Comprehensive review of cardiac monitoring events and systematic approach to quality improvement

Jessica Schoenthal, MSN, RN, CPPS[1]; Jackie Lamendola, MHA, RN, CPHQ[2]; Ellen Flynn, MBA, JD, RN[1]; Tammy Williams, MSN, RN, CPPS[1]

[1] Vizient, Inc.; [2] The Ohio State University Wexner Medical Center

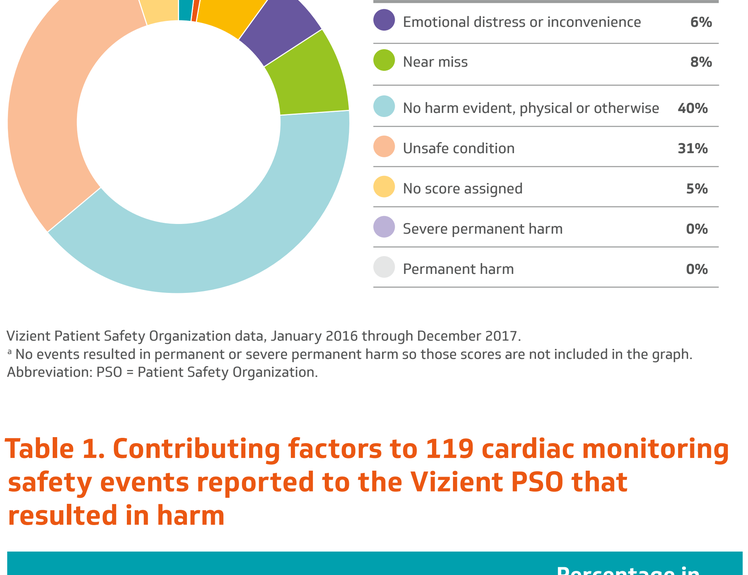
Introduction and background

In 2018, the Vizient® Patient Safety Organization (PSO) team conducted a review of high-harm events reported to the Vizient PSO database and identified management of cardiac alarms as an improvement opportunity. Further investigation included a comprehensive analysis of safety events reported to the PSO in 2016 and 2017; patient monitoring failures and inappropriate responses to cardiac alarms were noted in reports of high-harm events.

The Vizient PSO team worked with an expert advisory group, co-facilitated by Jackie Lamendola, MHA, RN, senior quality manager, patient safety, from The Ohio State University Wexner Medical Center (OSU), to identify leading practices and develop a systematic approach to cardiac monitoring.

The analysis of Vizient PSO data for 2016 and 2017 revealed 768 cardiac monitoring-related events. Ten percent of these required additional treatment or resulted in harm or death. A majority of these events required transfer to a higher level of care, activation of emergency response teams or attempted cardiopulmonary resuscitation (Figure 1). Factors that contributed to the events included omissions in monitoring, communication failures, alarm fatigue, technology failures and system issues (Table 1).

Figure 1. Distribution of harm[a] in 768 cardiac monitoring-related patient safety events reported to the Vizient PSO



Vizient Patient Safety Organization data, January 2016 through December 2017.
[a] No events resulted in permanent or severe permanent harm so those scores are not included in the graph.
Abbreviation: PSO = Patient Safety Organization.

Table 1. Contributing factors to 119 cardiac monitoring safety events reported to the Vizient PSO that resulted in harm

Contributing factors	Percentage in harm events[a]
Central telemetry did not communicate important information	26.89
Patient transported without telemetry monitoring	26.05
Patient removed leads or telemetry	10.92
Delay in response to alarm	10.08
Equipment not available	8.40
Order for telemetry monitoring not initiated	5.04
Other omission of monitoring	4.20
Equipment failure	2.52
Wrong patient	1.68
No order for telemetry monitoring (clinically appropriate)	1.68
Central telemetry did not receive important information	0.84
Alarm parameter errors	0.84
Artifact of cardiac rhythm	0.84

Vizient Patient Safety Organization data, January 2016 through December 2017.
[a] "Harm events" are defined as those requiring additional treatment or causing temporary, permanent, or severe permanent harm or death. Events may have more than one contributing factor.
Abbreviation: PSO = Patient Safety Organization.

The Vizient PSO collaborated with a group of national subject matter experts who have had success in decreasing alarm fatigue, redesigning telemetry monitoring and workflows, and improving communication of critical alarms. Leading practices from these experts were used to develop resources to help health care organizations improve patient outcomes.

Aim

To disseminate lessons learned from patient safety event data and leading practices from an expert advisory group to improve cardiac monitoring.

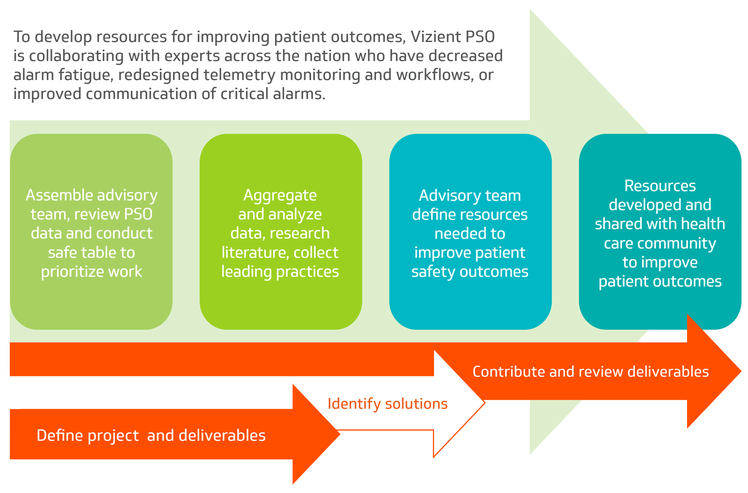
Methods

Figure 2 shows the timeline and objectives of the cardiac monitoring project. The Vizient PSO conducted a retrospective review and identified 768 cardiac monitoring events reported by PSO participants nationwide from January 2016 through December 2017, with a focused review of the events' narrative descriptions. A literature review was also conducted.

The PSO then hosted a privileged and confidential safe table in which PSO members could discuss why they believe gaps in cardiac monitoring occur and identify opportunities for care improvement, to promote understanding of the factors contributing to cardiac monitoring events. This meeting was co-facilitated by Lamendola and Jessica Schoenthal, MSN, RN, CPPS, Vizient PSO collaborative advisor.

Based on the data analysis and identified contributing factors, a Vizient PSO Safety Alert was developed with recommendations for improvement. Experts shared their successful improvement initiatives with a national audience at the PSO safe table and in a 90-minute cardiac monitoring safety webinar hosted by Vizient.

Figure 2. Reliable cardiac monitoring project timeline and objectives



Abbreviation: PSO = Patient Safety Organization.

Deliverables

The Vizient PSO hosted a webinar for PSO members nationwide in which the experts shared evidence-based leading practices that resulted in demonstrable improvement.

In collaboration with the expert advisory team, Vizient PSO published a Safety Alert, "Improving Cardiac Monitoring: What is Contributing to Alarm Fatigue?" that provides process improvement recommendations, including:

- Evaluating alternatives to cardiac telemetry monitoring
- Evaluating cardiac arrest prediction software
- Defining clear processes for management of alarms and holding staff accountable with the "just culture" algorithm
- Assessing current state and measuring progress[1,2] (Figure 3)
- Defining standard work
- Identifying the indications for monitoring[3]
- Promptly addressing leads-off alarms to reduce nuisance alarms; training staff on preventing leads from detaching with proper skin preparation[3] and proactively communicating to the care team (nurse, provider, monitoring technician) if there is a gap in monitoring because the patient's leads were off
- Reducing nuisance alarms by eliminating non–life-threating and duplicate alarms and by adjusting current alarm parameters so that alarms sound only when action is required [3,4,5] (Figure 4)
- Including cardiac monitoring indications and alarm parameters in shift-to-shift handoffs
- Developing a reliable communication and escalation procedure

Data analyses have revealed opportunities to reduce cardiac monitoring-related safety events by following these leading practices. For example, an analysis of cardiac monitoring at OSU revealed opportunities to increase compliance with standards established by the American Hospital Association[3] for use, duration, and indications for electrocardiographic monitoring (Figure 5). And analysis of Vizient PSO data revealed omissions in monitoring in 21% of cases due to leads being detached from the patient (Figure 6). Inpatient general care areas saw the greatest incidence of leads-off events (43%), and 3% of all leads-off cardiac events resulted in death.

References

1. Cantillon DJ, Loy M, Burkle A, et al. Association between off-site central monitoring using standardized cardiac telemetry and clinical outcomes among non-critically ill patients. *JAMA*. 2016;316(5):519-524.
2. Parmley CI, Neeley R. Acute altered mental status, mental status changes, depressed mental status, lethargic, obtunded, altered level of consciousness. ClinicalAdvisor.com website. https://www.clinicaladvisor.com/critical-care-medicine/acute-altered-mental-status-mental-status-changes-depressed-mental-status-lethargic-obtunded-altered-level-of-consciousness/article/585624. Accessed September 13, 2018.
3. Sandau KE, Funk M, Auerbach A, et al; American Heart Association Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young. Update to practice standards for electrocardiographic monitoring in hospital settings: a scientific statement from the American Heart Association. Circulation. 2017;136(19):e273-e344. doi:10.1161/CIR.0000000000000527.
4. Allen JS, Hileman K, Ward A. Simple solutions for improving patient safety in cardiac monitoring — eight critical elements to monitor alarm competency. AAMI website. http://s3.amazonaws.com/rdcms-aami/files/production/public/FileDownloads/Foundation/SafetyInnovation/2013_SI_Alarm_Competency_UPMC.pdf. Accessed September 13, 2018.
5. Sendelbach S, Funk M. Alarm fatigue: a patient safety concern. AACN Adv Crit Care. 2013;24(4):378-386.

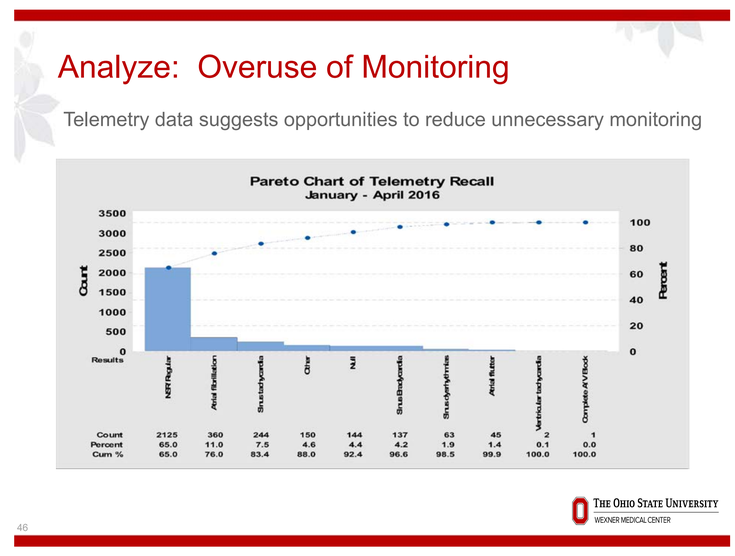
Figure 3. Structure and process used at OSU to assess current state of cardiac monitoring and measure change

Reproduced with permission from The Ohio State University Wexner Medical Center.
Abbreviation: DMAIC = define, measure, analyze, improve, control.

Figure 4. Example from OSU of reducing nuisance alarms by adjusting low HR parameters to levels supported by research

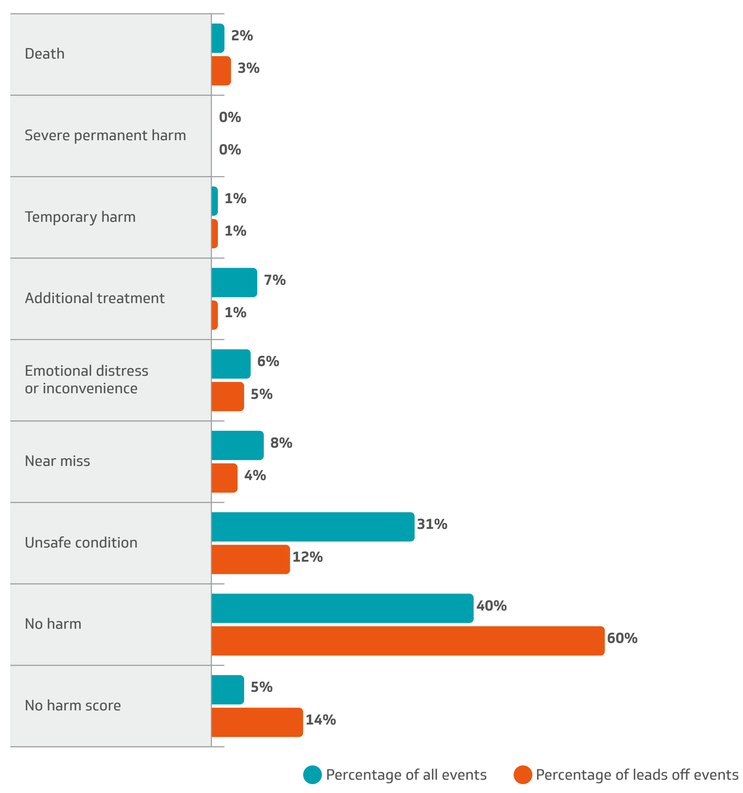
Reproduced with permission from The Ohio State University Wexner Medical Center.
Abbreviations: bpm = beats per minute; HR = heart rate.

Figure 5. Analysis of cardiac monitoring at OSU based on American Hospital Association practice guidelines showing opportunities for improvement



Reproduced with permission from The Ohio State University Wexner Medical Center.

Figure 6. Harm scores for 768 cardiac monitoring events and for 138 events associated with detached leads



Vizient Patient Safety Organization data, January 2016 through December 2017.

To learn about ways to improve cardiac monitoring at your organization, access the Vizient PSO Safety Alert at www.vizientinc.com/cardiacPSOalert.