Nurses' Performance Regarding ICU Devices Alarms

Thesis
Submitted for partial fulfillment of the Master Degree in Medical Surgical Nursing (Critical Care)

By

Ayman Mabrouk Abd ElhalimElnaggar

BSN-Ain Shams University

Faculty of Nursing
Ain Shams University
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Under supervision of

Prof. Eman Talaat Mohammed
Professor of Medical Surgical Nursing Department
Faculty of Nursing - Ain Shams University

Dr.Dalia Abdallah Abdelatief
Assistant. Professor of Medical Surgical Nursing Department
Faculty of Nursing - Ain Shams University

Faculty of Nursing
Ain Shams University
2019

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Ayman MabroukAbdelhalimElnaggar

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List of Abbreviations

Abbr.	Full term
AACN:	American Association of Critical Care Nurses
AARC:	American Association for Respiratory Care
AC:	Alternating Current
bpm:	Beats per Minute
BScN:	Bachelor of Science in Nursing
CEN:	ComitéEuropéen de Normalisation
CINAHL:	Cumulative Index to Nursing and Allied Health Literature
CO2:	Carbon dioxide
CPAP: Continuous Positive Airway Pressure	
dBA:	A weighted Sound level in Decibels
ECG:	Electrocardiogram
ECRI: Emergency Care Research Institute	
ENs:	European Normalization Standard
EtCO2 :	End Tidal Carbon Dioxide
FDA:	Food and Drug Administration
FiCO2 :	Fraction of Inspired Carbon dioxide
HTF:	Healthcare Technology Foundation
ICU:	Intensive Care Unit
IEC:	International Electro Technical Commission
IV:	Intravenous Therapy
JC:	Joint Commission
LAeq:	Time-Averaged Sound level
LAmax:	Peak-Noise levels
MAUDE:	Manufacturer And User Facility Device Experience

MEDline: Medical literature Analysis and Retrieval System Online

MEDSUN: Medical Device Surveillance Network / Medical Product Safety Network- FDA

NPSG: National Patient Safety Goals

O2: Oxygen

PACU: Post Anesthesia Care Unit

Paw: Airway Pressure and Alveolar Pressure during High Frequency Ventilation

PEEP: Positive End-Expiratory Pressure

SA: Situation Awareness

SPO2: Peripheral Capillary Oxygen saturation

SPSS: Statistical Package for Social Sciences

SRLF: The Société de Réanimation de Langue Française

TCICU: Transplant/Cardiac ICU

USA: United States of America

VE: Minute Ventilation

VT: Expiratory Tidal Volume

WHO: World Health Organization

Nurses' Performance Regarding ICU Devices Alarms

ABSTRACT

Alarms in the critical areas are an important component of most of the machines as they alert nurses on the change in the patients' condition. Most patients in the critical care units cannot speak for themselves hence cannot pinpoint when their condition. It is therefore important to assess the nurses' performance when managing clinical alarms.

The aim of this study was to assess the nurses' performance regarding devices alarms in intensive care units. **Design:** A descriptive exploratory design was followed to achieve the aim of this study. **Setting:** The study was conducted at the open heart intensive care unit at Academy of Heart affiliated to Ain shams University Hospitals. **Sample:** A Convenience sample of nurses (30) in ICU unit at Ain Shams University Hospital. **Tools of data collection:** A structured self-Administered knowledge assessment Questionnaire nurses, Observational check list and Nurses` attitude rating scale.**Results:** The results of this study showed that, (77%) of studied nurses had unsatisfactory knowledge and (80%) of them had unsatisfactory practice and (54%) of the study group of nurses had positive attitude regarding management of devices alarms. Furthermore, there was a highly statistical significant correlation between total studied nurses' knowledge and total practice and there was a highly statistical significant correlation between total studied nurses' practice and attitude. **Conclusion:** The current study concluded that, more than two third of the studied nurses had unsatisfactory level of knowledge and practice. **Recommendations:** The study recommended the importance of implementing an educational training program to improve nurses' performance regarding dealing with ICU devices alarms.

Key words: ICU devices alarms, Nurses' performance

INTRODUCTION

Alarms on clinical devices are intended to call the attention of caregivers to patient or device conditions that deviate from a predetermined “normal” status. They are generally considered to be a key tool in improving the safety of patients. The purpose of alarm systems is related to “communicating information that requires a response or awareness by the operator.”***(Siebig et al., 2010).***

A very interesting review of goals and indications for monitoring by Hudson: "Monitoring is making repeated or continuous observations or measurements of the patient, physiological function and the function of life support equipment, for the purpose of guiding management decisions, including when to make interventions and assessment of those interventions" ***(Ruppel, Funk, &Whittemore, 2018).***

The alarm design should adequately represent the underlying situation. The various goals of device alarms are: to detect the life threatening situations, detect imminent danger, diagnose(diagnostic alarms, they indicate a pathophysiological condition e.g. shock), detection of life threatening device malfunctione.g. disconnection from the

patient, occlusion of the connection to the patient, disconnection from power, gas etc and detection of imminent device malfunctions. ***(Schmid, Goepfert&Reuter 2013).***

The value of technology is allied with human competence, since clinical alarms are considered an essential and life-saving key tool. The Joint Commission on Accreditation of Healthcare Organizations defines clinical alarm as "any alarm that is intended to protect the individual receiving care or alert the staff that the individual is at increased risk and needs immediate assistance".***(Cosper et al., 2017)***.

The purpose of equipment alarms is to alert professionals for potential problems and serious or dangerous situations. However, they might also compromise the quality of work of nurses and patient safety due to the abundance of false positives. False positive alarms are understood as those that do not assume clinical relevance at the time or are caused by technical problems or artifacts.These may be generated not only by the equipment's hypersensitivity, but also by the inadequacy of the parameters' limits to the clinical condition of each patient. ***(Cosper etal., 2017)***

Effective alarm management in an intensive care unit (ICU) can be influenced by various factors; the culture of the department, nursing practice and technology. The aim of effective alarm management in ICU is to create an environment conducive to patient safety. ICU environments deliver advanced care for patients that are critically ill and thus they require close constant monitoring of their condition. In an ICU environment nurses are also dependent on clinical alarms of the various monitoring devices/ equipment being used. ***(Ramlaul, 2015)***

The purpose of clinical alarms is to ensure that nurses are given an alert or warning that the patient is requiring urgent attention and/or alerting them that there is a change in patients' condition that could be related to a potential problem. Nurses do rely on these clinical alarms to notify them of changes in the patient's condition.***(Ramlaul, 2015)***

Alarm hazards are a critical issue in patient safety. Of all health care providers, nurses are the ones most directly affected by the multitude of clinical alarms. ***(American Association for Critical-Care Nurses', 2013)***

Numerous organizations, including the Healthcare Technology Foundation (HTF), the Emergency Care Research Institute (ECRI), the Association for the Advancement of Medical Instrumentation, the American Association of Critical-Care Nurses, and The Joint Commission, have recognized alarm hazards as a critical issue in patient safety. ***(Cosper et al., 2017)***

The ECRI Institute, a nonprofit health services research organization, named alarm hazards as No. 1 of the top 10 health technology hazards for the years 2012 through 2014. The American Association of Critical-Care Nurses has made alarm safety a priority; the organization has produced an online toolbox of evidence-based resources, including a practice alert on alarm management and webinars. The Joint Commission recently established a National Patient Safety Goal on alarm management. ***(Cosper et al.,2017)***

The role of the nurse in cardiac care unit (CCU) is to observe the information that is provided by the different device systems and to decide whether the readings they get from the devices exceed or are lower than certain limits so that they can intervene. They also perform certain routine tasks to

determine the biophysical parameters of the patients every few hours. Nurses therefore respond to alarms and initiate actions. They may therefore end up relying on the alarms entirely if the alarms are dependable or they may ignore the cues from the alarms if most of the alarms that are set off are false alarms. ***(Meng'anyi, Omondi, &Muiva 2017)***

Although alarms are an important indispensable and lifesaving feature, they can be a nuisance and can compromise quality and safety of care by frequent false positive alarms. Nurses should therefore be familiar of the alarm modes and should check and reset the alarm settings at regular intervals or after a change in clinical status of the patient. ***(Meng`anyl et al.,2017)***

Nurses are concerned about the impact of alarm fatigue on nurses and patients, recognize the importance of nurses' role in reducing noise pollution, and offer valuable insight into strategies that can mitigate alarm hazards. ***(Funk, Clark, Bauld, Ott, &Coss, 2014)***