

Ensuring the Effectiveness of Clinical Alarm Systems

Requirements: Ensure that critical alarms used in the clinical environment are tested on an ongoing, scheduled basis and they are sufficiently audible to staff with respect to distance and competing noise in the unit.

Definition: A critical clinical alarm is any audible or visual indication from a system or device, that when activated, may result in the injury or death of a patient unless immediate clinical intervention results.

Process: A four step process is used to ensure the effectiveness of critical alarm systems, as defined below:

Step 1: *Determine which audible and visual indicators are included in the list of critical clinical alarms.* The determination of whether an audible or visual indication is considered a “critical clinical alarm” is evaluated by using a risk assessment process that considers the severity and probability of an inappropriate staff response to an alarm. A numerical evaluation is assessed and documented using the following criteria:

Severity Rating (likely result if the alarm is not attended to by staff on a timely basis)	5 – Death 4 – Serious injury, likely to be permanent 3 – Major injury, possible long-term effects 2 – Minor injury, not likely to have long-term effects 1 – No injury
Probability of an inappropriate staff response after the alarm has activated:	5 – Almost certain to occur 4 – Occurrence is probable 3 – Possible 2 – Very unlikely to occur 1 – Will not occur

The assessment score (AS) is calculated by multiplying the Severity Rating (SR) by the Probability (P): $AS = SR \times P$. Alarms that result from systems or equipment with scores greater than or equal to 9 will be included in the “critical alarm” list. Refer to Table 1 for the summary of risk assessment scores.

Step 2: *Clearly define testing responsibilities.* A description of the responsibilities for testing the critical clinical alarms is defined in Table 2.

Step 3: *Determine critical alarm audibility.* Although there are many methods to determine the audibility of critical alarms by clinical staff, the use of a self-assessment form (refer to Table 3) is recommended.

Step 4: *Verify that clinical staff respond as expected to critical clinical alarms.* Document clinical staff response through the use of an alarm evaluation simulation. Refer to Figure 1 for a sample test form.

Step 1 - Critical Clinical Alarm Risk Assessment

Device Description	Severity Rating (SR)	Probability of Inappropriate Response (P)	Total Score	Inclusion as Critical Clinical Alarm?
Ventilator	5	2	10	Yes
Blood Warmer	4	2	8	No
Infant Warmer	3	3	9	Yes
Anesthesia Unit	5	1	5	No
Apnea Monitor	5	2	10	Yes
Bipap Unit	2	3	6	No
Chair Occupancy Alarm	4	4	16	Yes
Defibrillator	5	1	5	No
Electrosurgical Unit	3	2	6	No
Feeding Pump	2	3	6	No
Hypo/Hyperthermia Unit	3	3	9	Yes
Infusion Pump	4	3	12	Yes
Injector	2	2	4	No
Intra-aortic Balloon Pump	5	2	10	Yes
Bedside Physiological Monitor	5	3	15	Yes
Heart Rate Monitor	5	3	15	Yes
NIBP Unit	2	3	6	No
Pulse Oximeter	3	3	9	Yes
SCD	2	3	6	No
Tourniquet	3	2	6	No
Bathroom Emergency Call	4	3	12	Yes
Code Blue Call	5	2	10	Yes
Infant Abduction Alarm	3	3	9	Yes
Nurse Call	3	4	12	Yes
Medical Gas Alarm	3	3	9	Yes
Line Isolation Monitor	2	3	6	No

Table 1

Step 2 - Critical Clinical Alarm Test Responsibility Matrix

Device Description	Clinical Engineering	Nursing	Ancillary Clinical	Plant Operations	Security
Ventilator	Scheduled PM tests	Ongoing checks	Alarm set-up limits	N/A	N/A
Infant Warmer	Scheduled PM tests	Ongoing Monitor	N/A	N/A	N/A
Apnea Monitor	Scheduled PM tests	Periodic checks	Alarm set-up limits	N/A	N/A
Chair Occupancy Alarm	Scheduled PM tests	Periodic checks	N/A	N/A	N/A
Hypo/Hyperthermia Unit	Scheduled PM tests	Periodic checks	N/A	N/A	N/A
Infusion Pump	Scheduled PM tests	Ongoing checks	N/A	N/A	N/A
Intra-Aortic Balloon Pump	Scheduled PM tests	Ongoing Monitor	Alarm set-up limits	N/A	N/A
Bedside Physiological Monitor	Scheduled PM tests	Ongoing monitor	N/A	N/A	N/A
Heart Rate Monitor	Scheduled PM tests	Ongoing monitor	N/A	N/A	N/A
Pulse Oximeter	Scheduled PM tests	Ongoing monitor	N/A	N/A	N/A
Bathroom Emergency Call	N/A	Respond as req'd	N/A	Scheduled alarm tests	N/A
Code Blue Call	N/A	Respond as req'd	N/A	Scheduled alarm tests	N/A
Infant Abduction Alarm	N/A	Respond as req'd	N/A	N/A	Scheduled alarm test
Nurse Call	N/A	Respond as req'd	N/A	Scheduled PM checks	N/A
Medical Gas Alarm	N/A	Respond as req'd	N/A	Scheduled PM tests	N/A

Table 2

Step 3: Determine Critical Clinical Alarm Audibility

Critical Clinical Alarm Nursing Self-Assessment Form

Device Description	Is the Alarm Audible?	Able to Discern the Alarm?	Can Alarm be Silenced?	Can Alarm Volume be Adjusted or Reset?	Has Staff Training been Provided
Ventilator					
Infant Warmer					
Apnea Monitor					
Chair Occupancy Alarm					
Hypo/Hyperthermia Unit					
Infusion Pump					
Intra-Aortic Balloon Pump					
Bedside Physiological Monitor					
Heart Rate Monitor					
Pulse Oximeter					
Bathroom Emergency Call					
Code Blue Call					
Infant Abduction Alarm					
Nurse Call					
Medical Gas Alarm					

Table 3

Step 4: Evaluate Clinical Staff Alarm Response

Date of Test: _____ Time of Test: _____

Department or Unit: _____

Room: _____ Room Type: _____
(example: isolation, patient, multi-bay, etc.)

Equipment or Device Tested: _____

Was the alarm initiated with a simulator? Y N

If no, how was the alarm initiated? _____

What type of alarm was initiated? _____

Is this alarm considered critical to patient care? Y N

Did the alarm activate as expected? Y N

Was the alarm heard? Y N

If the alarm was heard, where was the individual when he/ she heard it? _____

If the alarm was not heard, indicate the reason: _____

How long did it take for someone to respond to the alarm? _____

How many people responded to the alarm? _____

What other noises were in the environment, competing with the alarm? _____

What changes, if any, are needed to improve the effectiveness of critical clinical
alarms? _____

Signature of Department Representative: _____

Figure 1

