



Critical Ventilator Alarms and Corresponding Alarm Fatigue

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Abstract

Title: Critical Ventilator Alarms and Corresponding Alarm Fatigue

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Background: For over 35 years we had used an external low pressure disconnect alarm to detect patient/ventilator disconnects. After the time delay on the airway pressure monitor (APM) had been exceeded, it would audibly alarm, and a visual green light outside of the room would activate. For the rooms furthest away from the nursing station a speaker was installed outside of the patient room to augment the APM audio alarm. In the early 1980's there was a sentinel event when a general practice unit (GPU) patient was on an MA1 became disconnected, and the circuit fell on the bedding creating enough back pressure to disable the APM. This led to no ventilators being allowed on the GPU.

• There were no further events until 12/2013. Between the dates of 12/17/13-10/01/14, there were seven events where the APM, while properly set, was disabled due to a high back pressure.

• We came to the conclusion that our critical ventilator alarm system had to be redesigned. We have 148 adult ICU beds, in 9 separate locations running 80-100 ventilated patients daily. Each of the 9 ICUs had the Nurse Call board updated to allow integration of the ventilator alarms into the Nurse Call outside the room and at the nursing station. In our larger 40 surgical ICU the alarm is sent to the phones.

* We have had no documented ventilator critical alarm failures since inception of alarm system.

Results

- After the implementation of our alarm system in all nine adult ICUs we have had no incidents affecting patients as a direct result from alarms.
- Alarm fatigue from ventilators has drastically decreased because only critical alarms are sent to the overhead alarm, nurse call, and phone preventing most nuisance alarms.
- According to one study ventilators were the source of most alarms in the ICU (Sendelbach). Having the alarms linked to the nurse call is especially helpful because a health care provider can easily see from the nursing station what bed is alarming if they are on the other side of the unit.
- Integrating this system has vastly improved our patient's safety. This is because our respiratory therapists are notified of problems faster, decreasing response times to possible changes in the patient's condition. This is especially useful in the forty bed surgical ICU.

Introduction

Here at Henry Ford Health Systems patient safety has always been the number one priority. One of the 2015 National Patient Safety Goals (NPSG) was reducing harm associated with alarms, and we saw this as a perfect time to improve on our alarm systems. Our goal was to improve alarm awareness and response while decreasing alarm fatigue (when healthcare providers are subjected to constant alarms, it results in longer response times and missing possible critical alarms) and possible harm to our already critical patients.

JACHO NPSG 2015 #6:

“Clinical alarm systems are intended to alert caregivers of potential patient problems, but if they are not properly managed, they can compromise patient safety. This is a multifaceted problem. In some situations, individual alarm signals are difficult to detect. At the same time, many patient care areas have numerous alarm signals and the resulting noise and displayed information tends to desensitize staff and cause them to miss or ignore alarm signals or even disable them. Other issues associated with effective clinical alarm system management include too many devices with alarms, default settings that are not at an actionable level, and alarm limits that are too narrow. These issues vary greatly among hospitals and even within different units in a single hospital. There is general agreement that this is an important safety issue. Universal solutions have yet to be identified, but it is important for a hospital to understand its own situation and to develop a systematic, coordinated approach to clinical alarm system management. Standardization contributes to safe alarm system management, but it is recognized that solutions may have to be customized for specific clinical units, groups of patients, or individual patients. This NPSG focuses on managing clinical alarm systems that have the most direct relationship to patient safety. As alarm system management solutions are identified, this NPSG will be updated to reflect best practices”

Methods and Materials

- Tracking was done by notifying the respiratory supervisor and our online risk assessment forms, also called red forms or RL. Ventilator alarm guidelines were also revised:
- The low minute ventilation alarm being set no less than three liters a minute to help detect disconnects more quickly.
- High pressure ten to fifteen cm/H₂O above peak airway pressure.
- High minute ventilation one to two liters above actual minute ventilation.
- High respiratory rate at thirty five breaths per minute.

These being guidelines the respiratory therapist was expected to set the alarms to be clinically appropriate for the patient. Initially we started with no delay built in which resulted in many nuisance alarms. A twenty second delay was added that decreased nuisance alarms substantially. Now, when a critical ventilator alarm is activated, several things happen:

1. After twenty seconds the light outside of the patient room activates.
2. Simultaneously the audio alarm, which is wired into a volume controlled speaker is activated.
3. If the alarm is not reset or corrected, the spectralink® phone assigned to that bed is called, identifying the room number.
4. If the alarm continues, spectralink® phone #2 is called
5. If the alarm continues, spectralink® phone #3 is called
6. If the alarm continues, the supervisor and director's spectralink® is called
7. A computerized report of all alarms reaching spectralink® phones is also generated.
8. A Multi-disciplinary Committee was also formed, to address all ICU alarms, and how to decrease alarm fatigue (when healthcare providers are subjected to constant alarms resulting in longer response times and possible missing critical alarms)
9. After the new alarm system went into operation, all ventilator alarms were checked BID by the supervisor. After about 6 months, this practice was stopped.

Conclusions

In conclusion the updated ventilator alarms system has potentially helped save lives of critical patients on life support. The 2015 JACHO National Patient Safety Goal of reducing harm associated with alarms has helped strengthen our ICU staff by notifying more staff in a timely manner and further away. As a result safety has been improved here at Henry Ford Hospital.

References

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