Empowering Nurses and Residents to Improve Telemetry Stewardship in the Academic Care Setting

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Abstract

Inappropriate use of telemetry frequently occurs in the inpatient, non-intensive care unit setting. Recent telemetry practice standards have attempted to guide appropriate use and limit the overuse of this important resource, with limited success. Clinical-effectiveness studies of these practice standards have thus far not included care settings in which resident-physicians are the primary caregivers. Furthermore, studies of the role of nurses in appropriate telemetry use are lacking. In this report, we describe two interventions implemented on general internal medicine units of a large academic hospital over three years. The first intervention, or nurse-discontinuation protocol, allowed nurses to trigger the discontinuation of telemetry once the appropriate duration had passed according to practice standards. The second intervention, or physician-discontinuation protocol, instituted a Best Practice Advisory that notified the resident-physician via the electronic medical record when the appropriate telemetry duration for each patient had elapsed and suggested termination of telemetry. Results showed that the nurse-discontinuation protocol reduced mean patient time on telemetry and the physician-discontinuation protocol reduced mean telemetry orders per patient. These findings validate a prior study and expand on our understanding of telemetry use in the academic care setting in which trainees serve as the primary caregivers.

TEXT

Introduction

Telemetry is an important tool for real-time monitoring of patients in the hospital. However, telemetry is expensive, contributes to alarm fatigue, and may contribute to unnecessary diagnostics and interventions.[1-5] The first telemetry practice standards were published nearly 30 years ago to guide appropriate use outside of the intensive care unit (ICU).[6] These practice standards were updated in 2004 and again in 2017, complete with specific telemetry durations by indication.[7,8] Despite these practice standards, telemetry is still frequently ordered inappropriately and continued for excessively long durations.[9] Studies show that 57% of patients on telemetry lack an American Heart Association (AHA) Class I or II indication and the majority of providers remain unaware that these practice standards exist.[9-12]

As part of the Choosing Wisely Campaign, the American Board of Internal Medicine Foundation and the Society of Hospital Medicine have advocated for the development of institution-based protocols for all non-intensive care patients on telemetry to better incorporate evidence-based and practice standard-driven telemetry practices.[13]However, most protocols implementing practice standard-based approaches to improve telemetry appropriateness are labor-intensive or ineffective.[14-18] Data on successful interventions at academic

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medical centers, where residents are the primary providers, are particularly limited. Current literature predominantly uses stand-alone educational interventions rather than system or workflow changes, and thus the impact may not be sustained. Additionally, few studies have examined the impact of nursing-driven initiatives to limit telemetry use.[19]

We designed a study using systems-based interventions to reduce mean time on telemetry among patients cared for by internal medicine residents. We hypothesized that empowering nurses with the ability to discontinue telemetry once the recommended indication-specific duration had elapsed would lead to a reduction in mean time spent on telemetry. Furthermore, we hypothesized that transitioning responsibility for telemetry discontinuation from the nurse to the resident would lead to an increase in patient time spent on telemetry.

Methods

This study was conducted at a 1,154-bed quaternary hospital in the eastern United States with 65,000 ED visits and 16,000 hospital admissions per year. The study was implemented within the hospital's adult general medicine units (268 beds) and excluded intensive care, step-down, and cardiac care units. Approximately 50% of beds on these units are equipped with telemetry. The patients on these units are managed by the internal medicine residents and internal medicine faculty. The study captured 9,881 patient encounters with telemetry.

We used a before and after study design. The study involved two interventions. The first intervention, or the nurse-discontinuation protocol, allowed nurses to discontinue telemetry at 24 or 48 hours depending on the practice standard-recommended duration for the specific indication entered upon placement of the order. After daily assessment of telemetry data using a specified protocol based on the 2004 AHA Telemetry Practice Standards, nurses consulted with the resident to discontinue telemetry if appropriate. Residents were able to renew the order if telemetry was still required. The second intervention, or the physician-discontinuation protocol, which occurred immediately after cessation of the nurse-discontinuation protocol, residents were notified by a best practice advisory (BPA) if a patient's telemetry order had gone beyond the recommended duration according to the Practice Standards and recommended discontinuation of the order.

The study was implemented using both Allscripts (Chicago, IL) and Epic Systems (Madison, WI), as the hospital transitioned electronic medical record (EMR) systems mid-way through the study, at the start of the physician-discontinuation protocol. Data collection spanned eight months following the implementation of the nurse-discontinuation protocol and twelve months following the physician-discontinuation protocol, with data from the six months before the nurse-discontinuation protocol serving as the pre-intervention control.

The primary outcome was the total time spent on telemetry per patient per month. The secondary outcome was the percentage of patients placed on telemetry each month. All data were obtained from the electronic medical record. Analyses of average total time spent on telemetry every month were calculated using a t-test and, if data did not follow a normal distribution, were confirmed with a Wilcoxon Rank-Sum Test. Statistical computations were performed using SAS v9.4 software (SAS Institute, Cary NC).

Results

During the control period, the average time spent on telemetry was 86.29 hours/patient/month. During the nurse-discontinuation protocol patients spent on average 70.86 hours/patient/month on telemetry (Figure 1). During the physician-discontinuation protocol patients spent on average 81.6 hours/patient/month on telemetry (Figure 1). To assess the significance of the interventions and to determine that there was no pre-existing trend in time on telemetry over each study period, we performed an interrupted time series analysis that provides rates of change in time on telemetry over each period of the study. This analysis found a significant level drop in the mean hours on telemetry by 19.4 hours per patient per month after the nurse-discontinuation protocol (P<0.001, Figure 1). This analysis found no significant change in the trend of monthly time on telemetry after the physician-discontinuation protocol (P=0.34, Figure 1). During the nurse-discontinuation protocol, there was no significant change in the likelihood that a patient was placed on telemetry throughout their admission when compared with the control period (96.1% versus 92.1%, P=0.59,

Figure 2). During the physician-discontinuation protocol, there was a significant decrease of 56.1% in the likelihood that a patient would be put on telemetry when compared with the control time period (36.5% versus 92.1%, P<0.0001, Figure 2).

Discussion

Over a three-year period, we studied two interventions in telemetry workflow among internal medicine services at a large academic hospital in an attempt to improve telemetry use and resident stewardship of this important resource. Two primary findings add to the body of pertinent knowledge in this field. First, allowing nurses to discontinue telemetry led to a significant reduction in mean telemetry hours per patient. Second, implementing a BPA that notified residents of the recommended telemetry duration for each patient did not reduce patient time on telemetry but did lead to a significant reduction in total telemetry orders.

The finding that the nurse-discontinuation protocol led to significantly fewer hours spent on telemetry represents an important validation of a prior study[18] and a novel application of this intervention to the academic care setting in which resident-physicians are the primary caregivers. The presence or absence of telemetry directly impacts the daily workflow and workload of the nurse. The nurse is required to check the telemetry regularly, notify the physician of any alarms, and physically work around the telemetry leads that rest on the patient's chest. Therefore, nurses may be uniquely positioned to initiate the appropriate termination of telemetry in an academic training environment. This study represents the first trial of a nursing-driven intervention to reduce telemetry use in an academic care environment in which residents serve as the primary providers. Many other in-hospital treatments use "nurse-managed" protocols (e.g., heparin continuous infusions or withdrawal scoring and treatment).[20] Our study suggests that, like these other interventions, nurses can and should play a more integral role in telemetry management. Additionally, proper telemetry stewardship requires a team-based approach, and directly incorporating the nursing staff into this process allows for such collaboration.

The physician-discontinuation protocol began immediately following the end of the nursing-discontinuation protocol, and we expected time on telemetry to increase with this transition of responsibility. Residents were now solely responsible for telemetry management and the nurses could no longer trigger the removal of telemetry from their patients. There was, however, no significant change in mean patient time on telemetry. We did find a significant reduction in the number of telemetry orders placed per month. These findings suggest that residents, knowing that the BPA would appear, were less likely to order telemetry in the first place. However, once a patient is on telemetry, the BPA and awareness of the Practice Standards did little to impact the duration of telemetry. This study suggests that academic hospitals, in which residents serve as the primary providers, likely need stricter guidelines for telemetry use, closer monitoring for telemetry misuse, and regular education about the appropriate use of telemetry both via BPAs within the EMR and more traditional educational platforms.

This study has potential limitations. The start of the physician-discontinuation protocol was also the start of Epic Systems as the EMR at the study hospital. The switch between systems could have impacted the use of telemetry. The process of telemetry ordering, however, did not change between the two EMRs. Additionally, due to the timing of the study, the practice standards followed in this study were those from 2004, not 2017.

In conclusion, this study represents an important addition to the literature on telemetry use by resident physicians and nurses in the academic hospital setting. It demonstrates the impactful role that nurses can play in promoting adherence to the telemetry practice standards by internal medicine care teams. Additionally, it suggests that academic care environments that prioritize training may need to engage in more education and oversight to curb telemetry misuse.

FIGURES
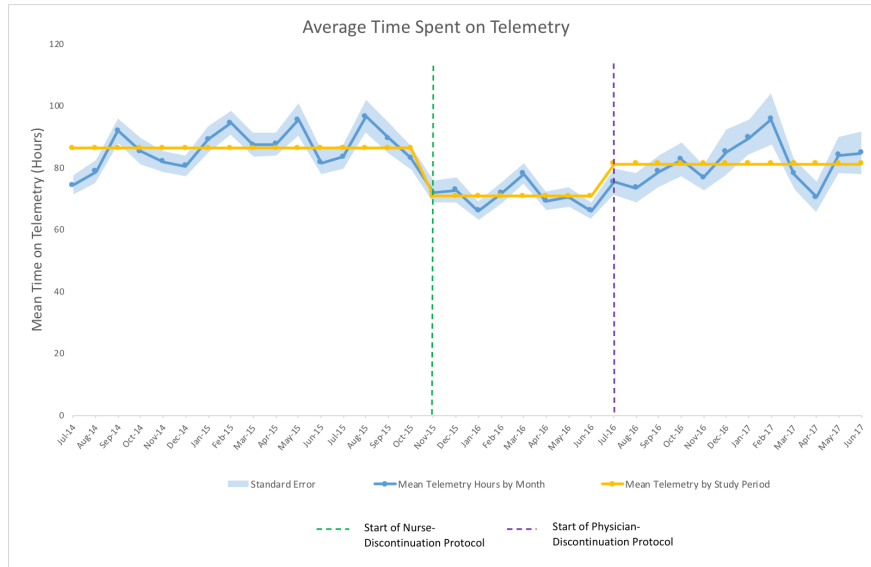
Figure 1: Mean telemetry duration per patient per month throughout the study period.
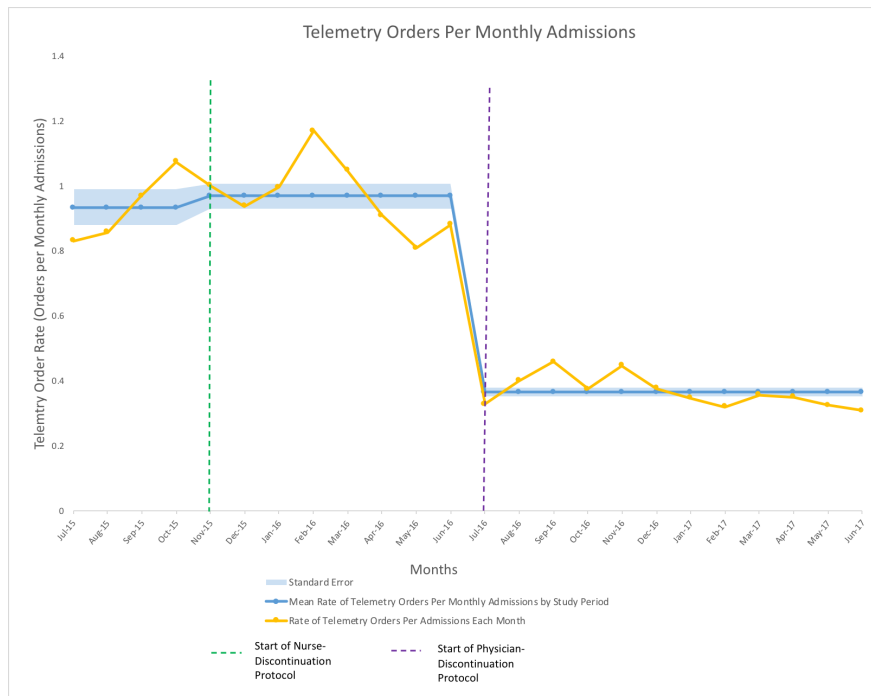
Figure 2: Telemetry order rate by month.

REFERENCES

1. Drew BJ, Califf RM, Funk M, Kaufman ES, Krucoff MS et al. Practice standards for electrocardiographic monitoring in hospital settings: an American Heart Association scientific statement from the councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: endorsed by the international Society of Computerized Electrocardiology and the American Association

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of Critical-Care Nurses. Circulation 2004; 110:2721-2746. [PMID: 15505110]

2. Sandau KE, Funk M, Auerbach A, Barsness GW, Blum K, et al. Update to Practice Standards for Electrocardiographic Monitoring in the Hospital Setting: A Scientific Statement from the American Heart Association. Circulation 2017; 137(2):e1-e72. [PMID: 28974521]

3. Johnson AE, Knight AM, Mock CK, Maygers JM, Zakaria S. Attitudes Surrounding Continuous Telemetry Utilization by Providers at an Academic Tertiary Medical Center. J Clin Outcomes Manag 2016; 23:127-134.

4. Benjamin EM, Klugman RA, Luckmann R, Fairchild DG, Abookire SA. Impact of cardiac telemetry on patient safety and cost. *Am J Manag Care* . 2013;19:e225-e232. [PMID: 23844751]

5. McCartney PR. Clinical alarm management. *MCN Am J Matern Child Nurs* . 2012;37(3):202. [PMID: 22549425]

6. AS, Atkins JM, Field JM, Francis CK, Gibson RS, et al. Recommended guidelines for in-hospital cardiac monitoring of adults for detection of arrhythmia. J Am Coll Cardiol 1991; 18:1431-1433. [PMID: 1939942]

7. Drew BJ, Califf RM, Funk M, Kaufman ES, Krucoff MW, Laks MM, Macfarlane PW, Sommargren C, Swiryn S, Van Hare GF. Practice standards for electrocardiographic monitoring in hospital settings: an American Heart Association scientific statement from the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. Circulation. 2004 Oct 26;110(17):2721-46. doi: 10.1161/01.CIR.0000145144.56673.59. [PMID: 15505110]

8. Sandau KE, Funk M, Auerbach A, Barsness GW, Blum K, Cvach M, Lampert R, May JL, McDaniel GM, Perez MV, Sendelbach S, Sommargren CE, Wang PJ. Update to Practice Standards for Electrocardiographic Monitoring in Hospital Settings: A Scientific Statement From the American Heart Association. Circulation. 2017 Nov 7;136(19):e273-e344. doi: 10.1161/CIR.0000000000000527. Epub 2017 Oct 3. Review. [PMID: 28974521]

9. Henriques-Forsythe MN, Ivonye CC, Jamched U, Kamuguisha LK, Olejeme KA, et al. Is telemetry overused? Is it as helpful as thought? Cleve Clin J Med 2009; 76(6):368-372. [PMID: 19487558]

10. Kanwar M, Fares R, Minnick S, Saravolatz L. Inpatient Cardiac telemetry Monitoring: Are We Overdoing It? JCOM 2008; 15(1):16-20.

11. Najari N, Auerbach A. Use and Outcomes of Telemetry Monitoring on a Medicine Service. Arch Intern Med 2012; 172(17):1349-1350. [PMID: 22892708]

12. Palchaudhuri, S, Chen S, Clayton E, Accurso A, Zakaria S. Telemetry Monitor Watchers Reduce Bedside Nurses' Exposure to Alarms by Intercepting a High Number of Nonactionable Alarms. Journal of Hospital Medicine. 2017;12(6):447-449. [PMID: 28574535]

13. Adult hospital medicine. Five things physicians and patients should question. 15 Aug 2013. Accessed at http://www.choosingwisely.org/societies/society-of-hospital-medicine-adult on 31 July 2017.

14. Gross PA, Patriaco D, McGuire K, Skurnick J, Teicholz LE. A nurse practitioner intervention model to maximize efficient use of telemetry resources. Jt Comm J Qual Improv. 2002; 28:566-573. [PMID: 12369159]

15. Leighton H, Kianfar H, Serynek S, Kerwin T. Effect on electronic ordering system on adherence to the American College of Cardiology/American Heart Association guidelines for cardiac monitoring. Crit Pathw Cardiol. 2013; 12:6-8. [PMID: 23411601]

16. Boggan JC, Navar-Boggan AM, Patel V, Schulteis RD, Simel DL. Reductions in Telemetry Order Duration Do Not Reduce Telemetry Utilization. J Hosp Med 2014; 9:795-796. [PMID: 25263661]

17. Beier M, Morgan DJ, Gulati, M. Educating Residents Why Less Is More With Telemetry. JAMA Int Med. 2015; 175: 864-865. [PMID: 25938315]

18. Dressler R, Dryer MM, Coletti C, Mahoney D, Doorey AJ. Altering Overuse of Cardiac Telemetry in Non-Intensive Care Unit Settings by Hardwiring the Use of American Heart Association Guidelines. Jama Int Med. 2014; 174: 1852-1854. [PMID: 25243419]

19. Perrin K, Ernst N, Nelson T, Sawyer M, Pfoh E, et al. Effect of a Nurse-Managed Telemetry Discontinuation Protocol on Monitoring Duration, Alarm Frequency, and Adverse Patient Events. Journal of

Nursing Care Quality. 2017;32:126-133. [PMID: 27607847]

20. Rivey MP, Peterson JP. Pharmacy-managed, weight-based heparin protocol. Am J Hosp Pharm. 1993 Feb;50(2):279-84. [PMID: 8480784]

Average Time Spent on Telemetry

Telemetry Orders Per Monthly Admissions