowledge?	❑ Yes	❑ No	
Was the purpose of the study clearly presented?	❑ Yes	❑ No	
Was the literature review current (most sources within the past five years or a seminal study)?	❑ Yes	❑ No	
Was sample size sufficient based on study design and rationale?	❑ Yes	❑ No	
If there is a control group: ▪ Were the characteristics and/or demographics similar in both the control and intervention groups?	❑ Yes	❑ No	❑ N/A
▪ If multiple settings were used, were the settings similar?	❑ Yes	❑ No	❑ N/A
▪ Were all groups equally treated except for the intervention group(s)?	❑ Yes	❑ No	❑ N/A
Are data collection methods described clearly?	❑ Yes	❑ No	
Were the instruments reliable (Cronbach's α [alpha] > 0.70)?	❑ Yes	❑ No	❑ N/A
Was instrument validity discussed?	❑ Yes	❑ No	❑ N/A
If surveys or questionnaires were used, was the response rate $\geq$ 25%?	❑ Yes	❑ No	❑ N/A

Were the results presented clearly?	❑ Yes	❑ No	
If tables were presented, was the narrative consistent with the table content?	❑ Yes	❑ No	❑ N/A
Were study limitations identified and addressed?	❑ Yes	❑ No	
Were conclusions based on results?	❑ Yes	❑ No	
Go to Quality Rating for QuaNtitative Studies section			
Appraisal of Systematic Review (With or Without Meta-Analysis)			
Were the variables of interest clearly identified?	❑ Yes	❑ No	
Was the search comprehensive and reproducible? ■ Key search terms stated	❑ Yes	❑ No	
■ Multiple databases searched and identified	❑ Yes	❑ No	
■ Inclusion and exclusion criteria stated	❑ Yes	❑ No	
Was there a flow diagram that included the number of studies eliminated at each level of review?	❑ Yes	❑ No	
Were details of included studies presented (design, sample, methods, results, outcomes, strengths, and limitations?	❑ Yes	❑ No	
Were methods for appraising the strength of evidence (level and quality) described?	❑ Yes	❑ No	
Were conclusions based on results?	❑ Yes	❑ No	
■ Results were interpreted.	❑ Yes	❑ No	
■ Conclusions flowed logically from the interpretation and systematic review question.	❑ Yes	❑ No	
Did the systematic review include a section addressing limitations *and* how they were addressed?	❑ Yes	❑ No	
Quality Rating for QuaNtitative Studies			
Complete quality rating for quaNtitative studies section.			
Circle the appropriate quality rating below **A** **High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B** **Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C** **Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.			
Section II: QuaLitative			
Level of Evidence (Study Design)			

A. Is this a report of a single quaLitative research study?	❑ Yes Level III	❑ No Go to Section II. B
Study Findings That Help Answer the EBP Question		
Complete the Appraisal of Single QuaLitative Research Study section.		
Appraisal of a Single QuaLitative Research Study		
Was there a clearly identifiable and articulated:		
■ Purpose?	❑ Yes	❑ No
■ Research question?	❑ Yes	❑ No
■ Justification for method(s) used?	❑ Yes	❑ No
■ Phenomenon that is the focus of the research?	❑ Yes	❑ No
Were study sample participants representative?	❑ Yes	❑ No
Did they have knowledge of or experience with the research area?	❑ Yes	❑ No
Were participant characteristics described?	❑ Yes	❑ No
Was sampling adequate, as evidenced by achieving saturation of data?	❑ Yes	❑ No
Data analysis: ■ Was a verification process used in every step by checking and confirming with participants the trustworthiness of analysis and interpretation?	❑ Yes	❑ No
■ Was there a description of how data were analyzed (i.e., method), by computer or manually?	❑ Yes	❑ No
Do findings support the narrative data (quotes)?	❑ Yes	❑ No
Do findings flow from research question to data collected to analysis undertaken?	❑ Yes	❑ No
Are conclusions clearly explained?	❑ Yes	❑ No
Go to Quality Rating for QuaLitative Studies section.		
B. For summaries of multiple quaLitative research studies (meta-synthesis), was a comprehensive search strategy and rigorous appraisal method used?	❑ Yes Level III	❑ No Go to Appendix F.

Study Findings That Help Answer the EBP Question

Complete the Appraisal of Meta-Synthesis Studies section.

Appraisal of Meta-Synthesis Studies		
Were the search strategy and criteria for selecting primary studies clearly defined?	❑ Yes	❑ No
Were findings appropriate and convincing?	❑ Yes	❑ No
Was a description of methods used to:		
■ Compare findings from each study?	❑ Yes	❑ No
■ Interpret data?	❑ Yes	❑ No

Did synthesis reflect:		
■ New insights?	❑ Yes	❑ No
■ Discovery of essential features of phenomena?	❑ Yes	❑ No
■ A fuller understanding of the phenomena?	❑ Yes	❑ No
Was sufficient data presented to support the interpretations?	❑ Yes	❑ No
Complete Quality Rating for QuaLtitative Studies section.		
Quality Rating for QuaLitative Studies		

Circle the appropriate quality rating below

No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria.

For meta-synthesis, there is preliminary agreement that quality assessments should be made before synthesis to screen out poor-quality studies[1].

A/B **High/Good quality** is used for single studies and meta-syntheses)[2].

The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report:

- **Transparency:** Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated.
- **Diligence:** Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence.
- **Verification:** The process of checking, confirming, and ensuring methodologic coherence.
- **Self-reflection and self-scrutiny:** Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations.

■ ***Participant-driven inquiry:*** *Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated.*

- **Insightful interpretation:** Data and knowledge are linked in meaningful ways to relevant literature.

C ***Lower-quality*** *studies contribute little to the overall review of findings and have few, if any, of the features listed for High/Good quality.*

Section III: Mixed Methods
Level of Evidence (Study Design)

You will need to appraise both the quaNtitative and quaLitative parts of the study independently, before appraising the study in its entirety. 1. Evaluate the quaNtitative portion of the study using Section I. Insert here the level of evidence and overall quality for this part: 2. Evaluate the quaLitative part of the study using Section II. Insert here the level of evidence and overall quality for this part: 3. To determine the level of evidence, circle the appropriate study design: **(a) Explanatory** sequential designs collect quaNtitative data first, followed by the quaLitative data; and their purpose is to explain quaNtitative results using quaLitative findings. The level is determined based on the level of the quaNtitative part. **(b) Exploratory** sequential designs collect quaLitative data first, followed by the quaNtitative data; and their purpose is to explain quaLitative findings using the quaNtitative results. The level is determined based on the level of the quaLitative part, and it is always Level III. **(c) Convergent** parallel designs collect the quaLitative and quaNtitative data concurrently for the purpose of providing a more complete understanding of a phenomenon by merging both datasets. These designs are Level III. **(d) Multiphasic** designs collect quaLitative and quaNtitative data over more than one phase, with each phase informing the next phase. These designs are Level III.	Level Level	Quality Quality

Study Findings That Help Answer the EBP Question

Use the Appraisal of Mixed Methods Studies section.			
Appraisal of Mixed Methods Studies[3]			
Was the mixed-methods research design relevant to address the quaNtitative and quaLitative research questions (or objectives)?	❑ Yes	❑ No	❑ N/A
Was the research design relevant to address the quaNtitative and quaLitative aspects of the mixed-methods question (or objective)?	❑ Yes	❑ No	❑ N/A
For convergent parallel designs, was the integration of quaNtitative and quaLitative data (or results) relevant to address the research question or objective?	❑ Yes	❑ No	❑ N/A
For convergent parallel designs, were the limitations associated with the integration (for example, the divergence of quaLitative and quaNtitative data or results) sufficiently addressed?	❑ Yes	❑ No	❑ N/A
Quality Rating for Mixed-Methods Studies			

Circle the appropriate quality rating below

A **High quality**: Contains high-quality quaNtitative and quaLitative study components; highly relevant study design; relevant integration of data or results; and careful consideration of the limitations of the chosen approach.

B **Good quality**: Contains good-quality quaNtitative and quaLitative study components; relevant study design; moderately relevant integration of data or results; and some discussion of limitations of integration.

C **Low quality or major flaws**: Contains low quality quaNtitative and quaLitative study components; study design not relevant to research questions or objectives; poorly integrated data or results; and no consideration of limits of integration.

Appendix C

Table 3

Synthesis of existing literature and evaluation table

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
AACN. (2013). *Competencies and Curricular Expectations for Clinical Nurse Leader Education and Practice*, 1-40 Retrieved from http://www.jaacnnursing.org/Portals/42/AcademicNursing/CurriculumGuidelines/CNL-Competencies-October-2013.pdf	Clinical practice guideline	None	Provides guidelines for competencies and curricular expectations for CNL education and practice Useful for outlining the entry level competencies for all Clinical Nurse Leaders	L IV A CNL-Competencies-October-2013.pdf
Cardoso et al. (2011). Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study. *Critical Care.* https://doi.org/10.1186/cc9975	Prospective-cohort study	Patients admitted to a university hospital between January and December 2005 were examined	The study showed a connection between delayed admissions to ICU due to bed availability and higher mortality rate The study is useful in the evaluation of ICU admissions delay can affect mortality rate for critically ill patients	L III A Cardoso et al.pdf
Study	Design	Sample	Outcome/Feasibility	Evidence rating
Chaflin et al. (2007). Impact of delayed transfer of critically ill patients from the	Cross-sectional analytical	50,322 patients admitted from the emergency	Emergency department patients who were critically	

emergency department to the intensive care unit. *Critical Care Medicine, 35,* 1477-1483. https://doi.org/10.1097/01.CCM.0000266585. 74905.5A	study using the Project IMPACT database (a multicenter U.S. database of ICU patients)	department to the ICU (2000-2003) were divided into 2 groups: emergency department boarding > or = 6 hours (delayed) vs emergency department boarding < 6 hours (not delayed)	ill with a > or = delay in transfer to ICU had increased hospital stay and hospital mortality The study is useful to discern the relationship of ED boarding and outcomes for the critically ill patients	L III A  Chalfin et al.pdf
Howell, M. D. (2011). Managing ICU throughput and understanding ICU census. *Current Opinion Critical Care, 17:* 626-633. https://doi.org/10.1097/MCC.0b013e32934b3e6e	Expert opinion	None	Provides practical guidance about the relationship between census, throughput, and patient demand. Managing ICU throughput by improving quality of care in ICU by providing early spontaneous breathing trials, daily wake-ups, and early PT/OT programs can decrease length of stay	L V A  Howell, M. D..pdf
Study	Design	Sample	Outcome/Feasibility	Evidence rating
Johnson et al. (2013). Delay of transfer from the intensive care unit: a prospective observational study of incidence, causes, and	Prospective observational study.	An IRB-approved prospective observational study	Delay in transfer from the SICU is costly and common	

financial impact. *Biomed Central,17 (4): R128.* https://doi.org/10.1186/cc12807	Reasons for delay were investigated and costs were approximated	conducted from January 24, 2010 to July 31, 2010 of 731 patients transferred from a 20-bed SICU at a large tertiary-care academic medical center	Insufficient availability of surgical-floor beds is one of the most common reason for delay in transfers from SICU With the scarcity of literature regarding delays in transfer out of ICU, the study is useful in examining the prevalence, causes, and costs of delayed throughput	L III A  Johnson et al.pdf
Matthews, K.S., & Long, E.F. (2015). A conceptual framework for improving critical care patient flow and bed use. *AnnalsATS, 12(6),* 866-894. https://doi.org/10.1513/AnnalsATS.201409-4190C	Quality improvement A description for a queuing model and illustrative simulation model were developed to indicate current triage protocol within the medical ICU and SICU at a large tertiary-care hospital	Patient acuity, arrival rate, and unit length of stay, consisting of a "service time" and "time to transfer" were estimated from 12 months of retrospective data at a large tertiary-care hospital	Hospital wait times with information obtained by observation or experimentation can evaluate how changes in ICU bed assignment could influence unit occupancy levels and patient wait times The study is useful in providing a framework for ICU patient flow, measurable outcomes, and the impact of various bed allocations	L V A  Matthew, K. S. & Long, E. F..pdf
Study	Design	Sample	Outcome/Feasibility	Evidence rating
Morris et al. (2016). Transfer delays from the neurologic intensive care unit: a	Prospective cohort study	Sixty-five consecutive patients	Discharge delays from the NICU were common but did not	

prospective cohort study. *Neurohospitalist, 6(2),* 59-63.		discharged over 1 month from the neurologic intensive care unit at a tertiary-care teaching hospital	significantly increase hospital LOS The authors believed that measuring and reporting NICU transfer delays (as opposed to only capturing overall LOS) will be of benefit to hospitals As a definable metric, bed request times should be recorded in neurologic intensive care unit (NICU) to improve patient flow The study is useful in quantifying discharge delays from the NICU and analyzing the impact on the overall hospital length of stay	L III A  Morris et al.pdf

Appendix D

Table 4

Project Charter

Improving Intensive Care Unit Throughput to Neurology Unit

Global Aim

We aim to optimize Intensive Care Unit patient throughput to neurology unit. We expect to decrease the transfer time to two hours from when the MD order is written to the time the patient leaves ICU to neurology unit. It is important to work on this now because it will maximize efficiency, decrease unnecessary hospital costs, increase optimal ICU utilization, and provide better quality of care to more patients.

Specific Aim

We will decrease the number of ICU throughput hours to neurology unit from an average of 6 hours to 2 hours by January 2018.

Background

With the competing high demand for the scarcity of resources in a hospital setting, the supply side of bed availability is crucial to meet the needs of patients needing admission to the hospital. Improving patient throughput is key to provide the right care to the right patient at the right time. The intensive care unit is the admitting unit for patients with critical medical needs. Bed availability is influenced by discharges and transfers of

patients. The delay of transfer of patients with neurological problems from ICU who are no longer considered critically ill to neurology unit impacts efficient use of scarce resources (Matthews and Long, 2015; Howell, 2011; Johnson et al., 2013). Maximizing efficiency of ICU throughput can decrease ICU length of stay, and allow for the treatment of more critically ill patients (Reddy et al., 2013). The inability of ICU to admit patients negatively affects hospital-wide patient throughput, particularly the ED and postoperative units, and is associated with increased mortality in critically ill patients waiting for ICU bed (Matthews and Long, 2015; Cardoso et al., 2011; Chafin et al., 2007). As seen in a neurological ICU population, increased wait times of up to five hours from the emergency department were associated with increased mortality (Morris et al., 2016).

Goals for the project

The goal is to improve ICU patient throughput to the neurology unit to provide the right care to the right patient at the right time. With the scarcity of bed availability compounded with the delay of ICU patient transfer to neurology unit, resulting to holding patients in an ICU setting who no longer need an ICU level of care; is an inefficient use of resources. Optimizing ICU throughput can decrease the length of ICU patient stay, thus, allowing for the treatment of more critically ill patients. The availability of ICU beds will help facilitate the admissions and transfers of patients who have critical medical needs from the emergency department and surgical departments. Managing ICU throughput will maximize efficiency, decrease unnecessary hospital costs, increase optimal ICU utilization, and provide better quality of care to more patients.

Family of Measures & Measurement Strategy

Measure	Operational Definition (how is the measure calculated?)	Type (Outcome, process, balancing)	Data Collection Plan
# of ICU throughput delays to neurology unit	# of ICU patient throughput delays to neurology unit attributed to no bed availability	Outcome measure	Assistant Department Managers document delay of ICU patient transfers to neurology unit and tally daily
ICU to neurology unit rate	Rate of ICU to neurology unit within 2 hours	Process measure	Assistant Department Managers document delay of ICU patient transfers to neurology unit and tally daily
FTE flexing to demand	# of ICU patient throughput delays to neurology attributed to staff availability	Process measure	Position control and staffing sheets
Overall Productive FTEs	Overall number of productive FTEs	Balancing measure	Pay-period report bi-weekly

Mentor

Faith Bettencourt	Director of Administrative Services

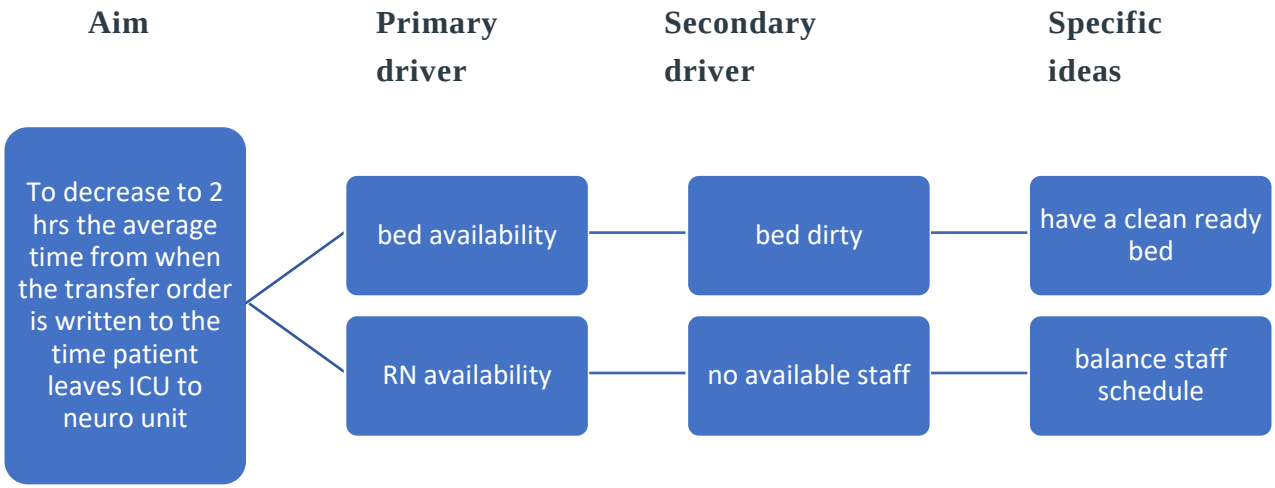
Sponsors

Amy Young	Chief Nurse Officer
Faith Bettencourt	Director of Administrative Services
Cathy Parker	Director of Adult Services
Colette Jappy	Clinical Nurse Specialist

Team Members

Mary Machanga	Manager of ICU
Charles Morato	Assistant Department Manager of ICU
Catherine Deo	Assistant Department Manager of ICU
Mely Vangeise	Registered Nurse of ICU
Paul Laygo	Registered Nurse of ICU
Yinghua Zhou	Manager of Neurology Unit
Jackie Narzikian	Assistant Department Manager of Neurology Unit
Navdeep Bajwa	Registered Nurse of Neurology Unit
Collin Coyne	Director of Environment Services
Maria Rodriguez	Staff Environmental Services
Ruben Rodriguez	Staff Environmental Services

Driver Diagram



Changes to test

The changes being implemented into the microsystem are focused on the nurse leader's master plan and ability to ensure bed availability and staff availability. In addition, nurse leaders will check on the expected date of discharge on health connect as to which patients can transfer to the neurology unit, and will round with the assigned staff to make sure throughput is expedited without any delay within two hours from when physician order is written to the time patient leaves ICU to neurology unit. Furthermore, nurse leaders will ensure staff timely transferring patients with transfer orders. Optimizing ICU throughput will maximize efficiency, decrease unnecessary hospital costs, increase optimal ICU utilization, and provide better quality of care to more patients.

Project timeline

	10/10	10/13	10/31	11/7	11/14	11/15	11/19	11/26	11/28
Define topic									
Aim Statement & Background									
Measures Develop Charter									
Measurement Strategy									
Collect Data Identify Changes to Test									
Complete Charter									
Driver Diagram									
Finalize Charter Prepare Presentation									
Final Presentation									

CNL Competencies

Organizational and Systems Leadership

- Collaborated with healthcare professionals to plan, implement, and evaluate improvement opportunity
- Participated in a shared leadership role to make recommendations for improvement at the microsystem level

Interprofessional Collaboration for Improving Patient and Population Health Outcomes

- Facilitated the lateral integration of healthcare services across the continuum of care with the overall objective of; gathering and influencing stakeholders buy-in, and achieving and sustaining high quality care
- Assumed a leadership role, by applying communication and collaboration skills that are integral in coordinating and leading the project with other interprofessional team members, to manage transitions across care settings to support patients and families to improve care outcomes

Quality Improvement and Safety

- Demonstrated professional and effective communications skills with staff, management, and other interprofessional team members
- Completed a comprehensive microsystem assessment, identified a problem, and developed a plan to come up with a solution

- Recognized the need for performance improvement based on EBP by understanding the delivery of care in a hospital setting and related hospital quality measures

Lessons learned

ICU leaders have a significant buy-in with the project and are more than willing to help to make the project successful. They engaged staff to keep a log with delays and reasons in patient transfer to the neurology unit. As for the ICU physicians, when they write their orders before 11 am, some orders have conditions before patients can be transferred or patient's condition changes. Other times, MD orders are written after 11 am and transfer of patients to neurology unit occurs at 3 pm as staff keep the patients close to the end of their shift. In regards to environmental services, the team has competing priorities as patient discharges and transfers tend to occur around the times between 2 pm to 4 pm, while this is also the time when patients needing admissions from ED are being admitted to the units. As for staff scheduling, even when staff schedule is balanced, there are the occasional staff sick calls that are unavoidable. ICU staff not convinced to have one bedside report and replace phone call report with a smart phrase on health connect as they're used to the past practices of having dual reports.

Appendix E

Table 5

SWOT Analysis

Appendix F

Table 6

Financial Analysis

Items	ICU	5S	7S
Estimated cost of stay per day	$12,000	$8,433	$5,533
Total cost of 6 days stay (average length of stay is 6-10 days)	$72,000	$50,598	$33,198
Cost of additional 4 days stay	$48,000	$33,732	$22,132
Total cost of 10 days stay (average length of stay is 6-10 days)	$120,000	$84,330	$55,330
Cost of 2 days overstay due to delay of neuro bed availability	$24,000	$16,866	$11,066
Total cost of length of stay 6 days + 2 days overstay due to delay of neuro bed availability	**$96,000**	**$67,464**	**$44,264**
Total cost of length of stay 10 days + 2 days overstay due to delay of neuro bed availability	**$144,000**	**$101,196**	**$66,396**

Appendix G

Table 7

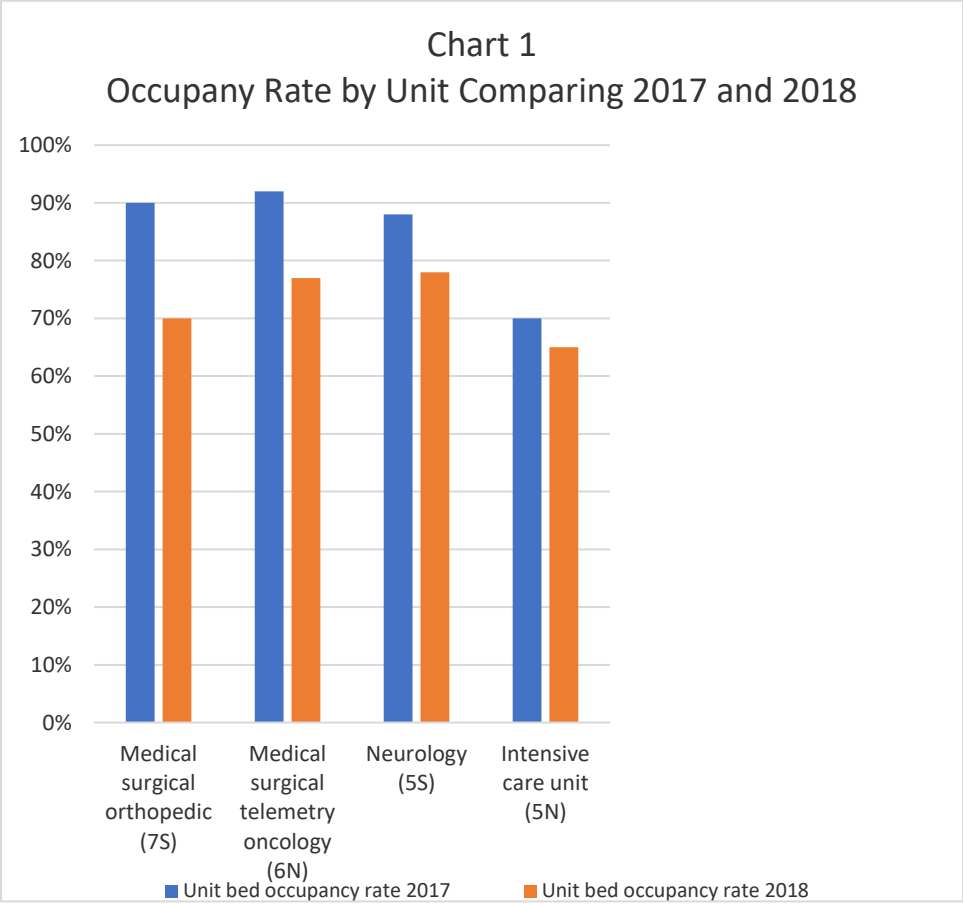
PDSA Cycles

Appendix H

Table 8

Unit bed occupancy rate

Units	2017	2018
Medical surgical orthopedic (7S)	90%	70%
Medical surgical telemetry oncology (6N)	92%	77%
Neurology (5S)	88%	78%
Intensive care unit (5N)	70%	65%



Medical surgical unit has a significantly lower occupancy rate by almost 10%, in contrast to the neurology unit

Appendix I

Table 9

Budget for training medical-surgical orthopedic staff

Item	2018 Annual Cost	Monthly Cost	2019 Annual Cost	Monthly Cost
Non-personnel Expenses				
Orientation & Training for 34 staff	$19, 622	$1,635	$0	$0
Office Supplies	$600	$50	$600	$50
Nursing Education Materials	$1500	$125	$750	$63
Total Non-personnel Expenses	$21,722	$1,810	$1,350	$113
Total Expenses Less Overhead	***$21,722***	***$1,810***	***$2,700***	***$113***
Overhead @5% of budget	$1,086	$90	$135	$5
Total Expenses	***$22,808***	***$1,900***	***$2,835***	***$118***

Appendix J

Table 10

CNL Project: Statement of IRB Non-Research Determination Form

Student Name: Mina B. Mai

Title of Project: Optimizing Intensive Care Unit Throughput to Neurology Unit

Brief Description of Project:

With the competing high demand for the scarcity of resources in a hospital setting, the supply side of bed availability is crucial to meet the needs of patients needing admission to the hospital. Improving patient throughput is key to provide the right care to the right patient at the right time. The intensive care unit is the admitting unit for patients with critical medical needs. Bed availability is influenced by discharges and transfers of patients.

A) Aim Statement: Global Aim

We aim to optimize Intensive Care Unit patient throughput to neurology unit. We expect to decrease the transfer time to two hours from when the MD order is written to the time the patient leaves ICU to neurology unit. It is important to work on this now because it will maximize efficiency, decrease unnecessary hospital costs, increase optimal ICU utilization, and provide better quality of care to more patients.

Specific Aim: We will decrease the number of ICU throughput hours to neurology unit from an average of 6 hours to 2 hours or less by December of 2018.

B) Description of Intervention:

The changes being implemented into the microsystem are focused on the nurse leader's master plan and ability to ensure bed availability and staff availability.

Intervention

To gather key stakeholder input, we used face-time to interview staff and leaders. Email and meetings were used to collaborate on and coordinate interventions, and to globally manage the project. The new ICU assistant nurse managers recommended keeping a ledger to track the following item: time of order for transfer, name of ordering physician, time of nursing telephone report, time of patient transfer, time of bedside report, and the reason for any delay. This recommendation for tracking patient transfer is plausible as this process is already in practice on the medical-surgical telemetry unit. The ICU staff were educated on the intent of the ledger and how to use it. Unit assistant(s) have agreed to maintain the log throughout their shift.

Every week information from the log will be tallied and entered into an excel spreadsheet. Once a week the team will meet to review trends in any delays. A designee then collaborates with the pertinent manager to assess if there are any modifiable factors, and then to formulate a responsive plan.

Our work thus far has suggested two interventions. One is to transfer neurology patients with specific assessment criteria to our medical-surgical orthopedic unit (7S).

The other is to staff for an admitting nurse who would facilitate transfers from the ICU and also transfers to the neurology unit.

We first reviewed bed occupancy rate by unit and found the medical surgical unit had a significantly lower occupancy rate, by almost 10% in contrast to the neurology unit (see appendix B). We recognized there was a potential opportunity in this bed availability to transfer select stabilized patients to 7S. Input from the critical care team, nursing units, and supporting disciplines culminated in the recommendation that patients with simple laminectomies, simple cervical laminectomies, and subdural evacuation port system(s) would be appropriate to receive care on our medical-surgical unit (7S). Historically, 7S staff have been trained to care for this patient population, though it did not result in these patients being transferred. In December 2017, 7S staff were re-trained during their yearly skills training.

C) How will this intervention change practice?

On January 2018, 7S unit began admitting this specific population of patients with simple laminectomies, simple cervical laminectomies, and subdural evacuation port system(s). This further identification of neurologic patients who do not require specialized neurological care has decompressed the neurologic unit. Current boarding minutes from ICU to the neurology unit have decreased to 4.16 hours from 4.84. Optimizing ICU throughput will maximize efficiency, decrease unnecessary hospital costs, increase optimal ICU utilization, and provide better quality of care to more patients.

D) Outcome measurements:

Family of Measures & Measurement Strategy

Measure	Operational Definition (how is the measure calculated?)	Type (Outcome, process, balancing)	Data Collection Plan
# of ICU throughput delays to neurology unit	# of ICU patient throughput delays to neurology unit attributed to no bed availability	Outcome measure	Assistant Department Managers document delay of ICU patient transfers to neurology unit and tally daily
ICU to neurology unit rate	Rate of ICU to neurology unit within 2 hours	Process measure	Assistant Department Managers document delay of ICU patient transfers to neurology unit and tally daily
FTE flexing to demand	# of ICU patient throughput delays to neurology attributed to staff availability	Process measure	Position control and staffing sheets
Overall Productive FTEs	Overall number of productive FTEs	Balancing measure	Pay-period report bi-weekly

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used:
(http://answers.hhs.gov/ohrp/categories/1569)

☐x This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

☐This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	**X**	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	**X**	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	**X**	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	**X**	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	**X**	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	**X**	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	**X**	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal	**X**	

research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.		
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	**X**	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

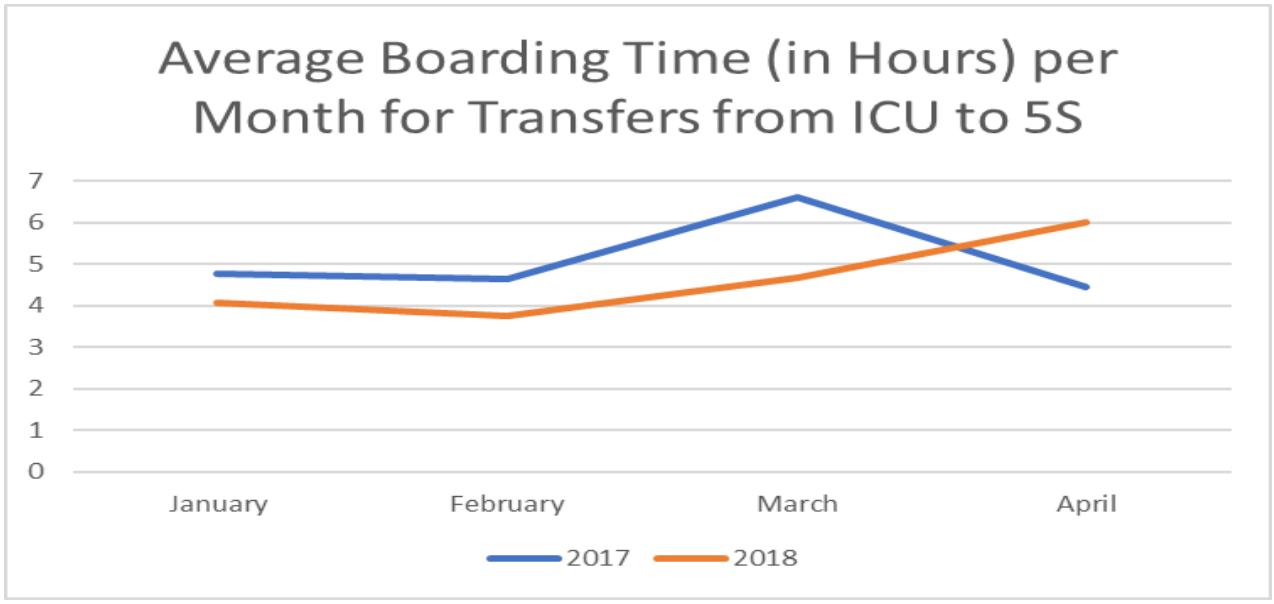
Appendix K

Table 11

Outcome measure results

Average Boarding in Hours for Transfers from ICU to Neurology Unit Comparing 2017 and 2018

	2017	2018
January	4.78	4.07
February	4.65	3.75
March	6.62	4.66
April	4.46	6.00
Total hours	20.51	18.48
Average boarding time in hours	5.13	4.62



Results reveal a 51 minute reduction in ICU boarding time to the neurology unit since January 2018.

Appendix L

Table 12

Outcome Measure: Capacity (%) by Unit comparing 2017 and 2018

	ICU	NOU	Med-Surg
Jan-17	70	81	67
Feb-17	72	79	65
Mar-17	69	80	62
Apr-17	67	75	61

	ICU	NOU	Med-Surg
Jan-18	71	79	68
Feb-18	70	75	68
Mar-18	65	73	65
Apr-18	64	72	66