The Alarming Challenge! Staffing Single Room NICUs and Alarm Burden

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Annual Quality Congress Breakout Session, Saturday, October 3, 2015
The Alarming Challenge! Staffing Single Room NICUs and Alarm Burden
Objective: Identify the use of real-time alarm data to guide staffing decisions in a single room NICU setting.
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Michelle Nemshak MSN, RNC-NIC, CNS / Rebecca Vartanian MD

Disclosure
Ms. Nemshak and Dr. Vartanian do not have any financial arrangement or affiliations with a commercial entity.
We will not be discussing the unlabeled use of a commercial product in our presentation.

Why Our Session?

Context #1: TJC is Coming!
• The Joint Commission mandated National Patient Safety Goal (NPSG.06.01.01)
  – Phase I: (ends December 2015)
    • Establish alarms as a hospital priority
    • Identify the most important alarms to manage
  – Phase II: (beginning in Jan 2016)
    • Develop and implement specific policies and procedures for alarm management
    • Develop a mechanism to educate staff about the purpose and proper operation of alarm systems

Context #2: Confused about Where to Start

Context #3: Seeking Clarification

Aren't tinnitus and other noise-related problems a common complaint?
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**Objective**

- Identify the use of real-time alarm data to guide staffing decisions in a single room (or any) NICU setting

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**Today’s Road Trip**

- **Stop 1:** Addressing Alarm Management
- **Stop 2:** How to identify and use pulse oximetry and/or alarm data to improve your alarm management
- **Stop 3:** Single-center experience with specific focus on the single-patient room

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**Definitions**

- **Alarm Fatigue**
  - Desensitization to audio and/or visual alarm signals resulting from excessive exposure (sensory overload).
  - Alarm fatigue has been identified as a major health hazard in reported sentinel events that have resulted in major injury or death

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**Why does it happen?**

- The majority of alarms (85-99%) are false alarms (JCAHO 2013)
  - A **false alarm**, also called a **nuisance alarm**, is the deceptive or erroneous report of an emergency, causing unnecessary panic and/or bringing resources (such as emergency services) to a place where they are not needed.
  - More alarms = More false alarms

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**Our Story**

Aim: To decrease the incidence of severe ROP (defined as >stage II ROP) in infants with birthweight <1500 grams from approximately 10% to 5% with a stretch goal of 3% by June 2013.
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Approach

Oxygen Management Guidelines

Response to High and Low Saturations

Parent Involvement

Technology

SpO₂ Alarms and Targets

<table>
<thead>
<tr>
<th>NICU Status</th>
<th>Target</th>
<th>Low Alarm</th>
<th>High Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants born ≥34 weeks, postnatal age on respiratory support</td>
<td>85-95</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td>Infants with PPHN ≥34 weeks at risk for chronic lung disease or pulmonary hypertension on respiratory support</td>
<td>90-95</td>
<td>86</td>
<td>98*</td>
</tr>
<tr>
<td>Infants born ≥34 weeks on respiratory support</td>
<td>92</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td>Term infants with persistent pulmonary hypertension</td>
<td>TBD***</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td>No respiratory support</td>
<td>88</td>
<td>TBD***</td>
<td></td>
</tr>
</tbody>
</table>

EGA/PMA Target

Low Alarm: 88-93
High Alarm: 95

Bedside Reminders

MD/NNP Response

RN/RT Response Algorithm

The Desaturating Baby

Parent Information

- With the presence of target signs and owls, parents are bound to ask questions
- There is an information sheet available to staff to facilitate discussions with parents
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Measures
• Primary Outcome Measure
  – Incidence of severe ROP in VLBW infants
• Process Measures Included:
  – % of alarm limits and targets ordered appropriately
  – % of alarm limits set appropriately at bedside
  – % of unit staff able to locate policy
  – % of time within target range
• Balancing Measure
  – Total SpO2 alarms
  – Mortality

Importance of Balancing Measure

Reaction
That’s only 6 alarms per patient per day

Important Lesson: Don’t Underestimate the Complexity of Alarm Management
• Multiple devices
• Technology configuration
• Data storage and access
• Human interaction(s)
• Responsibility and accountability
• Staffing
• Culture
• Architectural Layout
• Etc...

Where to Start: Alarm Management Steps
1. Define your problem
2. Understand your alarm system
3. Gather evidence (research or unit experience) for possible areas of change
4. Identify key drivers that influence your alarm system
5. P-D-S-A

Step 1: Defining the Problem
Medical device alarm safety

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Defining the Problem

Our Approach

Data:
- 10% of babies account for ~65-75% of alarms
- Individual alarm counts range from 0→400+

Alarm Management Steps

1. Define your problem
2. Understand your alarm system
3. Gather evidence (research or unit experience) for possible areas of change
4. Develop a driver diagram to align concepts of change with your aim
5. P-D-S-A

Step 2: Understand Your System

Simple System

Simple System
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Exercise
• Exercise
  – Diagram your alarm system
  – Discuss with your team:
    • What components do you need to know more about?
    • Who else should be a part of your team?
    • What are the opportunities for change?

“A bad system will beat a good person every time”
- W. Edwards Deming

Brandon NICU System

Alarm Management Steps
1. Define your problem
2. Understand your alarm system
3. Gather evidence (research or unit experience) for possible areas of change
4. Develop a driver diagram to align concepts of change with your aim
5. P-D-S-A

Step 3: Evidence
Now that you understand your alarm system components, review the evidence about what can be modified:
• Staffing
• Technology
• Provider Response
• Appropriate settings

Seek More Information
• Providers
  – How do you respond? What are your barriers?
• Biomedical Engineering (Clinical Engineering)
  – How does this work? Are there delays? What are the modifiable settings?
• Information Technologists
  – Where does the data go and how do I get it?
• Parents
  – What do you need to know?

Walk the Walk
• Identify your top “alarmers”
  – They are not all the same
• Observe work flow for areas to improve
  – Human response to alarms
  – Waste
  – Stress
  – Potential harm
• Talk with families--perceptions and worries
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Our Walk: Staff
• “My phone is my #1 Patient”
  – Back-up responsibilities
  – Others not answering their alarms
  – Perceived inability to silence from other rooms
  – “The Doc is just standing there and doesn’t silence the alarm”
  – Lack of clarity re: types of alarms
• Provider responses varied
  – “He’ll come up on his own”

Our Walk: Patient Assignments

Our Walk: SANS
High \(SpO_2\), Low \(SpO_2\), low heart rate all had same escalation to SANS

Our Walk: Patient Type
• Alarmers were not always who we expected
• Not all “high alarmers” require more attention
  – Does an alarm tell you what you want to know about your patient quantitatively?

Di Fiore 2012

Identifying Change Opportunities

Team Exercise
• Exercise
  – Diagram your alarm system
  – Discuss with your team:
    • What components do you need to know more about?
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Example: iNICQ Toolkit

Alarm Management Steps
1. Define your problem
2. Understand your alarm system
3. Gather evidence (research or unit experience) for possible areas of change
4. Develop a driver diagram to align concepts of change with your aim
5. P-D-S-A

P-D-S-A
• How will you know that your change is an improvement?
• Studying your changes will require you to acquire pulse oximetry or alarm data by some means

Today’s Road Trip
• Stop 1: Addressing Alarm Management
• Stop 2: How to identify and use pulse oximetry and/or alarm data to improve your alarm management
• Stop 3: Single-center experience with specific focus on the single-patient room
How to obtain and use pulse oximetry/alarm data
Steps
1. Identify potential data opportunities in your system
2. Explore the accessibility and ease of data extraction for given data opportunities
3. Prioritize data (biggest bang for the buck)
4. PDSA

Identifying Data Opportunities

“Easiest” = Electronic Data

“Automated” Data
• To become fully automated, the information must still be retrieved and packaged for clinicians
• Information technologists/Clinical Engineering must:
  – Incorporate data from separate systems
  – Query servers and manipulate data
  – Develop meaningful reports

Data Factors
• Data must have clinical value
• Data may still need interpretation
• Data may need context
  – How many alarms is too many?
  – How much time outside range is too much?
• Individuals may provide different data based on their own thresholds
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What if we don’t have capability?

Look at Your Data Opportunities
Walk the walk:
• Quantitative:
  – Bedside monitor
  – Other? Audits, hand clickers, etc
• Qualitative:
  – Staff
  – Families

Bedside Monitor
• Most bedside monitors capture a certain number of alarms
  – Estimate of alarms/day from captured alarms
    • 100 alarms in 24 hours
    • 100 alarms in 6 hours
  – SpO₂ trends
• Incorporated histogram technology
  – Use baseline percentage outside alarm settings
  – Time per day in alarm state or non-target state

Qualitative Data
• It may not be 100% accurate, but people can provide you data
  – Charge nurse could query staff
  – Nurse driven reporting (e.g. notify charge RN if alarms > X)
  – What could parents provide?

How to obtain and use pulse oximetry/alarm data
Steps
1. Identify potential data opportunities in your system
2. Explore the accessibility and ease of data extraction for given data opportunities
3. Prioritize data (biggest bang for the buck)
4. PDSA

Prioritize Data & PDSA
• Newer technology can provide volumes of data
  – Can be too much
  – Align what you want with processes
  – Look inside your institution at what other units have done
• If you will be relying on audits or other non-automated reports:
  – Use your people wisely
  – Start with one measure and evaluate usefulness and ease of obtaining
• Try it (PDSA) and see what works!
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Applying Data: Patient Care Assignments

Bringing it all Together
Using data to optimize patient care assignments

Assignments

“A focus on staffing ‘numbers’ to the exclusion of other factors is unlikely to improve patient safety and may even be detrimental to it... Beyond the basic numbers of personnel present on units and their qualifications, the critical elements of experience and expertise of nurses in caring for particular populations and of team stability are surely important”

Source: The Joint Commission Journal on Quality and Patient Safety, Volume 33, Supplement 1, November 2007, pp. 30-44(15)

Nursing Workload

• Nurses manage work at various levels
  – Unit
  – Job
  – Patient
  – Situational
• Evidence indicates nursing workload has an affect on nurse-sensitive conditions (infection, pressure ulcer, pain, etc.)
• Influence on self
  – Stress, burnout
  – Work arounds
  – Errors

Carayon & Gurses, (2006)

Nursing Care is Complex

• Competing tasks
• Physical demands
• Mental demands
  – Family, patient acuity
• Trade-off decisions
  – Decisions made between different but interacting or conflicting goals
• Interruptions
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Staffing Decisions

“A focus on staffing numbers to the exclusion of other factors is unlikely to improve patient safety…”

Making the Data Useful

“...if you have over 400 alarms two days in a row, something’s not right...action is needed”

Real Life Barometer Use

• Charge RN’s emailed alarm barometer daily
  – Used to guide nursing assignments
  – Goal: avoidance of two “Red Dots” together
  – Discussed in shift huddle
• Daily Bed Management Meeting
  – Multidisciplinary group
  – Alarm barometer has permanent spot

Real Life Barometer Use

• Strengths
  – Actual versus estimated/perceived
  – Aids in all staff knowing the “pain”
  – Aids providers
• Limitations
  – Barometer is based on past 24 hours
  – Does not capture if monitor is off or paused

Exercise

Take a few minutes to discuss how patient care assignments are determined in your unit. Map out the process that is used.

Using Data to Optimize Patient Care
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Breaking it Down
Using data to optimize patient care assignments

In Search of A New Tool

Histogram Technology

Optimizing Care at the Bedside
• Data accessible to care providers level can:
  – Decrease alarms
  – Increase satisfaction with care provided
  – Provide visual representation of patient status
• Histogram technology specifically
  – Takes complex data interpretation and makes it easy to see/use

A Bedside RN’s Perspective
• “The trends tell you how you have to respond to adjusting oxygen/support”
• “Helps to find that baby’s ‘sweet spot’”
• “I use it to help me determine if a baby is ready to wean yet or not”

“Finding this at the start of my shift was so frustrating I had to take a picture of it…this was not okay”

Overall, We Like It

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Other Interventions
Guidelines for alarm settings

Alarm Management and Response Guidelines

Alarms and Targets Discussed on Rounds

Guidelines for alarm settings

Alarm Compliance

SANS

Summary

• Data, whether quantitative or qualitative, can be useful in determining optimal patient care assignments and should be included in the staffing model
• Data that is easily accessible and interpretable can optimize the individual patient care assignment for providers