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What is the Effect of Frequent Basic Life Support Refresher Sessions on Health Care Professionals' Retention of Cardiopulmonary Resuscitation Skills? A Systematic Review

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Abbreviations: AED, Automated External Defibrillator; AHA, American Heart Association; BLS, Basic Life Support; CPR, Cardiopulmonary Resuscitation; EBL, Evidence Based Librarianship; IDG, Instructor Directed Group; NHMRC, National Health and Medical Research Council; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta- Analyses; RCT, Randomised Control Trial; RFST, Repetitive Sessions of Formative Self Testing; RFSTAP, Repetitive Sessions of Formative Self Testing with Additional Practice ROSC, Return of Spontaneous Circulation; SDG, Student Directed Group.

Abstract
Background: Cardiopulmonary resuscitation training is currently provided to health care professionals at biannual intervals to meet mandatory recertification in accordance with guidelines. However, literature reports that resuscitation skills decline rapidly and sometimes long before recertification. Inadequate CPR may result in a decrease in the incidence of achieving return of spontaneous circulation and other devastating outcomes. Good quality training and education in cardiopulmonary resuscitation is paramount to patient survival. Brief refresher sessions may prevent skill decay among health care professionals, improving skill retention over time and improving patient outcomes.
Objective: The aim of this systematic review is to determine the effect of frequent basic life support refresher sessions on health care professionals' retention of cardiopulmonary resuscitation skills.
Methods: A systematic review using narrative analysis was completed. A database search was conducted to identify relevant studies for inclusion. Databases searched include Medline, Embase, CINAHL and The Cochrane Library. Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were used to guide the review.
Results: Ten of the 11 studies in this paper concluded that basic life support refresher sessions may increase retention of cardiopulmonary resuscitation skills. Two of the included studies discussed self-perceived confidence as a secondary outcome. One of these two studies demonstrated a significant correlation between higher self-confidence and improved retention of cardiopulmonary resuscitation skills.
Conclusion: Basic life support refresher sessions can have a positive impact on cardiopulmonary resuscitation skill retention among health care professionals. However, the most effective method of delivering refresher sessions must be further clarified. The optimal duration of these sessions as well as the optimal timing of delivering these sessions also requires further clarification through further research.

1.0 Introduction

Cardiac arrest is a sudden loss of heart function in individuals who may or may not have a known heart disease [1]. It is the most urgent type of emergency both in-hospital and out of hospital [2,3]. Early recognition and prompt initiation of cardiopulmonary resuscitation (CPR) is imperative to survival [4]. CPR is a series of actions that have the potential to the increase the chance of survival in cardiac arrest victims [5]. Immediate high quality CPR and rapid defibrillation are crucial steps in the chain of survival [6]. Inadequate CPR may result in a decrease in the incidence of achieving return of spontaneous circulation (ROSC) by up to 30% in cardiac arrest victims [7]. Other devastating outcomes have been associated with poor quality CPR including neurological deficits [8]. Therefore, it can be suggested that training in CPR and basic life support (BLS) is a vital aspect of education for health care providers [3,9].

The 2015 AHA guidelines [6] are adhered to by many institutions globally, and the recommended timeline for renewal of the BLS course is every two years [10]. The process of recertification is usually a mandatory process in health care institutions [11,12]. Recertification consists of teaching BLS skills using a video, and a practice while watching session followed by an exam [6]. In addition to the written assessment, students must also complete a skills assessment. Despite this, it has be0en widely reported throughout the literature that health care professionals' skills in the area of resuscitation are poor [3,10,13-15]. The cause of this inadequate level of knowledge and competence among health care professionals in relation to CPR is unknown. It may be possible that the quality of training provided is poor [16,17]. However, it may also be possible that biannual recertification does not

prepare providers adequately for actual cardiac arrest situations [15]. The current AHA curriculum does not emphasise performing CPR skills within the hospital setting [18].

A well designed educational programme is paramount to effective, high quality CPR [2]. The use of simulation exercises which involve immersion of the health care provider in a realistic scenario, substituting the real patient for a virtual reality, high fidelity manikin has been used in some institutions [19]. Feedback devices have also been incorporated into training sessions and actual cardiac arrest scenarios in some health care institutions [20]. Feedback devices are devices that provide audio visual feedback on CPR skills [20].

In general, all skills must be practiced to be maintained and CPR is no exception [21]. Many health care professionals work in the acute hospital setting where cardiac arrest is a potential emergency in every area. However, health care professionals may not witness a cardiac arrest for prolonged periods of time [12]. As a result, BLS skills may only be practiced at the time of recertification [11,12,21]. However, it has been widely reported that CPR skills decline long before recertification [10,12,22]. CPR skills deteriorate rapidly, sometimes as early as three months following a training session [3]. Therefore, it can be argued that good quality frequent training sessions in CPR are imperative to health care providers' knowledge and skill retention. The AHA has stated that given how rapidly CPR skills decay, students should review their provider manual and practice skills whenever possible [10]. There is insufficient evidence available to suggest the optimal frequency of refresher sessions [23]. The optimal mechanism for training and maintenance of competence in CPR skills is also unknown [2]. New research is needed to determine the optimal refresher training intervals and mechanism of such refresher sessions as well as methodology of assessments in order to maintain competence among providers [2].

CPR/BLS guidelines are revised regularly in order to include ongoing research findings [24]. Therefore, BLS training sessions should be provided to health care providers regularly in order to maintain their skills and knowledge in accordance with the most up to date, evidence based guidelines. This systematic review aims to determine the effect of basic life support refresher sessions on health care professionals' retention of CPR skills.

2.0 Methods

The aim of this systematic review is to determine the effect of frequent basic life support refresher sessions on health care professionals' retention of cardiopulmonary resuscitation skills.

The systematic review question was structured using the PICO framework.

P	Population- Health care professionals
I	Intervention- Basic life support refresher sessions
C	Comparison- No refresher training
O	Outcome- Retention of cardiopulmonary resuscitation skills

2.1 Outcomes measured

The primary outcome measured was retention of cardiopulmonary resuscitation skills. The secondary outcome measured in this study was self-perceived confidence.

2.2 Inclusion and exclusion criteria

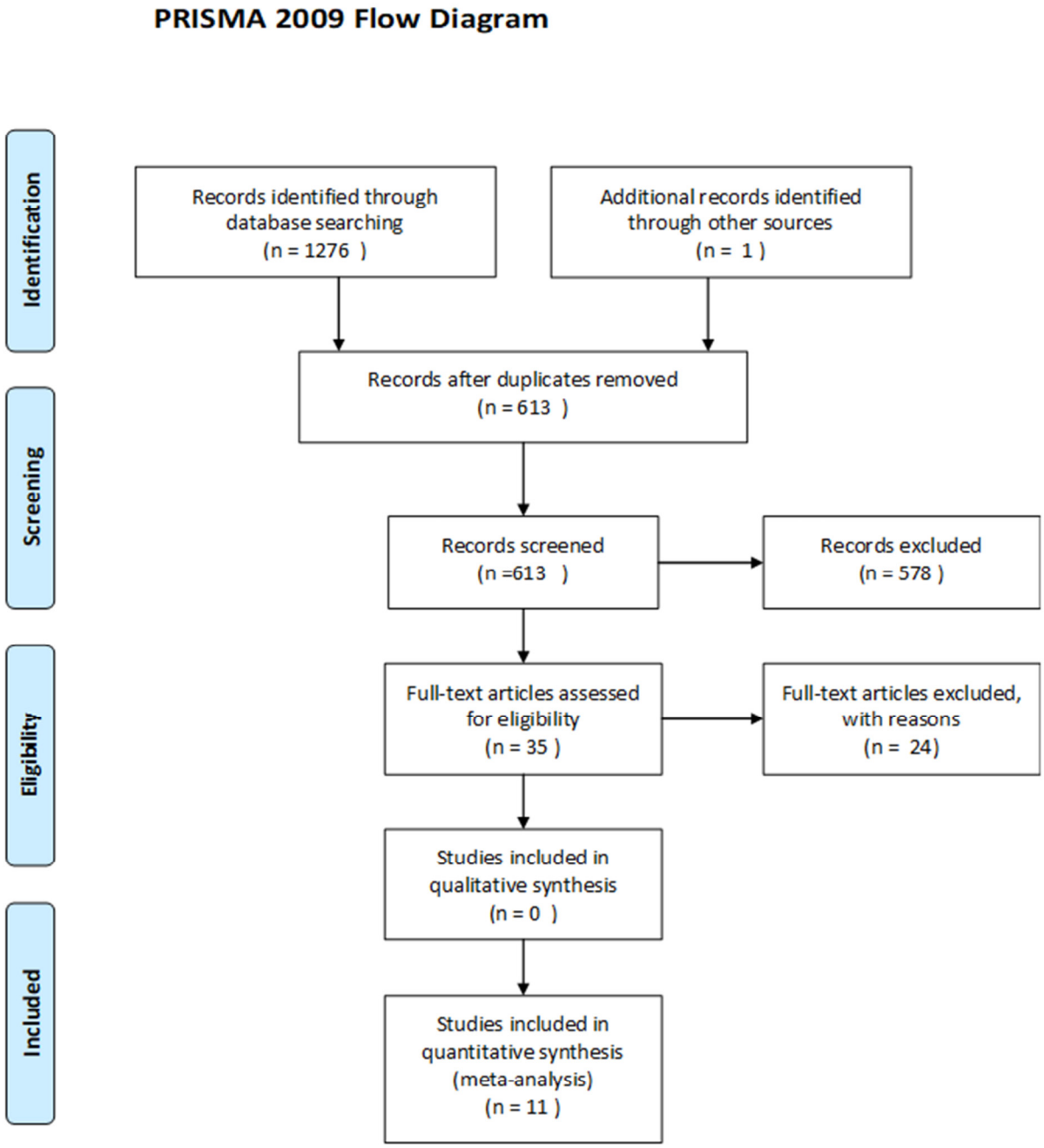
Inclusion criteria were: Studies examining the effect of basic life support refresher sessions provided at varying intervals utilising a variety of educational methodologies on health care professional's retention of cardiopulmonary resuscitation skills; studies including any or all health care professionals and English language studied only.

Exclusion criteria were: Studies examining the effect of basic life support refresher sessions on laypersons' retention of cardiopulmonary resuscitation skills and studies reporting on retention of advanced cardiovascular life support skills.

2.3 Search strategy

The following databases were searched using key search terms: Cumulative Index to Nursing and Allied Health Literature (CINAHL), The Cochrane Library, Medline and Embase. In order to identify variances in subject terms, Medical Subject Heading was used (Mesh). Key search terms as well as combinations of these terms were standardised across all four databases. Results of individual database searches were recorded in PRISMA flow diagrams and then merged to form an overall (Fig. 1) flow diagram [25]. In an effort to source any available grey literature, the above search terms were also searched using Open Grey and the AHA website. A "hand search" of reference lists was completed. One study was unavailable to the researchers across all of the databases. The author was contacted to obtain the full text article and this study was provided for inclusion in this paper. There was no limitation on year of publication.

Fig.1 PRISMA flow diagram



3.0 Results

3.1 Description of studies

The search results identified 1277 possible studies for inclusion (Fig.1). Following removal of duplicates, 605 articles remained. On further screening 578 articles were excluded. The rationale for exclusion of these studies was due to the secondary research methodology used or they did not meet inclusion criteria due to alternative population or intervention. The remaining 35 full text articles were screened and a further 24 articles were excluded, leaving 11 studies deemed appropriate and included in this paper. This search was verified by two authors.

3.2 Study location and population

Seven of the studies selected for inclusion were conducted in the United States [9,18,21,26-29], two in Jordan [30,31], one in Belgium [32] and one study was conducted across two universities in the United Kingdom and Spain [17]. Five of the included studies were conducted on nursing students [17,21,27,30,31] and one of the studies was conducted on

medical students [32]. Of the remaining five articles, two studies were conducted on staff nurses in the acute adult setting[18,28], two were conducted in the paediatric setting on nurses and physicians [9,29] and one in the neonatal intensive care unit which included physicians, nurses and respiratory therapists [26].

3.2 Quality appraisal

Quality appraisal of studies selected for inclusion was conducted and validated by a second author. An evidence based librarianship (EBL) critical appraisal checklist [33] was employed for both randomised control trials (RCTs) and non-randomised control trials. Studies were deemed to be of low or high validity following completion of an EBL checklist. Studies achieving >75% were considered to be of high validity, meanwhile studies scoring <75% were considered to be of low validity. Of the 11 studies in this review paper, ten were deemed to be of high validity following completion of an EBL checklist [9,17,18,21,26-31]. Studies included in this review paper have also been classified by level of evidence in accordance with the National Health and Medical Research Council (NHMRC) [34].

3.3 Primary outcome

The primary outcome is to examine the effect of BLS refresher sessions on health care professionals' retention of CPR skills. Two of the included studies examined skill retention as a secondary outcome [26,32]. Ten of the included studies demonstrated increased retention of CPR skills with the implementation of refresher sessions [9,17,18,21,27-32]. Sullivan et al conducted a RCT to assess CPR skill retention of nurses [18]. Participants were randomised into one of four groups; Standard AHA training (C), refresher sessions every two months (2M), three months (3M) or six months (6M). In this study, more frequent refresher sessions were associated with decreased median seconds to commencing chest compressions. When evaluating time to starting compressions by 20 seconds, significant differences were found between the participants in the groups that trained every two months and the control group: (C: 33 seconds vs 6M: 21 seconds vs 2M: 13 seconds vs 3M: 14 seconds; $p< 0.001$).

Similarly, it can be observed in fig. 2 that seconds to defibrillation was significantly lower in the 2M and 3M groups compared with the control group: (C:157 seconds vs 6M: 138 seconds vs 3M: 115 seconds vs 2M: 109 seconds; $p <0.001$). While statistically significant differences were demonstrated between the 2M group and control, no significant differences were discovered between the 2M and 3M groups in both skills. This study concluded that training sessions every three months are effective in improving time to commencing chest compressions and defibrillation.

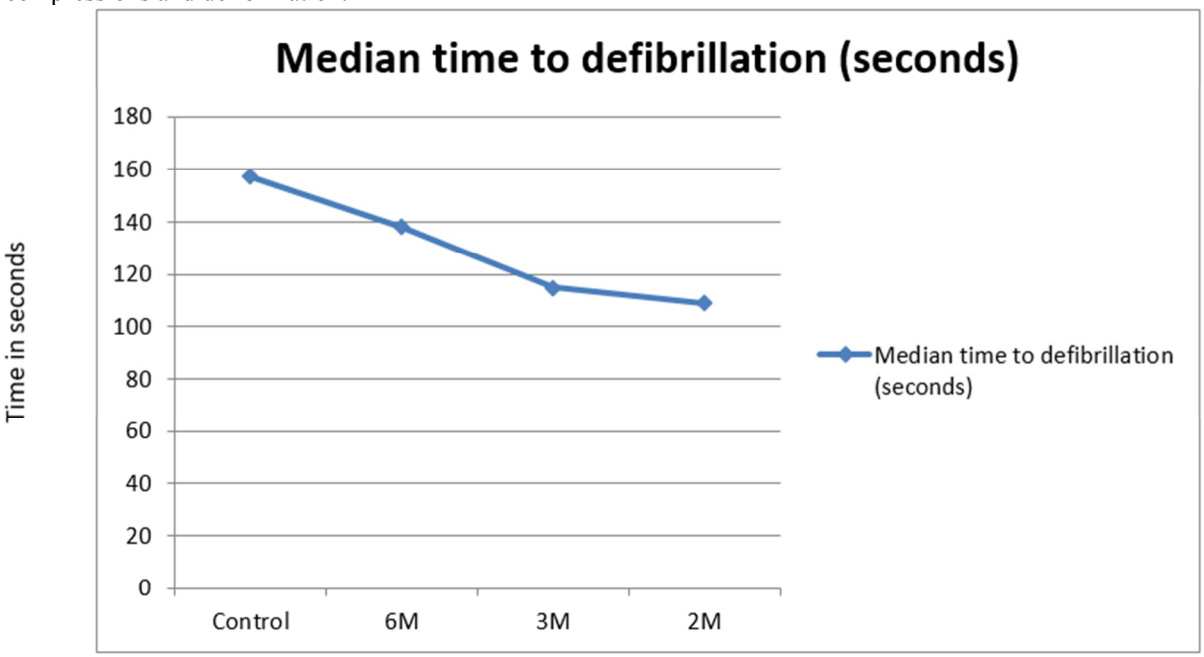


Fig.2 Mean time to defibrillation

Oermann et al also examined the effect of refresher sessions on skill retention at varying intervals (3,6,9 and 12 months) [21]. In this study, adequate compression depth was achieved in the experimental group. Students in this group did not demonstrate a decline in this skill over 12 months ($p= 0.31$). In contrast to this, the control group demonstrated significant skill loss between nine and 12 months ($p=0.0004$). The percentage of compressions performed with adequate depth decreased after reassessment at nine months ($p= 0.05$). At nine

months 55.7% of compressions were delivered with adequate depth in the control group. This finding is similar to the experimental group as percentage of chest compressions delivered with adequate depth was 55.4%. However, at 12 months only 36.5% of participants in the control group performed compressions with adequate depth compared with 59.2% in the experimental group.

In a study by Ackermann using simulation exercises, participants were randomised to control and intervention groups [27]. A 14 item questionnaire was completed pre-test, post-test and at the three-month retention test. There were no statistically significant differences between groups at pre-test (p= .902). Knowledge scores in the control group ranged between 9 to 13 (mean= 11.52, SD 1.149) in the post test assessment. When compared with pre-test results, a significant increase in CPR knowledge was demonstrated (p= .000). CPR knowledge scores in the experimental group ranged between 9 to 14 (mean= 12.25, SD= 1.218) in the post intervention assessment which is a statistically significant increase from the pre assessment (p= .001). At the three-month retention test however, the experimental group scored from 9 to 14 (mean=11.83, SD= 1.239) compared with 8 to 13 (mean= 10.68, SD= 1.282) in the control group. CPR knowledge retention in this study was significantly higher in the experimental group (p= .002). The control group also demonstrated increased acquisition of skills as scores ranged between 9 to 14 (mean= 11.36, SD= 1.270) in the post test. The scores for the experimental group at post-test assessment ranged between 11 to 14 (mean= 13.19, SD= .780). The experimental group demonstrated a significant increase in CPR skills at post-test assessment (p= .000). At the three-month retention test, the experimental group scored between 10 to 14 (mean= 12.5, SD= 1.180). Meanwhile participants in the control group scored between 8 to 14 (mean= 10.96, SD= 1.541). Participants in the experimental group demonstrated a higher retention rate of skills compared with the control group (p = .000).

In a study by Niles et al baseline skill retention was assessed six months post BLS recertification [28]. Of all study participants, 8% performed compressions with adequate depth and 35% of participants performed compressions with adequate rate. Following this baseline evaluation, participants conducted refresher sessions every two to three months for 12 months. CPR quality was reassessed at six and 12 months after the refresher programme was implemented. At the six-month evaluation, chest compression quality significantly improved and 46% of participants provided chest compressions with adequate depth. Mean depth of chest compressions improved by 12.1 mm (95% confidence interval= 9.1-15.1, p<0.001). Mean rate improved by nine chest compressions per minute (95% CI= 2.1-16, P= 0.011). From months six to 12, participants completed further refresher sessions and were reassessed at 12 months. There was no statistical difference between data collected at six months and 12 months in mean depth (p= 0.310) and rate (p=0.982). This study concluded that there is a significant lack of BLS guideline compliance six months post traditional training and that brief refresher sessions improved skills after six and 12 months.

In a study by Ahmad and Muayyad baseline knowledge was assessed using a 14 item questionnaire [30]. There was no significant difference between groups on assessment of baseline knowledge (p= .53). Mean score of control group was 5.93 (SD= 1.15) and mean score of the intervention group was 5.78 (SD= 1.2). The control group completed a traditional four-hour session in CPR only, and the intervention group received the same four-hour training session combined with additional training using high fidelity simulation. CPR knowledge was reassessed post training. Post test scores of CPR knowledge in the control group ranged between 9 to 13 (mean= 11.22, SD .90). Post test scores in the intervention group ranged between 10 to 14 (mean= 12.67, SD1.06). CPR skills were not assessed pre intervention. Post test scores in CPR skills in the control group ranged between 8 to14 (mean= 11.58, SD 1.63) and scores of the intervention group ranged between 10 to14 (mean= 13.13, SD 1.01). Knowledge retention scores for participants in the control group ranged between 7 to 12. Participants' scores in the intervention group ranged between 7 to14. Dependant sample *t*- test identified a significant difference (t= 8.05: p ≤.001) between the intervention group (mean= 12.27, SD 1.13) and the control group (mean= 10.07, SD 1.43) in the retention of knowledge after 3 months. Skills retention scores ranged between 7 to13 (mean=10.31, SD 1.88) in the control group and 8 to14 (mean= 12.8, SD 1.44) in the intervention group. Both CPR knowledge and skills declined at 3 months. However, participants in the intervention group demonstrated increased knowledge and skills in the retention test when compared with the control group.

In a study by Hernandez-Padilla et al, participants were randomly assigned to an instructor directed group (IDG) or student directed group (SDG) [17]. A questionnaire was used to assess overall competency pre-test, post-test and at three months following the intervention. Skill competency improved post intervention in both groups. In the retention test however, more participants scored higher in the student directed group compared to the instructor directed group. Overall BLS/AED skill competency retention in the IDG was 39% compared with 82% in the SDG group (p<0.001). This study concluded that a student directed strategy resulted in increased retention of CPR AED skills and knowledge.

Sutton et al also examined the effect of varying methods of delivering refresher sessions on skill retention [29]. This study was conducted in a paediatric ICU. In this study, feedback devices were used to measure CPR quality during simulated cardiac arrest scenarios. Participants were randomly assigned into one of four study groups:

1. Instructor only training

2. AED only
3. Instructor training combined with AED feedback
4. Control (no structured training)

Refresher sessions were provided at 0,1,3 and 6 month intervals. Each session consisted of a pre/post intervention evaluation and 120 seconds of training. Retention of CPR skills was 2.3 times more likely after two sessions (p= .02) and 2.9 times higher after three sessions (p=.005). However, lower retention rates were noted in the AED only group in comparison to instructor only training (p= .043). Niles et al also conducted their study in the paediatric setting [9]. In this study a portable manikin defibrillator system with chest compression sensor was used to conduct daily refresher sessions in a paediatric ICU. In this study, providers practiced until skill success was achieved. Providers that conducted ≤ 2 refresher sessions per month spent an average of 67 seconds to achieve success in comparison to providers that conducted ≥2 refresher sessions per month spending an average of 21 seconds to achieve skills success. This study concluded that ≥2 refresher sessions per month can result in a significant decrease in time to achieve skill success.

Al Hadid and Suleiman conducted a study to examine the effect of simulated training sessions on nursing students' retention of CPR knowledge and skills [31]. Participants attended a pre-test, followed by a three-hour workshop in CPR, followed by a post-test (post-test 1). A 25 item questionnaire was completed pre and post intervention. The possible score range was 0-25. A skills test was then completed on a low fidelity manikin. The experimental group attended simulation training at week six and the control group did not. Both groups were reassessed at week 13 (post-test 2). Pre-test knowledge scores in the experimental group (mean= 9.25) and control group (mean= 9.15) were similar (p=.904). Pre-test skills scores in the experimental group (mean= 11.60) and control group (mean=11.80) were also similar (p=.354). At post-test 1, knowledge scores in the experimental group (mean= 14.45) and control group (mean= 13.00) were similar (p=.074). Post-test 1 skill assessment results in the experimental group (mean= 21.40) and control group (mean= 21.80) were also similar (p=.267). However, there was a significant difference in knowledge and skills at post-test 2. The experimental group scored significantly higher in the skill assessment (mean= 23.5) when compared with the control group (mean= 17) (p=.000). Similarly, in the knowledge assessment students in the experimental group (mean= 14.50) scored significantly higher than the control group (mean= 9.95) (p=.002).

Mpotos et al [32] examined the effect of two retraining strategies in CPR on medical students' acquisition of skills over six weeks:

1. Repetitive sessions of formative self-testing (RFST)
2. Repetitive sessions of formative self-testing with additional practice (RFSTAP)

Skill retention was assessed six months' post intervention. Skill success in both groups was 96% by the end of the six weeks. After six months, skill success rate was 27% in the RFST group and 37% in the RFSTAP group. This demonstrates a 10 % difference between groups (CI 90% -2 to 23%). This study concluded that both methods of retraining are effective, however more frequent sessions are needed to prevent skill decay at six months.

Cepeda-Brito et al [26] conducted a study among neonatal health care providers using simulation. Participants were assigned to one of three groups: monthly, three monthly or six monthly refresher sessions. This study demonstrated conflicting findings when compared with previous studies in this paper. While skills improved for all providers in the study, the researchers in this study demonstrated that no statistical difference between groups were found, concluding that more frequent refresher sessions are not associated with improved skill retention.

All studies included in this paper (Table 1) deliver refresher sessions at varying intervals, using a variety of methods. It can be concluded that BLS refresher sessions incorporating high fidelity simulation and feedback devices are effective in ensuring CPR skill retention among health care professionals. Recommended duration of sessions ranges from one minute to four hours. The recommended frequency of sessions ranges from ≥2 times per month to six monthly refresher sessions.

Table 1

Author	Study design	Method of refresher training	Duration of refresher training	Frequency of refresher training	Level of evidence	Validity
Niles et al [28]	Quasi experimental time series design	High fidelity simulation	1-3 minutes	3- 6 months	III-2	High
Niles et al [9]	Observational study	Feedback device	5 minutes	≥2 times per month	III-2	High
Cepeda-Brito et al [26]	Single blinded randomised, longitudinal study	High fidelity simulation	No recommendation	No recommendation	III-2	High
Ahmad and Muayyad [30]	Randomised experimental trial	High fidelity simulation	15 minutes	No recommendation	III-1	High
Ackerman [27]	Quasi experimental	High fidelity simulation	5 minutes	No recommendation	III-1	High
Al Hadid and Suleiman [31]	Quasi experimental control group/ pilot study	High fidelity simulation	3 hours	Every 6 weeks	III-2	High
Mpotos et al [32]	RCT	Feedback device	2 minutes	No recommendation	II	Low
Hernandez- Padilla et al [17]	Cluster randomised trial	Feedback device	4 hours	No recommendation	II	High
Oermann et al [21]	RCT	Feedback device	6 minutes	Monthly	II	High
Sullivan et al[18]	RCT	High fidelity simulation	15 minutes	Every 3 months	II	High
Sutton et al [29]	RCT	Feedback device	2 minutes	No recommendation	II	High

3.4 Secondary outcome

Self-perceived confidence

Hernandez- Padilla et al assessed self-perceived levels of confidence of participants using the Basic Resuscitation Skills Self- Efficacy Scale (BRS-SES) [17]. In this study, participants who self-declared high confidence levels improved in skill level across both groups. However, it is important to note that more students reported higher self confidence levels in the (SDG) compared with the (IDG). As previously stated, the SDG group in this study demonstrated significantly higher retention of skills when compared with the IDG ($p<0.001$). In contrast to this, Cepeda-Brito et al assessed pre and post confidence levels of all participants in each of the three groups [26]. Participants that refreshed skills every three months reported higher self confidence levels when compared with groups that conducted refresher sessions monthly and six monthly. Interestingly, in this study the participants that conducted refresher sessions every three months reporting higher self confidence levels did not demonstrate better CPR skills.

4.0 Discussion

Timely and effective CPR is paramount to potential survival of cardiac arrest victims [7]. Efficient training strategies and development of staff is imperative to ensuring high quality CPR skills [3,9,35]. While the AHA guidelines [6] direct BLS sessions are taken every two years, many studies have demonstrated skill decay long before recertification, sometimes as early as three months following training [3]. The AHA has stated that given how rapidly CPR skills decay, students should avail of opportunities to practice skills whenever possible [10].

The primary aim of this systematic review was to examine the effect of BLS refresher sessions on health care professionals' retention of CPR skills. Nine of the included studies examined the effect of the intervention on retention of CPR skills as a primary outcome [9,17,18,21,27-31]. Meanwhile two of the included studies examined the effect of the intervention on skill retention as a secondary outcome [26,32].

The recommended timing of refresher sessions varies between all studies included in this paper and there is an inconclusive recommendation regarding optimal timing of BLS refresher sessions to maintain skill retention. The optimal method of delivering refresher sessions also varies. High fidelity simulation exercises have been trialled in five of the included studies and each of the five papers demonstrated improved skill retention [18,27,28,30,31]. High fidelity simulation was also trialled in the study by Cepeda-Brito et al however this study did not demonstrate increased skill retention with the use of refresher sessions [26]. Other studies used feedback devices as a method of refresher training [9,17,21,29,32]. Each of these studies using feedback devices demonstrated increased skill retention on reassessment.

It is important to note that all of the included studies share conflicting views on the duration of refresher sessions. Most of the studies have stipulated that brevity of refresher sessions is crucial to ensure feasibility [9,18,27-30,32]. In contrast to this, other studies recommend that refresher sessions lasting three to four hours are needed to ensure skill retention [17,31]. The secondary outcome discussed was self-perceived confidence. Hernandez-Padilla et al demonstrated a statistically significant correlation between higher self-confidence and improved retention and performance of CPR skills [17]. In contrast to this, Cepeda-Brito et al demonstrated conflicting views on the effect of self-perceived confidence on CPR skills [26]. In this study by Cepeda-Brito et al there was no correlation between self-perceived. confidence and CPR skill retention [26].

5.0 Limitations

A limitation of this review is the high heterogeneity of included studies. Disparities between the method of refresher training and the timing of which these sessions were delivered as well as the duration of the sessions resulted in high heterogeneity. As a result of this a meta- analysis could not be completed. It is also important to note that there is an absence of published RCTs on this topic therefore the authors included non RCTs which are deemed to be of low evidence level in accordance with the NHMRC guidelines [34]. It is also important to note that five of the included studies were conducted among nursing students [17,21,27,30,31] and one study was conducted on a group of medical students [32]. This may be considered a limitation as the results of these studies may not be transferable across groups of qualified health care professionals.

6.0 Conclusion

The aim of this systematic review was to examine the effect of frequent BLS refresher sessions on health care professionals' retention of CPR skills. This review has demonstrated an increase in CPR skill retention with the implementation of refresher sessions. However, it is important to note that this study has also demonstrated a lack of evidence to confidently conclude the optimal frequency, methodology and duration of these refresher sessions. Furthermore, some of the available literature on this topic has been conducted among nursing and medical students and not healthcare professionals. This systematic review has highlighted a need for more research in this area to determine the most effective frequency, method and duration of BLS refresher sessions in the clinical setting among healthcare professionals.

7.0 Recommendations for practice

This systematic review has highlighted a need for more research to determine the effect of frequent basic life support refresher sessions of health care professionals' retention of cardiopulmonary resuscitation skills. The authors suggest that this research is conducted among qualified health care providers. Due to the absence of RCTs in this area, the authors suggest that more RCTs are needed to confidently conclude the most effective frequency, method and duration of BLS refresher sessions in the clinical setting among healthcare professionals.

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