Quite Alarming! Reducing the Incidence of False Alarms to Prevent Alarm Fatigue

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Disclosure

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Objective

- Implement evidenced based practice alarm management strategies to improve patient safety.

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- No conflict of interests, or sponsorships

Purpose of Project

- The purpose of the project was to improve patient safety and reduce alarm fatigue by decreasing the incidence of false alarms for a central telemetry monitor station.

What is alarm fatigue?

- Alarm fatigue is sensory overload caused by exposure to an excessive number of alarms

- This leads to the nurse or monitor tech becoming desensitized to alarms causing
  ◦ delayed response time
  ◦ Ignored alarm assuming it's false

Medical Alarm Statistics

- In 1983, there were an average of 6 different medical alarm types

- As of 2011, the average number increased to 40

- Estimated 80-99% of alarms heard today do not require clinical intervention
  - Alarm conditions set too tight
  - Default settings are not adjusted for the individual patient
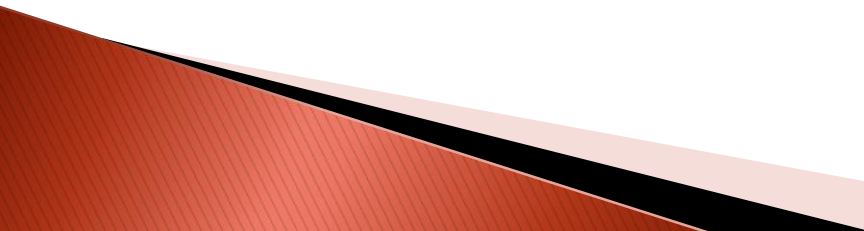 - EKG electrodes are dry or mis-positioned

Medical Alarm   Statistics

- From January 2009 to June 2012, the Joint Commission logged 98 sentinel alarm events
  - 80 deaths
  - 13 permanent loss of function
  - 5 unexpected additional care or extended stay

It's quite **alarm**ing...

Alarm fatigue occurs when hospital staff become desensitized to alarm alerts causing missed alarms or delayed response

216 deaths
Between 2005 and 2010, alarm fatigue caused 216 hospital deaths

#1 Hazard
Voted the top technology hazard of 2012 by ECRI, beating out 2011's radiation exposure

942 alarms each day
942 alarms sound off each day in a typical 15-bed unit

1 alarm every 90 seconds

90% are unanswered
Alarms are reported to be unanswered 90% of the time

It's no wonder that alarm fatigue is so prevalent

Alarm Fatigue
the most common contributing factor

Joint Commission 2014 NPSG

- Manage clinical alarm systems that have the most direct relationship to patient safety
  - Phased –in between 2014 and 2016
- 2015: Reduce the harm associated with clinical alarm systems
- By 2016 all organizations to have clear-cut guidelines for managing alarms
  - Clinically appropriate settings for alarms
  - When alarm can be disabled
  - When parameters can be changed
  - Who has the authority to set, change or turn off alarm parameters
  - Monitoring and responding to alarms
  - Checking individual for accurate settings, proper operation, and detectability

UnityPoint Health Methodist Study

▶ Data collected June 2013

  ▶ Total of 79 patients (5C = 30, non-cardiac = 27 and CVICU = 22)
  ▶ Alarm data was collected for 24 hours on each patient.

▶ Alarm data includes

  ▶ Total number of alarms by unit
  ▶ True and false alarms
  ▶ Causes of alarms

Implementation

- We manually collected alarm data by going into the alarm events that were recorded for each patient during the last 24 hours.

- We clicked on each alarm event which enabled us to view the EKG strip of the event.

    - If it was a true arrhythmia it counted as true alarm. For example: VT event and EKG showed a run of VT – this is a true alarm

    - If it alarmed VT and the EKG strip showed artifact, it was counted as a false alarm.

- We used tally marks when collecting the data then typed them into an excel file to analyze the data

- Collected alarm events for 24 hours per patient

- Our data does not include blood pressure, SpO_2, leads off alarms or any advisory alarms

- These alarms do not record on the monitor. To get these alarms, someone would need to sit at the monitors and count them as they hear them – very time consuming!
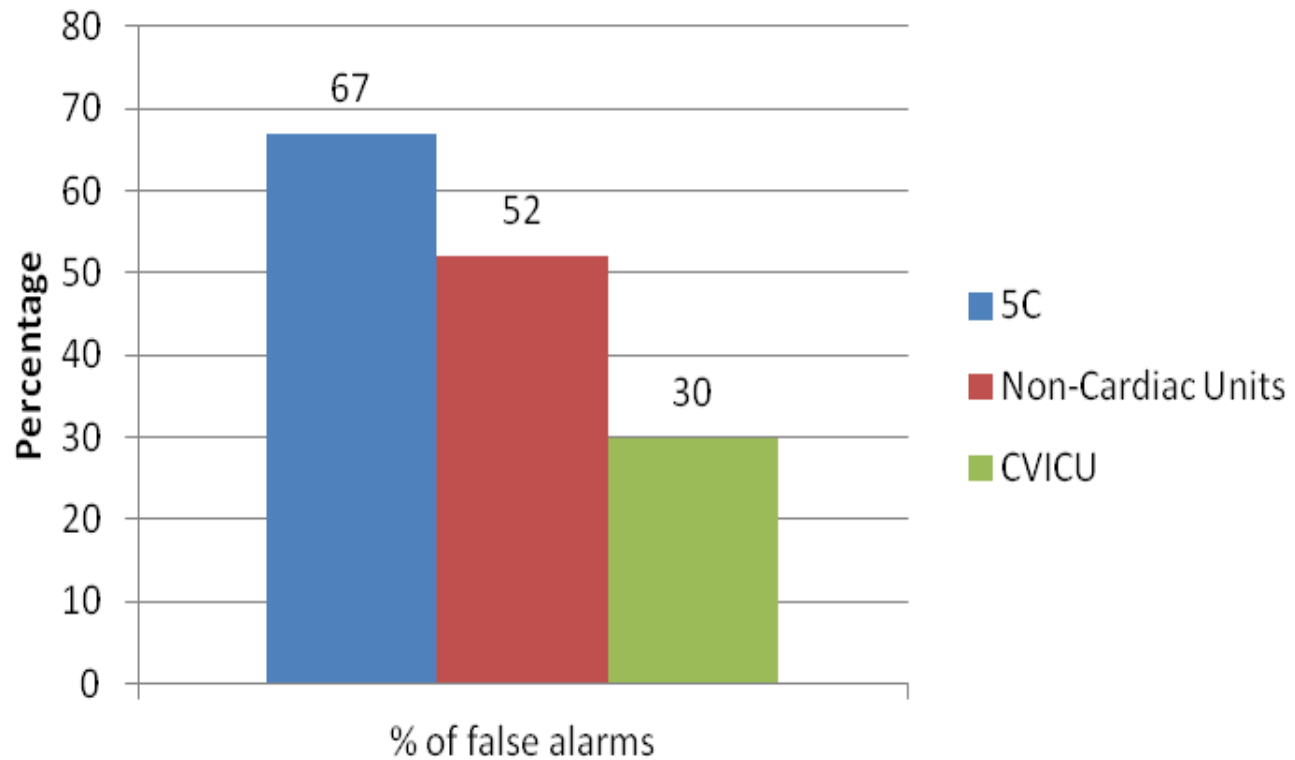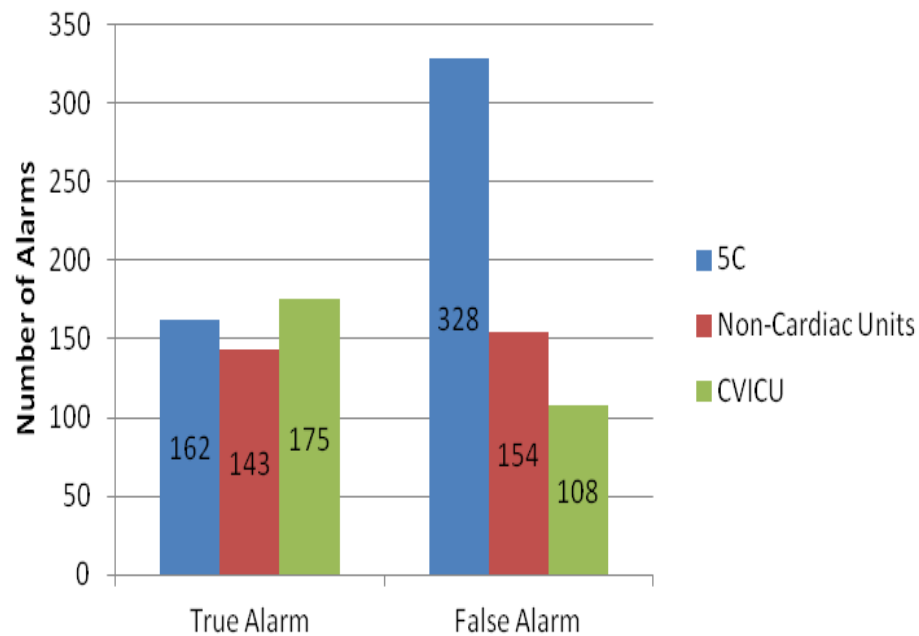
Average Number of Alarms per Patient in 24 hours
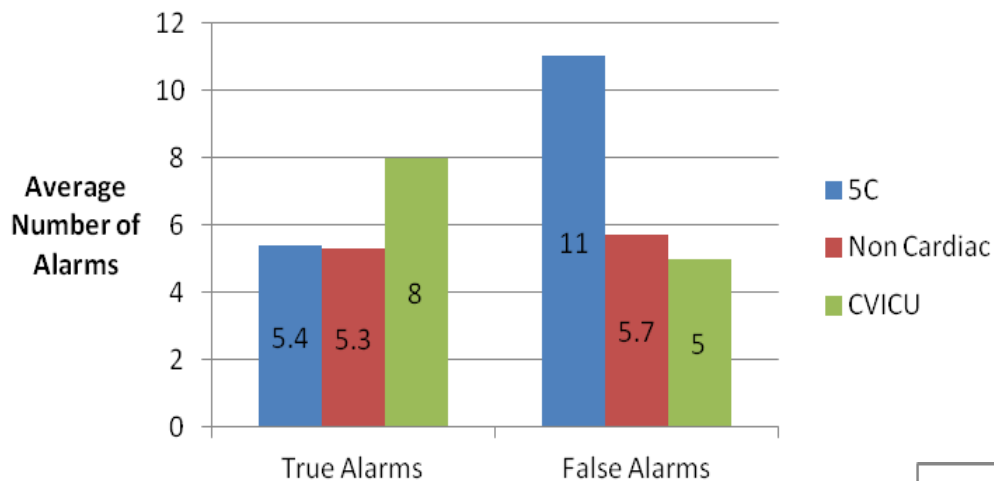
Number of Alarms by Unit

Demographics

▸ Data was collected from 57 patients from both cardiac and non-cardiac patient floors

▸ Central Telemetry Monitoring Station

▸ Station is able to watch up to 62 patients at any given time

▸ Time frame of 48 hours for data collection; 24 hours of data per patient

One alarm at least every 2.5 minutes

▸ Biggest Culprits of False Alarms were couplets and ST Segment.

▸ <u>All</u> ST Segment alarms were false!

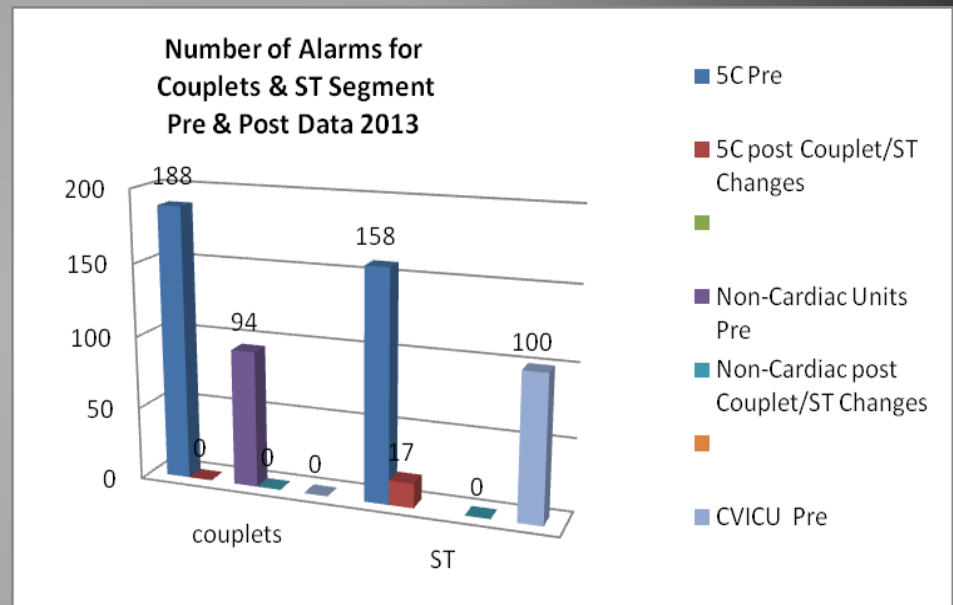**Pre data Causes of False Alarms**
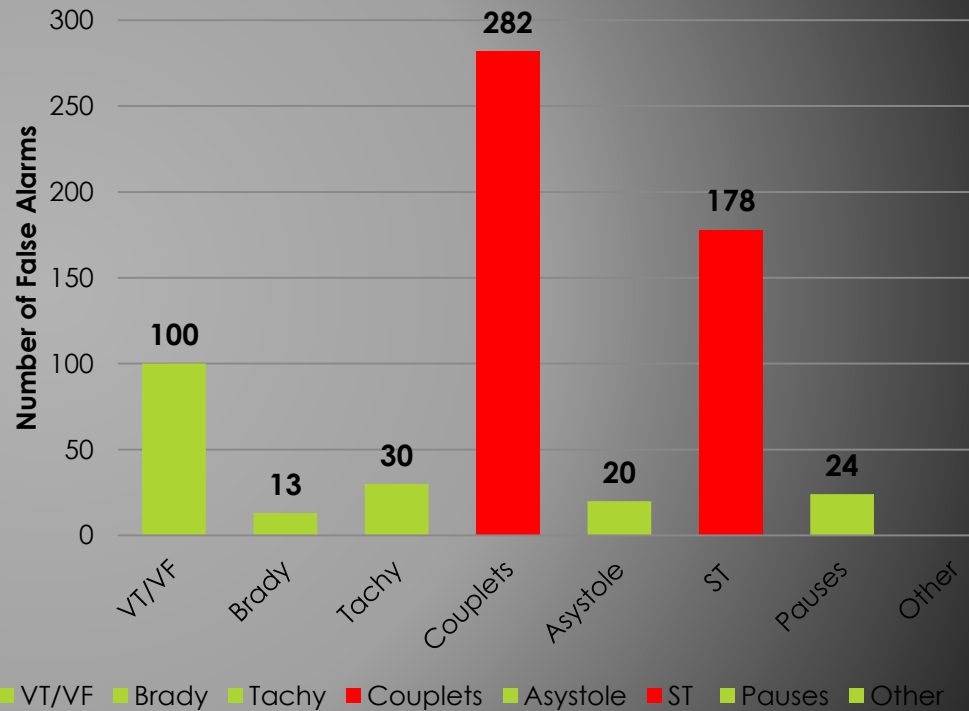
Interventions

▶ Adjust Alarms (this was implemented first)

   ◦ Changed couplet and ST segment alarms to message

   ◦ Adjusted alarms to specific patients
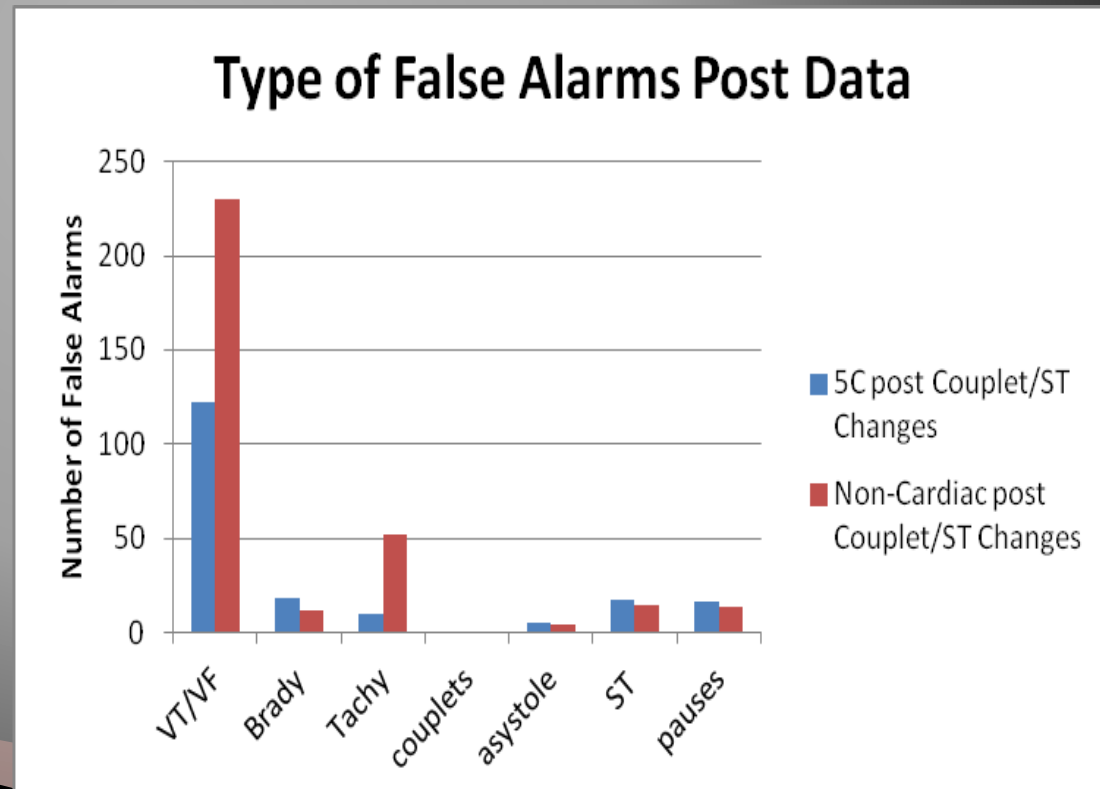
Parameter Adjustment Guideline
ST analysis

▸ Post Data Alarm Changes – WOW!

▸ Changing Couplets and ST to message, we **decreased 423 alarms** at 5 C central station in 48 hours
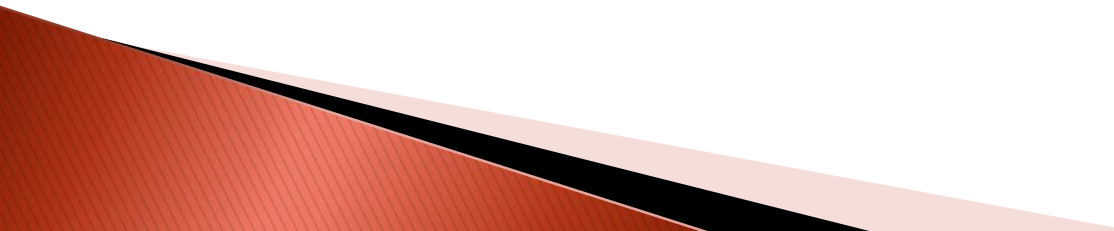

Number of Alarms for Couplets & ST Segment Pre & Post Data 2013

- 5C Pre
- 5C post Couplet/ST Changes
- Non-Cardiac Units Pre
- Non-Cardiac post Couplet/ST Changes
- CVICU Pre

couplets — 188, 0, 94, 0, 0
ST — 158, 17, 0, 100

False VT/VF alarms are now the #1 cause of false alarms

Type of False Alarms Post Data

Bar chart with x-axis labeled VT/VF, Brady, Tachy, couplets, asystole, ST, pauses and y-axis "Number of False Alarms" ranging 0 to 250. Legend: 5C post Couplet/ST Changes (blue), Non-Cardiac post Couplet/ST Changes (red).

- Proper skin preparation before ECG electrodes are placed decreases skin impedance and signal noise, thereby enhancing conductivity.

- Skin prep techniques
  ◦ Wash skin with soap and water
  ◦ Remove excess hair
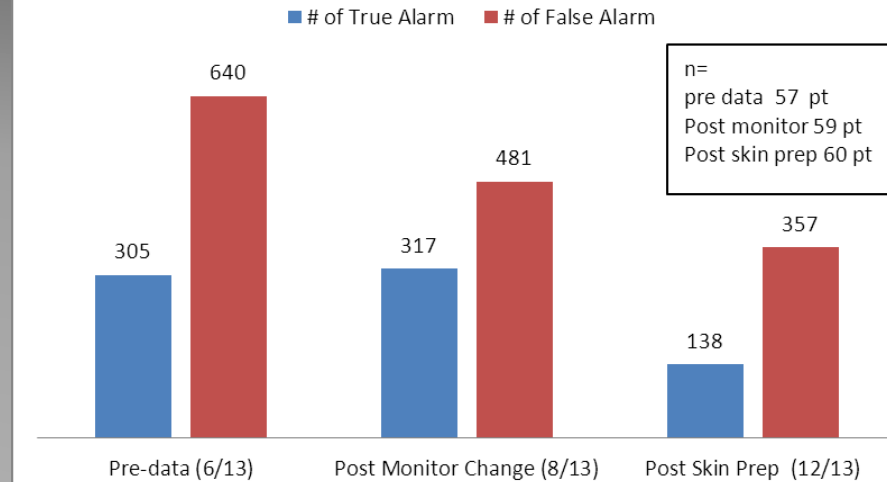 ◦ Roughen skin with abrasive washcloth or sandpaper

Summary of changes

▶ Skin prep prior to electrode placement

▶ Change couplet alarm to message

▶ Change ST alarm to message
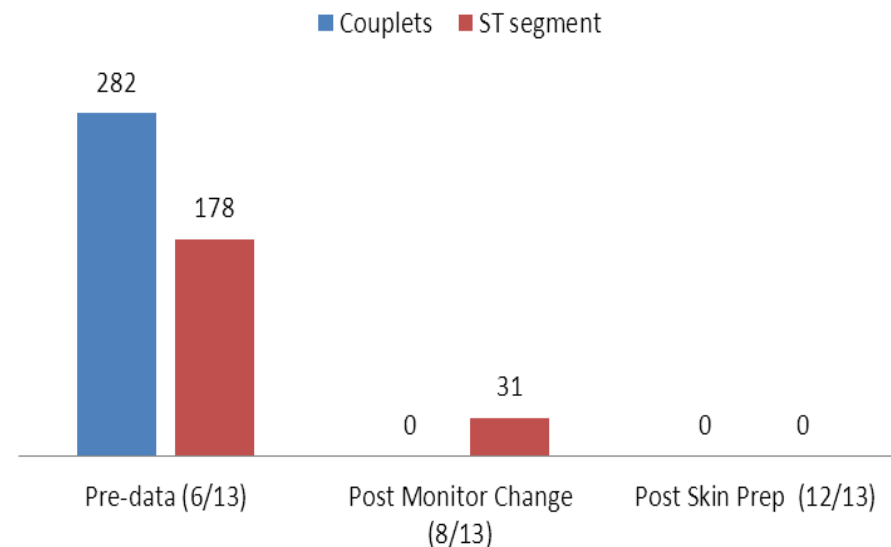
▶ Adjust inappropriate alarm limits

Outcomes

➢ 159 decrease in false alarms by with 1st intervention of changing ST and couplet alarms to message

➢ An additional 124 decrease in false alarms with the 2nd intervention of doing skin prep before lead placement

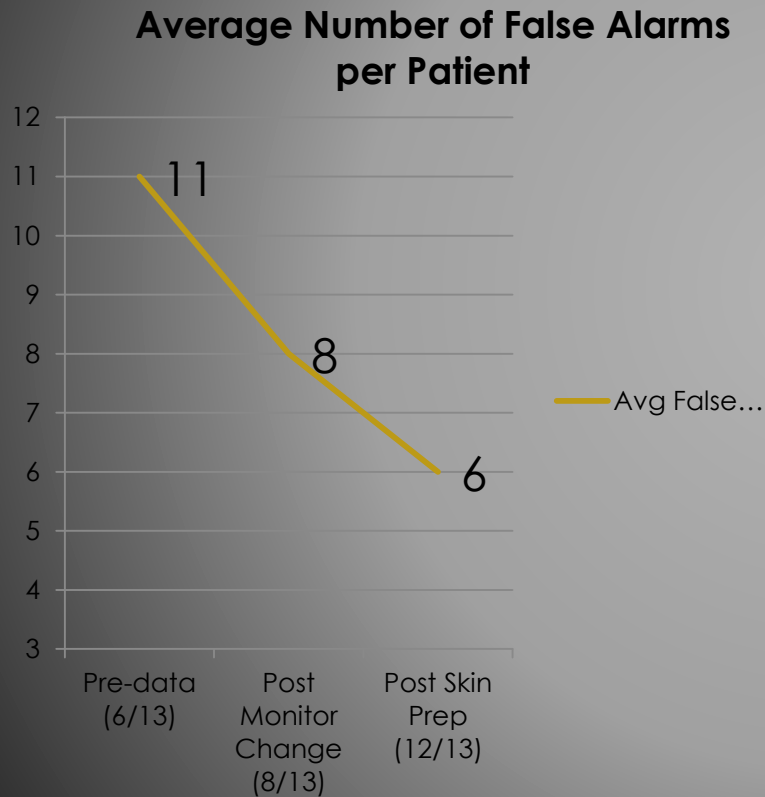➢ **We decreased the biggest culprits to "0" after both interventions!**

Comparison of True Alarms vs. False Alarms

■ # of True Alarm   ■ # of False Alarm

n=
pre data 57 pt
Post monitor 59 pt
Post skin prep 60 pt

640
481
357
305
317
138

Pre-data (6/13)   Post Monitor Change (8/13)   Post Skin Prep (12/13)

Reduction in Couplet and ST Segment Alarms

■ Couplets   ■ ST segment

282
178
0   31
0   0

Pre-data (6/13)   Post Monitor Change (8/13)   Post Skin Prep (12/13)
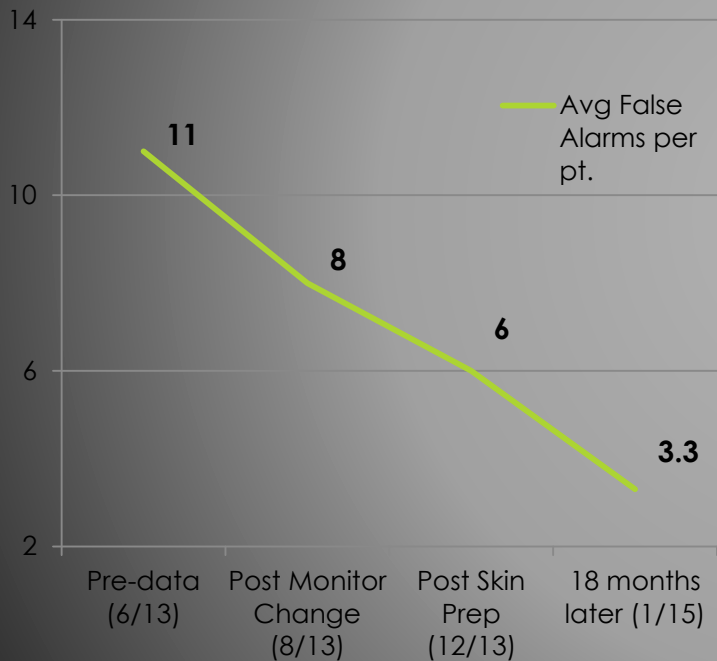
Outcomes Continued

Average Number of False Alarms per Patient

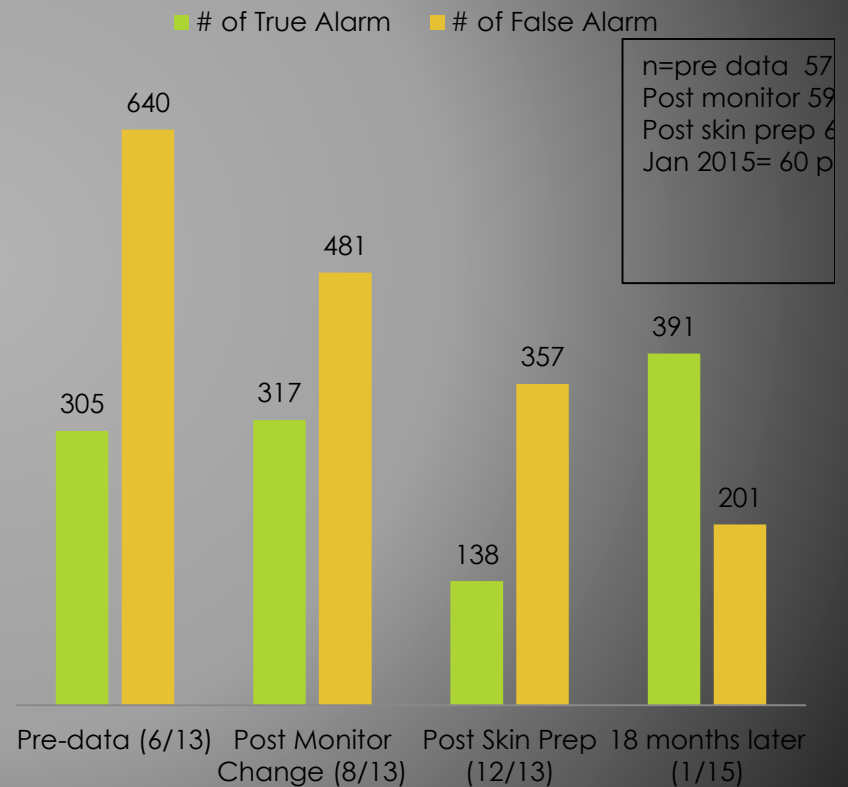

- **False alarms decreased by an average of 5 per patient in 24 hours at a central monitor station that can monitor up to 62 patients at a time.**

- **Thus the potential to have 310 less false alarms in 24 hours!**

Average Number of False Alarms per Patient in 24 hours

Avg False Alarms per pt.

- Pre-data (6/13): 11
- Post Monitor Change (8/13): 8
- Post Skin Prep (12/13): 6
- 18 months later (1/15): 3.3

Comparison of True Alarms vs. False Alarms

■ # of True Alarm   ■ # of False Alarm

n=pre data 57
Post monitor 59
Post skin prep 6
Jan 2015= 60 p

	Pre-data (6/13)	Post Monitor Change (8/13)	Post Skin Prep (12/13)	18 months later (1/15)
# of True Alarm	305	317	138	391
# of False Alarm	640	481	357	201

Quite Alarming! Reducing the Incidence of False Alarms to Prevent Alarm Fatigue

Jorica Davis, RN, MSN, CNML; Kelli Grothaus, RN; Cheryl Herrmann, APN, CCRN, CCNS-CSC-CMC; Amy Klaus, RN, BSN, PCCN; Kasi Lutz, RN, BSN, PCCN; Deborah Seynemeier, RN, BSN, PCCN; and Mychell Zepeda, RN, MSN, PCCN.

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Peoria, Illinois

Purpose:

The purpose of the project was to improve patient safety and reduce alarm fatigue by decreasing the incidence of false alarms for a central telemetry monitor station that can watch up to 62 patients.

Description:

After attending AACN NTI 2013, the NTI Action Pak – Alarm Management was presented to the cardiac performance improvement council. The council reviewed the literature, including the AACN Practice Alert on Alarm Fatigue. Excessive alarms, especially false ones, can desensitize medical personnel causing delay or no response that may lead to an adverse event. A false alarm is when an alarm sounds in response to inappropriate stimuli. A true alarm is when an alarm sounds in response to an event that needs an action. To assess our current situation with alarm management, a pre-data survey was sent to cardiac nurses to determine if the skin prep EBP guidelines were being utilized in daily practice. The survey included these questions: 1. How often do you prep the skin prior to electrode placement? and 2) How often do you change the electrode patches? In addition, data was collected on 57 telemetry patients on the cardiac and noncardiac units who are monitored at a central station. The data captured all arrhythmia alarms: false and true alarms and causes of alarms. Data was collected for 24 hours per patient.

Excessive alarms, especially false ones, can desensitize medical personnel causing delay or no response that may lead to an adverse event.

Pre data Causes of False Alarms
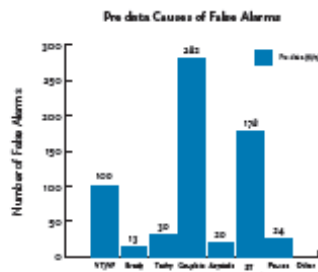
Pre-data was quite alarming!

In two days, the central station had a total of 945 alarms with 68% (n= 640) false alarms and an average of 11 false alarms per patient. The two biggest culprits for false alarms were the couplet alarm, constituting 282 or 44% false alarms, and ST segment alarm with 178 or 28% false alarms. One hundred percent of the time, the ST segment alarm was false. Based on the pre-data, the council used the AACN Practice Alert to create an action plan. The first step taken was to address the Practice Alert Expected Practice and Nursing Action: Customize alarm parameters and levels on ECG monitors by adjusting alarm default settings and customize alarms to patient needs. Couplet and ST segment alarms were changed to message alert rather than an audible sound. Couplets would not be typically an emergent situation and if life threatening they would be captured with the VT (Ventricular Tachycardia) > 2 alarm. Accuracy of ST segment analysis at the central station is challenging due to the frequent activity of the patients causing artifact. A message would show on the monitor screen when the monitor picks up ST segment changes > 2mm to alert the monitor technician to investigate further. In addition, ECG strips are printed every eight hours and compared to the previous strip to also assess for any changes.

Reduction in Couplet and ST Segment Alarms
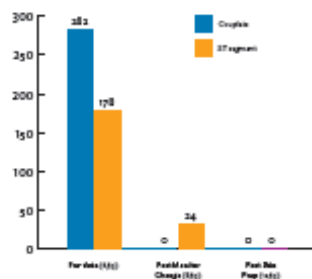
The two biggest culprits for false alarms were the couplet alarm, constituting 282 or 44% false alarms, and ST segment alarm with 178 or 28% false alarms.

Comparison of True Alarms vs. False Alarms
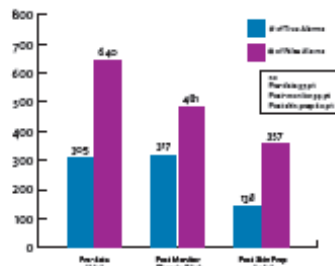
Evaluation and Outcomes:

After changing couplet and ST segment alarms to message, the central station alarms reduced couplet false alarms to zero and ST segment false alarms to 31 in just 48 hours of implementation. False alarms decreased by 159 (false alarm n= 480) and the average false alarms per patient in 24 hours decreased to 8. Further analysis of post data demonstrated VT/VF (ventricular fibrillation) alarm now is the big culprit for false alarms; relating to movement artifact. Pre-survey of the nurses indicated only 4% frequently prepped the skin prior to electrode application. In review of the data, the council implemented the next phase of the project: changing skin prep practice. This was based on the Practice Alert Expected Practice and Nursing Action: Provide proper skin preparation for ECG electrodes. Education was provided to all personnel who apply ECG electrodes. Education included: washing the electrode area with soap and water, wipe dry with washcloth or gauze, and then apply electrode. Post skin prep data demonstrated another reduction of 124 false alarms and decrease in average number of false alarms per patient to 6 in 24 hours.

Average Number of Alarms per Patient in 24 hours
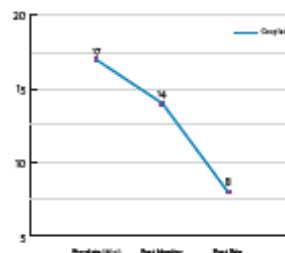
Average Number of False Alarms per Patient in 24 hours
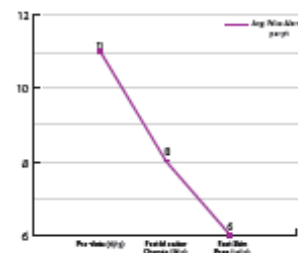
Conclusion:

Implementation of two aspects of the AACN Practice Alert on Alarm Management reduced false alarms by 283 alarms and the average number of false alarms per patient by 5 alarms in 24 hours. Data should be collected again to determine next steps to continue to decrease false alarms to prevent alarm fatigue and potential harm to patients. The project did not include other alarms that occur at the central station such as leads off, blood pressure, or SpO2. These could be reviewed for future action items.

Reference:

AACN Practice Alert: Alarm Management. Retrieved from www.aacn.org

Contact information:

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Abbreviations:

AACN NTI = American Association of Critical Care Nurses National Teaching Institute

Alarm Management Tools

- www.aacn.org

- AACN Practice Alert
  http://www.aacn.org/dm/practice/actionpaklist.aspx?menu=practice&lastmenu

- AACN Clinical Tool on Strategies of Alarm Fatigue (2013 AACN NTI ActionPak)
  http://www.aacn.org/wd/practice/content/practicealerts/alarm-management-practice-alert.pcms?menu=practice

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