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Use of Telemetry in a Non-Critical Care Setting

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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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Walden University
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Executive Summary: Clinical Practice Guideline

Use of Telemetry in a Non-Critical Care Setting

by

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Summary

This clinical practice guideline (CPG) project was developed for best utilization of telemetry. In order to diagnose arrhythmias and ischemic changes in the heart, continuous cardiac monitoring or telemetry is crucial. The practice-focused question was, "Does the evidence support the development and quality scoring of a CPG using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument, that is also approved for use in the practice setting by end users?" The purpose of this doctoral project was to create a CPG to offer the best evidence for practice and optimal approaches to improve the effective utilization of telemetry in the project organization. The Johns Hopkins Evidence-Based Practice model was the analytical strategy for the literature review. A comprehensive search was performed across five databases: PubMed, EBSCOhost, Google Scholar, Cochrane Review, and Epistemonikos. A total of 20 peer-reviewed articles published from 2019-2023 supports the project. A four-member expert panel reviewed the CPG using the AGREE II framework. Domain scores ranged from 97% to 75%, indicating a quality score for this CPG. The global scores reflected overall quality of 85% and 100% approval by end users for use in practice. Recommendations resulting from this project include electronic health record integration, an educational program for staff, and institutional policy changes to support adherence to telemetry monitoring guidelines The potential implications for nursing practice, positive social change, diversity, equity, and inclusion are averting superfluous and expensive diagnostic investigations, mitigate alarm fatigue exhaustion, alleviate the overcrowding in emergency departments, and alleviate the financial strain on healthcare institutions.

Background

This CPG laid the groundwork for improving clinical outcomes by addressing the gap in practice due to the lack of evidence-based (EB) guidelines. Providers at the project facility were not adhering to the 2017 American Heart Association and American College of Cardiology (AHA/ACC) guidelines related to clinically assigning cardiac telemetry monitoring (TM) in the 288-bed acute care facility (see Appendix A). Consequently, patients remained on telemetry longer than required, leading to a scarcity of telemetry monitors, an increase in patient load, a financial burden on the organization, and poor emergency room throughput where the average wait time is approximately 8-10 hours, according to the Informatics Specialist. This backlog presented a challenge and ultimatum to the institution to improve the emergency department throughput and cost savings to the organization. Nevertheless, it quickly became apparent that the belief in improved patient care attributed to TM resulted in its indiscriminate utilization in non-intensive care environments. Cardiovascular disease and management can be costly; in certain cases, resources such as TM are necessary to help sustain life. However, according to Chaudhary et al. (2020), the annualized cost of telemetry owing to improper utilization was determined to be greater than $500,000 per year.

The practice-focused question was, “Does the evidence support the development and quality scoring of this CPG using the AGREE II instrument that is also approved for use in the practice setting by end users?” The purpose of this CPG was to develop a framework for the initiation, continuation, and discontinuation of TM in an acute hospital setting. These recommendations were derived from a comprehensive analysis of available

data and an evaluation of the advantages and disadvantages associated with various treatment options. Created and executed according to international standards, they can decrease unjustified practice discrepancies, facilitate the application of research findings in practical settings, and enhance the quality and safety of healthcare (Panteli et al., 2019). In the evidence supporting the project change or gap in practice, it has been determined that providers were not using best practices and guidelines for assigning TM to patients in the non-critical care setting. According to the findings of Patidar et al. (2022) and Chahine et al. (2019), in many organizations, the adoption of a comprehensive telemetry protocol, which involves including the AHA/ACC practice standards into the electronic order, resulted in a notable reduction in the organization's utilization of telemetry (see Appendix B).

Regarding the evidence that supported the change and the strength of the evidence, there were two Level 1 experimental studies of high quality by Najafi et al. (2019) and Chin et al. (2020). There were two Level II quasi-experimental studies with strong quality by Patidar et al. (2022) and Duffy et al. (2020). Five Level III strong, non-experimental studies, including qualitative studies by Holm et al. (2024), Kim et al. (2021), Espinosa et al. (2021), and Caldwell et al. (2021). One strong Level IV, and finally, 10 strong Level V literature reviews, Quality Improvement, case reports, and expert opinion ranging from 2019-2023, provided scale and scope consistent with previous studies recommending integrating the AHA/ACC telemetry guidelines in the EHR, and provided education to caregivers regarding appropriate use of telemetry (see Appendix C).

Clinical Practice Guideline Development

In order to increase reliability, it is recommended that multiple appraisers complete AGREE II assessments for each guideline. The expert panel that was recruited to review the CPG consisted of four appraisers, including an Advanced Practice Registered Nurse (APRN) in the MICU and an Advanced Practice Registered Nurse on a cardiac step-down unit, both nurses from an external organization. The other two panel members were a Cardiology Fellow and an Internal Medicine Resident from the project organization. The nurses were recruited outside the subject organization as their time was flexible, and they were experts in the field of telemetry. The expert panel was identified based on their perceived ability to provide constructive, unbiased feedback for improvement, clarification, and feasibility of guideline development and recommendations. The panel experts also demonstrated scientific and clinical expertise in the relevant topic. None of the experts had any financial or other potential conflicts of interest to disclose. Similarly, they had no professional or intellectual bias that could diminish the review's credibility.

All AGREE II items and one of the two overall assessment rating items were evaluated on a 7-point scale. For the scoring, a score of 1 (Strongly Disagree) was allocated when there was an absence of relevant information concerning the AGREE II item, when the notion was insufficiently articulated, or when the authors openly indicated that the requirements were unmet. A score of 7 (Strongly Agree) was given if the reporting quality was exceptional, and all criteria and factors specified in the User’s Manual had been fulfilled. When the AGREE II item reporting did not align with the

comprehensive criteria or considerations, a score between 2 and 6 was assigned. A numerical value was allocated based on the extent and caliber of the reporting. Scores increased as additional criteria were satisfied and factors were taken into account. The formula employed to calculate the six domain scores was the obtained score minus minimum possible score divided by maximum possible score minus minimum possible score.

The CPG was presented to members of the expert panel on separate occasions. One presentation was conducted with the two physician members of the panel at the subject organization. The subsequent presentation was conducted with the two APRNs at the external organization. At each meeting, the appraisers were provided with the CPG, the online user's manual, which included information on where to find the item, criteria, considerations for rating each item, additional helpful advice, and the AGREE II score sheet. I explained the impetus for the CPG and the high expectations the guideline would offer patients and the organization. The CPG was presented in person to allow the appraisers to ask questions for clarity. I provided the AGREE II score sheet explaining how to utilize it when scoring the CPG. The appraisers were asked to return the CPG and the score sheet to the author via email for convenience. I utilized the AGREE II instrument's formula to calculate each domain's score. I paired each score sheet with the Overall Guideline Assessment to determine the content expert's assessment of the quality of the guideline and whether it was recommended for use.

Results

The AGREE II has 23 essential questions categorized into six domains and two global rating items for "Overall Assessment." Each domain encapsulates a distinct or unique dimension of guideline quality. Domain 1 encompassed Scope and Purpose and focused on the overarching objective of the guideline, the specific health inquiries, and the intended population (items 1-3). It inquired whether the item was composed effectively, whether the descriptions were explicit and succinct, and whether the content of the item was easily locatable within the guideline.

Domain 2 pertains to Stakeholder Involvement and emphasizes the degree to which the guideline was formulated by relevant stakeholders and reflected the perspectives of its intended users (items 4-6). Domain 3 pertains to the Rigor of Development, which encompasses the processes employed to collect and synthesize evidence, the methodologies for formulating recommendations, and the procedures for their updates (items 7-14). Domain 4 pertains to Clarity of Presentation and encompasses the guideline's language, structure, and format (items 15-17).

Domain 5 is Applicability, which was concerned with the potential obstacles and enablers to implementation, initiatives to enhance adoption, and resource considerations for adopting the guideline (items 18-21). Domain 6 pertains to Editorial Independence and focuses on the development of recommendations free from undue bias due to competing interests (items 22-23) (Brouwers et al., 2010). The entire assessment encompassed evaluating the guideline's quality and its recommendation for practical application (Brouwers et al., 2010). A score of 1 (strongly disagree) was assigned where

there was no pertinent information on the AGREE II item or when the concept was inadequately reported. A score of 7 (Strongly Agree) was assigned when the reporting quality was extraordinary, and all criteria and considerations were fulfilled.

The AGREE II has two global rating items referred to as the Overall Assessment that follows the 23 essential items organized in six domains. The rating of the guideline's overall quality and whether it would be recommended for application in practice are included in the overall assessment. It was also scored on a 7-point scale (1=strongly disagree, 7=strongly agree). The overall assessment required the user to judge the quality of the guideline while considering the criteria used in the assessment process. The user was also asked if he or she would advocate for the use of the CPG.

The CPG achieved a scope and purpose and stakeholder involvement domain score of 96% and 97%, respectively, by the expert panel. The domain of rigor of development scored 77%, clarity of presentation 89%, applicability 78%, and editorial independence 75% (see Figure 1)). The appraisers' score for evaluation of the overall quality of this CPG was 89%. There was also a score of 100% achieved for implementation of the guideline, resulting in end users' acceptance for use in practice.

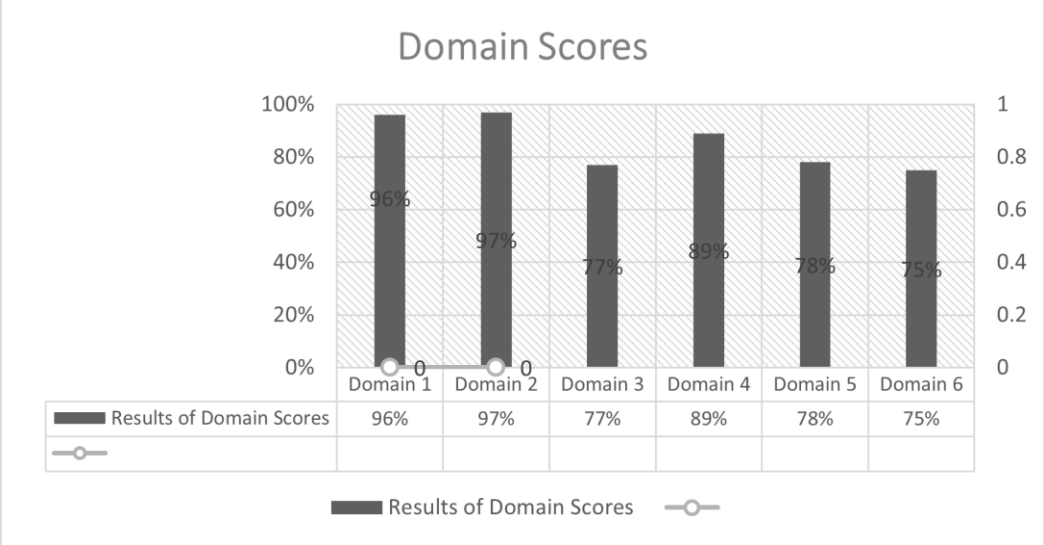
The agreement amongst appraisers was also high. Feedback from physicians included comments noting that this CPG “is an excellent project to undertake,” “I did not even know that guidelines for telemetry exist,” and yet another physician commented that he “puts all of my patients on telemetry just to be safe and my colleagues agree with me.” The impact of adopting this CPG on the organization lies in its capacity to be applied to other settings and units, making it very generalizable. Second, the guideline illustrates a

secure method for reducing superfluous cardiac monitoring through straightforward, targeted EHR interventions without unnecessary non-enduring educational campaigns. Third, the guideline will promote best practices amongst clinicians with initiation, continuation, and discontinuation of telemetry. Fourth, the overuse of telemetry may be mitigated by a nurse-driven initiative to promptly and efficiently remove patients from telemetry when it is no longer required. Finally, there is evidentiary alignment in the literature that employing the AHA/ACC recommendations improves appropriate telemetry utilization in the non-critical care inpatient setting.

The project is important beyond the local site because clinical practice guidelines play a fundamental role in improving healthcare and patients' outcomes generally by helping clinicians make the best evidence-based decisions for their patients in a time-efficient manner. The primary limitation of the project was that only a few physicians could participate in the initial project implementation. This was because the organization utilizes color-coded medical teams, including blue, red, green, and yellow Family Medicine and Cardiology. Although the project is generalizable, only the physicians on those respective teams experienced the initial project presentation, implementation, and conversation. Additionally, some physicians who pledged their support before project implementation did not adhere to the guidelines consistently. Rather, they relied on their outdated practice of prescribing telemetry monitoring out of an abundance of caution. Another limitation was one of the major stakeholders would not allow the guideline to be integrated into the EHR because the hospital is transitioning to a new clinical workflow information system.

Figure 1

Results of Domain Scores



Conclusions

Implementing the AHA/ACC guidelines for TM impacts the organization by improving patient outcomes and potentially assisting the healthcare facility with the best utilization of limited resources. In addition, healthcare providers can reduce alarm fatigue, which leads to better patient outcomes and fewer adverse events. Adhering to the AHA/ACC guidelines can help reduce unnecessary telemetry monitoring and improve monitoring accuracy for patients who need it. Guideline adherence could lead to shorter hospital stays, fewer patient complications, potential savings on equipment costs, and decreased healthcare expenses. Further recommendations that might be considered to improve adherence to clinical guidelines would be through education and a change to the EHR order entry system. The potential implications for nursing practice and the

principles of positive social change, diversity, equity, and inclusion help nurse leaders promote an open, inclusive environment that promotes teamwork, better addresses health inequities, and improves patient-care provider relationships. These principles are independently insufficient but offer safer, compassionate care that results in quality outcomes.

The evaluation method employed to evaluate this project was the AGREE II instrument. I adhered to the comprehensive instructions provided in the AGREE II user handbook. Upon obtaining the AGREE II score sheets from the four appraisers, I methodically reviewed all 23 items across the six domains and the overall assessments from each appraiser. The domain scores were determined by aggregating the scores of individual items within a domain and scaling the total as a percentage of the maximum achievable score for that domain. The scaled domain score was computed by calculating the obtained score minus the minimum possible score divided by the maximum possible score minus the minimum possible score.

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Appendix A: Clinical Practice Guideline Telemetry Use in Non-Critical Care

Problem

It is the responsibility of the emergency room physician to initiate telemetry, and the unit physicians are responsible for evaluating and re-evaluating the need for this healthcare technology. However, due to a gap in knowledge the unit physicians are non-adherent to American Heart Association and American College of Cardiology (AHA/ACC) guidelines related to clinically assigning cardiac telemetry monitoring. Consequently, patients are remaining on telemetry longer than required. As a result of physician non-adherence, there is overutilization of monitored beds on the resource-intensive telemetry units in our 288-bed acute care facility.

The overutilization has resulted in a donut hole leading to huge backlogs in the emergency room where the average wait time is approximately 8-10 hours according to the Informatics Specialist. This backlog presents a challenge and ultimatum to the institution to improve the emergency department throughput as well as cost savings to the organization.

Purpose

The purpose of these clinical practice guidelines is to provide a concise source of evidence and best practices to enhance the efficient application of telemetry in our hospital, and decrease the number of days that patients spend on telemetry by utilizing the American Heart Association's guideline criteria for telemetry.

Audience

The intended users of these clinical practice guidelines are nurses, physicians, pharmacists, patients and the management team.

Introduction

Voters that participate in the electoral process by casting their ballots constantly prioritize health care as one of their primary concerns. Chong-Yik (2018) asserts that around one-third of healthcare expenditure in the United States is categorized as wasteful, with expenses escalating at a rate that is not viable in the long term. The potential to decrease waste lies in the reduction of needless cardiac telemetry, an intervention that is both costly and prone to misuse. Findings from numerous studies in the United States indicate that telemetry is often overused in non-ICU settings (Kutky & Yohanna, 2022) (See Appendix A). The consequences of inappropriate telemetry utilization include decreased patient mobility, unnecessary investigations for patients and nursing fatigue. Interventions to reduce inappropriate telemetry use in the United States have been shown to decrease telemetry use and duration by as much as 70% and 47%, respectively (Kutky & Yohanna, 2022). This reduction in telemetry led to significant cost savings and reduced nursing workload without any increase in adverse events. In Canada, the Choosing Wisely campaign has identified telemetry utilization as a target for reduction and has advocated that non-ICU telemetry should only be used when indicated with systems in place for timely discontinuation (Kutky & Yohanna, 2022).

Alarm fatigue is well recognized as the predominant causative element in sentinel occurrences associated with alarms. A study conducted by researchers has revealed a

prevalence of 35% in the excessive utilization of telemetry, which has been identified as a significant contributing element to the phenomenon known as alarm fatigue (Phillips et al., 2019). The present study aims to assess the practice trends pertaining to the initiation and discontinuation of telemetry on medical-surgical units. The examination of practice patterns will be conducted in order to ascertain their alignment with the evidence-based practice standards for telemetry monitoring established by the American Heart Association (AHA) and the American College of Cardiology (ACC) (See Appendix B). Additionally, the congruence between the order indication and the patient's clinical status will also be assessed.

Background

The advent of telemetry monitoring (TM) has facilitated the ongoing monitoring of a patient's vital signs and cardiac rhythm throughout the past six decades. The American Heart Association (AHA) published practice guidelines in 2004 regarding the monitoring of cardiac patients during their hospital stay. The purpose of these guidelines was to enhance patient outcomes by promptly identifying and addressing any myocardial ischemic alterations, arrhythmias, or hemodynamic instability. The aforementioned guidelines were formulated relying on expert opinions, given the restricted availability of clinical trials pertaining to the subject matter during that period (Fayyaz & Rehman, 2020). A notable increase in the utilization of telemetry was noticed as an increasing number of healthcare facilities implemented advanced equipment for continuous rhythm monitoring. Nevertheless, it quickly became apparent that the belief in improved patient care attributed to TM was resulting in its indiscriminate utilization in non-intensive care

environments. For instance, one research study revealed that nearly 43% of the monitoring requests in non-critical care units lacked justification (Fayyaz & Rehman, 2020). Moreover, the prevailing practice of excessive utilization of TM has been linked to adverse consequences, including alarm fatigue and patient anxiety (Fayyaz & Rehman, 2020). This practice further exacerbates the load on an already burdened healthcare system and results in the inefficient allocation of human resources.

To effectively tackle this matter, the AHA/ACC issued an additional scientific statement in 2017, providing updated guidelines on the utilization of inpatient cardiac monitoring.

Regrettably, this particular procedure proved ineffective in resolving the primary issue because TM is commonly prescribed for non-cardiac conditions such as chronic obstructive pulmonary disease (COPD), pulmonary embolism, and pneumonia, which were not explicitly addressed in the AHA/ACC statement. Although the updated guidelines recommend taking into account the overall cardiovascular risk, they do not provide clear identification of the specific risk factors that can be utilized to stratify non-cardiac patients (Fayyaz & Rehman, 2020).

Guideline Development on Telemetry Initiation and Monitoring

Multiple protocols were implemented to guarantee a meticulous examination of the literature on clinical practice guidelines. Initially, an extensive exploration of scholarly publications was conducted, employing a diverse range of important terms such as telemetry, overutilization of telemetry, cardiac telemetry, alarm fatigue, and guidelines established by the American Heart Association. A comprehensive search was conducted

across five databases, namely PubMed, EBSCOhost, Google Scholar, Epistemonikos, and Cochrane Review. Furthermore, the reference section of each paper was thoroughly examined to locate supplementary articles. Additionally, an independent search was conducted on relevant publications such as the American Heart Association's standards for telemetry. A total of 15 peer-reviewed articles published between 2019 and 2023 were identified during the search procedure. The employed organizational technique involved conducting a thematic assessment of literature that focused on the issue of excessive telemetry usage. Each scholarly publication examined telemetry as a limited resource and/or explored the positive, negative, and unfavorable aspects of cardiac telemetry.

Methods

Utilizing a model is crucial for providing guidance in evidence-based projects. The Johns Hopkins Evidence-Based Practice (JHEBP) problem-solving methodology for clinical decision-making model is a three-phase approach employed for the purpose of this project. The PET method, also known as the practice question, evidence, and translation. The initial stage is the formulation of a practice question by the team, whereby the patient population, interventions, and outcomes (PICO) are identified. During the second phase, a comprehensive review of existing literature is conducted, and the evidence is evaluated for its robustness and excellence. During the third phase, the results are amalgamated in order to formulate practical recommendations (https://www.hopkinsmedicine.org/nursing/center-nursing-inquiry/nursing-inquiry/evidence-based-practice).

The function of guidelines in health policy creation is crucial, and the potential advantages are contingent upon the quality of the recommendations. The successful implementation of the resulting recommendations relies on the use of suitable approaches and rigorous strategies during the guideline creation process (Brouwers et al., 2010). The Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument is a tool that evaluates the methodological rigor and transparency of guidelines development in addition to addressing the issue of variability in guideline quality. The initial AGREE instrument underwent refinement, leading to the development of AGREE II, accompanied by the creation of a User's Manual. AGREE II comprises 23 essential components categorized into 6 domains, which are then followed by 2 global rating items referred to as "Overall Assessment". Every domain encompasses a distinct aspect of guideline quality (Brouwers et al., 2010).

AGREE II Domains

Domain 1. Scope and Purpose (items 1-3).

Domain 2. Stakeholder Involvement (items 4-6).

Domain 3. Rigor of Development (items 7-14).

Domain 4. Clarity of Presentation (items 15-17).

Domain 5. Applicability (items 18-21).

Domain 6. Editorial Independence (items 22-23).

AGREE II Evaluation

Overall assessment includes the rating of the overall quality of the guideline and a

determination of whether the guideline should be deemed suitable for implementation in practice (Brouwers et al., 2010). The primary objective of the AGREE II, as mentioned earlier, is to establish a structure for: evaluating the caliber of guidelines; offering a systematic approach for the creation of guidelines; and specifying the content and manner in which information should be presented in guidelines (Brouwers et al., 2010).

All AGREE II items and the two global rating items are evaluated on a 7-point scale. A score of 1 (Strongly Disagree) is assigned when there is no pertinent information regarding the AGREE II item, when the concept is inadequately reported, or when the authors explicitly state that the criteria were not satisfied. If the reporting quality is extraordinary and all the criteria and considerations outlined in the User's Manual have been met, a score of 7 (Strongly Agree) should be assigned. When the reporting of the AGREE II item fails to match the complete criteria or considerations, a score ranging from 2 to 6 is issued. A numerical value is allocated based on the extent and caliber of the reporting. Scores rise as additional criteria are satisfied and factors are taken into account (Brouwers et al., 2010). A four member expert panel reviewed the CPG using the AGREE II framework. Domain scores ranged from 97%-75%, indicating a quality score for this CPG. Global scores were 89% and 100%, resulting in approval for use in practice by end users.

Scope and Purpose

The goal of this clinical practice guideline is to develop a practice guideline for initiation and discontinuation of cardiac telemetry in an acute hospital setting. Clinical guidelines, often referred to as clinical practice guidelines, are authoritative statements

that provide suggestions aimed at enhancing patient care (Panteli et al., 2019). These recommendations are derived from a comprehensive analysis of available data and an evaluation of the advantages and disadvantages associated with various treatment options. If created and executed according to international standards, they provide the capability to decrease unjustified practice discrepancies, facilitate the application of research findings in practical settings, and enhance the quality and safety of healthcare (Panteli et al., 2019). Health professionals can utilize them to offer optimal practice recommendations for the treatment and care of individuals, establish criteria for evaluating the clinical practice of both individual health professionals and healthcare organizations, facilitate the education and training of health professionals, and empower patients in making well-informed decisions. The successful dissemination and implementation of a valid guideline have the ability to significantly impact care outcomes by informing care processes (Panteli et al., 2019). Clinical practice guidelines are part of the armamentarium of evidence-based medicine, as implied by their name (Panteli et al., 2019).

Evidence for Practice

The examined research aligns with the recognition that telemetry is widely utilized in numerous hospitals, however it continues to be a limited resource. According to the findings of Patidar et al. (2022), the adoption of a comprehensive telemetry protocol, which involved including the American Heart Association practice standards into the electronic order, resulted in a notable reduction in the organization's utilization of telemetry. Chahine et al. (2019) also emphasized the need of adhering to the telemetry

recommendations established by the American Heart Association. The researchers reached the conclusion that employing various educational modalities to enhance awareness regarding the suitable indications for telemetry utilization seems to be efficacious in reducing instances of inappropriate telemetry initiation. Implementing this approach will lead to a decrease in patient distress, alleviation of nurse alarm fatigue, and reduction in hospital expenses (Chahine et al., 2019). In their study, Knees et al. (2022) implemented a quality improvement intervention by employing the telemetry guidelines established by the American Heart Association (AHA) and the American College of Cardiology (ACC). The primary advantage of guidelines is in their ability to enhance the quality of patient care by advocating for evidence-based interventions that have been proven to be beneficial, while opposing the use of ineffective or potentially harmful interventions (Guerra-Farfan et al., 2023). Guidelines have the potential to enhance the uniformity of healthcare delivery, empower patients, shape public policy, facilitate the creation of disease performance metrics and assessments, and inform the strategic implementation of high-value interventions (Guerra-Farfan et al., 2023). Through the implementation of two PDSA cycles, Knees et al., (2022) successfully reduced the prevalence of telemetry misuse within their organization from 37% to 17%. This reduction was found to be statistically and clinically significant.

Recommendations

The overutilization of telemetry in non-cardiac diseases among medical trainees can be attributed to a combination of factors, including a lack of information, a perceived

sense of security, and incorrect trends established by their colleagues. To mitigate these inclinations to overuse telemetry follow these recommended interventions.

1. Furnish instructional or educational materials to the clinical personnel (Fayyaz & Rehman, 2020).
2. Incorporate the American Heart Association/American College of Cardiology 2017 practice guidelines in to practice since the research has shown the standards prevent excessive use of telemetry, alleviate alarm fatigue, and enhance the organization's revenue.
3. Use cardiac telemetry monitoring as a crucial component during acute hospitalizations to aid in the identification and surveillance of arrhythmias and myocardial ischemia.
4. Follow AHA/ACC guidelines published in 2017 for recommendations for the utilization of telemetry in settings beyond the intensive care unit (ICU). According to Kutky & Yohanna, 2022), these categories can be classified as follows:
    a. telemetry is recommended (Class I)
    b. telemetry may offer advantages (Class II)
    c. telemetry is unlikely to be advantageous or may have adverse effects (Class III)

Healthcare providers frequently request telemetry monitoring in order to prioritize patient safety, however, they may lack familiarity with the AHA/ACC standards.

Guidelines Goal

To ensure all nurses comprehend the indications of cardiac telemetry and the recommendations for initiation and discontinuation of the limited resource.

Assuring Accuracy of Telemetry

The accuracy of telemetry is contingent upon several factors:

- appropriate preparation of the skin i.e. if the skin is oily or has been subjected to

  diaphoresis, clean it with an alcohol swab. However, if the skin integrity is damaged, avoid using alcohol. In 2018, The Joint Commission recognized false telemetry alarms as a notable technological threat that endangers patients and puts them at risk of harm. One reason for such issue may arise due to inadequate skin preparation during the application of electrodes and incorrect placement of electrodes (McGuffin & Ortiz, 2019).
- the correct positioning of electrodes and leads
- the regular maintenance of equipment
- diligent patient monitoring
- comprehensive teaching

Reduction of False Readings

The reduction of false readings can be achieved through the implementation of accurate lead placement and effective skin preparation techniques. Optimal electrode adhesion and improved accuracy of telemetry strips can be achieved through the use of clean, dry skin.

- Nurses should conduct a daily assessment of every patient on telemetric monitoring in collaboration with a physician to determine the necessity of continuous cardiac monitoring. This evaluation should be recorded on a daily basis in the clinically oriented software product (Soarian) utilized on your unit. Before initiating telemetry monitoring, it is recommended to obtain a baseline 12 lead electrocardiogram (ECG) in accordance with the guidance provided by the cardiac team. If there are alterations in the ECG readings compared to the patient's initial baseline, it is recommended to conduct further ECG assessments.
- Nurses responsible for the care of patients on telemetry are required to be Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) certified.
- Nurses responsible for the care of patients on telemetry are required to have successfully fulfilled a basic ECG monitoring competency. Primary evaluations should be conducted at the commencement of each shift and subsequently, when deemed necessary based on clinical indications or in the event of any changes in the patient's condition. These assessments should be thoroughly documented in flowsheets or nursing notes.
- Nurses must ensure proper lead placement and will be responsible for observing, assessing, and maintaining the telemetry transmitter.
- Hourly visualization of a patient on telemetry is recommended. It is imperative to visually observe and evaluate the patient in response to each telemetry alarm. The nursing staff bears the task of maintaining constant awareness of their patients' locations, i.e. imaging studies, diagnostic procedures, surgery etc. Toilet doors

should remain unlocked at all times and patients should be within the nurse's eye view at all times.

- Provide patient education regarding telemetry and document it in the clinically oriented software (Soarian).
- Replace leads every 72 hours to maintain an accurate trace.
- Change batteries every 12 hours or more frequently as needed.

Indications for Telemetry

Indication	Monitoring Recommendation
Chest pain/Acute Coronary Artery Disease	Initiate immediately, continuing uninterrupted greater than or equal to 24-48 hours or until ruled out; negative biomarkers
Arrhythmias Ventricular Tachycardia (VT), post resuscitation from ventricular tachycardia or ventricular fibrillation (VF) cardiac arrest or hemo- dynamically unstable VT	Until ICD implanted or underlying problem resolved
Syncope of suspected cardiac origin	Monitor ≥24 h; until cause and treatment identified; then follow indications and durations per criteria in these practice standards
Transcutaneous pacing pads Standard temporary transvenous pacing wires	Monitor until pacing is no longer necessary and the device is removed or replaced with a permanent device
Acute decompensated heart failure	Until precipitating event is successfully treated
Stroke	Monitor 24–48 hours
Moderate to severe imbalance of potassium or magnesium	Until normalization of electrolytes
Hemodialysis	Continuous monitoring

Note. From "Update to practice standards for electrocardiographic monitoring in hospital settings: a scientific statement from the American Heart Association," by K. E. Sandau et al., 2017, Circulation, 2017. p. E273-E344 (https://doi.org/10.xxxxxxxxx).

Practice Standards

- For chest pain/coronary artery disease, complications such as recurrent angina or angina-equivalent syndromes require continued arrhythmia monitoring beyond 24 to 48 hours (Sandau et al., 2017).

- Patients with known permanent atrial fibrillation (AF) do not need ongoing monitoring once rate control is determined to be adequate (Sandau et al., 2017).
- Arrhythmia monitoring is reasonable in patients with chronic AF if a medical condition may affect their ventricular rate or if their heart rate may affect their clinical stability (Sandau et al., 2017).
- Arrhythmia monitoring should be used for patients with symptomatic bradycardia such as syncope (Sandau et al., 2017).
- Arrhythmia monitoring is not recommended for asymptomatic, hemodynamically stable patients with bradycardia (Sandau et al., 2017).
- Nurses must possess knowledge regarding drug classes that are known, have potential, or contingent in their ability to induce life-threatening arrhythmias.
- Nurses must be competent with all cardiac drips administered on the unit.
- Nurses will notify monitor techs when initiating telemetry for new patients and will enter requested patient information on the monitor.
- Nurses will print and interpret six second telemetry strips every four hours and placed in the patient's chart. Nurses will also ensure telemetry strips have been submitted to the medical record electronically.
- Nurses will verify the congruence between physician directives pertaining to telemetry parameters and the parameters displayed on the monitor.

The conditions identified are the disease entities that are commonly observed on our unit, necessitating the use of telemetric monitoring. The student will augment the list as the project progresses.

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Appendix B: Summary of Evidence

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
Edna Howerton	1	Patidar et al., 2022. "Evaluation of a Multifaceted Protocol in Reducing Unnecessary Telemetry Monitoring across a Large Healthcare System"	Retrospective analysis of telemetry utilization using R version 3.6.0 (R-Foundation for Statistical Computing, Vienna, Austria) Quasi experi-mental design	The population was an interdisci-plinary group of stakeholders from medicine, cardiology, nursing and nursing informatics. There were 23,774 total interactions assessed across four hospitals; a large quaternary center, tertiary care center, a large and small community hospital.	The telemetry guidelines from the American Heart Association (AHA) were integrated in the electronic medical record and a nurse-driven protocol was also utilized for discontinuing telemetry.	The results revealed a statistically significant reduction in the total period of telemetry monitoring by approximately 1.75 days.	Data collection through the Cerner Millennium electronic healthcare record (EHR).	The duration of monitoring was determined by analyzing the time stamps associated with the placement and discontinuation of the telemetry order in the EHR. Due to the fact that the two study periods fell within distinct months of the year, seasonal variability could have potentially	II/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
								introduced bias into the findings.		
Edna Howerton	2	Fayyaz & Rehman, 2020. "Utilization of telemetry monitoring for non-cardiac conditions in non-critical patients: what are the trends and perceptions amongst medical residents?"	Observational survey-based study	Patients admitted to general medicine units with a primary non-cardiac admitting diagnosis without any other health conditions and patients considered hemodynamically stable on admission. The study included 37 medical residents at Greater Baltimore Medical Center, 255-bed	Paper survey	Most of the physicians overutilized telemetry because of their lack of knowledge, insecurity, and the practice of their colleagues' incorrect practices.	Paper survey	This was a single medical residency program study Only a small percentage of those surveyed responded making it unlikely to generalize this study. The opinions of the medical residents were the only sources of	V/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
				community hospital.				information used in the survey. No patient data, medical records, or interventions were used to corroborate the results. The final analysis may have a certain level of bias as a result of the residents' year of training.		
Edna	3	Pendharkar et al., 2020.	Retrospective	Hospitalized patients on in-	The telemetry management	Chart review for pre and	Multi-variate linear	Retrospective	IV/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
Howerton		"AHA Telemetry Guidelines Improve Telemetry Utilization in the Inpatient Setting"	study	patient general medical wards 3245 patients involved in two groups. 1340 patients in pre-intervention 1905 patients in post-intervention The Brooklyn Hospital Center, 464-bed urban tertiary care hospital in Brooklyn, N.Y.	approach served as a viable framework for assuring the proper utilization of telemetry in alignment with AHA principles and local requirements.	post-intervention measurement collection PDSA cycles (2) to quickly assess an intervention Implementing changes in the electronic medical record Utilize reminder mechanisms for all professional caregivers	regression Multi-variable adjusted analysis to examine the data	Non-telemetry bed capacity Data was retrieved from EHR which could have overstated the number of patient telemetry days Single center study so this study results may not be generalizable Post-intervention surveys were not utilized to		

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
						Inter-professional care teams yielded adherence to AHA guidelines		confirm long-term understanding of physicians and other professional caregivers		
Edna Howerton	4	Knees et al., 2022. "Decreasing Inappro-priate Telemetry Use via Nursing-Driven Checklist and Electronic Health Record Order Set"	Retrospective Cohort	Patients 18 years and older Sample size was 300 patients at the Rocky Mountain Regional VA Medical center, a level 1A teaching hospital	Three cohorts studied. First cohort was the control cohort – no intervention Second – had an R.N. driven checklist. Reviewed PDSA cycle 1 Third – had R.N. driven checklist and	Nurse-driven checklist and EHR telemetry order set changes decreased inappropriate ordering 54%.	Telemetry records EHR	Telemetry duration is only counted in mid-nights which translates in to possibly losing revenue depending on the time-of-day telemetry was initiated. Small sample size	V/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					EHR order set Reviewed PDSA cycle 2					
Edna Howerton	5	Rubins, 2019. "Effect of default order set settings on telemetry ordering"	Retrospective	Patients admitted to a house staff medicine service 6,131 patients at Brigham and Women's hospital – 793 bed academic medical center and Brigham and Women's Faulkner hospital – 162 bed community teaching hospital	Special request forms Telemetry rounding daily Exclusion of telemetry from order sets Requiring the indication for telemetry when entering the order in EHR	Changing the order set settings can affect ordering practices. There was a significant decrease in ordering telemetry using the Residency Order Set in the postinter-vention period	EHR – EPIC chart reviews	Unable to determine if the change in ordering behavior had significant impact on patient care or patient safety. Could not control for un-measured confounding variables	V/A	
Edna Howerton	6	Caldwell et al., 2021.	Retrospective cohort	275 patients' charts reviewed in total on	A hybrid of educational and order entry	The imple-mentation of education and	Chart review	Small sample.	III/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
		"Telemetry Overuse and the Effect of Educational and Electronic Health Record-Based Interventions on an Academic Internal Medical Ward"		patients with variable diagnoses over three years at Tulane University Medical Center, a 218 bed teaching hospital	interventions improved compliance to telemetry guidelines	order entry changes resulted in a significant decrease in patients whose diagnosis was not AHA guideline directed. Findings signaled an increase in the adherence to AHA guidelines and cosigned previous evidence of hardwiring those guidelines into the order entry system.		The work in this study relied on data collection by telemetry operators and physicians in the past. Therefore, if the data were not accurately and appropriately recorded, there would be a risk of missed events and changes in management. The 2017 AHA guidelines were released after this study so the order entry		

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
								change was based on 2004 guidelines.		
Edna Howerton	7	Liu & Khawaja, 2023. "Telemetry Practices Among Physicians and Nurses at an Academic Tertiary Medical Center"	Quality Improvement Project	Total of 73 physicians and 64 nurses on general medical surgical units at Rhode Island Hospital in Providence, RI which is an academic tertiary medical center	Surveys sent to physicians and nurses that queried their level of comfort in discontinuing telemetry, opinions regarding overuse of telemetry and how often telemetry orders were reviewed	Knowledge gaps existed amongst the doctors and nurses about the AHA telemetry guidelines 81% of physicians agreed that telemetry was overused An educational program is needed to detail AHA telemetry guidelines and	Survey among physicians and nurses	Small sample size	VI/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
						their application clinically.				
Edna Howerton	8	Najafi et al., 2019. Assessment of a Targeted Electronic Health Record Intervention to Reduce Telemetry Duration"	Cluster Randomized Clinical Trial	Clinical trial of 1066 hospitalizations teams on general medicine service (total of 1021 patients) of the Division of Hospital Medicine at the University of California, San Francisco Medical Center which included doctors of 12 inpatient medical teams (6 intervention, 6 control)	An EHR alert was randomized to 50% of the teams on general medicine service during daytime hours on patients in the non-intensive care unit	499 hospitalization in the intervention arm, 567 in the control arm (1021 patients) 200 clinical decision support alerts sent in the intervention arm Mean telemetry hours per hospitalization was 50 and 41.3 intervention	Time-stamped orders data from the EHR database	This was a single-center study at a large academic medical center so findings may not be generalizable Recommen-dations for specific indications for telemetry duration were partially informed by local expert opinion and was mor permissive than the national	I/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
						group resulting in 17% reduction Cumulative reduction for intervention relative to control approximately 4341 hours or 181 days. A targeted alert to physicians to discontinue telemetry resulted in significant decrease in hours of monitoring		guidelines. The preintervention mean telemetry hours at the medical center was already lower than the baseline in prior studies which may have limited the effect size of the intervention.		

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
Edna Howerton	9	Espinosa et al., 2021. Appropriate Use and Outcomes of In-hospital Telemetry: Implications Regarding the Contem-porary Code Blue"	Retrospective Cohort analysis	177 patients who underwent code blue resuscitation during a three year period (2013-2016) at Scripps Mercy Hospital, a 300 bed tertiary care, teaching community hospital.	The data collected from all instances of code blues in the inpatient ward were examined, and the initial rhythm was classified as either shockable or non-shockable. The study recorded the duration and existence of telemetry before the code, the initial suitability of telemetry	91% of the 177 code blues were on telemetry and 94% were guideline appropriate.	Fisher's exact test for categorical variables Two-sided Student t-test for continuous variables Clinical variables investi-gated via multi-variable logistic regression analysis	Sample size small. Patients on telemetry were older which may have accounted for physician referral bias and a decreased response to resuscitative efforts. Despite the AHA guidelines, implementing telemetry might differ among various institutions based on local practice	III/C	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					according to the practice requirements of the American Heart Association, and the presence of a causal arrhythmia.			differences.		
Edna Howerton	10	Chahine et al., 2019. "Inter-ventions to Decrease Overuse of Cardiac Monitoring (Telemetry) When Tran-sitioning	Quality Improvement Study	246 study subjects during the preinter-vention and 94 study subjects in the intervention period at the Cleveland Clinic Fairview Hospital admitted to ICU for sepsis, stabilized and	Subjects were chosen and included in both the pre-intervention period (six weeks) and the intervention period (six weeks). Resident physicians and	Providing caregivers with information about when to use telemetry resulted in a reduction in excessive use of telemetry when patients were transferred	Electronic survey	Small sample size. Limitations of the study included its narrow focus on participants with sepsis and its short duration, which	VI/C	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
		from the Intensive Care Unit to the Regular Nursing Floor"		then transferred to non-ICU setting.	nurse practitioners were educated using various methods: didactic lectures in the first week, poster demonstrations in the third week, and video presentations in the fifth week. The integration of the AHA guidelines into the electronic medical record ordering system and the elimination of	from the ICU to the general nursing floor. Repetitive and multi-modality teaching interventions proved to be effective tools and were linked to a higher level of adherence to established criteria for the use of telemetry. Telemetry usage decreased by 23.1% by the conclusion of		restricted the ability to accurately predict the outcome. This study is limited to a single center and has a small sample size. The authors were unable to evaluate potential confounding factors.		

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					the unneeded telemetry order from order sets resulted in a reduction in overutilization	the intervention period.				
Edna Howerton	11	Chong-Yik et al., 2018. "Cost-Saving Oppor-tunities with Appropriate Utilization of Cardiac Telemetry"	Retrospective Chart Review	250 inpatients on telemetry at a 432-bed tertiary care hospital, Ochsner Clinic	A time-driven activity-based costing model/ analysis which is a method that allocates cost rates to different resources.	Telemetric monitoring is often over-utilized in patients who are hospitalized to noncardiac, noncritical care services. Reducing the number of unnecessary days of telemetry monitoring, in	Chart review	As this study involved reviewing past medical records, the accuracy and reliability of the data collected by the investigators depended on the quality of documentation maintained by the healthcare provider teams.	III/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
						line with the practice standards set by the American Heart Association (AHA), would lead to substantial cost savings without compromising the detection of medically important events.		Because of the significant differences in the pay of trainees, medical staff, and mid-level providers, the cost associated with their work time was not included in the investigators' time-driven activity-based costing model. As a result, the model underestimated the overall cost.		
Edna Howerton	12	Duffy et al., 2021. "Empow-ering Nurses	Quasi-experimental	9,881 patient encounters on telemetry.	The study encompassed two interventions.	The implement-tation of nurse-led discontinu-	The average total time spent on telemetry	The implementation of the physician-	II/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
		and Residents to Improve Telemetry Stewardship in the Academic Care Setting"		The study was done at a quaternary hospital in the eastern United States, which has a capacity of 1,154 beds. This hospital receives approximately 65,000 visits to the emergency department and admits around 16,000 patients annually.	The initial intervention was implementing the nurse-discontinu-ation procedure. The second intervention involved the implement-ation of a physician-led discontinu-ation strategy.	ation of telemetry resulted in a substantial decrease in the average number of telemetry hours per patient. Introducing a best practice advisory to inform residents about the appropriate duration of telemetry for each patient did not decrease the amount of time patients spent on telemetry, but it did result in a notable	each month was analyzed using a t-test. In cases where the data did not follow a normal distribu-tion a Wilcoxon Rank-Sum Test was used to corroborate the results. The statistical compu-tations were executed using SAS v9.4 software.	discontinuation strategy coincided with the introduction of Epic Systems as the (EMR) at the research institution. The transition between systems may have affected the utilization of telemetry. Given the period of the investigation, the study adhered to the AHA practice criteria established in 2004 rather		

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
						decrease in the overall number of telemetry orders.		than those of 2017.		
Edna Howerton	13	Kim et al., 2021. "Inappro-priate Telemetry Use Is Increased during the COVID-19 ERA"	Observa-tional study	6168 telemetry orders during the pre-COVID-19 period, 5559 telemetry orders during the peri-COVID-19 period at the Queen's Medical Center, a major academic medical center in Honolulu, HI	Retrospective chart review Investigators analyze the occurrence rate of improper telemetry ordering in the time before the COVID-19 pandemic and during the COVID-19 pandemic.	The study demonstrated a higher occurrence of improper utilization of telemetry during the COVID-19 period in comparison to the pre-COVID-19 period.	Chi-square test	The research period encompasses the initial stage of the COVID-19 pandemic. The study was conducted at a single institution, and the proportion of incorrect telemetry orders in this hospital was roughly 10%. This percentage is significantly	III/B	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
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								lower compared to other studies, which may impact the generalizability of the study findings.		
Edna Howerton	14	Vargas et al., 2022. "Improving Appropriate Utilization of Telemetry"	Quality Improvement Project	Total 180 encounters analyzed retro-spectively. Sample included patients admitted to telemetry unit at Corpus Christi Medical Center Heart Hospital	The intervention period involved instructing the internal medicine residents on incorporating a concise PowerPoint presentation that provides a summary of guidelines, based on the	The study illustrated that via adequate teaching, hospitals can diminish excessive utilization of continuous cardiac monitoring and result in shorter durations of hospitalization.	Mann-Whitney U-test	Small sample size	V/B	

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					AHA 2017 update. Additionally, they were given a pocket reference card and reminded to review the indications for ongoing telemetry use.					
Edna Howerton	15	Flanders & Hudson, 2020. "Appro-priate use of telemetry in the acute care setting: Nursing Management"	Quality Improvement Project	30 telemetry patient records at Massachusetts General Hospital	Retrospective chart review Synchronize the procedure of placing orders for telemetry with the American College of Cardiology guidelines for	Telemetry utilization was decreased by more than 70%	Retro-spective chart review	Small sample size.	V/C	

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Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					the correct utilization of telemetry.					
Edna Howerton	16	Narayanan et al., 2021. "Harnessing the Electronic Health Record to Actively Support Providers with Guideline-Directed Telemetry Use"	Quality Improvement Project	Two academic medical centers: Harborview Medical Center, a 413-bed academic referral center and safety net hospital University of Washington Medical Center, a 570-bed academic referral center	Three modifications were made to the electronic health record (EHR) system in order to facilitate guideline-directed telemetry ordering without the need for provider training or staff coaching.	EHR-based intervention decreased telemetry usage and had more impact on resident services	Data extraction from EHR for all hospital stays in which patients had telemetry monitoring on admissions	Due to our inclusion of only initial telemetry orders, our data is skewed toward occasions where telemetry was restarted. Investigators did not capture any negative effects resulting from the previous discontinuation of telemetry	V/C	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
								monitoring. Investigators did not gather data on the readmission rates of medicine patients whose telemetry orders were considered in this analysis.		
Edna Howerton	17	Falun et al., 2019. "Cardio-vascular nurses' adherence to practice standards in	Comparative study	Nurse delegates at the Annual National Congress on Cardiovascular Nursing in Norway completed surveys from 44	Investigators developed a self-report questionnaire conducted to evaluate the practical nursing qualifications	Investing in educational programs for cardiac telemetry monitoring is necessary to help ensure patient safety	Survey methodology IBM SPSS Statistics for Windows, version 24.0 used for	The number of specialized registered nurses is substantial, nevertheless, it is possible that the sample may not accurately	V/B	

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Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
		in-hospital telemetry monitoring"		hospitals in 2011 (185 delegates) and 38 hospitals in 2017 (178 delegates).	recommended in the 2004 AHA practice standards.	and improve care outcomes. The introduction of AHA practice standards for electrocardio-graphic monitoring in hospital settings enhances the practice of in-hospital telemetry monitoring.	statistical analysis	reflect the educational level of all nurses. Six years elapsed between the two surveys. It's possible that some delegates answered the survey more than once, which would have skewed the findings. The two surveys offer a limited perspective on the use of		

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Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
								telemetry in Norway and may not be applicable to other countries with different practices.		
Edna Howerton	18	Stoltzfus et al., 2019. "Appro-priate utilization of cardiac telemetry monitoring: a quality improvement project"	Quality Improvement Project	Conducted in a single academic medical center in Kansas City, Kansas on patients in eight intermediate care unitse	Two Plan, Do, Study, Act (PDSA) cycles utilized. PDSA cycle 1: Huddle intervention PDSA cycle 2: Admission telemetry monitoring	The average utilization of telemetry in all hospital units experienced a slight decrease following the implement-ation of the hospital-wide huddle intervention. The admission order	Data collection and PDSA modelrs	The first PDSA cycle involved an educational intervention and mild encouragement, but it was not maintained. During the first PDSA cycle, the investigators lacked the staff capability to	V/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					order Pre and post data collected for telemetry use with each cycle to decrease inappropriate telemetry monitoring on intermediate care units.	intervention resulted in significant decreases in average telemetry utilization across all hospital units, reducing it from a baseline of 62.4% to 51.3%.		consistently inquire about the use of telemetry during every huddle. During the second PDSA cycle, the intervention was specifically aimed at decreasing the incorrect ordering of telemetry when a patient is admitted. However, it did not address the issue of initiating telemetry after a patient had		

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Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
								already been hospitalized.		
Edna Howerton	19	Chin et al., 2020. "E-HeaRT BPA: electronic health record telemetry BPA"	Randomized Control Design	275 patients randomized to the intervention group 283 patients randomized to control group at a 600-bed academic, tertiary hospital All non-critical care patients with at least one telemetry order	Utilized EHR based BPAs for provider awareness about telemetry discontinu-ation. Patients hospitalized to non-ICU services with an active telemetry order, excluding Cardiology and cardiac surgery, were randomly	Intervention group had fewer telemetry days 3.8 vs 5.0 Stopped telemetry 31.7% Control group stopped telemetry 23.3% Best practice alerts (BPA) drastically cut down on telemetry without having a detrimental	Descriptive statistics were employed to compare the control and intervention groups in relation to their demo-graphics, primary outcomes, and secondary outcomes. Two statistical tests, specifically x2 tests and two-sample	This study was conducted at a single academic institution over a short timeframe, limiting generalizability A more comprehensive assessment of the stress and weariness experienced by healthcare providers would provide valuable insights. This could include	I/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
					allocated to either the control or intervention group using random number generation.	impact on patient outcomes.	t-tests, were conducted to determine the signifi-cance of binary and continuous outcomes, respectively. The Bonferroni correction was used to account for multiple compari-sons during the analysis of outcomes.	quantifying the amount of time providers spend engaging with the BPA system and their view of its impact on their daily practice.		
Edna Howerton	20	Holm et al., 2024. “The patient experience of in-hospital	Qualitative study	Twenty patients consented. The research was carried out at two university	The patients were intentionally selected based on their sex,	Patients expressed overall satisfaction with their	Audio-recorded interviews that lasted 13-18	Small sample size. Smaller	III/A	

EBP Question: In the adult population in non-intensive care settings (Patient population), how does physician non-adherence to American Heart Association/American College of Cardiology (AHA/ACC) guidelines (Intervention or Issue of interest) compared to overutilization of telemetry (Comparison intervention or issue of interest) impact cost and patient safety (Outcomes of interest) over one month (Time it takes for the intervention to achieve the outcomes)?										
Reviewer name(s)	Article number	Author, date, and title	Type of evidence	Population, size, and setting	Intervention	Findings that help answer the EBP question	Measures used	Limitations	Evidence level and quality	Notes to team
		telemetry monitoring: a qualitative analysis"		hospitals in Norway. Both sites included a total of 36 telemetry units that were specifically designated for adult patients in the medical and surgical wards and were monitored from a central monitoring station in the Medical Intensive Care Unit (MICU).	age, diagnosis, and arrhythmia occurrences in order to achieve a wide range of clinical and sociodemo-graphic features. The telemetry reports were examined and deliberated upon with the personnel at the central monitoring station. The nurses in the hospital wards were	telemetry monitoring experience, highlighting the perceived advantages of enhanced safety and a sense of reassurance due to continuous monitoring and documentation of their arrhythmia. The AHA practice standards for in-hospital telemetry monitoring highlight that the existing setup of	minutes Phillips MX40 telemetry system and Philips IntelliVue PiiC	hospitals may not always employ a specialized monitor technician to operate the central monitoring station around the clock. This can result in increased latency in responding to warnings.		

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					consulted to confirm that patients were capable of participating in an interview.	numerous telemetry devices, along with the high frequency of false alarms, may lead to alarm fatigue.				

Appendix C: Synthesis and Recommendations

Edna Howerton NURS 8703

EBP Question:			
Strength		Number of Sources (Quantity)	Synthesized Findings With Article Number(s) (This is not a simple restating of information from each individual evidence summary—see directions)
Level	Overall Quality Rating (Strong, good, or low)		
Level I ▪ Experimental studies	Good	2	➢ In their study, Najafi et al., (2019) aimed to ascertain whether a specific electronic health record (EHR) alert, directed to the appropriate clinician at the appropriate moment, might effectively decrease the need for inpatient cardiac monitoring without compromising patient safety. The literature consistently supports the fact that physicians use telemetry beyond the recommended duration set by AHA practice standards, which leads to alarm fatigue and exorbitant costs. Najafi et al., (2019) found that when physicians were presented with these specific alerts, the majority of them responded by behaving in a manner consistent with the established practice standards without the need for educational campaigns. ➢ Similarly, Chin et al., (2020) developed an electronic best practice alert (BPA) and evaluated its effectiveness using a randomized controlled trial. The daily BPA displayed guideline supported indications for telemetry and inquired whether the provided intended to discontinue its use. If providers expressed their refusal to do so, they were asked to offer a justification and there was also an option to postpone the BPA.
Level II ▪ Quasi-experimental studies	Strong	2	➢ Patidar et al., (2022) implemented a comprehensive electronic telemetry protocol by integrating American Heart Association (AHA) recommendations and utilizing a nurse-driven protocol to discontinue telemetry in order to enhance the appropriate utilization of telemetry in hospital settings. Telemetry monitoring decreased by 1.75 days. ➢ Studies examining the role of nurses in appropriate telemetry use are insufficient, as stated by Duffy et al. (2020). Nevertheless, they detailed two strategies, one of which was a nurse-termination strategy that empowered nurses to initiate the discontinuation of telemetry once the prescribed length had elapsed in accordance with practice guidelines. The second intervention implemented a physician-discontinuation approach, similar to the one used by Chin et al. (2020), which involved the implementation of a Best Practice Alert (BPA).

Level III ▪ Nonexperimental, including qualitative studies	Strong	5	➢ Holm et al. (2024) conducted a qualitative study to investigate the experiences of patients who underwent in-hospital telemetry monitoring. This study is reported as the first to investigate the experiences of patients who undergo in-hospital telemetry monitoring. ➢ Kim et al. (2021) conducted a retrospective analysis of the (EHR) to examine the rate of incorrect telemetry ordering before and during the COVID-19 pandemic. The efficacy of telemetry monitoring in the management of COVID-19 patients was uncertain. ➢ The findings of Chong-Yik et al. (2018) suggest that adhering to the AHA practice standards and reducing the number of inappropriate telemetry days could lead to substantial cost savings. ➢ Espinosa et al. (2021) did a retrospective analysis which showed that a significant proportion of inpatient code blue events were adequately monitored using telemetry. ➢ Caldwell et al. (2021) conducted a retrospective cohort study and found that modifying a telemetry order input system, in addition to an educational intervention, is more effective in reducing the use of telemetry in internal medicine resident practice compared to an educational intervention alone.
Level IV ▪ Clinical practice guidelines or consensus panels	Strong	1	➢ Pendharkar et al., (2020) study aligns with Patidar et al., (2022); Caldwell et al., (2021); Chong-Yik et al., (2018) and Vargas et al., (2022) wherein the AHA guidelines, care provider education on the guidelines and modification to telemetry order sets were implemented to decrease telemetry use. Since the AHA guidelines were last published in 2017, several independent studies indicate the recommendations improved appropriate telemetry use. However, despite telemetry guidelines, overutilization still remains a problem.
Level V ▪ Literature reviews, QI, case reports, expert opinion	Good	10	➢ Rubins, (2019) modified the telemetry order set settings as well as Knees et al., (2022) and Pendharkar et al., (2020) to decrease inappropriate telemetry use. ➢ Fayyaz & Rehman, (2020), however, pointed out that the recent AHA guidelines did not clearly address utilization of telemetry in non-cardiac conditions. They believed clinicians used telemetry based on personal preferences. ➢ Liu & Khawaja (2023) conducted a study to assess the comfort levels of nurses, residents, and attendings in stopping telemetry. The investigators observed a significant disparity in the knowledge and attitudes regarding the use and indications of cardiac telemetry among nurses, residents, and attendings. They determined that there is a need for an instructional

			program that provides detailed information on the AHA cardiac telemetry standards and how they are applied in clinical settings. These findings are consistent with other studies in the literature. ➢ Chahine et al. (2019) found in their quality improvement project that providing education to caregivers regarding the appropriate use of telemetry resulted in a reduction in the excessive use of telemetry when patients were transferred from the intensive care unit (ICU) to the usual floor. Repetitive and multi-modality instructional interventions proved to be successful methods and were linked to higher compliance with established guidelines for the use of telemetry. ➢ Vargas et al. (2022) showed that by adequate teaching, hospitals may not only effectively decrease the excessive use of continuous cardiac monitoring but also achieve shorter hospital stays. This is one study that mentioned decreased length of stay. ➢ Flanders & Hudson (2020) utilized a quality improvement project to specifically examine the alignment of the telemetry ordering process with the recommendations for acceptable telemetry use set by the American College of Cardiology (ACC). The physicians got the guidelines from the American College of Cardiology (ACC) regarding the use of telemetry. They carefully examined the patient's medical records and recorded on a spreadsheet which specific ACC advice was followed. This review corroborated the hypothesis of misalignment with evidence-based standards for the utilization of telemetry. ➢ Narayanan et al. (2021) and Stoltzfus et al., (2019) both used quality improvement projects to conduct a comprehensive EHR intervention that involved multiple strategies. This included the implementation of an order set that required clinicians to select an indication for telemetry, along with a recommended duration based on AHA standards. Additionally, an EHR-generated reminder page was used. Stoltzfus et al., used PDSA cycles. ➢ Falun et al. (2019) conducted a study to assess the level of knowledge and adherence of cardiovascular nurses to practice standards for cardiac surveillance. The study also aimed to evaluate if there was any improvement in their knowledge and practice over time. This objective distinguishes itself from previous research endeavors by prioritizing the expertise of nurses rather than that of physicians.