

The Philips logo is displayed in white, bold, uppercase letters on a dark blue background. The background of the entire slide features a glowing blue medical monitor screen with a white waveform and the word 'ALERT' in large, glowing blue letters.

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# The Silent Hospital, Is It Possible?

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## What Is It Noise?



WSJ.com

*“Unwanted sound  
judged to be  
unpleasant, loud  
or disruptive.”*

-Wikipedia



# The Goal Is To Effectively Manage Sound



# Sources of Unwanted Sounds For Patients & Families?

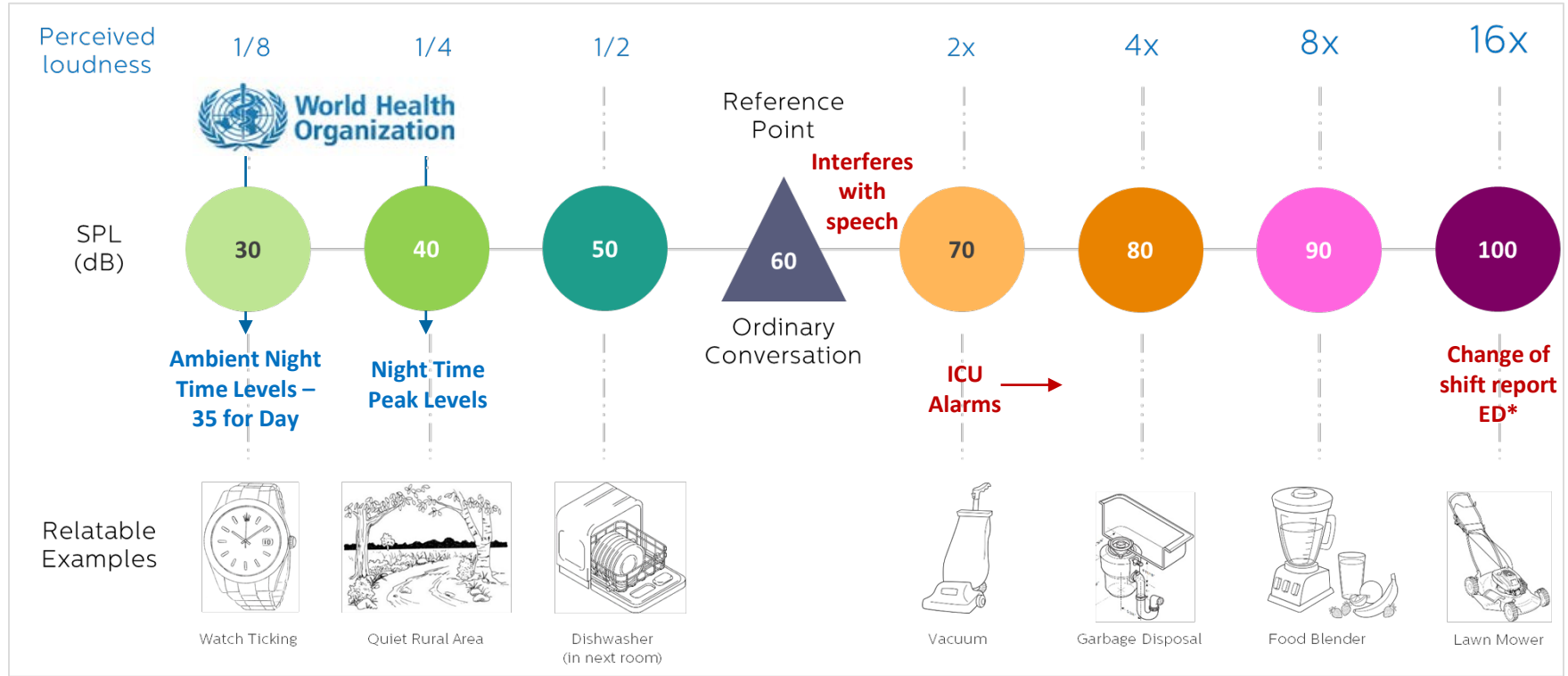
*One study identified 86 different sources of noise in the hospital environment*





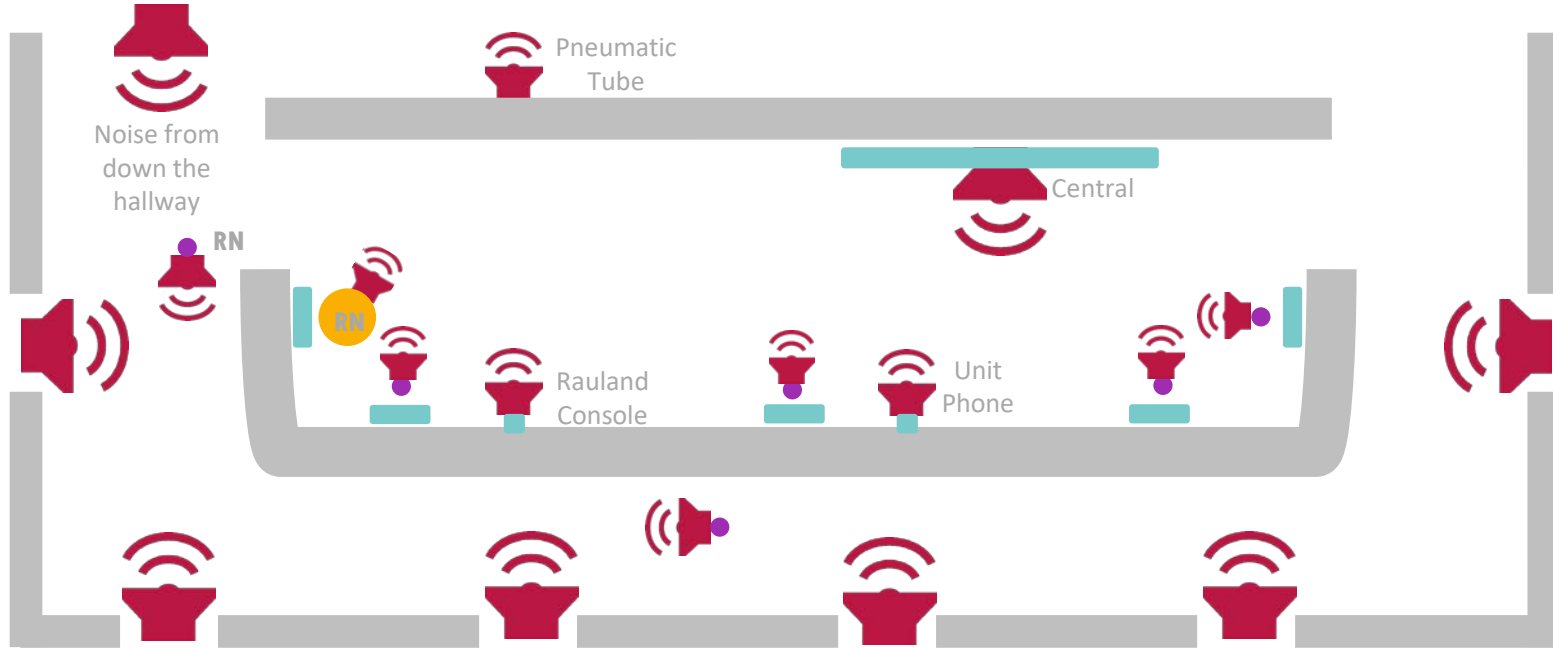
# Recommendations, Sound Levels, And Perception

*Decibel measurement is logarithmic: a 10-dB increase in noise represents a doubling of the noise level*



# Identify Areas of Noise

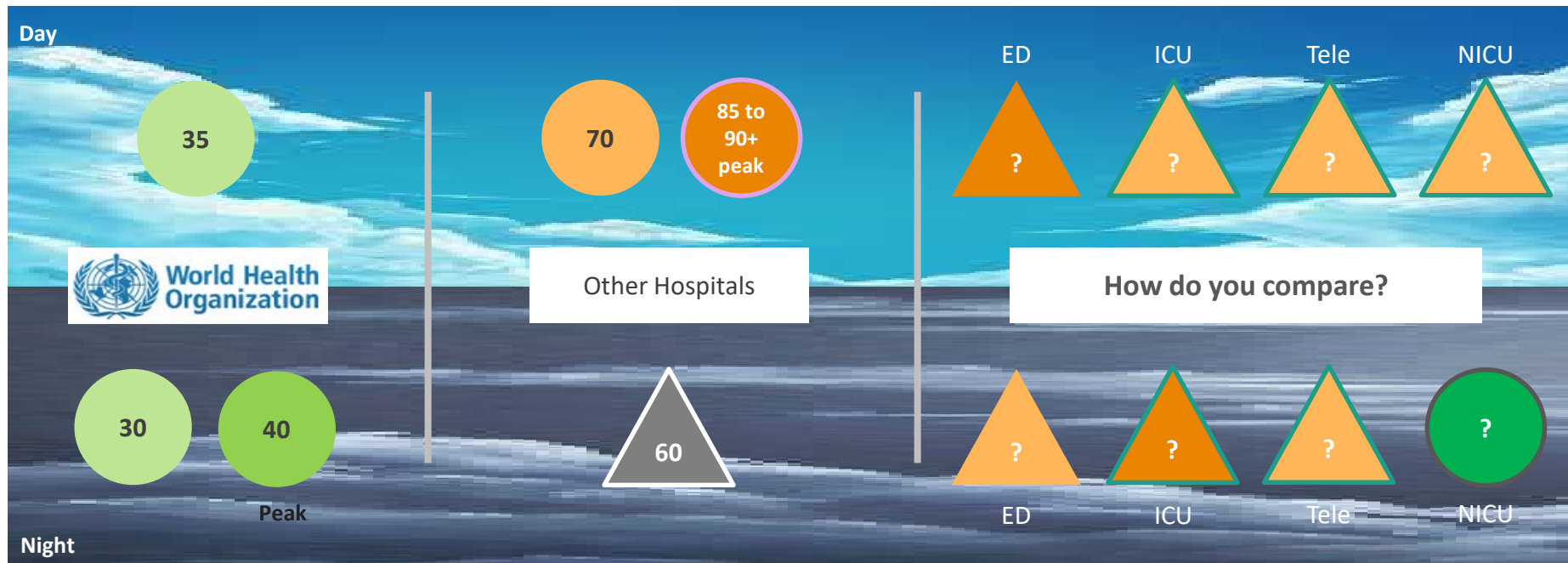
*Consider obtaining decibel levels*



(patient rm): IV pump alarms | Bed alarms | chair alarms | Med cabinet alarm, etc.



# Sound Pressure Level | Day vs. Night Recommendations & Actual



Day: 07:00 – 18:59

Night: 19:00 – 06:59

Values based on  $L_{Aeq}$

Tainter, CR: Noise Levels in Surgical ICU's Are Consistently Above Recommended Standards. Critical Care Medicine; Jan. 2016

# Potential Impact Of Noise On Adult Patients & Staff

## Physiological Risks<sup>1,3</sup> (Patients & Staff)

-  Heart Rate
-  Blood Pressure
-  Concentration
-  Wound Healing
- Aggressive Behavior
- **Impaired Sleep**
- Psychiatric Symptoms



Studies have found a correlation between noise and delayed wound healing in patients. As well, studies indicate surgical patients require more pain medication than those patients healing in quieter environments<sup>1</sup>

Sleep is an important part of the healing process . . .noise reduces both the quantity and quality of sleep, which weakens the immune system and impedes the body's ability to generate new cells. It can also lead to problems during the day, such as agitation and delirium.<sup>2</sup>

Noise disruptions impact caregivers' concentration, causing stress, fatigue, and errors, potentially affecting quality of care.<sup>2</sup>

### A Study<sup>3</sup>

Using EEG monitoring to observe sleep patterns, a study at a US hospital concluded environmental noise may impact sleep patterns of patients.

They found a strong correlation between the number of SPL peaks greater than 80 dB and arousals from sleep.

1- [https://www.medscape.org/viewarticle/574813\\_4](https://www.medscape.org/viewarticle/574813_4)

2- [Creating the Quiet Zone: Improving noise control in hospitals, July 12, 2016](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4812257/)

3- <http://europepmc.org/abstract/med/9122557>



## Other Impacts of Noise

*Medicare Reimbursement, Patient Safety, & Other Impacts*

*“During this hospital stay,  
how often was the area  
around your room quiet at  
night?”*

*-Hospital Consumer Assessment of Healthcare  
Providers and Systems (HCAHPS) survey  
question*

Per Hospital Compare, the national average response of those who reported it was quiet is 62% - this is one of the lowest rated satisfaction survey response.

A study found that “noise levels interfered with attending and resident interactions in more than a third of shift-change communication.”\*

\*Redesigning Hospital Alarms for Reliable and Safe Care by Paul Barach and Juan A. Sanchez in © Springer International Publishing Switzerland 2017 263  
J.A. Sanchez et al. (eds.), Surgical Patient Care, DOI 10.1007/978-3-319-44010-1\_17

“There is an intriguing, yet poorly understood, relationship between sleep and delirium”

Crit Care Med. 2016 Dec; 44(12): 2290–2291

# Sleep & Clinical Practice Guidelines

*Sleep was just added in 2018 as an area of focus*

“Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU.”

John W. Devlin, PharmD, FCCM (Chair)<sup>1,2</sup>;  
Yoanna Skrobik, MD, FRCP(c), MSc, FCCM (Vice-Chair)<sup>3,4</sup>; et al, Critical Care Medicine, 2018,  
p. 850

-Poor sleep is a common complaint from ICU patients

-Sleep disruption and sleep fragmentation can be significant for critically ill patients

# Recommendation

## Supplemental Table 42. Evidence Summaries and Evidence-To-Decision-Tables for Sleep Group Actionable Questions

<b>Recommendation</b>					
<b>Should a noise or light reduction strategy vs. no such strategy be used for improving sleep in critically ill adults?</b>					
<b>Balance of consequences</b>	Undesirable consequences <i>clearly outweigh</i> desirable consequences in most settings	Undesirable consequences <i>probably outweigh</i> desirable consequences in most settings	The balance between desirable and undesirable consequences <i>is closely balanced or uncertain</i>	Desirable consequences <i>probably outweigh</i> undesirable consequences in most settings	Desirable consequences <i>clearly outweigh</i> undesirable consequences in most settings
	○	○	●	○	○
<b>Type of recommendation</b>	We recommend against offering this option	We suggest not offering this option	We suggest offering this option	We recommend offering this option	
	○	○	●	○	
<b>Recommendation</b>	Apparent benefit in self-reported sleep quality, not costly				
<b>Justification</b>	May be able to be implemented in most crit care settings and many patients.				
<b>Comments during electronic voting by entire panel</b>	Low evidence, low harm The questions differ; the evidence profiles report noise OR light reduction strategies. Can we be more specific about the recommendation based on the evidence? Is it a light or noise reduction strategy, or both?				

# Implement An Alarm Management Strategy

*Reduce nuisance alarms*

“Of course, medical device alarms at the patient’s bedside present one of the biggest challenges to noise reduction strategies.”

Creating the Quiet Zone: Improving noise control in hospitals

•Published on July 12, 2016

<https://doi.org/10.1371/journal.pone.0110274>

**“Numerous deaths have been reported because of alarm fatigue, as beeps are ignored or go unheard, or because monitors are accidentally turned off or purposely disabled by staff who find the noise aggravating.”**

Boston Globe Report 2011

**5 ICUs had a total of 2.5 million monitoring alarms in a 31-day study period<sup>1</sup> –  
*the equivalent of 30 million alarms in a year***

**The majority of alarms, between 85%-99% are non-actionable.<sup>2</sup>**

**PHILIPS**

# What Makes An Actionable Alarm?

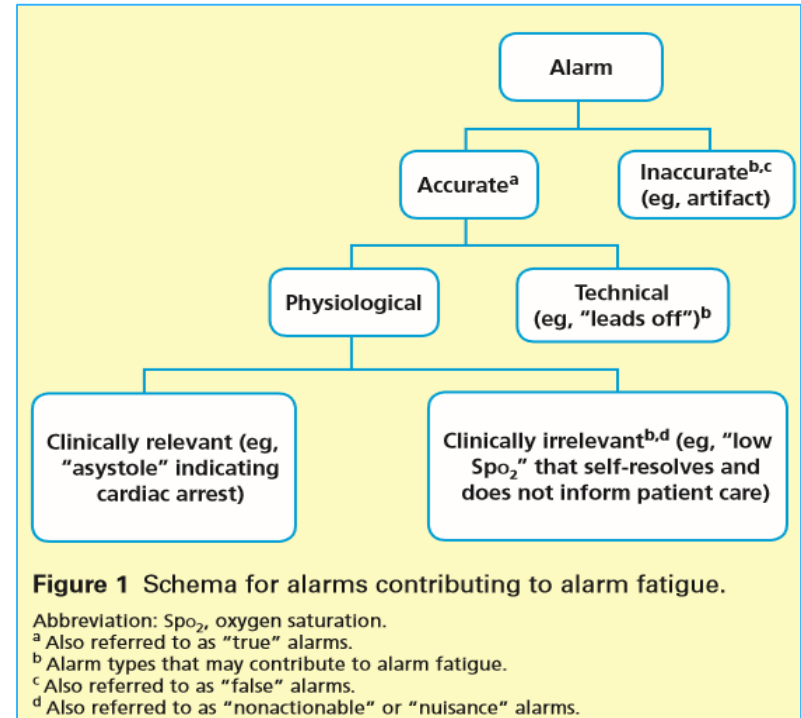
## Role of Alarm Informativeness:

### ALARM INFORMATIVENESS:

- Alarm accuracy
- Clinical relevance
  - Understanding alarm context – clinical status of the patient
  - May immediately require action
  - May be informative

### CONSIDERATIONS:

- Some unit defaults might reduce alarms but could impact patient safety by reducing nurse awareness of patient status
- Nurse driven alarm customization is important
- More research needed



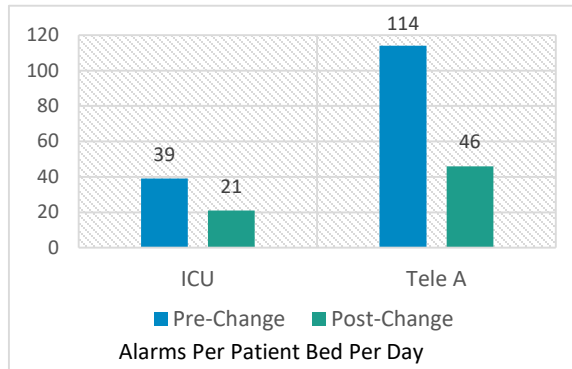
# Start With Data

Provides a foundation to identify initial default settings changes and to evaluate the impact of changes

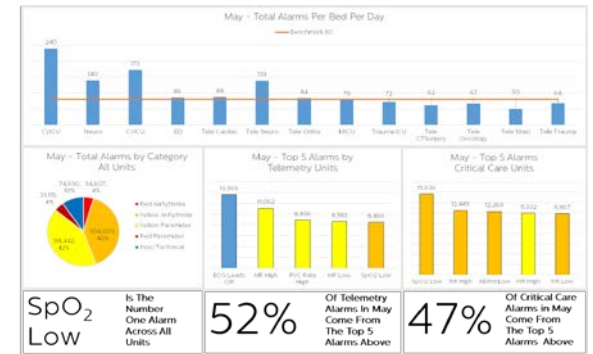
## 1 Establish a baseline



## 2 On-going assessment and impact of changes



## 3 Evaluation of sustainability of changes

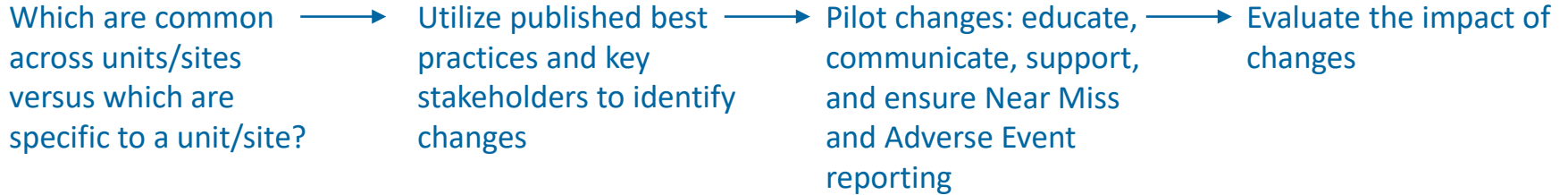


- What are the alarm triggers?
- Are alarms related? e.g. High HR and Extreme Tachycardia
- What can the user change and what is password protected?
- What metrics are important – total alarms and number of alarms per bed per day?



# Identify Areas of Focus

*Pilot changes and then make a decision of whether to implement*

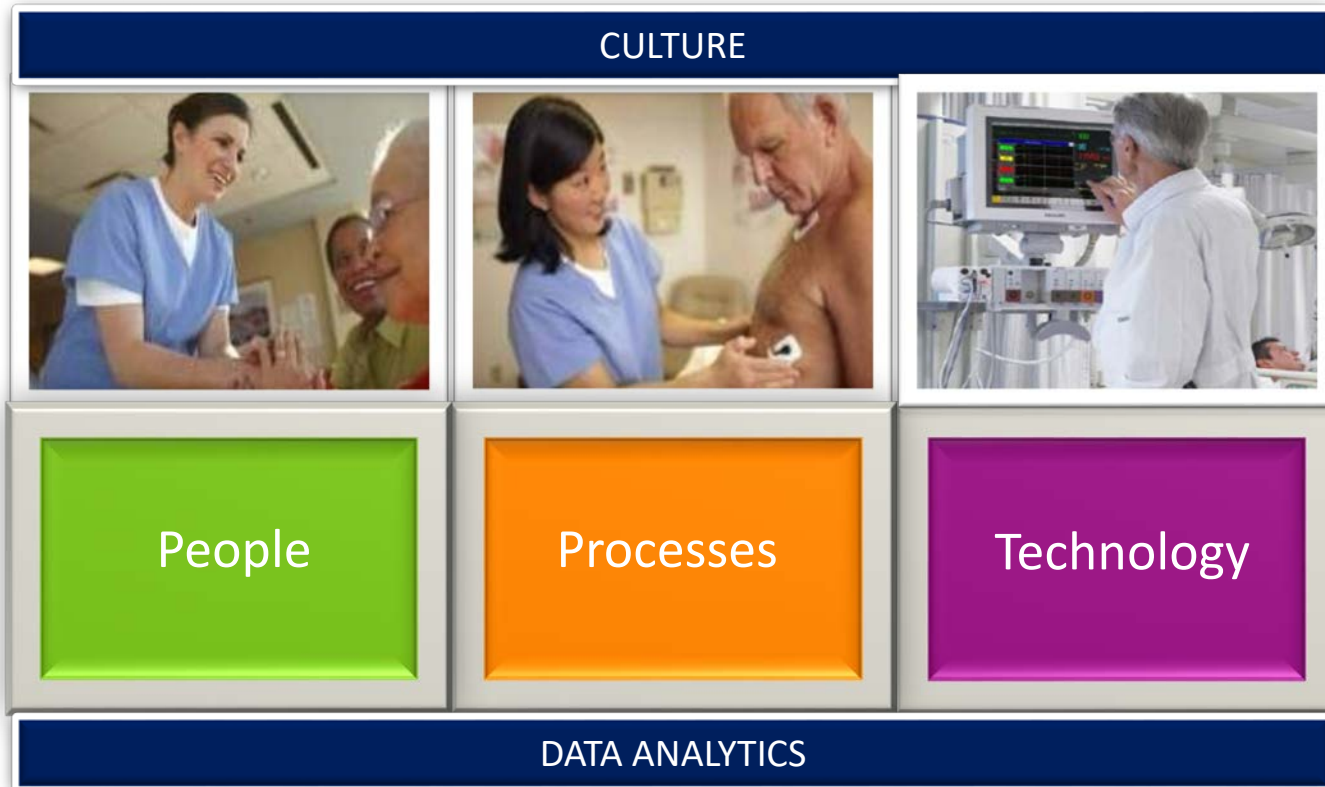


UNIT COMPARISONS- TOP 5 ALARMS			
UNIT 1	TOTAL	UNIT 2	TOTAL
HR HIGH	48,872	ECG LEADS OFF	18,417
ECG LEADS OFF	22,720	SPO2 LOW	18,073
HR LOW	21,208	HR LOW	15,637
PVCS PER MINUTE	12,871	PACER NOT PACING	10,184
PACER NOT PACING	4,381	DESAT	8,105

	Pre	Post	Percent Change
Total Yellow Arrhythmia Alarms	55,477	16,411	-70%
Total Alarms	108,264	54,920	- 49%
Total Alarms Per Patient Bed Per Day	202	129	- 36%

# Current State Assessment

*Important to understand all components from a unit, hospital, and system perspective*





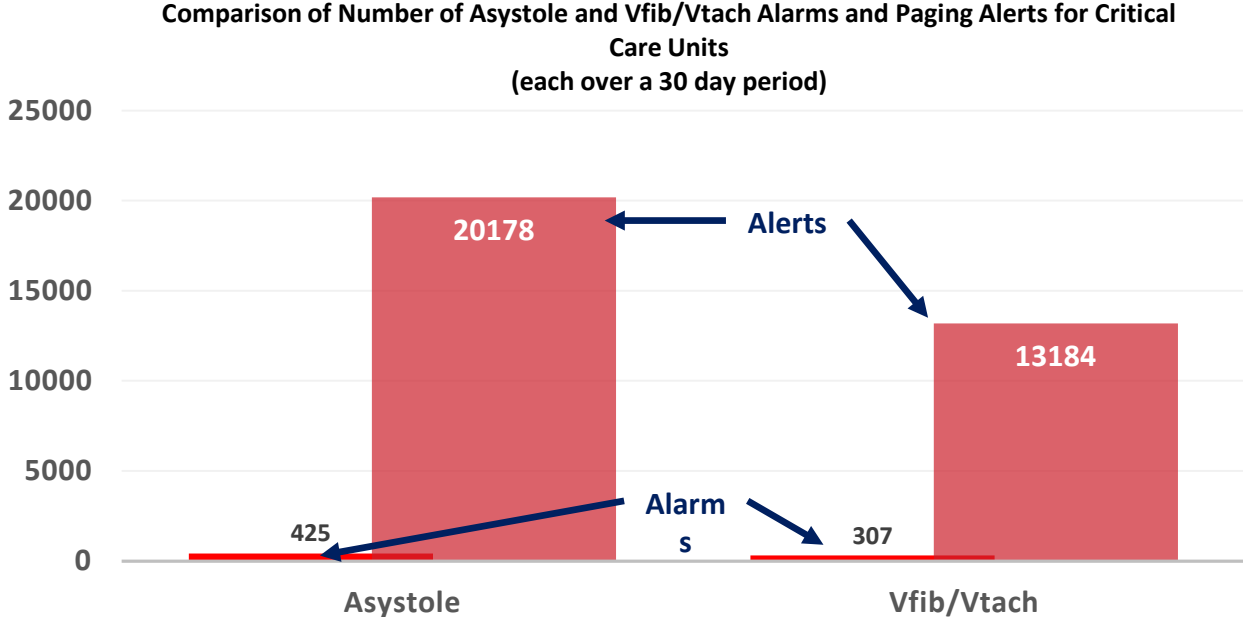
## Other Changes & Impact

*Total alarm reduction decreases noise on the units*

Unit	Change	Result	
		Total Alarms	Total Alarms Per Patient Bed Per Day
MICU	<ul style="list-style-type: none"> <li>Adjusted default limit settings for SpO<sub>2</sub> and RR</li> <li>Defaulted off some medium priority arrhythmia alarms</li> <li>Adjusted default trigger asystole</li> </ul>	↓ 39%	↓ 39%
Tele	<ul style="list-style-type: none"> <li>Defaulted off some medium priority arrhythmia alarms</li> <li>Adjusted default trigger asystole</li> </ul>	↓ 47%	↓ 47%
Peds	<ul style="list-style-type: none"> <li>Obtained appropriate size leads sets</li> <li>Initiated q24h electrode changes</li> </ul>	↓ 61%	↓ 61%
Critical Care	<ul style="list-style-type: none"> <li>Adjusted High &amp; Low HR limit and SpO<sub>2</sub> Low limit</li> <li>Defaulted off some medium priority arrhythmia alarms</li> </ul>	↓ 49%	↓ 36%
Specialty ICU	<ul style="list-style-type: none"> <li>Only changed the alarm customization process                             <ul style="list-style-type: none"> <li>Provided customization guidelines</li> <li>Provided change management support</li> </ul> </li> <li>No changes to default settings</li> </ul>	↓ 23%	↓ 26%

# Evaluate The Use & Impact Of Secondary Notification Systems

*If not utilized effectively, they can add to noise and alarm/alert fatigue*

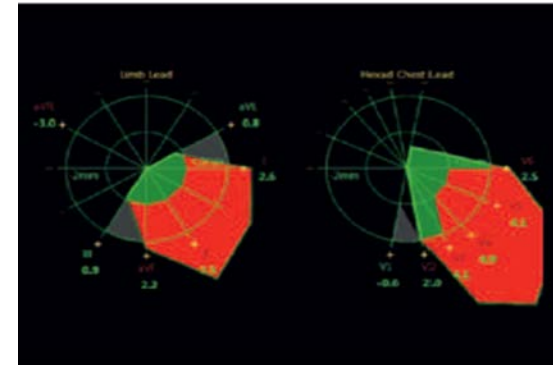
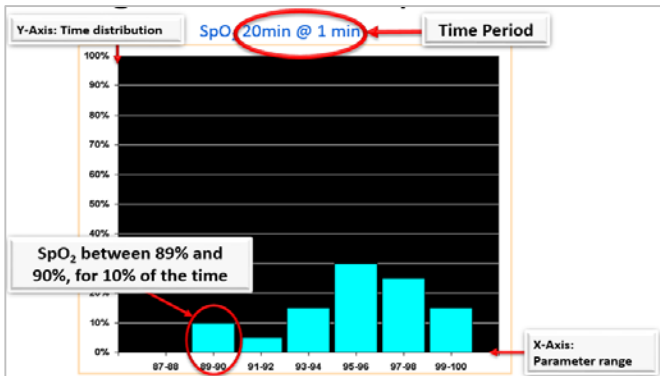
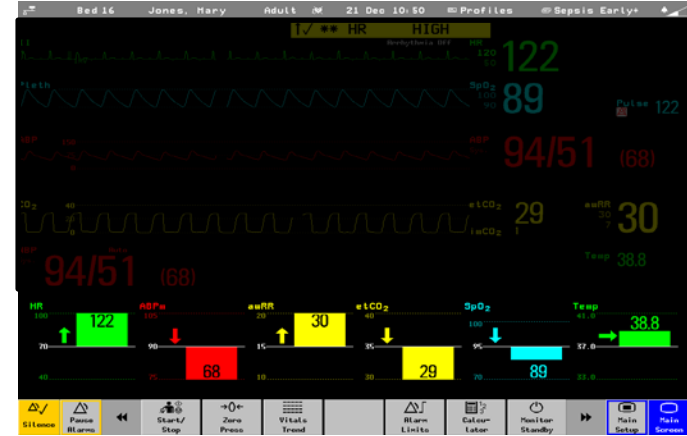


# Reducing Alarms At The Point Of Care

## *Understand technology capabilities*

Remote Alarm Device

- The Remote Alarm Device:
  - is mounted outside the room e.g. on the wall
  - provides additional visual and audible indications of alarms and tones, e.g. QRS, pulse, or prompt tones remote from the bedside
- When the caregiver goes to the bedside they can switch audio back on again with a single touch selection.



# Study Using A Bundled Strategy To Reduce Noise

## “REDUCTION OF ICU NOISE AND ALARMS WITH A NIGHTTIME NOISE REDUCTION BUNDLE AND MODIFIED ALARM PROFILE.”

Anne Marie Mattingly<sup>1</sup>, E. Kate Valcin<sup>1</sup>; <sup>1</sup>University of Rochester Medical Center, Rochester, NY Crit Care Med 2013 • Volume 41 • Number 12 (Suppl.)

-Implemented a nighttime noise reduction bundle (NNRB) including the following:

- Posting quiet hours signs
- Closing patient room doors
- Reducing IV pump and monitor volumes
- Modifying workflow to avoid precipitating alarms
- Turning off TVs and radios
- Reducing the volume of staff voices

-Patient monitoring alarm profile targeted at reducing nuisance alarms

Reduction of several metrics, including noise over 24 hours (median 54.3 to 53.0 dB,  $p < 0.0005$ ) and noise at night (median 52.8 to 51.3 dB,  $p < 0.0005$ ). Total alarms, total yellow alarms, and red arrhythmia alarms were all significantly decreased.

# Noise Reduction Opportunities

*What can you do now versus longer term?*

- Promote a quiet culture – library voice
- Dim hallway lights during night shift
- Turning off equipment not in use
- Limit overhead paging
- Equipment maintenance
- Adjust phone volumes – at desk and cell
- Implement an Alarm Management Strategy – monitors, IV Pumps, Nurse Call Systems, etc.
- Monitoring for clinical need based on guidelines
- Time non-nursing activities, e.g. restocking supplies, cleaning floors, etc.
- Use of ear plugs, eye pads, and/or soothing sounds
- Engage patients and families



## Long Term:

- Sound reducing ceiling tiles
- White noise devices
- Private rooms
- Planned location of elevators and ice machines
- Staff and transport hallways separate from patient rooms
- Staff rooms for communication

“The goal is not to silence your organization, but to have the sound of your hospital reflect your mission and values.”

(From: “Runaway Noise in the Hospital” Susan E. Mazer in H&HN Daily, 6/19/2014)

