Leveraging Technology to Reduce Inactionable Alarms from Bedside Physiologic Monitors

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Alarm Fatigue

- Alarms are intended to alert clinicians to changing conditions and reduce the risk of human error
- Alarms are everywhere! Nurses become desensitized to the alarms and fail to respond to alarms in a timely, appropriate manner
- Alarm fatigue is both auditory and mental

Alarms in the ICU

- Alarms every 19 seconds in a medical intensive care unit 350 alarms per patient per day (Welsh, 2012)
- Decreasing SpO_2 lower alarm limit from 90% to 88% resulted in a 45% decrease in alarms (Welsh, 2011)
- Education of nurses regarding alarms important step in addressing alarm fatigue (Graham & Cvach, 2010)
- No reports in literature regarding arrhythmia alarms

Setting

- 166 bed community hospital in Northern Colorado
- Cardiac Intensive Care Unit, Surgical Intensive Care Unit, Progressive Care Unit (12 beds each)
- Since 2009, policy already follows AACN's guidelines:
  - Change electrodes daily, properly prepare skin, set alarm limits based on patient condition, education for nurses

Quality Improvement Project

- Determine prevalence of alarms from bedside physiologic monitors in the critical care units
- Implement changes to decrease alarms
  - Turn off non-actionable alarms (eg, PVCs)
  - Turn off alarms that signify conditions that are not emergent (eg, fever)
  - Adjust alarms to actionable limits (eg, lower oxygen saturation alarm to 88%)

Initial State – One Day

Unit (Patients)	Alarms	Alarms/Pt	Alarms/Hr
SICU (7)	3661	523	153
CICU (7)	2521	360	105
PCU (12)	5923	494	247
Total (26)	**12105**	**466**	**504**

- Yellow arrhythmia alarms: 7,532 (62%)
- Low oxygen saturation alarms: 1,067 (9%)

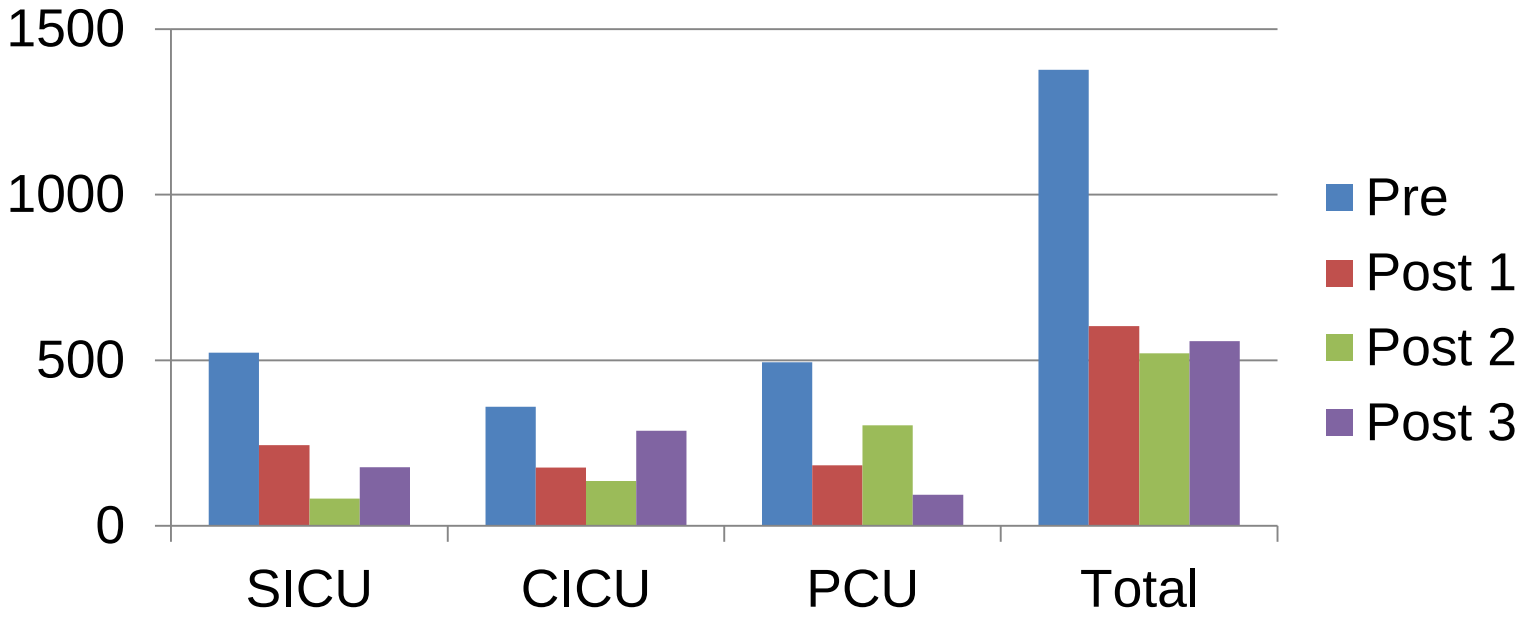
Leveraging Technology

- Reprogram monitor defaults
  - Turn off temperature, respiratory rate and CVP alarms (non-emergent alarms)
  - Decrease oxygen saturation alarm from 90% to 88% (actionable limits)
  - Turn off all non-lethal arrhythmia alarms except irregular heart rate (non-actionable alarms)
- Education for nurses

Data

- 3 post-intervention data collection dates
- Goal decrease overall number of alarms, not necessarily per patient
- Per patient alarm results due to variability in number and acuity of patients in the unit
- Individual patient “outliers” included in data analysis
- No statistical difference between units
- ANOVA with post-hoc pairwise comparisons to pre-measures

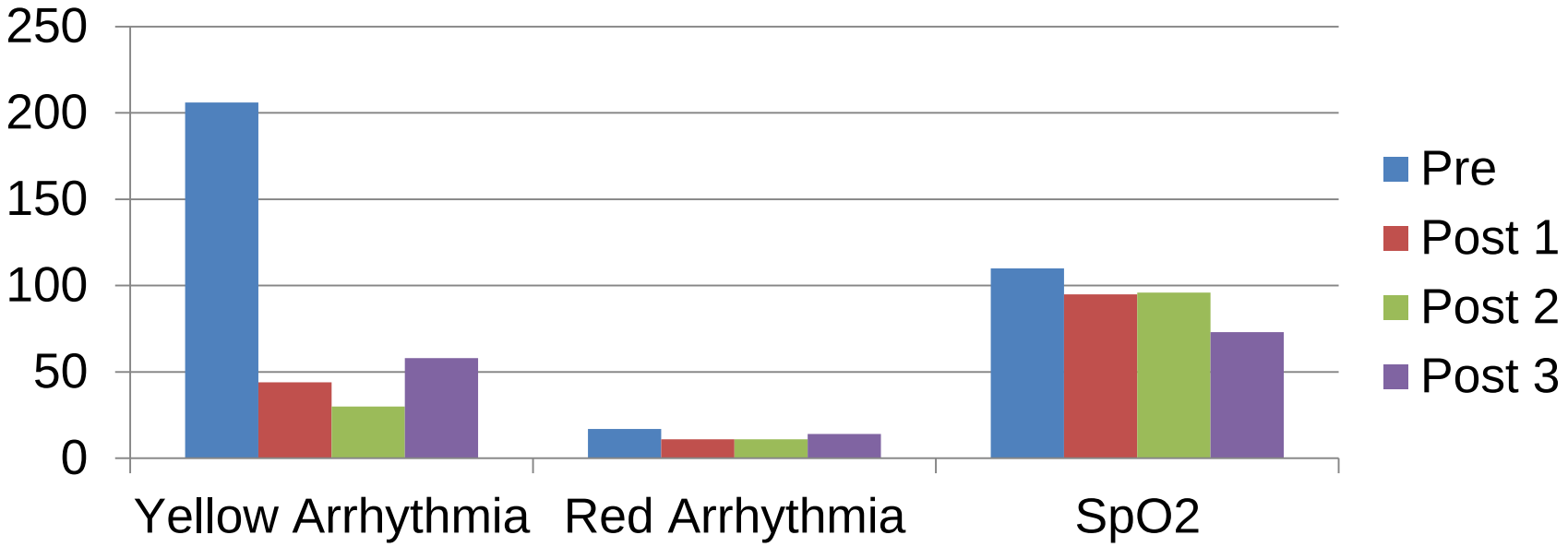
Alarms per Patient per Day



	Post 1	Post 2	Post 3
t*(6)	-3.133	-3.441	-3.292
p-value	0.010	0.007	0.008

Average Percent Change Pre-Post: 61%

Alarms per Patient



Pre to Post 3	Yellow	Red	SpO2
t*(6)	-6.282	-0.297	-0.297
p-value	0.00038	0.7764	0.7764
% Change	**79%**	**30%**	**20%**

Summary Points

- Nurses always had the ability to turn off or individualize alarms, but were afraid to do so
- Defaulting alarms off was easier and less distressing to the nurse
- No increase in Code Blue events or other untoward events after changes implemented
- Small changes can make a big difference
- Leverage the technology you have

Questions?

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