September 18, 2017
12pm to 1pm

From the National Coalition for Alarm Management Safety

A JOURNEY TO REDUCE ALARM FATIGUE:
Tips on What Not to Do

Peggy Bartholomew, MHSM, RN, PMP
Project Manager
Quality Project Management
UT Southwestern Medical Center
AAMI Foundation

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Speaker Introduction

Peggy Bartholomew, MHSM, RN, PMP
Project Manager
Quality Project Management
UT Southwestern Medical Center
A JOURNEY TO REDUCE ALARM FATIGUE: Tips on What Not to Do
Conflict of Interest Disclosure

• I have no actual or potential conflict of interest in relation to this presentation.
Who is UT Southwestern?

Zale Lipshy University Hospital

William P. Clements University Hospital
Charting a Course

Operational Barriers to Impacting Alarm Reduction
Know the Destination

• Navigating uncharted territory
How many people does it take to create a project team?

18+ Members

23+ Members
Logistical Challenge

• Two hospitals
  • In 1989, Zale Lipshy opened as the first University Hospital
  • In 2000, St. Paul Hospital joined with Zale Lipshy Hospital
Clinical Alarms Management – Project Critical Path

**Areas of Focus:**
- **Adverse Events and/or High-Risk to Patients**
- **Physiologic Monitors, Anesthesia Machines, Ventilators, Infusion Pumps**
- **Pilot CVICU and Anesthesia**
- **CVICU only**
- **Task Complete**
- **Task in Progress**
- **Task Not Started**

**Key Steps:**
1. **Project Start**
2. **Establish Alarm System Safety as a priority by Leadership**
3. **Create Project Charter, Objectives, Plans, Scope, Stakeholders**
4. **Create Project Governance Structure (Project Team, Steering Team)**
5. **Assess & prioritize patient care areas for project inclusion**
6. **Assess & prioritize devices**
7. **Capture critical alarms on each device**
8. **Conduct a Patient Care Area Assessment (ECRI)**
9. **Conduct a Nursing Staff Survey (ECRI)**
10. **Assess & Prioritize all alarms on each device (ECRI)**
11. **Analyze Critical Alarm Data/Information for Critical Devices**
12. **Identify Critical Alarms that Contribute to Alarm Load/Fatigue or impact policy**
13. **Create Strategies for Reducing Alarm Load/Fatigue for Critical Alarms**
14. **Policy Standards, Checklists, White Papers, Literature**
15. **Develop Policy**
16. **Revise Policy**
17. **Finalize Policy**
18. **Alarm Load/Fatigue Reduction Activity (Testing, Alarm Config, Priority)**
19. **Clinical Education for Clinical Alarm Management**
20. **Project Stop**
Creation of a new policy

Chapter: Provision of Care, Treatment, and Services (PC)
UHPC 19 Clinical Alarm Response and Alarm Management – Hospital Policy
Move to a New Facility
Redirecting the Course

Determining When to Ask for Help

UT Southwestern Medical Center
Post-Move Observations

- Diminished sense of urgency to reduce alarm fatigue
- Generalized policy and limited expectations on managing alarms
- Lack of empowerment to manage alarms
- Delay in embracing new technology
- Increased alarm load

Alarm Fatigue
Redirecting the Course

Barriers to Impacting Alarm Reduction
Assessment

Data was analyzed to support the current baseline and analysis

**DATA SOURCES**
- Floor Plans
- SPOK Reports
- Policies & Procedures
- PIIC IX Audit Log
- Configuration Reports

**SCOPE and ACTIVITIES**
- Data Analysis
  - Monitoring alarm data for 30 days on 19 units
  - SPOK Alert data (limited) for CVICU, SICU, and MICU
  - Configuration reports
- Interviews
  - Formal with leadership & committee members
  - Informal with staff
- Observations
  - 4 units and the CMU
  - Day, night, and weekend shifts
- Reviews
  - Policies
  - Committee Meeting participants and structure

UT Southwestern Medical Center
• High occurrence of non-actionable alarms
• Lack of awareness of default settings
• Gaps in our customization processes and practices
• Gap in understanding and use of our technology
• Identified policy gaps
Hope on the Horizon

One Approach to Reduce Non-Actionable Alarms
Top 10 Alarms

- **SpO₂ Low**: 99,647
- **HR High**: 213,305
- **ECG Leads OFF**: 58,342
- **RR High**: 17,471
- **Desat 31,845**
- **Pair PVCs**: 78,160
- **HR Low**: 89,163
- **Multiform PVCs**: 49,893
- **PVC Rate High**: 21,180
- **RR Low**: 24,475
ECG Leads Off Alarm

**Hazard Report**

*ECG Leads-Off Alarms Shouldn’t Be a Low Priority*

**PROBLEM**

Many incidents have been reported to ECRI and to the U.S. Food and Drug Administration (FDA) documenting patient injury and death during an electrocardiogram (ECG) leads-off condition. Most often, these incidents occurred because a clinician ignored, silenced, or permanently disabled the leads-off alarm, and the patient experienced a cardiac arrest with near-fatal outcome. From the clinician’s perspective, leads-off alarms are often viewed as a nuisance, since they occur frequently but don’t directly signal a critical problem. In addition, they are generally set as low-priority alarms, meaning that they have a different — usually less ear-catching — tone and/or a lower volume than do critical alarms. As a result, clinicians may silence these alarms without resolving the issue.

**Is the alarm properly prioritized for UT Southwestern Medical Center?**
Alarm Categories Across Units

Medium priority arrhythmia alarms contribute to over half of all the alarms captured

Alarm Category Summary Across Units

- High Arrhythmia: 280,148 (29%)
- Medium Arrhythmia: 60,305 (6%)
- High Parameter: 38,951 (4%)
- Medium Parameter: 559,317 (58%)
- Low/Technical: 24,391 (3%

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CVICU
• Piloted arrhythmia default setting changes

MICU
• Piloted alarm parameter default setting changes

NSICU
• Piloted manual customization of all alarm settings
In Zale ICU, the following arrhythmia alarms will be customized to the patient if provider is aware that the condition is pre-existing and patient is hemodynamically stable:

**Turn OFF arrhythmia alarms** -
- Atrial Fibrillation
- Irregular HR
- Missed Beat
- Multiform PVCs

**NIBP alarms** – adjust up to 10 mmHg above/below if charge nurse agrees; consult provider for anything beyond

**Resp High/Low Limit** – allowed OFF if patient has ETCO2 monitor/alarms

**ICP Low Alarm, any temperature-related alarm** – Nurse discretion

**Discuss alarm settings or alarm setting changes with provider** –
- ART, ABP – Turning alarm settings OFF (must have either invasive pressure or NIBP alarms on)
- PAP – Turning alarms OFF
- Pause, PVCs/min, Run PVCs, spO2 High/Low, ICP High/Low, CPP High/Low, ETCO2 High, SpO2 Desat – Changing alarm limits Higher/Lower

In CVICU, the following arrhythmia alarms will be defaulted to OFF:

- Ventricular Rhythm
- Ventricular Trigeminy
- Run PVCs
- Multiform PVCs
- Pair PVCs
- Missed Beat
- Ventricular Bigeminy
- Irregular HR

In addition,
- Pause threshold has been increased from 1.50 seconds to 2.00 seconds
- PVCs/min has been increased from 10 PVCs/min to 15 PVCs/min

In MICU, the following alarm parameter changes will be piloted:

- SpO2 Low alarm delay **↑** to **15 sec**
- ART & ABP Mean Low **↓** to 65 mmHg
- Resp High Limit **↑** to 40
- PAP Systolic Low **↓** to 10 mmHg
- Resp Low Limit **↓** to 6
- CVP Alarms turned OFF
- ART, ABP, PAP, & NIBP Diastolic High & Low Alarms turned OFF

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Piloted Changes
**SBAR Communication**

- Shared with providers and nursing
- Modified event reporting system to include clinical alarms
- Encouraged staff to submit event reports or notify Nursing manager to ensure patient safety
## Pre/Post Full Implementation

<table>
<thead>
<tr>
<th></th>
<th>Total Alarms (Pre/Post Full Implementation)</th>
<th>% Change in Total Alarms (Pre/Post Implementation)</th>
<th>Total Alarms Per Bed/Per Day (Pre/Post Implementation)</th>
<th>% Change in Total Alarms Per Bed/Per Day (Pre/Post Implementation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICU</td>
<td>118,576/56,422</td>
<td>- 48%</td>
<td>173/79</td>
<td>- 46%</td>
</tr>
<tr>
<td>CVICU</td>
<td>152,043/77,933</td>
<td>- 51%</td>
<td>216/116</td>
<td>- 46%</td>
</tr>
<tr>
<td>NSICU</td>
<td>68,526/43,462</td>
<td>- 37%</td>
<td>120/74</td>
<td>- 38%</td>
</tr>
<tr>
<td>SICU</td>
<td>54,433/45,843</td>
<td>- 16%</td>
<td>81/68</td>
<td>- 16%</td>
</tr>
<tr>
<td>ED</td>
<td>79,710/49,331</td>
<td>- 38%</td>
<td>71/44</td>
<td>- 38%</td>
</tr>
</tbody>
</table>

Four weeks pre-intervention – Jan 2017
Four weeks post-intervention – dates variable
Monitoring Plan – CVICU

High/Medium/Low Alarms per Bed per Day
CVICU I Chart

Arrhythmia default changes
Full implementation

Individual Value

0.00 50.00 100.00 150.00 200.00 250.00 300.00

Period

4-Sep-16 18-Sep-16 2-Oct-16 30-Oct-16 13-Nov-16 27-Nov-16 11-Dec-16 25-Dec-16 8-Jan-17 22-Jan-17 5-Feb-17 19-Feb-17 5-Mar-17 19-Mar-17 2-Apr-17 16-Apr-17 30-Apr-17 14-May-17 28-May-17 11-Jun-17 25-Jun-17

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Monitoring Plan – MICU

High/Medium/Low Alarms per Bed per Day

MSICU I Chart

Alarm parameter default changes

Full implementation

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Monitoring Plan – NSICU

High/Medium/Low Alarms per Bed per Day
NSICU I Chart

Manual customization of default changes
Full implementation

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Monitoring Plan – SICU

High/Medium/Low Alarms per Bed per Day
SICU I Chart

Full implementation

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Monitoring Plan – ED

High/Medium/Low Alarms per Bed per Day

ED I Chart

Individual Value

Period

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Just Do It – Central Monitoring Unit

High/Medium/Low Alarms per Bed per Day
CUH-Tele
I Chart

In Progress
Sustaining the Progress & Future Plans

• Transitioning to a future Alarm Safety Committee and Process Owner
• Determining the frequency of monitoring
• Developing Standard Operating Procedures
• Sharing the data
• Continuing the progress
Lessons Learned

- Determine a governance structure
- Organize, structure, and plan efforts early
- Find a process owner sooner rather than later
- Narrow the focus
- Understand the workflow and equipment
- Educate early and often
- Ask for help if needed; know your limitations
References


Future/Ongoing Initiatives
September 25, 2017 - 12 noon to 1pm EST

**Sonia Pinkney**  PEng, MHSc | Manager, Electromedical Group, Medical Engineering, University Health Network | Human Factors Engineer, HumanEra | Adjunct Lecturer, IHPME, University of Toronto and

**Andrea Cassano-Piché**, M.A.Sc., P.Eng
Human Factors Engineering Consultant
Human Factors North Inc., Canada

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