Telemetry use in the inpatient setting

Shawn Klapproth, MD

Disclosures

• No disclosures to report

Objectives

1. Review the history of telemetry
2. Review AHA guidelines for telemetry use
3. Identify causes of telemetry overuse
4. Discuss possible interventions for reducing over-use

Maybe you're like me and you felt like you were a dog chasing a drone trying to determine who and who isn't on telemetry and whether or not they need it

Physician awareness of patient cardiac telemetry monitoring

Poonam Sharma[*1], Alan Tesson[1], Adam Wachter[1], Samantha Thomas[2], Jonathan G. Bae[1]

[1] Duke University Health System, Durham, NC, United States
[2] Department of Biostatistics & Bioinformatics, Duke University Medical Center, Durham, NC, United States

- 369 bed hospital in the Duke University Health System
- Survey of 870 'inpatient providers'
- Surveyed over 8 days about which patients were on telemetry without reviewing EHR, but could review their own notes
  - If the patient was on telemetry, the provider was asked to give the indication

Results

Table 1. Provider awareness of telemetry use

	Provider believes telemetry present	Provider believes telemetry not present	Total
Telemetry present	307	110	417
Telemetry not present	60	393	453
Total	367	503	

Table 2. Rates of accurate knowledge of telemetry use by provider type

	All Providers	Role of Provider						p-value
		Hospitalist	Intern	Physician's Assistant	Resident	Teaching Attending	Student	
Number of Assessments (% of total)	870 (100%)	414 (48%)	103 (12%)	43 (5%)	156 (18%)	82 (9%)	72 (8%)	
Accurate Assessments	700 (80%)	349 (84%)	82 (80%)	31 (72%)	127 (81%)	59 (72%)	52 (72%)	.025
Patients Actually on Telemetry	417 (48%)	195 (47%)	53 (51%)	29 (67%)	73 (47%)	31 (38%)	36 (50%)	.056
Provider Unaware of Telemetry Use[*]	110 (26%)	39 (20%)	14 (26%)	8 (28%)	23 (32%)	10 (32%)	16 (44%)	.039
Rate of Identifying Appropriate Indication for Telemetry[*]	214 (58%)	106 (58%)	24 (52%)	18 (72%)	38 (68%)	17 (50%)	11 (46%)	.115

[*] Denominator reflects the number of patients on telemetry; [*] Out of the observations where provider gave indication for use

Just some examples…

- UTI
- Pancreatitis
- Low back pain
- Femur fracture

History…

History

- Initially used in the 1950-1960s for cardiac monitoring in the ICUs
- Rapid expansion to non-ICU setting
    1. Improve patient care
    2. Reduce medical/legal risks
    3. Labor saving

History

- 1991: ACC first published recommendations of telemetry utilization

JACC Vol. 18, No. 6
November 15, 1991:1431–3

1431

ACC POLICY STATEMENT

Recommended Guidelines for In-Hospital Cardiac Monitoring of Adults for Detection of Arrhythmia

EMERGENCY CARDIAC CARE COMMITTEE MEMBERS

ALLAN S. JAFFE, MD, FACC, *Chairman*

JAMES M. ATKINS, MD, FACC	ROBERT M. MENTZER, Jr., MD, FACC
JOHN M. FIELD, MD, FACC	JOSEPH P. ORNATO, MD, FACC
CHARLES K. FRANCIS, MD, FACC	EUGENE R. PASSAMANI, MD, FACC
ROBERT S. GIBSON, MD, FACC	PREDIMAN K. SHAH, MD, FACC
STANLEY J. GOLDBERG, MD, FACC	HUGH C. SMITH, MD, FACC
ALAN D. GUERCI, MD, FACC	W. DOUGLAS WEAVER, MD, FACC

History

- Divided indications into 3 classes
  - Class I: Indicated in most if not all patients
  - Class II: May have benefit but not essential for all
  - Class III: Not indicated

Class I
1. Suspected/proven AMI
2. During/after cardiac surgery (incl. ICD placement)
3. After resuscitation from cardiac arrest
4. All patients admitted to ICU setting
5. Toxicity from substances known to cause arrhythmias (Ex. TCAs)
6. During loading period of Type I or Type III antiarrhythmic
7. Immediately after heart cath with complication (ex. dissection/thrombus)
8. Unstable angina
9. High risk coronary arty lesions (L main) who will undergo LHC
10. After catheter ablations for arrhythmias

Class II
1. AMI after day 3 if at risk for ventricular arrhythmia
2. Potentially lethal arrhythmias several days after rhythm control
3. Patients deemed 'significant risk for cardiac arrest'
4. Clinically significant 'non-life threatening' arrhythmias (a-fib)
5. Suspected/paroxysmal tachyarrhythmias/bradyarrhythmias
6. Acute pericarditis without myocarditis
7. Unexplained Syncope
8. Immediately after percutaneous angioplasty
9. 48-72h after pacemaker placement
10. Stable condition after cardiac surgery

Class III
1. Post-operative patients who are low risk after non-cardiac surgery
2. OB patients
3. Patients with terminal illness who are not candidates from treatment of arrhythmias
4. After routine, uncomplicated coronary angiography
5. Chronic/stable A-fib
6. Stable asymptomatic PVCs
7. Patients with cardiac disease that has been stabilized and have not had any arrhythmias on 3 consecutive days of monitoring

History

- Not universally practiced
- Based on expert opinion

https://betanews.com/wp-content/uploads/2014/07/Im-an-expert-600x412.jpg

History

- 1999: Consensus statement regarding telemetry monitoring in ACS

MULTILEAD ST-SEGMENT MONITORING IN PATIENTS WITH ACUTE CORONARY SYNDROMES: A CONSENSUS STATEMENT FOR HEALTHCARE PROFESSIONALS

By Barbara J. Drew, RN, PhD. (Chair) and Mitchell W. Krucoff, MD, (Co-chair) for the ST-Segment Monitoring Practice Guideline International Working Group.* From the School of Nursing, University of California, San Francisco, Calif (BJD).

- *BACKGROUND ST-segment monitoring is underused by healthcare professionals for patients with acute coronary syndromes treated in emergency departments and intensive care units.*
- *OBJECTIVE To provide clinically practical consensus guidelines for optimal ST-segment monitoring.*
- *METHODS A working group of key nurses and physicians met in Dallas, Tex, in November 1998.*
- *RESULTS Consensus was reached on who should and should not have ST monitoring, goals and time frames for ST monitoring in various diagnostic categories, what electrocardiographic leads should be monitored, what equipment requirements are needed, what strategies improve accuracy and*

Continued

History

- 2004: AHA published first guidelines for telemetry

AHA SCIENTIFIC STATEMENT

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

Barbara J. Drew, RN, PhD, Chair, Robert M. Califf, MD, Marjorie Funk, RN, PhD, Elizabeth S. Kaufman, MD, Mitchell W. Krucoff, MD, Michael M. Laks, MD, Peter W. Macfarlane, DSc, FRCP, Claire Sommargren, RN, PhD, Steven Swiryn, MD, and George F. Van Hare, MD

Choosing Wisely campaign

- 2013 – SHM identified 5 opportunities to improve healthcare value
    1. Do not place/leave urinary catheters for incontinence or convenience of monitoring UOP in non-critically ill patients
    2. Do not prescribe medications for stress ulcer prophylaxis for inpatient use unless at high risk for GI complications
    3. Avoid transfusion of RBCs for arbitrary hgb/hct thresholds in the absence of symptoms or active heart disease such as heart failure, ACS or stroke
    4. Do not order continuous telemetry monitoring outside of the ICU without using a protocol that governs continuation
    5. Do not perform repetitive CBC/chemistry testing in the face of clinical and lab stability

History

- 2017: AHA released updated guidelines for telemetry

Circulation

Volume 136, Issue 19, 7 November 2017; Pages e273-e344
https://doi.org/10.1161/CIR.0000000000000527

CLINICAL STATEMENTS AND GUIDELINES

Update to Practice Standards for Electrocardiographic Monitoring in Hospital Settings: A Scientific Statement From the American Heart Association

Kristin E. Sandau, PhD, RN, FAHA, Chair, Marjorie Funk, PhD, RN, FAHA, Co-Chair, Andrew Auerbach, MD, MPH, Gregory W. Barsness, MD, FAHA, Kay Blum, PhD, CRNP[†], Maria Cvach, DNP, RN, Rachel Lampert, MD, Jeanine L. May, MPH, MSN, APRN, George M. McDaniel, MD, MS, FAHA, Marco V. Perez, MD, FAHA, Sue Sendelbach, PhD, RN, CCNS, FAHA, Claire E. Sommargren, PhD, RN, FAHA, Paul J. Wang, MD, FAHA, and On behalf of the American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Council on Cardiovascular Disease in the Young

History

AHA guidelines identified 4 rationales for monitoring

1. Recognition of sudden cardiac arrest
2. Recognizing deteriorating conditions
3. Arrhythmia monitoring to expedite management
4. Facilitate diagnosis of arrhythmias (ex. monitoring for arrhythmias after syncope)

Downside to inappropriate telemetry use

• False sense of security

• Alarm fatigue

• Artifactual findings lead to unnecessary testing/interventions

• Cost

• Increases risk of delirium in the elderly

*According to *Chahine et al,* the most common reason for over-utilization is a lack of awareness of appropriate indications

Interventions to Decrease Overuse of Cardiac Monitoring (Telemetry) When Transitioning from the Intensive Care Unit to the Regular Nursing Floor

Monitoring Editor: Alexander Muacevic and John R Adler

Johnny Chahine,[⊠1] Bicky Thapa,[1] Falgun Gosai,[1] Bahaa Abdelghaffar,[1] Suleiman I Al Ashi,[1] Anjli Maroo,[2] Narendrakumar Alappan,[1] and K V Gopalakrishna[1]

Cost

- Wide variability in cost: $50-60 per day for remote telemetry. Telemetry bed (step down unit/intermediate care unit) can cost significantly more.
- Secondary cost
  - Inappropriate use leads to bed limitations, increased boarding time in the ED and ambulance diversions

---
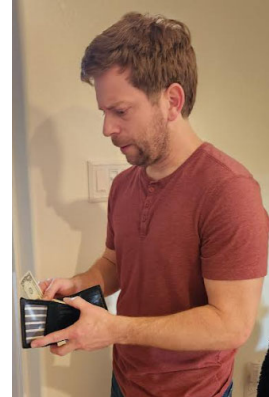
"Yeah, it may cost more, but I'm still going to order telemetry for my patient to provide the best possible care."

https://assets.yourlifechoices.com.au/2022/11/17160434/grumpy1200-384x216.jpg
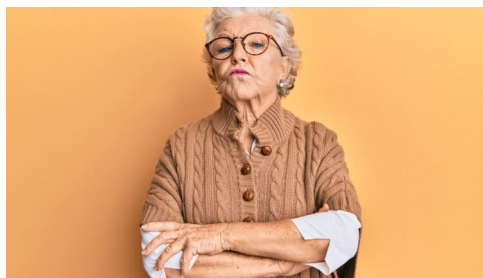
Reasons to avoid telemetry if not indicated

80yo M with history of A-fib, dementia who was admitted for treatment of a hip fracture after a fall from ground level. He was noted to have an irregular pulse (but not tachycardic) and was placed on telemetry to monitor for arrhythmias prior to surgery. No history of CAD and vitals were otherwise WNL. Overnight, he became agitated/confused and was found to be pulling off wires. Telemetry alarm sounded and he was placed in restraints and leads were replaced. He again yanked off his tele leads and he was treated with Ativan and placed in soft restraints. Sitter was called to watch closely.

Indications as they pertain to the majority of patients admitted to hospitalist service...this is NOT an exhaustive list of all indications

ACS indications for telemetry

CLASS (STRENGTH) OF RECOMMENDATION	LEVEL (QUALITY) OF EVIDENCE‡

CLASS I (STRONG) — Benefit >>> Risk
Suggested phrases for writing recommendations:
■ Is recommended
■ Is indicated/useful/effective/beneficial
■ Should be performed/administered/other
■ Comparative-Effectiveness Phrases†:
  ○ Treatment/strategy A is recommended/indicated in preference to treatment B
  ○ Treatment A should be chosen over treatment B
	LEVEL A
	■ High-quality evidence‡ from more than 1 RCT
	■ Meta-analyses of high-quality RCTs
	■ One or more RCTs corroborated by high-quality registry studies

	LEVEL B-R (Randomized) ■ Moderate-quality evidence‡ from 1 or more RCTs ■ Meta-analyses of moderate-quality RCTs

CLASS IIa (MODERATE) — Benefit >> Risk
Suggested phrases for writing recommendations:
■ Is reasonable
■ Can be useful/effective/beneficial
■ Comparative-Effectiveness Phrases†:
  ○ Treatment/strategy A is probably recommended/indicated in preference to treatment B
  ○ It is reasonable to choose treatment A over treatment B
	LEVEL B-NR (Nonrandomized)
	■ Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
	■ Meta-analyses of such studies

CLASS IIb (WEAK) — Benefit ≥ Risk Suggested phrases for writing recommendations: ■ May/might be reasonable ■ May/might be considered ■ Usefulness/effectiveness is unknown/unclear/uncertain or not well established	**LEVEL C-LD** (Limited Data) ■ Randomized or nonrandomized observational or registry studies with limitations of design or execution ■ Meta-analyses of such studies ■ Physiological or mechanistic studies in human subjects
CLASS III: No Benefit (MODERATE) — Benefit = Risk *(Generally, LOE A or B use only)* Suggested phrases for writing recommendations: ■ Is not recommended ■ Is not indicated/useful/effective/beneficial ■ Should not be performed/administered/other	**LEVEL C-EO** (Expert Opinion) Consensus of expert opinion based on clinical experience
CLASS III: Harm (STRONG) — Risk > Benefit Suggested phrases for writing recommendations: ■ Potentially harmful ■ Causes harm ■ Associated with excess morbidity/mortality ■ Should not be performed/administered/other	COR and LOE are determined independently (any COR may be paired with any LOE). A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective. * The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information). † For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated. ‡ The method of assessing quality is evolving, including the application of standardized, widely used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee. COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

59yo M with history of **DM, HTN, tobacco use**, who presented to the ED due to complaint of chest pain. He reported **L sided chest pain** that came on while mowing the lawn. He reported radiation of his pain to his L arm with dizziness. While in the ED, EKG showed **TWI in leads II, III and AVF**. **Troponin trended 35->52**. CXR showed no acute findings.

Does this person warrant telemetry?

AHA Guidelines

- Telemetry indicated for early phase ACS for intermediate to high risk patients

Table 3. Recommendations for Continuous ST-Segment Monitoring of Hospitalized Adult Patients

Class of Recommendation I	
None	
Class of Recommendation IIa	
Continuous ST-segment monitoring is reasonable for:	
Early-phase ACS (<24 h) for intermediate to high risk NSTE-ACS or STEMI, while receiving definitive diagnosis, initiating immediately and continuing uninterrupted ≥24–48 h (or until ruled out; negative biomarkers) (*Level of Evidence B*)	

Risk Stratification

- AHA Chest pain guidelines (2021)

AHA/ACC CLINICAL PRACTICE GUIDELINE

2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/ SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

Writing Committee Members*
Martha Gulati, MD, MS, FACC, FAHA, Chair†; Phillip D. Levy, MD, MPH, FACC, FAHA, Vice Chair†;
Debabrata Mukherjee, MD, MS, FACC, FAHA, Vice Chair†; Ezra Amsterdam, MD, FACC†; Deepak L. Bhatt, MD, MPH, FACC, FAHA†;
Kim K. Birtcher, MS, PharmD, AACC‡; Ron Blankstein, MD, FACC, MSCCT§; Jack Boyd, MD†;
Renee P. Bullock-Palmer, MD, FACC, FAHA, FASE, FSCCT†; Theresa Conejo, RN, BSN, FAHA||; Deborah B. Diercks, MD, MSc, FACC¶;
Federico Gentile, MD, FACC#; John P. Greenwood, MBChB, PhD, FSCMR, FACC**; Erik P. Hess, MD, MSc†;
Steven M. Hollenberg, MD, FACC, FAHA, FCCP††; Wael A. Jaber, MD, FACC, FASE‡‡; Hani Jneid, MD, FACC, FAHA§§;
José A. Joglar, MD, FAHA, FACC‡; David A. Morrow, MD, MPH, FACC, FAHA†; Robert E. O'Connor, MD, MPH, FAHA†;
Michael A. Ross, MD, FACC†; Leslee J. Shaw, PhD, FACC, FAHA, MSCCT†

Risk Stratification

- Use CDP (clinical decision pathway)
  - HEART
  - EDACS
  - ADAPT
  - NOTR
  - GRACE

TABLE

HEART Score for Predicting Major Adverse Cardiac Events in Patients with Chest Pain

Element	Points
History	
Highly suspicious	2
Moderately suspicious	1
Slightly or nonsuspicious	0
Electrocardiography	
Significant ST-depression	2
Nonspecific repolarization	1
Normal	0
Age (years)	
≥ 65	2
> 45 to < 65	1
≤ 45	0
Risk factors	
≥ 3 risk factors or history of atherosclerotic disease	2
1 or 2 risk factors	1
No known risk factors	0
Troponin	
≥ 3 times the normal limit	2
> 1 to < 3 times the normal limit	1
≤ normal limit	0
Total:	

Scoring: 0 to 3 points = low risk (0.6% to 1.7% risk of major adverse cardiac events); 4 to 6 points = intermediate risk (16.6% risk); 7 to 10 points = high risk (50.1% risk).

Adapted with permission from Backus BE, Six AJ, Kelder JC, et al. A prospective validation of the HEART score for chest pain patients at the emergency department. Int J Cardiol. 2013;168(3):2154.

From AAFP

59yo M with history of **DM, HTN, tobacco use**, who presented to the ED due to complaint of chest pain. He reported **L sided chest pain** that came on while mowing the lawn. He reported radiation of his pain to his L arm with dizziness. While in the ED, EKG showed **TWI in leads II, III and AVF**. **Troponin trended 35->52**. CXR showed no acute findings.

HEART SCORE: 8-9

TABLE

HEART Score for Predicting Major Adverse Cardiac Events in Patients with Chest Pain

Element	Points
History	
Highly suspicious	2
Moderately suspicious	1
Slightly or nonsuspicious	0
Electrocardiography	
Significant ST-depression	2
Nonspecific repolarization	1
Normal	0
Age (years)	
≥ 65	2
> 45 to < 65	1
≤ 45	0
Risk factors	
≥ 3 risk factors or history of atherosclerotic disease	2
1 or 2 risk factors	1
No known risk factors	0
Troponin	
≥ 3 times the normal limit	2
> 1 to < 3 times the normal limit	1
≤ normal limit	0
Total:	_____

Scoring: 0 to 3 points = low risk (0.6% to 1.7% risk of major adverse cardiac events); 4 to 6 points = intermediate risk (16.6% risk); 7 to 10 points = high risk (50.1% risk).

Adapted with permission from Backus BE, Six AJ, Kelder JC, et al. A prospective validation of the HEART score for chest pain patients at the emergency department. Int J Cardiol. 2013;168(3):2154.

- HEART score of 8-9
- High risk
- Needs telemetry

Table 3. Recommendations for Continuous ST-Segment Monitoring of Hospitalized Adult Patients

Class of Recommendation I

None

Class of Recommendation IIa

Continuous ST-segment monitoring is reasonable for:

Early-phase ACS (<24 h) for intermediate to high risk NSTE-ACS or STEMI, while receiving definitive diagnosis, initiating immediately and continuing uninterrupted ≥24–48 h (or until ruled out; negative biomarkers) (*Level of Evidence B*)

39yo F with history of migraines presented to the ED with complaint of chest pain. She reported progressive pain that started insidiously over the past 2 days and has been constant. She also reported some mild dizziness. While in the ED, EKG showed TWI in leads V1 and V2 but was otherwise, normal. Troponin trended BAL x2. CXR showed small basilar infiltrates. She was requiring 2L of supplemental O2. Viral testing obtained but pending. ER calls for admission.

Does this person require telemetry?

39yo F with history of migraines presented to the ED with complaint of chest pain. She reported progressive pain that started insidiously over the past 2 days and has been constant. She also reported some mild dizziness. While in the ED, EKG showed TWI in leads V1 and V2 but was otherwise, normal. Troponin trended BAL x2. CXR showed small basilar infiltrates. She was requiring 2L of supplemental O2. Viral testing obtained but pending. ER calls for admission.

Does this person require telemetry?

TABLE

HEART Score for Predicting Major Adverse Cardiac Events in Patients with Chest Pain

Element	Points
History	
Highly suspicious	2
Moderately suspicious	1
Slightly or nonsuspicious	0
Electrocardiography	
Significant ST-depression	2
Nonspecific repolarization	1
Normal	0
Age (years)	
≥ 65	2
> 45 to < 65	1
≤ 45	0
Risk factors	
≥ 3 risk factors or history of atherosclerotic disease	2
1 or 2 risk factors	1
No known risk factors	0
Troponin	
≥ 3 times the normal limit	2
> 1 to < 3 times the normal limit	1
≤ normal limit	0
Total:	____

Scoring: 0 to 3 points = low risk (0.6% to 1.7% risk of major adverse cardiac events); 4 to 6 points = intermediate risk (16.6% risk); 7 to 10 points = high risk (50.1% risk).

Adapted with permission from Backus BE, Six AJ, Kelder JC, et al. A prospective validation of the HEART score for chest pain patients at the emergency department. Int J Cardiol. 2013;168(3):2154.

- HEART score of 1-2
- Low risk, no indication for telemetry

- Incidentally, tested (+) for influenza

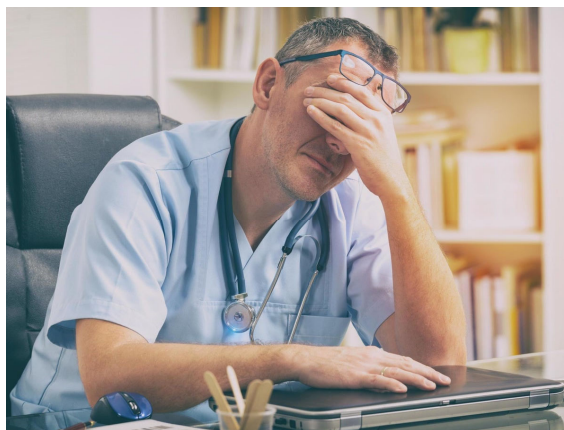| Class of Recommendation III: No Benefit; Level of Evidence C |
| --- |
| Continuous ST-segment monitoring is not beneficial for: |
| Fully awake and alert patients able to recognize and verbalize angina symptoms |
| After nonurgent PCI without complications |
| After routine coronary angiography (no further monitoring beyond femoral sheath removed and immediate postprocedure area) |
| Low-risk and noncardiac chest pain (risk score derived from established scoring tool) |

Mr. Jones is a 69yo M with history of T2DM, HTN, HLD who was undergoing pre-operative cardiac risk evaluation prior to undergoing elective hip replacement. A stress test was obtained that showed intermediate risk, although he denied any chest pain. Cardiology proceeded with a LHC that showed 90% stenosis of the LCx and he underwent PCI with a single stent placement. There were no complications from the procedure.

Per AHA guidelines, does he require telemetry for monitoring?

6/14/2023

- Nonurgent PCI without complications
- No indication for telemetry

Class of Recommendation III: No Benefit; Level of Evidence C
Continuous ST-segment monitoring is not beneficial for:
Fully awake and alert patients able to recognize and verbalize angina symptoms
After nonurgent PCI without complications
After routine coronary angiography (no further monitoring beyond femoral sheath removed and immediate postprocedure area)
Low-risk and noncardiac chest pain (risk score derived from established scoring tool)

Ok, soooo…when can I stop monitoring?

https://static.independent.co.uk/s3fs-public/thumbnails/image/2019/05/07/18/tired-doctor-gp.jpg

ACS indications

- For early phase ACS that is intermediate to high risk, continue monitoring for…
  - **24-48h or until rule out/negative biomarkers**
- After MI without revascularization or with residual lesions after PCI…
  - **Continue monitoring for 24-48h until no evidence of ongoing modifiable ischemia**
- After non-urgent PCI with complications (ex. hypotension, arrhythmia, dissection, thrombus, etc.) or suboptimal results…
  - **Continue for 24h or until complication resolved**
  - *Note that telemetry is not recommended for non-urgent PCI without complication*
- After MI with revascularization…
  - **Continue for 12-24h after revascularization**
- New L main coronary artery lesion
  - **Continue until revascularized (via PCI or bypass)**

ACS indications

Chest pain/ACS	Strength of recommendation	When to stop monitoring
Early ACS for intermediate or high risk	COR I LOE B	Continue 24-48h or until MI ruled out, negative biomarkers or successful revascularization
After MI with revascularization of all lesions	COR I LOE B	Continue 12-24h after revascularization
AFTER MI without revascularization or with residual lesions	COR I LOE C	Continue 24-48h or until no evidence of ongoing modifiable ischemia
Vasospastic angina	COR I LOE C	Until symptoms resolve
Newly diagnosed L main coronary artery lesion	COR I LOE C	Until revascularized
After nonurgent PCI with complications	COR IIa LOE C	For 24h or until complication resolved
After non-urgent PCI without complications	COR III LOE C NO BENEFIT	
After routine LHC	COR III LOE C NO BENEFIT	
Low risk chest pain	COR III LOE B NO BENEFIT	

QT monitoring indications for telemetry

52yo M with history of ESRD, stable CHF, HTN, T2DM who presented to the ED due to fatigue. BMP in the ED revealed K of 6.9. EKG did not show any significant changes. Nephrology was consulted for urgent HD.

Does this patient require telemetry?

- Moderate to severe hyperkalemia
  - 5.5-6.0 mild
  - 6.1-7.0 moderate
  - >7.0 severe
- Telemetry indicated

Moderate to severe imbalance of potassium or magnesium	Until normalization of electrolytes (*Class I; Level of Evidence B*)In less severe electrolyte abnormalities, if 12-lead ECG at time of abnormal laboratory result demonstrates electric abnormalities, consider continuous electrocardiographic monitoring

---

31yo M with history of long QT syndrome who presented to the ED with erythema and swelling to his forearm. EKG was obtained by the ED that showed a QTc of 503. K of 3.9 and Mg of 2.1. He was started on Vancomycin/Rocephin at admission.

He is not prescribed PPI as outpatient

Does this patient require telemetry?

- History of prolonged QTc without risk factors for worsening QTc
- No indication for telemetry

Patients without history of prolonged QTc or without general risk factors for TdP† who are started on nonantiarrhythmic drugs with risk for TdP Drugs with known risk Drugs with possible or conditional risk	QTc monitoring is not recommended *Class III: No Benefit; Level of Evidence C* *Class III: No Benefit; Level of Evidence C*

71yo M with history of A-fib, HTN, DM who was admitted with intractable headache. After admission, he developed A-fib with RVR. Cardiology was consulted and rate failed to improve with beta blockade. Cardiology elected to start Dofetilide. Baseline EKG showed QTc of 409.

Does this patient require telemetry?

- Initiating therapy with anti-arrhythmic drug with known risk for TdP.
- COR I/LOE B
- Telemetry indicated

Patients with or without risk factors for TdP† who are started on antiarrhythmic drugs with known risk for TdP Medications include dofetilide,‡ ibutilide,‡ sotalol, disopyramide, procainamide, quinidine	QTc monitoring is recommended: For dofetilide (*Class I; Level of Evidence B*)§ For others (*Class I; Level of Evidence C*)§

A 65yo F with history of recurrent UTIs was admitted to the ICU with sepsis due to UTI. She was treated with appropriate medications and was weaned from pressor support and she is now hemodynamically stable. MICU has consulted you to resume care.

Does this person require telemetry?

- Telemetry indicated with hemodynamic changes in sepsis, once hemodynamic changes resolve, may discontinue telemetry

Arrhythmia monitoring indications for telemetry

57yo M with history of paroxysmal A-fib, HTN, CKD3, COPD who presented to the ED with complaint of foot pain. ED monitor showed A-fib with HR in the 60-70s. BP 123/73. He was found to have cellulitis and was started on treatment with Vancomycin/Rocephin at admission.

Does this person require telemetry?

- Chronic a-fib with admission unrelated to arrhythmia
- Telemetry not indicated

Chronic AF	
If admitted for reason other than arrhythmia or rate and patient are hemodynamically stable	Class III: No Benefit; Level of Evidence C

44yo M whose only medical history is HTN controlled with Amlodipine, presented to the ED with complaint of palpitations and was found to have new onset A-fib with HR of 109. He was started on Metoprolol and TTE ordered at admission.

Does this person require telemetry?

- New onset A-fib, continue until treatment strategy confirmed

New or recurrent AF: monitor until treatment strategy determined   *Class I; Level of Evidence C*

82yo F with history of recurrent UTIs, HTN, HLD nursing home resident who was admitted to the MICU due to sepsis 2/2 UTI. She was transferred to the floor on hospital day 3 after weaning from pressor support. She is now on hospital day 5. Telemetry was not discontinued after transfer and you were informed by RN that telemetry had notified her that the patient's HR was in the 40-50s overnight. On your evaluation, her HR was 51 and she denied any symptoms of palpitations, chest pain or dizziness. She is also not taking any AV nodal blocking medications.

Should you continue telemetry?

- Telemetry indicated for MICU setting, however, no indication at transfer, and no indication to continue with asymptomatic bradycardia.

Asymptomatic, hemodynamically stable, admitted for other indication	Class III: No Benefit; Level of Evidence C

Arrhythmias		
Chronic A-fib	Class III LOE C NO BENEFIT	
New onset A-fib		
Symptomatic bradycardia	Class I LOE C	
Asymptomatic, significant bradycardia with negative chronotropic medications	Class IIa LOE C	
Asymptomatic bradycardia, hemodynamically stable	Class III LOE C NO BENEFIT	
2nd/3rd AV block	Class I LOE C	
Asymptomatic Wenckebach	Class III LOE C	

Cardiac/Non-ACS		
Acute decompensated heart failure	COR I LOE B	Until precipitating event successfully treated (ie. Ischemia, HTN, arrhythmia, volume overload)
History of ICD/PPM admitted for unrelated indication	COR III LOE C NO BENEFIT	
History of ICD with shocks requiring hospitalization	COR I LOE C	For duration of related hospitalization, until precipitating event treated
Syncope with suspected cardiac origin	COR I LOE B	For >24h until cause and treatment identified
Sepsis		May discontinue when hemodynamically stable

22yo F with history of depression and prior suicide attempts presented to the ED after reportedly taking an unknown amount of Amitriptyline just prior to arrival to the ED. EKG obtained that showed QTc 435. She was treated with activated charcoal.

Does this patient require telemetry?

- Drug known to cause prolonged QTc/TdP
- Telemetry indicated

Patients with overdose of drug with known TdP risk or with overdose of unknown drug(s)	QTc monitoring is recommended until: QT-prolonging drug levels have decreased Unknown drug has been identified as non–QT-prolonging QTc interval is in normal range No evidence of QT-related arrhythmias(*Class I; Level of Evidence C§*)

63yo M with history of HTN, DM, tobacco use who presented to the ED with complaint of L sided weakness. CT concerning for stroke, however, he is past the treatment window for tPA. TTE ordered at admission and pending.

Does this patient require telemetry?

Medical conditions		
Stroke	COR I LOE B	Monitor 24-48h; longer if cryptogenic or suspect intermittent a-fib
Moderate to severe potassium or magnesium imbalance	COR I LOE B	Until normalization of electrolytes
Drug overdose/suspect QTc prolonging medication	COR I LOE B	Until effective metabolism of drug and no ongoing QTc prolongation

Yeah but what about…

- ESRD
- Refeeding syndrome

How to improve

- Frequent assessment of telemetry orders
- Understanding/following AHA guidelines for use
- Removal of telemetry from admission order sets
- Financial incentives for meeting targets

69% reduction in telemetry use

Decrease in Inpatient Telemetry Utilization Through a System-Wide Electronic Health Record Change and a Multifaceted Hospitalist Intervention

Karli Edholm [1], Polina Kukhareva [2], Claire Ciarkowski [3], Jason Carr [4], David Gill [4], Austin Rupp [4], Jack Morshedzadeh [5], Nathan Wanner [3], Kensaku Kawamoto [2]

AHA Telemetry Guidelines Improve Telemetry Utilization in the Inpatient Setting

Nov 10, 2020
Sima S. Pendharkar, MD, MPH
Ibrahim B. Barry, MD, MPH

- Single center (The Brooklyn Hospital Center)
- January 2017 through July 31, 2018
- Intervention: Provide education regarding AHA guidelines, changing order sets
- Primary outcome: Days reduced on telemetry by following guidelines
- Average days on telemetry improved from 7.2->3.5 days
  - Total estimated cost savings of $22,200 per month

Summary

- Telemetry overuse continues to be an ongoing problem despite attempts to mitigate overuse.
- Following AHA guidelines has shown reduction in inappropriate use without causing harm, resulting in cost savings and improved care
- Daily assessment of appropriate use, provider education, financial incentives and removal of telemetry from order sets have all shown to be beneficial

Questions?
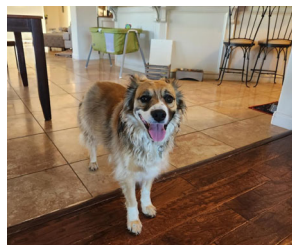
References

- Chahine et al. Cureus 2019 Mar, 11(3): E4311. Interventions to Decrease Overuse of Cardiac Monitoring (telemetry) When transitioning from the ICU to the Regular Floor
- Pendharkar S., Ibrahim B., The American Journal of Managed Care. AHA Telemetry Guidelines Improve Telemetry Utilization in the Inpatient setting. 2020 Nov, Vol 26 Iss 11
- Kansara et al. JAMA Internal Medicine. 2015 Aug, Vol 175 No 8. Potential of Missing Life-Threatening Arrhythmias After Limited the Use of Cardiac Telemetry
- Sandau et al., Circulation. Vol 136. No 19. Update to Practice Stands for Electrocardiographic Monitoring in Hospital Settings. Oct 2017
- Edhold et al., Journal of Hospital Medicine. Decrease in Inpatient Telemetry Utilization through a System-Wide Electronic Health Record Change and a Multifaceted Hospitalist Intervention. 2018 Feb.
- Sharma P. et al., SCIEDU Journal of Hospital Administration. Physician awareness of patient cardiac telemetry monitoring. Vol 5 No 3. 2016.
- Atkins et al. ACC. Recommended Guidelines for In-Hospital Cardiac Monitoring of Adults for Detection of Arrhythmia. Vol 18. No 6. November 15; 1991: 1431-3
- Barbara Drew et al. Multilead ST-Segment Monitoring in Patients with Acute Coronary Syndromes: A Consensus Statement for Healthcare Professionals. From the School of Nursing. University of California. San Francisco. 1999
- Drew et al., Circulation. Practice Standards for Electrocardiographic Monitoring in Hospital Settings. Vol 110 Issue 17 26 October 2004. 2721-2746
- Choosing Wisely Campaign. Society of Hospital Medicine. Statement. 2013.
- Chen S., Zakaria S., JAMA internal Medicine. Behind the Monitor - The Trouble With Telemetry: A Teachable Moment. 2015. Vol 175. No 6.
- Gulati et al., ACC Practice Guideline. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guidelines for the Evaluation and Diagnosis of Chest pain. Joint committee on clinical practice guidelines.

According to a recent study, what percentage of telemetry alarms represented a real (life threatening) emergency?

A. 100%

B. 10%

C. 0.1%

D. 0.01%

August 2015

Potential of Missing Life-Threatening Arrhythmias After Limiting the Use of Cardiac Telemetry

Pranav Kansara, MD, MS[1]; Kristi Jackson, BS[2]; Robert Dressler, MD[3,4]; et al

≫ Author Affiliations | Article Information

JAMA Intern Med. 2015;175(8):1416-1418. doi:10.1001/jamainternmed.2015.2387

- Retrospective analysis of 'all comers' from October 2012 – November 2012 compared to May-June 2013 before and after instituting protocols limited telemetry use
- Evaluated alarms/management before/after protocol
- Alarms divided into 3 classes:
  - Potentially life threatening
  - Clinically important
  - Questionable importance
- Monitored for management changes

Table 1. Alarms Before and After Revision of the Continuous Cardiac Telemetry Protocol

Variable	Before Revision (October 19, 2012, to November 19, 2012)	After Revision (May 22, 2013, to June 19, 2013)	P Value
Total No. of monitored patients during study periods	2658	2036	NA
Total No. of alarms from monitoring department during study periods	8273	4647	NA
Total No. (%) of emergency alarms from monitoring department during study periods[a]	70 (0.8)	46 (1.0)	.47
No. (%) of monitored patients examined in detail	1323 (49.8)	1322 (64.9)	NA
No. (%) of alarms examined in detail	4106 (49.6)	3094 (66.6)	NA
No. (%) of emergency alarms examined in detail[a] [95% CI]	42 (1.02) [0.99-1.05]	36 (1.16) [1.12-1.20]	.57
Mean (SD) length of monitoring per patient, d[b]	2.58 (8.64)	1.55 (1.45)	<.001
Mean (SD) No. of alarms per patient[a]	3.1 (3.0)	2.3 (2.7)	<.001
No. (%) of patients examined with no alarms[a]	341 (26)	397 (30)	.01

Abbreviation: NA, not applicable.

[a] P value obtained by χ^2 test.

[b] P value obtained by t test.

Table 2. Classification of Emergency Alarms

	No. of Alarms	
Variable	Before Revision (October 19, 2012, to November 19, 2012) (n = 42)	After Revision (May 22, 2013, to June 19, 2013) (n = 36)
Potentially LTA, sustained VT, VF, and pause >10 s[a]	1	0
Telemetry alarm led to immediate treatment	0	0
Telemetry alarm followed immediate treatment, problem detected by hospital staff before telemetry called	0	0
Clinically important arrhythmia, rapid SVT and AF >180/min, symptomatic heart rate <35/min, pause >5 s, second- or third-degree AVB, and recurrent NSVT	18	11
Recurrent NSVT	1	1
SVT, including AF with RVR	10	4
Pause >5 s, sinus, or AF	1	1
Symptomatic heart rate <35/min	2	3
Transient second- or third-degree AVB	4	2
Changes in patient management		
Telemetry alarm led to management change in 1 hour, SVT >180/min	10	4
Telemetry alarm influenced ultimate treatment decision, recurrent pause >3 s, and recurrent NSVT	2	2
Telemetry alarm did not lead to treatment or influence ultimate management decision	6	5
Arrhythmias of questionable importance (eg, asymptomatic heart rate <35/min with or without AF, or sinus pause of 3-5 s occurring during sleep or at rest, or details of alarms not available)	23	25

Abbreviations: AF, atrial fibrillation; AVB, atrioventricular block; LTA, life-threatening arrhythmia; NSVT, nonsustained ventricular tachycardia; RVR, rapid ventricular response; SVT, supraventricular tachycardia; VF, ventricular fibrillation; VT, ventricular tachycardia.

[a] One episode of VT of 32 seconds was detected. It was self-terminated, asymptomatic, and without any need for treatment.