

Patient Safety Tip of the Week

June 23, 2020 Telemetry Incidents

In our numerous columns on alarm fatigue and alarm management, we’ve emphasized that one of the interventions strongly recommended to reduce alarm fatigue is to eliminate unnecessary telemetry monitoring. Far too many patients are placed on telemetry monitoring without appropriate indications or are unnecessarily continued on telemetry monitoring after a legitimate need is no longer present. See our What's New in the Patient Safety World columns for October 2014 [“Alarm Fatigue: Reducing Unnecessary Telemetry”](#) and December 2018 [“Cost Savings from Eliminating Unnecessary Telemetry Monitoring”](#) and our April 16, 2019 Patient Safety Tip of the Week [“AACN Practice Alert on Alarm Management”](#).

But what about when use of telemetry monitoring is appropriate? What can go wrong? Actually, lots can go wrong and the result is often devastating.

One of our earliest Patient Safety Tips of the Week [“Unintended Consequences of Technological Solutions”](#) described one such event. A hospital purchased such a remote telemetry system in which the transmitter could be placed on a patient on one floor of a hospital and the receiver/monitor was in the CCU as part of a bank of telemetry screens that were continuously viewed by a nurse assigned to that duty. One day, right around nursing change of shift, two patients were admitted to the remote floor and telemetry was ordered on both. A nurse took two transmitters with him and hooked the patients up, then called the CCU monitoring nurse to tell her about the two patients just hooked up. About an hour later the CCU monitoring nurse called the remote floor because one of the patients was in ventricular fibrillation. A code was called and the floor staff and code team ran to the patient’s room, only to find him sitting up in bed, watching TV and eating a meal. Only after several minutes of fiddling with his EKG leads and talking to the nurse in the CCU did anyone realize that the patient several rooms down the hall was really the one in ventricular fibrillation. The **transmitters obviously had been transposed!** This is a variation of the “two in a box” phenomenon we talked about in the April 23, 2007 Tip of the Week [“Predictable Errors”](#). And, of course, the system was poorly designed in that it allowed the first nurse to take out two remote telemetry transmitters at the same time.

In our July 2011 [“What's New in the Patient Safety World”](#) column we noted that the ECRI PSO issued a Patient Safety E-lert on the very same issue ([ECRI PSO 2011](#)). They did not provide details of the cases in their database but did discuss contributing factors identified and made several good recommendations. They noted lack of good policies and procedures and lack of orientation and training plus communications failures as important

contributory factors. They specifically noted things like change of shift, inexperienced staff, lack of familiarity with procedure, and distractions. They also note technological issues and workflow issues.

They recommend patient identification be verified each time a patient is hooked up to telemetry (and that means verification at both the patient's end and the remote monitoring site). They stress that the telemetry receivers should incorporate a display with the patient identifiers to reconcile the telemetry transceiver with the correct patient (and to be especially cautious about patients with similar names). That patient identification needs to be done independently at the two sites to avoid confirmation bias. To their recommendations we would reiterate that your system should also use the constraint function of **preventing anyone from taking out two transceivers simultaneously**. Allowing more than one at a time to be taken simply increases the probability of such transposition.

Incidents related to telemetry often occur during **intra-hospital transports**. Many of our columns highlighting the dangers of the Radiology Suite stress that the dangers often have no relation to the radiology procedure. Our May 22, 2018 Patient Safety Tip of the Week "[Hazardous Intra-hospital Transport](#)" discussed a report from the California Department of Public Health ([CDPH 2018](#)) that illustrates the problem. A patient had been admitted after being found on the floor and noted to be in atrial fibrillation. He was placed on telemetry and had orders for serial EKG's and cardiac enzymes. It is not clear from the report whether the atrial fibrillation was persistent but subsequent EKG's apparently showed PVC's with trigeminy. A nurse notified his physician about the trigeminy and he was begun on oxygen 2 L/min. He was scheduled for an MRI scan of the head (reason not provided in report). The nurse apparently contacted the physician, who ok'd sending the patient for the MRI, though it did not appear the physician realized the patient would be transported without telemetry monitoring. No RN accompanied the patient to the MRI suite and he was not monitored in transit nor connected to telemetry on arrival at the MRI suite. The MRI technician did call the telemetry unit and asked a nurse whether the patient needed monitoring and the answer was "no". The patient was initially advanced into the MRI machine but was pulled out when he complained of shortness of breath. He sat up and was placed on high flow oxygen again but agreed to attempt the MRI again. He then asked to be pulled from the MRI again. As the MRI tech moved the patient back to the hallway and assisted him getting back in bed, the patient had a cardiac arrest. A code was called but attempts at resuscitation were unsuccessful.

The hospital's policy on intra-hospital transports had been revised about two years earlier to enable registered nurses to utilize clinical criteria to discontinue telemetry for select patients for transport to and during a test. The hospital, in its POC (plan of correction), again revised its policy and protocol for transport of monitored patients. It would require a physician's order stating that the patient could be transported without monitoring. If telemetry or other form of monitoring is to be continued, an RN must accompany the patient to the receiving area. The POC also included appropriate dissemination of the revised policy, inservice training, and an audit of subsequent transports of telemetry patients. Though the hospital POC mentions the hospital uses patient safety tools like the

Lean Daily Management Huddle on each nursing unit and multidisciplinary hospital Safety Huddles, there is no mention whether the hospital utilizes checklists like the “Ticket to Ride”. We have highlighted “Ticket to Ride” in multiple columns (see list below). It was originally started to ensure that patients being transported had adequate oxygen supplies, since some studies showed that over half of patients transported to sites like the radiology suite ran out of oxygen. But the “**Ticket to Ride**” checklist is a good way to remind everyone to address what should be done about remote monitoring when patients are transported.

Our February 4, 2014 Patient Safety Tip of the Week “[But What If the Battery Runs Low?](#)” highlighted another issue related to remote monitoring: **battery drainage**. A patient was being monitored by remote telemetry ([CDPH 2014](#)). The battery charge on the 9-volt battery on the remote unit was running low. The audible alarms for low battery status had been turned off and the only ones working were the visual ones. A low battery warning appeared as a yellow alarm on the screen. It later turned red but once the battery is dead no tracing at all appears on the remote monitor screen. The nurse who was manning the remote monitoring station (because no monitor tech was available) had multiple other distractions and did not see the yellow or red low battery alerts. The patient has a fatal event not picked up by monitoring.

Our February 23, 2010 Patient Safety Tip of the Week “[Alarm Issues in the News Again](#)” reminds us not to forget that monitoring and alarm systems consist of much more than pieces of medical equipment. The Pennsylvania Patient Safety Authority’s “[Alarm Interventions During Medical Telemetry Monitoring: A Failure Mode and Effects Analysis](#)” analyzed data on alarm-related incidents from the Pennsylvania Patient Safety Reporting System and identified 29 steps involved in the telemetry monitoring process (see our April 1, 2008 Patient Safety Tip of the Week “[Pennsylvania PSA’s FMEA on Telemetry Alarm Interventions](#)”). They provide excellent recommendations regarding patient identification, optimal display location, ensuring the power source of the telemetry receivers, protocols for when monitoring is temporarily suspended or on standby (eg. during transport or while electrodes are being manipulated), protocols for alarm volume levels, electrode placements and inspection and maintenance, making alarm parameters appropriate to both the individual patient and the setting, and protocols for responding to all alarms (whether low- or high-priority alarms) including establishment of a tiered backup response system. They also point out a very important question easily overlooked in a FMEA “Is telemetry monitoring indicated in this patient at all?”.

A more recent report from the Pennsylvania Patient Safety Authority ([Kukielka 2019](#)) analyzed 558 events reported to the Patient Safety Reporting System (PA-PSRS) over a 5-year period. These events specifically involving interruptions or failures associated with telemetry monitoring equipment or with the healthcare providers responsible for setting up and maintaining proper functioning of that equipment.

Almost half (47.1%) the events were attributed to user errors. But other errors included:

- batteries in telemetry monitoring equipment (14.0%)

- patients were not connected to telemetry monitoring equipment as ordered (12.9%)
- broken, damaged, or malfunctioning telemetry monitoring equipment (10.9%)
- patients were connected to the wrong telemetry monitoring equipment (9.0%)

Common scenarios were not keeping patients on telemetry when they left the floor for testing or forgetting to reconnect telemetry when they returned, poor handoffs at transfers, unsuccessful attempts by the monitoring nurse to reach the nursing staff on the floor when a significant arrhythmia occurred, dead batteries, and the classic error: alarm disabled or volume reduced to inaudible levels. And, yes, just as in our earliest case, the problem of two or more patient having their telemetry monitoring equipment switched happened again. In one such case, they provided details. Two patients in the same room were being monitored via telemetry. At some point their equipment was disconnected and mixed up before being reconnected. One of the patients then developed a rapid heart rate and an intravenous medication was ordered. Fortunately, as they were about to administer that medication, they identified the mix up and avoided what could have been a serious outcome.

The authors point out that harm associated with telemetry monitoring is rare but potentially catastrophic, with death being the most frequent outcome among serious events. Communication breakdowns, battery issues, and improper alarm settings rounded out their top 4 take home points.

Our own take home points:

- You need a system that clearly defines both the appropriate indications for telemetry monitoring and the duration of such monitoring
- Never allow 2 telemetry units to be taken at the same time
- Strict patient identity verification must take place at both the sending and receiving ends
- A “Ticket to Ride” checklist for intrahospital transport should have an item related to monitoring and include the need to check battery level for any such monitoring equipment
- Monitoring equipment and connections need to be rechecked when patients return from intrahospital transports
- Your protocols for handoffs when transferring patients from one floor to another must address use of any monitoring equipment
- Alarm volumes should not be tampered with
- Biomedical staff should assess telemetry equipment after use on a patient and before use on the next patient
- You need a system in place for the person in the monitoring station to readily contact someone on the floor when monitoring anomalies arise and a system for **escalation** when that person is not immediately reached

See also our July 2, 2013 Patient Safety Tip of the Week “[Issues in Alarm Management](#)” and our many columns on alarm-related issues listed below.

Some of our prior columns on the hazards associated with telemetry:

- June 19, 2007 “[Unintended Consequences of Technological Solutions](#)”
- April 1, 2008 “[Pennsylvania PSA’s FMEA on Telemetry Alarm Interventions](#)”
- February 23, 2010 “[Alarm Issues in the News Again](#)”
- July 2011 “[What's New in the Patient Safety World](#)”
- February 4, 2014 “[But What If the Battery Runs Low?](#)”
- May 22, 2018 “[Hazardous Intrahospital Transport](#)”

Prior Patient Safety Tips of the Week pertaining to alarm-related issues:

- March 5, 2007 “[Disabled Alarms](#)”
- March 26, 2007 “[Alarms Should Point to the Problem](#)”
- April 2, 2007 “[More Alarm Issues](#)”
- June 19, 2007 “[Unintended Consequences of Technological Solutions](#)”
- April 1, 2008 “[Pennsylvania PSA’s FMEA on Telemetry Alarm Interventions](#)”
- February 23, 2010 “[Alarm Issues in the News Again](#)”
- March 2, 2010 “[Alarm Sensitivity: Early Detection vs. Alarm Fatigue](#)”
- March 16, 2010 “[A Patient Safety Scavenger Hunt](#)”
- November 2010 “[Alarms in the Operating Room](#)”
- February 22, 2011 “[Rethinking Alarms](#)”
- February 2013 “[Joint Commission Proposes New 2014 National Patient Safety Goal](#)”
- May 2013 “[Joint Commission Sentinel Event Alert: Alarm Safety](#)”
- July 2, 2013 “[Issues in Alarm Management](#)”
- August 2013 “[Joint Commission Formalizes 2014 NPSG on Alarm Management](#)”
- February 4, 2014 “[But What If the Battery Runs Low?](#)”
- October 2014 “[Alarm Fatigue: Reducing Unnecessary Telemetry Monitoring](#)”
- December 15, 2015 “[Vital Sign Monitoring at Night](#)”
- February 9, 2016 “[It was just a matter of time...](#)”
- August 16, 2016 “[How Is Your Alarm Management Initiative Going?](#)”
- February 21, 2017 “[Alarm Fatigue in the ED](#)”
- April 18, 2017 “[Alarm Response and Nurse Shift Duration](#)”
- April 25, 2017 “[Dialysis and Alarm Fatigue](#)”
- October 17, 2017 “[Progress on Alarm Management](#)”
- November 21, 2017 “[OSA, Oxygen, and Alarm Fatigue](#)”
- May 1 2018 “[Refrigerator Alarms](#)”
- April 16, 2019 “[AACN Practice Alert on Alarm Management](#)”
- September 2019 “[Alarm Fatigue in the Emergency Room](#)”
- October 8, 2019 “[Another Freezer Accident](#)”

Some of our prior columns on the “Ticket to Ride” concept:

- April 8, 2008 “[Oxygen as a Medication](#)”
- November 18, 2008 “[Ticket to Ride: Checklist, Form, or Decision Scorecard?](#)”

- August 11, 2009 “[The Radiology Suite...Again!](#)”
- March 13, 2012 “[Medical Emergency Team Calls to Radiology](#)”
- August 25, 2015 “[Checklist for Intrahospital Transport](#)”
- September 1, 2015 “[Smarter Checklists](#)”
- November 2016 “[Oxygen Tank Monitoring](#)”
- February 2018 “[Oxygen Cylinders Back in the News](#)”
- May 22, 2018 “[Hazardous Intrahospital Transport](#)”
- October 30, 2018 “[Interhospital Transfers](#)”

References:

(Note: some of the links to the publications prior to 2015 listed below may no longer be valid)

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https://www.ecri.org/PatientSafetyOrganization/Documents/E-alert_Patient_Identification.pdf

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CDPH (California Department of Public Health). 2018. Intake Number CA00462998. Accessed April 21, 2018

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PPSA (Pennsylvania Patient Safety Authority). Patient Safety Advisory supplement “Alarm Interventions During Medical Telemetry Monitoring: A Failure Mode and Effects Analysis”. March 2008

http://www.psa.state.pa.us/psa/lib/psa/advisories/v5n1march_2008/mar_2008_medical_telemetry_fmea_supplementary_review.pdf

Kukielka E, Gipson KR, Jones R. A Brief Analysis of Telemetry-Related Events. Patient Safety 2019; 1(2): 36-44 December 2019

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