Reference Case: Avera Heart Hospital

Data-Driven Approach Helps Hospital Build Effective Clinical Alarm Management Program

Imagine that your home security system sounded an alarm at random intervals and for no urgent reason. For clinicians working in hospitals, this is a daily event. The only difference is that lives are at risk.

In 2016, alarm management was listed as a top health hazard by the ECRI Institute (formerly the Emergency Care Research Institute) and the Joint Commission*. It was also the key motivation for the National Patient Safety Goal on clinical alarm safety, whose mandate for alarm management (NPSG 06.01.01) went into effect January 2016.

Clinical alarm management represents a set of complex challenges and processes in every institution. However, the starting place for all alarm initiatives must be with the facts:

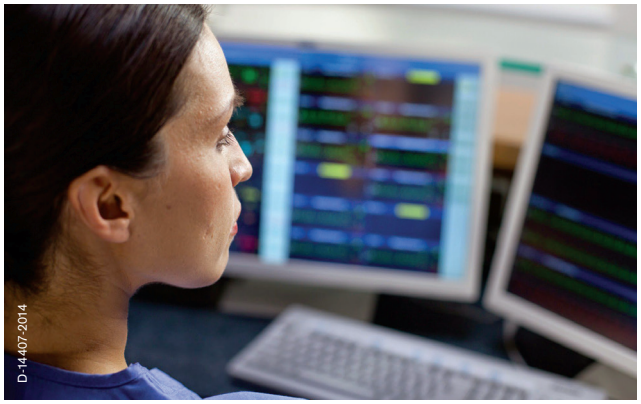
Hospitals must know their baseline alarm count. In order to comply with the NPSG mandate, Avera Heart Hospital adopted a data-driven approach to build an effective alarm management program. This approach gave the hospital the information it needed to reduce alarm rates by 30%, while continuing to keep patients safe.

ALARM DATA: THE CHALLENGE

To institute an effective clinical alarm management program, hospitals must move beyond simply being aware that their units are "noisy."

- They need a repeatable and scalable process for determining a baseline alarm count. That system needs to be vendor neutral because alarms come from many different smart devices.
- The collection of data needs to be ongoing and the data needs to be owned by the hospital.
- It needs to be easy to use and enable data to be shared.
- Improvement initiatives need to be measured against baseline alarm counts.

Without this baseline information, the hospital has no idea how severe its alarm problem really is or what initiatives made a difference.



In most hospitals, alarm data is not easy to find, understand or analyze. Often it starts with a critical call to the patient monitoring vendor asking for access to the hospital's alarm data. Within time there may be a site visit followed by a report. But each time the data needs to be accessed through a vendor.

NPSG 06.01.01 is not just about managing alarms from physiological monitors but from all things that ring, including ventilators, pumps and beds. Today there is a perfect storm of monitoring devices: There are many alarming devices, the defaults are not set to actionable levels, and the alarm limits are too tight. Monitors are very sensitive and unlikely to miss a true event. However, this results in too many false positives. There has been a shift to large clinical units with unclear alarm system accountability, private rooms with doors that close, and duplicate alarm conditions. Staff has become desensitized, putting patients at risk.

*https://www.ecri.org/Resources/Whitepapers_and_reports/2016_Top_10_Hazards_Executive_Brief.pdf

The good news is that it is now possible for hospitals to access their own alarm data – and use that data to understand where their alarms are most severe and map out an alarm management program. Hospitals need to collect many important pieces of information in addition to the baseline alarm count – including policy and control initiatives, current settings and escalations, secondary notification, electrode hygiene, architectural layouts, protocol, clinical work process, and more.

However, data will drive all clinical alarm management going forward. To keep patients safe, hospitals will need to know where they began their alarm management journey and prove the effectiveness of their process. All credentialing bodies will demand it.

Following is the journey toward NPSG compliance taken by Avera Heart Hospital.

A Case in Point: Avera Heart Hospital

BACKGROUND

Avera Heart Hospital in Sioux Falls, South Dakota, has a unique environment. In addition to being a heart hospital, the hospital uses a universal bed model of care that allows families and the patient to stay in the same room – whether the patient is admitted for a simple procedure or a triple bypass. Patients stay in the same room for their entire hospitalization and are monitored from admission to discharge. Avera Heart Hospital established alarm fatigue as an institutional priority for patient safety – an initiative that was supported by the hospital's CEO and medical staff.

ADDRESSING THE ALARM COUNT ISSUE

The quest to create a NPSG-compliant clinical alarm management system began with a call to Dräger, the hospital's patient monitoring vendor, for alarm information.

Dräger acknowledged that the process would be complex, with many phases and areas for improvement to be identified over time. The first step was to gather an automated baseline alarm count on Avera Heart Hospital's physiological alarms.

As a launch point, the hospital created a multi-disciplinary alarm management team that included nursing department heads, the CNO, biomeds, and IT staff. Physicians were available to give input and perspective.

A Dräger workflow consultant made a presentation to the team on clinical alarm management best practices and provided supporting literature. The team reviewed this information and revised its institutional policy accordingly.

ESTABLISHING THE BASE LINE

In 2014 Dräger developed a partnership with Connexall, the KLAS Category Leader in alarm management, to create a solution that would enable hospitals to own data for all of their alarming devices – monitors, pumps, vents and nurse call. The hospital selected Connexall as the vendor for alarm data collection because its software platform was:

- Vendor-neutral: NPSG 06.01.01 requires the management of all alarming devices, which requires a system that can collect alarm data across multiple vendors and alarming devices
- Automated: the solution was scalable and repeatable
- Easy to use and customize: clinical staff could use and customize the system rather than depending on IT support
- Owned by the hospital: Avera Heart Hospital staff would have the independence and the flexibility to access their data, not only as a starting point for alarm management, but for outcome data after change management programs were put in place

Working together, Dräger and Avera Heart Hospital evaluated the current state of alarms to collect baseline alarm data. The effort was focused initially on three care units – all critical care and telemetry patients – by evaluating physiological alarms as the starting point. To establish a meaningful benchmark, alarm data was collected around the clock for seven days.

DRÄGER COLLECTED AND PRESENTED THE DATA IN THE CONTEXT OF BEST PRACTICES, SCIENTIFIC LITERATURE, POLICY, AND OBSERVED WORKFLOW.

Avera Heart Hospital Pod #1					
TOTAL WEEKLY ALARMS	**17,055**				
L-T		**SERIOUS**		**ADVISORY**	
# of Alarm Types	6	# of Alarm Types	28	# of Alarm Types	30
% of Total Alarms	1%	% of Total Alarms	26%	% of Total Alarms	73%
Week Total	114	Week Total	4,517	Week Total	12,424

Avera Heart Hospital Pod #2					
TOTAL WEEKLY ALARMS	**657**				
L-T		**SERIOUS**		**ADVISORY**	
# of Alarm Types	1	# of Alarm Types	14	# of Alarm Types	18
% of Total Alarms	1%	% of Total Alarms	43%	% of Total Alarms	56%
Week Total	7	Week Total	282	Week Total	368

Avera Heart Hospital Pod #3					
TOTAL WEEKLY ALARMS	**1,086**				
L-T		**SERIOUS**		**ADVISORY**	
# of Alarm Types	3	# of Alarm Types	15	# of Alarm Types	22
% of Total Alarms	1%	% of Total Alarms	29%	% of Total Alarms	70%
Week Total	10	Week Total	312	Week Total	764

Based on this information, Dräger and Avera Heart Hospital reviewed default settings and eliminated duplicate and non-actionable alarms – such as couplets, bigeminy, bradycardia and tachycardia – and replaced them with high/low parameters. PVC parameters were changed from 10 to 20/min. SpO_2 was decreased to 88%. Re-training was done on proper skin hygiene prior to lead placement and uses of oximetry technology.

The hospital alarm committee was expanded to include representatives from CRNA, RT and PCU RN.

REDUCING TOTAL ALARM COUNT BY 30%

ANALYZING THE DATA

The baseline alarm count showed that for three units, there were 18,798 alarms in a week – which averaged 71 alarms per patient, per day. The biggest alarm source was advisory alarms specific to SpO_2 – which accounted for 46% of the alarms.

This data gave the hospital the information it needed to reduce the noise, nuisance alarms, redundant alarms, and too tightly set parameters and still keep patients safe.

After the initial changes, the hospital was able to reduce the average per bed/per day alarm count from 71 to 42 – a reduction of 30%.

The hospital team was proud of their accomplishments in creating a clinical alarm management program and the fact that they are now able to measure the effect of their changes. Avera Heart Hospital now has data to support their efforts – data that is easy to correlate to patient HCAHPS scores and patient safety.

HIGHLIGHTS OF INTERNAL PRE-BASELINE ASSESSMENT/SURVEY:

- Nursing felt that "alarms were an annoyance," but they were not complaining
- If asked, nurses guessed that the "SpO_2 alarms were the biggest offender"
- "If I can measure it is real" – but no one had the alarm count
- Nurses perceived that they just "knew what was going on with their patients" and responded appropriately
- The following was a self-assessment of their response times
  - Life Threatening – immediately
  - Serious – rapidly
  - Advisory – as quickly as possible
- Nursing's perception of the benefit of an alarm management program: reduce non-actionable alarms

LOOKING AHEAD

Avera Heart Hospital's ongoing safety and alarm goals include further decreasing the number of alarms per bed/per day – while improving alarm response time, increasing alarm recognition, and improving the accuracy of SpO_2 alarming.

Next steps include ongoing monitoring and implementing a second wave of changes. Dräger will address SpO_2 monitoring criteria and provide education to ensure a smooth transition.

The Avera Heart Hospital team is looking forward to the next phase, which will include ventilators and pumps, as well as continued work on all alarming device workflow.

CONCLUSION

A data-driven approach to alarm management gave Avera Heart Hospital a better understanding of the causes of nuisance alarms and false-positive alarms. They used data to help define and categorize alarm types and determine their clinical significance. Baseline alarm data also enabled the hospital team to understand the implications of alarms and the context of nurses' behaviors and responses.

By tackling the alarm management issue, the hospital was not only able to create an alarm management program that met the requirements of NPSG 06.01.01, but they learned how to tackle a complex and challenging problem and align the clinical team. By working with Dräger's Professional Services, and in conjunction with Connexall technology, the hospital was able to institute a phased approach to support sustainable change. The experience confirmed that a multi-disciplinary team was vital to success of the initiative.

The end result is that Avera Heart Hospital not only created an alarm management program that met the requirements of NPSG 06.01.01, but they also were on track to have a more efficient, better run hospital.

A STEP-BY-STEP APPROACH TO CLINICAL ALARM MANAGEMENT

STEP 1	Assemble an interdisciplinary alarm management team
STEP 2	Collaborate with biomedical engineering/IT to automate the collection of alarm data
STEP 3	Define and categorize alarm types
STEP 4	Determine the clinical significance associated with the alarms
STEP 5	Thoroughly analyze all data to understand the scope of the alarm problem
STEP 6	Understand how alarms are managed on a particular patient unit
STEP 7	Evaluate other conditions that affect the alarm system
STEP 8	Identify the goals and outcomes measures that will guide change and improvements
STEP 9	Implement targeted strategies or interventions
STEP 10	Monitor progress and sustain improvements
STEP 11	Develop patient unit care policies and protocols
STEP 12	Provide ongoing staff education and support
STEP 13	Engage managers in coaching staff
STEP 14	Remain abreast of changing technology and best practices concept based on web services. In addition to a reliable data exchange, the protocols enable the remote control of medical devices in accordance with requirements for patient safety, without limitations related to the run-time environment.

Avera Heart Hospital

ABOUT AVERA HEART HOSPITAL

Avera is a regional health system comprised of more than 330 locations in 100 communities throughout central and eastern South Dakota and areas of four surrounding states. Avera serves a population of nearly 1 million throughout a geographical footprint of 72,000 square miles and 86 counties. Avera is the health ministry of the Benedictine Sisters of Yankton, SD, and the Presentation Sisters of Aberdeen, SD.

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