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Development of a Policy and Procedure to Decrease Alarm Fatigue

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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2016

Abstract

Development of a Policy and Procedure
to Decrease Alarm Fatigue

by

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MS, Indiana State University, 2010

BS, Indiana Wesleyan, 2008

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

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Abstract

According to The Joint Commission (TJC), 98 unexpected and unacceptable events related to alarm fatigue were reported in United States hospitals between January 2009 and June 2012. There were 80 deaths, 13 permanent loss of function, and 5 extended care stays that occurred during this time period. The problem identified in this quality improvement (QI) initiative was the TJC report that nursing staff in the US was experiencing alarm fatigue due to the overstimulation of senses from continuous beeping from alarms on the unit. Framed within the Iowa model of evidence-based practice to promote quality care, the purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on alarm fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education. The developed policy and procedure was approved by the committee with the recommendation to revise the policy to involve all ancillary staff in direct contact with clinical alarms. The curriculum objectives were evaluated by 2 content experts using a 4 item *met/not met* response format. Findings showed that all objectives were met. The content of the nurse survey was reviewed by the experts using a 3 item Likert scale and all the items were deemed relevant. Finally, team members (n = 9) completed a summative evaluation of the project using an 8 item, 5-option Likert scale. All were in agreement that the project met its intent. The implementation of this project after graduation has the potential to bring about social change by increasing patient safety, patient wellbeing and reducing healthcare costs.

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Dedication

The dedication of my work is dedicated to my husband and children, who have been a consistent source of caring support and encouragement throughout the challenges of graduate school. I would also like to dedicate my work in memory of my deceased father, my parents Joseph and Young Hui Mentel, my siblings Subrina, Travis, and Kevin who have always been there for me throughout my tribulations in life. Everyone one of you have been an inspiration to me and continue to inspire me to become a leader in healthcare through academia and clinical practice.

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Section 1: Overview of the Project

Introduction

Clinical alarms are vital to patient safety; therefore, clinical alarms are placed at patient bedsides to help provide optimal nursing care to patients. The inconsistencies in nursing practice and over usage of clinical alarms have led to nurses experiencing alarm fatigue. Alarm fatigue is the overstimulation of the sensory system due to continuous alarms, resulting in desensitization to the environment (Creighton & Cvach, 2010). The continuous overpowering beeps may cause nurses to become exhausted, leading them to disable, silence, or ignore the alarms. These actions have shown to negatively impact patient safety (Cvach, 2012).

The Joint Commission (TJC, 2013) advised healthcare leaders to look at patient safety issues regarding clinical alarm management. The National Patient Safety Goal (NPSG) improvement plan on clinical alarm management mandated guidelines for all hospitals for 2016. This doctorate of nursing (DNP) project is a QI initiative in the prevention of alarm fatigue in the hospital. An initiative to help improve alarm fatigue through changes in a policy and procedure and education among RNs will improve the care rendered to patients in healthcare, which may ultimately enhance patient safety. The project will meet the American Association of Colleges of Nursing (AACN, 2006) Essentials of Doctoral Education for Advanced Nursing Practice II: Organizational and Systems Leadership for Quality Improvement Systems Thinking by decreasing safety hazards brought about by alarm fatigue.

Background

The first sentinel event related to alarm fatigue was reported by the ERCI Institute in 1974 (Sendlebach & Funk, 2014). According to TJC (2013), from January 2009 – June 2012, 98 sentinel events were reported in telemetry units, ICU, general medicine, and emergency departments in the United States (US). There were 80 deaths, 13 permanent loss of function, and five extended care stays that occurred from the 98 sentinel events. TJC sentinel event alert resulted in a new National Patient Safety Goal (NPSG) 06.01.01 clinical alarm management requires facilities to manage and prioritize clinical alarms to help reduce alarm fatigue to improve patient safety (TJC, 2013). The new NPSG for clinical alarm management requires healthcare facilities to complete a review of priority alarms and manage these alarms to improve alarm fatigue and reduce sentinel events (TJC, 2013).

The new NPSG requirement was introduced in a two-phase implementation process. The first phase began in January 2014. Every hospital was required to prioritize clinical alarm system safety in their hospital. Throughout 2014, each hospital had to determine the clinical alarms that were relevant to manage patient safety. The second phase of the new NPSG, beginning in January 2016, required each facility to develop a policy and procedure to regulate clinical alarms that were identified as a priority. Throughout the year, hospital staff and practitioners were required to receive education on the purpose and proper use of clinical alarms.

The hospital leadership will put this QI policy and procedure in place after my graduation from Walden University. The facility is a long-term acute hospital setting that

has 269 beds. The Pulmonary Care Unit (PCU) can house 44 patients and Medical Complex Unit (MCU) can house 38 patients. The facility can monitor 100% of the patients on any given day. In the PCU, 100% of the patients are observed with cardiac monitors. Throughout the year, the MCU is full 90% of the time and PCU 50% of the time.

The mission of the facility is to provide life changing, patient-centered care, drive innovation through research, and educate and inspire the next generation of health care providers (“About UCHealth”, n.d.). The vision is to be at the forefront of quality health care in the community and to be the leader in resolution in medical attention. The values of the institution are based on respect, integrity, teamwork, and excellence. The national accreditation obtained is TJC accreditation.

Problem Statement

The problem identified in this quality improvement (QI) initiative was the TJC report that nursing staff in the US was experiencing alarm fatigue due to the overstimulation of senses from continuous beeping from alarms on hospital units. The first responses to alarm hazards were noticed after a death occurred in a patient at Massachusetts General Hospital in 2010. In this case, a patient's alarm had been negligently turned off. The nurse on duty turned off the alarm because of alarm fatigue (Cvach, 2012). The completion of a review conducted between March 1, 2010 and June 30, 2010 disclosed that 73 deaths were directly related to clinical alarms and 33 were due to functional monitors. Alarm fatigue in staff nurses attributed to these deaths. An analysis of alarm fatigue revealed that this disorder was caused by excessive alarms that

effected nurses' response to alarms (Cvach, 2012). It is necessary to produce an effective strategy to reduce alarm desensitization to increase patient safety. Improving alarm management is crucial to making nurses attentive to alarm situations. The focus of research in reduction of alarm fatigue should be on alarm parameters for particular units within the facility (Cvach, 2012).

According to TJC (2013), the factors that contributed to alarm-related sentinel events were alarm fatigue, uncustomized alarm settings, inadequate staff education, equipment malfunctions and failures, insufficient support for staff, and multiple alarm integration. RNs who completed literature surveys recognized that false alarms were a problem, nuisance alarms were an issue in patient care, and false and nuisance alarms caused an issue with disabling alarms (Korniewicz, Clark, & David, 2014). Monitoring practices have been shown to decrease the ability of RNs to recognize early signs of adverse clinical events, which was is essential in successful intervention for deteriorating patients (Curry & Jungquist, 2014).

Purpose Statement

The purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on compassion fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education. The organization did not have a policy or procedure for management of alarm fatigue. A key strategy to improving alarm fatigue is the enhancement of autonomous practice by enabling nurses to tailor clinical alarm settings as a patient's condition changes, which

can decrease nuisance alarms (TJC, 2013). Lack of knowledge on how to manage clinical alarms is the root cause of adverse events reported in TJCs Sentinel Event database (TJC, 2013).

Project Goal and Outcome

Goal

The goal of the alarm fatigue initiative was to provide nurses with education to reduce alarm fatigue among nursing staff through management of clinical alarms in order optimize patient safety.

Outcomes

1. Literature Review
2. Policy and procedure (Appendix A)
3. Curriculum plan (Appendix B)
4. PowerPoint Educational Module (Appendix C)
5. Clinical Alarm Management Survey (Appendix D)
6. IOWA model into Designing the Practice Change (Appendix F)
7. Content Expert Validation form for survey (Appendix G)
8. Curriculum Plan Evaluation (Appendix I)
9. Summative evaluation form (Appendix K)
10. Poster Presentation (Appendix L and M)

Framework/Model for the Project

IOWA Model

The IOWA Model (Appendix E) guided the changes in clinical practices for clinical alarm management to improve alarm fatigue. The changes in clinical practices for clinical alarm management were needed to help improve safety and quality of care for patients. The model uses seven key steps: (a) identifying topic of priority, (b) collaboration, (c) conducting research, (e) evaluation of evidence, (f) developing a standard, implementation, (g) and evaluation (Doody & Doody, 2011).

Nature of the Project

The first step of the Iowa model, identifying a topic of priority is discussed in this section. Step 3 will begin in Section 2 with evaluation of the literature, while Steps 2 and 4 will be discussed in Section 3 with the team approach. Steps 5 is included in Section 4, and Step 6 will a part of the implementation after graduation.

Examination of the literature was conducted on alarm fatigue, standards on clinical alarms, and protocols for cardiac monitoring devices to help develop the alarm fatigue initiative. The outcome products of the initiative were developed using best practices in collaboration with nursing leadership and a clinical nurse educator, and will be implemented after graduation. The development of a new Clinical Alarm Management policy and procedure will enable PCU, MCU, and the facility reach the requirement for TJCs new NPSG clinical alarm management.

Definition of Terms

Alarm Fatigue. The desensitization of alarms after repeated exposure of frequent beeping of alarms. The occurrence of frequent beeping of alarms can lead to decreased staff response and unintentional neglect of patient needs (Cvach, 2012).

Evidence-based practice (EBP). Interdisciplinary approach to clinical practice. An EBP approach is used to help improve the quality of care for patients across the United States [US] (AHRQ, n.d.).

Quality Improvement. Desired health outcome that is consistent with professional knowledge through health care services (Institutional of Medicine (IOM), 2001). The improvement in quality of care improves safe, effective, patient-centered, timely, efficient, and equitable care to patients (IOM, 2001).

Sentinel Events. Occurrence of events that involve death, permanent harm, or intervention to sustain life in a patient (TJC, n.d.). These events must be reported to TJC after the occurrence has happened. The reporting of sentinel events helps to improve patient safety by decreasing the reoccurrence, improving standard of care, and improving quality of care.

The Joint Commission. Nationwide nonprofit accrediting body for health care organizations and programs. Their commitment to health care is standardization in the performance to help improve the safety and efficient care for our patients (TJC, n.d.)

Assumptions

One assumption of this project is that nurses on the unit want to provide safe patient care and help improve the quality of care. Another assumption is that there is

information in the literature on best practices to alleviate or minimize alarm fatigue. The assumption is that leadership supports the change in practice for nurses in decreasing alarm fatigue and following the mandated new NPSG.

Scope & Delimitations

The scope of this QI project is nursing staff on the PCU and MCU units trained in this area of practice to help improve clinical alarm management practices. Research data showed nursing practices in clinical alarm management varied throughout the United States (U.S.). The inconsistencies in nursing practices increased alarm fatigue, which decreased patient safety and quality in care (Agency for Healthcare Research and Quality (AHRQ), (n.d.).

Limitations

The fact that there has not been extensive research completed on the actual reasons for increased nuisance of alarms is a limitation.

Significance of Project

Contributing changes to a new patient care policy and procedure for clinical alarm management will help improve nursing practice. Educating RNs on clinical alarm management and alarm fatigue can help improve patient safety and meet TJC mandated regulations that began in January 2016.

Summary

The mandating of the new NPSG developed by TJC was partially implemented in January 2013 with full implementation in January 2016 in hopes that it will help decrease sentinel event reporting due to clinical alarms, introduce clinical alarm management

education with nursing staff, and ultimately improvement on clinical alarm fatigue that leads to desensitization of clinical alarms. Improvements in clinical alarm management are necessary to help improve alarm fatigue that leads to desensitization of RNs to clinical alarms. Section 2 of this paper outlines the literature and theoretical framework that supported the need for change in clinical practices for clinical alarm management to help improve alarm fatigue among nursing staff.

Section 2: Literature Review

Introduction

The problem identified in this quality improvement (QI) initiative was the TJC report that nursing staff in the US was experiencing alarm fatigue due to the overstimulation of senses from continuous beeping from alarms on hospital units. The purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on compassion fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education. Current literature shows that improvements in cardiac electrode placement, customization of alarms, ongoing education on devices with alarms, and addressing issues related to alarms will decrease desensitization of clinical alarms which will help increase patient safety and quality of care (American Association of Critical-Care Nurses (AACN), 2013). In the following section I will discuss the research strategy, followed by the literature review of alarm fatigue, clinical practice guidelines, and policy and procedure development.

Literature Search Strategy

Nursing and Health Databases from Walden University Library were used to complete the literature search strategy was used. The four databases used; CINAHL Plus with Full Text, ProQuest Nursing & Allied Health Source, MEDLINE with Full Text, and Ovid Nursing Journals Full-Text. A combination of keywords was used in the literature search. The combinations consisted of *alarm fatigue, clinical alarm*

management, clinical alarm management/protocols, clinical alarm management/policies, clinical alarm management/patient safety, IOWA model and *TJC*. The primary resources of articles consisted of Healthcare Technology Foundation, ERCI Institute, AACN, Association for the Advancement of Medical Instrumentation (AAMI) and peer-reviewed articles. Article years searched were from 2006-2014.

Theory/Model

IOWA Model

The IOWA model (Figure 1) was used to help develop the new Patient Care policy and procedure on clinical alarm management and alarm fatigue. The IOWA model implementation process (Figure 2) was used to help develop the curriculum plan, which creates awareness and interest, building of knowledge, promotion of action and adoption, and integration with sustainability (The University of Iowa Hospitals and Clinics, 2015). The framework is useful in the determination of the problem, which further induced the implementation and evaluation process. The seven key steps, along with the implementation process outlined below. This project is a design-only project and goes into part of Step 4.

Literature Review

A national online survey of hospital personnel was administered to assess the correlation between attitudes and practices related to clinical alarms by the Healthcare Technology Foundation (HTF) in 2005-2006 and 2011. In 2005-2006, there were 1327 respondents and in 2011 there were 4278 respondents. In 2005-2006 51% of respondents were RNs and 33% of the 2011 respondents were RNs. The RNs were from either acute

care Hospitals or Intensive Care Units (ICUs). The survey showed that a small portion of hospitals reported changes in alarm improvements and over 20% had shown injurious events related to clinical alarms. The survey demonstrated that staff was inappropriately turning off alarms even after the increased awareness of nuisance alarms. Administering this survey increased the awareness of the management of clinical alarms, increased knowledge among their nurses, which changed the culture within each specialty unit (Funk, Clark, Bauld, Ott, et al., 2014).

A pilot survey of nurse's perceptions of current practices of clinical alarm management and alarm settings administered in an Australian Regional Critical Care Unit (CCU) produced comparable results from the HTF surveys. The pilot survey showed 93% of respondents agreed alarm fatigue led to desensitization of alarms, and 81% of the respondents indicated that false-positive alarms and inappropriately set alarms were a critical factor (Christensen, Dodds, Sauer, & Watts, (2014). Conventional alarms that produce false-positive alarms are pulse oximetry readings, which measures oxygen saturation. When pulse oximetry alarms continuously beep, serious injuries or even deaths can occur. These nuisance beeps are a result of poor sensor placement (Dodds, Sauer, & Watts, 2014).

The AACN, (2013) practice alert for alarm management showed that practice changes and actions of nurses needed to occur to help reduce nuisance alarms and adverse events. Practice changes that should occur are to provide ECG electrode practice changes, threshold changes, initial and ongoing education on device alarms, development of policies and procedures, and a decrease in some patients monitored. Supporting

evidence has shown that these changes and actions of nurses will reduce the nuisance of alarms and adverse events (AACN, 2013).

Curry and Jungquist produced a review of an inpatient ward on the critical assessment of monitoring practices, patient deterioration, and alarm fatigue (2014). The key reason for alarm fatigue was secondary to rapidly evolving clinical cascades (RECC). RECCs are adverse clinical events that can be unexpected and deadly. The inability of nursing staff to identify early signs of deterioration prevented successful intervention. The assumption of the assessment was that one of the attributive factors was the dependence on monitoring systems for evaluation of patients. Lowering pulse oximetry thresholds to 80% would not place the patients at harm. Standardization on pulse oximetry thresholds is not designed for individualized patient care. The Dartmouth-Hitchcock Medical Center Program Patient Surveillance System (PSS) initiation monitors 100% of their patients with a pulse oximetry threshold of 80%. The threshold showed a decreased amount of alarms beeping per shift and reduced the number of adverse events. Other changes made to limits in PSS program were notifications when heart rates fell to less than 50 or rose to more than 140 beats per minute. and change in a 15 second to 30 second notification delay from bedside to nurse (Curry & Jungquist, 2014).

The clinical practice approaches that nurses take to decrease the sounds of alarms lead to forgotten and postponed response to alarms (Funk, Clark, Bauld, Ott, & Coss, 2014). The negative effect that continuous sounds of alarms have on staff nurses is one of the defining factors of inappropriate clinical alarm practices. The overpowering sound of

beeping alarms leads to desensitization and can be prevented through standardizing the use of medical monitors and clinical alarms.

The second phase in NPSG clinical alarm management mandates that institutions develop policies and procedures for clinical alarms (TJC, 2013). The American College of Clinical Engineering completed a survey in 2006 stated that health care professionals felt that when alarms beep constantly, they can impede patient care. This is in part because they create a lack confidence in "true" alarms (Creighton Graham & Cvach, 2010).

A pilot program completed in a small medical progressive care unit (MPCU) with diverse population by their Comprehensive Unit-Based Safety Program (CUSP) showed that minor changes in clinical alarm management improved care for their patients. The pilot program helped develop a standard education program and implement a hospital-wide protocol. The benefits from this program were an improvement in nurse's knowledge of medical equipment and a decreased number of continuous beeping clinical alarms (Creighton Graham & Cvach, 2010).

Summary

Placing a priority on changes in behaviors among nurses and improving strategies in clinical alarm practices is imperative to improve desensitization to alarms and reduce alarm fatigue. Literature has shown that changing clinical practice and educating nurses on early warning signs, clinical reasons for false alarms, and increasing awareness of alarm fatigue will improve desensitization to alarms and reduce alarm fatigue. The development of a new patientcare policy and procedure, along with a curriculum plan

will help improve the safety and quality of patients. Section 3 of this paper will discuss the approach and methods in the QI initiative to improve clinical alarm management to help improve alarm fatigue among nursing staff.

Section 3: Methods/Approach

Introduction

The purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on compassion fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education. Outcomes included:

1. Literature Review
2. Policy and procedure (Appendix A)
3. Curriculum plan (Appendix B)
4. PowerPoint Educational Module (Appendix C)
5. Clinical Alarm Management Survey (Appendix D)
6. IOWA model into Designing the Practice Change (Appendix F)
7. Content Expert Evaluation form for survey (Appendix G)
8. Curriculum Plan Evaluation (Appendix I)
9. Summative evaluation form (Appendix K)
10. Abstract and poster presentation (Appendix L and M)

This section presented the approach and methods for the project.

Methods/Approach

The IOWA model (Appendix E) was used to help guide the programs guidelines and in making a change in clinical practice to help improve alarm fatigue and evaluate

my progression. Because the project is not being implemented and, therefore, cannot be evaluated, the only evaluations of this project will be of identified outcome products.

Support from clinical staff and leaders is essential for a QI project to be successful. The new patient care policy and procedure and curriculum plan can develop the cultural change among the nursing staff to achieve clinical alarm management on both the PCU and MCU.

I led a committee for the development of the clinical alarm management initiative The committee members consisted of the Director of Nursing (DON), the Director of Education, the Director of Respiratory, a manager for each unit, charge nurses, nurses, telemetry monitoring techs and patient care assistants. The established committee stakeholders consisted of experts in their field within the hospital. Two of the members served as content experts for the evaluation of the curriculum plan and the Clinical Alarm Management survey.

After the formation of the clinical alarm management committee I presented an analysis of the literature and synthesis of pertinent information. I held monthly clinical alarm management meetings. During these meetings discussion took place to help identify the gap in clinical practice in the PCU and MCU unit at the hospital. Follow-up meetings each month provided a process for evaluation by identifying the priority needs, readiness, and areas that need to be changed. Agendas and minutes were sent out by email to ensure close contact with the team members. The use of meetings, agendas, and minutes allowed the team input to guide the development of the policy and procedure, and curriculum plan. There were ten meetings:

- Meeting 1: Introduced the purpose of the committee, the NPSG and mandated requirements set forth by Joint Commission, and the purpose of the DNP project.
- Meeting 2: Introduced relevant changes in clinical practice to reduce continuously beeping clinical alarms in an effort to improve alarm fatigue among nursing staff. The committee discussed current research, best practices, and evidence-based practice that was relevant to improving clinical alarm management and alarm fatigue.
- Meeting 3: The committee discussed the previous procedures for clinical alarm management, the staffing situation on each unit, and the current knowledge of early warning signs of deterioration, clinical alarm management, and alarm fatigue.
- Meeting 4 & 5: The first draft of the developed new Patient Care Services policy and the procedure presented and reviewed with recommendations from the committee.
- Meeting 6: Recommendations were updated in the newly developed Patient Care Services policy and procedure. After the committee had discussed these changes, the policy and procedure were approved.
- Meeting 7: The focal point was to discuss the development of the educational plan. A discussion occurred about the content of education for the nursing staff after I graduate from Walden University. I recommended the introduction of the material in this order: (a) purpose

for education, history of clinical alarm management and causes of alarm fatigue, (b) new Patient Care Services policy and procedure, (c) prevention of early warning signs of deterioration, (d) purpose and use of clinical alarms, and (e) how to improve alarm fatigue among nursing.

- Meeting 8: Recommended content and Clinical alarm management survey was approved.
- Meeting 9: I presented the curriculum, and the Director of Education reviewed it.
- Meeting 10 the final educational product was approved.

Evaluation

The completed development of the new patient care policy and procedure (Appendix A), curriculum plan (Appendix B), Clinical Alarm Management Survey (Appendix D), IOWA model into Designing the Practice Change (Appendix F), Clinical Alarm Management Survey Content Expert Validation form for survey (Appendix G), Curriculum Plan Evaluation (Appendix I), and Summative Evaluation form (Appendix K) were evaluated using formative . Formative evaluation began during the process of development, during collaboration with the clinical alarm management committee and leadership. The curriculum plan was evaluated using the Clinical Alarm Management Evaluation Questionnaire, which the Director of Education (DOE) reviewed. The construction for the survey items were validated by experts in assessment.

Summary

In this section, the DNP project development and strategies details explained the approach and method process. The need to make changes in policies, procedures, and education modules were instigated by the new NPSG clinical alarm management requirement. The initiation of the NPSG has improved patient's safety and reduced the occurrence of alarm fatigue among our hospital staff.

Section 4 of this paper will discuss evaluation and findings and discussion for the QI initiative to improve clinical alarm management to improve alarm fatigue among nursing staff.

Section 4: Discussion and Implications

Introduction

The purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on compassion fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education. In order to meet the goal, five outcomes were completed: (1) a literature review, (2) policy and procedure for managing alarm fatigue (Appendix A), (3) curriculum plan (Appendix B) (4) PowerPoint Educational Module (Appendix C), (5) clinical alarm management survey? (Appendix D), (6) IOWA model into Designing the Practice Change (Appendix F), (7) Content Expert Validation form for survey (Appendix G), (8) Curriculum Plan Evaluation (Appendix I), (9) Summative Evaluation form (Appendix K) and (10) Abstract and Poster (Appendices L and M). This section presents a discussion related to the evaluation and the findings Outcomes 2, 3, 5, and 9.

Evaluation/Findings and Discussion

Effective strategies are an integral part for the implementation and evaluation plan (The University of Iowa Hospitals and Clinics, 2015). The IOWA model and implementation process are ways to improve the search for evidence, the design of the project, and integration of information. The key components of the IOWA model are decision-making through collaboration, process of problem-solving, guided change process, and an interdisciplinary approach to clinical practice changes (The University of Iowa Hospitals and Clinics, 2015). The IOWA model was used to identify the cause and

effect for clinical alarm management, alarm fatigue, development of a team, and collection of best evidence through appraisal and synthesis of EBP research. The use of the IOWA model, along with the utilization of the implementation process model, helped form the construction and navigation of the clinical practice change. The IOWA model (Figure 1) and implementation process guide (Figure 2) guided the beginning of the project and the further development of the new Patient Care policy and procedure and curriculum plan. The plan included: (a) project goals, (b) program model used, strategies for staff, (c) implementation process, (d) development of the project, (e) activities, (f) data collection, and (g) evaluation of clinical practice change. Using the IOWA Model process enabled stakeholders to view and express their perspectives on critical details of the project.

Evaluation is an ongoing process and is a foundation for planning, focus, design, and interpretation and use of results. Evaluation occurred during the completion of the project and used formative and summative evaluation, along with content validation. The efficient process framework provided by the IOWA model and implementation process enabled effective collaboration in order to meet the project outcomes, which led to acceptance of the project.

Evaluation

The following outcomes were accomplished through continuous process evaluation using the IOWA Model implementation process. The DNP project was completed with support from stakeholders, leadership, and evidence gathered from the literature review.

Ongoing process evaluation of the project occurred with input from the clinical alarm management team committee. These discussions occurred during regular bi-weekly meetings. The new comprehensive policy and procedure and curriculum plan was developed with guidance from the clinical alarm management team.

Project Outcomes

The use of the IOWA model was to have an unbiased process to introduce EBP, best practice to improve clinical alarm management, and reduce alarm fatigue with the help from expert stakeholders involved in the care of patients who are monitored. The following outcome products were developed and evaluated by content experts and team members.

Outcome 1 Literature Review

The synthesis of literature was presented to the clinical alarm management committee, which enabled them to view the priority for implementing a new patient care policy and procedure and curriculum plan. Formative evaluation occurred throughout each meeting during the process of development. Literature was reviewed again when concerns were raised concerning the management of clinical alarms. The literature validated the use of EB and best practice suggestions made by me.

Outcome 2 Policy and Procedure (Appendix A)

Discussion. The TJC requires every hospital to develop a policy and procedure on clinical alarm management concerning the purpose and proper operation of alarm systems (TJC, 2013). The input of the clinical alarm management committee provided insight into current practices and roles on each unit before the development of the new

patient care policy and procedure. The new patient care policy and procedure was developed with current literature and evidence-based guidelines. After the development of the policy and procedure I presented the completed document to the clinical alarm management team participants and discussion ensued on recommendations for changes in the presented policy and procedure.

Findings. The hospital clinical alarm management and policy and procedure committee have approved the new Patient Care Service policy and procedure. The recommendation was given to involve all ancillary staff in direct contact with clinical alarms rather than just the professional nurses. The inclusion of all ancillary staff in the education who could be affected by the nuisance alarms would improve clinical alarm management and alarm fatigue by having a knowledge of the topic and knowing what to do to prevent alarm fatigue.

Outcome 3 Curriculum Plan (Appendix B and I)

Discussion. The educational content provided was information about clinical alarm management, alarm fatigue, early warning signs of deterioration, and the new patient care policy and procedure. The proposed curriculum plan consisted of a pre-education survey, followed by a PowerPoint educational module. (Appendix C). The education was tailored to ensure the hospital meets TJCs NPSG guidelines. Two experts from the team reviewed the curriculum to assure that content met the objectives. Both hold an RN degree, one holds a Doctorate of Nursing Practice (DNP) and one with a Doctor of Philosophy (Ph.D.) The first expert reviewer develops and evaluates

curriculum. The second expert reviewer has expertise in item and curriculum development.

Findings. The two content experts reviewed the curriculum plan to see if content met the objectives. The reviewers evaluated the four objectives of the curriculum plan using a 4 item *met* or *not met* response. All objectives were found to be *met*. The curriculum plan was then reviewed by the clinical alarm management committee, nursing educator on each unit, and nursing leadership who agreed with the development and findings of the experts.

Outcome 5 The Clinical Alarm Management Survey (Appendices D and G)

Discussion. The survey will be given prior to the oral presentation to assess the participant's attitudes about clinical alarm management and alarm fatigue.

Findings. The survey was reviewed by both expert reviewers using the curriculum objectives were evaluated by two content experts using a 4 item *met/not met* response format. Findings showed that all objectives were met. The content of the nurse survey was reviewed by the experts using a 3 item Likert scale and all the items were deemed relevant (Appendix J) form. Recommendations were made to address the actual knowledge base of the participants related to clinical alarm management. The reason for the change in the question was to see if employees' opinions changed on how, when, and understanding of clinical alarm management had improved after the educational session.

Outcome 6 IOWA model into Designing the Practice Change (Appendix F)

Discussion. The IOWA model into designing the practice change enabled the team to view key strategies and how development of the QI project would move from one

paradigm to the next. Time management, resource allocation, and budget constraints will not play a role in the implementation of the curriculum plan. The curriculum plan is considered part of the yearly mandated education requirements set forth for the nursing staff. The curriculum plan will be an ongoing assessment for the hospital to meet the TJC NPSG clinical alarm management guidelines. After dissemination of the curriculum plan, changes will be made accordingly to ensure that the hospital engages in a continuous improvement cycle to improve clinical alarm management and reduce alarm fatigue.

Findings. As reflected in the meeting minutes, the IOWA model into designing the practice change was used to describe the process of implementation. The team approved the plan.

Outcome 9 Summative Evaluation of the Project (Appendix K)

Discussion. The Summative evaluation form (Appendix K) was provided to each team member in the last meeting (n=9), and filled out without identification and returned in a plain envelope. The questionnaire focused on me as a team leader, and included an evaluation of meeting the outcomes for the project and meeting the overall goal for the institution.

Findings. A return rate of 100% was obtained. There were a total of 8questions that used a 5-point Likert scale response. Three of the questions were in relation to the evaluation of outcomes for the project, one that evaluated me as a team leader, one that evaluated the involvement process of the project, one about the overall satisfaction on the project, and one about meeting the overall goal for TJC.

The questions asked in the evaluation are as follows, with response rates:

- Scope of project matched what was defined in the Project Proposal? Strongly agreed = 100%
- Project review process was an effective way to initiate communication with the primary stakeholders and buy-in of the project? Strongly agreed = 100%
- Strategies for implementation was adequate for the project? Strongly agreed = 100%
- Thoroughness of training plan and training curriculum were met? Strongly agreed = 100%
- Meets The Joint Commissions mandates for clinical alarm management?
- Provides best practice approach for education? Strongly agreed = 100%
- Supports and facilitates efficient cross functional communication that results in few project or production delays? Strongly agreed = 100%
- Managed impending change efficiently? Strongly agreed = 100%

The evaluation results showed the goal and outcomes for the DNP project were met. The results of the evaluation supported my ability to be an effective leader in QI projects.

Applicability to Health Care

The use of evidence-based practices and best practices have shown to improve clinical alarm management, which ultimately shows the reduction in alarm fatigue. Research has shown the overpowering nuisance alarms desensitizes staff which can lead to adverse events reported in TJC Sentinel Event Reporting (TJC, 2013). An event reported in 2010, showed a 60-year-old man died from the delayed response to an alarm

signal that altered his health status (TJC, 2013). According to TJC, (2013) “This unanticipated death was the result of a significant problem that occurs every day, in many hospitals a failure to respond to appropriate alarm signals in a timely manner” (pg. 1). The increased education on clinical alarm management and alarm fatigue will help guide the improved change in clinical practice to reduce adverse events that are occurring as a result of mismanagement and desensitization of clinical alarms.

Implications

Changes in clinical practice are inevitable in the ever-changing environment in healthcare today. Changes the management of clinical alarm practices improve care procedures and outcomes for the patient, which ultimately leads to nurses delivering improved quality of care.

The contributing factor to the successful development of the new Patient Care Services policy, procedure and educational module was the invaluable input on previous procedures for clinical alarm management, staffing situation on each unit, and the current knowledge of early warning signs of deterioration, clinical alarm management, and alarm fatigue received from the committee team. The input received showed there were high turnover rates for nursing staff and lack of knowledge about the new NPSG for clinical alarm management, managing clinical alarms, and realization that alarm fatigue exists. The facilities current staff nurse are primarily new nursing graduates. The ratio of new nursing graduates accounts for 80% of the current staffing.

Practice

Clinical alarm management changes in policy and procedures, and improved educational process enables transformational of knowledge to occur by improving clinical practice. Decreasing intermittent noise to help the ill has been a theme for Florence Nightingale. Florence Nightingales idea of the noise that affects patient care was the mere hearing of sound places a supposition in the mind that can decrease a patient's wellness and nurse's inability to recognize the continuous beeping sounds (Florence Nightingale, 1860). TJC NPSG on clinical alarm management addresses the issue with the loud, overpowering clinical alarms that have become a problem for patient and nurse safety (Sendelbach & Funk, 2013).

DNP Use of Research in Practice

Research is the key to improving the quality of care for patients. Institute of Medicine [IOM], (2010) recommendation two is for nurses to broaden their growth in research, redesign, and improve practice environments and health systems in collaboration with physicians and medical teams.

Future clinical alarm management research opportunities could be done to identify the specific cardiac arrhythmias that cause cardiac monitors to alarms to continuously beep and the need for a critical care internship for nurses working on a complex medical unit. As part of a society that yearns for improved quality of care being reminded healthcare is a forever rapid changing environment, there is always room to learn and improve on every aspect of healthcare (Sherar & Maley, 2015). Knowing this

will give healthcare professionals the golden opportunity to continue work as a scholar-practitioner to help improve the quality of care for our patients.

Social Change

The Healthcare Reform has brought about new social changes leading to quality improvement and patient-centered care to the forefront of issues that need resolving. The resolution of these changes will be conducted through increased research using evidence-based nursing approaches by nurse leaders. The goal for The Center for Quality Improvement and Patient Safety is to integrate research findings into clinical practice (Center for Quality Improvement and Patient Safety [CQuiPS], 2012). The ability for nurse leaders to conduct QI projects to help improve the quality of care. Completing a QI project on clinical alarm management to improve alarm fatigue will assist the Center for Quality Improvement and Patient Safety (CQuiPS) to reach their goal in improving the quality of care to help increase patient safety and ultimately improve health care costs.

Strengths and Limitations

Strengths

Strengths of the DNP project are generated by the realization the need to manage clinical alarms to help improve alarm fatigue. The national focus on management of clinical alarms placed a priority on alarm safety by mandating all facilities to develop new policies, procedures and educate all nursing staff on these issues and concerns for alarms. The last strength is the encouragement and support given to me from leadership and key stakeholders.

Limitations

Limitations to the DNP project has been the inability to implement the project before graduation. The inability to implement the DNP project has placed time constraints to meet the NPSG implementation of phase two requirements with re-evaluation of accurate education for all nursing staff. The ability to remedy the limitations of the DNP project, the educational process will begin right after graduation and the re-evaluate the educational process, if not completed, after the new NPSG implementation of phase two requirements.

Analysis of Self

As Scholar

As a scholar, I have recognized the growth in knowledge in the advancement of health care practices, which enables versatility in clinical practice and academia. The DNP education has increased the depth of knowledge in best practice and evidence-based research to help improve the quality of care for current and future patients for healthcare.

As Practitioner

Benner's Model Novice to Expert can help explain the self-analysis as a practitioner. Starting out in the DNP program this student started out as a competent provider who had the ability to take past experiences to help guide the care of patients (Benner, 2001). Completing the DNP program has allowed the progression to a proficient provider who will have the ability to prioritize the needs of healthcare to help predict outcomes (Benner, 2001). The continuation as a scholar-practitioner will provide the ability for the progression to an expert provider to have the capacity to resolve or

improve complex situations in healthcare through the extensive knowledge throughout the years of experience in practice (Benner, 2001).

As Project Developer

Project development is a new role for me in transitioning to a scholar-practitioner. Course work, practicum, scholarly writing, which has been a successful role transition. Development of project needs to be facilitated by an individual who seeks achievement through the organization and the ability to inspire others. The ability to become a project developer takes a shared leadership value who desires continuous improvement to help improve outcomes in health care. These aspects have been shown to the DNP student and has proven to be a role the student wants to continue.

What Does this Project Mean for Future Professional Development?

The development as a scholar-practitioner, shows that becoming a nurse leader to help improve the quality of care and safety for patients. Nurse leaders have shown to help improve the quality of care through research, which is helping shape a new healthcare system that embodies nurses making healthcare decisions (Hassmiller & Quinn, 2015). As a nurse leader envisioning what other changes could be made in the healthcare arena and academia to help improve the quality of care and safety for patients. Starting the process of researching what changes could contribute to improving the education of future nurses could improve health care outcomes for the healthcare community.

Summary and Conclusions

The development of a comprehensive new Patient Care Services policy, procedure, and a curriculum plan will help improve the health outcomes for patients through clinical alarm management by providing improved quality of care and increasing patient safety. Closing the gap between evidence-based research and practice has shown to improve patient care by meeting health care outcomes. Disseminating of this project will help meet Institute of Medicine [IOM] Recommendation 2: Expand opportunities for nurses to lead and diffuse collaborative improvement efforts (IOM, 2010). Section 5 of this paper includes a scholarly product for dissemination.to help improve management of clinical alarms and alarm fatigue.

Section 5: Scholarly Product for Dissemination

Section 5 is a scholarly product for dissemination. This abstract follows the guidelines of and has been formatted to meet AACN Evidence-Based Solutions Abstract Criteria (Appendix L) and Poster (Appendix M) and uses an Evidence-Based (EB) solution to improve clinical alarm management to help reduce alarm fatigue in nursing staff.

Title

Development of a Policy and Procedure To Decrease Alarm Fatigue

Purpose

The purpose of this DNP QI project was to develop a patient care alarm fatigue initiative based on analysis and identification of best practices in the literature review and in alignment with the TJC mandates. The goal of the alarm fatigue initiative was to provide nurses with education to reduce alarm fatigue among nursing staff through management of clinical alarms in order optimize patient safety. The issues addressed in the DNP project were early warning signs of deterioration, clinical alarm management, and alarm fatigue.

Description

The use of evidence-based literature and best practices used to develop a comprehensive patient care policy and procedure and curriculum plan. to improve management of clinical alarms and improve alarm fatigue framed within the IOWA model of evidence-based practice. The Quality Improvement (QI) project creates social

change through transformation of behavioral patterns and cultural norms among nursing staff.

According to The Joint Commission (TJC), 98 unexpected and unacceptable events related to alarm fatigue were reported in United States [US] hospitals between January 2009 and June 2012. There were 80 deaths, 13 permanent loss or function, and five extended care stay that occurred. The sentinel event database stated that the factors that contributed to alarm-related sentinel events were alarm fatigue, uncustomized alarm settings, inadequate staff education, equipment malfunctions and failures, insufficient support for staff, and multiple alarm integration (TJC, 2013). The problem identified in this quality improvement (QI) initiative was the TJC report that nursing staff in the US was experiencing alarm fatigue due to the overstimulation of senses from continuous beeping from alarms on hospital units.

Evaluation and Outcomes

In order to meet the goal, five outcomes were completed: (a) a literature review, (b) policy and procedure for managing alarm fatigue, (c) incorporating the AACN Strategies for Managing Alarm Bundle with additional evidence-based literature into the curriculum plan, (d) implementation strategies, and (e) evaluation plan of the outcomes. The use of formative along with content validation were completed by experts in assessments with a summative evaluation completed by team members.The curriculum plan consisted of a survey on nursing opinions of alarm management followed by an educational presentation..

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Appendix A: Patient Care Policy and Procedure

TITLE: Clinical Alarm Systems and Patient Safety	**POLICY # PC1.91**
EFFECTIVE DATE:	**AUTHOR**:
Approval Signatures: Vice President/Chief Nursing Officer	Director of Nursing
Reviewed/Revised By:	**Date:**
Responsibility: Quality Managment	

I. SCOPE:

This policy applies to Daniel Drake Center Post Acute Care ("Hospital") and all Hospital staff (whether employees or independent contractors) and Medical Staff members.

II. PURPOSE:

The purpose of this policy is to promote safe patient care through the use of monitoring and response to clinical alarms.

III. DEFINITIONS:

Clinical alarms include all patient physiologic monitoring and patient care equipment alarms that are intended to promote safe patient care or to alert the staff that the patient is at risk and needs assistance.

IV. PROCEDURE:

A. Medical Equipment/Device Alarms

1. All Registered Nurses (RNs) and Central Monitoring Unit (CMU) must check alarm settings to ensure they are appropriate, and that audible alarms will be clearly discernable about ambient and competing noise.
2. At no time shall any clinical alarms be bypassed, shut off or medical equipment alarm volumes adjusted to a level that cannot be readily heard when the alarm activates.
3. All clinical staff must immediately respond to medical equipment alarms by assessing the patient.
4. Alarm systems must be set to the patient care unit's protocol:

Heart Rate (HR)	SP02	Notification Delay
HR threshold: <50 beats per minute >140 beats per minute	**Pulse Ox threshold: <80%**	**15 second audio alarm delay at bedside and 15 second delay for pager notification = 30 second total delay**

5. Any deviation from the patient care unit's protocol must be documented by the responsible RN. Documentation must include the rationale for deviation of alarms and new settings used. Alarm changes must be communicated to the charge nurse and physician.

B. Alarm Maintenance and Testing

1. Clinical Engineering Department must, as a part of the patient care equipment inventory, identify those devices and systems that include physiologic and patient care alarms at the time new equipment is put into place or checked annually.

TITLE: Clinical Alarm Systems and Patient Safety	POLICY # PC1.91
EFFECTIVE DATE:	AUTHOR:
Approval Signatures: _____ Vice President/Chief Nursing Officer	 _____ Director of Nursing
Reviewed/Revised By:	Date:
Responsibility: Quality Managment	

C. Patient Safety and High-Risk Areas

The Clinical Alarm Management Committee will work with the Clinical Engineering Department to structure the program. Minimum required components of this program must include:

1. Annual Inventory of all alarms.
2. Clinical Guidelines for settings of all alarms.
3. Development and evaluation of alarm plan to minimize alarms that sound.
4. Development of processes to customize alarm to individual patient care needs and document as part of a plan of care.
5. New and annual alarm program training for patient care staff.

IV. REFERENCES:

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Appendix B: Curriculum Plan

Clinical Alarm Management Strategies To Help Improve Alarm Fatigue

Problem: The problem identified in this quality improvement (QI) initiative was the TJC report that nursing staff in the US was experiencing alarm fatigue due to the overstimulation of senses from continuous beeping from alarms on hospital units.

Purpose: The purpose of the project was to develop a patient care alarm fatigue initiative as mandated by TJC including a policy and procedure for managing alarm fatigue, a curriculum plan for educating the nursing staff on compassion fatigue, and a survey on nurse attitudes toward alarm fatigue to be administered at the beginning of the education.

Goal: The goal of the alarm fatigue initiative was to provide nurses with education to reduce alarm fatigue among nursing staff through management of clinical alarms in order optimize patient safety.

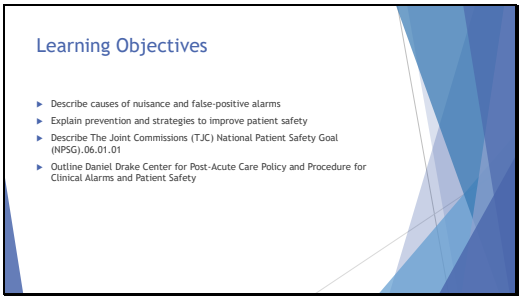
Objectives **At the conclusion of this educational experience**	**Content Outline**	**Evidence**	**Method of Presenting**	**Method of Evaluation P/P Item**
Interpret The Joint Commission [TJC] National Patient Safety Goal [NPSG].06.01.01	NPSG.06.01.01	The Joint Commission	Picture of NPSG on PPT presentation Handout of NPSG	Post test
Describe the causes and impact of nuisance and false-positive alarms	TJC Sentinel Events	The Joint Commission	PPT presentation	Post test
Identify nurse-led strategies to help improve clinical alarm management	Description of strategies	AACN Guidelines	PPT presentation	Post test
Identify evidence-based implementation strategies for improving patient safety	Description of strategies	John Hopkins Research Dartmouth Research AAMI Research	PPT presentation	Post test
Translate Patient	Patient Care		Picture of	Pre/Post

Care Services policy and procedure for Clinical Alarm and Patient Safety	Services policy and procedure		Patient Care Services policy and procedure on PPT presentation Handout of Patient Care Services policy and procedure	test

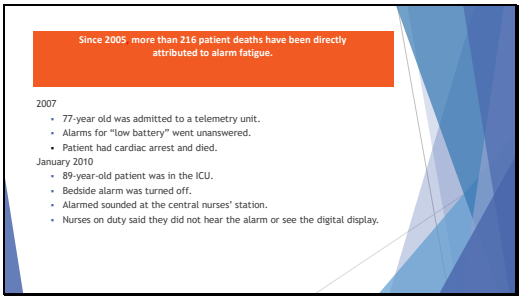
Appendix C: PowerPoint Educational Module

Slide 1

Slide 2



Slide 3

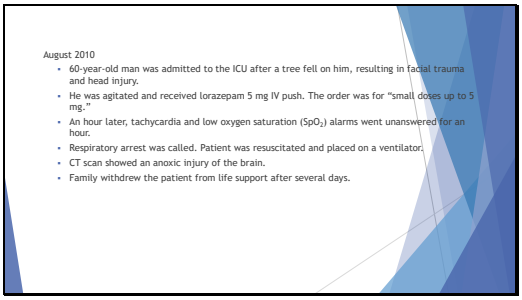


- Since 2005, more than 200 patients have died as a result of alarm fatigue.

- In 2007, 77-year-old Madeline Warner was a patient in a telemetry unit. The batteries in her telemetry pack were low, generating a "low battery" alert that went unanswered. Madeline then had a cardiac arrest and died.

- Another well-publicized event occurred at a major U.S. hospital in January 2010. CMS investigators concluded that alarm fatigue contributed to the death of a patient.
  - In this particular case, a bedside alarm had been turned off. Another alarm sounded at the nurses' station, but staff members failed to hear it.
  - Nurses told CMS investigators they did not remember hearing the alarm or seeing the digital display.
  - The clinicians also indicated they were "experiencing alarm fatigue and a desensitization to alarms after hearing them throughout the workday."

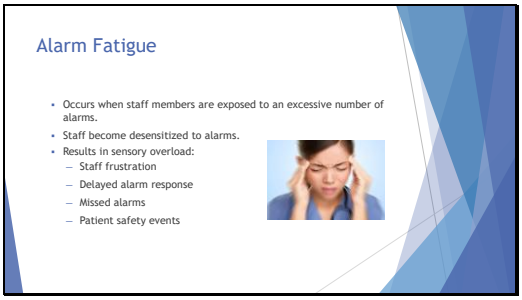
Slide 4



In August 2010, a 60-year-old man was admitted to the ICU after a tree fell on him, resulting in facial trauma and a head injury.

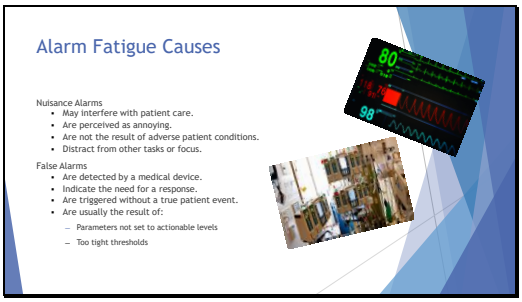
- He had been agitated all day and his pulse-ox alarm sounded throughout the day.
- Staff members requested sedation for him from the resident, and lorazepam was ordered in small doses up to 5 mg IV. This order was interpreted as 5 mg IV push, which is the dose the patient received.
- An hour later, the patient had difficulty breathing, he became tachycardic and tachypneic, and his SpO_2 alarms sounded.
- The alarms went unanswered for an hour and eventually a code was called.
- The patient was placed on a ventilator. CT showed anoxic brain injury. He showed no signs of progress and after several days his family withdrew life support.

Slide 5



According to ECRI Institute, alarm fatigue occurs when staff members are exposed to an excessive number of alarms, which can desensitize them to alarms and result in sensory overload. Desensitization can result in delayed alarm response or missed alarms.

Slide 6



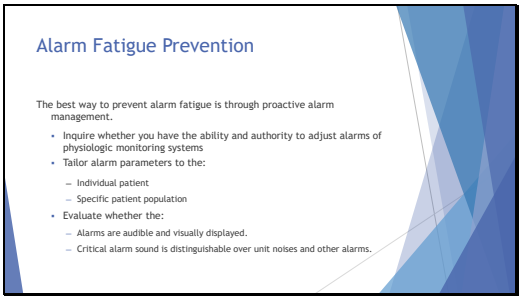
Nuisance alarms are alarms that typically do not result from adverse or potential adverse patient conditions. (ECRI Institute)

- The are perceived by staff to be annoying and may interfere with patient care.
- Nuisance alarms become problematic because – despite the lack of any real patient condition requiring attention – they can distract caregivers from other critical tasks despite and contribute to alarm fatigue.

False alarms are alarms detected by a medical device or system that indicates a need for response to a physiologic event when a true event has not occurred. (ECRI Institute)

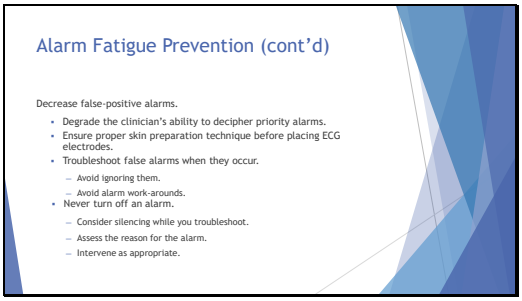
- Additional factors contributing to false alarms are alarm parameters not being set to actionable levels or thresholds that are too tight.

Slide 7



- The best way to prevent alarm fatigue is through better alarm management.
- Ask whether you have the ability and authority to change the alarm level within physiologic monitoring systems, and tailor alarm parameters to the individual patient and/or specific patient population.
- Evaluate:
  - How audible alarms are
  - How clearly alarms are displayed
  - Whether the sound of critical alarms is distinguishable over the noise of the other alarms in the unit or facility

Slide 8

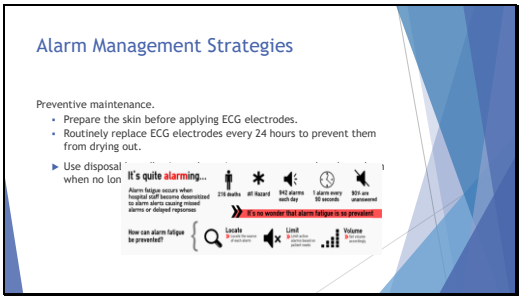


False-positive and/or nuisance alarms must be decreased because they degrade the ability of clinicians to decipher important alarms.

To help minimize the frequency of unnecessary alarms:

- Ensure proper skin preparation technique before placing ECG electrodes on the patient.
- Have frontline clinicians strive to troubleshoot false alarms when they occur rather than ignoring them or finding a way to work around them.
- Never turn off an; rather, consider silencing the alarm until you have assessed the problem and have intervened as appropriate.

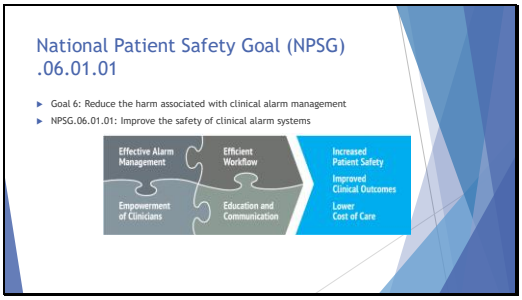
Slide 9



Slide 10

Recognizing early warning signs of deterioration decreases morbidity and mortality rates. The inability to recognize warning signs of deterioration delays interventions that could save a patients life. The two most important predictors for patient adverse events are Respiratory Rate and Heart Rate, and experts have begun to emphasize the importance of continuous monitoring of vital signs as a means of detecting patient deterioration. Any sign of early warning signs of deterioration should be reported to the primary physician or physician on call.

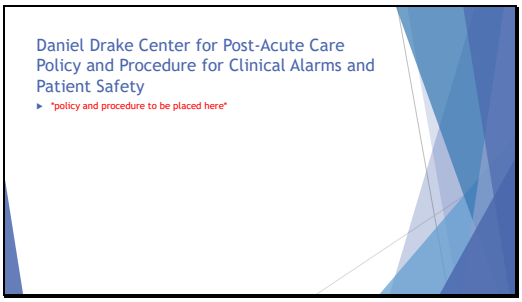
Slide 11



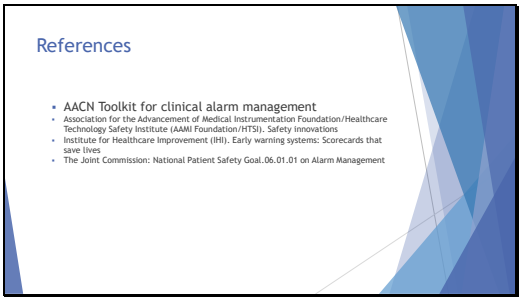
Improve the safety of clinical alarm systems. NPSG.06.01.01 Elements of Performance for NPSG.06.01.01 Clinical alarm systems are intended to alert caregivers of potential patient problems, but if they are not properly managed, they can compromise patient safety. This is a multifaceted problem. In some situations, individual alarm signals are difficult to detect. At the same time, many patient care areas have numerous alarm signals and the resulting noise and displayed information tends to desensitize staff and cause them to miss or ignore alarm signals or even disable them. Other issues associated with effective clinical alarm system management include too many devices with alarms, default settings that are not at an actionable level, and alarm limits that are too narrow. These issues vary greatly among hospitals and even within different units in a single hospital. There is general agreement that this is an important safety issue. Universal solutions have yet to be identified, but it is important for a hospital to understand its own situation and to develop a systematic, coordinated approach to clinical alarm system management. Standardization contributes to safe alarm system management, but it is recognized that solutions may have to be customized for specific clinical units, groups of patients, or individual patients. This NPSG focuses on managing clinical alarm systems that have the most direct relationship to patient safety. As alarm system management solutions

are identified, this NPSG will be updated to reflect best practices.

Slide 12



Slide 13



Appendix D: Clinical Alarm Management Survey

Clinical Alarm Management Survey

The following is a survey designed to assess opinions of staff related to for Clinical Alarm Management

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Continuous Beeping Alarms					
Continuously beeping alarms is a regular occurrence on my unit					
Continuous beeping alarms affect the care of patients on the unit					
Continuous beeping alarms are ignored on the unit					
Management of Clinical Alarms					
When beeping alarms are heard I always check the patient right away					
Continuous beeping alarms are not addressed in a timely manner					
There are no solutions to continuous beeping alarms					
Policy and Procedure					
Policy and procedures on how and who is responsible for managing clinical alarms exist					
Evidence-based protocols have been implemented on the unit					
Action plan has been developed to management alarms on the unit					
National Patient Safety Goal					
Staff are aware of The Joint Commissions National Patient Safety Goal for managing clinical alarms					

Appendix E: IOWA model

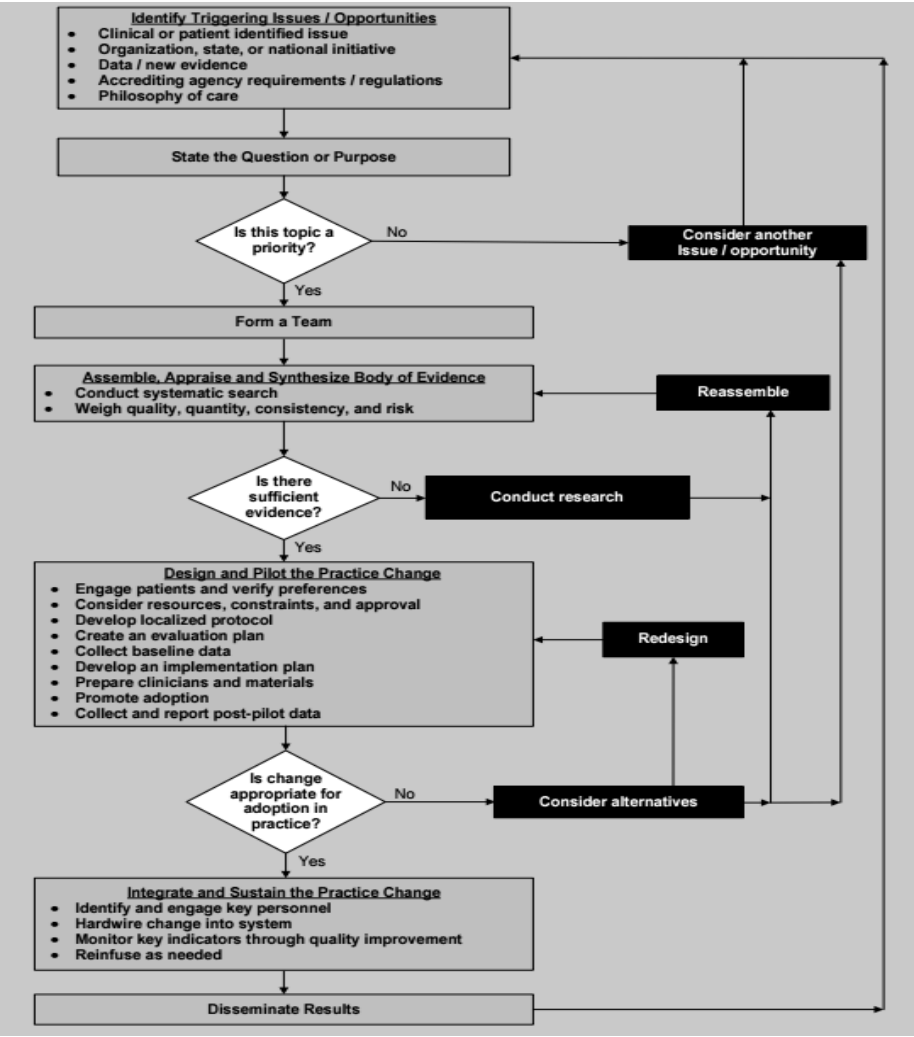


Figure 1. IOWA Model. Used/Reprinted with permission from the University of Iowa Hospitals and Clinics. Copyright 2015. For permission to use or reproduce the model, please contact the University of Iowa Hospitals and Clinics at (319) 384-9098.

Appendix F: IOWA model into Designing the Practice Change

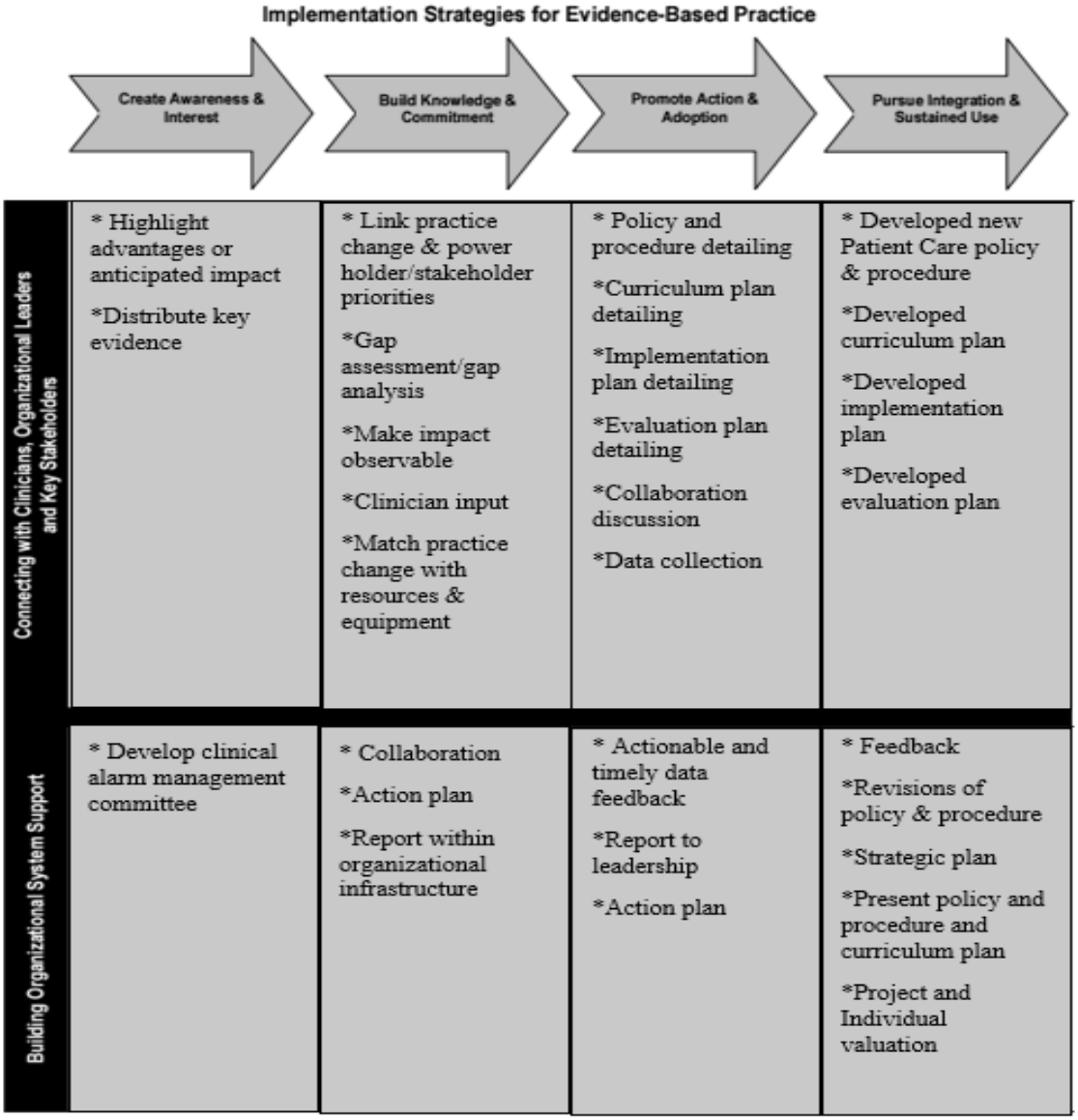


Figure 2. Copyright of the *Implementation Guide* will be retained by The University of Iowa Hospitals and Clinics. Used/Reprinted with permission

Appendix G: Content Expert Validation form for survey

Clinical Alarm Management Survey
EXPERT CONTENT VALIDATION
Clinical Alarm Management Strategies to Help Improve Alarm Fatigue
Curriculum Plan, Pretest/Posttest, Complete Curriculum
INSTRUCTIONS: Please check each item to see if the question is representative of the course objective and the correct answer is reflected in the course content.

Test Item #	Not Relevant	Somewhat Relevant	Very Relevant
1. Continuously beeping alarms is a regular occurrence on my unit	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
2. Continuous beeping alarms effect the care of patients on the unit	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
3. Continuous beeping alarms are ignored on the unit	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
4. When beeping alarms are heard I always check the patient right away	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
5. Continuous beeping alarms are not addressed in a timely manner	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
6. There are no solutions to continuous beeping alarms	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
7. Policy and procedures on how and who is responsible for managing clinical alarms exist	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
8. Evidence-based protocols have been implemented on the unit	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
9. Action plan has been developed to management alarms on the unit	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐
10. Staff are aware of The Joint Commissions National Patient Safety Goal for managing clinical alarms	Not Relevant ☐	Somewhat Relevant ☐	Very Relevant ☐

Appendix H: Clinical Alarm Management Survey Expert Content Validation

Expert Reviewers	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**	**NR**	**SR**	**VR**
Question	1			2			3			4			5			6			7			8			9			10		
Reviewer 1			1			1			1			1			1			1			1			1			1			1
Reviewer 2			1			1			1			1			1			1			1			1			1			1
Total			2			2			2			2			2			2			2			2			2			2

NR = not relevant SR = somewhat relevant VR = very relevant

Min Value	**Max Value**	**Average Value**	**Variance**	**Deviation**	**Responses**	**Respondents**
1	**2**	**1.00**	**0.00**	**0.00**	**2**	**2**

Appendix I: Curriculum Plan Evaluation

Clinical Alarm Management Strategies To Help Improve Alarm Fatigue
Products for review: Curriculum Plan, Complete Curriculum Content
Instructions: Please review each objective related to the curriculum plan, content and matrix. The answer will be a "met" or "not met" with comments if there is a problem understanding the content or if the content does not speak to the objective.

Curriculum Objectives	Not Met	Met
Objective 1: Describe Causes of nuisance and false-positive alarms Comment:	Not Met☐	Met☐
Objective 2: Explain prevention and strategies to improve patient safety Comment:	Not Met☐	Met☐
Objective 3: Describe the Joint Commission National Patient Safety Goal Comment:	Not Met☐	Met☐
Objective 4: Outline Daniel Drake Center for Post-Acute Care Policy and Procedure for Clinical Alarms and Patient Safety Comment:	Not Met☐	Met☐

Appendix J: Summary of Curriculum Plan Evaluation by Content Experts

Expert Reviewers	Objective 1		Objective 2		Objective 3		Objective 4	
	Met	Not Met	Met	Not Met	Met	Not Met	Met	Not Met
Reviewer 1	1		1		1		1	
Reviewer 2	1		1		1		1	
Total	2		2		2		2	

Min Value	Max Value	Average Value	Variance	Deviation	Responses	Respondents
1	2	1.00	0.00	0.00	2	2

Appendix K: Summative Evaluation form

Clinical Alarm Management Evaluation

The following survey was designed to assess and provide feedback regarding the Clinical Alarm Management development of the new Patient Care policy and procedure, curriculum plan, implementation plan and evaluation plan.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Development of Project					
Scope of project matched what was defined in the Project Proposal?					
Project review process was an effective way to initiate communication with the primary stakeholders and buy-in of the project?					
Implementation Plan					
Strategies for implementation were adequate for the project?					
Thoroughness of training plans and training curriculum were met?					
Educational Plan					
Meets The Joint Commissions mandates for clinical alarm management?					
Provides best practice approach for education?					
DNP Student Performance					
Supports and facilitates efficient cross functional communication that results in few project or production delays					
Managed impending change efficiently.					

Appendix L: Abstract

An Evidence-Based Solutions or poster may be the result of an organizational process that, when applied across the continuum of critical care, achieves a desired outcome or meets or exceeds a benchmark for a standard of nursing practice. An Evidence-Based Solutions or CSI poster abstract in acute and critical care nursing can be submitted on a wide variety of processes, strategies and practice innovations.

Prepare Evidence-Based Solutions and/or CSI poster abstracts to include the following key elements:

1. **Purpose** – What was the intent/goal of the project? What problem was addressed by the evidence-based solution? (Limit 500 characters, including spaces)
2. **Description** – What was the evidence-based or CSI solution? How was it developed and implemented? Cite the research for the evidence implying how you made a clinical decision based on the best available current research or literature, your own clinical expertise or patient's needs to change a process to improve nursing practice. Do not submit and actual reference/bibliography list (Limit 1,250 characters, including spaces)
3. **Evaluation and Outcomes** - What were the outcomes of the project? How was success measured? (Limit 700 characters, including space

Appendix M: Poster

Development of a Policy and Procedure To Decrease Alarm Fatigue

Samantha Deck, DNP, MSN, RN
Walden University

Problem

The problem identified in this design-only DNP project was alarm fatigue experienced by nurses due to the overstimulation of senses from continuous beeping from alarms on the unit. The first responses to alarm hazards were noticed after a death occurred in a patient at Massachusetts General Hospital in 2010. The patient's alarm had been negligently turned off. These actions by the nurse were precipitated by alarm fatigue (Cvach, 2012). The completion of a review starting March 1, 2010 – June 30, 2010 disclosed that 73 deaths were directly related to clinical alarms and 33 that contributed to functional monitors. These deaths were attributed to alarm fatigue in staff nurses.

Purpose of Project

The purpose of this Doctorate of Nursing Practice (DNP) Quality Improvement (QI) project is to optimize patient safety through the management of clinical alarms and reducing alarm fatigue among nursing staff through the development of a new comprehensive Patient Care Services policy, procedure, and curriculum plan. The issues addressed in the DNP project were early warning signs of deterioration, clinical alarm management, and alarm fatigue.

Background

Sentinel events reported due to clinical alarm desensitization was evident since the first reported sentinel event in 1974. Clinical alarm management has been studied and has not shown improvement in a decrease in alarm fatigue. According to TJC (2013), 98 sentinel events were reported in telemetry units, ICU, general medicine, and emergency departments in the United States [US]. There were 80 deaths, 13 permanent loss or function, and five extended care stays that occurred from the 98 sentinel events.

Clinical Initiative

Goals

The goal of the alarm fatigue initiative was to optimize patient safety through management of clinical alarms in order to reduce alarm fatigue among nursing staff.

Outcomes

At the conclusion of this DNP project:

- An extensive literature review was completed
- A policy and procedure for managing alarm fatigue was developed
- Incorporating the American Association of Critical-Care Nurses [AACN] Strategies for Managing Alarm Bundle and additional evidence based literature into a curriculum plan was completed
- An implementation plan to be conducted after graduation was developed
- An evaluation plan to be conducted after graduation was developed

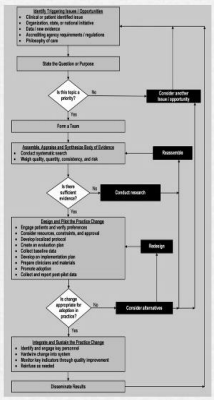
Framework/Model for the Project

Framework/Model for the Project

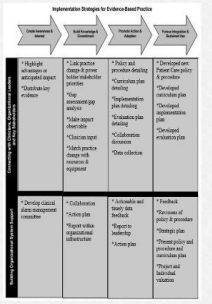
IOWA Model

IOWA Model guided the changes in clinical practices for clinical alarm management to help improve alarm fatigue. The changes in clinical practices for clinical alarm management are needed to help improve safety and quality of care for patients. The model uses seven key steps; identifying topic of priority, collaboration, conducting research, evaluation of evidence, developing a standard, implementation, and evaluation (Doody & Doody, 2011). Alarm fatigue is contributed to clinical alarms creating false alarms (Karsh, Holden, Alper, & Or, 2006). False alarms precipitate nurses' desensitization to the beeps and sounds. issues in patient safety may arise from staff nurses decreasing the sounds, turning off clinical alarms, or completely ignoring sounding alarms. Reduction in patient errors and injuries, along with refining Evidence-Based Practice (EBP) will enhance patient safety.

IOWA Model



IOWA Implementation Strategies for Evidence-Based Practice



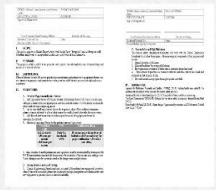
Conclusion

Dissemination:

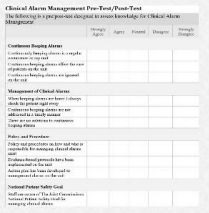
New comprehensive Patient Care Services policy and procedure and curriculum plan were used to help improve clinical alarm management and reducing alarm fatigue among nursing staff by increasing the knowledge in early warning signs of deterioration, clinical alarm management and alarm fatigue.

A pre and post-test with an educational module was administered to ensure an increase in knowledge occurred among the staff nurses. The successfulness of the project was measured by the increased knowledge in management of clinical alarms and a reduction in alarm fatigue.

Clinical Alarm Management Policy and Procedure



Clinical Alarm Management Pre/Post-Test



Contact information

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