Evaluation of Telemetry Utilization, Policy, and Outcomes in an Inner-City Academic Medical Center

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Objective: To evaluate the appropriateness and intermediate outcomes of telemetry admissions.

Methods: We abstracted demographic and clinical data from records of all new telemetry admissions during a 2-month period. To determine appropriateness, 2 authors classified patients using the American College of Cardiology (ACC) guidelines and our telemetry policy. Other utilization and outcome measures were assessed. Agreement between both guidelines was computed (κ coefficient). Categorical group covariates were compared using χ^2 test. Variations in telemetry length of stay (LOS) were compared using Mann-Whitney and Kruskal-Wallis tests. LOS predictors were ascertained by multiple regression analysis.

Results: Of the 120 patients, appropriate admission was 81.6% (ACC criteria) and 83% by our criteria. Guidelines interrater reliability was .89 (κ). Telemetry events incidence was 33.3%, with 5.8% major and 27.5% minor. LOS was longer among major than minor events group (7.8 vs 3.4 days, $p = .01$). Type of telemetry event was a predictor of LOS ($p = .0001$). The occurrence of a major telemetry event was associated with cardiology consultation ($p = .03$).

Conclusions: Appropriate telemetry admission was observed in more than 80% of cases. Our telemetry policy had very good agreement with standard guideline. However, the low rate of major telemetry events in all patient groups suggests current guidelines might have considerable limitations.

Keywords: evaluation ■ health care ■ quality improvement ■ health service utilization

J Natl Med Assoc. 2010;102:598-604

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INTRODUCTION

Medical telemetry was developed in the mid-1960s initially to monitor astronauts.[1] Later, its use was extended to monitoring patients in hospitals for life-threatening arrythmias. Currently, telemetry monitoring is still widely used in critical and noncritical care settings to detect catastrophic cardiac arrhythmias in a wide variety of medical and surgical patients. Generally, cardiac telemetry is considered an important health care procedure, but it is expensive and requires continuous human surveillance by specialized personnel. In the face of rising health care costs and limited resources, health system managers, policy makers, and physician-experts strongly advocate the appropriate use of telemetry beds. It is therefore pertinent to routinely evaluate the appropriate use of these resources. There is also the potential for harm to patients if artificial telemetry findings in low-risk patients lead to the performance of inappropriate invasive procedures. In 1991, the American College of Cardiology (ACC) published guidelines for in-hospital cardiac monitoring of adults for the detection of arrhythmias. This was revised in collaboration with the American Heart Association (AHA) in 2004 (Box 1). These recommendations were made because the use of cardiac monitoring in noncritical care settings had increased significantly over the years.

As a quality of care enhancement project, our institution, like some other health care organizations in the United States, developed and implemented a telemetry unit admission, transfer, and discharge (ADT) policy (Box 2) based on the ACC guidelines. Medical directors were also appointed to oversee the implementation of the telemetry policy, including the authority to transfer low-risk patients out of the telemetry unit. However, very little research has been done on the proper utilization of telemetry and on adherence to the ACC guidelines. In a study by Saleem et al, in which 105 low-risk patients admitted to telemetry were observed, none of the patients experienced cardiac events or arrhythmias warranting changes in management.[2] Inappropriate utilization of telemetry can lead to a waste of scarce health care resources and accentuate the financial burden on the health care system. Sivaram et al, in 1998,

showed that almost $42 000 was needed for 379 days of cardiac monitoring.[3] We therefore sought to evaluate the appropriateness and intermediate outcomes of admissions to the telemetry unit of our large inner-city teaching hospital.

METHODS

Study Setting and Population

The study site is a 953-bed inner-city public hospital that serves as a teaching facility for 2 leading medical schools in Georgia, and is the largest provider of service to low-income and under-/uninsured patients in the state. It is an acute care hospital with up to 35 000 admissions, 900 000 outpatient visits, and 175 000 emergency department visits annually. The patient population is predominantly African American. There are a total of 64 non-intensive care unit (ICU) telemetry beds; 41 in the telemetry unit along with 23 other satellite telemetry beds located on other medical wards but monitored from the telemetry unit. Patients are admitted to the telemetry unit

Box 1. Summary of the American College of Cardiology/American Heart Association Recommended Guidelines for In-Hospital Cardiac Monitoring of Adults for Detection of Arrhythmias

Class	Clinical Situations for Cardiac Monitoring
I	• Cardiac monitoring indicated in most or all; includes all patients at risk of immediate life-threatening arrhythmia
	• Initially suspected and subsequently proved acute myocardial infarction
	• Clinical or electrocardiogram criteria or both suggest myocardial infarction
	• Postoperatively in patients who have undergone cardiac surgery (including placement of an internal cardioverter defibrillator)
	• Patients resuscitated recently from cardiac arrest
	• Most critically ill patients requiring management in intensive care units
	• Acute management of patients who have been poisoned with drugs/chemicals at doses known/suspected to have cardiac arrhythmic toxicity
	• Acute myocarditis
	• During initiation and loading of type I or type III antiarrhythmic drugs for potentially life-threatening arrhythmias in patients clinically prone to proarrhythmic effects
	• Immediately after percutaneous transluminal coronary angioplasty for patients with complications of the procedure
	• Unstable angina
	• Patients with high risk coronary artery lesions who are candidates for urgent mechanical revascularization
II	• Patients in whom monitoring may be beneficial but not essential for all
	• Patients 3 days post acute myocardial infarction
	• Patients with potentially lethal arrhythmias several days after control of the arrhythmia
	• Patients at risk for cardiac arrest, respiratory arrest, or development of hypotension
	• Patients with clinically significant non–life-threatening arrhythmias at increased risk for proarrhythmic effects during initial treatment with type I or III antiarrhythmics due to underlying cardiac dysfunction
	• Patients with suspected or proved hemodynamically significant paroxysmal tachyarrhythmias or bradyarrhythmias
	• Acute phase of pericarditis
	• Unexplained syncope or other transient neurological signs/symptoms that might be due to cardiac arrhythmias
	• Immediately after percutaneous transluminal coronary angioplasty
	• The first 48-72 hours after implantation of a permanent pacemaker
	• Patients in stable condition after cardiac surgery
III	• Patients in whom cardiac monitoring is generally not indicated as the risk of serious arrhythmia or likelihood of therapeutic benefit is low
	• Postoperative patients at low risk
	• Obstetric patients without significant medical conditions
	• Patients with terminal illness who are not candidates for treatment of arrhythmias that might be detected
	• Routine uncomplicated coronary angiography
	• Chronic stable atrial fibrillation
	• Patients with stable asymptomatic premature ventricular contractions or nonsustained ventricular tachycardia hospitalized for reasons other than cardiac or hemodynamic compromise
	• Patients whose underlying cardiac disease has been stabilized and who have had no arrhythmias on 3 consecutive days of monitoring

from the emergency room, ICUs, primary care clinics, and other specialty clinics. Telemetry unit medical directors review all admissions daily to ensure that low-risk patients are discharged from telemetry beds in a timely manner.

Study Design

A prospective observational study of all new admissions to the telemetry unit was conducted over a 2-month period in 2006 using paper and electronic medical records. Patients were followed for their entire length of stay (LOS) in the telemetry unit, and a descriptive cross-sectional program evaluation design was used to assess the process and intermediate outcomes of telemetry utilization based on the institution's telemetry policy and the ACC guideline.

Data Collection

We performed paper and electronic chart abstraction using standard data abstraction sheets to obtain data on patients' demographics, diagnoses, clinical status telemetry events, and LOS. The specific variables collected included patients' age, sex, telemetry admission and discharge dates, source of admission, presenting complaint or admission diagnosis, comorbid conditions, medications, cardiac enzymes, electrolytes, electrocardiogram and chest x-ray findings, events recorded on the cardiac monitor, and procedures performed while patients were on the telemetry unit. We also documented whether the cardiology service was consulted during the telemetry admission and the total number of days the patient spent on the telemetry unit. All data were entered into an Excel database (version 5.0; Microsoft Corp, Redmond, Washington).

Box 2. Study Site Institutional Telemetry Admission Policy

- New onset (in last 2 weeks) of class III or IV angina; may remain on telemetry after myocardial infarction (MI) ruled out only if highly suspicious, stuttering cardiac chest pain in the last 12 hours, and waiting for cardiac catheterization
- Suspected acute coronary syndromes while waiting for results of 2 sets of cardiac enzymes no more than 12 hours apart; may remain on telemetry after MI ruled out if percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) in last 6 months until cardiology evaluation or testing
- Significant coronary artery disease (CAD) awaiting CABG or PCI
- CAD with ventricular ectopy
- Presyncopal/syncopal episodes of suspected cardiac etiology for up to 48 hours
- Atrial fibrillation/flutter with ventricular rate <55 or >110 in the last 24 hours
- Supraventricular tachycardia (psvt) may remain on telemetry for 24 hours after normal sinus rhythm is restored.
- Symptomatic bradycardia with heart rate <50
- Tachy-brady syndrome
- Third-degree atrioventricular block or Mobitz type II block
- Digoxin or other cardiac drug toxicity (48 hours maximum, depends on the drug)
- Cardiac contusion, 72 hours
- Initiation of antiarrhythmic therapy
- Postpermanent pacemaker insertion (48 hours maximum)
- Suspected pacemaker malfunction
- Overdose of any drug known to cause cardiac dysrhythmias
- Transfer from cardiac care unit after acute MI complicated by: significant left ventricular or right ventricular dysfunction, transient or persistent significant conduction defects, bifascicular block, alternating bundle branch block, (second-degree atrioventricular block, etc), atrial fibrillation/flutter, complex ventricular ectopy
- Post-PCI
- Transfer from cardiac care unit following uncomplicated acute MI requiring further cardiac monitoring (up to 72 hours)
- Postcardioversion (24 hours max)
- Known or suspected cardiac tamponade, hemodynamically stable
- Preoperative acute mitral regurgitation/aortic regurgitation, left main CAD, or equivalent
- Severe CHF (class III or IV) with severe valvular heart disease.
- Perioperative atrial fibrillation x 24 hours or until ventricular rate <110 x 24 hours
- Hypokalemia or hyperkalemia with ECG changes (K <2.5 MEQ/L or >7 MEQ/L)

Telemetry Transfer/Discharge Criteria

- When monitoring for symptomatic or asymptomatic tachy or brady dysrrhythmia is no longer necessary: stable cardiac rhythm and rate (heart rate >50 and <110) x 24 hours (rhythm stable for patient) and no major dysrhythmias
- Acute MI ruled out by 2 sets of negative cardiac enzymes
- Resolution of cardiac-related chest discomfort without complications
- Absence of symptomatology related to cardiac failure in patients with known CAD or valvular disease

Measurements

Based on a dichotomous variable—admission criteria "met criteria" and "criteria not met," 2 authors classified each patient twice using either the institution's telemetry policy (Box 2) or the ACC guidelines (Box 1) at each instance to determine the appropriateness of telemetry utilization and compliance with guidelines. The degree of agreement between the ACC guideline and our institution's telemetry policy was assessed. The ACC guideline developed by an expert consensus panel is summarized in 3 classes viz I, II, and III (Box 1). Patients who met the criteria for ACC class I or II were grouped as compliant and appropriate telemetry admission, while those in class III were considered as inappropriate and noncompliant admissions. Similarly, patients who met the institution's telemetry policy stipulations were considered appropriate admissions, while those who did not meet the institution's policy stipulations were termed inappropriate admissions. Our institution's telemetry policy was developed by a joint committee comprising cardiologists, critical care physicians, internal medicine physicians, nurses, and other health care personnel. The committee used the ACC guideline as a key reference document along with other evidence-based resources on telemetry utilization. We grouped telemetry-detected events as major and minor events. A *major event* was defined as an immediate life-threatening cardiac arrhythmia, while a *minor event* was a non–life-threatening arrhythmia or abnormal cardiac activity. Also, the use of cardiology consultation based on the telemetry event was measured as a surrogate for the influence of telemetry findings on the primary physician's decisions. Overall, the process measures employed in this evaluation were: percent of admissions meeting the institution's telemetry criteria, percent of admissions meeting ACC classes I and II (compliance with ACC criteria), degree of agreement between ACC and the institution's telemetry criteria (reliability), and the distribution of patients by ACC class. The percent of total events detected by telemetry, incidence of major events detected, frequency of events detected, mean or median telemetry LOS, and percent of telemetry events that had

Table 1. Telemetry Utilization and Outcome Measurements

Measurements	N	Values	95% CI or *p* Value
Process Measures			
Admissions meeting GHS telemetry policy	120	83.3%	CI, 75.4%-89.5%
Admissions meeting ACC classes I and II	120	81.6%	CI, 65.1%-99.2%
ACC classification	120		
Class I		58.3%	
Class II		23.3%	
Class III		18.3%	
ACC and GHS telemetry criteria agreement	120	κ, 0.89	
Outcome Measures			
Overall incidence of telemetry events	120	33.3%	
Overall incidence of major events[a]	120	5.8%	CI, 2.4%-11.7%
Overall incidence of minor events[b]	120	27.5%	CI, 19.9%-36.7%
Incidence of >1 telemetry event per patient	120	3.2%	
Use of cardiology consultation	118	28%	CI, 20.1%-37.0%
Telemetry event influence on cardiology consultation (physician decision surrogate)	37	RR, 2.34	CI, 1.34-4.09; *P* = 0.03
Telemetry length of stay (mean ± SD, median + IQR)			
All patients studied	120	3.6 ± 2, 3 (2-4) days	
Met GHS telemetry criteria	100	3.6 ± 2, 3 (2-4) days	
GHS telemetry criteria not met	20	4.1 ± 2, 4 (2-5) days	
Mean/median length of stay by ACC class	120		
Class I		3.8 ± 2.5, 3 (2-4)days	
Class II		3.2 ± 1, 3 (2-4) days	
Class III		3.8 ± 2, 4 (2-5) days	
Mean/median length of stay by telemetry event type	37		
Major		7.8 ± 4; 5 (5-11) days	Kruskal-Wallis,
Minor		3.4 ± 1.4, 3 (2-4)days	H = 7.6; *P* = .006
Length of stay predictor (telemetry event type)		Minor vs major	.0001

Abbreviations: ACC, American College of Cardiology; CI, confidence interval; GHS, Grady Health System; IQR, interquartile range; RR, relative risk.

[a] Major events: asystole, ventricular fibrillation, ventricular tachycardia, extreme tachycardia, extreme bradycardia.

[b] Minor events: nonsustained ventricular tachycardia, runs of premature ventricular contraction, supraventricular tachycardia, ventricular bigemeny, missed beat, pacer not in place, sinus pauses.

cardiology consultation were assessed as outcome measures (Table 1).

Statistical Analysis

Univariate analyses of demographic and clinical data as well as telemetry events were expressed as percentages, and mean ± standard deviation or median with interquartile ranges as appropriate. Bivariate analyses were done using χ^2 or Fisher's exact test to compare patient-groups and determine association between categorical variables such as ACC class or the institution's admission criteria and type of telemetry events, ACC class or the institution's admission criteria and the frequency-group of telemetry events, ACC class or the institution's admission criteria and cardiology consultation, type of events and the use of cardiology consultation. Cohen's κ coefficient was computed to ascertain the degree of agreement between the ACC criteria and the institution's telemetry policy. This interrater reliability assessment focused on the established criteria of the 2 patient classification systems rather than the authors' judgment. To accommodate the positive skewness of the telemetry LOS distribution, median LOS was measured along with mean LOS, and differences in mean LOS were compared using the Mann-Whitney and the Kruskal-Wallis nonparametric tests for 2-group and multiple-group analysis, respectively. Multiple regression analysis was done to determine predictors of telemetry LOS, which was considered a continuous dependent variable in this case. The 95% confidence interval (CI) was employed and a p value of $< .05$ ascertained statistical significance. All analyses were done using SPSS version 15.

Table 2. Demographic and Clinical Characteristics of the Telemetry Study Population

Variable	Value (n = 120)
Age, y (mean ± SD)	57.3 ± 15.3
Age group, y	
27-49	32%
50-64	35%
65-95	33%
Sex (male)	58.5%
Race	
Black	89.7%
Hispanic	2.1%
White	8.2%
Admission source	
Emergency care center	84.1%
Medical inpatient	4.7%
Cath lab	2.8%
Cardiac clinic	2.8%
Primary care clinic	2.8%
Intensive care unit	2.8%
Common diagnoses[a]	
Hypertension	78.4%
Chest pain	45.8%
Shortness of breath	47.5%
Heart failure	33.1%
Dyslipidemia	31%
Coronary artery disease	29.9%
Diabetes mellitus	26.3%
Chronic kidney disease	20.2%
Coronary artery bypass graft	5.1%
Atrial fibrillation	7.6%

[a] Multiple occurrences per patient; hence, do not total 100%.

RESULTS

The overall mean age of the 120 new patients admitted to telemetry during the study period was 57.3 ± 15.3 years, with males accounting for 58.5% of the cohort. Majority (89.7%) of the patients were non-Hispanic blacks. The emergency care center (ECC) was the commonest source of admission (84.1%) followed by the medical inpatient floors (4.7%), with cardiology clinic, primary care clinic, ICU, and the cardiac catheterization laboratory contributing 2.8% each. Common admitting diagnoses and comorbidities among these patients were hypertension (78.4%), shortness of breath (47.5%), chest pain (45.8%), heart failure (33.1%), dyslipidemia (31%), coronary artery disease (29.9%), diabetes mellitus (26.3%), and chronic kidney disease (20.2%). Only 5.1% and 7.6 % of admissions had a history of coronary artery bypass graft (CABG) and atrial fibrillation, respectively (Table 2). Based on our institution's telemetry policy, 83.3% of the study group was categorized as appropriate admission. Classification according to the ACC criteria showed that among the entire study cohort, 58.3% were in class I, 23.3% in class II, and 18.3% in class III. Therefore, the proportion of admissions that met the ACC criteria for in-hospital cardiac monitoring (classes I and II) was 81.6% (Table 1). There was very good agreement between the ACC classification and the institution's telemetry admission criteria ($\kappa = .89$), going by the commonly used interpretation system for the values of κ as documented in Altman DG et al:[4] poor agreement (<0.20), fair agreement (0.20-0.40), moderate agreement (0.40-0.60), good or substantial agreement (0.60-0.80), and very good or greater than substantial agreement (0.80-1.00).

Telemetry events occurred in 33.3% of the 120 patients, with only 5.8% of the cohort having major events. No major event occurred among patients with inappropriate telemetry admission. Most (66.7%) of the patients had no telemetry event, 30.1% had only 1 event, while 3.2% had 2 or 3 events during the telemetry unit stay. The overall average telemetry LOS was 3.6 ± 2 days with median and interquartile range of 3 (2-4) days. There was no significant difference in the average LOS among ACC classes I (3.8 days), II (3.2 days), and III (3.8 days) patients. However, patients with major events had a significantly higher mean LOS (7.8 days) than those with minor events (3.4 days), $p = .0001$. In fact, the type of event, which is a surrogate for the severity of telemetry event, was the only significant predictor of telemetry LOS after adjusting for

other covariates ($p = .0001$). Also, the severity of telemetry event was associated with the request for cardiology consultation by the primary physician. The proportion of patients who had cardiology consultation, which served as a surrogate for the telemetry-influenced physician practice decision, was significantly higher among patients with major telemetry events compared to those with minor events ($p = .03$).

DISCUSSION

Telemetry utilization reviews have been conducted as a resource management project by health care institutions using the ACC guidelines for in-hospital cardiac monitoring as standard reference.[2,3,5-7] In our institution's review, the proportion of admissions that met criteria for appropriate use of telemetry—83.3% (95% CI, 75.4%-89.5%)—compared reasonably with reported experience in similar institutions.[3,5-7] It suggests good compliance with institutional policy and standard guidelines by providers. The analysis showed that there is a very good agreement between our institution's policy and the ACC criteria going by the κ coefficient (κ) of .89 and based on the standard ranking system for κ values.[4] This indicates that our institution's telemetry policy is a good match to the ACC guideline. A study by Estrada et al at the Henry Ford Hospital (Detroit, Michigan) reported 98% appropriate admissions, while Sabharwal et al found that 18.4% of patients admitted to their telemetry unit at the Jackson Memorial Hospital (Miami, Florida) did not meet criteria for cardiac monitoring.[5,7] There seems to be a close-to-18% opportunity for improvement in the appropriate use of telemetry at the time of unit admission in our institution similar to the situation at Miami's Jackson Memorial Hospital. This underscores the need for further provider education and more supervisory efforts on the part of the telemetry medical directors.

The incidence of all telemetry events, and especially major events or known life-threatening arrhythmias, among our study cohort was low. Coupled with the nonoccurrence of major events in the inappropriate admissions group, this might reflect more effective medical management of our patient population, or it could indicate limitations of the current guidelines. It could also raise questions about the effectiveness of the current ACC criteria in identifying patients at risk for major cardiac events. Consequently, the current guidelines may not be as useful as previously thought. As a part of our institutional policy, telemetry medical directors were empowered to transfer low-risk patients from the telemetry unit to nonmonitored beds. The medical directors conduct bed-review rounds daily to identify and transfer patients considered to be low risk per the institutional telemetry policy. The impact of this policy supervision strategy is reflected to some degree by the relatively high appropriate admission rate noted in our study. It is, however, recommended that more efforts be made to minimize the admission of ACC class III patients to the telemetry unit or at least significantly reduce their 3.8 days' mean telemetry LOS. Furthermore, the primary predictor of telemetry LOS in our study population was the severity or type of telemetry event with major events or life-threatening arrhythmias accounting for longer stay. This supports the fact that more efficient telemetry utilization can be achieved by the use of a system that is sufficiently sensitive and specific to identify patients at risk of major telemetry event while excluding the admission of low-risk patients. Instituting more robust telemetry supervision and a system of continuous provider-education with periodic evaluation could eliminate the suboptimal telemetry utilization suggested by the LOS similarity between ACC class I and class III patients in this cohort. Institutional measures in conjunction with ACC criteria are therefore necessary to ensure appropriate use of telemetry beds. This could lead to a reduction in the cost of hospitalization and could reduce bed availability wait time for patients admitted from the emergency room and clinics.

Though there is limited literature addressing the effectiveness and costs of telemetry in non-ICU settings, in a study by Saleem et al, 100 patients were admitted to telemetry, none of which experienced cardiac events or arrhythmias severe enough to warrant changes in management.[2] Also, Estrada et al evaluated the outcome of patients admitted to non–intensive care telemetry units and the role of telemetry monitoring in medical decision making involving 2240 patients. The patients were followed prospectively over a 7-month period; physicians perceived telemetry monitoring as helpful in 5.7% of patients despite no resultant management change.[5] In another study, findings from telemetry monitoring directly affected the management decisions in only 7% of the study population.[6] In 2000, Schull and Redelmeier reported that telemetry monitoring had little impact on survival benefit. During their study, 20 patients experienced cardiac arrest, of which 56% were alerted by telemetry monitors. Those patients with arrest signaled by telemetry monitors did not have a difference in survival experience when compared to the group of patients whose events were not signaled by a monitor.[8] In our study, major telemetry events were more likely than minor events to influence physician decision to change patient management as depicted by the request for cardiology consultation service. Cardiology consultation was requested in 85.7% of patients with episode of major events compared to 36.7% of those with minor events. Overall however, only 28% of our entire study group had telemetry-detected events sufficient to warrant cardiology consultation based on the primary physician's judgment. Again, these findings call attention to the need for determining the actual usefulness of cardiac monitoring or the sensitivity of the current guidelines and the institutional telemetry policy in identifying

patients at risk for major cardiac events.

In 1998, Sivaram et al published a cost analysis that showed that $42 000 was required for 379 patients on cardiac monitoring; the cost per patient at that time was estimated at $683.[3] In our institution, the cost of one night's stay on telemetry is $1400, as opposed to a non-monitored bed, which costs $600 per night. Inappropriate admissions to the telemetry unit may contribute to increased cost of hospitalization. The close-to-18% suboptimal use of telemetry monitoring and the prolonged LOS for ACC class III patients, as found in our study, present a substantial opportunity for cost savings and more efficient utilization of telemetry beds at this center. Continuous education of physicians regarding the institutional policy and ACC telemetry guidelines, regular telemetry bed-review rounds by empowered medical directors, and the incorporation of LOS on monitored beds as a core performance measure might be potential strategies to leverage the improvement opportunity. These strategies could also be adopted in similar institutions as a telemetry resource utilization culture.

The following limitations, which could impact the generalizability of our findings, merit further consideration. Firstly, this is a single-center health care resource utilization evaluation. Secondly, the classification of patients by 2 of the authors using the ACC guidelines and our institution's telemetry policy might have been subject to some interrater bias. This was not calculated here but assumed to be minimal from a previous study using the same method.[5] Thirdly, the single measure used in this evaluation to serve as surrogate for change in patient management decision may not totally capture physician practice decisions influenced by telemetry findings.

This study did not explore terminal outcomes such as morbidity and mortality, and their relationship to telemetry events and length of stay. Overall, it showed that there was very good agreement between the ACC guideline and our institution's telemetry policy. Appropriate telemetry utilization as determined from both guidelines was observed in more than 80% of admissions. Also, institutional measures implemented alongside the guidelines enhanced appropriate telemetry utilization. However, the low rate of major telemetry events in all patient-groups suggests that current guidelines might have considerable limitations. This notion has been corroborated by other studies.[9,10]

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