Question	Answer
Nursing Practice	
What are the best strategies to reduce the number of clinical alarms?	Multifactorial: • Establish an inter-professional team to address alarm fatigue across all environments of care • Conduct an inventory of alarm-equipped medical devices • Develop guidelines for alarm settings & tailoring of alarms • Provide proper skin preparation for EKG electrodes • Customize alarm parameters & levels on EKG monitors • Customize delay & threshold settings on O2 sat monitors • Provide initial & ongoing education about devices with alarms • Monitor only those patients with clinical indications for monitoring http://www.aacn.org/wd/practice/docs/practicealerts/alarm-management-practice-alert.pdf Managing Alarm Fatigue: New Approaches and Best Practices Live Q&A: Alarm Management Implementation Revisited Sendelbach,S. & Funk, M.(2013). Alarm fatigue: A patient safety concern. *AACN Advanced Critical Care, 24*(4), 378-388.
For monitored units, how often do you review alarms? What does your review include (i.e. arrhythmias, yellow alarms, trends, alarm limits, etc.)?	Documentation is organization specific. • Consider patient acuity level • Determine priority of alarms (high, medium, low) and risk of death/unintended consequences if unattended • Identify actionable alarms (requires clinical intervention or some type of action) • Identify non-actionable alarm signal (true alarms that do not require a clinical intervention or action) http://www.aami.org/meetings/webinars/HTSI/resources/10302013_Slides.pdf http://www.aami.org/meetings/webinars/htsi/resources/12032013_Checklist.pdf Sendelbach, S., & Funk, M. (2013). Alarm fatigue: a patient safety concern. *AACN advanced critical care*, *24*(4), 378.
Where do nurses document alarm review?	Documentation is organization specific. Policies should guide: • Standardized location of information • What is included in the documentation (e.g., lead, rhythm interpretation, intervals, alarm review, alarm limits) • Frequency of documentation ✓ How often the strip must be run, interpreted and posted ✓ How often documentation of the rhythm needs to be in the medical record
How can I support the appropriate use of telemetry? (or	Evidence Based Practice:

make sure telemetry is not over-prescribed or implement a " telemetry use reduction project") How can I encourage physician buy-in?	• Expert opinion and research recommend monitoring only those patients with clinical indications for monitoring • Developing an alarm safety program helps identify the appropriate patients and helps standardize the practice across clinical environments. http://www.aacn.org/wd/practice/docs/practicealerts/alarm-management-practice-alert.pdf http://www.aami.org/meetings/webinars/HTSI/resources/10302013_Slides.pdf http://www.aami.org/meetings/webinars/htsi/resources/12032013_Checklist.pdf Drew, B. J., Califf, R. M., Funk, M., Kaufman, E. S., Krucoff, M. W., Laks, M. M., & Van Hare, G. F. (2004). Practice Standards for Electrocardiographic Monitoring in Hospital Settings An American Heart Association Scientific Statement From the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: Endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. *Circulation*, *110*(17), 2721-2746. http://circ.ahajournals.org/content/110/17/2721.full.pdf+html Feder, S., & Funk, M. (2013). Over-monitoring and alarm fatigue: For whom do the bells toll? *Heart & Lung: The Journal of Acute and Critical Care*, *42*(6), 395-396. Funk, M., Stephens, K., May, J., Fennie, K., Feder, S., & Drew, B. (2013). An alarming rate of unnecessary monitoring in the Practical Use of the Latest Standards of Electrocardiography (PULSE) trial. *Journal of the American College of Cardiology*, *61*(10_S).
Is there a standard or recommendation for how often to change ECG electrodes?	Evidence suggests that changing EKG electrodes daily decreases the number of false alarms. http://www.aacn.org/wd/practice/docs/practicealerts/alarm-management-practice-alert.pdf
Should nurses be allowed to adjust default alarm settings? Are there guidelines available?	Default settings are programmed into the monitors by clinical / biomedical engineers. Settings should be revised to eliminate duplicate alarms and so that alarms are clinically significant and actionable- nurses should be educated to prospectively individualize alarm parameters so that alarms are meaningful & actionable (Graham & Cvach, 2010) Graham, K.C. & Cvach, M. (2010). Monitor alarm fatigue: Standardizing use of physiological monitors and decreasing nuisance alarms. *American Journal of Critical Care, 19(*1), 28-34.

	Advancing Safety in Medical Technology. (2011). *A siren call to action: Priority issues from the Medical Device Alarm Summit*. Retrieved from http://www.aami.org/htsi/alarms/pdfs/2011_Alarms_Summit_publication.pdf Gross, B., Dahl, D., & Nieson, L. (2011). Physiologic monitoring alarm load on medical/surgical floors of a community hospital. *Biomedical Instrumentation & Technology, 45*(1), 29-36. doi:http://dx.doi.org/10.2345/0899-8205-45.s1.29 Sendelbach,S. & Funk, M.(2013). Alarm fatigue: A patient safety concern. *AACN Advanced Critical Care, 24*(4), 378-388. Welch, J. (2011). An evidence-based approach to reduce nuisance alarms and alarm fatigue. *Biomedical Instrumentation & Technology, 45*(1), 46-52. doi:http://dx.doi.org/10.2345/0899-8205-45.s1.46
Are educational resources/competencies available for staff regarding clinical alarm management?	NACNS Alarm Safety Crosswalk
Which interventions will result in the greatest alarm reduction?	EBP utilization for telemetry monitoring. An analysis of 1095 adult patients with cardiac telemetry on medical surgical and progressive units (non-ICU), at 4 teaching hospitals. More than 30% of all telemetry days did not meet accepted indications for monitoring. Benjamin, E.M., Klugman, R.A., Luckmann, R., Fairchild, D.G., & Abookire, S.A. (2013). Impact of cardiac telemetry monitoring on patient safety and cost. *American Journal of Managed Care, 19*(6), 225-232. Drew, B. J., Califf, R. M., Funk, M., Kaufman, E. S., Krucoff, M. W., Laks, M. M., & Van Hare, G. F. (2004). Practice Standards for Electrocardiographic Monitoring in Hospital Settings An American Heart Association Scientific Statement From the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: Endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. *Circulation*, *110*(17), 2721-2746. http://circ.ahajournals.org/content/110/17/2721.full.pdf+html
Defaults / Parameters	
How can I ensure/demonstrate appropriate staff decision making regarding alarm parameters?	One strategy is to use case studies. Select cases for patients that are most often seen in your practice area and create key questions. For example, for heart failure patients, how many PVCs would the provider treat? If the patient's normal pulse ox is 85%, what would be an appropriate setting? 82%? 80%? Ask providers what do they want to be notified about – ask

	if that is how the parameters can be set. NACNS Alarm Safety Crosswalk
Are there established default settings for physiologic monitoring? Are they evidence-based? Are they variable based on the level of acuity?	There is no evidence that recommends particular default settings. There is evidence that will guide you to how changes in defaults can decrease the number of alarms. Defaults are a starting point, if specific default values are not appropriate for individual patients, customization is essential. Korneiwicz, D.M., Clark, T., & David, Y. (2008). A national online survey on the effectiveness of clinical alarms. *American Journal of Critical Care, 17*(1), 37-41.
How can I sort out multi-parameter monitors and eliminate or reduce duplicate alarms?	Each brand of monitor is set up differently. Consult with the clinical liaison from your monitoring company, ask very specific questions. If an alarm assessment has not been completed, that may be helpful. Evaluate the need for each parameter to be on as a default, i.e., do all patients need continuous respiratory rate monitoring?
How do I determine the current default settings?	Some organizations have the same defaults for all monitors; others have specific defaults for specific units. One strategy to decide on defaults is to analyze data for particular values (eg, HR, RR, BP) over a period of time (possibly a week) and use that information to decide what values specific defaults should be. NACNS Alarm Safety Crosswalk
Fatigue	
How can I measure alarm fatigue?	Healthcare Technology Foundation Clinical Alarms Survey http://www.thehtf.org/clinical.asp Korneiwicz, D.M., Clark, T., & David, Y. (2008). A national online survey on the effectiveness of clinical alarms. *American Journal of Critical Care, 17*(1), 37-41.
Data	
What types of reports are available from my equipment? How can I partner with the equipment vendors?	Each vendor has different reports available. It is important to organize the information you need and meet with the vendor and the clinical / biomedical engineers. Be specific about the data you need, the frequency you need the report and a plan for dissemination (e.g., monthly or weekly reports).
How can I obtain data from my monitor system?	Collaborate with clinical / biomedical engineers and the monitor vendor. Establish concrete data points that are available from the monitor, work to set up ongoing reports, supplied by either clinical / biomedical engineers or the monitor vendor. Be very clear about the data request: what data; from which units; how often. Establish a plan for data analysis and dissemination.
Technology	

How can I test clinical alarms for audibility?	Descriptive analysis of noise levels in John Hopkins Hospital; particular at night. Busch-Vishniac, I. J., West, J. E., Barnhill, C., Hunter, T., Orellana, D., & Chivukula, R. (2005). Noise levels in Johns Hopkins hospital. *The Journal of the Acoustical Society of America*, *118*(6), 3629-3645.
What is the best process for monitoring telemetry? How many patients should a monitor tech be in charge of? What is best process for notifying nurse of an alarm? When should an alarm be escalated?	There are no outcome data to support one type of telemetry model (eg, local telemetry techs, "war room" model of telemetry techs, nurse accountability without tele techs). There is no evidence to specify how many monitors one technician can observe. If a tele tech needs to notify a nurse, the best strategy is through direct communication via an individual phone or communication device. Whenever there is an intermediary, there is a risk for delayed or dropped communication. An alarm should be escalated when the risk of the alarm going unanswered could possibly result in patient harm.
Miscellaneous	
Does the hospital receive additional reimbursement for a patient on telemetry?	Most hospitals are paid based on negotiated contracts. On admission, the hospital is reimbursed per DRG by most payers, including Medicare. Rarely, commercial contracts may pay more for patients on telemetry, but it would need to be on a pre-negotiated contract.
How do I obtain information (or who do I contact) regarding serious safety event data?	Data on serious safety events is aggregated by different people in different organizations. Some examples of resources for the data include risk management; the office of patient safety; and the office of regulatory compliance.
Who are the key stakeholders? Who should I include on my multidisciplinary team to address clinical alarms?	See AACN and AAMI websites NACNS Alarm Safety Crosswalk
Should I try to address all clinical alarms, or just cardiac monitoring? What about specialized alarms, like fetal monitoring?	This is an organizational decision. The NPSG requires that you identify alarms that could result in harm if not attended to in a timely way, the focus of the work needs to prioritize those alarms.