


Alarm Safety Update: Are You Ready?

October 5, 2015

LinkedIn Questions

Join our group ™

Please post questions about alarms on the
AAMI Foundation's LinkedIn page:

<http://www.linkedin.com/groups/Healthcare-Technology-Safety-Institute-HTSI-4284508>

Disclosures

- Nothing to Disclose

History of NPSG's...

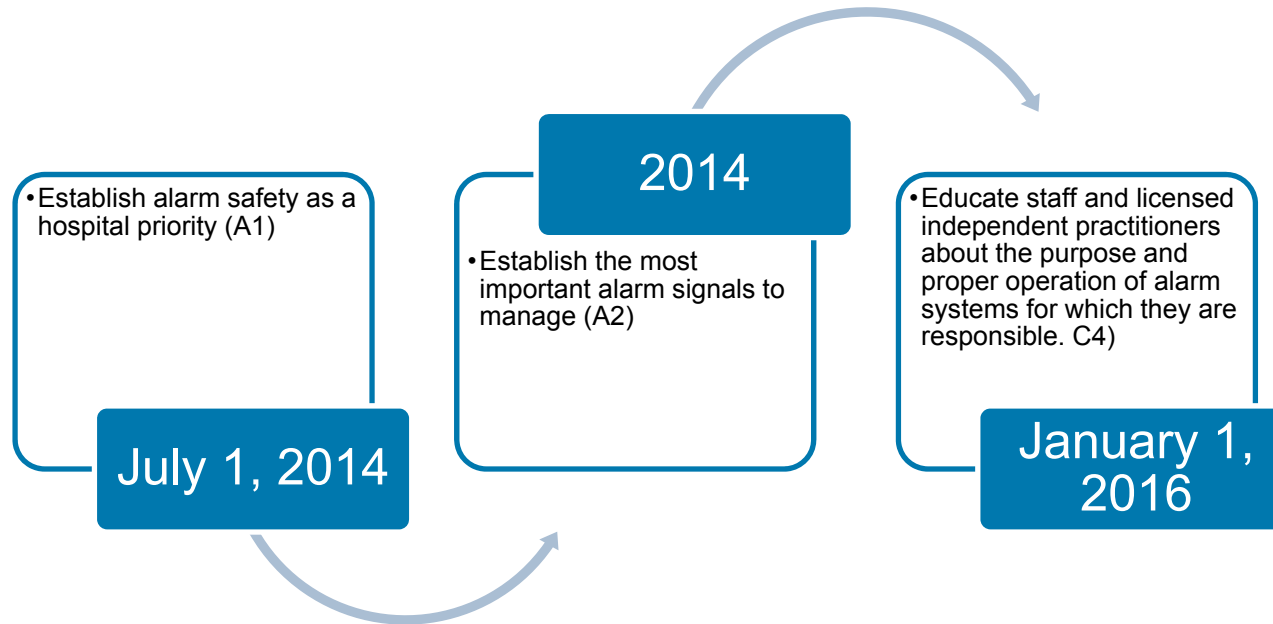
- ❖ The Joint Commission first implemented the first set of NPSG's for healthcare organizations in **January 1, 2003.**
- ❖ **Hospital Accreditation** is dependent on compliance with the NPSG's.



Alarms Safety

NPSG.06.01.01 *Make improvements to ensure that **alarms** on medical equipment are **heard and responded to on time.***

Improve the safety of clinical alarm systems



Unintended Consequences — Patient Death

2014:

- 62 -year old was admitted to a ICU at 0540.
- Patient becomes agitated.
- Multiple alarms for “cannot analyze ECG and Sinus tachycardia were occurring for this patient and bradycardia for another patient.
- Dr. ordered 0.5 mg Ativan for this patient and another patient who was bradycardic.
- At 0724, Nurse A says “why don’t we turn them off”(alarms)
- Tele strip shows patient going from sinus tachycardia to ventricular tachycardia (no alarm sounds).

Unintended Consequences— Patient Death (cont'd)

- 0737 – Red alarm apnea, silenced at central monitor – unable to determine who silenced it.
- RN going into another patient room notices that her patient in room #2 doesn't look right.
- The monitor shows PEA and nurse does sternal rub.
- Primary hospitalist enters and states “The patient looks dead”.
- Nurse cannot find a pulse.
- Charge nurse arrives and asks “why aren't alarms going off?”
- Nurse states she turned them off.
- 0747 - Code discontinued, no return of spontaneous circulation.
- Nurse states alarms were not turned off, “I silenced them”.

Medical device alarm safety

Scope of problem

100s → 1,000s → 10,000s

100s of alarm signals per patient, per day = 1,000s of alarm signals on each unit = tens of thousands of alarm signals throughout a hospital per day

85-99% of alarms don't require clinical intervention

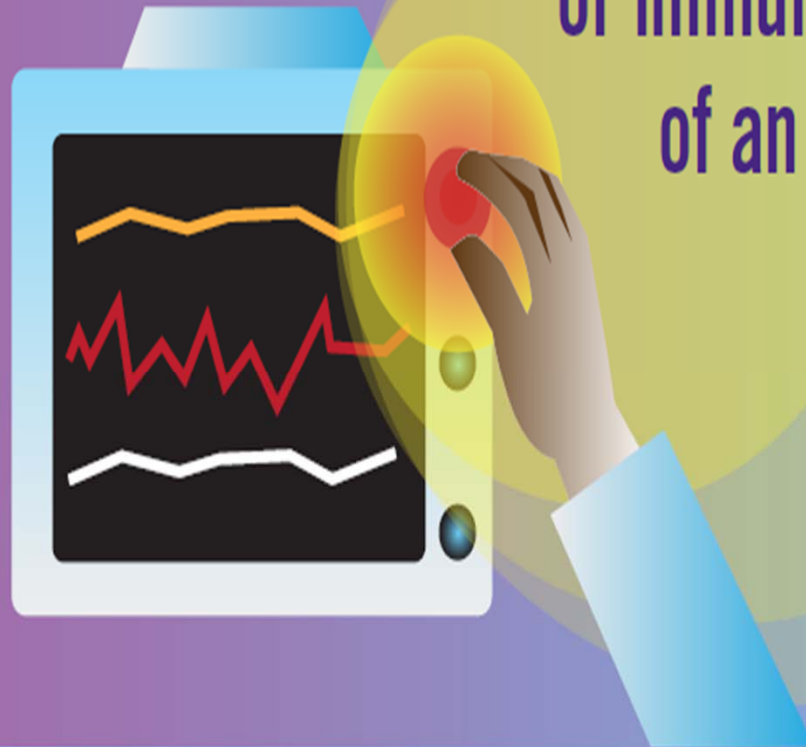
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Defining the Problem

Alarm Fatigue

Clinicians become desensitized, overwhelmed or immune to the sound of an alarm.



Fatigued clinicians may:

- Turn down alarm volume
- Turn off alarm
- Adjust alarm settings

These actions can have serious or fatal consequences.

Factors that should be taken into consideration include (Joint Commission, 2013):

- Necessity of the alarm
- Risk if the alarm goes unanswered or fails
- Review of related facility adverse events, current best practices, and guidelines
- Engagement of clinicians

Alarm Related Sentinel Events 2010-2015*

Event Category	Number of Incidents
Anesthesia-Related Event	2
Criminal Event	3
Delay in Treatment	25
Elopement	3
Fall	57
Infant Abduction	1
Maternal Death	1
Med Equipment-Related	23
Medication Error	4
Op/Post-op Complication	3
Other Unanticipated Event	3
Perinatal Death/Injury	3
Radiation Overdose	1
Restraint-Related Event	1
Suicide	3
Ventilator Death	5
Total	138

* The reporting of most sentinel events to The Joint Commission is voluntary and represents only a small portion of actual events. Therefore, these data are not an epidemiologic data set and no conclusion should be drawn about the actual relative frequency of events or trends in events over time.

NPSG 06.01.01

Standards Not Compliant	% Standards Not Compliant	Standard Comp No EPs Scored	% Standard Comp No EPs Scored	Standards Not Applicable	% Standards Not Applicable	Tot Svys	Net Applicable Surveys
5	0.71%	697	99.29%	1	0.14%	703	702

Standards Compliance Report for 1/1/2015 to 6/30/2015, State = *ALL*, Program = *ALL*, run on: 7/15/2015 8:45:02 AM

NPSG on Alarm Mgmt.

- **Phase II (as of January 2016)**

Hospitals will be expected to have:

- developed and implemented specific components of policies and procedures that address at a minimum:
 - Clinically appropriate settings
 - When they can be disabled
 - When parameters can be changed
 - Who can set and who can change parameters and who can set to “off”
 - Monitoring and response expectations
 - Checking individual alarm signals for accurate settings, proper operation and detectability
- educated those in the organization about alarm system management for which they are responsible

Recommended Approaches

- Consider appointing the interdisciplinary committee early, to focus on baseline data and potential solution development
- Evaluate risks in each area where alarms are used:
 - Begin with identification of all alarm types and locations
 - Measure baseline (numbers per day, staff and patient comments, etc)
- Evaluate solutions specific to each area; assign department “champions” to help; set goals for alarm management
- Develop an interdisciplinary policy that reflects continued evaluation and revisions, as needed

D

Final Recommendations

1. Engage leadership support and form a multidisciplinary Alarm Management Committee
2. Measure and Analyze the problem
3. Use data to make improvements
4. Perform an inventory-risk analysis
5. Use a rapid cycle process improvement approach
6. Identify best methods to notify staff of alarm signals
7. Develop an alarm policy
8. Sustain educational efforts

Topic Details

Friday 2:26 CST, August 9, 2013

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News and Alerts**[Sign up here](#)

Topic Library Item

Sentinel Event Alert Issue 50: Medical device alarm safety in hospitals

April 8, 2013

[Download This File](#)

Many medical devices have alarm systems. These alarm-equipped devices are essential to providing safe care to patients in many health care settings; clinicians depend on these devices for information they need to deliver appropriate care and to guide treatment decisions. However, these devices present a multitude of challenges and opportunities for health care organizations when their alarms create similar sounds, when their default settings are not changed, and when there is a failure to respond to their alarm signals.

Additional resource:Podcast: [Take 5 with The Joint Commission: Medical Device Alarm Safety](#)

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Alarm safety webinar – May 1, 2013

May 2, 2013

Sentinel Event Alert Issue 50: Medical device alarm safety in hospitals, highlights important issues and approaches to improving safety surrounding alarm-equipped medical devices in hospitals. To stimulate further discussion on this important patient safety issue, The Joint Commission held a web conference featuring an ECRI Institute representative and staff from Boston Medical Center who discussed their successful Cardiac Alarm Management Pilot.

The May 1, 2013 webinar on alarm safety

- [Hear the replay](#)
- [Read the transcript](#)

Speakers:

- Jim Keller, vice president of Health Technology Evaluation and Safety, ECRI Institute
- From Boston Medical Center:
 - Deborah Whalen, M.S.N., M.B.A., APRN, FAHA, clinical service manager and nurse practitioner for Cardiology
 - Patricia Covelle, B.S.N., M.M., R.N., director of Critical Care Nursing
 - Jim Piepenbrink, BSBME, director of Clinical Engineering
- Ron Wyatt, M.D., medical director, Division of Healthcare Improvement, The Joint Commission

Questions?

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Audible alarms and alerts: Implementing a bundled set of interventions to improve alarm response 10/05/15

Maria Cvach, DNP, RN, FAAN

JHHS Clinical Safety Specialist, Armstrong Institute for Patient Safety
and Quality

Sharon H. Allan ACNS-BC, MSN, RN, CCRC

JHH CVSICU Clinical Nurse Specialist



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Cardiovascular Surgical Intensive Care Unit (CVSICU)

- 18 bed high acuity surgical ICU with rapid changes in vital signs
- Population served- bypass & valve surgical procedures, heart and lung transplants, extracorporeal membrane oxygenation
- Large unit with private rooms; 3 nursing stations; no central monitor watcher; nurses used both Wi-Fi phones and pagers

Baseline CVSICU Monitor Alarm Assessment

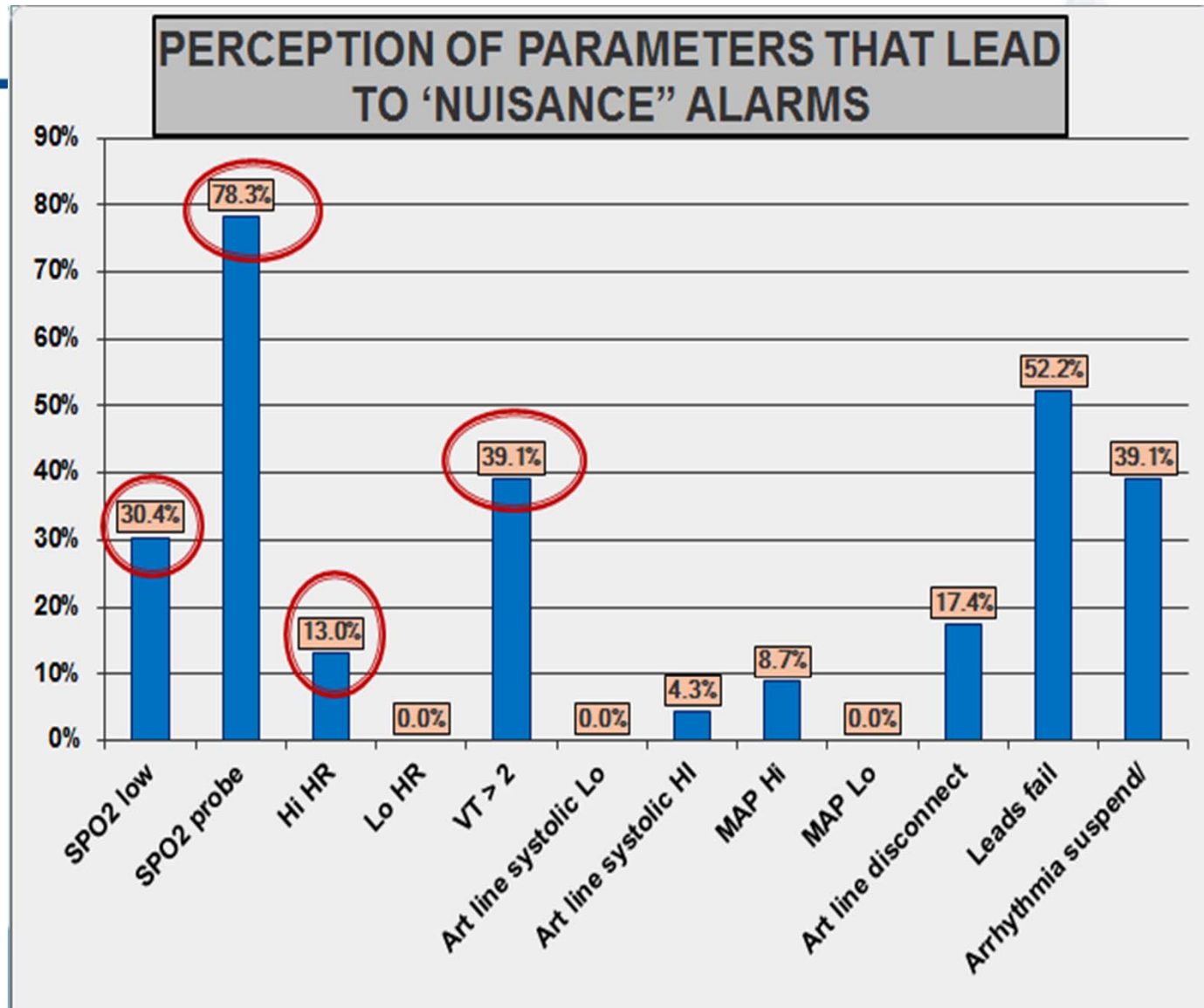
Weekly Report	CVSICU
Ave Beds Reporting Alarms/ Day	14
High Priority	186 (1%)
Medium Priority	1972 (9%)
Low Priority	16080 (77%)
Technical	2603 (12%)
TOTAL ALARMS	20841
Ave Alarms/Bed/Day	208

**Staff Performance on Audibility
Recognition Test
Baseline**

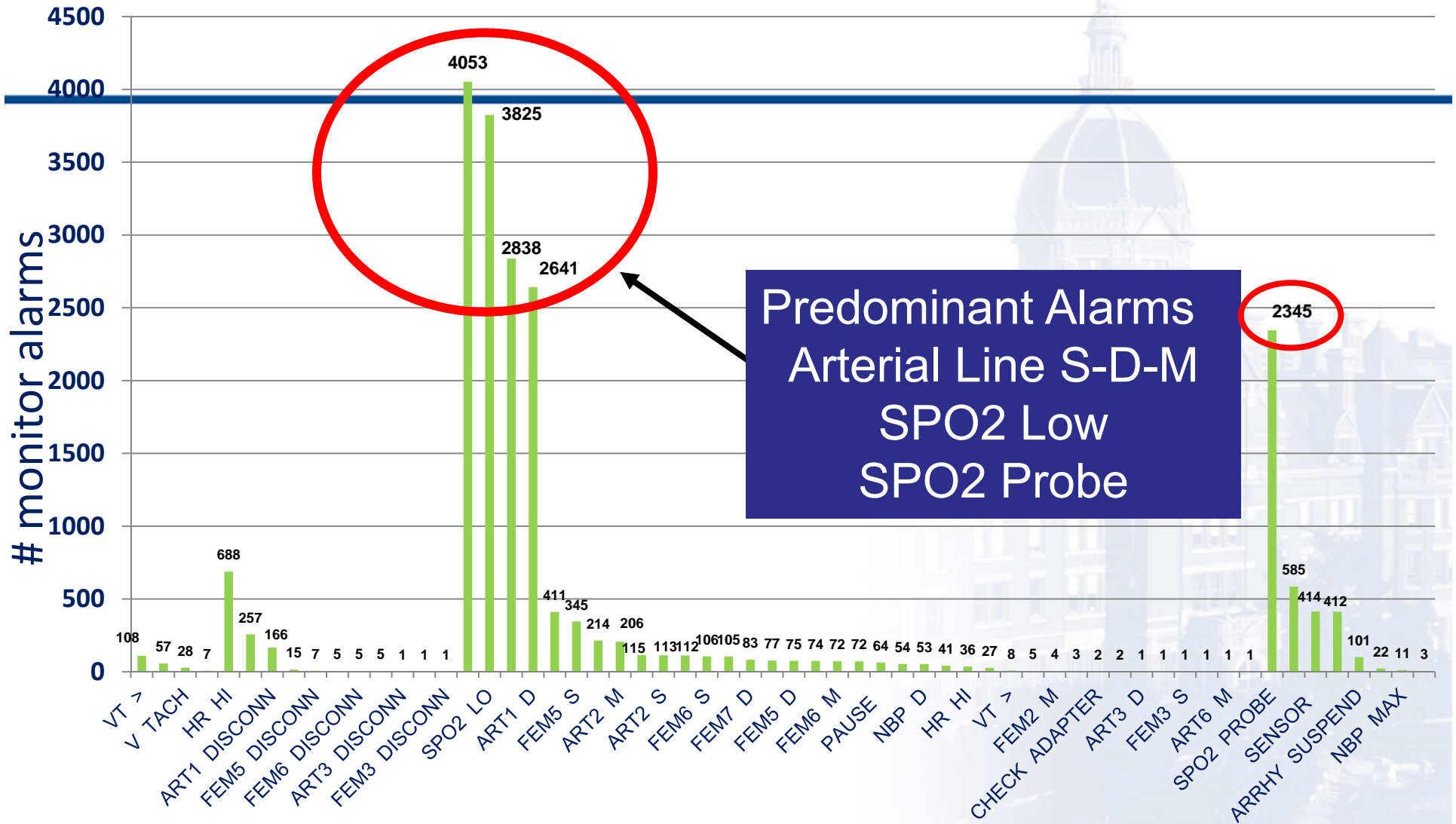
- **25 CVSICU Bedside Nurses**
 - >6 m \leq 2 years
 - >2yr \leq 5 years
 - > 5 years
- **3 trials - 17 common unit alarms**
- **Sounds randomly administered using headphones**
- **10 sec for each sound**
- **Staff had to state the name of the alarm (i.e. nurse call, monitor, WiFi phone, pager) and state the reason for the alarm (i.e. staff emergency, lav emergency, crisis)**

Tone	Accuracy in identifying tone (n = 75)
• Nurse Call System Alert - Patient Normal Call	100%
• Wi-Fi Phone Alert – Voice Call	100%
• Cardiac Monitor Alert - High Priority Patient Alarm and Hallway Waveform Screen Alarm	84%
• Wi-Fi Phone Alert - Code Blue, Lavatory Emergency	68%
• Cardiac Monitor Alert - Low Priority Advisory Alarm	68%
• Nurse Call System Alert - Code Blue	67%
• Nurse Call System Alert - Staff and Lavatory Emergency	67%
• Cardiac Monitor Alert - High Priority Technical Alarm	67%
• Wi-Fi Phone Alert - Disconnect or Text Message	67%
• Nurse Call System Alert - Lavatory Patient Assist	63%
• Pager - Monitor Crisis Alert	60%
• Pager - Monitor Non-Crisis Alert	57%
• Cardiac Monitor Alert - Medium Priority Patient Alarm	36%
• Nurse Call System Alert - Equipment or Ventilator Alarm	25%
• Cardiac Monitor Alert - Low Priority Technical Alarm	11%
• Nurse Call System Alert - Staff Normal Call or Disconnect	3%
• Wi-Fi Phone Alert - Staff Call, Patient Call, or Lavatory Assist Alert	0%

Nurse Survey Results



CVSICU Weekly Alarm Report Detail



Predominant Alarms
Arterial Line S-D-M
SPO2 Low
SPO2 Probe



CVSICU Alarm Reduction Project

Does a bundled set of alarm reduction interventions:

- *↓ quantity of alarms/bed/day;*
- *↑ alarm response time,*
- *↑ audible alarm recognition, and*
- *Improve staff alarm attitudes*

Timeline for Bundled Set of Interventions

Phase 1A Roll out Mid-Oct 2014

1. SPO2 “probe off” change to system advisory
2. SPO2 alert trigger decrease from 89 to 88
3. SPO2 alert add 15 sec delay to alert trigger
4. VT>2 crisis default – changed from crisis to advisory
5. Silence the hallway waveform monitors

Phase 1B Roll out Feb 2015

1. High HR threshold increased from 120 to 130 bpm
2. BP default threshold increased from 150 to 170 mmHg
3. BP diastolic low limit decreased to 30 mmHg

Phase II Roll out Feb-Mar 2015

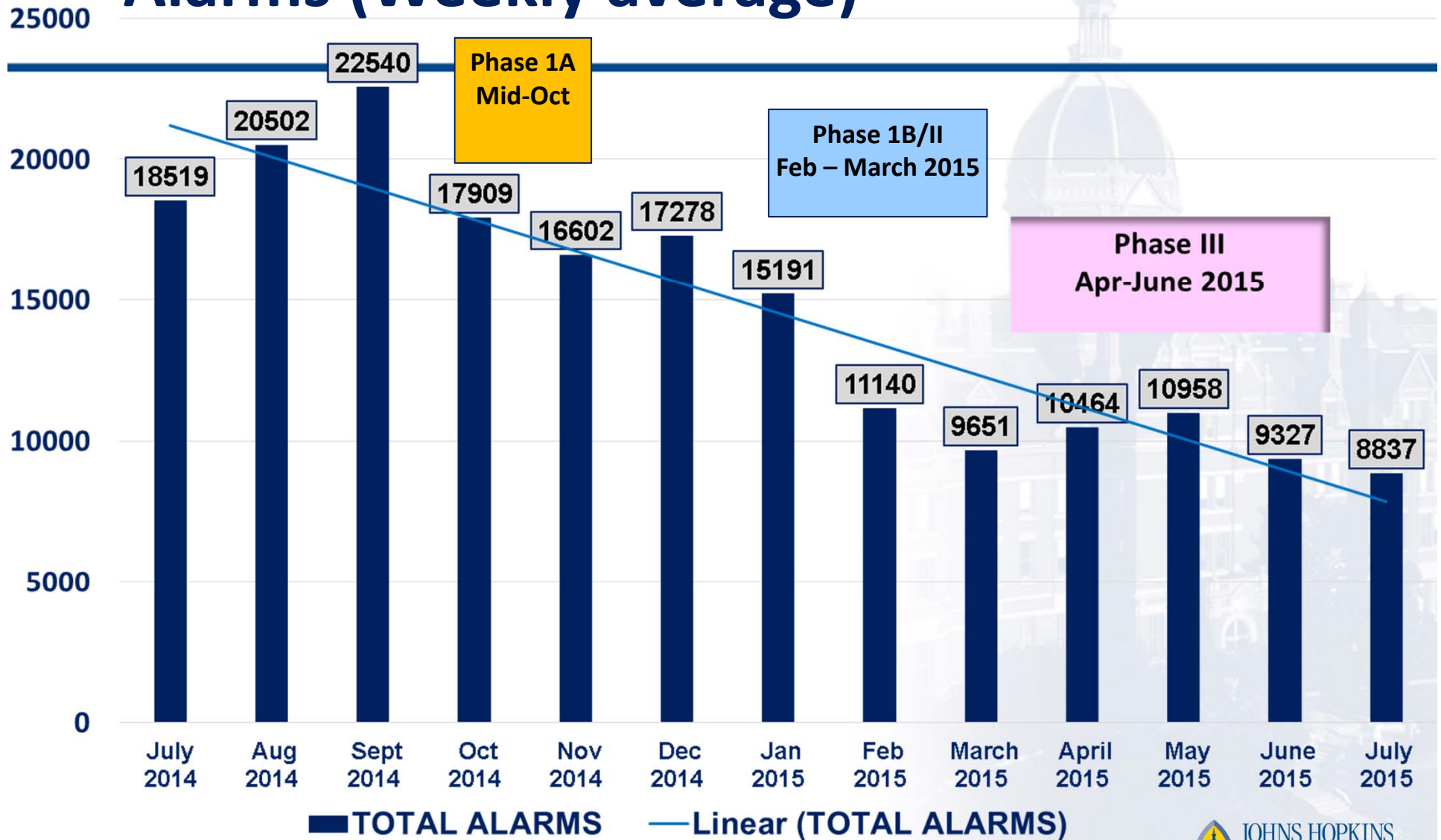
1. Audit compliance of nurse customization of alarms (Alarm Flood Reports)
2. 1:1 feedback with nurse on customization of alarms

Phase III/IV Roll out Apr-Jun 2015

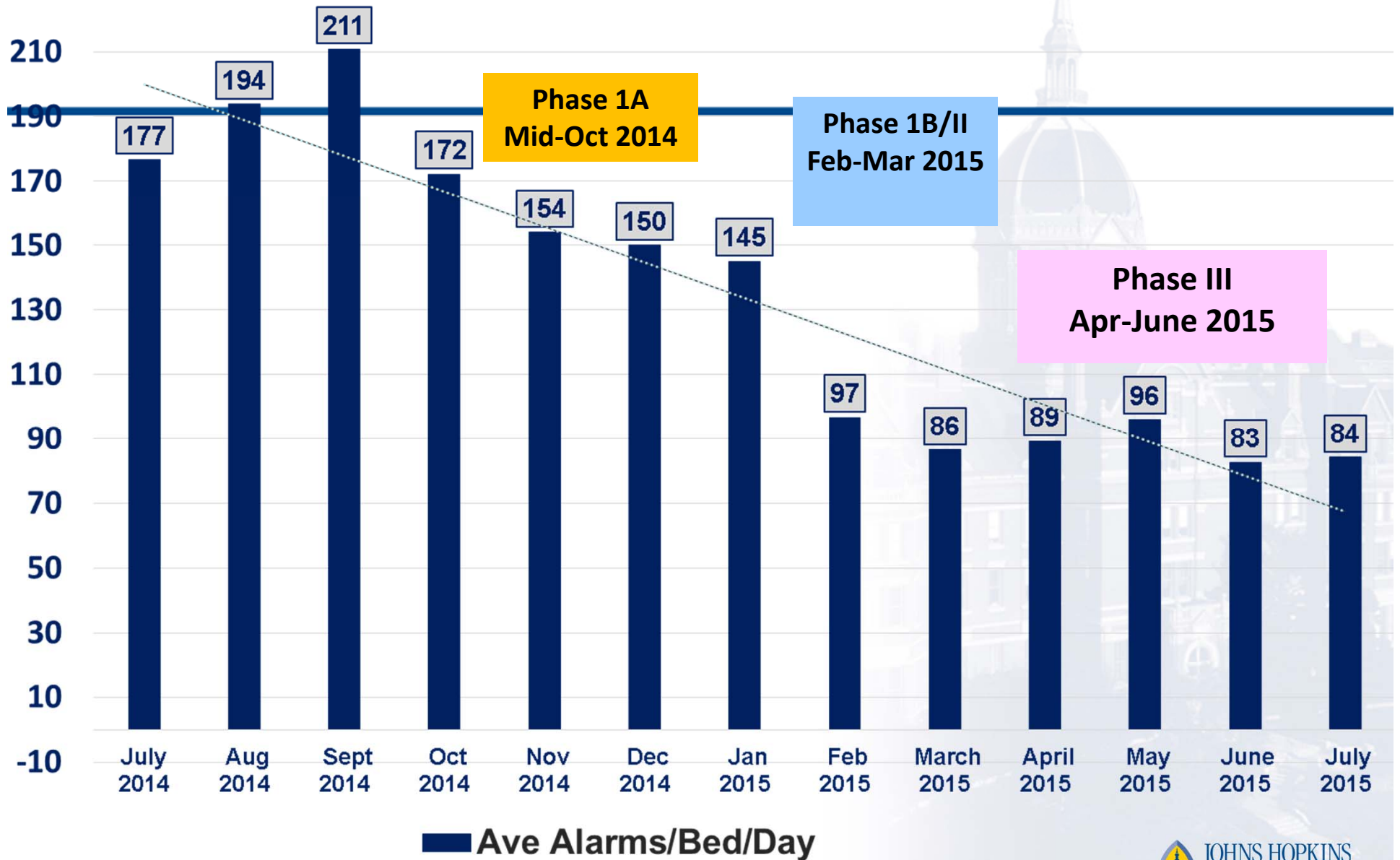
1. Begin sending monitor alerts to wifi phones and retiring Phys Mon Pagers
2. Post test Nurse Alarm Perception Survey
3. Utilize flood data reports to monitor sustainability of intervention positive effect

Work Breakdown Structure	Planning	Implementation	Evaluation
<u>AIM #1</u> Decrease quantity of alarms	CVSICU Timeline 18 months	Monitor alarm data extraction CES	Alarms/bed/day
<u>AIM #2</u> Decrease time to alarm response	CVSICU Timeline 18 months	Monitor alarm duration CES	Duration alarms/day
<u>AIM #3</u> Increase audible alarm recognition	CVSICU Sample: 25 staff members 6m-2y; 2-5y; >5y Pre/post	17 CVSICU audible alarm signals (3 trials; random order)	% correct pre/post
<u>AIM #4</u> Improve staff attitudes about alarms	CVSICU alarm survey pre/post	Online survey tool	Pre/post survey

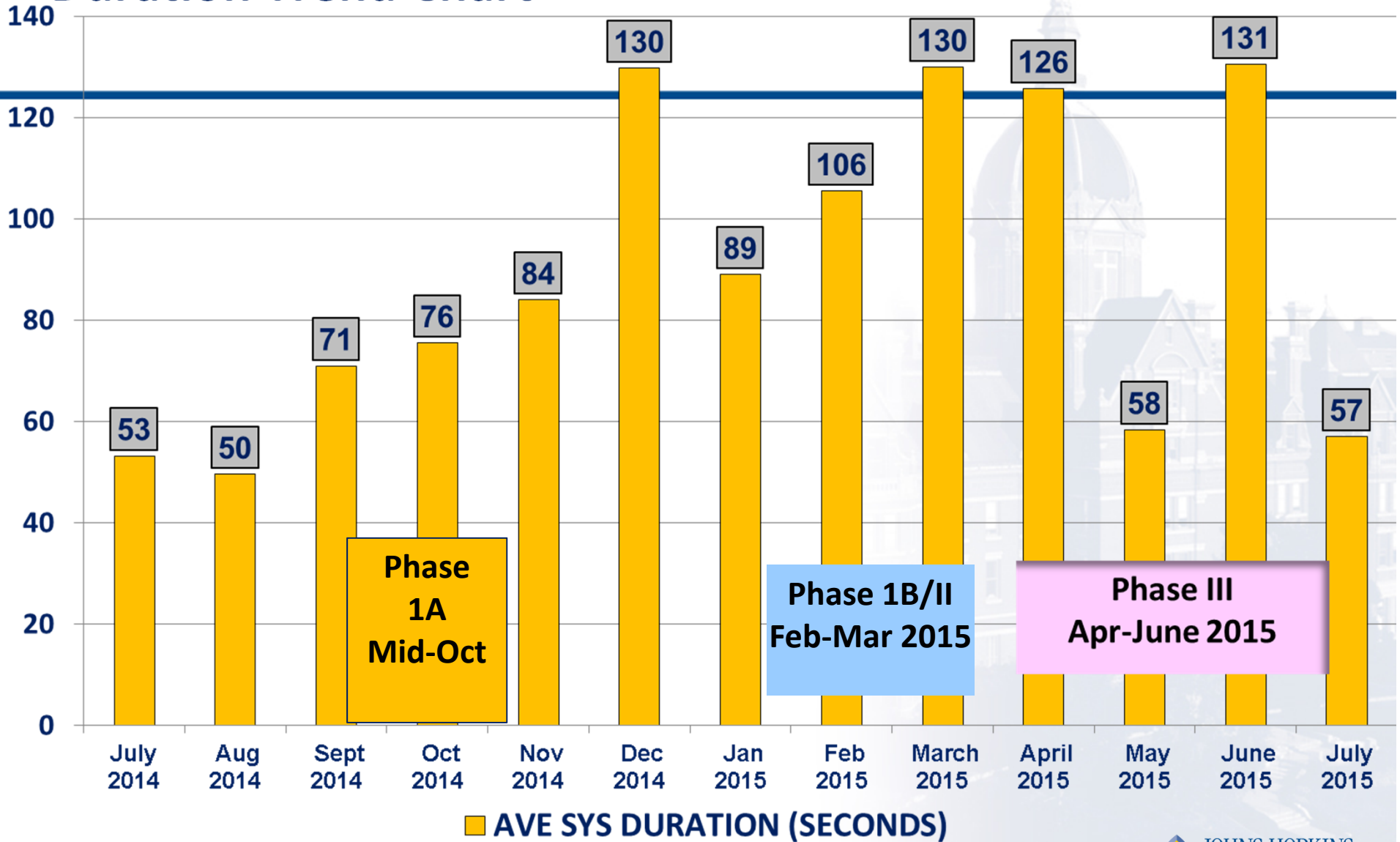
Evaluation Aim 1: CVSICU Total Monitor Alarms (Weekly average)



Evaluation Aim 1: CVSICU Alarms/Bed/Day



Evaluation Aim 2: CVSICU Technical Alarm Duration Trend Chart



Education and Sustainability Plan

Phase 1A Roll out Mid-Oct

1. SPO2 “probe off” change to system advisory
2. SPO2 alert trigger decrease from 89 to 88
3. SPO2 alert add 15 sec delay to alert trigger
4. VT>2 crisis default – changed from crisis to advisory
5. Silence the hallway video feed monitors

Phase 1B Roll out Feb 2015

1. Re-routed hallway waveform screen displays to minimize noise
2. High HR threshold increased from 120 to 130 bpm
3. BP default threshold increased from 150 to 170 mmHG
4. BP Diastolic default decreased to 30 mmHg

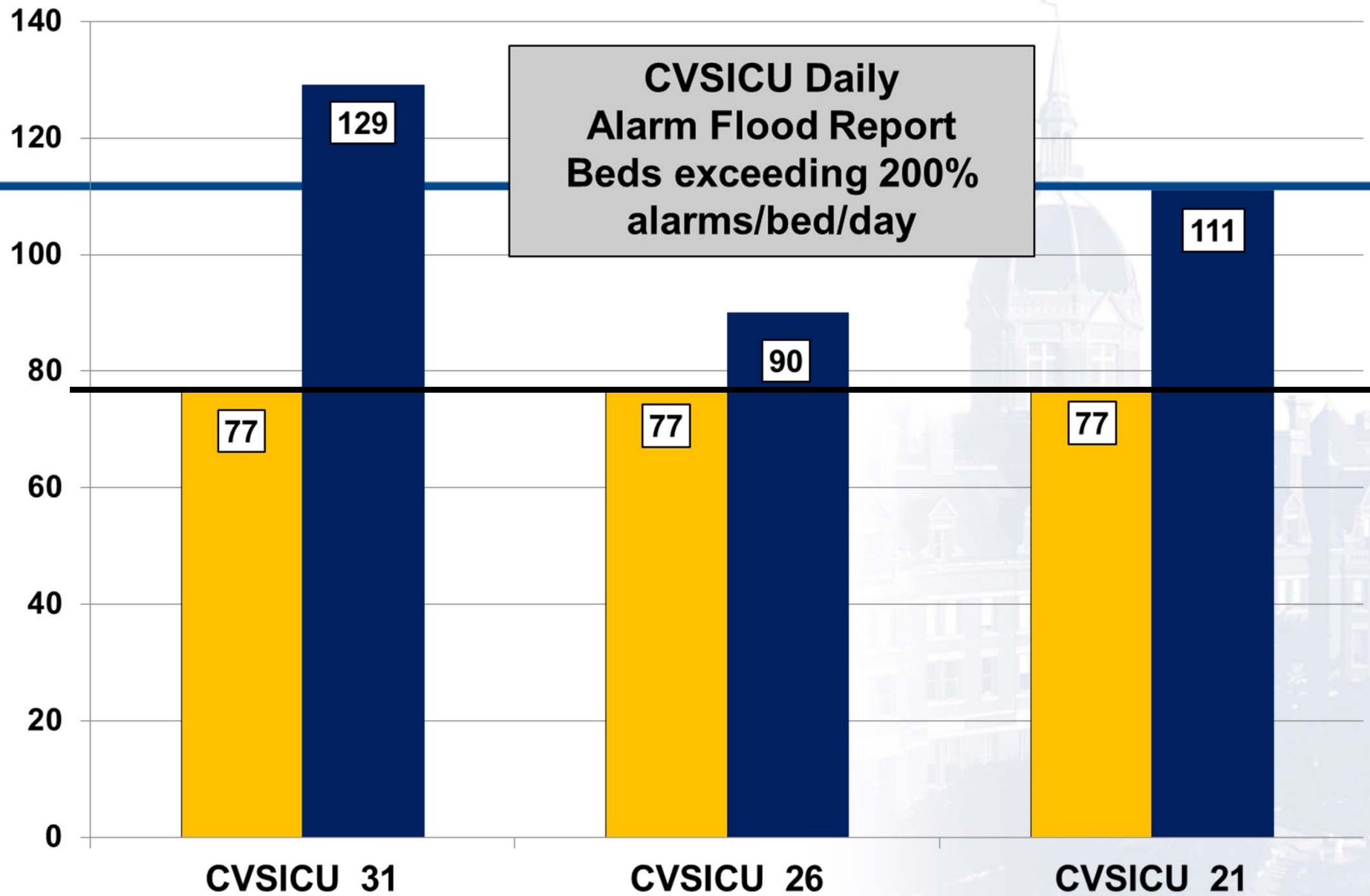
Phase II Roll out Feb-Mar

1. Audit compliance of nurse customization of alarms (Alarm Flood Reports)
2. 1:1 feedback with nurse on customization of alarms

Phase III/IV Roll out

1. Begin sending monitor alerts to wifi phones and retiring Phys Mon Pagers
2. Post test Nurse Alarm Perception Survey
3. Utilize flood data reports to monitor sustainability of intervention positive effect

**CVSICU Daily Alarm Flood Report
Beds exceeding 200% alarms/bed/day**



■ Ave Alarm in 7 Days

■ CURRENT TOTAL ALARM

Alarm Flood Report

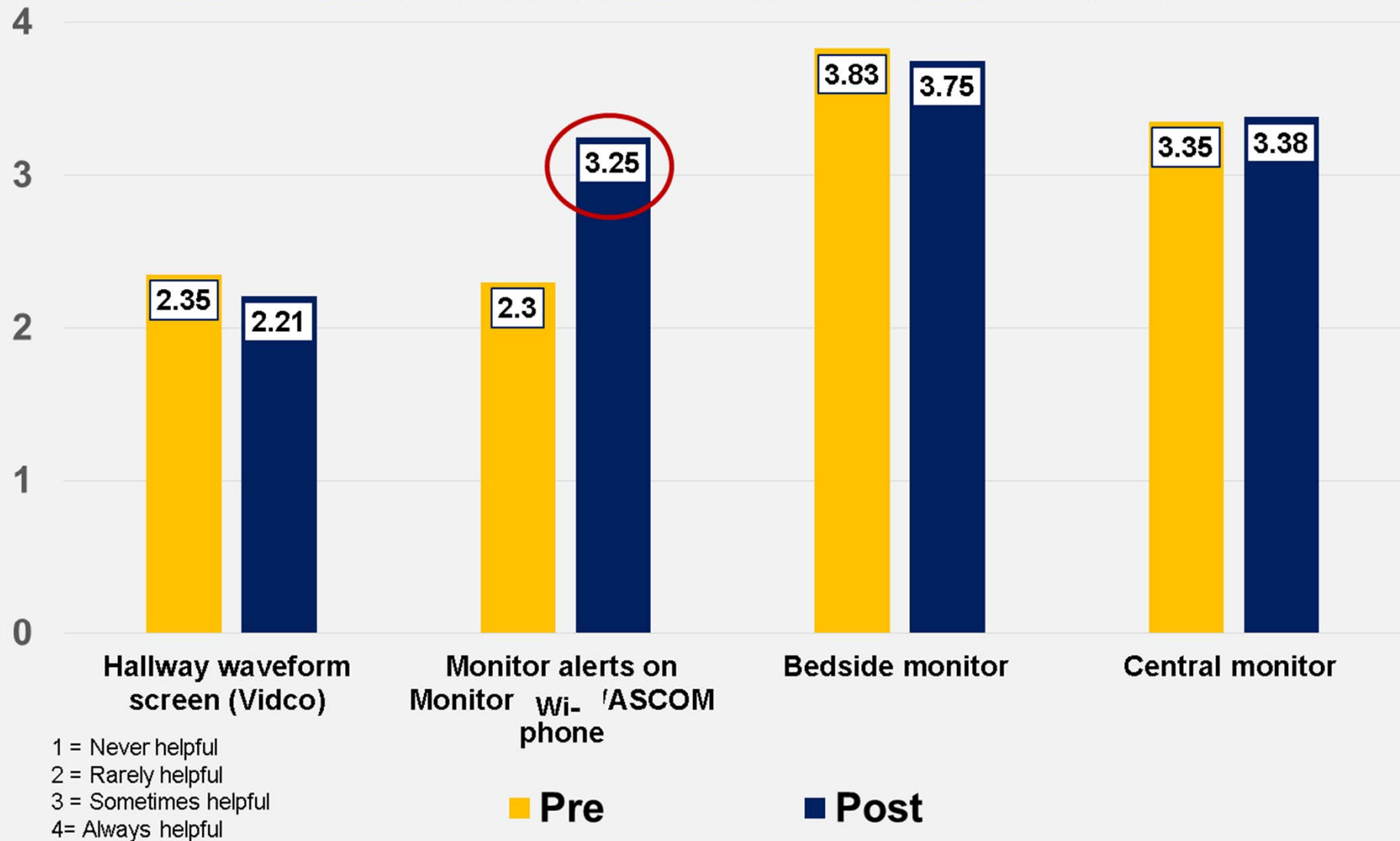
UNIT	Bed Number	FIXINFO	FIXINFO COUNT
CVS	29	FEM5 S HI 170	1
CVS	29	FEM5 S HI 168	1
CVS	29	FEM5 S HI 161	1
CVS	29	FEM5 S HI 160	1
CVS	29	FEM5 S HI 159	1
CVS	29	FEM5 S HI 158	8
CVS	29	FEM5 S HI 157	2
CVS	29	FEM5 S HI 156	11
CVS	29	FEM5 S HI 155	13
CVS	29	FEM5 M HI 138	1
CVS	29	FEM5 M HI 122	1
CVS	29	FEM5 M HI 121	3
CVS	29	FEM5 M HI 120	1
CVS	29	FEM5 D HI 310	1
CVS	29	ART1 S LO 54	1
CVS	29	ART1 S HI 272	1
CVS	29	ART1 S HI 251	1

- Unit staff representative looks at daily alarm flood report
- Used as a teaching tool for alarm customization
- Example: Systolic and mean high alarm needed adjustment

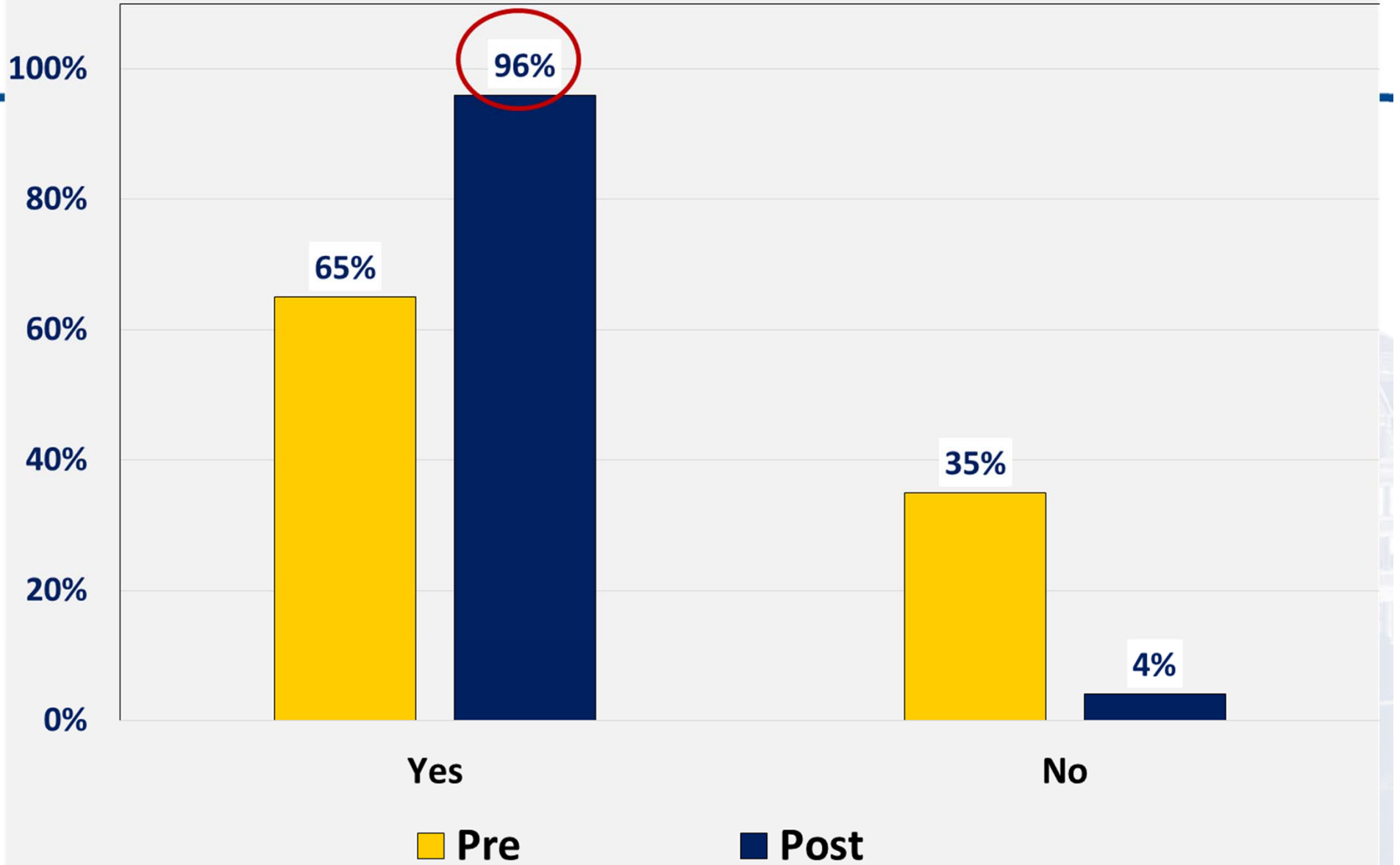
Evaluation Aim 4: Nurse Alarm Perception Survey

- Pre/post nurse survey conducted June 2014 and April 2015
- Attitudes regarding alarm notification

Rate how much you value the following devices for monitor alarm notification

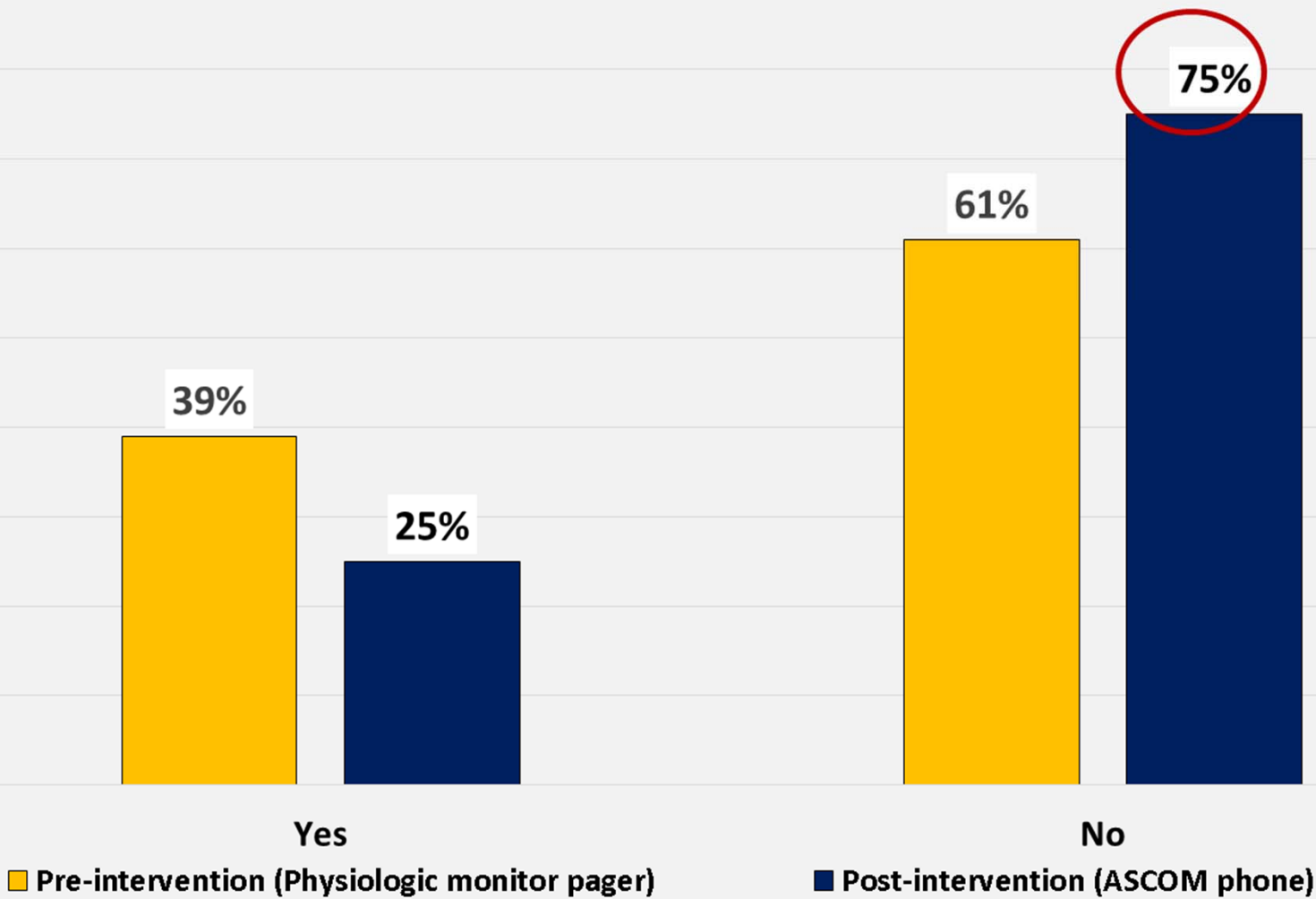


Is the alarm escalation process acceptable to you?

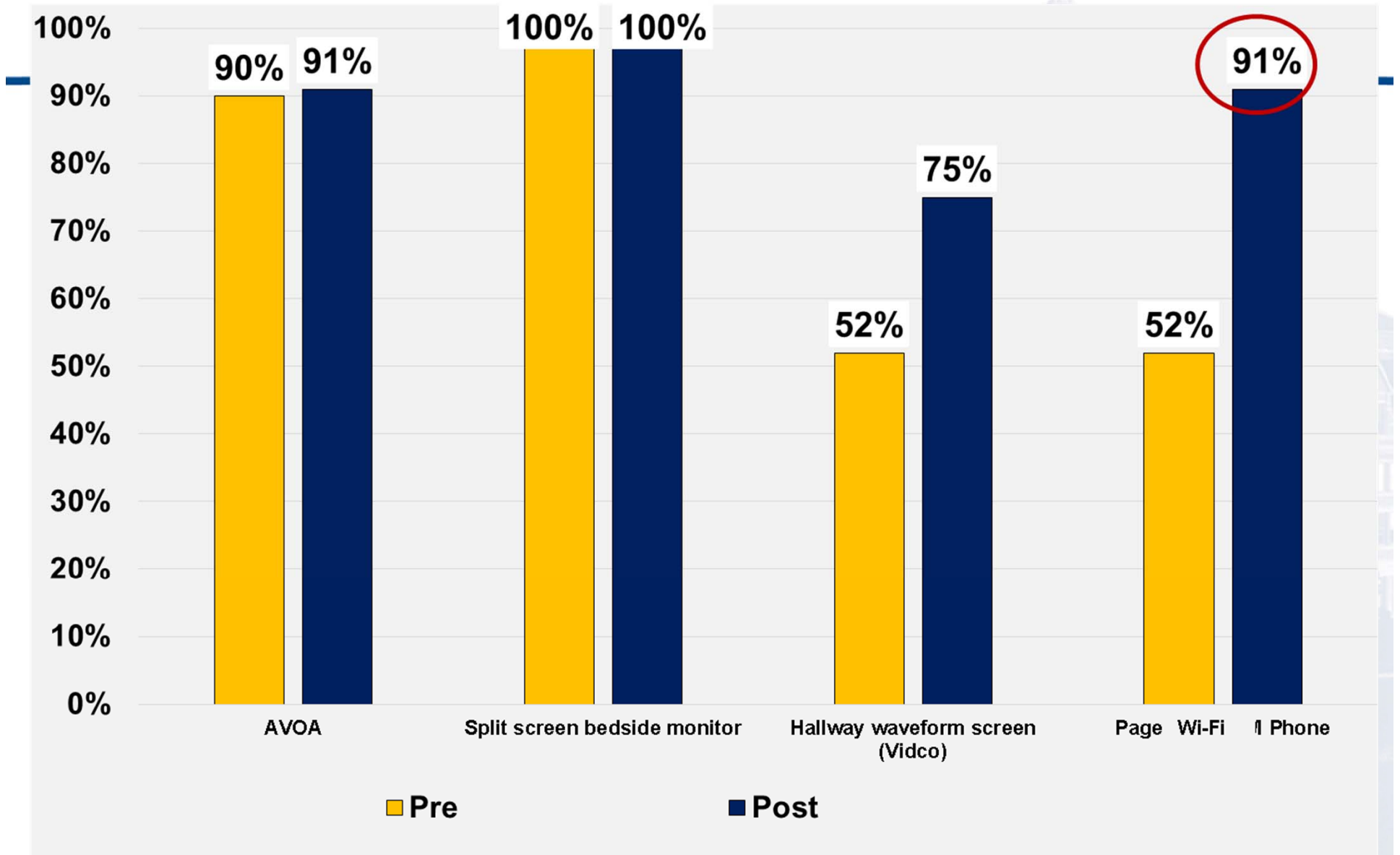


Are there any alarms/messages that you think should not be sent to your Physiologic | Wi-Fi or pager/ASCOM phone?

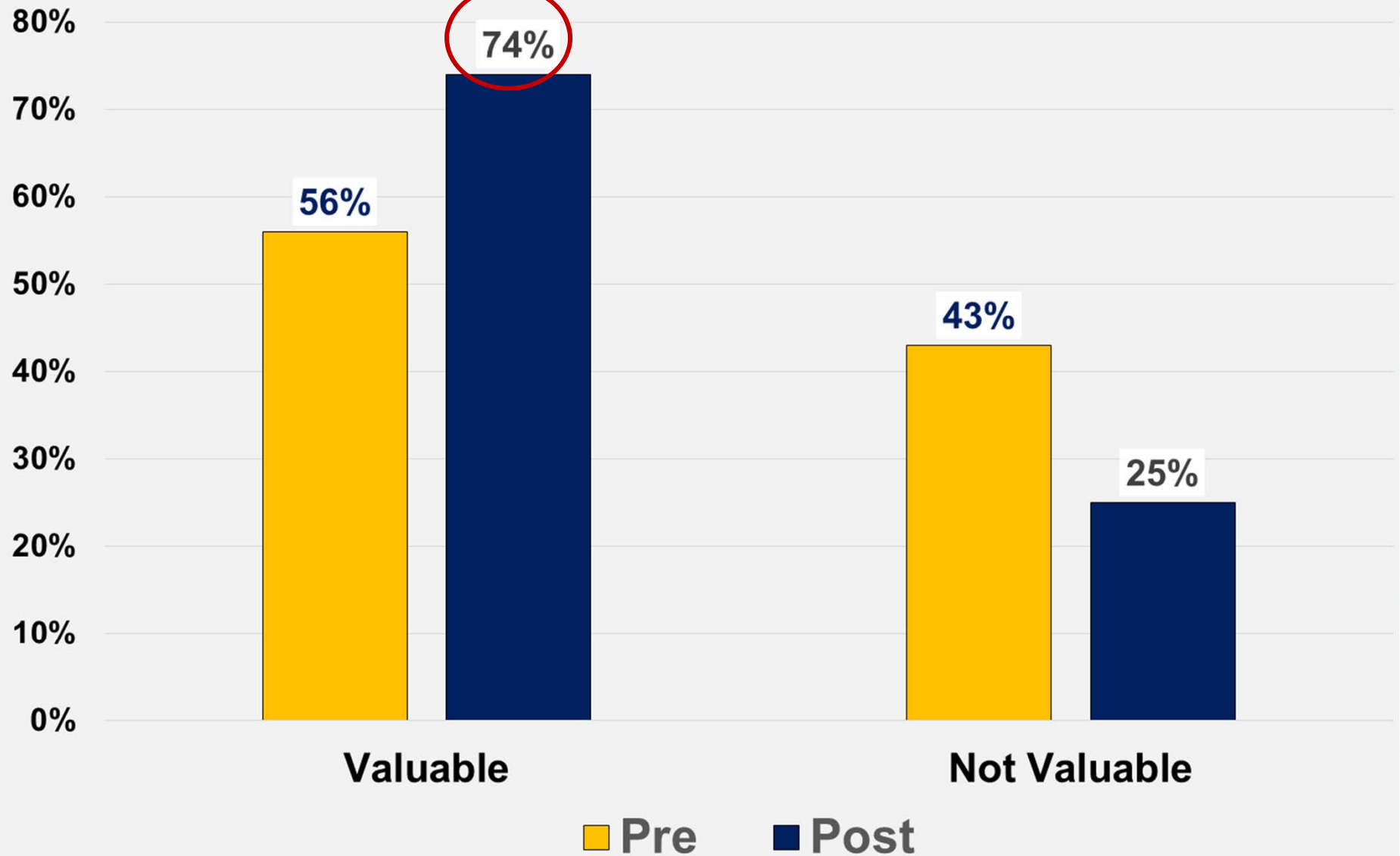
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%



The percentage of respondents that felt the following devices were sometimes or always helpful for locating a room with a physiologic monitor alarm



Thinking about all of the information you receive on your WiFi phone throughout your shift, rate the value of the device



Thank you!



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NURSING

Thank You to Our Industry Partners

This Patient Safety Seminar is offered at no charge thanks to funding from our National Coalition for Alarm Management Safety industry partners. The AAMI Foundation and its co-convening organizations appreciate their generosity. The AAMI Foundation is managing all costs for the series. The seminar does not contain commercial content.

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EarlySense

