Sensory Overload and Technology in Critical Care

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KEYWORDS

• Sensory overload • Technology • Device alarms • Intensive care • Human factors

KEY POINTS

- Critical care nurses identified alarms from cardiopulmonary physiologic monitors, ventilators, and IV pumps as contributing most to sensory overload and as the most helpful ones.
- Barriers of cardiopulmonary physiologic monitor alerts/alarms include being unable to silence alarms, difficulty adjusting alarms, unable to recognize nontextbook rhythms, unable to recognize baseline rhythms, and being too sensitive.
- IV pump alarms were helpful for critical care nurses to know the array of IV drips administered were properly running.
- Barriers with IV pump alarms include unnecessary alarms while trouble-shooting, being overly sensitive, silence function with too short of duration, and loud and obnoxious alarm sounds.
- Several device/technology alarms make identical or nearly identical sounds regardless of their priority.

INTRODUCTION

The intensive care unit (ICU) has been characterized as a demanding work environment where the background noise of monitors, ventilators, and alarms and flashing lights are continuous.[1] In addition, the prompt attention required to continually turn off false alarms and monitor multiple devices for multiple patients is deemed often beyond the capabilities of most humans.[1] This high-stress environment is demanding physically, emotionally, and cognitively. As a result, critical care nurse burnout is pervasive and is the major reason nurses leave these intensive environments.[2–4] One-third of ICU nurses experience severe burnout and 60% of those with severe

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burnout contemplated leaving the nursing profession.[5] Nurses often work 12-hour shifts, so it is not surprising that ICU nurses have the second highest turnover rates, second only to psychiatric units.[6]

Critically ill patients in the ICU are connected to an increasing number of monitors and life-sustaining medical devices. Managing the ever-evolving, sophisticated technology in the ICU is an expected skill for critical care nurses. Yet, critical care nurses have identified insufficient training and malfunctioning advanced technology to be stressful and threatening.[7] Moreover, noise levels in the ICUs often exceed recommended thresholds.[8] Critical care nurses report feeling fatigued, exasperated, and angry[9] from the constant bombardment of noise. Prolonged exposure to such noise often results in noise-induced stress, a predictor of burnout in critical care nurses.[10,11] Research has shown that people adapt to noisy work environments by becoming less interpersonally engaged, less caring, and less reflective.[8] Noise impedes the performance of complex intellectual tasks that require focused attention[12] and increases the frequency of errors in work environments.[13] Such negative performance effects from noise is more pronounced in those who are already experiencing sensory overload, defined as the state or condition produced by "overstimulation of one or more of the senses," and are working at near-capacity levels.[14] Therefore, improving the physical work environment of ICU is imperative.

A national survey of 6312 registered nurses from across Canada in 2010[15] reported that, "Fatigue has had its impact on nurses with 25.8% considering resigning; 20.2% considering retiring; and 25.6% considering leaving the profession owing to fatigue. ….Nurses also identified a feeling of sensory overload, functionally disorganized workplaces and relentless change within the workplace as contributors to their fatigue."[15] The purpose of this study was to identify issues and concerns associated with sensory overload among ICU nurses that are specifically related to medical device/technology generated alarms/alerts.

METHODS

Study Design

A qualitative study was conducted using focus groups with critical care nurses (working $\geq$20 hours per week over the past 6 months in a critical care environment). Participants for this study were identified through established contacts, emails, and study recruitment advertisements placed in critical care units. Critical care nurses with supervisory roles were excluded to avoid any concerns about participating from potential subjects. At beginning of each focus group, time was allotted to review the purpose of the study, answer questions, and obtain informed consent. The University of Arizona Human Subjects Protection Program reviewed and approved this project.

Pre–focus Group Survey

A preinterview survey was developed and completed before the structured interview. This self-administered questionnaire included (1) questions concerning demographic characteristics (participant age, gender, years in practice, years in critical care practice, and education), (2) asked participants to rate specific device alarms/alerts that contribute to sensory overload at work, and (3) asked participants to rate specific device alarms/alerts that are most helpful at work. These devices alarms/alerts included cardiopulmonary physiologic monitor auditory and visual alarms, nurse call light alarms, bed exit alarms, intravenous (IV) pump alarms, ventilator alarms, electronic health record (EHR) visual alerts, and medication dispensing systems. The participants rated each alert/alarm on a 10-point scale where 0 was contributing least to