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Featured Article

Timely Recognition of Ventricular Fibrillation and Initiation of Cardiopulmonary Resuscitation by Intensive Care Unit Nurses: A High-Fidelity Simulation Observational Study

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Abstract

Background: Early cardiopulmonary resuscitation has been shown to increase survival. Nurse-initiated defibrillation could decrease delays before shock administration.

Method: An observational study was conducted in a university hospital in Quebec (Canada) in late 2017. A standardized simulated scenario of a cardiac arrest after ventricular fibrillation was used.

Results: It took, on average, 12 seconds for the nurses to call for medical assistance, and 28.8 seconds to initiate chest compressions. Most nurses could recognize ventricular fibrillation and that manual defibrillation was immediately required (91%).

Conclusion: Further research could help assess translation of skills from simulation scenarios to clinical context and should evaluate whether nurse-initiated defibrillation improves patient outcomes.

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Causes of cardiac arrest are multiple. They can lead to ventricular tachydysrhythmias, such as pulseless ventricular tachycardia (VT) and ventricular fibrillation (VF), which are both shockable rhythms, as well as pulseless electrical activity and asystole, which are both nonshockable rhythms

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(Link et al., 2015). A shockable rhythm is an abnormal heart rhythm that could potentially respond to defibrillation. Early identification and defibrillation of shockable rhythms—either with an automated external defibrillator for basic life support (BLS)–trained providers or with a manual defibrillator for advanced cardiovascular life support (ACLS)–trained providers—has also been shown to increase survival in the context of VT or VF (Kleinman et al., 2015; Link et al., 2015). Multiple studies have shown that survival increases when the first observed rhythm is shockable (Benjamin et al., 2017; Mallikethi-Reddy et al., 2017; Meaney et al., 2010; Nadkarni et al., 2006; Nolan et al., 2014; Sandroni, Nolan, Cavallaro, & Antonelli, 2007). However, VT and VF are much less frequent than pulseless electrical activity and asystole (Mallikethi-Reddy et al., 2017; Meaney et al., 2010; Nadkarni et al., 2006; Nolan et al., 2014; Sandroni et al., 2007). Nurse-initiated manual defibrillation before the arrival of the attending physician is not a frequent practice in the context of an in-hospital cardiac arrest (IHCA). However, it has been suggested that rapid identification of shockable rhythms by the first responder—which is most commonly a nurse—increases the proportion of successful defibrillations (Borak et al., 2014). Prior research has shown that training nurses to recognize shockable rhythms and initiate defibrillation maneuvers decreases time to first shock after VT or VF in simulated settings (Delac, Blazier, Daniel, & N-Wilfong, 2013) and increases the number of patients defibrillated before the arrival of the cardiac arrest team in acute care settings (Borak et al., 2014; Chan et al., 1998; Coady, 1999). Notably, Borak et al. (2014) reported a 61% increase of early defibrillator use after nurses received proper training sessions in cardiopulmonary resuscitation (CPR).

Key Points

- The success of nurse-initiated defibrillation is highly dependent on appropriate skills being applied in a timely manner, which has not been investigated thoroughly.
- Most intensive care unit nurses in the sample correctly recognized ventricular fibrillation and determined that defibrillation was required.
- Further research should investigate the impact of nurse-initiated defibrillation on patient outcomes.

However, the use of shock advisory defibrillators (or automated external defibrillators) might reduce survival rates after IHCA (Chan et al., 2010; Forcina, Farhat, O'Neil, & Haines, 2009) because this intervention is associated with a user-dependent time loss (Wurmb et al., 2015), which can prolong the preshock pause, therefore decreasing shock success (Edelson et al., 2006) and survival probabilities (Chan et al., 2010). Consequently, institutions and researchers suggest the use of manual defibrillators by trained professionals (Chan et al., 2010; Cummins, Ornato, Thies, & Pepe, 1991). The use of manual defibrillation requires the ability to recognize ventricular tachydysrhythmias, assess pulseless state, and initiate CPR maneuvers. However, significant barriers to nurse-initiated defibrillation—like a real or perceived lack of appropriate training in life support and defibrillation, a lack of opportunities to apply this knowledge, and a reluctance to perform defibrillation even with appropriate background training—remain (Dwyer, Williams, & Mummery, 2007; Hui, Low, & Lee, 2011). Moreover, the degree with which nurses initiate ACLS maneuvers is variable and often influenced by regulations specific to every hospital (O'Higgins, Ward, & Nolan, 2001).

In Canada, it is an ethical and professional obligation for nurses to be competent in interventions such as CPR (College of Nurses of Ontario, 2018; Truchon, 2009) and therefore to recertify according to the continuously updating resuscitation guidelines. In certain Canadian provinces, intensive care unit (ICU) nurses' have to hold an active BLS and ACLS certification. However, nurses in Quebec, while asked to recertify every two years, are not required to formally demonstrate that they have an active CPR license. To our knowledge, the actual proportion of ICU nurses in Quebec having an active BLS or ACLS certification is unknown.

Clinical simulation offers the possibility to train health care professionals to perform highly complex technical tasks and nontechnical skills (e.g., decision-making ability, clinical judgment) in a safe and controlled environment without any prejudice to patients (Lewis, Strachan, & McKenzie Smith, 2012). Prior studies have documented the validity of clinical simulation to assess clinical skills in health care professionals (Weller, Kurrek, Cohen, & Cleave-Hogg, 2003).

Taking advantage of the important characteristics of clinical simulation, this study aimed to answer the following research question: "Do ICU nurses' have the proper skills to initiate the first critical steps of CPR following pulseless VF onset?"

Conceptual Framework

To guide the inception of this study, the conceptual framework of O'Malley, Perdue, and Petracca (2013) was used. It was developed after an inductive process that involved a thematic analysis of the literature on health care training programs and aimed to adequately assess the impact of the implementation of such programs. Indeed, the authors noted that although new training programs are frequently introduced in health care sectors, very few evaluated their actual impacts. Notably, these authors suggest assessing the individual performance and skills of the study population. Although no actual training program was introduced in this research, we conducted an analysis of training