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Do Technical Skills Correlate with Non-Technical Skills During Crisis Resource Management?

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Abstract

Introduction: Both technical skills (TS) and non-technical skills (NTS) are indicators to ensuring the patient safety during critical care practice and effective crisis resource management (CRM). These skills are usually assessed and taught individually.

Objectives: To assess the relationship between the TS and NTS in CRM.

Method: Extended literature review using electronic data bases such Google Scholar, Pubmed and Medline via Ovid databases.

Results: The TS and NTS were significantly correlated.

Conclusion: The TS and NTS should be treated as relevant factors to achieve an efficient CRM practice. Therefore, both TS and NTS are not independent of each other in intraoperative crisis management. More studies needed to evaluate the influence of NTS on the performance of TS.

Keywords: Cardiopulmonary resuscitation; CPR; Cardiac arrest; Non-technical skills; Technical skills

influence the performance of CPR [3,4]. Moreover, clinical performance training, assessment and research could have broad implications in such situations for our understanding of the association between these two attributes [5]. This is what sparked the attention of the author, as seeking development in clinical practice is commonplace regarding this issue [2]. Accordingly, this paper aims to evaluate the relationship between TS and NTS.

Search strategy

Initially, to assess how many articles might be available on the topic, Google Scholar was applied as a scoping exercise. PubMed and Medline via Ovid databases were used for a more in-depth search. Nine articles in Pubmed and eight articles in Medline via Ovid were retrieved using the keywords: "Cardiopulmonary resuscitation" OR "CPR" AND "cardiac arrest" AND "non-technical skills" AND "technical skills". The time-frame for the search was from 2010 to 2016, to ensure that recent articles were retrieved [6].

After careful screening, the following article was selected, and to be evaluated using a framework devised by CASP, due to its relevance to the rationale of this study.

Article critique

Riem et al. [7] conducted an observational study to investigate the correlation between TS and NTS in resuscitation management during crisis situations. However, the authors did not clarify the study design. Parahoo described notes that writers must specify their study design, such as case-control, longitudinal, or cross-sectional study, in order to allow the reader to judge its applicability to answer their question; otherwise the article might be misclassified [6].

Ensuring a sufficient the sample size before conducting any study is vital for cost and ethical reasons [8]. Fifty anaesthesiology residents were enrolled in Riem et al. [7] study: this sample size was estimated based on a previous study performed by Boet et al. [9]. Boet et al. [10] justified their sample size by using power calculation. Grove et al. [11] note that subsequent studies could sample the same number,

Introduction

Rationale

Technical skills (TS) and non-technical skills (NTS) are two sets of skills required in crisis resource management (CRM) to enhance patient safety [1]. In situations of cardiac arrest, there is imminent danger to life if this is not realized; consequently, the European Resuscitation Council (ERC) recommends that like any other skill, NTS need to be trained [2]. Increasing evidence suggests that NTS – such as decision-making, task management, situation awareness, and team working –

assuming that similarities exist between the populations being studied and the number of groups being compared [12]. As the previous study was similar to the current study population, this sample seems sufficient. This approach saves time and reduces costs [8].

The targeted population implicated in the study seems appropriate, as the inclusion and exclusion criteria were clearly presented, increasing the external validity of the result [8]. The inclusion criteria included anaesthesiology residents responding to crisis conditions in postgraduate year two out of five. They were novices who might have defects, especially in NTS [5]; therefore, Riem et al. [7] sampling strategy was suitable to represent the population [6]. Subjects were excluded if they had not undertaken advanced cardiac life support (ACLS) certification in the previous five years.

The authors used pre-test videos from a previous study conducted by the same team of researchers to develop the current research question [10]. Pre-tests are used to measure knowledge gained from participating in a training course, and can also be used to establish a research question: this approach is valid and adequate. Eppich et al. [13] found that the use of videotaping for observation has a positive short-term effect. Moreover, the authors obtained additional and specific ethical approval for a retrospective analysis of the videos. It is vital to determine that ethical principles are being applied and that the rights of the individual are being protected [14].

Two scenarios were presented in the study, within intraoperative cardiac arrest secondary to a malignant arrhythmia: either pulseless ventricular tachycardia (VT) or ventricular fibrillation (VF). In a context irrespective of management, short cardiac arrest scenarios were chosen by the authors, because this kind of case is considered to be a climacteric event archetype [13].

To ensure a comparable level of difficulty, two scenarios were piloted by the authors. This allowed consideration of any problems with the observation, such as noise intervention, aspects of the task that cannot be recorded, or issues with the recording tools [15]. Event sampling is where the observer selects pre-specified events for observation, such as cardiac arrests [12]. It requires that the researcher has some prior knowledge regarding the occurrence of events, and thus will increase the credibility of the findings [8].

In Riem et al. study [7], participants were distributed randomly to the two scenarios, to decrease potential bias [16]. However, the authors failed to clarify how this operation was accomplished. This influences the reliability of the randomization process and reduces the study's validity [6].

The authors used two checklists: Delphi and the Anesthetists' Non-Technical Skills (ANTS), to assess TS and NTS. The authors used the Delphi iterative approach to advanced cardiac life support management, modified with ten experts by Morgan et al. [17], to assess TS. Delphi is a method pertaining to the utilization of expert opinions and is a valid and reliable measurement checklist [6,18]. The authors demanded agreement of 80% for all items, to prevent chance agreement

between the ten experts, using a judgment quantification process, the consensus on all of the checklist items was measured after three rounds of the Delphi procedure. Bowling [8] stated that during this process, the range of the answers is likely to decrease and the group will tend to converge towards the "correct" answer, thus increasing the stability of the result. The authors used the ANTS scale to measure NTS: this is a validated scale for the assessment of behavioural performance [19,20].

In the present study, four independent assessors were recruited from experts in simulation, clinical practice, and CRM principles. Okeke [21] notes that the training of observers has been identified as a crucial aspect in helping to improve validity and reliability. Moreover, blinding was not applicable due to the nature of the study, which was based on direct observation of participants. Hancock et al. [22] emphasised that blinding is impossible with observational studies, although it is possible to use an evaluator who is blinded to the assessors who assess each subject. Therefore, the risk of selection bias was reduced [6], while the ten expertise evaluators were blinded.

Skills were assessed through a certain anaesthesia cardiac arrest scenario. However, this might not be the case for TS, because it has been shown that NTS appear to be transferrable across acute crisis management scenarios [13]. Therefore, the results may not be generalizable to other populations or status (Anders Ericsson and Towne). It is probable that not all NTS can be assessed through a short scenario, despite the algorithm-driven and well-structured scenario used in the study [14].

The authors explicitly specified the outcomes using numerical results in tabular form, which were easy to understand. As noted by Parahoo [6], tables are helpful in presenting numerical data, enabling readers to identify particular information. Moreover, the findings indicate that TS and NTS performance in intraoperative simulated scenarios were associated through crisis management ($r=0.45$, $P<0.05$).

A correlation was found between TS and NTS, measured by checklists, and ANTS score for technical performance. The TS checklist scores and ANTS categories had statistically significant correlations, with r ranging from 0.31 to 0.45. This result supports those reported by other researchers emphasised that it is important to compare results with other similar studies; this can improve readers' knowledge and set the results in context [23].

Riem et al. [7] clearly identified their study's limitations. Such limitations can impact the results [16]. In the context of healthcare practice, appraisal of the strengths and weaknesses of research will assist the reader to determine the significance and validity of the results [24].

Finally, the population in Riem et al. [7] study was limited to anaesthesiology residents in relation to NTS. Other members of the resuscitation team, such as operating department practitioners (ODPs), anaesthesia practitioners (APs) and nurses, were excluded. Nevertheless, the evaluation was compatible to the other team members in all elements of the

TS, except for leadership in NTS. These could be implemented with other members in further research.

Results and Discussion

Main study findings and implications for practice

TS and NTS were significantly correlated. Therefore, the authors concluded that TS and NTS are related and not autonomous from each other in intraoperative crisis management [7].

The study states that the nature of this relationship has yet to be classified, and the research provides the basis for future studies to evaluate the influence of NTS training on the performance of TS; also, whether different TS are required and whether NTS are common and transferable between crisis situations [7]. This reveals a need to implement some changes in organizational settings. Also, more support from managers is noted to be the top ranked facilitator of research implementation.

Moreover, in most cases and as with any other skill, accomplishing successful resuscitation is a team performance for which NTS needs to be trained (ERC 2015). Training in NTS, using CRM principles decisively in simulations, has been shown to lead to the transfer of learning simulation into clinical practice [9]. Furthermore, specific training such as CRM training can increase perceived teamwork, satisfaction with care and observed teamwork skills, and the effect can last for up to one year [25,26]. Educational programs are valuable in enhancing and organizing an effective team response, structuring cooperation and teamwork in crisis [27]. The results of this study clearly support the evidence-based value of CRM for providing a framework for multidisciplinary collaboration in a crisis.

Assessment instruments (mainly checklists) such as the Anesthetists' Non-Technical Skills- Anesthetists' Practitioner (ANTS-AP) scale, have been developed, validated, and recommended for resuscitation team members, including ODPs and APs [28]. Rating scales exist for the assessment of team performance [29]. Moreover, within ORs, situation awareness, teamwork and task management, which seem to be important NTS for APs and ODPs in the management or development of critical incidents [30].

To organize group efforts, each resuscitation team needs a leader. The responsibilities of the team leader are to ensure that everything is obtained in the right way at the right time via supervising and combining the individual performance of team members [25]. Nevertheless, the team leader needs to be skilled in all the particular skills that need to be employed during resuscitation [30]. This level of expertise is necessary so that the leader can serve as backup for any team member who might face problems implementing his/her role or assigned task. The team leader role includes modelling outstanding leadership skills and team behaviour as well as helping team

members to comprehend why tasks are completed in a particular way (American Heart Association (AHA)).

Moreover, within the scope of practice, the team members must be accomplished in the skills that they are trained and authorized to perform [31]. The Standards of Conduct, Performance and Ethics (SCPE) state that "you must keep within your scope of practice by only practicing in the areas you have appropriate knowledge, skills and experience for" [32]. Certain elements of effective resuscitation team dynamics must be considered, including clear messages, closed-loop communication, knowing one's limitations, clear roles and responsibilities, deductive intervention, knowledge sharing, re-evaluation and summarizing, and mutual respect (AHA). These elements, associated with TS and NTS, require training of the team members in similar simulations to enhance the team's performance to achieve excellence in resuscitation outcomes [9].

To ensure patient safety while performing any intervention, according to the SCPE of the Health Professions Council (HPC), healthcare professionals must be competent and well trained. In most circumstances, from an ethical point of view, before any intervention or treatment, patient consent has to be acquired; however, in resuscitation scenarios, the situation is somewhat different and intervention without the consent is deemed legal to preserve the patient's life (Royale College of Nursing). However, resuscitation decisions become more complicated if the arrested patients are seriously ill or in cases of genetic anomaly in neonatal patients which bring concerns regarding viability. Resuscitation is predominantly prevented in such cases, as it can either be futile for survival or extend the process of dying. Therefore, rescuers and providers should also be educated about ethical and legal issues [33]. Moreover, the decision as to when to end the resuscitation process belongs to the team leader, and this must be made explicit to the parents, with sensitivity [34].

There are four basic ethical principles surrounding health decisions: beneficence, non-maleficence, autonomy and justice [35]. Beneficence involves ensuring the patient's best interest. Consequently, to begin CPR, the rescuers must be certified and trained to do so. Meanwhile, non-maleficence prescribes avoiding injury or harm to the patient by the provider. Hence, to guarantee the delivery of safe and effective patient care, the TS of CPR must be properly taught and revised by the teachers [33].

From the perspective of autonomy, patients have the right to make their own decisions about their health and treatment, and the principle of justice dictates that care must be provided regardless of race, ethnicity or religion [6]. Legal advice should be requested if a child's parents reject suitable and effective treatment for reasons of religion or belief: then the decision must be considered by the doctors in the patient's best interest. Hence, particular documentation is necessary to demonstrate the reasons underlying such a decision [31]. Furthermore, whilst conveying life-sustaining treatment to patients, healthcare practitioners should weigh the benefits and risks to avoid harm [36-40].

Conclusion

To conclude, to achieve successful practice during CPR, TS and NTS should be considered as related factors [7,9,28,41-43]. Therefore, hopefully by avoiding any legal complaints and satisfying the suggested implications, practice in healthcare will progress and satisfactory outcomes to CPR will be increased [44-47].

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