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Advance Alert Monitor

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Advance Alert Monitor Implementation in a Medical Center

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Section I: Abstract

Problem: The acute deterioration of patients outside the Intensive Care Unit (ICU) are safety and quality concerns. Studies have shown that these deteriorations are associated with increased morbidity and mortality. This study aims to standardize the Rapid Response Team (RRT) nurse documentation in response to an Advanced Alert Monitor (AAM) alert, as at baseline no such alert nor standardized response and documentation exist.

Context: Hospitals are continually challenged to innovate and create systems that can track multiple parameters and identify at-risk patients earlier on. An Early Warning System (EWS) in combination with a RRT significantly reduces patients' potential for clinical decline. Predictive analytic systems such as an EWS are being introduced in response to this challenge and are anticipated to become the standard of care. The healthcare system/organization examined in this study aims to provide high quality, affordable health care services; and to improve the health of its members and the communities it serves. The Advance Alert Monitor (AAM) program enables this healthcare system/organization to better deliver on that mission by closing the quality gap of failure to recognize clinical decline in patients' conditions.

Interventions: The health system's EWS is the AAM program. Its goal is to address safety and quality concerns associated with failing to identify a decline in patients' conditions in a timely manner. The electronic health record and other sources are scanned constantly to generate an AAM score hour. If the score is eight percent or greater risk of deteriorating within 12 hours, E-Hospital staff review the patient's chart and notify the RRT nurse. The RRT nurse collaborates with the primary nurse to assess the patient and communicate findings to the attending hospitalist. A standardized RRT nursing note is utilized to document the response for all initial AAM alerts.

Measures: A family of measures was developed for the project. The outcome measure focused on the percentage of RRT nursing notes present for all initial AAM alerts. This measure recorded both a response and documentation of that response to the alert. Process measures included RRT proactive rounding documentation, and training of 100% RRT nurses on the AAM workflow. Tracking of code blue events outside the ICU was used as a balancing measure.

Results: From January 1 through June 30, 2018, there were 527 initial AAM alerts. Of those, 504 (95.6%) initial AAM alerts had the RRT nursing note present which indicates an intervention was made.

Conclusions: The aim of this project was to integrate AAM predictive analytics with RRT practices that include a newly implemented standardized RRT nursing note; with AAM enabling early intervention to prevent a decline in patients' conditions, and the RRT nursing note the documentation of such. The project was successfully implemented at the medical center with 95.6% RRT nursing note completion - and thus an intervention made - for all initial AAM alerts.

Advance Alert Monitor Implementation in a Medical Center

Section II. Introduction

The 100,000 Lives Campaign from the Institute for Healthcare Improvement (IHI) has challenged hospitals across the United States to reduce cardiac arrests and other sudden, life-threatening events in patients on general medical floors by implementing a system of Rapid Response Teams (IHI, 2018). As of 2018, approximately 1,500 hospitals are now implementing or actively using RRTs (IHI, 2018) and as a result cardiac arrest rates, mortality rates, and lengths of stay in the intensive care unit (ICU) are dropping, and hospitals with an RRT are moving their cultures towards a team-based approach to address clinically challenging situations. Currently, most RRTs in the United States are triggered by one abnormal clinical parameter at a time, an indication of a significant change in that particular vital sign (IHI, 2018). The increased focus on reducing harm, improving the quality of care of patients, and decreasing the length of stay are important drivers of continuous quality improvement efforts (Burstin, Leatherman & Goldmann, 2016). These foci are also organizational priorities at the medical center and health system identified in this study.

Problem Description

The acute deterioration of medical-surgical patients outside the ICU is a quality and patient safety concern. Studies have demonstrated that these patients, with an unplanned transfer to the ICU, have increased mortality and morbidity (Escobar et al., 2012). Many hospital deaths are potentially preventable as the acute deterioration of patients is often preceded by changes in their physiological conditions from six to 24 hours prior to the event (McGaughey et al., 2009). The most common changes are in basic vital signs and level of consciousness. Unfortunately, these changes are often missed, which can result in unplanned

ICU admissions, increased hospital length of stay, cardiac arrest, or death (McGaughey et al., 2009).

The purpose of proactive rounding is to recognize a decline in a patient's clinical condition early. Although the RRT program has successfully reduced the number of code blues outside of the ICU by approximately 50%, opportunity remains to identify at-risk patients earlier during their hospitalization. To help identify an early decline in the patient's condition, the Advance Alert Monitor (AAM) program will be implemented. AAM is a new interdisciplinary program which includes the RRT nurse, primary care nurse, attending physician, social services, and palliative care/life care planning resources. AAM enables teams to be proactive rather than reactive in identifying at-risk patients and can ultimately improve quality of care and patient safety.

The medical center's ICU is a Beacon Silver designated ICU. The Beacon Award for Excellence by the American Association of Critical Care Nurses (AACN) honors individual units that distinguish themselves by improving every facet of care of the critically ill patient. The ICU has 20 licensed beds and serves a combination of medical and surgical patients. The interdisciplinary team in the ICU includes the following department resources: nursing, pharmacy, laboratory, respiratory therapy, radiology, social work, and palliative care. The ICU staffing includes an RRT nurse on every shift whose primary responsibility is to conduct proactive patient rounding and respond to RRT calls, code blues, and other facility-wide alerts.

The current RRT program at the medical center is more reactive than proactive. The primary role of the RRT nurse is to respond to alerts of patient decline and at risk of a code blue. The most at-risk patients are not well defined within the clinical parameters prompting the RRT nurse rounding. Further, the documentation of RRT proactive rounding is inconsistent in

completion and content. This study aims to standardize the RRT nurse documentation in response to an AAM alert, as at baseline no such alert nor standardized response and documentation exists.

Available Knowledge

PICO Question

Does Advance Alert Monitor (AAM) (I) reduce Intensive Care Unit (ICU) mortality (O) of medical-surgical patients (P) at the Kaiser Roseville facility as compared to the mortality of medical-surgical patients at a non AAM (C) Kaiser facility in Northern California? An electronic search was conducted on February 10, 2018 in the Cochrane Database of Systematic Reviews, CINAHL Complete, and Pub Med databases using the search terms: *RRT program, EWS, Code Blue Prevention, Proactive Rounding.* Limitations were set to include English only, systematic reviews, research, and publication dates no earlier than 2008. Twelve articles were retrieved that had specific relevance to the PICO question and six were selected to review.

Literature Review

A comprehensive review of the literature was conducted to assess evidence of RRT programs, as well as implementation of an Early Warning System (EWS). The Johns Hopkins Nursing Evidence-Based Practice (JHEBP) research evidence appraisal tool (2007) was used to appraise the evidence for this review. A Cochrane review of two randomized control studies (RCTs) was appraised as a Level IA study. One RCT study in this review showed statistical significance in the reduction of inpatient mortality when an EWS was utilized (McGaughey et al., 2007). Two Level II articles were reviewed and respectively rated as Level II A (Escobar, Laguardia, Turk, Kipnis, & Draper, 2012) and Level II B (Ludikhuize et al., 2014) studies. Two retrospective review articles provided varying results of the effectiveness of RRT teams. Of

these, Guirgis et al. (2013) performed a retrospective review of a prospectively collected database, a study rated Level III A. A retrospective observational study rated Level III B found that proactive rounding did not improve patient outcomes (Butcher, Vittinghoff, Maselli, & Auerbach, 2013). Although this study did not report improvement in patient outcomes, it was valuable to review as it identified the need for multiple site RCTs. One Level V A expert opinion article was reviewed and provided evidence for the effectiveness of an RRT team in one teaching hospital in Chicago (Thomas, Force, Rasmussen, Dodd, & Whildin, 2007). The effectiveness of RRT programs varied widely within all of the studies reviewed. See Appendix B for evaluation table of evidence-based research.

Proactive rounding is an effective strategy to reduce the number of code blues outside the ICU, as well as mortality associated with those codes (Guirgis et al., 2013). While this single-aspect approach has produced successful interventions, what if organizations could identify the at-risk patients even before such extreme changes have occurred in their clinical conditions? A few hospitals have implemented such systems through an early warning scoring (EWS) system. According to Duncan, McMullan, and Mills (2012), an EWS is a physiologic scoring system used in units outside the ICU to identify high-risk patients before their clinical condition deteriorates. Using the EWS system in conjunction with an RRT has yielded significant reductions in cardiac arrests as well as unplanned transfers to the ICU (Duncan et al., 2012). Ludikhuize et al. (2014) did a 3-month quasi-experimental study to determine the effect of protocolized measurement of an EWS by their RRT. Their findings were that protocolized measurements support more reliable RRT activations, as well as better detection of physiologic abnormalities in patients.

The organization's Northern California region has piloted the AAM EWS to predict an individual's likelihood of clinical deterioration (Escobar et al., 2012). AAM calculates, in real time, the risk of a patient deteriorating within the next 12 hours. The organization's electronic medical record known as Health Connect (HC), and other information sources are scanned in real time, and an EWS score is generated every hour. Several factors affect the score, including laboratory values, vital signs, neurologic score, and age (Escobar, Gardner, Greene, Draper & Kipnis, 2013). If the score is equal to or greater than eight percent risk of deteriorating within 12 hours, the RRT Registered Nurse (RN) collaborates with the primary nurse to assess the patient and communicate the findings to the Hospital-Based Services (HBS) physician.

Rationale

Quinn's Advanced Change Theory (ACT) and the Betty Neuman's Systems Model were selected as the conceptual and theoretical frameworks for the implementation of AAM. Quinn's ACT is a systematic approach to change, and guides organizations through transformation (Quinn, 2000). One of the steps is the creation of an emergent situation by the leader to establish a vision for the common good (Quinn, Spreitzer, & Brown, 2000). To be successful in this step, the leader must engage other members of the team to gain their support, commitment, and participation. As a result, the team can participate in honest dialogue while remaining committed to the vision and willing to make personal sacrifices for the team to reach its goals (Quinn, Spreitzer, & Brown, 2000). Using Quinn's ACT as a framework and creating a sense of urgency, local leadership support is obtained and leveraged to set the stage for a common vision and goals for the project.

The Betty Neuman's Systems Model is a comprehensive and holistic system-based approach to nursing that provides nurses an element of flexibility they would not otherwise have

(Nursing Theory, 2017). The theory is based on patients' responses to actual or potential threats or stressors. Primary, secondary, and tertiary prevention and intervention are deployed to maintain patients' well-being (Neuman Systems Model, 2005). Primary intervention focuses on preventing stressors that negatively impact patients. In the event that a stressor negatively affects the body, secondary prevention focuses on preventing damage to the body, building systems of resistance, and removing the stressor. Tertiary prevention occurs when the patient has gone through secondary intervention and prevention strategies (Nursing Theory, 2017). The goal of the tertiary prevention phase is to rebuild energy levels and get patients back to previous levels of function and health (Neuman Systems Model, 2005).

The Betty Neuman's Systems Model provides the framework to guide the patient-specific aspect for implementation of AAM, and to educate the RRT nurses to the specific AAM workflows. The primary goal of AAM is to proactively identify patients who are at risk for clinical deterioration, which correlates with the primary prevention arm of Neuman's systems theory. If an AAM alert is triggered and the patient assessment by the RRT nurse and HBS physician requires a change in the treatment plan for the patient, the transition to secondary prevention is key to prevent damage to the body in addition to removing the stressor. If transfer to ICU is necessary, tertiary intervention can be started earlier because necessary identifications have already been made.

Specific Project Aim

The aim of this project is to increase utilization of Rapid Response Team (RRT) standardized note for initial AAM alerts from 0% to 90% by the end of June 2018.

Section III. Methods

Context

The medical center examined in this study is a 340-licensed-bed hospital in Northern California. The ICU has 20 licensed beds and serves a combination of medical and surgical patients. The unit's leadership includes a Nurse Manager and a Medical Director. The ICU team is a multidisciplinary team and the ICU staffing includes an RRT nurse every shift whose primary responsibility is to respond to RRT calls, code blues, complete proactive patient rounding, and respond to other facility-wide alerts.

Evaluating the system setting readiness for this change is crucial to ensure successful implementation. The ICU has a mature RRT program, with consistent workflows that include proactive rounding on their patients. The AAM workflow requires consistent RRT staffing. For AAM to be successfully implemented it is important to ensure the RRT nurse is not assigned to patient care.

Consistent and standardized documentation by the RRT nurse needs improvement and is a potential barrier to maximizing the benefit of AAM. Resistance to change from the medical-surgical nurses is another potential barrier to successful implementation of AAM. This subset of nurses may feel a loss of autonomy with implementation of the program. Thus, it will be important to include them in the AAM process and ensure they are active participants and collaborators in the plan of care of the patient in order to overcome this potential barrier.

A structured local facility implementation team is also needed. This includes the local facility sponsors and leaders, physician and nursing champions, and key frontline clinicians including the Hospital Based Physician (HBS), intensivist, ICU manager, RRT nurse, social worker, palliative care team, and quality representative.

The ICU's dedication to quality of care and continuous improvement efforts will ensure that AAM implementation is successful. The AAM program has been successfully piloted at two alpha and two beta sites in this organization's Northern California region, and the program is ready to be spread and implemented in the other Northern California facilities. This expansion of AAM has been approved by senior executive leadership, and a regional team will support the local facility during the implementation phase of AAM.

Intervention

The overarching purpose of this project is to reduce harm and improve the quality and safety of care by implementing an EWS to determine the risk of patient deterioration within the next 12 hours. The organization's EWS, called AAM, utilizes many different components from the Electronic Health Record (EHR) as well as clinical parameters to calculate—in real time—the risk of a patient deteriorating, thus preventing unplanned transfer of the patient to the ICU. The calculations are determined from laboratory values, vital signs, neurologic score, and age affect the score (Escobar, Gardner, Greene, Draper & Kipnis, 2013).

Health Connect (HC) and other information sources are scanned in real time and an AAM score is generated every hour. If the score is equal to or greater than an eight percent risk of deteriorating within 12 hours, E-Hospital nursing staff reviews the patient chart and notifies the RRT nurse of the AAM score. The RRT RN collaborates with the primary nurse to assess the patient and communicate the findings to the HBS physician. The HBS physician then assesses the patient and adjusts the treatment plan accordingly (AAM Playbook, 2017).

The RRT nurses are trained on the AAM workflow, which includes utilization of the standardized RRT nursing note for all initial AAM alerts. The RRT nursing note is new HC documentation specifically developed for the AAM program. The note provides a framework for

all interventions performed by the RRT nurse and provider team. An example of the RRT nursing note is provided as Appendix G. Education is important to ensure that all members of the multidisciplinary team are effectively engaged around the program objectives, workflows, and role-specific expectations. Nursing specific education was carried out for the RRT nurses, as well as for all medical-surgical nurses. Validation of the RRT specific competencies is crucial as the RRT nurse is the first point of contact locally, and all subsequent interventions rely on RRT adherence to the workflow.

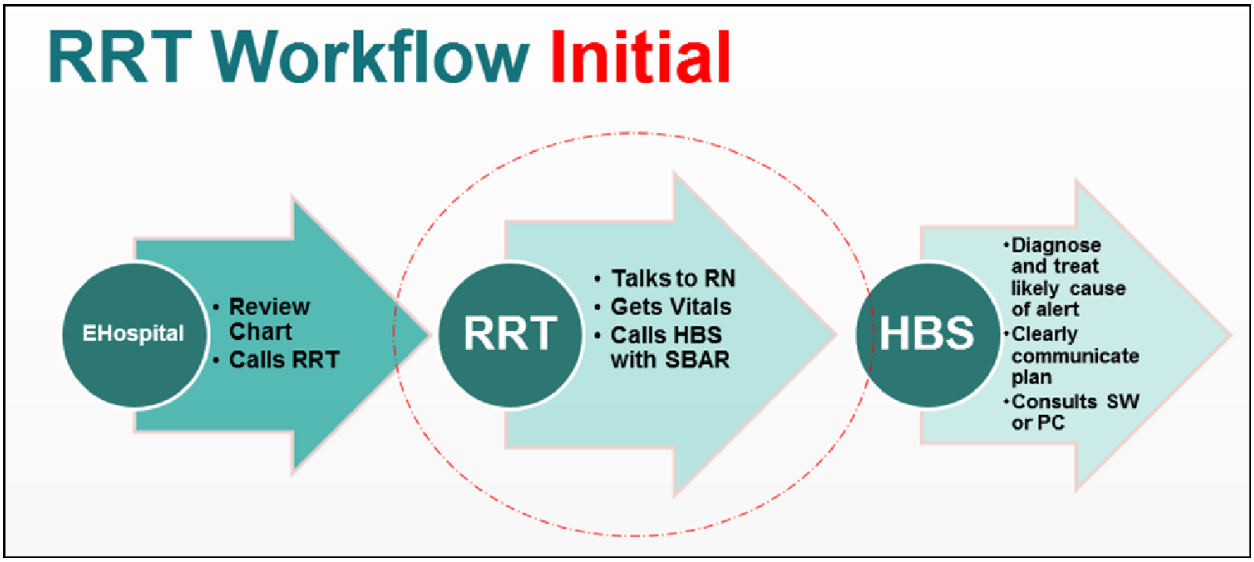

Figure 1. RRT workflow

Successful implementation requires interdisciplinary teamwork, leadership, and coordination across hospital departments. An implementation action plan (Appendix C) serves as a guide so the local team can anticipate next steps of the implementation.

Study of Intervention

Measurement is an important part of the project implementation. Measures tell the team whether the changes they implemented led to improvement and achievement of set goals (IHI, 2017). Small tests of change were done to test the RRT nurse workflows and to identify

potential breakdown in the workflow. One small test of change was conducting a post-day-shift debrief to review all initial AAM alerts received during that shift. RRT nurse documentation was reviewed to ensure the standardized RRT nurse note was completed within three hours of receiving the initial AAM alert. This was tested for five days and seven out of nine initial AAM alerts had the required RRT nurse documentation present. This small test of change was then spread to the afternoon shift. Post-shift debriefs were done for five days and 100% of initial AAM alerts had the required RRT nurse documentation present. During these debriefs, the frontline RRT nurses provided valuable feedback on the different documentation components, which allowed for immediate action to resolve barriers or challenges. Education of the medical-surgical nurses was a crucial part of the implementation plan, especially because the floor nurses could potentially feel a loss of autonomy. Education of the floor nurses was done during shift huddles by the frontline RRT nurses as a test of change over three shifts. The post-education feedback from the floor nurses was overwhelmingly positive and the decision was made that the RRT nurses would complete all the floor nurse education.

Evaluation of the implementation of AAM occurred through daily oversight of the specific processes and outcome measures. The data was reviewed on a weekly to monthly basis depending on the source and availability of reports. Weekly calls were scheduled between the regional AAM team and the local facility implementation team to review performance and adherence to the proposed workflows.

AAM-specific dashboards pull information automatically from the HC database and local facility quality dashboards. A regional data analyst was assigned to the project to validate data for accuracy. Weekly AAM measurement meetings were held with the data analyst and the local facility implementation team to review the data so that any necessary revisions could be made

immediately. The data analyst tested and validated all data prior to disseminating to the local team. AAM reports are available on the regional AAM website, see appendix E for an example of the report template. The results were shared with the frontline clinicians to keep them informed of progress or gaps, as well as to celebrate success.

Measures

AAM will be fully implemented at the Medical Center by the end of June 2018. The outcome measure for the AAM implementation focused on the percentage of RRT nursing notes present for all initial AAM alerts. Several primary and secondary drivers played a role in ensuring that the specific aim for the project was met. In addition to the outcome measure, process measures and a balancing measure were also used to evaluate success. In addition to the RRT nursing note for initial AAM alerts, a process measure monitored RRT documentation for proactive rounding. Proactive rounding is a proven strategy to prevent code blues outside the ICU. Every intervention must be documented as part of the process measure. An important process measure was training 100% of the RRT nurses to the workflow of the initial AAM alert to ensure success of the program. The number of code blue events outside the ICU is a balancing measure and is tracked on a monthly basis. The specific measures are listed in Appendix D. Process measures are studied on a weekly basis, enabling the implementation team to understand any gaps or issues in the implementation process. Clarification and understanding of measures are necessary to ensure the frontline teams perform to the expected workflows.

Ethical Considerations

The implementation of an EWS adds another layer of detection to the RRT program, enabling earlier identification of deteriorating patients. However, EWS's are still uncommon in the United States. The Medical Center will be one of only a few hospitals in the US to

implement an EWS system in 2018. Predictive analytic systems in health care, such as an EWS, are expected to become the community standard in the future (Slabodkin, 2014). As this EWS becomes the standard of care, if an alert is issued and the frontline clinicians do not follow the standardized workflows, take appropriate action, and document their actions and decisions, the EWS may expose clinicians and the healthcare organization to medical-legal risk. However, technology and data utilization has historically pushed medicine forward, and AAM is poised to do the same. This 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) approval was not required. A statement of determination as a non-research project was approved by the University of San Francisco faculty, see Appendix A.

Section IV. Results

Outcome Results

The outcome measure focused on the percentage of RRT nursing notes present for all initial AAM alerts. Involvement of the frontline RRT nurses was crucial to ensure that the identified workflows were followed. Based on frontline RRT nurse feedback, the standardized RRT nursing note was changed to be more clinician friendly, which led to increased utilization of the note.

The outcome measure assessed the percentage of RRT nursing notes present within three hours of the initial alert time. This measure is reflective of the compliance of the RRT nurse workflow for all initial AAM alerts. No baseline data was available as this is a new nursing note utilized by the RRT nurses. The response within three hours at the medical center from January 1, 2018 through June 30, 2018 was 95.6%, thus exceeding the goal set at 90%. Specifically, a total of 527 initial AAM alerts were received by the RRT nurse within that time span. The RRT

nursing note was present for 504 of those 527 initial AAM alerts. The results by month are listed in Appendix F.

Section V: Discussion

Summary

AAM was successfully implemented at the medical center. Lessons learned during the study period were that consistent RRT nurse staffing as well as standardized workflows were essential for successful implementation. Additionally, proactive rounding by the RRT nurse combined with the AAM predictive analytics ensured optimal management of the patients at risk of physical decline in their clinical condition. The combination of proactive rounding and AAM predictive analytics is expected to improve patient safety and clinical outcomes, making AAM a very useful and value-added endeavor for inpatient care. AAM promotes strong interdisciplinary collaboration and empowers all members of the care team to speak up for the patient. Nursing is the biggest group of frontline staff affected by the AAM workflows, and their buy-in to the program is critical to ensure success. The RRT nursing note is a critical communication and documentation tool leveraged by the multidisciplinary care team, thus strengthening the overall success of the AAM program.

Effective communication among all stakeholders and frontline providers was of the utmost importance and significantly contributed to successfully making the changes necessary for successful implementation. Through the use of AAM, the care team culture shifted from a reactive to a proactive approach, which is important for sustainability. Further, more proactive monitoring of indicators of patients' future conditions and response to those indicators is a substantial change in nursing and physician practice; with interventions potentially made prior to decline.

Inconsistent RRT nurse staffing could have negatively impacted the implementation, therefore local leadership was committed to ensure the presence of a dedicated RRT nurse every shift who was not assigned to patient care. The potential loss of floor nurses' care autonomy was another project threat, but by utilizing the frontline RRT nurses to educate the medical-surgical nurses, better collaboration was achieved. With AAM deployed, bedside nurses work side-by-side with the RRT nurse to ensure a proactive approach and collaborate to ensure timely intervention in patients' plans of care.

Projections from the organization's Division of Research (DOR) indicated that AAM will decrease total hospital days. The AAM interventions at the initial pilot sites, showed a definite trend towards Length of Stay (LOS) favorability, with an average 32.9 hour decrease in the hospital LOS, and 6.8 hour decrease in ICU LOS (Escobar et al., 2016). The investment costs related to AAM implementation are the result of training the RRT and medical-surgical nurses about the AAM program and workflows, including the RRT nursing note. The total cost for the implementation of the AAM program in this medical center was $16,038. The return on investment (ROI) from the AAM program will be from savings associated with decreased RN labor cost secondary to the decrease in LOS. This anticipated cost savings is significant and is approximated to yield $31,923,729 in LOS-associated labor savings for the first and second year post-implementation. The detailed AAM program ROI is outlined in Appendix H.

Conclusion

The acute deterioration of medical-surgical patients outside the ICU is a quality and patient safety concern. The aim of this project was to integrate AAM predictive analytics with current RRT practices to provide early intervention to prevent clinical decline in the patient's condition. The financial benefits from implementing this program clearly outweigh the

implementation cost. More importantly, the value of a human life saved due to earlier recognition and intervention simply cannot be calculated or quantified.

The project was successfully implemented at the medical center with 95.6% RRT nursing note completion for all initial AAM alerts. The RRT nursing note completion represents the receipt, evaluation, and potential actions taken as a result of an AAM alert. Therefore, high rates of completion of the RRT nursing note indicate successful adoption of a new documented workflow for the rapid response team that includes important predictive clinical data that was previously unavailable to the multidisciplinary team. Successful implementation of AAM at this particular medical center paved the way for expansion to all of the other 16 Northern California facilities within this healthcare system/organization. A regional AAM playbook was developed to guide local facilities through the implementation process. This playbook employs all of the lessons learned as well as stakeholder feedback from the pilot site study for ease of implementation at the remaining facilities in the region; as well as serving as a reference for program expectations should there be drift in the future. To sustain current performance and ensure continued success of the AAM program, the medical center has transitioned the review of AAM data to their bimonthly Code Blue Committee meetings where all RRT and AAM performance data are reviewed. AAM program review and associated feedback has been embedded into the medical center's current bylaw meeting infrastructure to ensure it will receive ongoing attention and support from both committee and medical center leadership.

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Section VIII: Appendices

Appendix A

IRB Non-research determination form

CNL Project: Statement of Non-Research Determination Form

Student Name: Liesel Buchner

Title of Project:

Advance Alert Monitor (AAM) Implementation at a Medical Center

Brief Description of Project:

A) Aim Statement:

Global Aim: By June 2018 AAM will be fully implemented at the Medical Center.

B) Description of Intervention:

The overarching purpose of this project is to reduce harm as well as improve the quality and safety of care by implementing an Early Warning System (EWS) to determine the risk of patient deterioration within the next 12 hours. Advance Alert Monitor (AAM) utilizes many different components from the Electronic Medical Record (EMR) as well as clinical parameters to calculate in real time the risk of a patient deteriorating within the next 12 hours, thus preventing the unplanned transfer of the patient to the Intensive Care Unit (ICU). A patient with an elevated AAM score (>8%) triggers an alert. The remote e-Hospital staff reviews the patient chart and contacts the Rapid Response Team (RRT) Registered Nurse (RN) to notify them about the alert. The RRT RN assesses the patient and contacts the covering physician to provide an update on the patient condition. The

covering physician assesses the patient and based on their assessment makes changes in the plan of care or treatment plan.

C) How will this intervention change practice?

The acute deterioration in the clinical condition of patients can be prevented by early recognition of signs and symptoms of clinical decline and early intervention. By using an Early Warning System (EWS), deteriorating patients are identified earlier and treated accordingly to improve the quality of care and ultimately improve patient outcomes. Delays in care are associated with increased mortality and unplanned transfers to the Intensive Care Unit (ICU). The AAM program aims to address these patient safety and quality of care issues. The role of the RRT nurse is crucial in the AAM workflow since they are the recipient of the initial and repeat alerts. Part of the RRT nurse workflow is the use of a standardized note for all AAM alerts, as well as the follow-up on patients.

D) Outcome measurements:

RRT nurse note utilization for initial AAM alerts

E) Process measurements:

RRT nurses trained on AAM workflow

F) Balancing measurements:

Incident rate of Code Blue events on the medical-surgical/telemetry units

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)

☒ 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 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 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.

STUDENT NAME (Please print):
Liesel Buchner

Signature of Student:

_____DATE_____

SUPERVISING FACULTY MEMBER NAME (Please print):
Dr. Nancy Taquino

Signature of Supervising Faculty Member

_____DATE_____

Appendix B

Evaluation Table

Study	Design	Sample	Outcome/Feasibility	Evidence rating
McGaughey, J., Alderdice, F., Fowler, R., Kapila, A., Mayhew, A., & Moutray, M. (2007). Outreach and early warning systems (EWS) for the prevention of intensive care admission and death of critically ill adult patients on general hospital wards. *Cochrane Database of Systematic Reviews, 3. d*oi:10.1002/14651858.CD005529.pub2.	Cochrane Review	Two RCT studies were included in this review One study was a prospective cluster randomized controlled trial (RCT) of general inpatient wards in 23 hospitals in Australia The other study was a prospective stepped-wedge randomized controlled trial in 16 acute adult general wards in one hospital in the United Kingdom (UK)	The primary outcome in the Australian trial (a composite score comprising incidence of unexpected cardiac arrests, unexpected deaths, and unplanned ICU admissions) showed no statistical significant difference between control and medical emergency team (MET) hospitals (adjusted P value 0.640; adjusted odds ratio (OR) 0.98; 95% confidence interval (CI) 0.83 to 1.16). The UK-based trial found that outreach reduced in-hospital mortality (adjusted OR 0.52; 95% CI 0.32 to 0.85) compared with the control group. The results of the two studies showed either no evidence of the effectiveness of outreach or a reduction in overall mortality in patients receiving outreach. The lack of evidence on outreach requires further multi-site RCT's to determine potential effectiveness.	Level I/A  Outreach and early warning systems - CI

Study	Design	Sample	Outcome/Feasibility	Evidence rating
Guirgis, F. W., Gerdik, C., Wears, R. L., Williams, D. J., Kalynych, C. J., Sabato, J., & Godwin, S. A. (2013). Proactive rounding by the rapid response team reduces inpatient cardiac arrests. *Resuscitation*, *84*(12), 1668-1673. doi:10.1016/j.resuscitation.2013.08.013	Retrospective review of a prospectively collected database	Single tertiary hospital setting 1,253 non-ICU patients who had cardiac arrests from 2005 to 2012 Total study = 223,267 patients 70,129 patients pre-proactive rounding (PR) 153,138 patients post proactive rounding (PR)	The quarterly code rate before PR was 66 and the code rate after the institution of PR was 30 (difference = 36.8, 95% CI 25.6–48.0, p < .001). Quarterly code deaths decreased from 29 to 7 (difference = 21.95, 95% CI 16.3–27.6, p < .001). This decrease in floor codes and code deaths was still present after adjusting for inpatient admission and inpatient days. Average quarterly RRT interventions increased from 141 in the pre-PR period to 690 in the post-PR period (difference = 549, 95% CI 360–738, p < .001). Average quarterly transfers to Higher Level of Care went up from 38 pre-PR to 164 post-PR (difference = 126, 95% CI 79–172, p < .001). Conclusions: The institution of proactive rounding at a tertiary care, academic, level 1 trauma center	Level III/A ProactiveRoundingResuscitation - Guirgis.p

Study	Design	Sample	Outcome/Feasibility	Evidence rating
			resulted in reduced floor codes and code deaths as well as increased RRT interventions and transfers to a higher level of care.	
Butcher, B., Vittinghoff, E., Maselli, J., & Auerbach, A. (2013). Impact of proactive rounding by a rapid response team on patient outcomes at an academic medical center. *Journal of Hospital Medicine*, *8*(1), 7-12. doi:10.1002/jhm.1977	Retrospective, observational study	All adult patients discharged alive from the intensive care unit (ICU) at the University of California San Francisco Medical Center between January 2006 and June 2009 11,687 patients were admitted to the ICU during the study period; 10,288 were discharged alive and included in the analysis 4,902 patients admitted to the ICU 17 months prior to the study 6,785 patients admitted to ICU	ICU readmission rate: no change (6.7% before vs 7.3% after = 0.24). ICU LOS: no change (5.1 days vs 4.9 days, p = 0.24). In-hospital mortality: no change (6.0% vs 5.5%, p = 0.24). Proactive rounding by the RRT nurse did not improve patient outcomes.	Level III/B Rapid Response research article - Butc

Study	Design	Sample	Outcome/Feasibility	Evidence rating
		during the 25 months post-study		
Ludikhuize, J., Borgert, M., Binnekade, J., Subbe, C., Dongelmans, D., & Goossens, A. (2014). Standardized measurement of the modified early warning score results in enhanced implementation of a rapid response system: A quasi-experimental study. *Resuscitation,85*(5), 676-682. doi:10.1016/j.resuscitation.2014.02.009	Quasi-experimental study	University Hospital in Amsterdam between September and November 2011 Patients included in the study who were admitted at least for one overnight stay 372 patients in the protocolized group 432 patients in the control group	MEWS calculations from vital signs occurred in 70% (2513/3585) on the protocolized wards versus 2% (65/3013) in the control group. Compliance with the protocolized regime was present in 68% (819/1205), compliance in the control group was present in 4% (47/1232) of the measurements. There were 90 calls to primary physicians on the protocolized and 9 calls on the control wards. Additionally, on protocolized wards, there were twice as much RRT calls per admission. Conclusions: Vital signs and MEWS determination three times daily, results in better detection of physiological abnormalities and more reliable activations of the RRT.	Level II/B Standardized measurement of early
Thomas, K., Force, M. V., Rasmussen, D., Dodd, D., & Whildin, S. (2007, February 2007). Rapid response team; Challenges, Solutions, Benefits.	Expert Opinion	One non-teaching hospital in Chicago	The use of RRTs during a 16-month period resulted in a 56% reduction in the monthly rate of code blues in medical-surgical units.	Level V/A

Study	Design	Sample	Outcome/Feasibility	Evidence rating
CRITICALCARENURSE, 27, 20-27. Retrieved from http://ccn.aacnjournals.org/		267 patients during a 16-month period	Unanticipated transfers from the medical-surgical units to the ICU were decreased by 10%. Because of early interventions, 63% of all RRT patients remained in the medical-surgical units and did not require a change in the level of care. Overall, only 2% of all RRT patients experienced a code blue event during their hospital stay. Although RRT patients had a mean stay of 10 days, which implies a high clinical acuity level, the total survival rate at discharge was 86%.	RRT article - AACN.pdf
Escobar, G., Laguardia, J., Turk, B., Kipnis, P., & Draper D. (2012). Early detection of impending physiologic deterioration among patients who are not in intensive care: Development of predictive models using data from an automated electronic medical record. *Journal of Hospital Medicine*, *7*(5), 388-395. doi:10.1002/jhm.1929	Retrospective case-control study	Hospitalized adults at 14 hospitals with comprehensive inpatient Electronic Medical Records (EMRs) Unit of analysis was a 12-hour patient	Developed an approach for predicting impending physiologic deterioration of hospitalized adults outside the ICU. EMR-based detection of impending deterioration outside the ICU is feasible in integrated healthcare delivery systems.	Level II/A Escobar J Hosp Med 2012 Early detection a

Study	Design	Sample	Outcome/Feasibility	Evidence rating
		shift. Shifts where a patient experienced an unplanned transfer were event shifts; Shifts without a transfer were comparison shifts Hospitalization records were transformed into 12-hour shift records, with 10 randomly selected comparison shifts identified for each event shift 4,036 events and 39,782 comparison shifts from a cohort of 102,422 patients' hospitalizations		

Appendix C

Project Timeline

Implementation Step	2 weeks before kick off	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Ongoing
Identify MD, RN, SCS Leads, project manager, & implementation team members										
Hold Kick off meeting										
Weekly Local Implementation Team Meeting										
Assess facility readiness & interdepartmental agreements for hospital escalation										
Review AAM workflows & establish agreements across stakeholder groups										
Develop communication & change management plan										
Develop training plan										
Cascade communication										
Train staff on workflows & documentation										
Simulation & “test runs”										
Go live										
Evaluation & ongoing performance Improvement										
Attend Regional Collaborative Calls										

Appendix D

Project Charter

Advance Alert Monitor Implementation at a Medical Center

Liesel Buchner

University of San Francisco

Table of Contents

Project Charter: Advance Alert Monitor (AAM) Implementation at a Medical Center

Global Aim: By June 2018 AAM will be fully implemented at a Medical Center

Specific Aim: Increase utilization of the Rapid Response Team (RRT) note for initial AAM alerts from 0% to 90% by end of June 2018.

Background:

The 100,000 Lives Campaign from the Institute for Healthcare Improvement (IHI) has challenged hospitals across the United States to reduce cardiac arrests and other sudden, life-threatening events in patients on general medical floors by implementing a system of Rapid Response Teams (RRTs) (IHI, 2017). As a result of this call to action, approximately 1,500 hospitals are now actively using and/or implementing RRTs. Cardiac arrest rates, mortality rates, and lengths of stay in the Intensive Care Unit (ICU) are dropping, and hospitals with an RRT are moving their cultures towards a team-based approach to addressing clinically challenging situations. Currently, most RRT action in the United States is triggered by one abnormal clinical parameter at a time, which is an indication of a significant change in that particular vital sign (IHI, 2017).

The acute deterioration of patients outside the ICU is a quality and patient safety concern. Studies have demonstrated that medical-surgical patients with unplanned transfer to the ICU have increased mortality and morbidity (Escobar et al., 2012). Many hospital deaths are potentially preventable as the acute deterioration of patients is often preceded by changes in patients' physiological condition from six to 24 hours prior to the decompensating event (McGaughey et al., 2009). The most common changes are in basic vital signs and level of consciousness. Unfortunately, these changes are often missed which can result in unplanned ICU admissions, increased hospital length of stay, cardiac arrest, or death (McGaughey et al., 2009).

RRT programs which have proven to be most effective proactively round on high-risk patients in the medical-surgical units, as well as on patients who recently transferred to the floor from the ICU. Proactive rounding is an effective strategy to reduce number of code blues outside the ICU, as well as mortality associated with those codes (Guirgis et al., 2013). While this single-aspect approach has produced successful interventions; what if organizations could identify the at-risk patients even before such extreme changes in their clinical condition? A few hospitals have implemented such systems through an early warning scoring (EWS) system. According to Duncan, McMullan, and Mills, an EWS is a physiologic scoring system used in units outside the ICU to identify high-risk patients before their clinical condition deteriorates (Duncan et al., 2012). Using the EWS system in conjunction with an RRT has yielded significant reductions in cardiac arrests as well as unplanned transfers to the ICU (Duncan et al., 2012).

Goals:

The overarching purpose of this project is to reduce harm as well as improve the quality and safety of care, and the project design will include the following steps:

1. Implementation of AAM
2. Proactive rounding by the RRT nurse
3. Utilization of the AAM/RRT note

Sponsors:

Assistant Physician in Chief – Hospital Operations	Dr. Richard Haynes
Chief Operating Officer	Kimberly Menzel
Chief Nurse Executive	Allyson Mason-Herr

Measurement Strategy

Background (Global Aim): Full implementation of AAM by June 2018 at a Medical Center

Population Criteria: Medical-surgical and telemetry patients at a Medical Center

Data Collection Method: Data will be obtained from Health Connect to compare baseline data with current data at weekly intervals.

Data Element	Definition
RRT nurse AAM note	The nursing documentation completed by the RRT nurse for all initial AAM alerts.
RRT nurse proactive rounding note	The nursing documentation completed by the RRT nurse for all proactive patient rounds.
RRT AAM training	Education for all RRT nurses on the AAM workflow
Code Blue events	An emergency in which a patient is in cardiopulmonary arrest and needs immediate resuscitation

Measure Description

Measure	Measure Definition	Data Collection Source	Goal
Frequency of AAM note utilization for AAM initial alerts	N = # of AAM note present for all initial AAM alerts D = # of initial AAM alerts (in %)	Health Connect	90%

Frequency of RRT note utilization for proactive rounding	N = # proactive rounding notes present
	D = # of patients on proactive rounding list (in %)
		Health Connect	90%

Percent of RRT nurses trained on AAM workflow	N = # of RRT nurses trained on AAM workflow D = # of total RRT nurses	Health Stream RRT AAM competencies	100%
Incident rate of adult non-ICU/non-ED Code Blue events	N = # of adult Code Blue events per month outside the ICU & ED D = # adult non-ICU/ED inpatient days	Quality dashboard	Current-5% (Data retrieval in process)

Measures

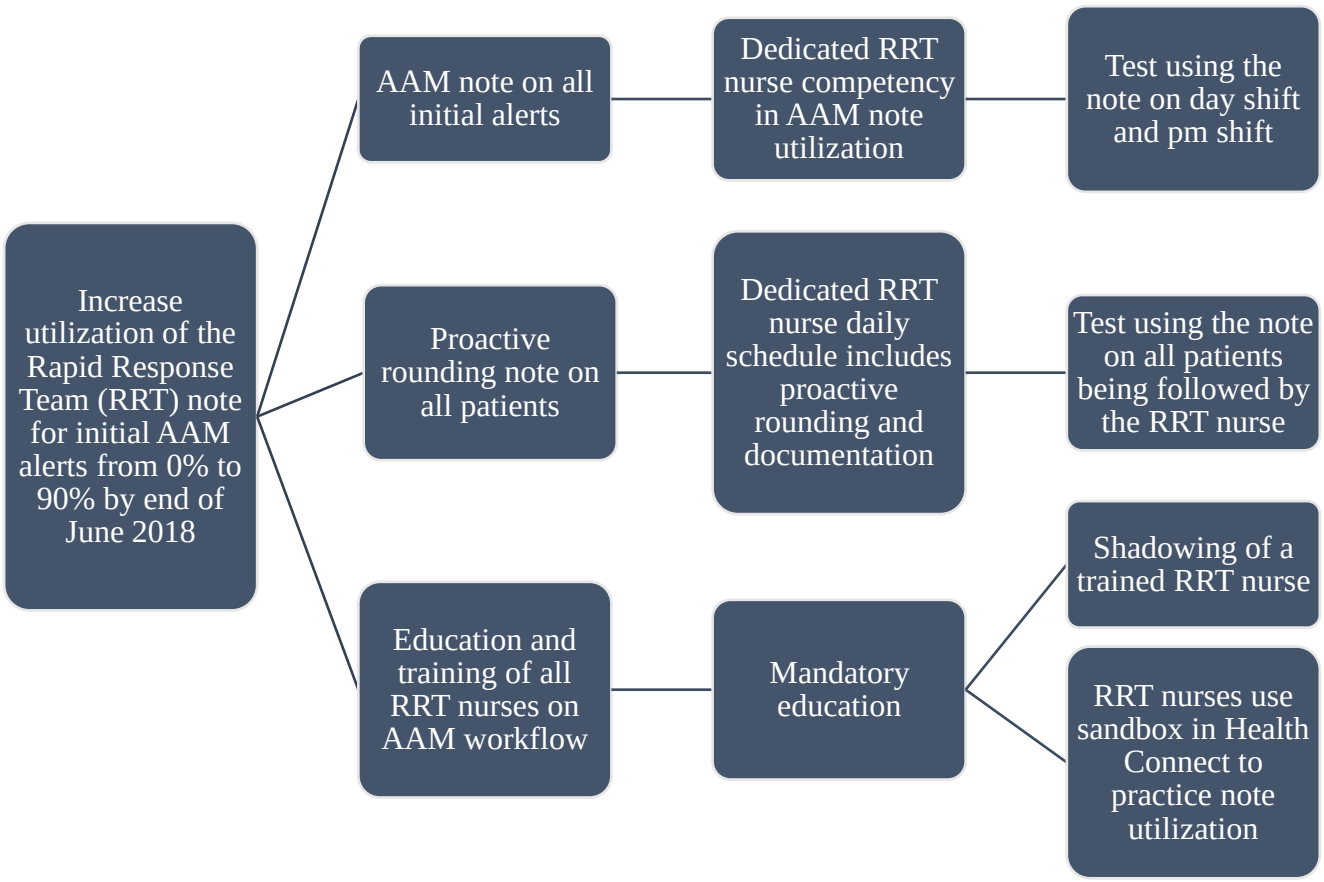
Measure	**Data Source**	**Target**
Outcome		
RRT note utilization for initial AAM alerts	Health Connect	90%
Process		
RRT note utilization for the proactive rounding note	Health Connect	90%
Percent of RRT nurses trained on AAM workflow	Health Stream RRT AAM competencies	100%
Balance		
Incident rate of Code Blue on the medical-surgical/telemetry units	Quality dashboard	Current-5% (Data retrieval in process)

Team

Project Lead	Liesel Buchner
ICU Manager	Molly Cassady
ICU Assistant Nurse Manager	Julie Suarez
Hospital Based Physician (HBS)	Dr. Hayssam Hajar
RRT Registered Nurse (RRT)	Pamela McCormick
Project Manager	Jordan Hanson
Social Work Manager	Erica Menzer
Palliative Care Manager	Pam Coulter
Quality Nurse Consultant	Mandy Rebello

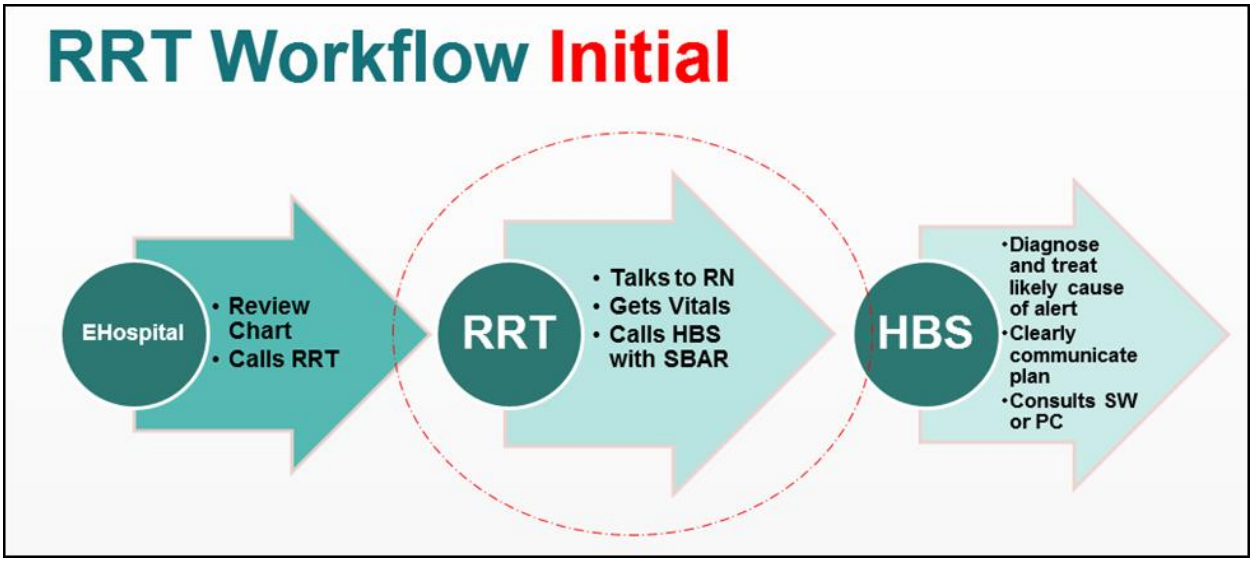
Driver Diagram

Aim	Primary Driver	Secondary Driver	Ideas to Test or Change Concept



Changes to Test

The RRT nurses will be trained on the AAM workflow (AAM playbook, 2017).



The RRT nurses will be trained on utilizing the standard note for all initial AAM alerts. RRT nurses will also use the standardized proactive rounding note on all patients being followed by the RRT nurse.

The AAM workflow will be tested for 2-3 weeks on the day and evening shifts to identify any barriers in implementation of AAM. Testing will mirror the identified ideal workflow of the E-hospital staff notifying the RRT nurse of the initial alert, and the RRT nurse assessing the patient within 3 hours and notifying the HBS physician.

Daily debrief calls will be conducted to discuss any potential barriers in the AAM workflow.

Project Timeline

Implementation Step	2 weeks before kick off	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Ongoing
Identify MD, RN, SCS Leads, project manager, & implementation team members										
Hold Kick off meeting										
Weekly Local Implementation Team Meeting										
Assess facility readiness & interdepartmental agreements for hospital escalation										
Review AAM workflows & establish agreements across stakeholder groups										
Develop communication & change management plan										
Develop training plan										
Cascade communication										
Train staff on workflows & documentation										
Simulation & “test runs”										
Go live										
Evaluation & ongoing performance Improvement										
Attend Regional Collaborative Calls										

Lessons Learned

Initial identification of the local medical center sponsors and leaders is key to ensuring effective communication to all stakeholders participating in the performance improvement project. Meeting early on with the local sponsors to explain the project fundamentals will be necessary to garner their support for time and resource management during the project timeline. Establishing a collaborative and supportive relationship with local leadership will assist in removing potential barriers during implementation.

The standardized RRT nurse workflows as well as consistent 24/7 staffing of the RRT nurse are instrumental to successful AAM implementation. Inconsistency in the RRT nurse workflows and staffing will be a barrier to achieving set goals for this improvement project. As the Clinical Nurse Leader leading this project, it is important to assess the medical center for readiness to ensure the necessary workflows and resources are in place.

Educating all affected staff will be essential in order to effectively engage the multi-disciplinary team around the program objectives, workflows, and role-specific expectations. Validation of the RRT specific competencies is crucial as the RRT nurse is the first point of contact locally, and all subsequent interventions rely on RRT adherence to the workflow. Resistance to change could be a potential problem, so sharing the clinical evidence and data supporting the program's effectiveness will be a top priority.

CNL Competencies

The Clinical Nurse Leader (CNL) functions at the microsystem level and is best positioned to ensure that patients and their families receive safe, high-quality care. According to the American Association of Colleges of Nursing (AACN) white paper, the CNL "designs, implements, and evaluates client care by coordinating, delegating, and supervising the care provided by the health care team" (AACN, 2007). For this project, the CNL will serve as the team leader for the implementation of AAM at the Medical Center.

Designing and implementation of new care delivery models are essential organizational and systems leadership competencies for CNLs (AACN, 2013). As the leader of the team, these will be essential skills to master to ensure a successful implementation of AAM. Participation and investment from all team members and medical center leadership will be key to success in AAM implementation and adoption. Effective CNLs utilize their skills to connect clinicians to the purpose of change and build collaborative teams that foster an environment of trust where all members have an equal voice. This will be particularly important to ensure buy-in and participation of the floor nurses since they might feel a loss of autonomy.

Appendix E

Weekly Operational Report

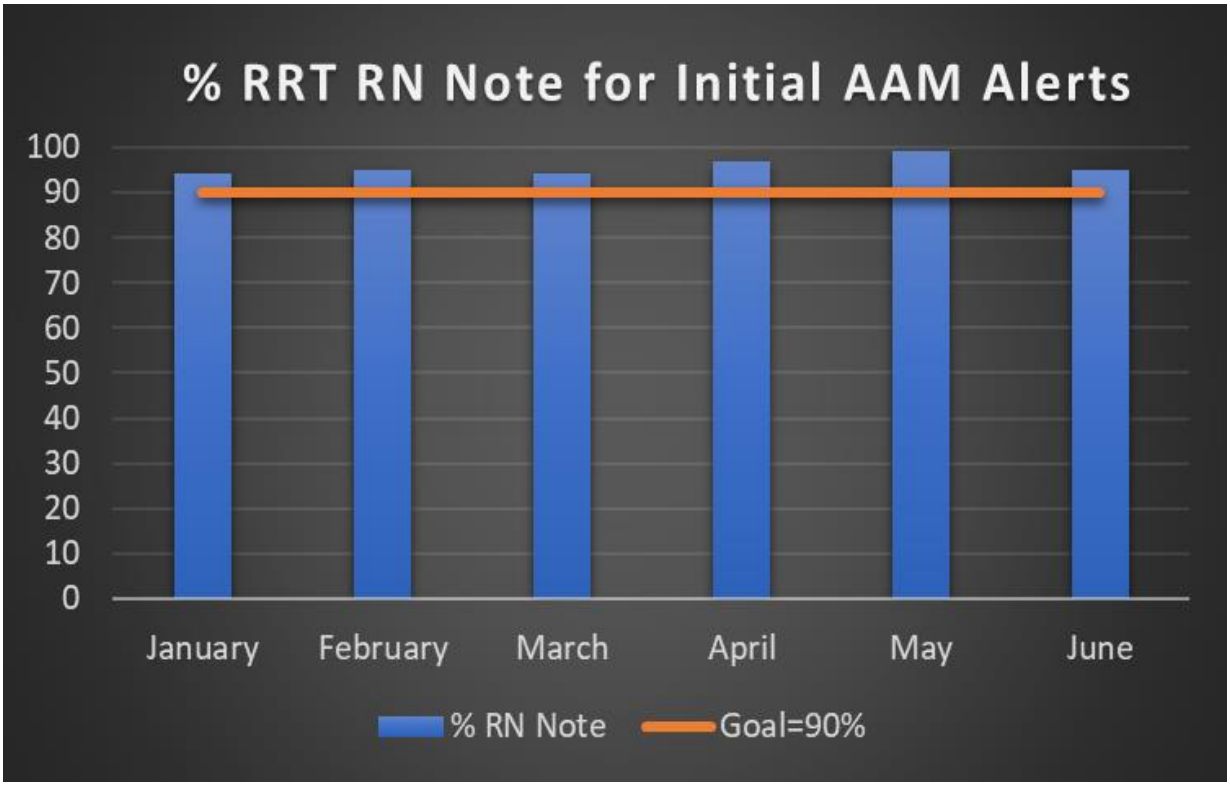
Local Weekly Operational Report

Summary of Initial Alerts by Week

Week	Facility	# ICU Up-transfers	# Full Code Ward Patient Deaths	% ICU Up-transfers with an AAM Alert (n)	% Patient deaths with AAM Alerts (n)	# Patients with AAM Alert or AAM Alert >24 hrs After ICU Downgrade	Total # Patients with Initial Alert	# patients that ehospital called on initial Alert or # of patients with an initial alert for non-ehosp sites	% eHospital response within 1 hour of initial Alert (n)	Median time from initial alert to ehospital call	% Patients with RN Initial Notes (n)
)4JUL2017 TO 10JUL2017	WCR	6	1	66.7% (4)	0.0% ()	28	31	25	60.0% (15)	0.78	80.0% (20)
:7JUN2017 TO 03JUL2017	WCR	7	0	71.4% (5)	0.0% ()	21	25	18	77.8% (14)	0.43	77.8% (14)
:0JUN2017 TO 26JUN2017	WCR	0	0	0.0% ()	0.0% ()	26	28	20	65.0% (13)	0.83	85.0% (17)
:3JUN2017 TO 19JUN2017	WCR	1	0	0.0% ()	0.0% ()	37	39	33	103.0% (34)	0.33	90.9% (30)

Appendix F

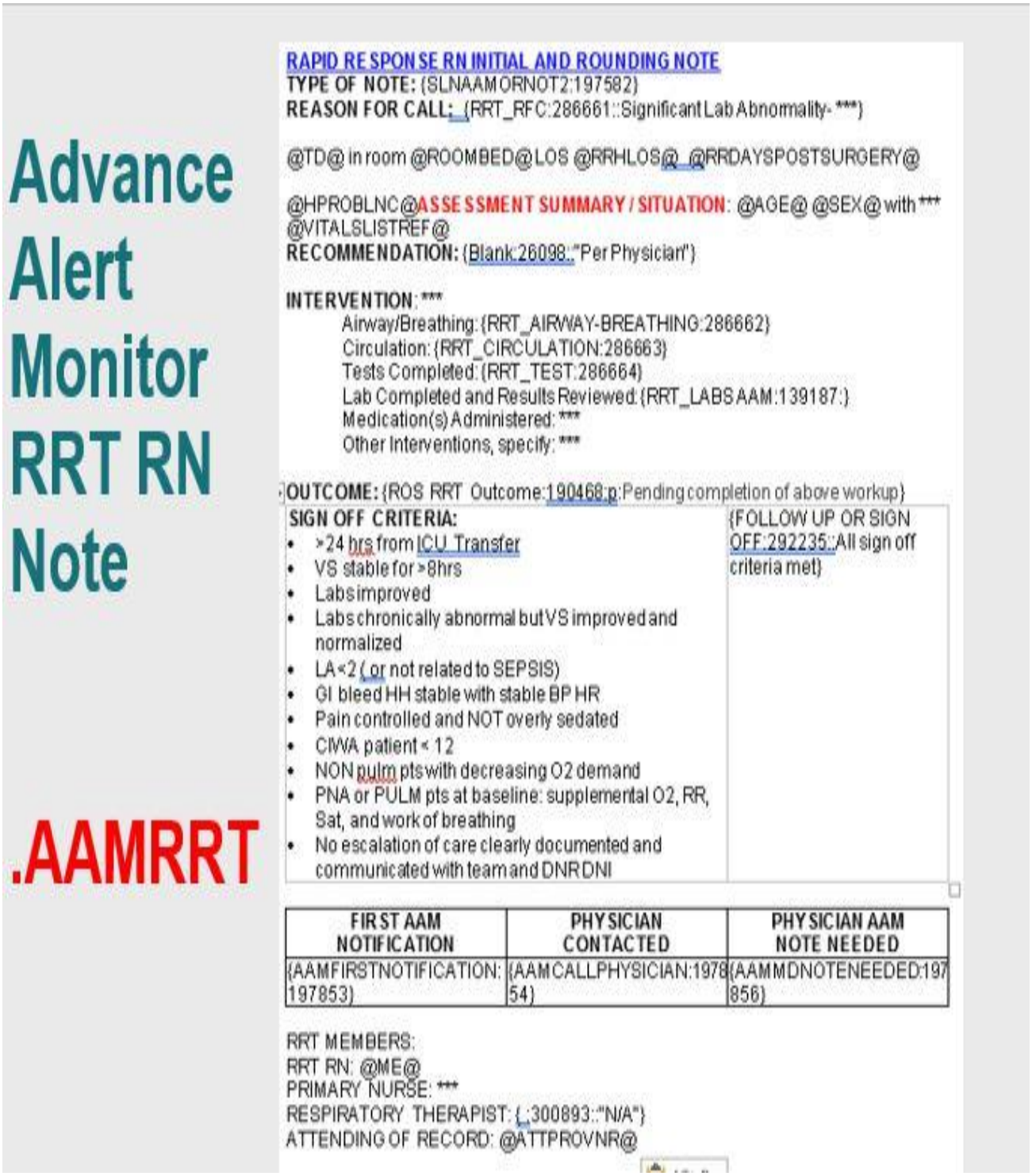
Outcome Measure



Appendix G

Intervention:

RRT Nursing Note



Appendix H

Cost benefit Analysis

Return on Investment (ROI)

Investment:

Costs:

Total RRT Education costs: $4,582.20

Total Medical-Surgical Nursing Education costs: $11,455.50

Total Local costs: $16,037.70

Return:

Medical Center Inpatients	Length of Stay	Discharges	Average Length of Stay
2017 Actuals	47,428	12,712	3.73
AAM reduction (32.9 hours per discharge)	17,426		1.37
Prediction post AAM-implementation	30,002		2.36

Number of days saved converted to hours: 17,426 days x 24 hours = 418,224 hours

Hours Saved	RN Hourly Rate	Amount Saved
418,224	$76.37	$31,939,766.90

ROI:

First Year: $31,939,766.90 - $16,037.70 = $31,923,729.20

Second Year: $31,939,766.90