

AHA Telemetry Guidelines Improve Telemetry Utilization in the Inpatient Setting

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Telemetry usage on inpatient general medical wards has been identified as an area where resources are utilized inappropriately, which leads to higher costs and a negative impact on patient experience. One study showed that clinical care changed in only 7% of patients on telemetry as a result of their telemetry usage.¹ Telemetry overutilization costs approximately \$54 per patient per day, and each hospitalization day can cost \$1400 per day.²⁻⁵ Using telemetry when it is not needed can increase costs associated with telemetry administration, diminish hospital throughput, and cause delays and increased patient length of stay (LOS). Additionally, inappropriate use of telemetry may result in a negative patient experience due to alarm sounds, artifact data leading to excessive procedures, and provider alarm fatigue.⁶

In 2013, the Society of Hospital Medicine added recommendations to the Choosing Wisely campaign, recommending that all nonintensive care telemetry decisions should be protocol-driven to reduce waste.⁷ Additionally, in 2017, the American Heart Association (AHA) revised its 2004 telemetry guidelines.^{8,9} Since the AHA guidelines were first published, individual studies demonstrated that the guidelines improved appropriate telemetry utilization when applied in the context of institution-specific clinical guidelines. Despite telemetry guidelines, overutilization remains a problem. The reasons are multifactorial: Hospitals may not have guidelines in place to regulate the use of telemetry, providers may be unaware that a patient under their care is on telemetry, provider practice patterns on telemetry use deviate from guideline recommendations, and there is insufficient continuing education about guidelines for appropriate use of telemetry.^{10,11} One study found that, among interviewed clinical providers, accurate assessments for telemetry indications were made 80% of the time whereas only 26% of participants were aware that their patient was on telemetry; 42% did not give a correct indication for telemetry use.¹² Another study showed that order sets guiding telemetry use in accordance with AHA guidelines decreased weekly telemetry orders by more than half and avoided an estimated \$4.8 million of waste annually.¹³

An evidence-based implementation guide by Yeow et al¹⁴ considered 8 interventions addressing telemetry use for hospitalized

ABSTRACT

OBJECTIVES: Overuse of telemetry among hospitalized patients results in poor patient care and wasted health care dollars. Guidelines addressing telemetry use have been developed by the American Heart Association (AHA) and are effective when applied to specific clinical practices and high-value care. The purpose of our intervention was to facilitate more effective utilization of telemetry in our hospital. We aimed to reduce patient days on telemetry through use of AHA guideline criteria for telemetry.

STUDY DESIGN: We used Plan-Do-Study-Act cycles with chart review for pre- and postintervention measurement collection.

METHODS: We included patients hospitalized at The Brooklyn Hospital Center on inpatient general medical wards from January 1, 2017, through July 31, 2018. The intervention consisted of a standard process of reviewing patients on telemetry based on AHA guidelines, educating teams on the guidelines, and changes to telemetry order sets. The primary outcome measured was the total number of days that patients remained on telemetry. Secondary measures included the daily number of telemetry downgrades and total number of patients on telemetry. Diagnosis-related group and case mix index were also noted.

RESULTS: Patient average days on telemetry changed from 7.20 days preintervention to 3.51 days post intervention ($P < .0001$). The number of patients on telemetry with a diagnosis meeting AHA guidelines for telemetry increased.

CONCLUSIONS: The stated intervention resulted in more effective use of telemetry, evidenced by fewer patient days on telemetry and increased numbers of patients on telemetry meeting AHA guidelines for telemetry.

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patients. Four of the 8 interventions implemented changes in the electronic health record (EHR) to improve telemetry utilization. Two of the 8 interventions incorporated an educational component to ensure adherence to appropriate telemetry use. Three of the 8 interventions incorporated an educational component to influence a team's decision on telemetry use. Of the interventions observed, 7 resulted in a decreased duration of telemetry days, whereas the intervention by Boggan et al¹⁵ did not affect patient days on telemetry. Despite various quality improvement activity initiatives relating to telemetry, telemetry overutilization remains problematic, and there is a lack of best practices on how to implement programs that regulate telemetry use within hospitals.^{13,16}

METHODS

The study period was 18 months, from January 1, 2017, through July 31, 2018. All patients hospitalized at The Brooklyn Hospital Center (TBHC), a 464-bed urban tertiary care hospital in Brooklyn, New York, on the inpatient general medical wards and on telemetry during this period were included in the study. Patients who were 18 years or older were included. Exclusion criteria included being in the medical intensive care unit and being 17 years or younger. The study design involved chart review for pre- and postintervention measurement collection. Preintervention data included EHR data collected prior to August 1, 2017. The intervention began on August 1, 2017, and changes were sustained for the duration of the study. Postintervention data included patients who were on telemetry in the period stated previously. Patient days on telemetry each month were analyzed. The pre- and postintervention groups' patient telemetry days were compared, with case mix index (CMI) factored into our multivariable adjusted analysis. SAS 9.4 (SAS Institute) was used to analyze the data. Additionally, the number of patients downgraded off telemetry during our multidisciplinary rounds (MDRs) each day was monitored. Continuous variables that were normally distributed were expressed as means and SDs. Categorical variables were presented as frequencies. Multivariate linear regression was performed to determine whether the intervention was associated with changes in telemetry utilization and hospital LOS after adjusting for age, gender, race, and the Medicare Severity Diagnosis-Related Group (MS-DRG) (federal and New York State weight). A *P* value $\leq .05$ (2-tailed) was considered statistically significant.

To calculate the average cost savings per month, we first calculated the difference of mean telemetry LOS between the preintervention and postintervention periods (Δ) by subtracting the average telemetry LOS for each month of the postintervention period from the average telemetry LOS for the preintervention period that extended from January 2017 to July 2017. We then calculated the total patient days

TAKEAWAY POINTS

This study addresses the use of telemetry in the inpatient setting and examines the effect of tracking and adjusting telemetry time on length of stay in the hospital.

- ▶ Our study intervention decreased hospital inpatient telemetry time by half while increasing adherence to American Heart Association recommendations for telemetry by Plan-Do-Study-Act cycles.
- ▶ Observing that physicians lack reminder mechanisms to track and adjust telemetry time, this intervention used a novel interdisciplinary team-based approach to continually reassess appropriate use of this technology.
- ▶ Our study shows the impact of a team-based strategy in health care to improve quality of service, reduce costs, share accountability, and use resources more effectively.
- ▶ More studies are required to assess the effectiveness and sustainability of interprofessional teams to improve long-term health care quality.

for each month of the postintervention period by multiplying Δ by number of patients for each. Finally, we used \$34, as reported,¹⁷ as an average daily cost savings for telemetry use and multiplied \$34 by the number of patient days per month to ultimately obtain total cost savings for 11 months (from August 1, 2017, to June 31, 2018) and average savings per month.

Telemetry usage data were collected from the EHR (Allscripts 3.0) on patients utilizing telemetry during the study period. Approval was received from The Brooklyn Hospital Center Institutional Review Board on April 26, 2018, that encompassed data collection inclusive of the pre- and postintervention periods.

Our hospital's Patient Flow Committee oversees hospital throughput and meets monthly. One charge for this committee is patient overcrowding in the emergency department, which was linked to inpatient cardiac telemetry utilization. The committee includes various stakeholders from multiple departments, including resident physicians, nurses, and nursing managers from the internal medicine and emergency medicine departments. We developed 2 focused interventions with regard to improved telemetry utilization to address these behaviors and knowledge barriers.

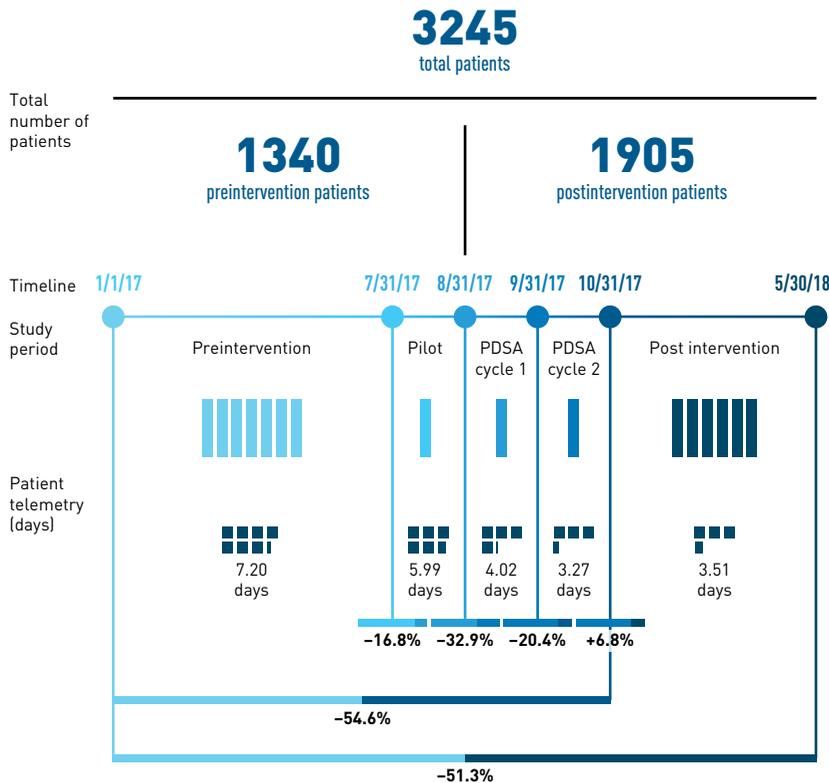
We chose to use Plan-Do-Study-Act (PDSA) cycles in this study to allow for rapid assessment of an intervention. The study intervention was designed and piloted for a 2-week period before the first PDSA cycle was implemented (Figure). Two hospital medicine teams were involved in the pilot phase. The chief quality resident (CQR) and a nurse sat in MDRs daily and discussed all telemetry patients with the 2 hospital medicine teams involved. Specifically, they were asked, "Does your patient need telemetry and meet criteria for telemetry?" Based on the reply from the resident and attending physicians, a computerized order to "discontinue telemetry" could be immediately entered, if indicated, using a computer on wheels. Nurses and the CQR were also given pocket cards designed to highlight AHA criteria for telemetry as a decision aid tool (eAppendix Figure [eAppendix available at ajmc.com]).

In PDSA cycle 1, the interventions were planned for broader implementation at TBHC with the aim of further reducing patient telemetry days hospital-wide. For PDSA cycle 1, the CQR and nursing staff attended MDRs for all 6 of the hospitalist teams. If telemetry

FIGURE. Study Overview

Telemetry study schemata

■ = 1 month ■ = 1 day



PDSA, Plan-Do-Study-Act.

was not needed, orders to discontinue telemetry were entered immediately. The CQR and nursing staff distributed the decision aid pocket card to the attendings and resident physicians of all teams. PDSA cycle 1 lasted for 4 weeks.

In the next cycle, PDSA cycle 2, the intervention described in PDSA cycle 1 was continued with addition of a 48-hour automatic discontinuation order for all telemetry orders.

RESULTS

Of the 3245 patients who were placed on telemetry during the study period and who met study inclusion criteria, 1340 patients were in the preintervention group and 1905 patients were in the postintervention group (Table 1). We found that patient average telemetry days in the preintervention group were 7.20 days and in the postintervention group were 3.51 days (Table 1). The intervention resulted in a 51.25% mean reduction of patient telemetry days ($P < .0001$) after using multivariate analysis and adjusting

for age, gender, race, and MS-DRG. We noted that the preintervention mean hospital LOS was 7.48 days compared with 5.68 days post intervention ($P < .001$).

The most common cardiac diagnoses for which telemetry was ordered in the preintervention and postintervention phases were acute coronary syndrome (ACS) (18.21% preintervention and 21.31% post intervention) and heart failure (HF) (10.90% preintervention and 9.29% post intervention) (Table 1). The mean MS-DRG (federal weight) during the study period was 1.47 in the preintervention period and 1.80 in the postintervention period, but this increase did not achieve statistical significance.

The monthly average of patient average telemetry days declined to 2.98 days at the end of the postintervention period in June 2018 (Table 2) from 8.66 days at the beginning of the preintervention period in January 2017 (Table 3), thus constituting a total decline of 5.68 days (65.69%) in monthly patient average telemetry days from beginning to end of the study. Additionally, there was an overall increase in the total number of patients on telemetry from 153 patients in January 2017 (Table 3) to 217 patients in June 2018 (Table 4), and a greater number of these were using telemetry appropriately, according to AHA guidelines.

For all patients in the postintervention group (Table 4), patient days on telemetry decreased compared with the preintervention group regardless of the diagnosis or telemetry unit (eAppendix Table 1). For

instance, mean telemetry LOS for gastrointestinal bleed was 9.56 days vs 4.80 days; for arrhythmia was 8.68 days vs 3.80 days; for asthma/chronic obstructive pulmonary disease exacerbation was 8.28 days vs 4.45 days; and for altered mental status was 8.24 days vs 3.75 days. Values for chest pain, ACS, electrolyte abnormality, congestive HF exacerbation, cerebrovascular accident, syncope, seizures, and sepsis are shown in eAppendix Table 1. We also noted a decrease in the number of patients placed on telemetry for gastrointestinal bleed, syncope, and sepsis. Although patient telemetry days significantly decreased, nontelemetry patients' hospital LOS increased slightly during the intervention period. The CMI also increased from 1.4 in the preintervention period to 1.64 in the postintervention period.

The monthly average decline of patient telemetry days ranged from 1.21 days to 4.22 days during the postintervention period (eAppendix Table 2). Additionally, the total intervention cost savings was \$244,199.90 in 11 months, for an average savings of \$22,199.99 per month (eAppendix Table 2).

TABLE 1. Baseline Characteristics

Characteristic	Preintervention (n = 1340)	Post intervention (n = 1905)
Gender, n (%)		
Male	649 (48.43)	957 (50.24)
Female	691 (51.57)	948 (49.76)
Race, n (%)		
White	114 (8.51)	126 (6.61)
Black or African American	892 (66.57)	1270 (66.67)
Hispanic or Latino	199 (14.85)	288 (15.12)
Asian	38 (2.84)	63 (3.31)
Other	97 (7.24)	159 (8.35)
Age in years, mean (SD)	68.52 (16.10)	66.96 (15.70)
Hospital length of stay, mean (SD)	7.48 (15.35)	5.68 (7.68)
Telemetry length of stay, mean (SD)	7.20 (15.67)	3.51 (4.37)
Federal weight MS-DRG, mean (SD)	1.47 (1.67)	1.80 (2.37)
Diagnosis, n (%)		
Chest pain	27 (2.01)	19 (1.00)
ACS	244 (18.21)	406 (21.31)
Arrhythmia	83 (6.19)	119 (6.25)
Electrolyte abnormality	23 (1.72)	22 (1.15)
CHF exacerbation	146 (10.90)	177 (9.29)
CVA	115 (8.58)	93 (4.88)
GI bleed	53 (3.96)	32 (1.68)
Asthma/COPD exacerbation	66 (4.93)	70 (3.67)
SOB	31 (2.31)	29 (1.52)
Seizure	35 (2.61)	38 (1.99)
AMS	55 (4.10)	35 (1.84)

ACS, acute coronary syndrome; AMS, altered mental status; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CVA, cerebrovascular accident; MS-DRG, Medicare Severity Diagnosis-Related Group; GI, gastrointestinal; SOB, shortness of breath.

TABLE 2. Mean Telemetry and Hospital Length of Stay: Preintervention, Pilot, Intervention, and Post Intervention

Month	Telemetry length of stay in days, mean (SD)	Hospital length of stay in days, mean (SD)
Preintervention (1/1/17-7/31/17)	7.20 (15.67)	7.48 (15.35)
Pilot (8/1/17-8/31/17)	5.99 (12.26)	5.68 (10.04)
PDSA cycle 1 (9/1/17-9/30/17)	4.02 (4.65)	5.52 (8.39)
PDSA cycle 2 (10/1/17-10/31/17)	3.27 (4.09)	5.08 (8.05)
Post intervention		
November 2017	3.28 (3.55)	5.46 (8.30)
December 2017	3.21 (3.33)	5.43 (7.15)
January 2018	3.28 (3.87)	6.46 (9.26)
February 2018	3.59 (4.60)	5.74 (6.50)
March 2018	4.22 (6.09)	5.85 (8.49)
April 2018	4.10 (5.26)	6.16 (6.97)
May 2018	3.40 (4.56)	5.19 (6.97)
June 2018	2.98 (3.73)	5.13 (7.76)
P value: pre- vs post intervention	<.0001	<.001

PDSA, Plan-Do-Study-Act.

TABLE 3. Monthly Distribution of Mean Telemetry Length of Stay and Hospital Length of Stay for Preintervention Period

Month	Telemetry length of stay in days, mean (SD)	Hospital length of stay in days, mean (SD)	Frequency, n (%)
January 2017	8.66 (20.40)	8.52 (18.35)	153 (11.42)
February 2017	8.04 (17.79)	8.25 (17.25)	154 (11.49)
March 2017	6.57 (13.94)	7.07 (14.22)	151 (11.27)
April 2017	7.63 (15.96)	8.32 (16.36)	152 (11.34)
May 2017	8.72 (19.49)	8.67 (19.12)	200 (14.93)
June 2017	5.24 (10.47)	5.75 (10.96)	181 (13.51)
July 2017	5.51 (11.67)	5.77 (11.18)	182 (13.58)
August 2017	5.99 (12.26)	5.68 (10.04)	167 (12.46)

DISCUSSION

Despite efforts to raise awareness on a national level, inappropriate telemetry use is still high and remains problematic for multiple reasons.^{18,19} Up to 43% of patients on telemetry lack appropriate indications for telemetry.²⁰ Our initial assessment of telemetry utilization in the hospital showed that telemetry was not frequently reassessed once it was started. Additionally, other studies suggest that a lack of provider knowledge about whether their patients were on telemetry was a large contributor to excessive telemetry days.^{12,21} The telemetry management approach developed and implemented in this study may be a feasible framework for ensuring appropriate use of telemetry in accordance with AHA guidelines and local needs. The novel approaches of the study intervention included interdisciplinary team collaboration for resource management and daily tracking of telemetry use during MDRs.

The goal of this effort was to reduce hospital-wide patient telemetry days by creating more effective standardization for utilization of telemetry. By breaking down our interventions into PDSA cycles and measuring patient telemetry days and secondary outcomes, we were able to achieve our stated quality improvement goals. We observed from our pilot study that the main limiting factor for prolonged number of patient telemetry days was that physicians did not have reminder mechanisms in place to help them reevaluate the need for telemetry. In other words, if telemetry was not reassessed during a hospital stay, it could be left on for days longer than indicated. Our intervention created structure integrated into the physician workflow that facilitates continuous reassessment of telemetry, thereby enabling physicians and the care team to use telemetry resources more judiciously. This personalized, team-based approach resulted in an effective reduction of patient telemetry days at our

TABLE 4. Monthly Distribution of Mean Telemetry Length of Stay and Hospital Length of Stay for Pilot, Intervention, and Postintervention Periods^a

Month	Telemetry length of stay in days, mean (SD)	Hospital length of stay in days, mean (SD)	Frequency, n (%) (Total = 1905)
August 2017	5.99 (12.26)	5.68 (10.04)	167 (12.46)
September 2017	4.02 (4.65)	5.52 (8.39)	173 (9.08)
October 2017	3.27 (4.09)	5.08 (8.05)	177 (9.29)
November 2017	3.28 (3.55)	5.46 (8.30)	180 (9.45)
December 2017	3.21 (3.33)	5.43 (7.15)	164 (8.61)
January 2018	3.28 (3.87)	6.46 (9.26)	196 (10.29)
February 2018	3.59 (4.60)	5.74 (6.50)	179 (9.40)
March 2018	4.22 (6.09)	5.85 (8.49)	209 (10.97)
April 2018	4.10 (5.26)	6.16 (7.75)	195 (10.24)
May 2018	3.40 (4.96)	5.19 (6.97)	215 (11.29)
June 2018	2.98 (3.73)	5.13 (7.76)	217 (11.39)

^aPilot: August 2017; intervention: September and October 2017; postintervention: November 2017 to June 2018.

institution. Additional support integrated into the workflow through changes to the EHR resulted in further improvements, which was also noted in other studies.

In fact, review of the literature shows that changes to the EHR are among the most common and effective ways of reducing telemetry LOS. The study by Dressler et al implemented revised telemetry order sets and reported a 43% reduction in mean weekly telemetry orders placed and a 47% reduction in the mean duration of telemetry hours.¹³ One study required physicians to select a clinical indication for telemetry with a duration for monitoring, which was associated with a multifaceted intervention that included guideline education, removal of telemetry orders from admission order sets, daily discussion of telemetry by hospitalists, monthly feedback, and financial incentives for meeting targets.²² It showed a 69% reduction in telemetry use within the hospitalist medicine group.²² On the other hand, the study by Boggan et al¹⁵ did not affect patient days on telemetry. A study by Stoltzfus et al²³ used a bed huddle first, followed by a subsequent intervention that forced physicians to indicate a reason for telemetry on admission orders in the EHR. It showed an initial drop in telemetry use with a return to preintervention baseline, as there was no major reduction and even some instances of increased telemetry use with the huddle intervention in certain studied patient units, but it had a 17.8% relative decrease in hospital-wide telemetry use using the physician-based order-related intervention.²³

Increasingly, hospitals are using interprofessional health care teams consisting of employees with different types of training (eg, attending physician, resident, nurse) to tackle specific problems. Team-based care is rooted in the premise that optimal health care delivery is determined by a complex set of relationships among different types of caregivers, and these relationships are associated with higher performance.^{24,25} Prior to our intervention, decisions regarding the use of telemetry were made by a single physician

functioning as the sole decision maker. Upon implementation of our process utilizing interdisciplinary teams, improper use of telemetry decreased. Use of telemetry for diagnoses where telemetry was not indicated also decreased, and mean patient days on telemetry decreased. We noted that the use of telemetry for inappropriate clinical indications, such as altered mental status, also decreased after our intervention was in place.

The overall increase in the total number of patients on telemetry from 153 patients in January 2017 to 217 patients in June 2018 suggests that there was improved understanding of appropriate clinical indications to start telemetry or continue it appropriately. The decrease in the daily number of telemetry downgrades from the beginning to the end of the study period can be attributed to the seasonal shifts in the hospital's total patient census. The CMI was higher in the postintervention period because those months correspond to a high patient census time in the calendar year when overcrowding of the emergency department and high hospital bed occupancy rates are seen. Thus, it appeared that our telemetry interventions effectively reduced patient telemetry days, regardless of the clinical complexity of the patients and high patient census. These findings support the development and implementation of an interprofessional health care team in quality improvement efforts toward appropriate use of telemetry. By leveraging a team to create accountability, we saw better utilization of resources. Nonetheless, further investigation can be done to assess the sustainability of such an intervention and identify additional novel interventions for continued improvement.

It has been reported that a waste reduction at a medium-sized community hospital with 175 telemetry-capable beds could translate to annual cost savings of \$213,986.¹⁷ Indeed, we found an intervention cost savings of roughly \$244,000 for 11 months. Therefore, every possible measure should be pursued to minimize the inappropriate use of telemetry, including care provider training and education, as well as EHR-based protocolization of telemetry monitoring.¹⁷

The possibility of other interventions, such as financial incentives that may be awarded to health group providers or department divisions for physician-driven cost-saving improvement projects, may interfere with the accuracy of studies. For example, the intervention by Edholm et al utilized a financial incentive for the hospitalist group to encourage judicious use of telemetry.²² Studies would be needed to characterize whether financial incentives or other approaches are appropriate and effective in improving appropriate telemetry usage. No financial incentive was applied in our study.

Limitations

The limitations of our study included the retrospective nature of the study, which relies on the quality of documentation by the health provider teams, as well as on continuity of the educational intervention for incoming residents and staff despite staff turnover. With resident rotation switches, there is a continuing need for education about the initiative. Another limitation was nontelemetry bed capacity; even if a clinical team appropriately

discontinued telemetry, it is possible that a patient remained in a telemetry bed simply because a nontelemetry bed was not available. Data about patient telemetry days were derived from data available in the EHR, which could have resulted in a falsely higher number of patient telemetry days. However, this would suggest that the patient days on telemetry reported may actually be an underestimation of the actual effect of the intervention. This was a single-center study, and this may limit the generalizability of the intervention, as other hospitals may lack similar resources to implement our intervention protocols and achieve similarly successful results. Additionally, we did not use postintervention surveys to confirm long-term understanding by medical house staff residents, attendings, and other personnel. This would also be important to maintain consistently good clinical practice with respect to appropriate telemetry use. Despite these limitations, the interventions implemented in this qualitative improvement study appeared to be feasible and resulted in a positive impact that could be replicated at individual institutions seeking to improve appropriate telemetry utilization.

CONCLUSIONS

Our intervention showed that we can reduce hospital inpatient telemetry usage by half with appropriate reminder mechanisms involving not only physicians but all other professional caregivers. An interprofessional care team resulted in increased adherence to AHA guidelines for telemetry usage in addition to reduced costs, shared accountability, and improved quality of health care. The effectiveness and sustainability of such team-based approaches to enhance health care quality require further studies. ■

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eAppendix Table 1. Pre- and Post-Intervention Length of Stay by Diagnosis

Diagnosis	Pre-Intervention Length of Stay	Post-Intervention Length of Stay
Chest Pain	5.99 +/- 3.14	2.81 +/- 1.72
ACS	6.34 +/- 2.56	3.17 +/- 2.66
Arrhythmia	8.68 +/- 4.91	3.80 +/- 2.91
Electrolyte Abnormality	8.19 +/- 4.30	3.47 +/- 1.70
CHF Exacerbation	4.64 +/- 3.38	3.50 +/- 1.53
CVA	5.85 +/- 3.20	4.06 +/- 3.66
Syncope	7.11 +/- 4.57	2.76 +/- 6.09
Asthma/COPD Exacerbation	8.28 +/- 3.33	4.45 +/- 1.80
Seizure	6.14 +/- 1.05	2.35 +/- 1.95
AMS	8.24 +/- 4.99	3.75 +/- 1.18
Sepsis	8.04 +/- 4.50	4.03 +/- 4.90
GI bleed	9.56 +/- 3.25	4.80 +/- 7.15

ACS, acute coronary syndrome; AMS, altered mental status; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CVA, cerebrovascular accident; GI, gastrointestinal; SOB, shortness of breath. Data are mean +/- standard deviation.

eAppendix Table 2. Monthly and total cost saving of mean telemetry length of stay Post-Intervention

Average Telemetry Pre-Intervention*	Date	Telemetry LOS Post-Intervention	N	Delta (Average Telemetry LOS Pre-intervention -Telemetry LOS Post-Intervention)	Patient Days (N X Delta)	Cost saving (\$34 x Patient days)
7.2	Aug-17	5.99	167	1.21	202.07	6870.38
	Sep-17	4.02	173	3.18	550.14	18704.76
	Oct-17	3.27	177	3.93	695.61	23650.74
	Nov-17	3.28	180	3.92	705.6	23990.4
	Dec-17	3.21	164	3.99	654.36	22248.24
	Jan-18	3.28	196	3.92	768.32	26122.88
	Feb-18	3.59	179	3.61	646.19	21970.46
	Mar-18	4.22	209	2.98	622.82	21175.88
	Apr-18	4.1	195	3.1	604.5	20553
	May-18	3.4	215	3.8	817	27778
	Jun-18	2.98	217	4.22	915.74	31135.16
	Total saving					\$244, 199.9
	Average monthly saving					\$22,199.99

Average calculated for the period from January 2017 to July 2017.

eAppendix Figure. Telemetry Pocket Card

Does My Patient Need Telemetry?

Assess each patient daily to determine if they truly need telemetry or not

<p style="text-align: center;">YES My Patient will Clinically Benefit from Telemetry</p> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> <p>My patient has one of the following conditions</p> <ul style="list-style-type: none"> - Post cardiac arrest - Temporary pacing - High grade AV block - Post cardiac surgery, high risk - Arrhythmias (including LQTS and WPW) Intensive care unit - New onset bradyarrhythmia - Overdose of a pro-arrhythmic agent - Severe Hypokalemia or hypomagnesemia <p style="font-size: x-small;">Continue telemetry indefinitely based on clinical condition</p> <p style="text-align: center; font-weight: bold;">← YES NO</p> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;"> <p>My patient has one of the following conditions</p> <ul style="list-style-type: none"> - Acute/subacute heart failure - Acute MI - Syncope of unknown etiology - Post-noncardiac surgery high risk - Acute neurological event <p style="font-size: x-small;">Continue tele for 24 hours</p> <p style="text-align: center; font-weight: bold;">← YES NO</p> </div> <div style="border: 1px solid #ccc; padding: 5px;"> <p>My patient has one of the following conditions</p> <ul style="list-style-type: none"> - Post-pacemaker/ablation/ICD - Chest pain syndrome (excluding very low-risk patients) - Uncontrolled atrial tachyarrhythmia Initiation of drug known to cause TdP <p style="font-size: x-small;">Continue tele for 24 hours</p> <p style="text-align: center; font-weight: bold;">← YES</p> </div>	<p style="text-align: center;">NO My Patient No Longer Needs Telemetry</p> <div style="margin-bottom: 10px;">  <p style="font-size: x-small;">I have placed a D.C. Order I told nurse</p> </div> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px; font-size: x-small;"> <p>I know that patients with the following conditions do not automatically need telemetry</p> </div> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;">  <p style="font-size: x-small;">Dyspnea or hypoxemia</p> </div> <div style="text-align: center;">  <p style="font-size: x-small;">GI Bleed</p> </div> </div> <div style="text-align: center; margin-bottom: 10px;">  <p style="font-size: x-small;">Stable PE without right heart strain</p> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p style="font-size: x-small;">Alcohol Withdrawal</p> </div> <div style="text-align: center;">  <p style="font-size: x-small;">Anemia</p> </div> </div>
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Now that I have stopped telemetry:

- My patient will be less likely to suffer from alarm fatigue
- I'm helping the hospital improve throughput, yay me!
- I'll be saving the nursing staff time that would otherwise go toward tele logistics
- I know there's a low incidence of clinically significant arrhythmias in patients on tele who are not in ICU

DID YOU KNOW?

- Telemetry is a costly resource that should only be utilized if needed
- Think about whether having your patient on telemetry will change management or not
- Telemetry is estimated to cost **\$1400 per patient per 24 hours**

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Together, we can deliver excellent care in a resource effective manner, THANK YOU for all that you do!!

Brought to you by the MSSL Telemetry Committee