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Cardiac Telemetry Monitoring: Understanding Misutilization and How to Ameliorate

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Cardiac Telemetry Monitoring: Understanding Misutilization and How to Ameliorate

by

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Abstract

Inappropriate usage of cardiac telemetry in the hospital setting is a problem that plagues healthcare facilities almost ubiquitously. By writing orders for a telemetry monitor when it is not needed, providers are potentially increasing the costs of that patients stay in multiple areas. The goals of this project are to decrease telemetry monitoring misutilization, thus decreasing costs in several different areas. The plan is to create interventions, based on literature reviews of previous studies, and enact new guidelines that will lead to success of project goals. This plan could have significant impacts in the areas of patient length of stay, hold time in the Emergency Department, and telemetry usage in general, which in turn could create cost savings in all three areas. Even success in one area would bring the project proposal goals to fruition.

Keywords: telemetry utilization, telemetry misuse, cardiac telemetry, and cardiac monitoring.

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CHAPTER I

Introduction

Problem Statement

There are various issues in the inpatient hospital setting that consistently need to be improved upon, such as patient satisfaction, mortality rates, financial efficiency, patient flow inadequacies, and discharge timeliness. There is one area of focus that could possibly make improvements in one or all of these areas simultaneously, without the need for new equipment, staff, or excessive expenditures which is the appropriate use of telemetry monitoring. The appropriate utilization of telemetry monitoring throughout a hospital has been an obstacle that currently seems to have no correct answers. There is frequently a lack of available hospital telemetry monitors because of inappropriate use of the monitors in various units. This creates major problems when patients have admission orders to be placed on telemetry monitoring or have a change in their condition and require one after they have been admitted as the monitors are not available when needed. Inappropriate telemetry utilization creates unnecessary cost and utilization of resources and reducing this improper use could have potential long-term cost savings and more efficient workflow processes.

Significance

With the various issues a hospital faces on a day-to-day basis, telemetry monitoring misuse continues to be one with a multitude of proposed solutions, none of which have seemed to solve the enigma. Regardless of the unit or service line, in the inpatient setting, the process of telemetry monitoring and its over usage and subsequent shortage, which has repercussions for patient care and cost of care. When looking at the

patient care aspect, there are three areas to consider: admissions from the emergency department, new need for telemetry monitoring for existing inpatients, and patients being downgraded from Intensive Care Units (ICU). When there is a lack of monitors on the non-Intensive Care Unit (non-ICU) inpatient units, admissions from the Emergency Department (ED), initiating telemetry on established patients or transfers from ICU to a lower level of care can be delayed a significant length of time. These delays can cause a backup of patients in the ED, which causes patient flow issues within the ED, increased mortality rate, and increases the length of stay (Singer, 2011). Delaying patient transfers out of ICU can increase the time it takes to admit a patient needing ICU-level care, further increasing their risk of developing complications. Chahine et al. (2017), showed that 86% of caregivers were not familiar with the indications for telemetry on a regular nursing floor, which most likely contributed to the excessive orders for telemetry. Conventional wisdom would say that having a telemetry monitor for every bed in a hospital would solve this dilemma, but not every patient admitted to the hospital needs telemetry monitoring, so it would be a waste of resources to have monitors that were not being used. The number of patients who do not need telemetry monitoring varies greatly day to day, but they are about 20% according to Chen et al. (2017). These numbers represent a large population of patients who are being monitored with telemetry when it is unnecessary, which leads to the unavailability of telemetry monitors when it is necessary.

Purpose

The purpose of this project was to develop new strategies and guidelines to facilitate a more efficient and appropriate use of telemetry monitoring. With numerous

studies showing patient population in a hospital having telemetry ordered for non-cardiac reasons, the project will focus on how to decrease this number, ensuring more telemetry availability. Improvement in telemetry utilization with this project will lay the foundation for this to be implemented throughout multiple units and service lines throughout a healthcare system. Correctly ordering telemetry monitoring according to guidelines, and the continued oversight of this issue by a multidisciplinary team will produce a reduction in improper telemetry usage and increase its efficiency.

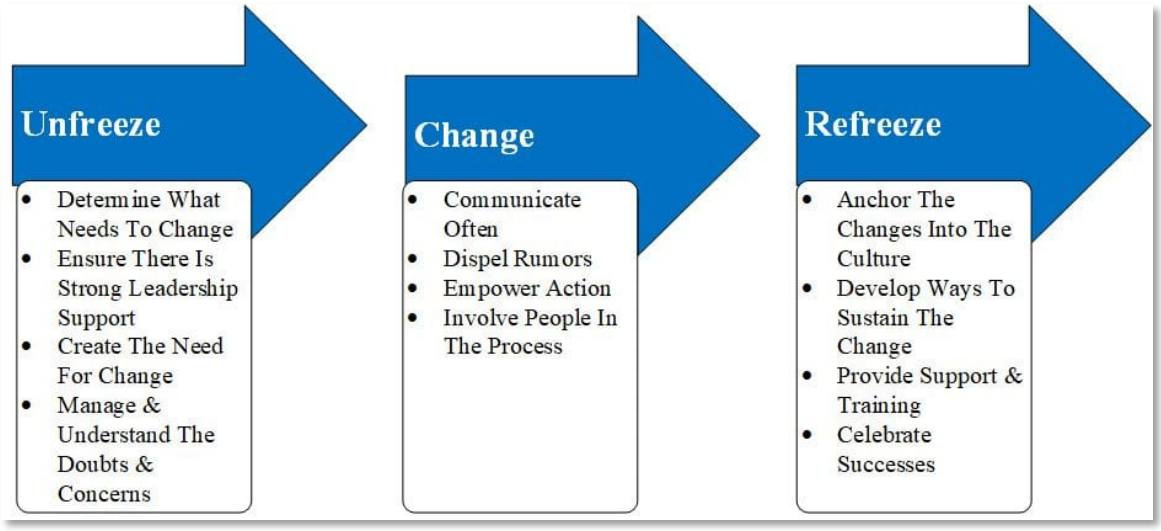
Theoretical and Conceptual Framework

This project will require a change in the way physicians and nursing analyze, process, and provide care to patients when determining the need for telemetry monitoring. In order to facilitate this change, Lewin's Change Theory Model will be followed (Smith, 2020). Lewin's Change Management Model is a comprehensive change model aiming to understand why change occurs, and what must be done to deliver change in the most seamless way possible (Smith, 2020). The theory utilizes a three-step method to enact a change in process in healthcare: unfreezing, changing, and refreezing. Unfreezing involves recognizing the need for change, and in the case of this project, that need would be to enhance the utilization of telemetry monitoring by improving the process of ordering and discontinuing it by providers and recognizing the need to do so by nurses. The changing phase of this theory is the actual implementation of change by planning these changes, taking action to introduce new methods, and educating staff. This will be the intervention phase of the project where providers and nurses will be educated on the changes to processes. The final step to Lewin's model is refreezing. This is when the changes are reinforced with the population affected, integrated into normal processes,

and developed to sustain success. The post implementation phase of this project will be a retroactive chart review and cost analysis to determine if it was successful, and if the change created in the project should be permanently introduced to hospital processes. Lewin's Change Theory Model will provide the structure for how to implement change through this project and give it the highest chance for success. (Figure 1)

Figure 1

Lewin's Change Theory



(Lewin's, 2018)

Definition of Terms

Throughout this project, there may be some terms that the reader is unfamiliar with. Telemetry monitoring is the use of a medical device, used in hospitals in project, that are attached to the patient and sends continuous information about the patient's heart rate, rhythm, and arrhythmias (arrhythmias are abnormal beats of the heart). There will be mention of several different types of nursing units throughout the project such as medical, surgical, med/surg, cardiac or post coronary care (PCU), intermediate, and intensive care (ICU). They each describe the type of patients that are admitted to each unit. The terms

boarding and holding will be used interchangeably to reference patients in the emergency department (ED) who have orders to be admitted to the hospital but do not have an available bed to move to.

Summary

Telemetry monitoring misutilization and improper usage can take a devastating toll on many facets of patient care and hospital resources, it has been a well-known problem, without a consistently successful resolution. By identifying the reasons behind this problem, intent focus can be aimed towards it in the hopes of explicating a permanent solution. The purpose of this project was to develop new strategies and guidelines to facilitate a more efficient and appropriate use of telemetry monitoring. Numerous studies have been done throughout the United States which indicate that hospitals have cardiac telemetry ordered for reasons that do not fall in line with the American Heart Association (AHA) guidelines (Sandau, 2017) (Appendix A). The project will focus on how to decrease this number, ensuring more telemetry availability, and laying the foundation for this to be implemented throughout multiple units and service lines throughout a healthcare system. Correctly ordering and discontinuing telemetry monitoring according to the AHA guidelines, and the continued oversight of this issue by a multidisciplinary team will produce a reduction in improper telemetry usage and increase its efficiency.

CHAPTER II

Literature Review

This project is being created to identify inefficiencies in hospital telemetry usage and develop new strategies and protocols to correct the issues which will allow for a more efficient processes to be introduced. A literature review of multiple related studies and articles is being done for several reasons; to confirm that telemetry usage is being utilized inappropriately and done so nationwide, find studies that have already been conducted which are aimed at correcting this issue, and allow this project to incorporate proven methods of improving this problem. This review was conducted using the OneSearch program of the Dover Library at the University to locate and cite related articles while using the keywords telemetry utilization, telemetry misuse, cardiac telemetry, and cardiac monitoring.

Inappropriate Provider Utilization

A study, conducted by Chen et al. (2017), assesses providers ordering practices for telemetry monitoring to look for inappropriate usage, which can lead to increased costs, alarm fatigue, and inefficient nursing care. The question this study looks to answer is if telemetry monitoring indications are being followed and if not, at what percentage is telemetry being inappropriately ordered by physicians. It was conducted at a 477-bed academic hospital in Maryland and is an institutional review board-approved, retrospective study. All telemetry orders on patients in a non- Intensive Care Unit (non-ICU) setting were reviewed at discharge during the 11-month study. It separated patients into two main categories: cardiac and non-cardiac indicated telemetry monitoring. From there, each case was reviewed to see if the telemetry order met the clinical guidelines for

each category to have telemetry monitoring. This collected the number of telemetry orders that were initiated for non-guideline supported indications. Conclusions of the study reported that 20.2% of all telemetry orders did not fall within the guideline-supported indications. This is interpreted as over one-fifth of all patients in this study could be properly cared for without the need to perform telemetry monitoring, which supports the theory that provider ordering practices need reevaluation to determine why they ordered telemetry when it was not indicated for use per guidelines. The major strength of this study was the fact that it examines the data using telemetry ordering guidelines so that there is no misinterpretation of what is or is not an indication of needing such an order. The greatest weakness of this study is that it does not examine why the physician did not adhere to the indication guidelines and ordered for telemetry monitoring regardless. It would be an important aspect to determine the causation of these non-indicated orders and further explore the reasoning.

Another retroactive study by Chong-Yik et al. (2016), at an urban tertiary care hospital that reviews 250 consecutive patients admitted with cardiac telemetry evaluates the use of telemetry as appropriate or inappropriate using the American Heart Association (AHA) guidelines (Sandau, 2017). The study also looked at significant cardiac events, cardiac arrests, and significant clinical decisions that happen with these patients during this time. The data is analyzed by the prospective of total days hospitalized, which was 1,642. Of those days, 23% were deemed to be appropriate for cardiac telemetry usage. Also, of the 39 total cardiac events, cardiac arrests, and significant clinical decisions, only two happened during an inappropriate cardiac day. This study determined that 77% of the days these patients were hospitalized, telemetry monitoring was inappropriately

ordered. It also discovered that serious cardiac events and significant clinical decisions happened with inappropriately ordered telemetry patients 5% of the time. The strengths of this study include a breakdown of patient hospitalization days for more accurate results and the data collection of serious cardiac events that happen during this time. Its major weakness is limiting the number of patients in the study.

Similar results were found in a retroactive study completed by Sandeep et al. (2012), in an acute care facility. Analysis using AHA comparisons, 562 hospitalized patients were studied to determine if the number of clinically significant events were captured by telemetry monitoring. The patients were divided into two groups, telemetry indicated and telemetry not indicated, using the institution's telemetry guidelines, which were developed by the AHA guidelines. Clinically significant events were determined by the team prior to the study so that a baseline would be established. The study discovered that 36% of the “telemetry indicated” group had a clinically significant event, while the other group had no such events. The strengths of this study include using a large number of patient chart reviews. The major weakness of this study is the fact that it only looked at clinically significant events for each group, and not at other factors.

A similar study was conducted by Chong-Yik et al. (2018), at a 432-bed tertiary care hospital to which reviewed 250 sequential inpatients who were monitored via cardiac telemetry during their stay. The goal was to identify inappropriate telemetry use and how much cost savings could be obtained by using telemetry appropriately Patients from ICU, Cardiac Care Unit (CCU), and cardiothoracic step-down units were not included due to these units always requiring telemetry. Two physicians performed retrospective chart reviews focused on the appropriateness of telemetry initiation upon

admission, and the continuation of telemetry monitoring throughout the patients' stay. The criteria used to guide them was the AHA telemetry indications. They used these guidelines to look at every single day each of these patients were hospitalized, which ended up being a total of 1,399 patient days. Using this method allowed them to break down appropriate versus inappropriate telemetry usage to a daily count, which was 334 (23.8%) and 1,065 (76.5%) respectively. This study was done with the aim of identifying potential cost reductions when eliminating inappropriate telemetry days, which showed misuse of telemetry in over 75% of patient days, and could have saved $36,540 for these patients, and over $500,000 of annual savings for the entire hospital population. The strength of this study was the retrospective look at these patients and the telemetry process, allowing the physicians to critique all details of each patient care, which yielded the results they predicted. The weakness of this study was the lack of focus on exactly why there was such a large number of inappropriate telemetry usage.

Chen et al. (2018), conducted a retrospective study that reviewed hospitalist-led teaching team patients who have telemetry monitoring ordered and do not have an initial cardiac diagnosis. While there are currently no cardiac telemetry guidelines for non-cardiac admitted patients, they reviewed the charts of 1,594 medical patients, with 254 having telemetry orders to see if they had any significant cardiac issues during their stay. This could help strengthen the case for the team to show that telemetry monitoring is not always a necessity, especially in non-cardiac-related illnesses. The data showed that a significant number, 24% of the entire patient population being studied, was admitted for sepsis, and none of them exhibited any abnormal cardiac arrhythmias or issues during their hospital stay. It also showed that 10% of patients were ordered telemetry monitoring

solely for the indication of hypoxia because there were no stand-alone oxygen monitoring devices. The strength of this study was that there are a significant number of patients who are utilizing telemetry monitoring who could potentially have no need for it. Its major weakness was that it focuses too narrowly on specific patient populations and needs to report data on all 254 patients that were included.

Fayyaz and Hafiz (2020), completed a study that surveyed resident physicians undergoing internal medicine training at a community hospital to determine their reasoning to support ordering cardiac telemetry on patients who had no indication that it was needed. This article states that most of a physician's professional practices are governed by the habits developed during their residency, which is why this group was surveyed. The population of this study differs from many of the others in the fact that it consists of non-cardiac diagnoses, for which the AHA does not have standard guidelines. The results were critiqued by experienced physicians at that facility who used their expertise and hospital-generated guidelines to determine the inappropriateness of telemetry orders on this population group. Results showed a multitude of reasons as to why telemetry was ordered and/or not discontinued sooner. A major finding showed that 35% of residents stated that they felt more comfortable when a patient is being monitored via telemetry. In addition, 60% of the residents would initiate telemetry orders at the request of the nursing staff. Another 57% of residents stated that they felt compelled to "often" order cardiac monitoring just for its capability to do continuous pulse oximetry. This showed that residents were ordering telemetry monitoring based on no actual medical science and could continue that trend well beyond their residency. Differing from other studies reviewed, the strength in this study was obtaining the physician's

reasoning behind ordering telemetry monitoring so that reeducation can be focused on the areas where there are concerns. The major weakness of this study was that it depends on subjective data, which can easily vary between facilities.

The longest study presented in this literature review, completed by Habibian et al. (2015), consists of a 3-year retrospective analysis on appropriate usage of telemetry monitoring at a 170-bed acute care facility. Using retrospective chart reviews, they analyze 3,694 patients and groups them according to AHA guideline classes of "appropriate," "may be beneficial," and "not indicated." Patients from all inpatient settings except ICU and cardiac units were included in this study. The findings showed that 19.7% of patients had telemetry monitoring ordered when it was not indicated, equaling 54,159 hours of non-indicated telemetry usage. The greatest strength of this study is its length of review, allowing for a large amount of data to be collected. The major weakness in this study is that it only looks at strict data points, which does not allow for data to be collected to answer the "why" behind the issue at hand.

In a survey study, Brug et al. (2019), assessed the decision-making process providers use regarding telemetry monitoring. This would be a survey-based study only and would send be sent to internal medicine residents and faculty at an urban medical center. The survey included 14 patient scenarios that were taken directly from the AHA Practice Standards and utilized the 3-point scale found in these AHA guidelines as answers. The responses on this survey to the 14 scenarios were analyzed to see how often the provider correctly identified the patient scenario. The survey results showed that the scenarios were correctly classified 53% of the time, and the level of training the provider had did not vary the results. The second part of this survey included a 5-point Likert scale

to assess statements by these providers about awareness and use of the AHA Practice Standards. This part of the survey showed that 19.6% of the providers used the AHA Practice Standards when determining the need for telemetry orders. The collective data obtained during this entire survey led the study to discuss potential options for improving awareness and education for providers on the AHA guidelines for telemetry monitoring, which would be included in a subsequent study. The greatest strength of this study was determining how accurately physicians were correctly ordering telemetry monitoring, and how many of them were using the correct guidelines when doing so. One of the weaknesses of this study was that it did not include any actual patient data and was using hypothetical situations to obtain their data. Another weakness was that it used the 2004 AHA Telemetry Practice Standards and not the updated version that came out in 2017.

Physician-Based Implementation Studies

This physician-led study by Ramkumar et al. (2017), was conducted in two phases to use the AHA guidelines to determine appropriate usage of telemetry monitoring of patients. The study was conducted at an acute care facility, and each phase was completed at different times. The first phase collected data on appropriate telemetry use of non-ICU patients during a 6-month time to establish a baseline date. Phase II gathered the same type of data on the same patient population over 6 months, but 4 years later. This was done to ensure results from Phase I could be replicated. The next stage of Phase II was a 4-month interventional study that consisted of implementing the AHA guidelines for physicians to follow when admitting and rounding on patients and ordering or discontinuing telemetry orders based on these guidelines. Next, daily physician rounds on units that were telemetry capable were implemented and reviewed every patient with

telemetry monitoring to determine if they met the AHA guidelines or not. It was determined that 27% of patients reviewed did not meet the standards set in the guidelines and were able to have the cardiac telemetry discontinued. This study's greatest strengths were validating that data from Phase I could be replicated, and that during the intervention stage, telemetry orders were actively changed, based on the results found. The greatest weakness was not allowing the interventional stage to be the same length as Phase I and the first part of Phase II.

This study by Wajeeha et al. (2017), was a retrospective and interventional endeavor at three different regional acute care facilities using the same EMR with a goal to reduce overuse of telemetry monitoring. Pre-implementation data on telemetry usage was collected for 7 months, and then a retrospective analysis was done for the 7 months following the implementation of this "pop-up" alert in this patient population groups' chart. Once criteria for non-telemetry monitoring were met after 48-hours of the patient being on telemetry, a pop-up appeared on the patients' chart to remind the healthcare team to follow up on discontinuing this order. It was determined that telemetry overuse was reduced by 37% after the post-implementation period. The strength of this study was that it relies on objective data to make a proposal to the healthcare team about the discontinuation of telemetry monitoring utilizing indicators on the patients' charts. The major weakness was that there is no mention of putting this into practice after the study, and no follow-up to see if this data continued to trend in a similar direction.

This article by Chahine et al. (2019), details a 12-week quality improvement study that was conducted to attempt to reduce telemetry utilization when a patient is transferred from an intensive care unit (ICU) to a regular nursing floor. The study focused on

resident physicians and nurse practitioners who were transferring septic ICU patients to non-ICU units and preceded in two steps. The first was the pre-intervention stage when all providers involved were given a survey to assess their understanding of the cardiac telemetry guidelines set forth by the AHA and used at that facility. The percentage of patients transferred during this stage was noted, and then education was given to these providers on the proper use and guidelines for telemetry usage. This was done through posters, PowerPoint and video presentations, and chart reviews, which were implemented separately throughout the study. The results show that after each educational implementation, telemetry usage in this population group dropped incrementally. The final data showed that at the end of the study, there had been a total reduction of 23.1% in telemetry usage on these patients. One of the major strengths of this study was that it targeted a specific patient population, allowing for more consistent methods and results. Its major weakness was that it did not do any follow-up or extend the study post-intervention to see if these interventions had lasting success. It is important that any study show viability to be successful outside the constraints of the study itself.

Nurse-Involved Interventions and Studies

This nurse-led intervention was conducted by Zadvinskis et al. (2018), at a large, acute-care Magnet hospital, with the goal of increasing adherence to time-sensitive cardiac telemetry monitoring and discontinuation. By decreasing the number of telemetry monitoring being used, the cost would be reduced as telemetry patients cost the hospital more than those who are non-telemetry. They would implement daily communication with nurses and providers on two cardiac units, which would be called “tele-talks,” and using the AHA guidelines, make suggestions on whether the patient met the criteria to

discontinue TM. Providers and nurses on these units would be educated on the AHA guidelines before the intervention, and preset times to huddle together were established. This was a 30-day implementation study in which 250 of these "tele-talks" occurred and led to the removal of 77 telemetry monitors from patients. The study calculated that these removals saved the hospital $6,347.88 during that time, proving that they were able to significantly reduce hospital costs while utilizing very few resources aside from the staff members and their education. The strengths of this study include having a low-cost versus savings design, and the implementation process was very straightforward. The major weakness of the study was the limited timeframe it was conducted and the small sample size of patients. A longer study incorporating more patients would have given more accurate indications to determine if these results were sustainable. There was also no baseline data presented in the study, which does not allow for any comparisons to be made from pre and post interventions.

A retrospective and interventional study conducted by Alsaad et al. (2017), was aimed to reduce telemetry usage by implementing guidelines based on those published by the AHA. It was completed on a 27-bed Post-Coronary Unit (PCU), at an acute care facility in Florida. The plan consisted of educating nurses and providers specific to that unit on the new guidelines created. They completed a 13-week retrospective analysis of telemetry usage before the implementation to obtain baseline data. Then, the new protocols created were educated to these staff members and implementation of this study lasted for 3 months, while post-intervention data were collected simultaneously. Data collected after the start of intervention protocols showed a reduction in telemetry usage of 22%, which correlated to a 42% cost reduction for the unit during this time. One year

after the end of the study, follow-up data was collected to assess the long-term success and found that telemetry usage was down 10% from preintervention numbers. The major strengths of this study are the longer pre and post-intervention time frames, as well as the follow-up 1 year later to reassess its retention with proper telemetry orders. The biggest weakness in this study would be the lack of education with new staff during the year following the intervention, which could have helped the study to get closer to their initial results.

In this study by Rayo et al. (2016), a new hospital-wide continuous cardiac monitoring policy based on AHA telemetry guidelines was implemented at five tertiary care hospitals within the same hospital system. It affected 37 medical/surgical, cardiac, critical care, and hybrid units which contained a combined 1,000 beds capable of continuous cardiac telemetry. The goal of this study was to decrease inappropriate telemetry usage, and in turn, decrease ED holding/boarding times. They also measured the patient length of stay (LOS) and mortality rates, to identify if this new policy would have any impact on these patient outcomes. A retrospective analysis was completed 12 weeks before and after the intervention to allow comparisons in data to be made. A task force for this study was created and was responsible for the education of all nurses and physicians, with a focus on nursing being the main driving force behind this initiative, with physicians' champions to help them create the change. Once completed, data showed that the average cardiac monitoring rates dropped by 53% and the average ED boarding time decreased by 36.6%. There was no significant change in LOS or mortality rates during this time, which showed that the new policy had no negative patient outcomes in those two areas. The major strength of this study was the in-depth analysis of

cardiac telemetry monitoring and ED boarding times while validating that the intervention would not have negative outcomes in patient LOS and mortality. The greatest weakness was that a longer implementation phase is needed when looking at LOS and mortality to get a more accurate picture of the effects on them, as certain times of the year typically yield higher LOS and mortality rates, based on the acuity of the patient census.

In this study by Whelan and Stanton (2013), a retrospective analysis was initiated to determine the effectiveness and utilization of telemetry monitoring, and then develop an initiative after the study to improve upon any inconsistencies they found. It was conducted at a healthcare system that included six acute care hospitals, with a total of 1,830 beds, of which 500 had telemetry capabilities. A multidisciplinary team was formed, with the main focus being on nurses and physicians, and a 12-month retrospective analysis was conducted using the AHA guidelines to determine if inappropriate usage of telemetry monitoring was occurring, and the reasons behind it. Their findings showed several reasons as to why telemetry was being inappropriately ordered such as ineffective criteria for admission to telemetry, lack of available alternative beds, and the provider's preference. Of these three, ineffective criteria were the most common, but specific data numbers were not given. After this information was collected, the team then visited four similar hospitals outside of their system, to evaluate how they addressed this issue. Using strategies learned there and incorporating guidelines from the AHA into practice, the team would develop plans for a new interventional study at a later date. The greatest strength of this study was assessing the reasons as to why there was inappropriate telemetry usage, so that specific strategies could be created to

improve usage. The most glaring weakness in this study was the lack of any objective data obtained to back up the subjective data that was received.

This interventional study by Duffy et al. (2020), uses nursing-driven protocols to decrease the inappropriate use of telemetry patients and was conducted on all internal medicine, non-ICU units of a 1,154-bed quaternary academic hospital. A protocol was developed using the AHA Standard Practice Telemetry Guidelines to allow nurses to trigger the discontinuation of telemetry monitoring once the guideline criteria was no longer met, which is similar to nurse-driven urine Foley catheter removal protocols that are commonplace in many hospitals throughout the US. The study began with a control period of 8 months to collect data on the average time spent on telemetry, which was 86.29 hours/patient/month. The nurse-driven protocol was then implemented for 8 months, in which data during this time revealed that patients spent on average, 70.86 hours/patient/month on telemetry. This was almost an 18% reduction in telemetry hours monthly for each patient. The greatest strength of this study was the utilization of nursing protocol in enacting desired changes, through the use of minimal resources. The strongest weakness was that data was not obtained on a larger scale to determine a reduction in telemetry totals throughout the entire hospital.

Stoltzfus et al. (2019), devised a quality improvement project with the aim of reducing inappropriate cardiac telemetry monitoring on intermediate care units, which are used for patients too sick for a regular medical unit, but not sick enough for the intensive care unit. It was conducted at an academic medical center and used the 2004 AHA telemetry guidelines as the guide to educate nurses and physicians on the criteria for telemetry monitoring. They found through research into previous studies, that

intermediate care units had higher rates of inappropriate telemetry units than other units in a hospital setting. Education on these guidelines was given to all nurses and providers working on the eight intermediate care units involved, and a plan was created to have the nurses and providers huddle daily to discuss the need for further telemetry monitors for their patients. Data on telemetry usage was collected for 6 months preintervention to obtain baseline information, then there was data collected during the 6 months of the huddle interventions, and 6 more months after the huddles ceased. The data revealed that during the huddle intervention stage, telemetry utilization decrease varied between units, and on units that did see a drop, it correlated to a decrease in 1% up to 19%. In the following 6 months after the huddles were discontinued, telemetry utilization increased to preintervention numbers or higher on five units. The wide-ranging results of this study caused that team to conclude that the inclusion of nurse and provider huddles could not provide the consistent results they were seeking but may be able to have more success with the addition of another intervention, which would be tested separately. The greatest strength of this study was the long length of times that were used pre and post-intervention, allowing for more accurate data to be processed. The biggest weakness of the study was the varying specialties that the units involved had. Even though they were all considered intermediate care, they all specialized in different areas of focus, which could skew results.

In conclusion, this literature review has successfully identified that telemetry monitoring is being inappropriately utilized and many of the reasons why this is happening. Numerous studies indicate varying success with multiple types of interventions, both provider and nurse-led. Using a combination of policy and guideline

implementations, it was shown that telemetry misutilization can be improved upon, and it was also shown in several studies what interventions did not have success and reasonings for this. By using the successful practices reviewed in this study, this project proposal will implement changes in this hospital to facilitate appropriate telemetry monitoring.

CHAPTER III

Needs Assessment

Target Population

The target population for this project was any patient admitted to a non-ICU inpatient unit at this facility. While not all patients will be affected by inappropriate telemetry utilization, everyone in this population will statistically have a chance of being affected. This will include patients on one medical and surgical unit, one PCU/cardiac/medical unit, and one observation unit. The main PCU unit and ICU patients will not be included in this study due to the need for all PCU patients on this unit and ICU level patients requiring telemetry monitoring per hospital guidelines. In total, 106 beds will be observing the protocols set forth during the implementation stage of this project.

Setting

This project will be initiated at a 209-bed acute care facility that serves as a community hospital but is part of a larger regional healthcare system. This facility served as the community/county hospital for many years before expanding to create their healthcare system for several years before joining the much larger, multi-state system. This facility offers a wide range of inpatient and outpatient services, which has made it a cornerstone of healthcare in the surrounding community. Even though it is part of a much larger corporate healthcare system now, the culture at this facility remains and is dedicated to the community members. I believe that the hospital's close ties with the community will allow for this project to have a better chance of success, and any cost reduction could benefit the community directly.

Sponsors and Stakeholders

This project had sponsors at several tiers of administration so that the multi-faceted approach to correcting that stated problem. The Chief Medical Officer (CMO) will be helpful in the navigation of the provider-focused element of this project and promote buy-in with what will be required of them and communication amongst the other disciplines involved. The Assistant Vice President of Patient Care Services (AVP-PCS) will serve as a liaison between the project needs and all of the other stakeholders outside of the providers. For cost-related implications and outcomes, the Vice President of the facility will be included as a sponsor to assist with any cost-related needs or questions during implementation and to view cost-related outcomes that should result at the conclusion of this study. Finally, the Director of Nursing Services (DNS) will work with this project the closest of all the stakeholders, as they are directly over patient flow data collection and new process implementation, which will be heavily impacted during this project, and hopefully improved as a result.

This will be a large-scale project which will span several months, so there is a large pool of stakeholders that will be involved in the implementation and potential success of this study. Inpatient providers with admitting privileges and bedside nurses on the units where the patient population exists will be the largest groups of stakeholders. They will both be responsible for completing education related to the project, and directly affecting the success of this initiative. The education department consisting of registered nurses and nurse managers for the units that will be affected by this implementation will also be stakeholders in this project. The education department will be responsible for ensuring that all providers and nurses (full-time, part-time, and per diem) involved are

properly educated and able to adhere to the new standards that will be set forth during the duration of this study. Nurse managers will ensure, through audits and teammate rounding, that staff is correctly following the guidelines that will be in place during this time. Information technology (IT) will be the final stakeholder in this project, as they will be needed to make changes to the electronic medical record (EMR) system, to accommodate the needs of this study and implement the necessary changes to patient charting. Their assistance will be needed to turn on the function in the patient charting system, Cerner, which will be one of the main initiatives of this project.

Desired Outcomes

The desired outcomes of this project should impact several different areas that are affected by the misuse of telemetry monitoring, all of which are predicted to have a positive impact in their respective area. These outcomes should be seen in the areas of patient flow, length of stay, and cost associated with telemetry monitoring.

The first of these is the improvement of patient flow from the Emergency Department (ED) to these areas, and from higher levels of care to lower levels within the hospital. This will be done through the benefit of "freeing" up telemetry monitors that are being used inappropriately and allowing patients who are waiting for a bed assignment but have been unable to get one due to the lack of available telemetry monitors. By having more available telemetry monitors, patients holding in the ED for an inpatient bed or on inpatients units awaiting a downgrade to another unit will be able to be outfitted with a monitor quicker. This will allow the ED to see more patients due to freeing up bed space and decompressing the number of inpatients holds they have. The measurable

outcome desired is a decrease in average ED hold times of 2 hours. ED holds times will directly affect the length of stay (LOS).

Length of stay in a hospital is affected by numerous factors in an inpatient setting, one of them being telemetry monitoring. The study will hopefully indicate that the proper usage of telemetry monitoring will lead to a decrease in the average length of stay for patients in the targeted population. The desired outcome of this metric will be a decrease in the average LOS of 0.5 days. Decreasing the length of stay will decrease the average daily cost of patients, as they will be hospitalized for a shorter period of time.

The final desired outcome that will be expected is a decrease in the cost of telemetry monitoring, which is associated with an increased length of stay. There is a cost associated with every day a patient is in the hospital, and separately, every day they have an order for telemetry monitoring. Patients at this facility with telemetry orders have an average cost of 6% higher than those with no telemetry monitoring. The outcome desired is a decrease in telemetry usage of 20%, which should correlate to an overall decrease in cost due to the lower number of telemetry patients, which on average, cost more than non-telemetry.

SWOT Analysis

A SWOT analysis was performed identifying strengths, weaknesses, opportunities, and threats. Internal organizational factors affect the strengths and weaknesses, while external factors affect opportunities and threats. These are presented below in a table format. (Figure 2).

Figure 2

SWOT Analysis

Strengths	**Weaknesses**
• Current AHA guidelines for telemetry monitoring in place • Leadership support for change	• Provider comfortability with AHA guidelines • Staffing resources
Opportunities	**Threats**
• More appropriate and cost-effective care for community • No capital cost or expenses	• Sudden increase in high acuity patients • COVID-19

An internal analysis shows very clear strengths and weaknesses by having conversations with nurses and providers on the use of TM and pulling data related to TM usage during times of high census when providers are pushed to reduce their use. Our two major strengths are the existence of the 2017 American Heart Association (AHA) based telemetry guidelines, (Appendix A), and the strong support of leadership to rectify this issue. Our providers and nurses having these guidelines and knowing how to use them correctly will be a crucial step and one of which most of these staff members are at least aware of. Having the support of leadership also emboldens the providers and nurses to adhere to these guidelines, even if there is resistance amongst them. Our weaknesses include the providers being uncomfortable not having most of their patients on a telemetry monitoring and not trusting the nursing staff to provide adequate care without one. The providers must buy-in on this process for it to succeed, so building trust with the

nurses is something that can be done through group education and implementation. Another weakness discovered was the lack of nursing resources. Even before the COVID pandemic but especially now, staffing can be extremely low at times which makes it difficult to prioritize these guidelines and relay this to providers.

When analyzing external factors through opportunities and threats, several conditions were noted. The opportunities found were cost-related and by properly utilizing the telemetry guidelines, the hospital can reduce the cost of a patient stay. This can also decrease the cost for the hospital by prolonging equipment life, decreasing the length of stay and general cost of telemetry usage, and eliminating the need to purchase more monitors, which is often the solution many facilities use as a solution to this problem. The cost reduction to the hospital allows for more important projects to be funded, providing more extensive care for the surrounding community. The threats that exist are those that are out of the control of the hospital and its staff. A sudden increase or surge in patient census and acuity levels can happen at any time, putting a strain on hospital resources. There are times where despite whatever processes are in place, the true need for telemetry monitoring exceeds the number of monitors that are available. Another threat is new disease processes such as COVID-19, in which, a new and relatively unknown virus or disease can create uncertainty and angst among providers and nurses, which tends to have them err on the side of caution when caring for these patients, instead of following guidelines.

Resources

Resources needed for the achievement of desired outcomes need to be identified and then compared with the existing resources. This will help determine the feasibility of

the project. Ensuring that the proper resources are being used, while minimizing unnecessary expenditures, will assist in determining the success of the implementation of the project plans.

This project will require no physical or equipment-related resources, as nothing will be added or new in terms of those types of resources. The only real resource needed to achieve the desired outcome is the time of the project sponsors, stakeholders, and team members. The data collection, education, implementations, and post-data collection will take time from all involved that was previously not needed. Once the initial education has been done, this will diminish the resources needed as well. This resource can be made tangible by calculating the number of hours needed to complete all stages of the project, and what the cost would be moving forward. Compensation and funding in the hospital setting are always looked at very meticulously, so utilizing everyone's time effectively and purposefully will be of the utmost importance in the utilization of this resource.

Team Members

The team members needed to implement this project will come from multiple areas of expertise throughout the hospital and command structure. Providers from varying shifts would be vital in determining the effectiveness of the project implementation amongst their peers and would provide valuable feedback on any positives or negatives that their team of providers encounters. Similarly, a nurse from each unit involved would be recruited as a member of this team for the same reasons as the provider. Providing real-time data and feedback on how this study is being received and initiated by their peers would ensure there are minimal errors in the process or even find areas of improvement for the study. Finally, the last team member needed would be an upper-

level nursing administrator such as a nursing AVP or director who can provide support and direction, as well as being a liaison with the multitude of stakeholders and departments that will be involved.

Cost-Benefit Analysis

With this project, the initial cost of training and educating the staff involved will be compared to the long-term cost savings that could come from the decreased usage of telemetry monitoring and decrease in patient length of stay. The fact that there will be no additional equipment expenditures, and the costs will be up front, the benefits from this project implementation should grow throughout the length of the intervention period, and then sustain if the new processes are successful and continued. The anticipated cost of this project proposal is $11,320 (Table 1). With the potential to decrease the number of telemetry patients, LOS, and ED hold times, the long-term benefits will show cost reductions (Table 2 and Figure 3) far exceeding the cost to initiate this project. Even a reduction in only one of these areas can have a significant impact on the cost-saving opportunities of this proposal.

Table 1

Projected Budget

Summary	Projected Cost
Provider Cost for Education	$6,600.00
Nurse Cost for Education	$2,720.00
General and Administrative Costs	$2,000.00
Total Projected Budget	$11,320.00

Additional Budget Considerations:

- Number of providers to be educated – 20
- Number of Nurses to be Educated – 85
- Median Nurse Salary - $32/hour
- Median Provider Salary - $110/hour
- Number of Total training Hours Per Person – 3 hours
- Provider Cost - $6,600
- Nurse Cost - $2,720
- General and Administrative Cost - $2,000
- Total Projected Cost - $11,320

Table 2

Projected Outcomes

Metrics	Baseline	Projected
Average ED Hold Time (Hours)	6	4
Average Length of Stay (Days)	4.853	4.353
Average Telemetry Monitors Utilized Per Day	90	72
Average ED Hold Cost/Day ($44.50 per hour)	$267.00	$178.00
Average Length of Stay Cost	$5,183.00	$4,649.00
Average Telemetry Cost per Day	$4,590.00	$3,672.00

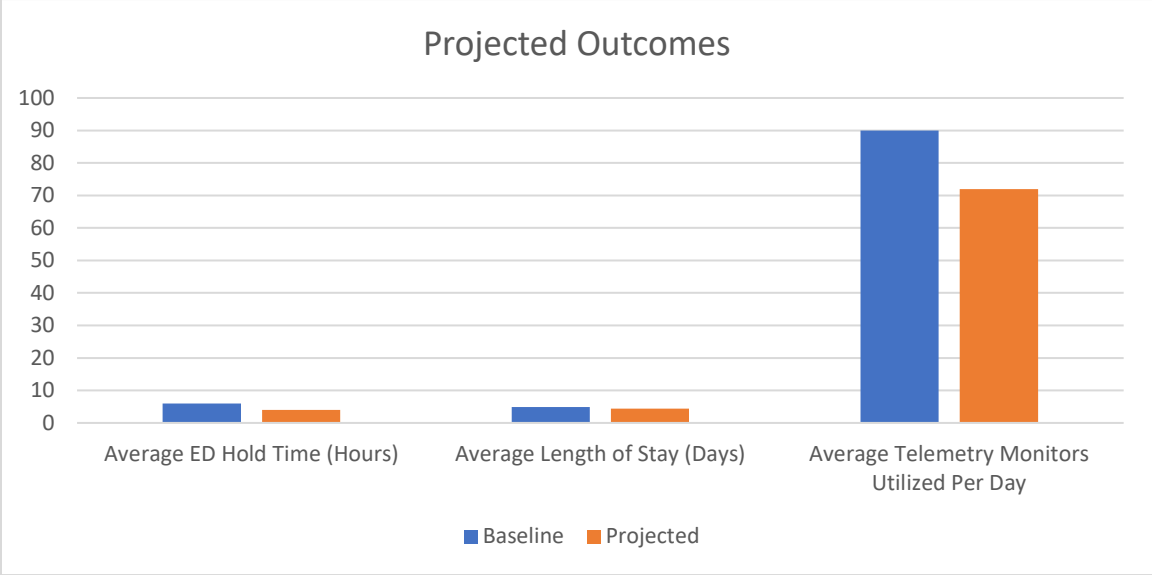
If desired goals are met, the potential savings are as follows:

- Average ED hold time cost reduction per patient - $89
- Average LOS cost reduction - $534

- Average reduction in cost/day Telemetry usage - $918

Figure 3

Projected Outcomes Chart



Conclusion

In conclusion, the needs assessment has shown the importance of creating a diverse range of professionals in the hospital to collaborate in an effort to decrease inappropriate telemetry utilization. The collaboration to implement this project proposal has the potential to create continual cost savings for the facility, while also decreasing the patients' length of stay in the ED when waiting for admission, and their total stay on an inpatient unit. Ensuring that the proper resources, or in this proposal, education of the direct team members involved, will be critical to the success of the proposed initiatives. The SWOT analysis allowed for the identification of weaknesses, which will be targeted directly to give this proposal the greatest chance to reach the desired outcomes. If successful, the hospital and the surrounding community will benefit greatly beyond the timeframe of this project.

CHAPTER IV

Project Design

Goals and Objectives

Cardiac telemetry misutilization, as shown through the literature review, is a well-known issue in the inpatient healthcare setting, one that delays patient care, increases the length of stay, and increases the cost to the patient and hospital. The goal of this project was to implement new strategies utilizing the guidelines set forth by the 2017 American Heart Association (AHA) (Appendix A) to decrease the inappropriate use of telemetry monitoring, which in turn, should decrease patient ED hold times, length of stay (LOS), and telemetry usage cost.

The goals are as follows:

1. Decrease ED hold times/Cost associated
2. Decrease patient LOS/Cost associated
3. Decrease telemetry usage/Cost associated

The objectives of this project are as follows:

1. Gather data on the three points of emphasis prior to implementation of project plan. This will give baseline data to compare post-implementation.
2. Initiate plan, which will be in practice for three months.
3. Gather data after three months and compare with the data that was obtained prior to implementation.
4. Analyze and compare all data to see if the goals established were attained.

The data being collected consisted of three pieces of information: the time it takes for a patient requiring telemetry monitoring to transfer from the ED to an inpatient unit or

transferring from a unit with dedicated telemetry monitors to a unit that has a limited number. The second will be looking at the length of stay for any patient who was ordered telemetry monitoring at the time of their admission. The final data point will be to look at the cost reduction created by the implementation of this plan.

Plan and Material Development

The plan for this project was to use a multi-step approach through physician and nurse education and patient charting upgrades to decrease the usage of inappropriate telemetry utilization. The first step requires educating all hospitalists who admit to and round on the units involved, and the nurses on these units. They will be educated on the 2017 AHA guidelines for cardiac telemetry (Appendix A) for utilization. Even if some team members are familiar with these guidelines, they must all be educated in the same manner so that there is no deviation in how they perceive the expectations of the project. There will also be education informing the team that "pop-up" reminders will show on a patient's chart if they no longer meet telemetry guideline criteria, and a task will be automatically generated that must be addressed. This "pop-up" will be a function that will require Information Technology (IT) to activate in the electronic charting system.

The providers will be asked to not order telemetry upon admission if there is no indication per guidelines unless there were extenuating factors in which they deemed it necessary, and those factors must be properly documented. They must also discontinue telemetry orders on inpatients if the criteria are no longer met and must be evaluated every day upon physician rounds with their patients. The nursing staff will be instructed to evaluate the AHA criteria for telemetry usage for their patients on every shift, and if

there are no longer indications for use, they will contact the provider to get an order to discontinue. They will be asked to document their interaction with the provider.

While pre-initiation data is being collected, the first part of this plan requires collaboration with the education department so that they can begin the new education to teammates that will be required as part of this project. The education will consist of learning the 2017 American Heart Association Standard Practice for Telemetry Monitoring and how to put them into practice. Education will also include information on the new "pop-up" on the patients' electronic medical record (EMR) in Cerner that will notify them that the patient no longer meets telemetry monitoring requirements, and what steps to take once it has alerted them. It will first be distributed through online learning modules, which is done in the Relias system at the project facility. This learning activity will be a review and understanding of the 2017 American Heart Association Telemetry Guidelines/Standards of Practice (Appendix A) and AHA Treatment Effect Guidelines and Quick Reference (Appendix B). Once this is complete, in-person classes for real-time Question & Answer will be held to give all nurses and providers involved a chance to speak up on any concerns they have or parts they do not understand. Attendance rosters will be required to ensure that everyone involved can be accounted for attending, and this class is estimated to take 2 hours. It will utilize documents from Appendix A and Appendix B to detail any issues the teammates involved might have so that they can be focused directly on those documents. The final education piece will be providing the document in Appendix A to all units to keep at a desk and Appendix B will be provided to all nurses and providers involved so that they can have a quick reference sheet if they need it while performing patient rounds.

The plan is as follows:

1. Educating all hospitalist and primary nurses on the inpatient units involved (one Medical, one Surgical, two PCU, and one observation unit) on:
    a. 2017 AHA Guidelines regarding telemetry monitoring parameters (Appendix A and B)
    b. How to use and recognize “pop-up” alerts on electronic charting system indicating that telemetry monitoring does not meet criteria
    c. How to incorporate the guidelines in their patient rounding every shift, and if no criteria is met, then the provider will discontinue the order. If the nurse finds that the criteria is no longer being met, then they will contact the provider to discontinue the order.
2. The project leader will work with IT to upload criteria into the hospitals electronic charting system and ensure that it works correctly for the units who will be using it. Once the criteria for telemetry monitoring is no longer met, a new task will be generated in that patient’s chart, as well as a “pop up” message to inform the provider and nurse that telemetry monitoring is no longer indicated.
3. Once the plan has been initiated, the project team will meet weekly to discuss any issues or limitations that may arise, and to report on the compliance of these initiatives being completed correctly.
4. After 3 months, the team will collect and analyze the new data, then compare it to the data collected before the project began, so conclusions can be made about the efficacy of the project.

Timeline

Pre-plan data collection will begin on week 1 and run for 2 weeks to collect the previous 3 months of data. Working with the education department and education of teammates will be done for 6 weeks from the initial start date. The adding of reminders and tasks to the charting system with IT will last for 2 weeks from week 1. The implementation period will be 3 months long and begin 6 weeks after the initial start date. Once the implementation has been complete, the final analysis and comparison will take approximately 1 month. From beginning to end, this project proposal will last a total of 25 weeks. (Figure 4 and Table 3).

Figure 4

Project Timeline

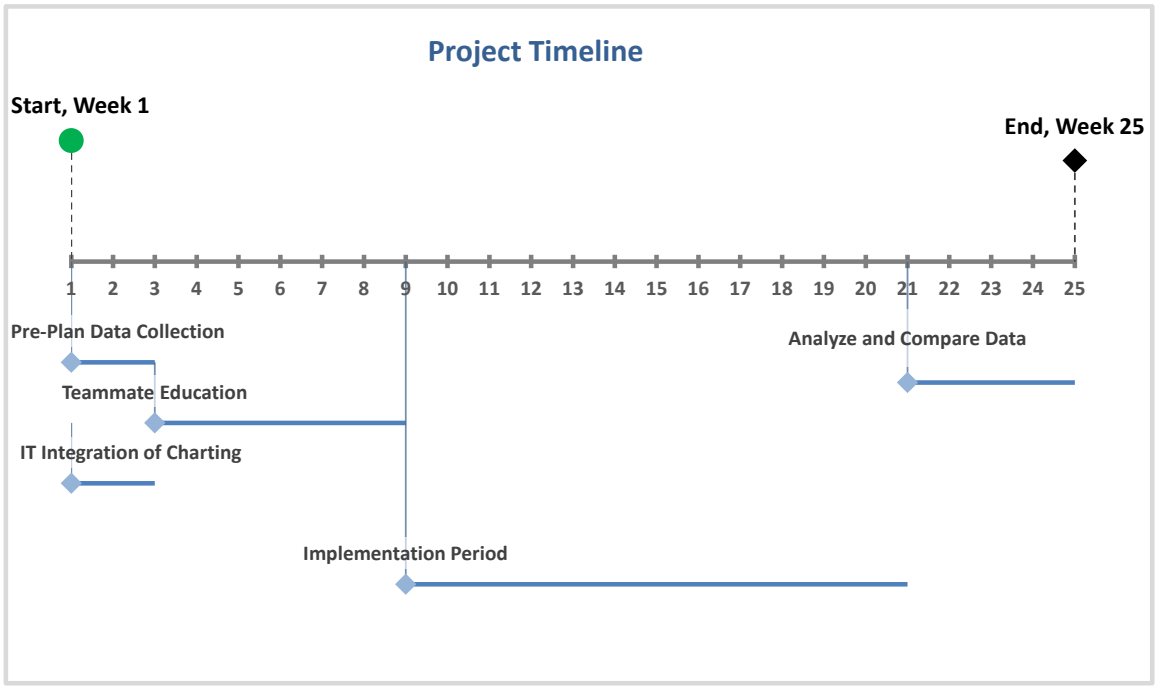


Table 3

Project Tasks and Duration

Tasks			
Start Week Number	End Week Number	Duration	Label
1	2	2	Pre-Plan Data Collection
3	8	6	Teammate Education
1	2	2	IT Integration of Charting
9	20	12	Implementation Period
21	25	4	Analyze and Compare Data

Budget

This project is built around the education of teammates and process changes, so it does not require budgeting needs for new equipment or materials. The plan does, however, require in-depth education of a large number of teammates, mostly physicians, and nurses. There will also be an administrative cost when pulling the team together to work on gathering data and implementing the plan.

Evaluation Plan

This project proposal will evaluate the finding for the actual outcomes of the proposed interventions to determine the success or failure of the desired outcomes. The three data points to analyze pre-and post-intervention will be the average length of ED holds, the average LOS, and the average number of telemetry monitors in use. Once this is complete, each data point will be broken down using specific formulas to determine, if any, the amount of cost savings.

ED Hold Times

ED hold time data is collected using software programing that is integrated into the FirstNet charting system the ED uses. Data will be pulled from the 3 months prior to the project start date, and for 3 months from the start of the intervention to the end. This data will be measured in hours. The formula will be as follows:

- (Average daily ED hold time pre-intervention) – (Average daily ED hold time post-intervention) = (Total decrease in average daily ED hold time)

This result will then be multiplied by the average ED hold time cost reduction per patient hour. The desired outcome of this proposal is a reduction in 2 hours of ED hold time per patient, which would yield a cost reduction of $89/day/patient.

Average LOS

Like ED hold times, the average LOS is calculated by computer software and can be generated at any given time, for any specific number of days. The formula for calculating the cost savings for the desired outcome of decrease in LOS by 0.5 hours is:

- (Average LOS pre-intervention) – (Average length of stay post-intervention) = (Total reduction in average length of stay), then (Total reduction in average length of stay) / (Average LOS pre-intervention) = (Percentage of reduction in average length of stay)

The percentage of reduction in average length of stay will be multiplied by the average LOS cost to give the average LOS cost reduction.

Telemetry Monitor Usage

Daily telemetry monitor usage is also collected through computer software within the telemetry monitoring system. Once the data from pre-and post-intervention is

gathered, the change in usage can be determined by comparing timeframes and generating a percentage in how much it dropped, with the desired number being 20%. The formula for calculating the decrease in cost associated is:

- (% drop in tele usage) X (Average daily # of tele in use) = Average # of tele decreased per day. Then do, (Average # of tele decreased per day) X (extra cost of tele) = (Average cost reduction per day)

Evaluation Summary

The calculations for these cost-saving estimates are based on the desired outcomes of this project proposal. As you can see, if all desired outcomes are met, the cost savings would be tremendous, especially when extrapolated over the 3-month timeframe of this project intervention. These formulas are designed to work with whatever the outcome of the data is for each category. If desired outcomes are below the goals, then the cost savings would decrease accordingly.

Summary

The goals and objectives of this project proposal are to decrease telemetry utilization by eliminating inappropriate usage through a planned intervention, which should lead to a decrease in ED hold times and patient length of stay, with the outcomes of decreasing costs in all three areas. Calculations and goals were created based on the review of literature on telemetry misutilization and using current data from the facility. The implementation of the proposed plan will hopefully yield the anticipated results, but even if the results are not as successful as predicted, there only needs to be a success in one goal to reach cost saving that will make this project financially beneficial.

CHAPTER V

Dissemination

This project proposal was created with the intention of implementing the American Heart Association Guidelines (Appendix A and B) which would create more efficient and appropriate use of cardiac telemetry monitoring. Numerous studies analyzed with a literature review show that inappropriate use and ordering of telemetry monitors for hospitalized patients is a reoccurring issue at facilities across the nation. Various interventions and methods have been used to correct this problem and implementing a combination of several methods should lead to a reduction in the inappropriate use of telemetry monitors at this facility.

Dissemination Activity

The financial implications of inappropriate utilization of telemetry monitoring have been well documented throughout this project proposal. With the potential of reducing cost in several areas, this plan will be presented to the following individuals at this facility: Chief Nursing Executive, Vice President, Assistant Vice President of Patient Care Services (AVP-PCS), and Finance Director. PowerPoint handouts were used during this presentation, in which details can be found in Appendix A & B.

Failure to ensure proper ordering and timely discontinuation of telemetry monitoring can have costly effects on an acute healthcare facility, and potentially increase the patient's length of stay, along with Emergency Department hold times. A thorough examination of literature has shown that the implementation of telemetry guidelines, updates to processes, and the use of electronic charting tools can have a significant positive impact on the costs associated with telemetry monitoring. The

implementation of this plan and data related to potential cost savings is presented through this dissemination activity. These possible cost savings far outweighed the cost to initiate this proposal, and if successful, could yield long-term results.

Proposal planning post successful implementation is to include current teams who work to improve patient flow and determine if this plan could help them find success with their targeted endeavors. This would allow for not only potential cost savings, but it could help these teams reach goals in terms of patient length of stay and Emergency Department hold times which they are held accountable for by corporate administration. This recommendation could lead to a follow-up project proposal and even be incorporated into our teams' processes.

Limitations

One of the greatest anticipated strengths of the project was the incorporation of nurses and providers on multiple units, which should lead to better outcomes and reductions in cost. The limitation to this is the fact that there has been increasing turnover in staffing throughout the last 2 years due mainly to COVID-19 related issues. This turnover leads to the hiring of new staff, and the use of travel nurses, which requires them to be educated on the proposed plan. New staff orientation is already so saturated with information that the potential to not grasp the importance of this education could affect results. On the other side of this, travel nurses are given a very brief orientation, possibly would not have time to be properly educated according to the planned education times. Improvements could be made to the education process to possibly narrow the time needed to educate, thus making new staff and travelers more apt to retain the information.

Implications for Nursing

This project proposal requires nurses to be involved in order for it to have a chance at being successful. Nursing is the biggest advocate for patients, and this plan empowers them to make recommendations to providers on their patients' care. This could create a culture of trust and relationship-building between nurses and providers that would extend far beyond the confines of this proposal. While this is positive implications for nursing, this plan could also add more duties to their daily processes, increasing the risk of it not being implemented properly beyond the length of the project. The degree of success of this project proposal could influence how well nursing adheres to these new protocols, so reaching some or all of the goals set forth could have a significant impact on future practice implications.

Recommendations

While there are three main areas that are focused on during this project proposal, further study of inappropriate telemetry utilization could discover other areas that are positively impacted by the implementation of this plan. By identifying and researching these, new goals and objectives could be developed which would broaden the impact of this project. In doing this, more support could be garnered from hospital administration, creating a higher chance of making these changes part of normal processes once the plan is complete. Having more support and resources would be a huge win and broadening the areas of impact would allow this to happen.

Conclusion

Telemetry monitoring misutilization is a problem seen in most all acute care hospitals and has been the subject of many studies and debates. There is no concise

answer on how to solve this problem, which brings unnecessary costs to facilities and ties up more resources. Research does show; however, that the implementation of certain practices and strategies and reduces inappropriate usage and facilitates cost-savings.

This project proposal uses multiple strategies gather during the literature review to develop an interventional plan, that should improve proper telemetry usage, and decrease the cost of telemetry monitoring, patient length of stay, and emergency department hold times. The plan involves nursing and provider teammates, which creates more interactions with patients regarding new processes and increases the likelihood of success. Involvement of electronic charting systems further strengthens the viability of this project, allowing for it to conform to current practice. The potential cost savings are projected to far exceed the costs of implementing this plan and could sustain these savings far beyond its completion.

Healthcare is an ever-changing and growing field, and the continued exploration for improvement never ends. Finding more efficient and superior practices will affect all aspects of patient care, especially those nursing-related. Through the use of multidisciplinary collaboration and enhanced technology, improvements to telemetry monitoring utilization can be achieved, laying the groundwork for continued change.

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Appendix A

2017 AHA Guidelines Regarding Telemetry Guidelines/Standards of Practice

Patient Population/Indication	Arrhythmia Monitoring Recommendations	Continuous ST-Segment Ischemia Monitoring Recommendations
Early-phase ACS (<24 h) for intermediate- or high-risk NSTE-ACS or STEMI	Should be initiated immediately, continuing uninterrupted ≥24–48 h (or until ruled out; negative biomarkers) (*Class I; Level of Evidence B*)	Is reasonable to initiate immediately, continuing uninterrupted ≥24–48 h (or until MI ruled out; negative biomarkers or successful reperfusion/revascularization) (*Class IIa; Level of Evidence B*)
After MI, with revascularization of all ischemic lesions	Should be initiated immediately, continuing uninterrupted ≥12–24 h after revascularization (duration of monitoring after PCI may be shorter or longer, depending on how quickly patient was revascularized, cardiac biomarker levels, and clinical condition) (*Class I; Level of Evidence B*)	May be considered for immediate initiation, continuing uninterrupted ≥12–24 h after revascularization (duration of monitoring after PCI may be shorter or longer, depending on how quickly patient was revascularized, cardiac biomarker levels, and clinical condition) (*Class IIb; Level of Evidence B*)
After MI, without revascularization or with residual ischemic lesions	Should be initiated immediately, continuing uninterrupted ≥24–48 h until no evidence of ongoing modifiable ischemia or hemodynamic or electric instability (*Class I; Level of Evidence C*)	Is reasonable to initiate immediately, continuing uninterrupted ≥24–48 h until no evidence of ongoing modifiable ischemia or hemodynamic or electric instability (*Class IIa; Level of Evidence C*)
Targeted temperature management	*Class I; Level of Evidence C*	Decision must be based on presumed cause of arrest (*Class IIb; Level of Evidence C*)

Vasospastic angina (ie, Prinzmetal)	Until symptoms resolved (*Class I; Level of Evidence C*)	Can be useful in patients to document transient ST-segment changes until clinical syndrome diagnosed and stabilized (*Class IIa; Level of Evidence C*)
Apical ballooning syndrome (stress cardiomyopathy)	Until symptoms resolved (*Class I; Level of Evidence C*)	May be useful to document until symptoms resolved (*Class IIb; Level of Evidence C*)
Newly diagnosed left main coronary artery lesion	Until revascularized (*Class I; Level of Evidence C*)	Until revascularized (*Class IIa; Level of Evidence C*)
After nonurgent PCI, with complications	For ≥24 h or until complication resolved (*Class IIa; Level of Evidence C*)	For ≥24 h or until complication resolved (*Class IIa; Level of Evidence C*)
After nonurgent PCI, without complications	No further monitoring beyond femoral sheath removal and immediate postprocedure area (*Class III: No Benefit; Level of Evidence C*)	No further monitoring beyond femoral sheath removal and immediate postprocedure area (*Class III: No Benefit; Level of Evidence C*)
After routine diagnostic coronary angiography	No further monitoring beyond immediate postprocedure area (*Class III: No Benefit; Level of Evidence C*)	No further monitoring beyond immediate postprocedure area (*Class III: No Benefit; Level of Evidence C*)
Low-risk and noncardiac chest pain (risk score derived from established scoring tool)	If normal ECG and negative biomarkers (*Class III: No Benefit; Level of Evidence B*)	If normal ECG and negative biomarkers (*Class III: No Benefit; Level of Evidence B*)
Open heart surgery		
Uncomplicated: 48–72 h	*Class I; Level of Evidence B*	Intraoperatively (*Class IIa; Level of Evidence B*) and postoperatively in intubated and sedated patients until able to recognize and report new or ongoing ischemia (*Class IIb; Level of*
High risk for AF: monitor until discharge from acute care unit	*Class I; Level of Evidence B*	

		Evidence B)
Mechanical circulatory support		Only if patient meets respective criteria (ie, signs and symptoms of angina)
Clinically significant cardiovascular or hemodynamic deterioration	*Class I; Level of Evidence C*	
Immediately after implantation	*Class I; Level of Evidence C*	
Admitted with noncardiac problems	*Class IIa; Level of Evidence C*	
Admitted to a rehabilitation facility	*Class III: No Benefit; Level of Evidence C*	

Patient Population/Indication	**Arrhythmia Monitoring Recommendations**	**Continuous ST-Segment Ischemia Monitoring Recommendations**
Transcatheter structural interventions		Not indicated unless ischemic origin is suspected; then follow indications and duration per ischemia criteria
After TAVR, particularly with periprocedural conduction abnormalities	≥3 d after procedure (*Class I; Level of Evidence C*) and after day 3 (*Class IIa; Level of Evidence C*)	
Other transcatheter interventions (eg, VSD, ASD, valvuloplasty)	Duration of monitoring varies with procedure, device, and patient factors (*Class I; Level of Evidence C*)	
VTs; postresuscitation from VT/VF cardiac arrest or hemodynamically unstable VT	Until ICD implanted or underlying problem resolved (*Class I; Level of Evidence C*)	For all arrhythmias, add ST-segment monitoring only if ischemic origin is suspected; then follow indications and duration per ischemia criteria
Nonsustained VT	*Class IIb; Level of Evidence C*	
Atrial tachyarrhythmias		
New or recurrent AF: monitor until treatment strategy determined	*Class I; Level of Evidence C*	

Hemodynamically unstable or symptomatic AF	*Class I; Level of Evidence C*
Ongoing rate control management	*Class I; Level of Evidence C*
Initiation of new antiarrhythmic agent†	See text; QTc monitoring may be indicated for hospitalized patients
Chronic AF	
If admitted for reason other than arrhythmia or rate and patient are hemodynamically stable	*Class III: No Benefit; Level of Evidence C*
If medical condition affects ventricular rate or patient is unstable	*Class IIa; Level of Evidence C*
Sinus bradycardias	
Symptomatic	*Class I; Level of Evidence C*
Asymptomatic, significant bradycardia with negative chronotropic medications initiated	*Class IIa; Level of Evidence C*
Asymptomatic, hemodynamically stable, admitted for other indication	*Class III: No Benefit; Level of Evidence C*
Atrioventricular block	
Symptomatic second- or third-degree atrioventricular block of any anatomic origin	*Class I; Level of Evidence C*
Asymptomatic second- or third-degree block caused by distal conduction system disease	*Class I; Level of Evidence C*
Third-degree atrioventricular block	*Class I; Level of Evidence C*

caused by intranodal disease	
Asymptomatic Wenckebach or transient atrioventricular block of vagal origin	*Class III: No Benefit; Level of Evidence C*
Congenital or genetic arrhythmic syndromes (eg, WPW, Brugada, LQTS)	
Hemodynamically unstable, recurrent syncope, increased arrhythmia susceptibility	Until appropriate therapy is delivered (*Class I; Level of Evidence C*)
WPW with rapid conduction via accessory pathway during atrial arrhythmia	Until therapy such as antiarrhythmic medication or ablation is delivered (*Class I; Level of Evidence C*)
Congenital long QT with unstable ventricular arrhythmias or further QT prolongation induced medically or metabolically	Until stable, exacerbating cause reversed, QTc returned to baseline (*Class I; Level of Evidence C*)

Patient Population/Indication	**Arrhythmia Monitoring Recommendations**	**Continuous ST-Segment Ischemia Monitoring Recommendations**
Meeting admission criteria for syncope, cause of syncope suspected to be cardiac	Monitor ≥24 h; until cause and treatment identified; then follow indications and durations per criteria in these practice standards (*Class I; Level of Evidence B*)	Not indicated unless ischemic cause is suspected; then follow indications and duration per ischemia criteria
Uncomplicated SVT ablation	Can be discontinued after immediate postprocedure area (*Class IIb; Level of Evidence C*)	For signs and symptoms of ischemia, follow indications and duration per ischemia criteria

Complex ablation (pulmonary vein isolation) or serious comorbidities (eg, heart failure)	Monitor for 12–24 h (duration of monitoring varies with procedure, vascular access, and patient factors) (*Class I; Level of Evidence C*)	
Atrioventricular nodal ablation after incessant tachycardia and after chronic AF with concomitant pacemaker implantation	Monitor for 12–24 h (*Class I; Level of Evidence C*)	
Transcutaneous pacing pads	Monitor until pacing is no longer necessary and the device is removed or replaced with a permanent device (*Class I; Level of Evidence C*)	*Class III: Harm; Level of Evidence C*
Standard temporary transvenous pacing wires	Monitor until pacing is no longer necessary and the device is removed or replaced with a permanent device (*Class I; Level of Evidence C*)	
Semipermanent transvenous pacing		
Day 1	*Class IIa; Level of Evidence C*	
After day 1	*Class IIb; Level of Evidence C*	
Permanent pacemaker or ICD		
Pacemaker dependent	For 12–24 h (*Class I; Level of Evidence C*)	
Not pacemaker dependent	For 12–24 h (*Class IIb; Level of Evidence C*)	
Generator change	In immediate postprocedure period (*Class IIb; Level of Evidence C*)	

ICD shocks, requiring hospital admission	For duration of related hospitalization until precipitating event treated (*Class I; Level of Evidence C*)	*Class III: No Benefit; Level of Evidence C*
ICD or pacemaker, admission for unrelated indication	*Class III: No Benefit; Level of Evidence C*	
Stable with wearable defibrillator, admission for unrelated indication	*Class III: No Benefit; Level of Evidence C*	
Acute decompensated heart failure	Until precipitating event (eg, volume overload; ischemia; anemia; progressive ventricular, respiratory, or renal failure; hypertension; exacerbation of comorbidities; new-onset AF; or infection) is successfully treated (*Class I; Level of Evidence B*)	Only if possible ischemic origin and in the setting of evaluable ST segments (*Class IIb; Level of Evidence C*)
Infective endocarditis	Until clinically stable (*Class IIa; Level of Evidence C*)	*Class III: No Benefit; Level of Evidence C*
Postconscious sedation	May be of benefit until patients are breathing per baseline and hemodynamically stable; consider that monitoring other than ECG may be more appropriate (eg, oximetry, end-tidal CO_2) (*Class IIb; Level of Evidence C*)	Decision based on preoperative cardiac risk assessment
Patient Population/Indication	**Arrhythmia Monitoring Recommendations**	**Continuous ST-Segment Ischemia**

		Monitoring Recommendations
Noncardiac surgery	Not indicated among asymptomatic postoperative patients; postoperative patients with angina equivalent symptoms or rhythm changes should be treated according to chest pain/coronary artery disease standards above (*Class III: No Benefit; Level of Evidence C*)	Only if specific practice standard met (*Class III: No Benefit; Level of Evidence C*)
Noncardiac major thoracic surgery	After noncardiac major thoracic surgery such as pulmonary resection to identify AF through postoperative day 2–3 and may be helpful until discharge from acute care (*Class IIa; Level of Evidence B*)	
Stroke	Monitor 24–48 h (*Class I; Level of Evidence B*) Monitor longer if cryptogenic stroke (to assess for intermittent AF and asymptomatic rapid ventricular response) (*Class IIa; Level of Evidence B*)	ST-segment monitoring should be considered only in patients with acute stroke at increased risk for cardiac events with evaluable ST-segments (24–48 h) (*Class IIb; Level of Evidence C*)
Moderate to severe imbalance of potassium or magnesium	Until normalization of electrolytes (*Class I; Level of Evidence B*) In less severe electrolyte abnormalities, if 12- lead ECG at time of abnormal laboratory result demonstrates electric abnormalities, consider continuous	*Class III: No Benefit; Level of Evidence C*

	electrocardiographic monitoring	
Drug overdose	Monitor until free of the influence of the drug(s) and clinically stable (*Class I; Level of Evidence B*) (see specific recommendations for QTc monitoring in Table 6)	*Class III: No Benefit; Level of Evidence C*
Hemodialysis	Efficacy is not well established for most patients receiving chronic hemodialysis unless they have another indication (eg, hyperkalemia, arrhythmia) (*Class IIb; Level of Evidence B*) (see specific recommendations for QTc monitoring in Table 6)	*Class III: No Benefit; Level of Evidence C*
When data gained from monitoring would trigger interventions consistent with patient wishes (eg, rate control if symptomatic)	Follow practice standards for related conditions	Follow practice standards for related conditions
When data will not be acted on and comfort-focused care is the goal	*Class III: Harm; Level of Evidence C*	*Class III: Harm; Level of Evidence C*

- Need for continuous electrocardiographic monitoring should be reevaluated at least every 24 to 48 hours.
- Patients in an intensive care unit and immediate postprocedure area (eg, catheterization laboratory) will have continuous electrocardiographic monitoring.
- Patients with Class I indications for arrhythmia monitoring who need to be transported off the unit should have continuous electrocardiographic monitoring via a portable monitor–defibrillator/pacemaker with a healthcare provider skilled in use of the equipment and in electrocardiographic

interpretation.

- For chest pain/coronary artery disease, complications such as cardiogenic shock or recurrent angina or angina-equivalent syndromes require continued arrhythmia monitoring beyond 24 to 48 hours.
- For chest pain/coronary artery disease, reapplication of ischemia monitoring should be considered in previously stable patients who experience recurrent signs/symptoms of ischemia.
- For continuous ST-segment monitoring, monitor all 12 leads in the setting of a nursing unit with technology, education, and protocols that facilitate reduction of false and nonactionable alarm signals; not appropriate for patients with uninterpretable ECG (ST segments).
- ACS indicates acute coronary syndrome; AF, atrial fibrillation; ASD, atrial septal defect; DNR/DNI, do not resuscitate/do not intubate; ICD, implantable cardioverter-defibrillator; LQTS, long-QT syndrome; MI, myocardial infarction; NSTE-ACS, non–ST-segment–elevation acute coronary syndrome; PCI, percutaneous coronary intervention; STEMI, ST-segment–elevation myocardial infarction; SVT, supraventricular tachycardia; TAVR, transcatheter aortic valve replacement; VF, ventricular fibrillation; VSD, ventricular septal defect; VT, ventricular tachycardia; and WPW, Wolff-Parkinson-White.

*QTc monitoring indicated; see comprehensive QTc monitoring recommendations in Table 6.
†For patients who are hospitalized.

(Sandau, et. al., 2017)

Appendix B

AHA Treatment Effect Guidelines and Quick Reference

ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	SIZE OF TREATMENT EFFECT: CLASS I *Benefit >>> Risk* Procedure/Treatment **SHOULD** be performed/ administered	CLASS IIa *Benefit >> Risk* *Additional studies with focused objectives needed* **IT IS REASONABLE** to perform procedure/administer treatment	CLASS IIb *Benefit ≥ Risk* *Additional studies with broad objectives needed; additional registry data would be helpful* Procedure/Treatment **MAY BE CONSIDERED**	CLASS III *No Benefit* or CLASS III *Harm* Procedure/Test: COR III: No benefit — Not Helpful; COR III: Harm — Excess Cost w/o Benefit or Harmful Treatment: No Proven Benefit; Harmful to Patients
LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	■ Recommendation that procedure or treatment is useful/effective ■ Sufficient evidence from multiple randomized trials or meta-analyses	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from multiple randomized trials or meta-analyses	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Sufficient evidence from multiple randomized trials or meta-analyses
LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is useful/effective ■ Evidence from single randomized trial or nonrandomized studies	■ Recommendation in favor of treatment or procedure being useful/effective ■ Some conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation's usefulness/efficacy less well established ■ Greater conflicting evidence from single randomized trial or nonrandomized studies	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Evidence from single randomized trial or nonrandomized studies
LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	■ Recommendation that procedure or treatment is useful/effective ■ Only expert opinion, case studies, or standard of care	■ Recommendation in favor of treatment or procedure being useful/effective ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation's usefulness/efficacy less well established ■ Only diverging expert opinion, case studies, or standard of care	■ Recommendation that procedure or treatment is not useful/effective and may be harmful ■ Only expert opinion, case studies, or standard of care
Suggested phrases for writing recommendations	should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit: is not recommended; is not indicated; should not be performed/ administered/ other; is not useful/ beneficial/ effective COR III: Harm: potentially harmful; causes harm; associated with excess morbidity/mortality; should not be performed/ administered/ other
Comparative effectiveness phrases†	treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B		

(Sandau et. al., 2017)