

Slide 1

Dräger

# Alarm Fatigue:

Clinical Management and Patient Safety

Charlene Vennard RN  
Sr. Clinical Implementation Specialist

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Slide 2

Dräger

Federal investigators concluded that alarm fatigue was a factor in the death of a cardiac patient at Massachusetts General Hospital in January 2009.

The patient's heart rate gradually declined, then stopped, over a 20-minute period, but none of the 10 nurses on duty that morning recalled hearing the alarms or seeing the scrolling alarm messages on three hallway signs. While alarms are designed to draw attention to patient problems, they go off so frequently that healthcare staff tend to tune them out after awhile. Call it "the boy who cried wolf" syndrome.

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Slide 3

Dräger

Nurses at Johns Hopkins Hospital conducted a quality improvement initiative to decrease alarm fatigue and improve patient care. A key component of the initiative was tailoring alarm parameters to individual patients — an intervention that eventually led to a 40% reduction in critical care alarms.

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Slide 4

Dräger



*"You're in a hospital, Nurse Hill. If you collapse from exhaustion, the emergency room is just down the hall."*

**"You're in the hospital, Nurse Hill. If you collapse from alarm fatigue, the emergency room is just down the hall!"**

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Slide 5

Dräger

Imagine for a minute you are the nurse entering your unit for your shift.



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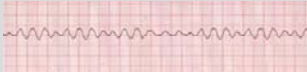
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Slide 6

Scary Scenario #1

Dräger

Your patient on continuous cardiac monitoring experiences v-fib and dies without her monitor sounding or displaying an alarm.<sup>7</sup>



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Slide 7

**Scary Scenario #2** Dräger

Your post op patient's chest leads slip off in the ICU, the monitor sounds a low-pitched beep, but no one hears it. Its too late when it is discovered the patient has stopped breathing.<sup>8</sup>

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Slide 8

**Scary Scenario #3** Dräger

Your patient's ECG displays a "flat line" for more than two hours because the battery in the telemetry monitor has died. You have checked on him throughout the shift, but not changed the battery. At the end of your 12 hour shift he suffers a heart attack and is found unresponsive without a pulse.<sup>8</sup>



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Slide 9

**AJCC SURVEY** Dräger

The hospital environment contains countless bells, beeps, and buzzers, most of which are used to monitor the acuity level of patients.



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Slide 10

**Dräger**

According to the Boston Globe:  
More than 200 hospital patient deaths occurred nationwide between January 2005 and June 2010 that were linked to problems with alarms.

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Slide 11

**Dräger**

These waves are all from the same patient. Some of them were recorded at the same time. These arrhythmias were observed while a patient was in the hospital. If you compare the first and last wave, you will see that the heart rate has increased significantly.

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Slide 12

**Dräger**

Learning outcomes:

- Describe differences between 'nuisance' and 'appropriate' alarms in the work area.
- Determine factors that impede normal use of the alarms.
- Determine appropriate measures to decrease nuisance alarms.
- Learn strategies to avoid alarm-related adverse events.

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Slide 13

**Dräger**

- Alarms on clinical devices are intended to call the attention of the clinicians to [conditions of patients](#) or [devices](#) that deviate from a pre-determined "normal" status.<sup>5</sup>
- Alarms are considered a key tool in improving the safety of patients.

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Slide 14

**Dräger**

Alarm Levels

- **High priority** alarms indicate an urgent situation that requires immediate attention
- **Medium priority** alarms indicate a dangerous situation that requires a quick response
- **Low priority** alarms indicate that attention is needed<sup>5</sup>

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Slide 15

**Dräger**

AJCC Survey

Healthcare workers must discern whether these alarms, auditory or visual, are [clinically important enough to necessitate intervention](#).<sup>3</sup>



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Slide 16

Things that affect alarms Dräger

- Nurses have difficulty differentiating more than six alarms at a time.<sup>2</sup>



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Slide 17

What Are SOME of the ALARMS Heard in the ICU? Dräger

IV Pumps	Phones (personal and unit)
Syringe Pumps	Paging Devices
Feeding Pumps	Ventilators
Bed Alarms	Intercom (in room and unit pages and announcements)
Thermoregulation Devices	Balloon Pumps
ROM Devices	Ecmo Machines
High Volume Dialysis Machine	SVQ2 Devices
Low Volume Dialysis Machine	ICP Devices
Compression Devices	People
Defibrillator	Call Light
CPAP BiPAP	Housekeeping noise
Code Calls	TV's

**CARDIAC MONITORS**

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Slide 18

Therefore: Dräger

Your awareness and appropriate response to alarms not only protect your patient, but also protect you and your employer.

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Slide 19

Things that affect alarm usefulness **Dräger**



Persistence REDUCE

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Slide 20

Alarm Response also is effected by: **Dräger**

- Nurse workload
- Unit culture: responsibilities to respond to alarms
- Appropriateness of alarm setting
- Number of nuisance or low level alarms

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Slide 21

Nuisance Alarms Survey **Dräger**

- **Nuisance alarms**
  - 81% stated the alarms occur frequently
  - 77% stated they disrupt patient care
  - 78% stated it can reduce trust in alarms and cause caregivers to disable or ignore them<sup>3</sup>
- **What happens now?**

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Slide 22

Now...Reliability is questioned Dräger

- Too many false or low priority alarms lead to the perception that the alarms are unreliable .
- More nuisance alarms that sound the more likely the staff will ignore the alarms, or set limits so broadly that they are unlikely to be exceeded
- Alarm systems are almost useless when false alarm rates are high<sup>5</sup>

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Slide 23

What's Important Dräger

- Unreliable alarms and clinically irrelevant alarms distract the staff from what they are doing.
- With distraction, comes error.
- The more nuisance alarms that sound, the more likely it is that the staff will ignore the alarms, and potentially --- > a clinically relevant alarm.<sup>4</sup>

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Slide 24

FDA recommendations<sup>6,7</sup> (January, 2011) Dräger

- Do NOT silence alarms without first checking on the patient.

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Slide 25

FDA recommendations Cont. 

- **Make sure:**
  - that all patient alarms are appropriately activated and not suspended
  - that dysrhythmia detection functions are available and appropriately activated
  - that the alarm volume is high enough to be heard outside the patient's room
- **Perform these checks when:**
  - assuming care of patients from colleagues
  - after shift changes
  - after patients are transferred

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Slide 26

FDA recommendations Cont. 

- Become familiar with all monitor functions, especially dysrhythmia alarms and icons on the screen, and the meanings of various alarm sounds.
- **Make sure** that new staff members, including travel and float nurses, are adequately trained on the unit's monitors before they care for patients.
- **Never** rely solely on pagers, mobile phones, and other secondary alarm enhancements for alarm communication. Learn the hospital's backup plan if monitors become dysfunctional.

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Slide 27

Evidence Based Practice: one unit's journey 

A medical progressive care unit<sup>9</sup> at a major academic medical center was assigned the following tasks:

1. Evaluate alarms and response to them in the unit
2. Standardize the hospital's approach to alarm management
3. Assess the reliability of secondary/adjunct alarm notification devices
4. Determine educational needs regarding alarm management
5. Assess new technology and systems that might improve alarm management

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Slide 28

Evidence Based Practice: one unit's journey 

**Table 2**  
Changes in default settings on monitors in the medical progressive care unit

Parameter	Before intervention	After intervention
Heart rate, beats per minute		
Low	60	50
High	120	150
Oxygen saturation, %	90	88
Limit on premature ventricular contractions, per minute	5	10
Heart rate high and low	Warning	Message
Bradycardia and tachycardia	Advisory	Warning
Couplet	Warning	Message

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Slide 29

Evidence Based Practice: one unit's journey 

- One year after completing those tasks they had a **43% reduction** in critical physiological monitor alarms.\*
- The unit-based initiative launched a revamping of alarm management for the entire institution.

\* Advisory alarms were not included.

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Slide 30

Evidence Based Practice: one unit's journey 

- **Their recommendations:**
- Ensure proper training of staff about monitoring systems
- Regular assessment and individualization of alarm parameters is essential (determine if appropriate and avoid duplicate alarms)
- Set alarm levels at actionable levels to decrease the number of nuisance alarms
- Ensure audibility and accountability of alarms
- Revise monitor alarm defaults appropriately

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Slide 31

Conclusions Dräger

- Effective clinical alarm management relies on:
  - Equipment designs that promote appropriate use
  - Clinicians who take an active role in learning how to safely use and understand their monitor's full capabilities
  - Hospitals recognizing the complexities of managing clinical alarms & devoting necessary resources to develop effective management schemes

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Slide 32

THANK YOU!



*"On the up side, you're the healthiest patient on ICU."*

Dräger

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Slide 33

References Dräger

1. Clinical alarm management and integration: issues, changes, and emerging technologies, and clinical engineering initiatives. Available at: <http://www.fda.gov/oc/ohrt/clinicalalarmintegration.pdf>
2. Edworthy J, Hillier E. "Fewer but better auditory alarms will improve patient safety." *Quality Saf Health Care*. 2002;14:212-214.
3. Hornshead D, Clark T, Yaghi D. "A National Online Survey on the Effectiveness of Clinical Alarms." *American Journal of Critical Care*. 2008;17:36-41.
4. Phillips J. "Clinical Alarms: Complexity and Common Sense." *Crit Care Nurs Clin N Am* 19 (2006) 145-156.
5. Alarm Monitor Problems FDA Patient Safety News: Show #106, January 2011.
6. Weil, K.M. "Alarming monitor problems." *Nursing* 2009; 9 (2009) 58.
7. Kowalczyk, L. "Patient alarms often unheard, unheeded." *Boston Globe*, February, 13, 2011.
8. Creighton, K, & Cuvash, M. "Monitor Alarm Fatigue - Standardizing Use of Physiological Monitors and Decreasing nuisance Alarms." *American Journal of Critical Care* 19 (2010) 36-47.
9. Brown, J, & Anglin-Regal, P. "Clinical Alarm Management: A Team Effort." *Patient Safety Focus*, March/April 2008.
10. Edworthy, J & Hillier, E. "Fewer But Better Auditory Alarms Will Improve Patient Safety." [www.patient-safety.com](http://www.patient-safety.com), May 2012.

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