Key Summary of the Evidence
Telemetry Monitoring – Alarms

July 2009

Telemetry Technology (1, 2, 3, 4, 5)
  o Alarms (1,2,3,5)
    ➢ Ensuring audibility of alarms is challenging in intermediate & general care areas, as compared to critical care areas (2).
    ➢ Alarms must be addressed promptly, as unresolved patient conditions result in ongoing alarms (2).
    ➢ A high number of remote telemetry warning arrhythmias are artifact and false alarms (1)
      • Monitor algorithms are intentionally set for high sensitivity with low specificity, resulting in numerous false alarms (3)
      • These alarms must be evaluated by healthcare professional to avoid over-treatment of pts (3)
      • 93.7% of true arrhythmia events did not require interventions (5)
    ➢ Literature review shows limitations of clinical alarms systems (2):
      1. 99.4% of alarms are false/nuisance, & may be THE most serious shortcoming of alarm effectiveness & credibility (2)
      2. Caregivers’ difficulty in discerning between hi & lo priority alarm sounds (2)
      3. Individuals have difficulty learning more than 6 different alarm signals (2)
    ➢ Alarm Management is complex & must answer (2):
      1. Are alarms sufficiently audible to alert nurses wherever they are in an environment with competing alarms? (2)
      2. Do current staff levels allow enough time to manager a large number of alarms? (2)
      3. Have devices been configured to minimize nuisance alarms? (2)
      4. Has staff received adequate training? (2)
      5. Are adequate methods of communication between staff available to exchange alarm info & facilitate a response? (2)
    ➢ Effective alarm management relies on (2):
      1. Equipment design promoting appropriate use (2)
      2. Active role of clinicians in learning safe use of equipment to its full capability (2)
      3. Hospital recognizing & developing human & financial resources to manage the complexity of alarms (2)
    ➢ Effective Alarm Ideal (2):
      o When alarm is triggered by a problem, which adversely affects the patient, staff must ID the source & meaning of the alarm, & correct the problem prior to an adverse patient event (2).
    ➢ Alarm purpose: “Communicating information that requires a response or awareness by the operator.” (2)
      1. Users rely on alarms to call their attention to adverse conditions (2)
      2. Become substitutes for a degree of caregiver attention (2)
- **Alarm action**: Caregiver is tasked with (2):
  1. Note alarm (2)
  2. Identify source (2)
  3. Respond appropriately (2)

- **Effective alarm setting, noting, & responding is an issue of (2)**:
  1. **Design**: should be easy to set, easily determined status, triggered alarm easily identified & unambiguous (2)
  2. **System**: designed for all intended pt care environments (2)
  3. **User**: adequately trained, suitable number for setting & number of pts (2)

- **Excessive alarms degrade quality of care (4)**
  1. Distract nurses (4)
  2. Create “cry wolf” environment (4)

- **Survey of Nuisance alarms (4)**
  1. Occur frequently (81%) (4)
  2. Disrupt pt care (77%) (4)
  3. Reduce alarm trust & leads to alarm disabling by staff (78%) (4)

- **Sources of Excessive Alarms (4)**
  1. False Alarms (ECG) (4)
  2. False Alarms (Pulse Oximetry) (4)
  3. ECG Leads Off (4)
  4. Inappropriate Protocols for Inactivation (4)
  5. Inappropriate Alarm Limits & Settings (4)
  6. Overutilization of Physiologic Monitoring (4)

- **Systematic Plan for Controlling Alarm Quantities (4)**
  1. ID type of excessive alarm (4)
  2. Quantify instances of identified alarm for a given period of time (4)
  3. Implement 1 or more changes to address specific problem (4)
  4. Repeat quantification step and compare (4)

- **Nursing Implications (2, 4)**
  1. Heart rate limit setting should be chosen that provide sufficient protection for the patient, while not allowing rate changes that are not clinically significant to set off nuisance alarms (2)
  2. Proper ECG electrode application technique must be employed to limited leads-off alarms (2)
  3. Recommendations (4)
    - **False Alarms via artifact, asystole, improper wave detection, other noise (4)**
      - Placement of electrodes & tension of lead (4)
      - Quality of electrode adhesion (4)
      - Ensure electrodes not expired (4)
      - Appropriate skin preparation (4)
      - Higher signal amplitude (4)
      - Select best lead for wave display (4)
    - **False Alarms (Pulse Oximetry) (4)**
      - Upgrade to newest technology (4)
      - Disposable probes vs. finger clip probes (4)
      - Remove false nails, polish, other agents (4)
      - Place on arm opposite NIBP, IV, or Art line (4)
      - Cover sensor to reduce ambient light (4)
      - Verify quality of sensor site & blood flow (4)

©Kaiser Permanente SCAL Nursing Research Program; June 30, 2009 by Cecelia L. Crawford, RN, MSN
- **ECG Leads Off (4)**
  - Replace continually detaching leads (4)
  - Ensure quality of leads sets in use (4)
  - Spot bad lead sets in general use & replace (4)
  - Examine product purchases for best leads & electrodes (4)
- **Inappropriate Protocols for Inactivation (4)**
  - Establish alarm response protocols for: (4)
  - Alarm suspend (4)
  - Monitor standby (4)
  - Train staff to follow protocols (4)
- **Inappropriate Alarm Limits & Settings (4)**
  - Select alarm limits & arrhythmia alarms that maximizes likelihood that system will alarm for true, clinically significant changes in patient’s condition, while minimizing occurrence of alarms that don’t correspond to changes. (4)
    - a. Individualize to settings & unique pt conditions (4)
- **Over-utilization of Physiologic Monitoring (4)**
  - Specific guidelines for initiation & discontinuation of monitoring (4)
  - Place guidelines in a checklist for MD orders (4)
  - Staff members inform MD about need to adjust monitoring utilization practices (4)
  - Educate all MD on impact of unnecessary utilization on nurses’ alarm burden. (4)
References


Purpose/intended Audience

Because we want everyone in our communities to have the healthiest lives possible, we are making our evidence reviews available to the communities we serve to help Californians and others lead healthier lives.

Integrative reviews and evidence summaries are provided as a community service for reference purposes only, and must be used only as specified in this disclaimer. These documents are intended for use by clinicians. If you are not a clinician and are reading these documents, you should understand that the information presented is intended and designed for use by those with experience and training in managing healthcare conditions. If you have questions about them, you should seek assistance from your clinician. The information contained in the evidence reviews is not intended to constitute the practice of medicine or nursing, including telemedicine or advice nursing.

Limitations On Use

These documents have been developed to assist clinicians by providing an analytical framework for the effective evaluation and treatment of selected common problems encountered in patients. These documents are not intended to establish a protocol for all patients with a particular condition. While evidence reviews provide one approach to evaluating a problem, clinical conditions may vary significantly from individual to individual. Therefore, clinicians must exercise independent professional judgment and make decisions based upon the situation presented.

Kaiser Permanente's documents were created using an evidence-based process; however, the strength of the evidence supporting these documents differs. Because there may be differing yet reasonable interpretations of the same evidence, it is likely that more than one viewpoint on any given healthcare condition exists. Many reviews will include a range of recommendations consistent with the existing state of the evidence.

All of the Kaiser Permanente integrative reviews and evidence summaries were developed from published research and non-research evidence and do not necessarily represent the views of all clinicians in Kaiser Permanente. These documents may also include recommendations that differ from certain federal or state health care mandates.

Intellectual Property Rights

Unless stated otherwise, all of these materials are protected by copyright and should not be reproduced or altered without express written permission from Kaiser Permanente. Permission is granted to view and use these documents on single personal computers for private use within your hospital or hospital system. No portion of these materials in any form may be distributed, licensed, sold or otherwise transferred to others.

The organizations within Kaiser Permanente retain all worldwide rights, title and interest in and to the documents provided (including, but not limited to, ownership of all copyrights and other intellectual property rights therein), as well as all rights, title and interest in and to their trademarks, service marks and trade names worldwide, including any goodwill associated therewith.

2013 Kaiser Permanente Southern California Regional Nursing Research Program
Nursing.Research@kp.org
No Endorsement or Promotional Use

Any reference in these documents to a specific commercial product, process, or service by trade name, trademark, or manufacturer, does not constitute or imply an endorsement or recommendation by Kaiser Permanente. The views and opinions expressed in these documents may not be used for any advertising, promotional, or product endorsement purposes.

Disclaimer of All Warranties and Liabilities

Finally, although Kaiser Permanente believes that all of the information provided in its documents is accurate, specific recommendations derive from combining the best available evidence. Although we have sought to ensure that the documents accurately and fully reflect our view of the appropriate combination of evidence at the time of initial publication, we cannot anticipate changes and take no responsibility or assume any legal liability for the continued currency of the information or for the manner in which any person who references them may apply them to any particular patient. Kaiser Permanente does not assume any legal liability or responsibility for the completeness, clinical efficacy or value of any apparatus, product, or process described or referenced in the documents. We make no warranties regarding errors or omissions and assume no responsibility or liability for loss or damage resulting from the use of these documents.