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Nurse Interrupted: Educating Nurses to Reduce Work Interruptions in the Intensive Care Unit

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Unit

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N653 Practicum II: Quality Improvement and Outcomes Management

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Abstract

Background: Interruptions occur in high frequency in the critical care hospital setting. The purpose of this study is to understand the impact of work interruption for the critical care nurse and to examine ways to mitigate predominant, non-urgent interruptions.

Methods: The nurse interrupted project followed the Lean methodology framework to identify which high-frequency interrupters to address. Baseline assessment of the intensive care unit (ICU) nurses identified alarms and patient family member calls as predominant causes of interruption. A literature review was conducted to understand work interruption for nurses and to identify available solutions.

Intervention: To address the volume of incoming calls, daily out-bound calls were made by nurses to update family members and expectations were set for the next update. Daily electrode lead changes were completed to reduce clinically non-relevant alarms. Improvement huddles were completed daily by unit ICU nurses identified as stakeholders in this project.

Results: During a 4-week implementation period, 20-day shifts were monitored and found a 12.03% reduction of in-bound calls from family members. Data points showed a trend indicating the test of change was effective. Daily electrode lead change had a 62.2% reduction in *leads off* alarms (894 events to 338). However, *cannot analyze* alarm events increased four weeks post-intervention, followed by 21.9% reduction at eight weeks post-intervention.

Conclusions: Nurse leaders should implement workflow conducive to limiting non-urgent interruptions and educate nurses on how to mitigate interruptions that may cause patient harm or impair care experience.

Keywords: *nurse interruption, patient satisfaction, work interruption, patient safety, nursing workflow*

Section II: Introduction

Problem Description

Several authors have demonstrated nurses are interrupted 8.6 to 21.8 times per hour (Craker et al., 2017; Mamykina et al., 2017). While not all interruptions are detrimental, non-urgent interruptions during high severity tasks can be disruptive. Sansangohar et al. (2015) found non-urgent interruptions by colleagues were reduced when they were made aware of nurses' task engagement. In addition, Myers et al. (2016) studied patients' perception of interruptions, which resulted in patients rating interruptions that occurred outside their room as more beneficial than interruptions that occurred inside their room. Hopkinson and Weigand (2017) gave insight into the importance of understanding the culture of nursing, as nurses who emphasize the value of fulfilling the needs of their patients and completing all tasks by themselves, no matter how frenzied the workflow. Furthermore, Johnson et al. (2018) discovered that nurses who received education in interruption mitigating techniques were more self-aware and felt better equipped to manage interruption.

Continuous and timely information exchange is critical for effective interdisciplinary patient management in the critical care setting. In the intensive care unit (ICU), nurses are at the epicenter of all communication and experience frequent interruptions during all tasks, whether the task is routine, complex, structured, or non-structured. According to Drews et al. (2019), interruption in the ICU can contribute to patient harm due to delay in care and safety hazards.

Work interruptions may not only lead to patient safety compromises, but also diminish care experience for patients and cause job dissatisfaction for nurses. Every healthcare system is invested in having excellent patient care-experience scores, especially when surveys commissioned by regulating bodies such as Centers for Medicare & Medicaid Services (CMS)

are monitoring patient satisfaction metrics collected by Hospital Consumer Assessment of Healthcare Providers and Systems (2020).

Available Knowledge

PICOT Question

A PICOT question was developed to guide literature review: In nurses working in the intensive care unit (P), how does the nurse interrupted project, which provides strategies to reduce interruptions (I), compared to standard nursing practice (C), decrease non-urgent interruptions (O) within two months (T)?

Search Strategy

An electronic literature search was conducted by using the search terms *nurse interruption, work interruption, nurse interruption rate, interruption mitigation, nursing workflow, patient satisfaction,* and *nurse satisfaction,* using CINAHL Complete, SCOPUS, and PubMed databases. Search limitation was set for English language and articles published no earlier than 2010; however, due to low yield, limitations were reset for articles published no earlier than 2000. Of fifty results generated, five articles were selected for review of strength and quality of evidence using Johns Hopkins Evidence-Based Practice (JHEBP) tool to address work interruption in the clinical setting specific to nursing workflow, its effects on patient satisfaction, and strategies to mitigate work interruptions for the nurse.

Synthesis of Literature

Drews et al. (2019) described task interruptions as "accident contributors" (para. 2). This 24-month long observational study focused on examining interruption and its effect on identified patient hazards and took place in seven ICUs across four metropolitan and university hospitals. Drews et al. examined the nursing tasks of direct care, indirect care, and medical devices. Tasks

were considered structured or protocol driven if the task demands steps to perform the goal. Patient hazard events were categorized as protocol non-adherence, delay in care, and patient safety hazards.

After recording 73,733 nursing tasks, totaling 1,148 hours, the observers noted that 8.4% of tasks were interrupted at a rate of 4.95 every hour (Drews et al., 2019). Human interruptions (healthcare members, patient family members) occurred two times more than medical device interruptions (65.9%) and alarms (24.1%). Nurses commonly responded to interruptions by multitasking (42.6%) or leaving current task and switching to new task (40.8%). Of the 774 potential patient hazards observed, the occurrence of hazard was an average of 89 minutes. Overall, Drews et al. (2019) observed patient safety hazards occurring approximately once every 89 minutes of the total observed time of 1,147.8 hours. Using the ~~Johns Hopkins Nursing Evidence-Based Practice~~ (JHEBP) appraisal tool, this study is rated as level III/B (Dang & Dearholt, 2017), indicating this non-experimental study is of good quality.

Sasangohar et al. (2015) conducted an observational study to determine if a task-severity awareness tool (TAT) would minimize non-urgent interruptions during tasks deemed high-severity (severity of consequence to patient outcome) in the ICU setting. The TAT tool is an LED display that scrolls a *do not disturb please!* message outside of a patient room, which can be activated by the nurse. Over a 3-week period, there were 15 observations (189 interruptions) in the TAT equipped cardiac intensive care unit room and 13 observations (217 interruptions) in the rest of the CVICU rooms, for a total of 40 hours and an average of 104 minutes per nurse observation (Sasangohar et al., 2015). Data collected included interruption source, primary task, and interruption content, for which Cohen's kappa was 1.00, 0.72, and 0.87, respectively, which showed interrater reliability analysis for the coding methods (Sasangohar et al., 2015, para. 6).

Sasangohar et al. (2015) found that in rooms where TAT was activated during high-severity tasks, non-urgent interruptions were significantly reduced, with a mean difference of 13.9 less interruptions per hour and 95% confidence interval (-17.72 to -10.09), as compared to rooms without TAT. Nurses engaged in non-high-severity tasks were interrupted the same number of times, regardless of being in TAT or non-TAT rooms. The JHEBP was used to rate this study as level II/B (Dang & Dearholt, 2017), indicating this quasi-experimental study is of good quality.

In a mixed-methods study in a trauma unit, Myers et al. (2016) studied patients' value of comfort and time as dependent variables through direct observation of 13 nurses for 48 hours, a 55-question online survey completed by 47 nurses, and retrospective data collection on hands-free communications devices (HCDs) worn by nurses. A nominal logistic regression model was used to distill the data to a significance value of 0.05. On average, nurses in the direct observation study were interrupted every 11 minutes, more than 35% of the interruptions occurred during high-severity tasks, and retrospective data on the HCDs showed nurses received an alert every three minutes (Myers et al., 2016). Eighty-five percent of the online survey responders stated that interruptions might pose patient harm. Utilizing mapping and modeling, the researchers determined interruptions occurring outside the patient's room and interruptions initiated by patients had a favorable effect on the patient's value of comfort and time (OR 5.9 with 95% CI of 2.0-17.7). This outcome was further asserted via a nominal logistic regression model, with a $p < 0.0001$, in which patient-initiated interruptions ($p = 0.0003$) and interruptions not occurring in the patient's room ($p = 0.0002$) were deemed more beneficial to patient values of comfort and time. This quasi-experimental study is deemed as good quality by a rating at Level II/B on the JHEBP appraisal tool (Dang & Dearholt, 2017).

Johnson et al. (2018) assessed nurses' perceptions of the value of an e-learning module that taught behavioral strategies to reduce interruption during medication administration. Strategies such as multitasking, prevention, blocking, engaging, and mediation were discussed in the module using videos, case-studies, and expert opinion talks. Nine nurses from two wards were placed into focus groups to discuss the effects of the module in their practice three to six months after module education. An inductive thematic analysis of the focus groups' responses was varied. Though the topic's relevance was understood, the nurses reported difficulty recalling content and having time to complete modules. Nurses also reported that general collegiality and respect amongst colleagues contributed to less interruption during medication administration. Although the sample size and study design are limitations to this study, the mode of education is easily adaptable. Using the JHEBP appraisal tool, this study is categorized as providing low quality, non-research evidence, rating as Level V/C (Dang & Dearholt, 2017).

Sanderson et al. (2019) highlighted the recent focus in researching interruptions in the healthcare setting. Most of the research in that arena sets out with the assumed relationship between interruption and errors or patient harm. Most researchers have recommended the need for further research to study causal connection of interruption and errors (Sanderson et al., 2019). To address that issue, Sanderson et al. suggested using Bradford Hill criteria of causality and four scientific theories and concepts for studying interruptions, which they refer to as metanarratives. Bradford Hill criteria for attributing causality are association, gradients, generality, and manipulation. Association refers to the consistency, strength, and specificity of cause and effect. Gradients weigh the time gradient between interruption and error, while generality refers to the consistency and plausibility of relationship between cause and effect. Lastly, manipulation refers to the predictivity of causes and interventions put forth.

Metanarratives selected are from those concepts and theorems mostly adopted by interruption researchers: applied cognitive psychology, which focuses on observation to formulize theory; epidemiology, which focuses on studying the source of interruption and its impact; quality improvement, which strives to differentiate between necessary and harmful interruptions and produce measurable improvement plans; and cognitive systems engineering, which employs studying systems as a whole (Sanderson et al., 2019). The JHEBP guide was utilized to rate this study as Level V/B for providing a good quality criterion through which to evaluate studies that link between patient harm and work interruption.

The literature review guided by the PICOT question has borne several insights into work interruption in nurses. Interruptions originate mostly by humans, followed by alarms, and when self-aware healthcare workers are less likely to interrupt each other. Furthermore, the frequency of interruption caused by communication devices was highlighted, including on how it negatively affects patient satisfaction. The lack of investment to educate and equip nurses with tools to mitigate interruption is evident and needs to be remedied. There is a need to have criteria to evaluate experiments that study work interruption in healthcare (see Appendix A for the literature evaluation table.

Rationale

A fusion of caring science theory (Watson, 2008) and Lean methodology (Liker, 2003) is the conceptual framework for the nurse interrupted project. Caring science theory aids in identifying values pivotal to both the nurse and the patient. Lean methodology provides the structure to examine and implement a value-added process to the nurse's workflow.

Caring Science

Transpersonal caring relationship is a concept of from Jean Watson's caring theory (Watson, 2008). Specifically, when nurses connect with patients by being "authentically present" (Watson, 2008, p. 34) at the bedside, a healing space is created. The connection benefits both patient and nurse. With data supporting high frequency of work interruption for nurses in the clinical setting (Craker et al., 2017; Mamykina et al., 2017), work interruption is viewed as a variable that could affect the connection between patient and nurse. The question of how nurses can be authentically present when their day is fraught with interruption, even at the sacred space of the bedside, is considered. In order to foster that sacred space, researching solutions to allow for *curative* and *carative* (Watson, 2008) time at the bedside will be a focus of this study.

Lean Methodology

Jeffrey Liker (2003), an expert who disseminated Toyota's Lean methodology to the world, explained the five main steps of Lean: (a) focusing on identifying value for the customer (patient and nurse in this pursuit), (b) establishing a value-stream map in order to identify and eliminate processes that do not add value, (c) developing a process that is efficient to reach the goal, (d) having the customer seek the process, and (e) continuously assessing and improving on the process.

Watson's caring science explains the need for both nurse and patient to connect and create a healing space, despite the setting, while Lean identifies and eliminates wasteful workflow processes. Lean methodology has specific steps to take in order to create a *lean* process: define the value, map value process, form the process, pull from the client, and work towards a goal by continuous improvements to the process (D'Andreamatteo et al., 2015). This blended framework allows for reviewing processes that detract from adding value to the end goal

(Lean), in this case, healthy, safe, and connected care delivery to the patient (caring theory).

Workflow processes that do not add value to that goal will be seen as waste, in this case

interruptions, and action plans will be implemented in order to minimize or eliminate detrimental

interruptions.

Specific Aim

By November 2020, there will be a 20% reduction of interruption experienced by the

ICU nursing staff caused by calls from patient family members and non-relevant alarms.

Section III: Methods

Context

A clinical microsystem, as part of a larger entity, is a group or unit of people trained to provide specialized skills to patients. This ICU is a 20-bed unit embedded into a 360-bed medical center in northern California. Its microsystem assessment was examined using the in-patient unit profile of the Dartmouth Microsystem Assessment Tool (Dartmouth Institute, 2005).

The ICU takes care of critically ill patients, with age distribution of 18 years of age and above. This ICU tends to patients primarily suffering from sepsis, cardiac arrest, stroke, heart failure, respiratory failure, gastrointestinal bleeds, hypertensive crisis, and complex surgical patients. Based on information from Business Strategy and Finance (BS&F), this ICU currently has an average daily census of 10 patients, with bed capacity of 20 patients (Kaiser Permanente, 2020). At the time of this microsystem assessment, the ICU had a Hospital Consumer Assessment of Healthcare Provider and Systems (HCAHPS) survey score of 3.0, with $n = 3$, as ICU rarely discharges patients to home from the unit. The scores highlighted the need for quiet at night, nurse responsiveness, and medication side-effect education.

ICU core staffing for dayshift is 13 and 12 for nightshift. Per shift, there are non-direct patient care roles that make up the ICU nursing team, such as procedure nurse, rapid response team nurse, and break relief nurses. There are 62 full time (FTE) employees and 10 per-diem nurses. A team of 10 rotating attending physicians lead a team of residents and interns. There is an assigned social worker and, just recently, a patient care coordinator (PCC). There have been three interim nurse educators in 2020, and the role of clinical nurse specialist remains vacant. A director, unit manager, and four assistant nurse managers oversee the ICU nursing staff.

Microsystems that link to the ICU include emergency department, bed hub, telemetry units, outside facilities, and clinics. In addition, supporting departments include respiratory therapists, rehabilitation services such as physical/occupational/speech therapy, imaging services, patient care technicians, imaging, laboratory services, nutrition services, wound care, palliative care, and environmental services.

Patients are received into the ICU after being accepted by an ICU attending physician. The ICU has 20 rooms and 20 beds. Nurses are assigned patients by the procedure RN of the day, and each nurse is assigned one to two patients, according to patient's level of acuity. At change of shift, nurse knowledge exchange takes place before a nurse takes ownership of a patient. Physicians and nurses continually assess and update care plans according to diagnoses. When the patient's admission course improves, transfer to a lower level of care occurs. Seldom, patients would get discharged home directly from the ICU.

Daily shift huddle takes place at the unit Viswall – a dry erase display of the pillars of care as set out by the hospital's vision: People, Safety, Metrics that Matter, Staffing, and Education. Multi-disciplinary rounds occur each shift, with the primary nurse presenting the patient and other members of the treatment team updating the care plan. There are five unit-based committees that meet on a monthly basis and report to the unit-based committee. These committees contribute to the unit's standards of care and elevate the nursing care provided in the ICU.

The ICU productivity is within 98% and 110%. Measures are taken to reduce incremental overtime, and after data analysis, FTE positions have been approved to reduce overtime. Furthermore, due to nurse-floating agreement made by the healthcare system and the California Nurse Association (CNA) union, a bulk of the overtime comes from floating out ICU nurses to

units who face staffing shortages. Data for performance year 2020 (October 2019 – September 2020), at the time of writing this paper, is one hospital acquired pneumonia, two catheter-associated urinary tract infections, four c-difficile infections, one central-line associated blood stream infection, zero unstageable hospital acquired pressure injury, and one no-injury fall.

Return on Investment

The Joint Commission (2015) highlights human factor as contributing to 80%-90% of medical errors. In this microsystem, voluntary reporting of medical errors or near-miss events is encouraged to foster a safety-first culture. An electronic reporting system is available to all ICU employees. From January 2019 to February 2020, five errors were reported in the ICU where interruption was cited as contributing factor (J. Estrada, personal communication, June 28, 2020). In their study, Van Den Bos et al. (2011) noted the average cost of medical errors per occurrence in 2008 was $11,366. The cost-avoidance of errors, aside from not harming patients, is estimated to be $56,830 per year (see Appendix B). Research has effectively displayed the occurrence of frequent non-urgent interruptions nurses face in critical care, with the potential of patient harm and dissatisfaction. In order to foster a safe environment that ameliorates safety and a patient-centered workplace, identifying and improving issues that nurses find interruptive is essential.

Intervention

After reviewing evidence from the literature review, the Nurse Interrupted project stakeholders (see Appendix C) sought out to identify what or who interrupts nurses in this ICU. In compliance with the adopted conceptual framework Lean methodology, a survey was administered to determine who or what the frequent interrupter was, as perceived by the nurses. All responses were discussed by the stakeholders, see Gantt chart (see Appendix D). The top two

frequent interrupters in this microsystem were selected for intervention – alarms and patient

family members calling for updates. A fishbone and driver diagrams were constructed to assess

and select solutions (see Appendix E and Appendix F respectively).

In order to address alarms, the hospital's electrode lead hygiene recommendations were

examined (see Appendix G). The unit-based research and innovation committee members sought

out to verify compliance with daily electrode lead change in the ICU, where it was discovered

there was no way to verify lead change compliance. Primarily led by three ICU nurses, an

informal survey was conducted, where it was discovered nurses on each shift historically change

leads when they appear old or adhesive is worn, and there was no unit expectation for set lead

change time. For a week, morning and night shift huddles were performed by emphasizing

importance of lead hygiene in reducing aberrant alarms and reviewing hospital policy. The

stakeholders further designated the responsibility of changing leads to night shift RNs after

patient baths, which occur on night shift.

In order to address interruptions from family members seeking updates on patients, the

stakeholders in the nurse interrupted project scheduled improvement huddles with ICU RNs

regarding proactively making outbound phone calls to family members. With the intention of

capturing reliable information, a daily survey was given to ICU RNs at the end of the day shift

(see Appendix H). During each call, family members were educated on expectation of once-a-

day update call by nurses and with any event warranting an additional call. This intervention was

assigned to day shift nurses.

Nurses were educated on phone etiquette and on updating information relevant to their

scope of practice (see Nurse Guide for Family Update Phone Call in Appendix I). It was also

emphasized this was not a replacement for physician updates.

Study of the Intervention

Qualitative and quantitative data derived from:

- Real time end-of-shift survey collected from ICU RNs during the intervention month, August 2020.

- Internal Clinical Alarms Management System (CANS) dashboard that analyzes type and frequency of alerts received by nurses via wireless phones.

Measures

The outcome measure for the nurse interrupted project is 20% reduction of interruption experienced by the ICU nursing staff caused by calls from patient family members and non-critical alarms. The process measures employed will be daily electrode lead changes and daily outbound calls made to update patient family members. The identified balancing measures would be the added task to an already burdened nurse workflow and positive increase in patient and family satisfaction regarding nursing communication. Additional details are outlined in Table 1.

Table 1

Measures

Measure	Data Source	Target
Outcome Measure		
Decrease in RN interruptions from patient family members	Survey	20%
Decrease in aberrant alarms coming through to wireless phones utilized by RNs	KP CANS dashboard	20%
Process Measure		
ICU RNs to change electrode leads daily to reduce aberrant alarms	Survey	20%
Percent of ICU RNs who complete outbound calls to update patient's family members	Survey	20%
Balancing Measure		
Nurses reporting NI project as a valid tool to reduce work interruption	Survey	20%
Improving customer satisfaction (patient family members)	Survey HCAHPS	20%
Improving meaningful communication with patient's family members	Informational interview	20%

Ethical Considerations

The nurse interrupted project was approved as a quality improvement project by the hospital and faculty (see Appendix J). Non-research quality improvement processes were followed without requiring IRB approval. Permission to interview nurses via survey was obtained from the unit manager and the director. The survey was sent to ICU nurses, with the disclaimer of data to be used for the nurse interrupted process improvement project. A unit-based committee was engaged as lead for this project. The unit director and nurse manager, in conjunction with an information technology (IT) consultant who will vet security and IT HIPAA compliance, have also given permission to have three nurses use iPhones in lieu of Cisco wireless, and data will be collected to evaluate work interruption. Code of ethics for nursing must be adhered to ensure compliance and respect to all subjects involved. No conflicts of interests were discovered.

Section IV: Results

Of 48 ICU nurses who took the pre-intervention survey (Appendix K), 75.56% rated

alarms as high frequency interrupters and 36.36% rated *patient family members* as the second

most frequent interrupters.

Lead Change Intervention

Two data points from the CANS dashboard were selected due to their direct link with

electrode lead placement and lead hygiene: *Cannot Analyze* and *Leads Off*. Alarms triggered by

the *Leads off* alarm were reduced from 894 events to 338 logged events after the intervention,

showing a 43.3% reduction in alarms four weeks post-intervention, and 62.2% eight weeks post-

intervention (see Appendix L). Appendix O shows an 81.3% compliance in changing electrode

leads daily.

The influence of the daily lead change intervention on *Cannot Analyze* alarms needs to be

further analyzed. Thirty-two events were recorded for the month before intervention roll-out,

with 55 logged events four weeks post-intervention, followed by 25 events eight weeks post-

intervention showing a 21.9% reduction from the pre-intervention *Cannot Analyze* alarms data

(see Appendix L).

Outbound Call Intervention

An average of 5.4 out-bound calls were placed by nurses to give updates to patient family

members, resulting in an average of 0.65 in-bound calls received from family members (see

Appendix N), showing a shift and trend indicative of an effective test of change (12.03%

reduction). Compliance with making out-bound calls varied. As shown in Appendix O, nurses

placed 108 outbound calls out of a possible 129, showing an 83.7% compliance. Voice mail

messages or phone calls placed by nurses without connecting with family members were

eliminated from data aggregation.

A post-intervention survey (Appendix P) was randomly assigned to 36 ICU nurses,

representing half of the nursing staff. Of the 36 nurses, 83.3% stated they believed the making

out-bound calls reduces the number of calls received from patient family members. Seventy five

percent stated changing leads daily could help reduce aberrant alarms.

Section V: Discussion

The nurse interrupted project has shown there are simple ways to mitigate non-urgent interruptions that nurses experience in the critical care setting. Review of literature on this topic has revealed the challenges nurses and patients experience in dealing with interruptions. Though more research is needed to expand the repertoire, nurse leaders can implement evidence-based solutions that lessen the negative impact of interruptions and lead to a culture change in microsystems (Thomas & Herrin, 2009). Nurse leaders can help design workflow for the nurse to minimize unnecessary interruptions. Strategies with which to cope and prioritize interruptions can be taught in nursing schools, during orientation, and yearly nursing competencies. Leaders in nursing are challenged to engage in research that will result in building a gold standard framework for the nurse's workflow. If not the clinical nurse leader, who is better equipped to galvanize and spearhead these changes for future nurses?

The response of patients' family members in getting updates from nurses has been enthusiastic, some reporting gratefulness, some asking for the same nurse to take care of their loved one so they do not have to worry about receiving updates, and others have expressed relief from fear of the unknown. Of note is the peer-to-peer feedback witnessed during improvement huddles. Nurses who had already established relationships with family members due to out-bound phone calls were witnessed encouraging other nurses to do the same. There is value in the motivation factor when any project improvement is being implemented. The COVID-19 pandemic has influenced care experienced by all healthcare members—nurses, patients, and their families. The no-visitation or limited visitation guidelines most hospitals espoused has had a heavy impact on family members calling in to check on their loved ones. This may also account for why nurses perceive family members as the main interrupters. In contrast, data collected by

the unit assistant (secretary) showed ICU nurses receive as many or more calls from other

members of the healthcare team (see Appendix Q).

Lessons Learned

      Due to the COVID-19 pandemic related constraints, roll out of implementation was

delayed, resulting in four weeks of observation and a total of 20 shifts. Longer duration of study

will afford more data points. The author also suggests expanding interventions to reduce

interruptions caused by other healthcare members. As an example, the facility rolled out a secure

chat application (after initiation of the nurse interrupted project), which allows for healthcare

team members, such as lab personnel and rehabilitation personnel, to communicate via chat for

non-urgent communication. Furthermore, since the current wireless phones do not have the

ability for texting, the author acquired permission to trial smartphone use for ICU nurses and to

study if that aids in quick and less disruptive communication between healthcare team members.

Due to time constraints, that will be studied after the completion of this paper. Based on SWOT

analysis (Appendix S) maintaining compliance to these interventions may have barriers. As a

result, the unit has included *family update* and *lead change* on a mandatory electronic ICU shift

note, (see Appendix T).

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Conclusions

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      The nurse interrupted project has highlighted the importance of identifying non-urgent

interruptions experienced by critical care nurses. As interruption occurs in all disciplines, this

study can connect with all care units, including surgical and outpatient centers. Literature review

showed that though not all interruptions are detrimental, they may cause patient harm and

dissatisfaction. Nurse leaders are able to implement workflow conducive to limiting non-urgent

interruptions and educate nurses on how to mitigate those that may cause patient harm or impair

care experience.

Clinical nurse leaders (CNLs) have an important role as risk anticipators. The CNL is

responsible for anticipating risk as it relates to patient safety (King et al., 2019). The CNL is also

responsible for identifying knowledge gaps and involving intra-disciplinary teams to educate

nurses and teams who have direct impact at point of contact with patients (King et al., 2019).

Replication and dissemination of this project are relevant to all units, as it affects patient care

experience. Furthermore, unit assistant/secretary training (see Appendix R) translates well into

other care units. The Gantt chart (Appendix D) is useful in replication or expansion of such a

project, learning from tests of change that had unexpected duration changes or ideas that were

otherwise rejected.

The nurse interrupted project emphasized that small changes can have big impacts,

especially in the customer service arena, where nurses are seldom focused. In the ICU, saving

lives remains primary, and this project is poised to show that critical steps can be taken to help

reduce interruption, while impacting patient and family member experience.

Section VI: References

Craker, N. C., Myers, R. A., Eid, J., Parikh, P., McCarthy, M. C., Zink, K., & Parikh, P. J.

    (2017). Nursing interruptions in a trauma intensive care unit: A prospective observational

    study. *Journal of Nursing Administration, 47*(4), 205-211.

    https://doi.org/10.1097/NNA.0000000000000466

D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in healthcare: A

    comprehensive review. *Health Policy*, *119*(9), 1197-1209.

    http://dx.doi.org/10.1016/j.healthpol.2015.02.002

Dang, D., & Dearholt, S. (2017). *Johns Hopkins nursing evidence-based practice: Model and*

    guidelines (3rd ed.). Sigma Theta Tau International.

Dartmouth Institute. (2005). *Clinical microsystem assessment tool*.

    https://clinicalmicrosystem.org/

Drews, F. A., Markewitz, B. A., Stoddard, G. J., & Samore, M. H. (2019). Interruptions and

    delivery of care in the intensive care unit. *Human Factors, 61*(4), 564-576.

    https://doi.org/10.1177/0018720819838090

Hopkinson, S. G., & Wiegand, D. L. (2017). The culture contributing to interruptions in the

    nursing work environment: An ethnography. *Journal of Clinical Nursing, 26*(23-24),

    5093-5102. https://doi.org/10.1111/jocn.14052

Hospital consumer assessment of healthcare providers and systems. (2020, January 10).

    Hcahpsonline.org. Retrieved June 22, 2020, from https://www.hcahpsonline.org/en/facts/

Johnson, M., Levett-Jones, T., Langdon, R., Weidemann, G., Manias, E., & Everett, B. (2018). A

    qualitative study of nurses' perceptions of a behavioral strategies e-learning program to

reduce interruptions during medication administration. *Nursing Education Today, 69*, 41-47. https://doi.org/10.1016/j.nedt.2018.06.028

Joint Commission. (2015). Human factors analysis in patient safety systems. *The Source, 13*(4). https://store.jcrinc.com/human-factors-analysis-in-patient-safety-systems

Kaiser Permanente. (2020). *Average daily census* (PP13) [Unpublished raw data].

King, C. R., Gerard, S. O., & Rapp, C. G. (Eds.). (2019). *Essential knowledge for CNL and APRN nurse leaders.* Springer Publishing.

Liker, J. (2003). *The Toyota way* (1st ed.). Safari Books.

Mamykina, L., Carter, E. J., Sheehan, B., Hum, R. S., Twohig, B. C., & Kaufman, D. R. (2017). Driven to distraction: The nature and apparent purpose of interruptions in critical care and implications for HIT. *Journal of Biomedical Informatics, 69*, 43-54. https://doi.org/10.1016/j.jbi.2017.01.015

Myers, R. A., McCarthy, M. C., Whitlatch, A., & Parikh, P. J. (2016). Differentiating between detrimental and beneficial interruptions: A mixed-methods study. *BMJ Quality & Safety, 25*(11), 881-888. https://doi.org/10.1136/bmjqs-2015-004401

Myers, R. A., & Parikh, P. J. (2017). Nurses' work with interruptions: An objective model for testing interventions. *Health Care Management Science, 22*(1), 1-15. https://doi.org/10.1007/s10729-017-9417-3

Sanderson, P., McCurdie, T., & Grundgeiger, T. (2019). Interruptions in health care: Assessing their connection with error and patient harm. *Human Factors, 61*(7), 1025-1036. https://doi.org/10.1177/0018720819869115

Sasangohar, F., Donmez, B., Easty, A., & Trbovich, P. L. (2015). Mitigating nonurgent interruptions during high-severity intensive care unit tasks using a task-severity

awareness tool: A quasi-controlled observational study. *Journal of Critical Care, 30*(5),

1150.e1-1150.e6. https://doi.org/10.1016/j.jcrc.2015.05.001

Thomas, J., & Herrin, D. (2009). Care model transformation: A necessity, not an option. *Journal*

of Nursing Administration, 39(11), 453-456.

https://doi.org/10.1097/NNA.0b013e3181bd5eac

Van Den Bos, J., Rustagi, K., Grey, T., Halford, M., Ziemkiewicz, E., & Shreve, J. (2011). Still

crossing the quality chasm. *Health Affairs, 3*(4).

https://doi.org/10.1377/hlthaff.2011.0084

Watson, J. (2008). *Nursing: The philosophy and science of caring.* University Press of Colorado.

https://doi.org/10.1001/archinternmed.2010.65

Section VI: Appendices

Appendix A

Evaluation Table

Citation	Conceptual Framework	Design/ Method	Sample/ Setting	Variables Studied and Their Definitions	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Drews et al. (2019)	Authors discussed healthcare environment as being socio-technical system, with complex relational challenges. Purpose: To study the effect of interruptions on patient safety hazards.	Observational Study Direct observation by 10 trained nurses with IRR validation.	Setting: 7 Intensive Care Units in 6 Veteran Hospitals affiliated with university systems, 1 non-Veteran Affairs hospital Direct Observation of interruption: Over the course of 24 months, 175 RNs observed, 1,146 hours of observation, 74,733 nursing tasks observed. .	**DV1:** Nursing Tasks **DV 2:** Patient safety hazard **IV:** interruption source (human or device).	Structured tasks: tasks that require following protocol. Non-structured tasks: those that do not require steps to accomplish. Interruption: discontinuous delivery of treatment and attention to a patient. Device- related interruption. Human-initiated interruption.	Descriptive statistical analysis was completed for: -frequency of interruption -observation time -study subjects -source, type and response to interruption -type of patient hazard	175 nurses and 74,733 tasks were observed 8.4 % of tasks were interrupted, at a rate of 4.95 per hour. Source of interruptions: humans (65.9%) alarms (24.1%) others (10%) Interruptions caused by device alarms to non-structured tasks had high risk of patient safety hazards and delays in care. human- or device-caused interruptions did not show increased risk of protocol non-adherence (RR=0.82, 95% CI of 0.62 to 1.08, p=0.17), and RR=0.98, 95% CI of -.67-1.44,	**Strengths:** Delineation of *structured* and *non-structured* tasks Showcasing the issue of varied interruption rates reported by numerous studies, including in this manuscript **Limitations:** -number of ICUs observed (7) -complex observation tool and device used -Hawthorne effect **Critical Appraisal Tool & Rating:** JHEBP Level III B **Applicability:** Improving design of both tasks and devices may help decrease patient hazards.

					p=0.92) respectively.		
Myers et al. (2016)	Authors discussed *lean methodology* to select performance measures for this study. Purpose: To differentiate between beneficial and detrimental interruptions as viewed against patient's placed value to *comfort* and *time*	Mixed-methods study: -Direct observation -Survey -Retrospective data on HCDs **-**modelling performance measures of time and comfort against observed interruptions	Setting: Trauma Unit in a Level 1 trauma center *Direct Observation of interruption*: 13 RNs for 48 hours *Survey:* 47 RNs (fully completed), 55 questions *Retrospective study of data on HCD:* On all observed RNs.	*DV 1: Patient's Comfort*: Deemed as patient's expectation of service – this includes patient's ability to have basic needs met such as toileting, ADL, nourishment. *DV 2: Patient's Time*: delays experienced by patients due to interruptions of care delivery. For this study, time is identified as a factor that influences patient's perspective on care delivery. *IV:* Interruption source	*Patient's Comfort*: Deemed as patient's expectation of service – this includes patient's ability to have basic needs met such as toileting, ADL, nourishment. *Patient's Time*: delays experienced by patients due to interruptions of care delivery. For this study, time is identified as a factor that influences patient's perspective on care delivery.	*Direct observation of interruption:* n=194; <u>beneficial</u>: n=112 <u>detrimental</u>: n=82 *RN Survey*: 85% of 47 RNs deemed interruptions as deleterious to patient safety. 21% reported all interruptions should be removed. *Retrospective HCD data*: RNs received a message every 3 minutes. 23% of those account for repeat messages. Utilized a nominal logistic regression model to determine interaction effects of significant factors (α=*0.05)* such as *task* and *source of interruption, location:* Interruption arising outside of pt.'s room and initiated by pt. is beneficial to measures of *comfort* and *time* (p=0.0002) and	-RNs were interrupted every 11 minutes -Interruptions are a necessary element in the clinical setting -Not all interruptions are negative: -Interruptions returning attention back to the patient were beneficial -Interruptions reinforcing clinical team communication were deemed beneficial	**Strengths:** -Strong statistical analysis -Mixed method of qualitative + quantitative data. -Patient's values and perceptions included -Nurse's workflow evaluated **Limitations:** Level 1 trauma center, where interruption rates may be higher. -Interruption conundrum not accounted for -Study did not address the effect of interruption to nurses. -Hawthorne effect **Critical Appraisal Tool & Rating:** JHEBP Level II B **Applicability:** Nursing workflow may be improved by strategies such as clinician-initiated updates, streamlining alerts to HCDs, educating nurses to discern beneficial from detrimental interruptions, and equipping them with mitigating skills – these may lower

						(p=0.003) respectively. *Modelling*: With OR 3.5, 95% CI 1.6 to 7.4, interruptions taking place outside pts room were deemed more beneficial than those taking place in pt. rooms Pt initiated interruption was perceived as more beneficial than those from others (OR 5.9, 95% CI of 2.0-17.7)		patient dissatisfaction and reduce the interruption-laden workflow for the nurse.
Johnson et al. (2018)	N/A	Qualitative Study Purpose**:** To assess the nurses' response to an e-learning module whose content taught strategies to mitigate interruption during medicine administration (MA).	2 Nurse Mangers, 6 Nurses, 1 Nursing student Palliative care unit and Aged-care unit.	*IV:* Interruption-mitigating strategies during MA. *DV*: Nurses' perception of techniques to mitigate interruptions during MA such as ***blocking****: hand signals to stop interruption,* ***engaging****: addressing interruption*	Focus group discussion of efficacy of e-leaning module and evaluation of the e-module content and delivery. E-learning module rolled out on both units; data collection completed over 10 months. Focus group discussion was recorded, and a	A focus group was convened 3 & 6 months after the e-learn roll out was complete to evaluate efficacy of the modules.	Mixed responses from the small focus groups Realistic images of interruption and strategies within the e-module were impactful Concern of unit culture-change was voiced along with maintaining good habits of interruption management Busyness on the units was	**Strengths:** -Use of focus groups to get direct nursing input -Identified existing tool to educate nurses **Limitations:** -Small sample size -Focused on interruption during medication administration specifically **Critical Appraisal Tool & Rating:** JHEBP Level V/C

| | | | | *while stopping MA* ***mediation:*** *engaging interruption but ensuring return to MA,* ***multitasking:*** *continue with task of MA while engaging interruption,* and ***preventing:*** *preemptive planning to avoid interruption during MA.* | category of major themes discussed was collected. | | highlighted as a barrier to effective interruption management

Time to view e-module considered hinderance by some participants

Some participants had difficulty recollecting information 3-6 months after training concluded. | **Applicability:** Feasible application to an already existing education platform. Low-cost, and could be utilized to teach new nurses, and be part of annual training. This study suggests realistic images and possibly role-playing may be a more impactful and longer-lasting educational method. Biannual training may be suggested since the focus group had trouble with recollecting training points. |
| Sasangohar et al. (2015) | N/A | Observational Study, Quasi controlled Purpose: To determine if clinicians would regulate their interruptions when made aware of their colleague's task engagement. | CVICU in a tertiary hospital

Direct observation of 28 RNs, for approximately 2 hours each over 3 weeks. | *DV:* rate of interruptions during high severity task.

Task severity: Severity of consequence to patient outcome

IV: *TAT:* task-severity awareness tool – an LED display outside of a pt. room with a message | Interruption source (patient, MD, visitor, PCA pump, etc.)

-Primary task performed (procedure, medication administration, teaching)

-Interruption content (patient related, personal, or work-related) | -Interrater reliability test for the observers: Cohen's κ=1 for interruption *source*, 0.87 for *content*, and 0.68 for event *start and end times* (0.69). -In rooms where TAT was activated during high-severity tasks, non-urgent interruptions were significantly reduced with a mean difference of -13.9 interruptions per hour and 95% | -Interruptions were significantly reduced in TAT rooms when TAT was activated during high-severity tasks.

-If TAT was not activated, no difference in interruption rates were found.

-Non-urgent or personal interruptions were completely | **Strengths:** -Real time data collection -Strong reliability test -Identified a simple and effective tool (TAT) **Limitations:** -TAT required activation, adding task to the nurse -CVICU setting, high likelihood of frequent interruptions -effect of interruption to nurses not studied -Hawthorne effect **Critical** |

				"*do not disturb*" activated by nurses when engaged in high severity task Interruption management: Urgent and non-urgent interruptions		CI of -17.72 to -10.09 as compared to in rooms without TAT	mitigated in TAT rooms	**Appraisal Tool & Rating:** JHEBP Level II B **Applicability**: This study supports that non-urgent interruptions could be minimized effectively by using a tool such as TAT. The TAT is a cost-effective and feasible tool that can be initiated on units to reduce non-urgent interruptions in the clinical environment.
Sanderson et al. (2019)	-*Bradford Hill* causality criteria -*Metanarrative* of research relating to interruptions in healthcare	Utilizing the chosen frameworks, selected articles studying interruption in healthcare setting with assumed relationship between interruption and patient harm.	Literature Review through the lens of Bradford Hill and chosen Metanarrative research criteria	**Bradford Hill:** *strength/consistency/specificity of association *time gradient b/n interruption and error *generality of causality of error *manipulation: is the intervention predictive? **Metanarrative:** *cognitive psychology: observation to formulize theory	Assessment of how each 'metanarrative' concept/theory-view the link between interruption and error/patient harm	*Applied cognitive psychology*: Accepted belief that interruption creates challenge of task completion and cognition. *Epidemiology*: These studies tend to be retrospective, with the belief that interruption in healthcare needs to be understood, and view research as way to determine clinical burden: e.g., medical error and interruption. *Quality Improvement*:	Not all theories prove cause and effect of interruption and errors, nor offer solutions to totally satisfy the Bradford Hill criteria of causality	**Strengths:** Using available scientific framework of causality **Weakness:** Selection of research not explained well **Critical Appraisal Tool & Rating:** JHEBP Level V B **Applicability:** Interest in studying WI in healthcare has increased as evidenced by number of recent studies. Having clear understanding of causality and a

| | | | | *epidemiology: study source of interruption and impact *quality improvement: differentiate b/n detrimental and necessary interruptions *cognitive systems engineering: study systems as source and solutions of interruptions | | System error that can be ameliorated by action plans to improve process. The researchers found issues with interventions introduced in systems that have mixed results: e.g., longer but fewer interruptions, going back to "old habits," post-intervention.

Cognitive systems: Theory that supports healthcare setting as complex systems, and interruption is but one contributor | | framework to funnel findings and solutions are imperative. |

Appendix B

Cost Benefit Analysis/Return on Investment

Improvement Goal	Improvement Cost	Revenue Improvement through Cost Avoidance	ROI
Reduce nurse interruption stemming from patient family members and non-critical alarms	Cost of implementing the Nurse Interrupted project:	Avoidance of the estimated 5 errors per year relating to nurse interruption in the ICU	
	1*Nurses making a daily out-bound phone call to update families: No monetary cost 2*Nurses changing lead electrodes daily: No added cost, policy of lead manufacturer and current hospital policy	Estimated average cost of medical error per occurrence: $11,366 5 errors x11,366 = $56,830	5 errors avoided = cost avoidance of **$56,830/year**

Appendix C

Team Members/Stakeholders

Unit Lead – Unit manager	Jaspreet Bajwa, BSN, RN, CCRN
Senior Director of Nursing Administration	Vinni G. Schek, MPH, BSN
Preceptor	Veronika Santamaria, MBA, MSN, BSN
Research and Innovation Committee	Alexis Slater, RN, CCRN, Deb Szeto, MSN, RN, CCRN, Charlotte Zajac, RN
Assistant Nurse Manager Co-Lead	Arveena Balu, BSN, CCRN
Education Champion	Angela Benefield DNP, RN, CCRN-CSC-CMC

Appendix D

Gantt Chart

Nurse Interrupted Project

ID #	Phases and Steps	Responsible Party(ies)	Status
1	**Assessment Phase**	LS: Lela Shiferaw	
1.1	Microsystem Assesment	LS	Completed
1.2	Literature Analysis	LS	Completed
1.3	IRB and IHI Certification	LS	Completed
1.4	Project Charter	LS	Completed
1.5	Survey Formulation, Send Out, and Compilation	Nurses/LS	Completed
2	**Design and Coodination Phase**		
2.1	Interview an expert: Angela Banefield, DNP, CSN	LS	Completed
2.2	Interview an expert: Kevin Zeng, Assistant Director	LS	Completed
2.3	Interview an expert: Carlo DeLara IT:	LS	Completed
2.4	Gantt Chart LinkedIn Learning	LS	Completed
2.5	Statement of Determination	LS	Completed
2.6	Determine Test of Change Steps	LS	Completed
2.7	Budget	LS	Completed
2.8	Gantt Chart	LS	Completed
2.9	SWOT	LS	Completed
2.11	Action Team Meeting	Team/LS	Completed
3	**Execute the Delivery Phase**		
3.1	PDSA logistics and expectation in huddle and with core nurses	Team/LS	Completed
3.2	PDSA cycle 1: Outbound calls	Team/LS	Completed
3.3	PDSA cycle 2: Change out electrode leads	Team/LS	Completed
3.4	PDSA cycle 3: Chage Alarm Parameters at shift change	Team/LS	Aborted
3.5	PDSA cycle 4: UA education on screening calls prior to transferring to Nurses	Team/LS	Completed for Core ICU
3.6	Chart Chat: unexpected introduction of intervention	Team/LS	Ongoing
4.7	Communicate w/ partners on continuous basis	Team/LS	Ongoing
4	**Evaluation & and Presentation Phase**		
4.1	Complete Nurses' Post Survey	Nurses	Completed
4.2	Complete Final Prospectus		Completed
4.3	Monitor and document progress/lessons learned		Completed
4.4	Complete Poster Presentation		Pending
4.5	Determine ongoing commitment & sustainability		Completed/Ongoing
4.6	Graduation		Pending

Appendix E

Fishbone Diagram
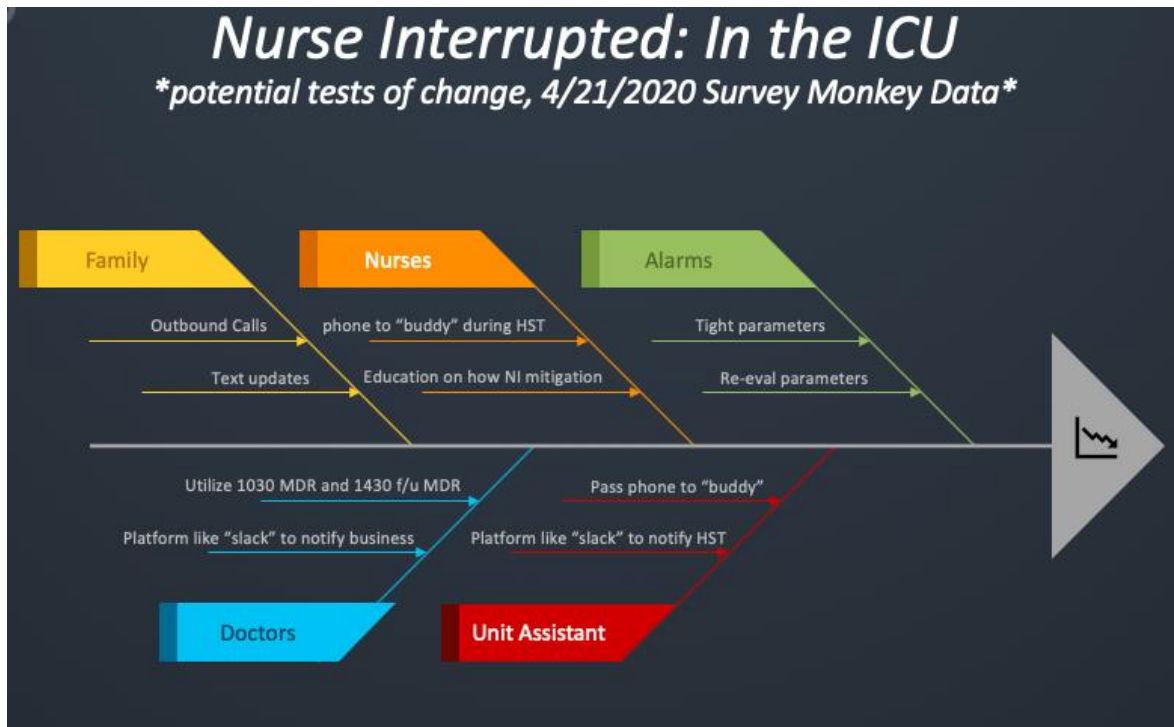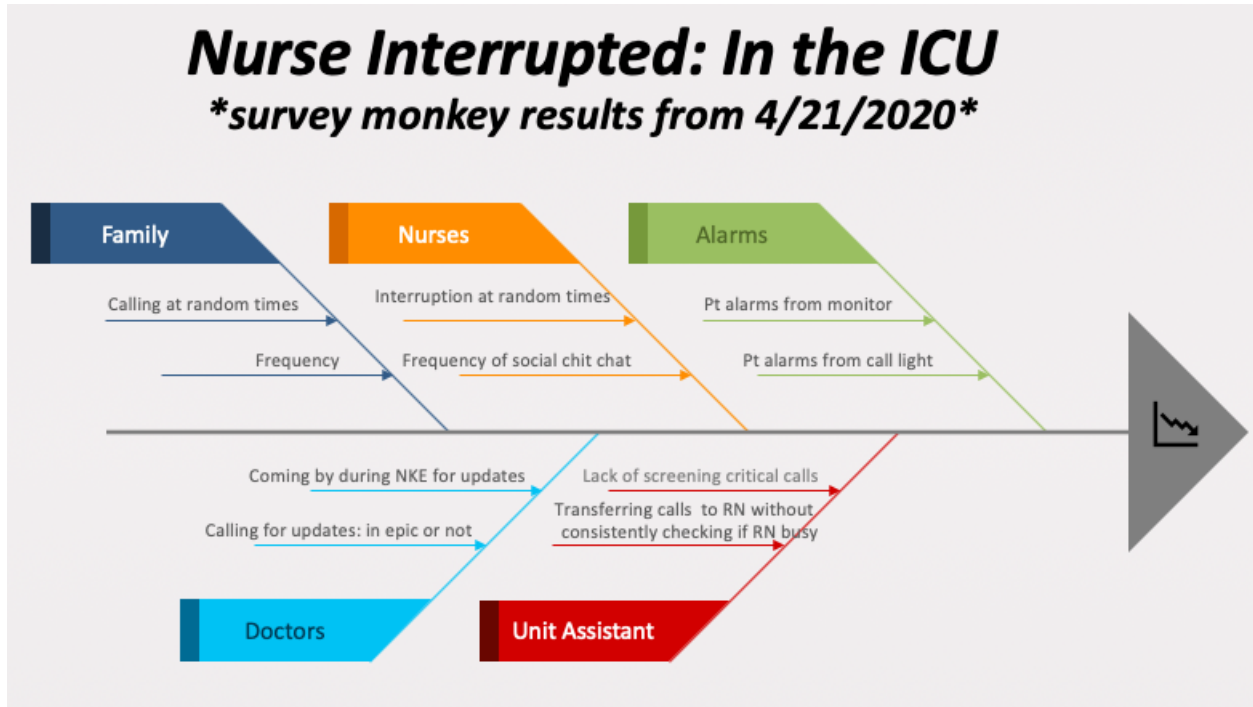
Appendix F

Driver Diagram

Balancing Measures:

- ⬇ speed of information flow
- ⬆ staffing needs
- ⬇ interdisciplinary communication

Outcomes:

By November 2020:

-20% of ICU RNs will state one EB interruption management intervention

-Education related to NI program will be crafted with goal to implement for both existing and new staff on an annual basis

Process Measures:

- ICU nurses will complete interruption survey

-Inter-disciplinary staff will complete safety culture survey

Key Drivers:

Family members: *calling for updates*

Nurses: *chit chat, interruption regardless of high-severity task*

Doctors: *seeking updates on pts whether documented on EPIC or not*

Unit Assistants: *tx calls to RNs without screening or checking nurse task*

Alarms: *from patient monitors*

Interventions:

Partnership b/n RN and family member

Managing expectation

Partnership b/n RN an MD

Partnership with Unit Assistant

Alarm management

Ideas for test of change:

"Outbound" phone call, instead of "inbound"

Communication platform such as Slack to notify HST involvement

Education:
UA: which calls to screen
RN: interruption mitigation skills
MD: Utilizing MDR and secondary time for check in.

Pass Spectralink phone to a "buddy" during HST

Tight alarm parameters evaluated at beginning, mid-shift, and as need basis

Version 1, 4/22/2020

Appendix G

Policy and Procedure: Telemetry

Facility policy highlighting telemetry and alarm guidelines, including frequency of electrode changes (highlighted number 5.2.1).

1.0   Policy Statement

    1.1   Kaiser Permanente is committed to maintaining patient safety by monitoring patients at high risk of cardiac dysrhythmia that include standard practices for pager/phone notification to the RN.

    1.2   A physician's order is required for telemetry monitoring/cardiac monitoring and discontinuation; discontinuation may also be permitted per NCAL Telemetry Optimization Protocol.

    1.3   The patient's alarm limits and parameters will be reviewed at the beginning of each shift, customized for appropriate physiologic parameters and audible to staff.

2.0   Purpose

    2.1   Use evidence based practices that direct the nursing care and management of patients on continuous cardiac monitoring.

    2.2   Standardize telemetry monitoring practices and processes.

    2.3   Design safe systems and provide technology to support staff, increase efficiency, and prevent alarm fatigue.

3.0   Scope/Coverage

This policy applies to all employees who are employed by the following entities (collectively referred to as "Kaiser Permanente"):

    3.1   Kaiser Foundation Hospitals and Health Plan, Inc. (together, KFH/HP);

    3.2   This policy applies to staff caring for patients in a telemetry capable unit in all Northern California Kaiser Medical Centers subject to accreditation standards or regulations, excluding the ambulatory clinics that have a current order for cardiac monitoring.

4.0   Definitions

    4.1   Philips Emergin System or IEM (Intellispace Event Management: pagers/spectralink/Cisco phones and two to four stationary constant displays and one or more administrative workstation (central station/PIIC (Phillips IntelliVue Information Center)/ Overview Station) and may include stationary displays.

        4.1.1   Information displayed, at a minimum, includes the patient name, bed #, name of dysrhythmia, heart rate, and time of event. The stationary monitor displays the rhythms with alarm in the same format as the Central Workstation/PIIC/Overview Station.

    4.2   Pager/phone receives system detected ECG-related crisis alarms or system warning alarms

        4.2.1   Assess the patient and validate the alarms, if it is true:

            4.2.1.1   Red – respond immediately. Activate Rapid Response Team or Code Blue as necessary.

4.2.1.2   Yellow – Top priority and answer required promptly. Assess patient for symptoms as appropriate. Check vital signs as appropriate.

4.2.1.3   Inoperative – Answer promptly.

5.0   Provisions/Procedures

5.1   A physician's order is required for telemetry monitoring/cardiac monitoring and discontinuation.

5.1.1   The nurse may discontinue telemetry monitoring/cardiac monitoring according to the regional discontinuation criteria when a physician's order previously specifies the discontinuation protocol is to be followed by the nurse.

5.2   Standard electrode placement is used with the display lead of II and MC_L1 or V_1 at the central/overview station unless otherwise indicated by patient assessment. Lead placement may be different if the patient has a pacemaker, (medical center specific).

5.2.1   Telemetry leads and monitor are to be applied by the Registered Nurse (RN) each day and verified at least every 8 hours.

5.2.2   The PCT may only apply and remove telemetry monitors under the direction of the registered nurse.

5.3   Central Station

5.3.1   Patient's name, room number, and MRN will be entered into central monitor next to corresponding telemetry rhythm

5.3.2   The patient's alarm history is available and will be reviewed as needed.

5.4   Suspend Mode:

5.4.1   Patients will only be placed on suspend status during transport to procedures while portable cardiac monitor is in use

5.5   When placing a patient on or taking off of suspend mode, two RNs must verify that the correct patient is addressed on the central station monitor Pager/Phone System Use

5.5.1   Telemetry patients are assigned to pagers/phones based on the nursing patient care assignment completed at the beginning of the shift.

5.5.2   Unused pagers/phones must be turned off.

5.5.3   RN will ensure that pager/phone is correctly programmed with assigned patients, and all required alarms are audible (red, yellow, and inoperative).The California default alarm configuration will be used to alert the RN by pager/phone (see attached California Default Standard device notification configuration).

5.5.4 RNs carry assigned pager/phone at all times except when on breaks or meals. When leaving the unit, hand off pager/phone to another relieving qualified RN, who has been assigned.

5.5.4.1 As per Medication Administration Policy, telemetry phones/pagers may be set to roll to the nursing station or handed off to other team members for monitoring during the med admin process

5.5.5 At the start of each shift, at least every 8 hours, Pager/Phone memory must be cleared and test pages measured to ensure delivery within 10 seconds.

5.5.6 Each pager, phone, telemetry box, and lead wires will be cleaned with germicidal disposable wipes after each use to prevent nosocomial infections.

5.5.7 Shift Change – off-going shift must retain telemetry assigned pager/phone until end of shift and must hand pager/phone off to the assigned qualified RN on the oncoming shift.

5.6 Battery Maintenance:

5.6.1 New batteries are to be placed in telemetry box for each newly admitted patient. Batteries in the telemetry box must be replaced every shift and when "low battery" or "replace battery" message appears.

5.6.2 Immediately replace the pager battery, when indicated at the monitor, to ensure no disruption of alert notification.

5.6.3 Replace Phone batteries at the beginning of each shift and as needed throughout the shift.

5.7 Name Alerts:

5.7.1 Patients on cardiac monitoring will be identified as a NAME ALERT on the central/overview station monitor

5.7.2 NAME ALERT will be communicated in the shift huddle

5.7.3 All reasonable efforts will be taken by management staff to avoid assigning NAME ALERT patients to the same RN or the same central monitoring station

5.8 Rhythm Strips

5.8.1 RN will print rhythm strip(s) when:

5.8.1.1 a patient is placed on the monitor (Initial Strip)

5.8.1.2 the unit standards require, at least every 8 hours

5.8.1.3 a patient has telemetry discontinued (Final Strip)

5.8.1.4   there is any rhythm that results in change in treatment, notification of a physician, intervention or change in level of service for the patient

5.8.1.5   alternative monitoring equipment is used

5.8.1.6   patient is placed back to telemetry monitoring, after alternative monitoring equipment use

5.8.2   Label rhythm strips with patient name and MRN, date, time and lead(s) recorded, PR interval, QRS duration, QT interval, and rhythm interpretation.

5.9   Documentation in medical record

5.9.1   Rhythm and rate on DocFlow sheet in KPHC, as required by unit standards

5.9.2   Labelled Rhythm strips (5.10.2) in Mini Records Chart (hard copies)

5.9.3   Patient and family teaching and patient's response to teaching

5.10   Clinical Technology will test the cardiac alarms annually as part of the regularly scheduled preventive maintenance program on the patient monitoring system.

5.11   Any concerns with pager, phone or telemetry monitor performance will be escalated to the unit ANM, NM, or designee. Emergency procedures in the event of cardiac monitoring equipment failure:

5.11.1   If the integrity of the alarm system is in question, the Nurse Manager/ANM will assign a qualified individual to monitor the central/overview station until the system is deemed reliable

5.11.1.1   The Nurse Manager will immediately alert Clinical Technology and the Clinical Adult Service Director and/or House Supervisor

5.11.1.2   The Clinical Adult Service Director or House Supervisor will notify the Chief Nursing Executive (CNE).

5.11.1.3   The CNE will immediately notify local Risk Management and Regional Patient Care Services, as appropriate.

5.11.2   Alert all staff on the unit of the equipment failure. The Nursing Supervisor will determine the need to call an internal disaster.

5.11.2.1   Do not admit new telemetry patients whenever possible.

5.11.3   Obtain alternative monitoring equipment such as transport monitors and defibrillators immediately to allow for continuous monitoring of all patients.

5.11.4   Implement continuous visual observation of all until the central monitors are functioning again.

> 5.11.5 The Nursing Supervisor is to maintain contact with Clinical Technology, and notify applicable units and ED when telemetry system is fully operational.

6.0   References/Appendices

   6.1   Attachment A: California Default Standard device notification configuration

   6.2 Kaiser Permanente Clinical Library, Northern California. Lippincott's Nursing Procedures and Skills.
   https://clm.kp.org/wps/portal/cl/NCAL/ReferenceShelf?memberage=N&category =N&doctype=Reference Shelf&sdtype=Nursing References&location=ReferenceShelf

   6.3 Kaiser Permanente, Northern California, Medication Administration Policy

NATIONAL POLICY AND PROCEDURES		
Policy Name	**Topics/Category**	**Website/Location**
N/A		
REGIONAL POLICIES AND PROCEDURES		
Policy Name	**Topics/Category**	**Website/Location**
Telemetry	Adopting Regional PCS policy template, revision date 12/15/2015	https://kpnortherncal.policytech.com/docview/?docid=25783
LOCAL POLICIES AND PROCEDURES		
Policy Name	**Topics/Category**	**Website/Location**
N/A		

7.0   Approvals

   7.1   Owner Department: Patient Care Services

   7.2   Custodian: Adult Services Director

   7.3   Reviewer:

   7.3.1   Emergency Department Director

   7.3.2   Unit 220 Manager

   7.3.3   Unit 335 Manager

   7.3.4   Unit 135 Manager

   7.3.5   CEPI Educator(s) for Telemetry Units

   7.4   Approver:

   7.4.1   Nursing Policy and Procedure Committee – 4/11/2017

   7.4.2   Chief Nursing Executive – 5/26/2017

   7.4.3   Medical Executive Committee 6/06/2017

Alarm	Arrhythmia	California Standard Default Configuration (Rings RN's Mobile Device)	Configuration	Reminder	Synchronization with Central Station
Red	Lethal Arrhythmia	Asystole (on)	Assigned RN + Another RN	Reminder after 1 min	All Reds alarm at central station
		V Fib/Tach (on)			
		V Tach (5 PVCs + and HR rate >100)			
		Extreme Tachy (HR>140 bpm)			
		Extreme Brady (HR< 40 bpm)			
Yellow	Non-Lethal Arrhythmia	HR (<50 or >130)	Assigned RN	None	All Yellows alarm at central station
		Ventricular Rhythm (idioventricular)			
		R on T PVC's			
		Pacer Not Capture			
		Pacer Not Paced			
		Pause (2.5 seconds)			
		Afib			
		Irregular HR			
Inoperative NCAL & SCAL: 30 seconds delay	N/A	Cannot Analyze ECG	Assigned RN	None	All Inops alarm at central station
		ECG Leads Off (all)			
		No Signal			
		Replace Battery			
		SpO2			

Appendix H

Data Collection Worksheet

Worksheet utilized to collect data on lead change and outbound calls.

Date: RN:	RM:	RM:
Did you call family members?	No ⟋ Yes	No ⟋ Yes
Were leads changed?		
Family comments/response to update call?		
Did you receive or perceive fewer incoming calls today due to your out-bound call?		

Appendix I

Nurse Guide for Family Update Phone Call

Education tool used to teach nurses on how to make outbound calls to update family members.

Purpose: To provide a structured, concise way of delivering daily patient updates to the designated spokesperson

Please begin by verifying whether the caller can provide the **patient's full name and MRN**.

You may also clarify whether the caller is the **designated spokesperson** by checking the patient's medical record and/or asking the caller directly. If the caller is **NOT** the designated spokesperson, you can kindly state: "Thank you for calling about [patient's name]. To minimize interruptions to the care environment, our practice is to give updates to the patient's designated spokesperson. Would you kindly coordinate with [designated spokesperson's name/relationship to patient] to obtain updates on [patient's name]?"

Phone update - before MDRs: Be brief. In general, you can summarize how the patient slept, how the patient is eating, and what the patient's mood is like. If the family member continues to ask questions, emphasize that you are happy to call the family member back after morning rounds, when you will have a better sense of the plan of care.

Phone update - after MDRs: Explain the plan of care. Emphasize that you or the physician will call if anything changes. Assuming caller is designated spokesperson, can add: "If other family members or friends of [patient's name] would like updates, please have them reach out to you, as this helps us minimize interruptions to the care environment."

Leaving a voice message: "Hello, my name is [your first name], and I am a nurse at Kaiser Santa Clara. I am caring for your family member (do NOT state patient's name). This is not an emergency. I am simply calling to provide you with an update on their condition. Please feel free to call the unit back at your convenience. Our number is (408) 851-____. Thank you!"

Information that we should not be discussing (i.e., not within RN scope of practice):
- Interpretations of scans (CT, MRI, etc.)

Appendix J

Statement of Non-Research Determination Form

The Nurse Interrupted project is deemed a non-research, quality improvement project.

1

CNL Project: Statement of Non-Research Determination Form

Student Name: Lela Shiferaw, RN, BSN, BA, CCRN

Title of Project:

Nurse Interrupted: Educating Nurses and Reducing Work Interruptions in the Intensive Care Unit.

Brief Description of Project:

Literature review informs that nurses in the Intensive Care Unit are interrupted frequently throughout their shift while being engaged in sensitive and critical tasks with their patients. The *Nurse Interrupted* improvement project is aimed at implementing small tests of change that would educate nurses on mitigating non-urgent interruptions by controlling incoming phone calls from family members and evaluating practice that would streamline patient alarms – both issues identified as primary interrupters by nurses in the subject ICU.

By working on the *Nurse Interrupted* project, nurses will be equipped with interruption management skills, and patient family's satisfaction relating to patient updates will increase.

A) Specific Aim Statement:

By November 2020, 20% of ICU nursing staff will state one evidence-based intervention to reduce interruptions in high severity tasks.

B) Description of Intervention:

Forty-eight ICU nurses responding to a survey on April 21, 2020 reported *alarms* and *family members* as being top interrupters for nurses in the ICU.

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- RNs place tight alarm parameters at beginning of shift, mid-shift, and as patient symptoms dictate.
- RNs to change lead electrodes daily to minimize aberrant alarms.
- RNs to utilize 'Outbound calls' to update family members with expectations of subsequent set at the beginning of each shift.
- Multi-Disciplinary Rounds to be utilized as non-urgent communication platform regarding plan of care for the team and family members, if present.
- Unit Assistants to screen critical calls prior to transferring to RNs.

B) How will this intervention change practice?

Current practice in the ICU:

- Regarding phone calls from families seeking updates: non-proactive, RNs typically await to receive calls from families to give updates unless urgent situation has occurred.
- Unit Assistant (UA) practice: screening of calls go as far as checking correct patient and transferring to correct assigned RN. Inconsistently, some UAs verify if the caller is allowed to get updates by checking the patient profile. Rarely, UAs verify if the RN is available to take calls.
- Alarm parameters are not consistently changed to fit the patient's alarm profile, and electrode lead hygiene is in consistent.

D) Outcome measurement(s):

- Twenty percent of ICU RNs will state one evidence-based intervention for minimizing interruptions during high-severity-tasks (HST).
- Decrease level of perceived RN interruption in the ICU during HST by post-survey to be deployed November 2020.
- Forty percent of ICU RNs will define interruption as a priority to promote a safe work environment.

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)

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☒ 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: *Nurse Interrupted: Educating Nurses and Reducing Work Interruptions in the Intensive Care Unit*	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 research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	X	
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 Kaiser Permanente Santa Clara Hospital 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.

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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.

STUDENT NAME (Please print):

Lela Shiferaw, RN, BSN, BA, CCRN

Signature of Student:	*[signature]*	DATE: 6/14/2020

SUPERVISING FACULTY MEMBER NAME (Please print):

Dr. Cathy Coleman, DNP, RN, OCN, CPHQ, CNL

Signature of Supervising Faculty Member *Cathy Coleman*   DATE 6/30/2020

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Appendix K

Pre-intervention Survey

Nurse Interruption Survey   SurveyMonkey

## Q1 Who or what interrupts you the most while you are engaged in a task with your patient?

Answered: 48   Skipped: 1
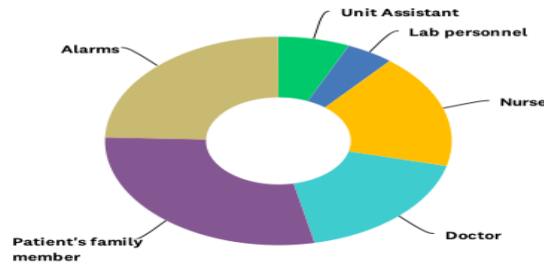
ANSWER CHOICES	RESPONSES	
Unit Assistant	6.25%	3
Lab personnel	4.17%	2
Nurse	16.67%	8
Doctor	16.67%	8
Patient Care Technician	0.00%	0
Patient's family member	27.08%	13
Management	0.00%	0
Alarms	22.92%	11
TOTAL		48

Q2 On an average shift, how frequently are you interrupted by the following:

Answered: 49   Skipped: 0

Low frequency   Medium frequency   High frequency   N/A
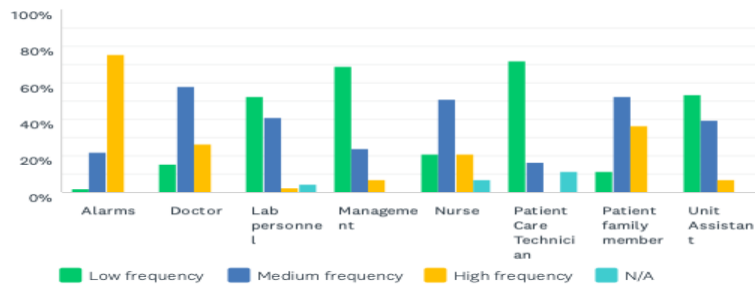
	LOW FREQUENCY	MEDIUM FREQUENCY	HIGH FREQUENCY	N/A	TOTAL	WEIGHTED AVERAGE
Alarms	2.22% 1	22.22% 10	75.56% 34	0.00% 0	45	2.73
Doctor	15.56% 7	57.78% 26	26.67% 12	0.00% 0	45	2.11
Lab personnel	52.27% 23	40.91% 18	2.27% 1	4.55% 2	44	1.48
Management	69.05% 29	23.81% 10	7.14% 3	0.00% 0	42	1.38
Nurse	20.93% 9	51.16% 22	20.93% 9	6.98% 3	43	2.00
Patient Care Technician	72.09% 31	16.28% 7	0.00% 0	11.63% 5	43	1.18
Patient family member	11.36% 5	52.27% 23	36.36% 16	0.00% 0	44	2.25
Unit Assistant	53.49% 23	39.53% 17	6.98% 3	0.00% 0	43	1.53

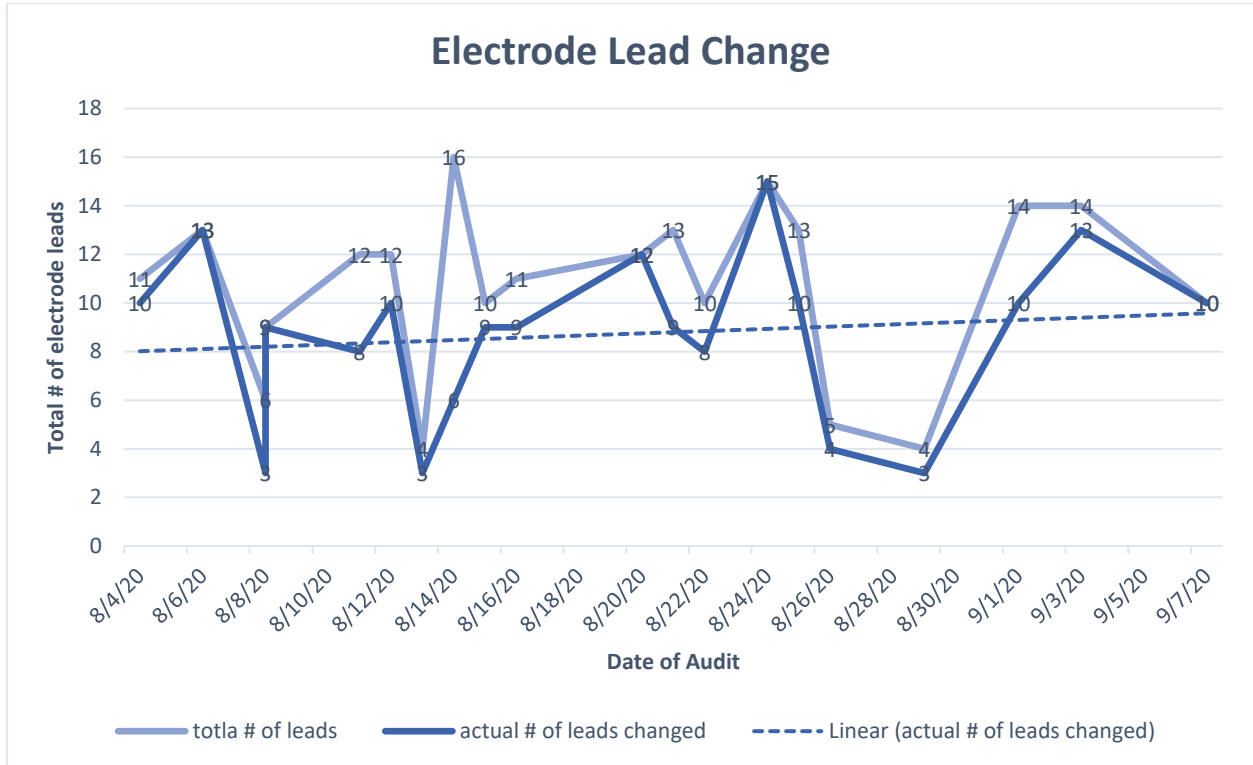**Appendix L**

CANS Alarm Data

Alarms data collected from the facility's clinical alarms notification system – data is

derived from the intensive care alarm system. "Leads Off" alarm showing a decrease in

occurrence post intervention. "Cannot Analyze" alarm, showing an initial increase in

occurrence post intervention, then a decrease in the September.
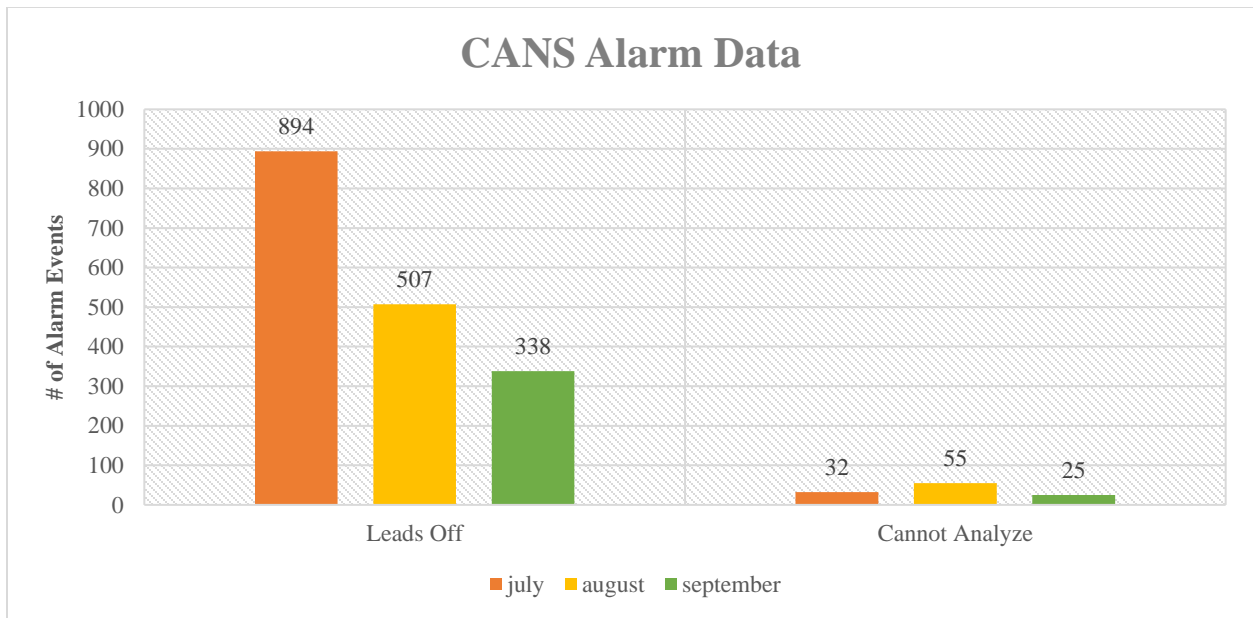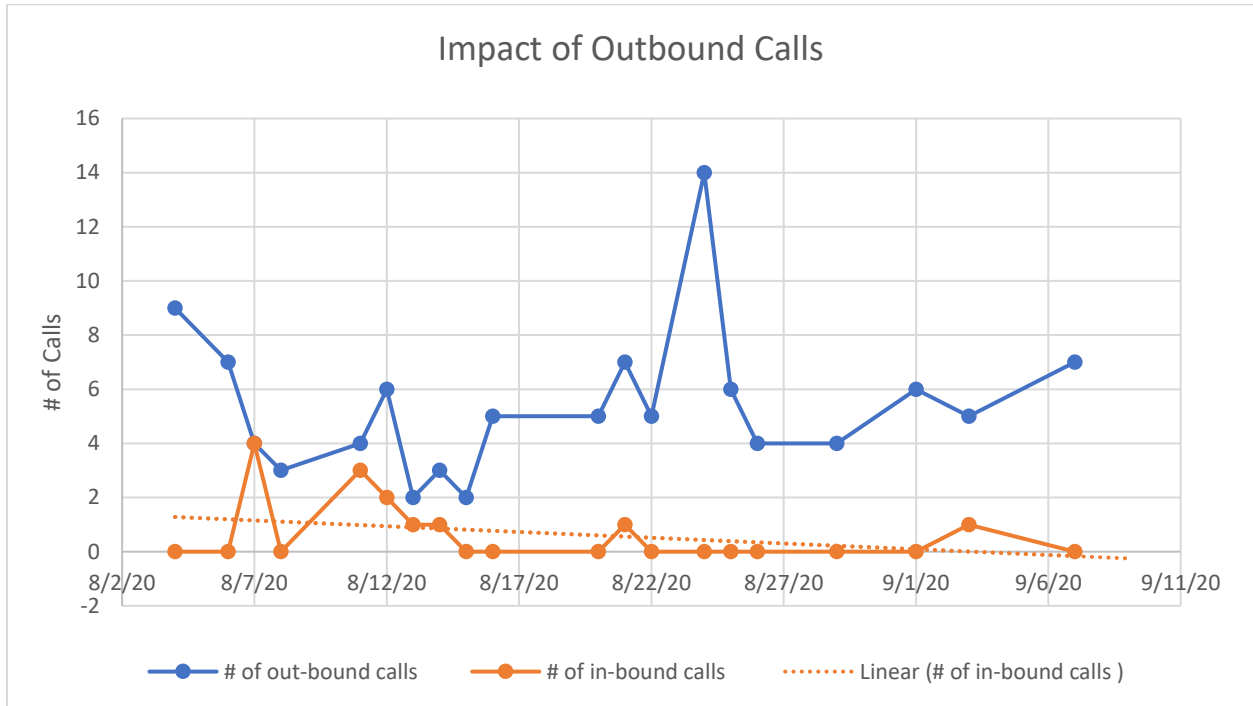
Appendix M

Electrode Lead Change Compliance

Trend line indicates increasing compliance with unit's electrode lead change practice.
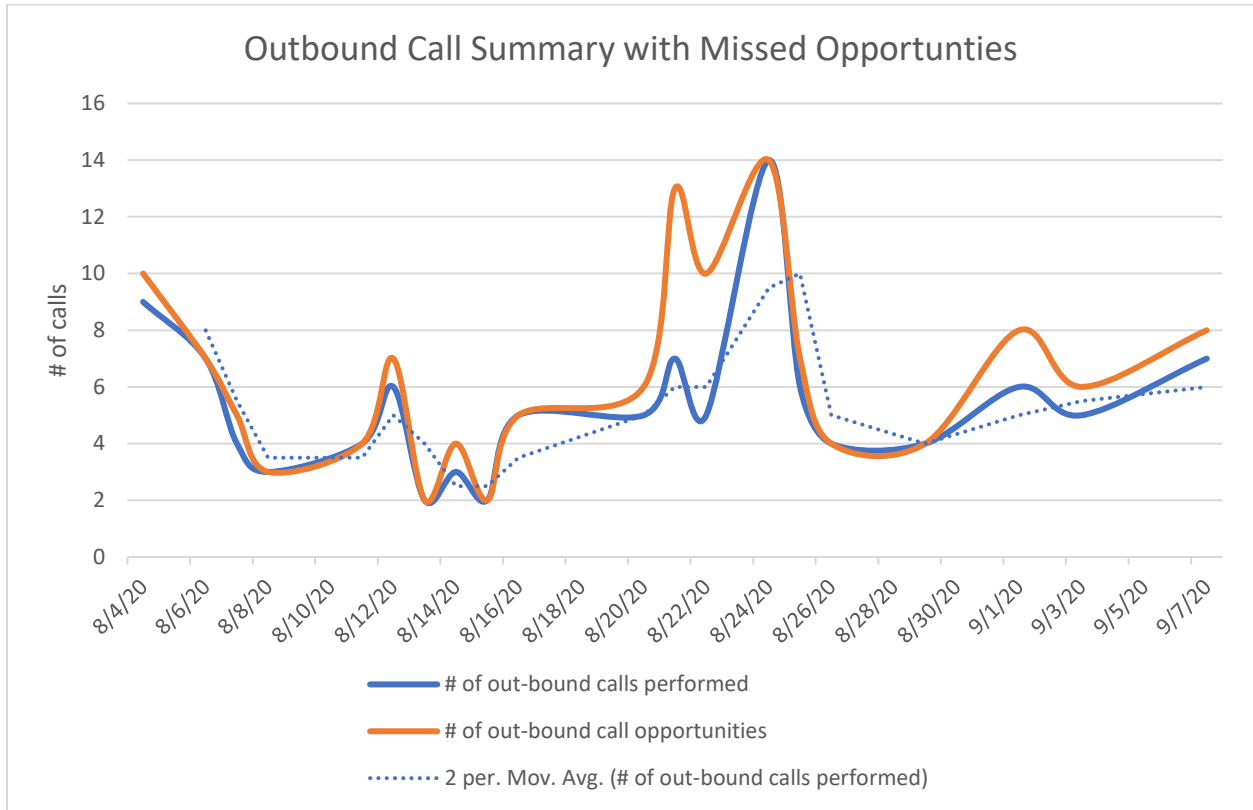
Appendix N

Impact of Outbound Calls

With the exception of one day, 8/7/2020, an inverse relationship is observed with outbound calls and inbound calls. The linear trendline indicates a trending down in number of inbound calls from family members.

Appendix O

Summary of Outbound Calls

Outbound Call Summary with Missed Opportunties

Appendix P
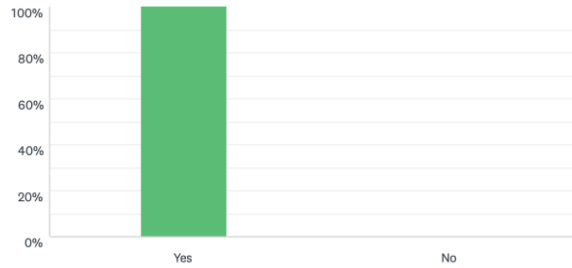
Post-Intervention Survey

Nurse Interrupted II   SurveyMonkey

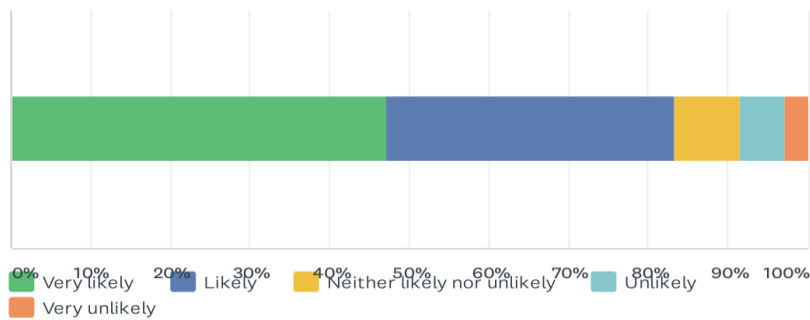**Q1 In your opinion, do you find calling and updating patient's family members good customer service?**

Answered: 36   Skipped: 0

ANSWER CHOICES	RESPONSES	
Yes	100.00%	36
No	0.00%	0
TOTAL		36

Q2 In your opinion, do you find taking time to call and update family members is likely to reduce calls you receive from family members for updates?
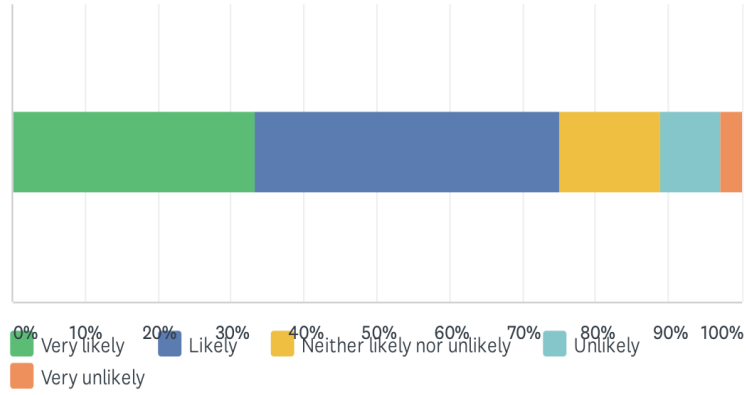
Answered: 36   Skipped: 0

ANSWER CHOICES	RESPONSES	
Very likely	47.22%	17
Likely	36.11%	13
Neither likely nor unlikely	8.33%	3
Unlikely	5.56%	2
Very unlikely	2.78%	1
TOTAL		36

Q3 In your opinion, could the practice of daily changing electrode leads, result in fewer aberrant alarms (eg: "leads off" or "can't analyze" alarms)?
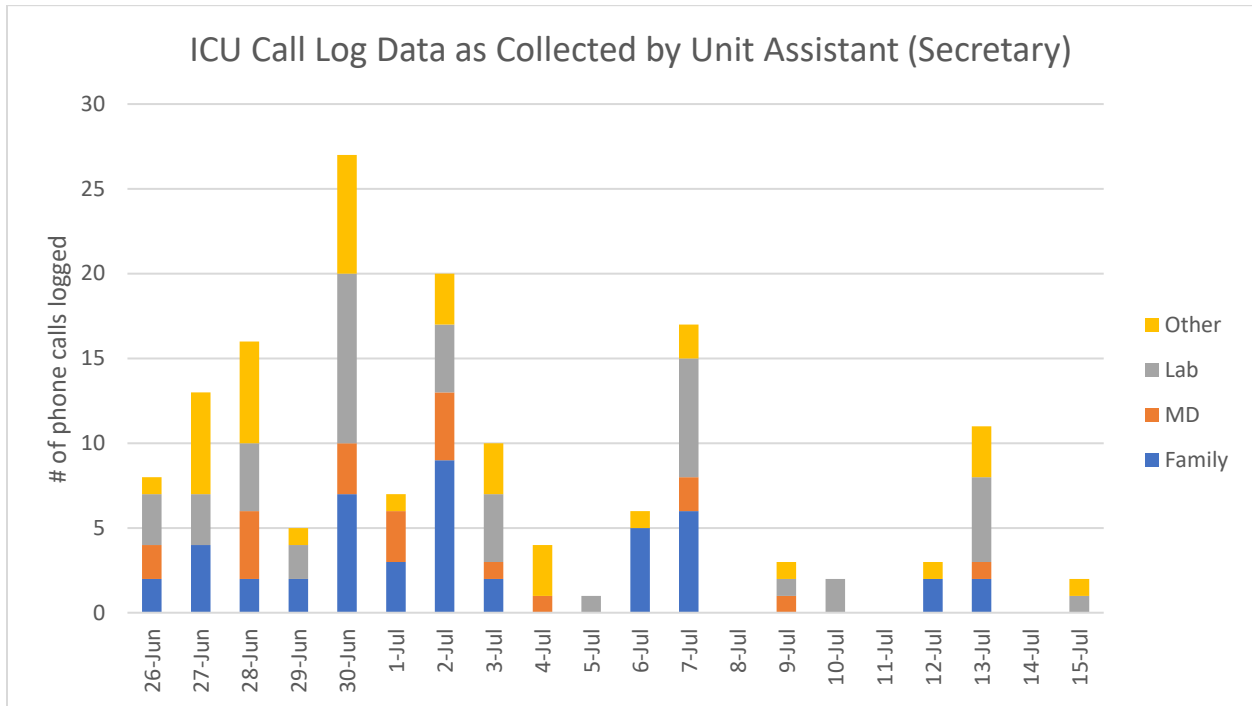
Answered: 36   Skipped: 0

ANSWER CHOICES	RESPONSES	
Very likely	33.33%	12
Likely	41.67%	15
Neither likely nor unlikely	13.89%	5
Unlikely	8.33%	3
Very unlikely	2.78%	1
TOTAL		36

Appendix Q

Pre-Intervention ICU Call Log

ICU Call Log Data as Collected by Unit Assistant (Secretary)

A generic ICU call log as collected by unit assistants. This was an attempt of a phone

call taxonomy. No data collected on July 8th and July 11th; data not comprehensive due to

inconsistent due to unit assistant availability and staffing challenges.

Appendix R

Unit Assistant Family Update Script

Script to guide units assistants – goal is to prevent blind call transfer to ICU nurses by unit assistants.

Family Update Telephone Script for UAs

STEP 1: OBTAIN AND VERIFY 2 PATIENT IDENTIFIERS
If caller is unable to provide 2 patient identifiers, proceed to step 5.

STEP 2: ADDRESS PHONE CALL
If caller is able to provide 2 patient identifiers, and it is before MDRs (i.e., before 11:30 am), proceed to step 3a.
If after MDRs (i.e., after 11:30 am), proceed to step 3b.

STEP 3A (BEFORE MDRS/11:30 AM)
"Generally, the nurses and physicians discuss the plan of care during morning rounds, which occur between 10:30-11:30 am. You will receive a better update after these rounds, so I will have the nurse call you then. This will also help us minimize interruptions to the care environment. What is the best time to reach you?"

or

STEP 3B (AFTER MDRS/11:30 AM)
"To minimize interruptions to the care environment, I will notify the nurse to provide you with an update at his/her earliest convenience. What is the best time to reach you?"

STEP 4: USE SECURE CHART CHAT TO SEND MESSAGE TO RN
Also, verbally notify RN if possible.
Sample message: "[Name of caller] called at [time] for an update. Thanks!"

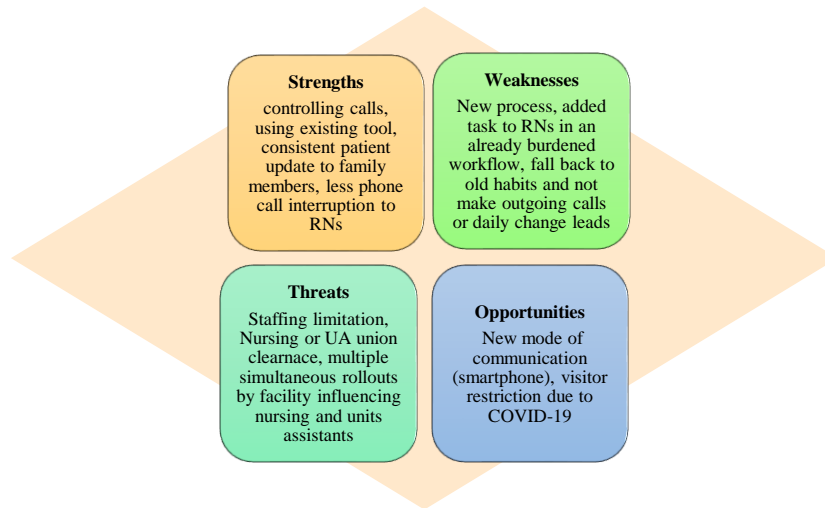**STEP 5: *ONLY IF CALLER UNABLE TO PROVIDE 2 IDENTIFIERS***
"I'm sorry, but due to HIPAA, we are prohibited from providing patient information if you cannot give us the required patient identifiers."

For repeated phone calls during same shift, kindly state: "Thank you for calling about [patient's name]. Typically, after the first update, the nurse or physician will call you if anything changes. In order to minimize the number of interruptions to the care environment, could we have [insert name of nurse] call you if anything changes?"

For calls from people who are not the designated spokesperson, kindly state: "Thank you for calling about [patient's name]. To minimize interruptions to the care environment, our practice is to give updates to the patient's designated spokesperson. Would you kindly coordinate with [designated spokesperson's name/relationship to patient] to obtain updates on [patient's name]?"

Appendix S

SWOT Analysis

Strengths

controlling calls, using existing tool, consistent patient update to family members, less phone call interruption to RNs

Weaknesses

New process, added task to RNs in an already burdened workflow, fall back to old habits and not make outgoing calls or daily change leads

Threats

Staffing limitation, Nursing or UA union clearnace, multiple simultaneous rollouts by facility influencing nursing and units assistants

Opportunities

New mode of communication (smartphone), visitor restriction due to COVID-19

Appendix T

End of Shift Handoff Nursing Note

End-of-shift electronic ICU nursing note for the patient chart that reminds nurses

to update family members and change electrode leads.

SCL ICU Shift Handoff:

Informative update to family by nursing staff: {YES/NO:28208}

Skin Assessment:

Skin {IS/IS NOT:233440} intact (excluding surgical/interventional sites).

Admission and wound photos are taken: {YES/NO:28208}

Head to toe skin assessment and handoff completed with ***, RN

ECG leads and oxygen saturation probe changed (daily): {YES/NO:28208}

High Alert Medication Handoff Completed (including medication patches): {TH

YES NO NOT APPLICABLE:304017}

Admission assessment completed: {YES/NO:28208}

Restraints documented (every 2 hours): {TH YES NO NOT APPLICABLE:304017}

Ensure belongings list completed and checked: {YES/NO:28208}

Documented by: *, RN**