

Running head: CPR EDUCATION

Impacting Practice through Change: Implementing Cardiopulmonary
Resuscitation into a Nebraska School's Curriculum

Samantha Renter

Nebraska Methodist College

Mentor: Tara Whitmire DNP, APRN-NP

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Table of Contents

Abstract	6
Overview	8
Background	8
Population	10
Problem Statement	10
Purpose Statement	11
Outcomes	11
Review of the Literature	11
Synthesis of Evidence	13
Summary of Findings	16
Theoretical Framework	16
Application of Framework to PICO Question & Clinical Problem	18
Organizational Assessment	20
Readiness for Change	21
Stakeholders	21
Facilitators & Barriers	22
Risks and/or Unintended Consequences	24
Methodology	24
Setting	24
Sample	25
Implementation & Data Collection Procedures	25
Ethical Considerations	27
Data Analysis	27

Results.....	28
Discussion.....	32
Limitations	33
Plan for Sustainability.....	33
Implications for Practice	35
Conclusion	36
References.....	37
Appendices.....	42
Appendix A: Search Trail Summary.....	42
Appendix B: Reference Matrix.....	43
Appendix C: CPR in Schools Training Kit Overview	50
Appendix D: CPR in Schools Lesson Plan.....	51
Appendix E: CPR in Schools Pre/Post-Test	60
Appendix F: CPR in Schools Test Answers	61
Appendix G: Nebraska High School Survey	62

List of Tables

Table 1. Key Barriers to Learning CPR.....	22
Table 2. Key Barriers to Performing CPR.....	23
Table 3. Key Facilitators to Learning and Teaching CPR.....	23
Table 4. Demographics of responding schools and characteristics of CPR training programs	29

List of Figures

Figure 1. Seven Steps of the IOWA Model17

Figure 2. Map of responding Nebraska high schools29

Figure 3. Perceived barriers to implementation30

Figure 4. Responses to survey questions31

Abstract

Cardiopulmonary resuscitation is a life-saving technique that serves importance in many emergencies, in which someone's breathing, or heartbeat has stopped. Despite strong evidence proving that basic life support (including cardiopulmonary resuscitation) improves survival rates after cardiac events, current studies show that there is a significant lack of knowledge regarding typical signs and risk factors associated with serious medical conditions (Enizi et al., 2016). Alarmingly, only a small percentage of the United States (U.S.) population knows how to administer CPR; indicating that the widespread implementation of CPR training will benefit high school students while impacting the broader U.S. public. In the state of Nebraska, it is not a requirement to learn CPR prior to graduation. The aim of this capstone project was to 1) establish a sustainable delivery model that provides CPR training and education to secondary school students in the 7th grade at a rural Nebraska high school and 2) to conduct a needs assessment of the secondary schools in the state of Nebraska to collect data about school demographics, details of CPR programs, cost, logistics, and barriers to implementation, as well as automated external defibrillator training and availability.

Keywords: CPR education, CPR in school curriculums, secondary schools

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Sudden cardiac arrest (SCA) is a leading cause of death in the United States affecting people of all ages: nearly 356,000 people experience SCA outside of hospitals each year with nine out of the ten victims dying (Sudden Cardiac Arrest Foundation, 2018). SCA is defined as an electrical breakdown in the heart that causes an irregular heartbeat and interrupts the flow of blood to organs such as the lungs and brain. When cardiac arrest occurs, survival rates highly depend on immediately receiving cardiopulmonary resuscitation (CPR). Chances of survival can be doubled and even tripled if CPR is started immediately (Sudden Cardiac Arrest Foundation, 2018).

Unfortunately, CPR is initiated less than 10 percent of the time outside of healthcare facilities (American Heart Association, 2017). Since it is difficult to train the general population, the American Heart Association (AHA) has created a movement toward implementing CPR education in schools to attain a future state of a CPR trained public. The AHA (2018), collected data from the Cardiac Arrest Registry to Enhance Survival (CARES) database -- a surveillance registry used to track out-of-hospital cardiac arrests (OHCA) -- which indicated that bystander CPR was higher in states that require CPR training in high school. In states that required CPR training in high school, 11.3% of those who suffered OHCA survived to hospital discharge. Only 8.9% survived in states without enacted CPR laws (American Heart Association, 2018). As a result, the AHA strongly encourages the requirement of cardiopulmonary resuscitation education in school curriculums (Watanabe, Lopez-Colon, Shuster, & Philip, 2016).

In 2016, legislatures across the United States (U.S.) began to initiate new laws that required secondary schools to train students in CPR before high school graduation. However, not

all states have passed this mandate, including Nebraska. To improve bystander CPR rates, training within schools will ensure that a broad proportion of the population is trained in CPR and ready to respond in case of an emergency.

Overview

Background

Cardiopulmonary resuscitation is a life-saving technique that plays an important role in many emergencies, in which someone's breathing, or heartbeat has stopped. CPR is an emergency procedure used for manually preserving brain function until further measures to restore spontaneous blood circulation and breathing in a person who is in cardiac arrest. It is indicated for those who are unresponsive with no or abnormal breathing (Onyeaso & Imogie, 2014). It is a medical fact that following cardiac arrest, the brain can survive for only 3 to 5 minutes without any damage (Bottiger, Semararo, & Wingen, 2017). Unfortunately, Bottiger, Semararo, and Wingen (2017) estimated that emergency medical services will not arrive until more than 6, 8, 10, or more minutes. As a consequence, in most cases, emergency medical services come too late for those who suffer OHCA.

Despite strong evidence proving that basic life support (including cardiopulmonary resuscitation) improves survival rates after cardiac events, current studies show that there is a significant lack of knowledge regarding typical signs and risk factors associated with serious medical conditions (Enizi et al., 2016). Alarming, only a small percentage of the U.S. population knows how to administer CPR; indicating that the widespread implementation of CPR training will benefit high school students while impacting the broader U.S. public.

Statistically, 60 is the average age for victims of SCA (Sudden Cardiac Arrest Foundation, 2018). However, many of those who experience SCA are younger than 60, including

children and teenagers. The Heart Rhythm Society estimates that 5,000-7,000 youth in the U.S. die each year because of SCA. The rate of young people dying from cardiac arrest has increased significantly in the last 10 years from 6,300 in 2005 to 7,000 in 2015. SCA accounts for approximately 75% of all cases of death in young athletes (Ohio University, 2016). Therefore, training students within school systems is ideal for implementing CPR training.

High school students are well positioned to improve rates of bystander CPR initiation. This age group's engagement could reduce deep disparities in regional rates of survival of OHCA through early initiation of bystander CPR (Sorets & Mateen, 2015). By requiring high school students to learn CPR, each year a group of potential lifesavers can be created. Even though there are more than 16 million high school students in the United States, there are still roughly 700,000 high school students who live in states without mandated CPR training; this represents a missed opportunity to equip the population with vital skills that save lives (Lief, 2017).

In 2013, Nebraska missed an opportunity to implement CPR in secondary schools when the legislature failed to adopt Legislative Bill (LB) 365. The proposal of LB 365 required instruction in certain emergency procedures as a prerequisite to high school graduation and stated that all students enrolled in a Nebraska high school should complete an instructional program on basic first aid, CPR, and operation of an AED, and successfully pass a written test covering said topics (Nebraska Unicameral, 2013). Two major hearings were scheduled to discuss the purpose and intent of the bill but fell short of a final decision. Despite the need for CPR implementation within school curriculums, LB 365 was indefinitely postponed in the Education Committee in April of 2014 for unknown reasons; raising a concern for ways to increase bystander CPR (Nebraska Unicameral, 2013).

To take part in SCA prevention, the AHA recommends that American schools should establish goals to train all faculty members and students in CPR. As of 2018, there are 38 states who have made it a requirement for students to learn CPR before graduating high school (American Heart Association, 2018). Once legislation takes effect, 2.2 million public school students will be CPR trained each year (American Heart Association, 2017).

Population

Secondary school students (grades 7-12) were the target population with focus on policy development and regulation for CPR education. The goal was to educate and empower students to act during an emergency and change the pattern of unnecessary deaths from SCA. Targeted CPR training programs can help teach students basic skills and give them the confidence they need for emergency situations (Sorets & Mateen, 2015).

Problem Statement

When cardiac arrest occurs, CPR is a critical first-line response of basic life support before defibrillation and advanced life support become available; indicating the importance of bystander CPR. Timely bystander CPR increases the likelihood of survival by 2-4 times. Unfortunately, the problem is that in the United States, the current bystander rate of CPR is less than 50% (Watanabe et al., 2016). With a low percentage rate, the odds of being saved by a bystander are slim; the lack of bystander CPR has a large impact on survival outcomes. Secondary schools provide a venue to train a large number of students who would be able to perform CPR. A set standard of policies and implementation of CPR guidelines and regulations are needed in secondary school curriculums in order to increase bystander rates and decrease SCA deaths.

Purpose Statement

The aim of this capstone project was to 1) establish a sustainable delivery model that provides CPR training and education to secondary school students in the 7th grade at the rural Nebraska high school and 2) to conduct a needs assessment of the secondary schools in the state of Nebraska to determine attitudes towards CPR education, potential barriers, efficacy and retention of CPR education.

Outcomes

The outcomes associated with this capstone project were twofold; 1) conduct a pilot study of the AHA's "CPR in Schools" kit and curriculum development within the rural Nebraska high school. The outcome measure was that that 90% of the students successfully pass a written test on CPR and operation of an AED. 2) Determine attitudes towards CPR education, potential barriers, efficacy and retention of CPR education and program development strategies by evaluating data from the Nebraska High School Survey.

Review of the Literature

A search of relevant literature was performed by accumulating articles based on applicable material in addition to reliability and validity. Searches were made in the following databases: CINAHL, Medline, and ProQuest. The use of CINAHL databases were incorporated into the search strategy by using nursing research to provide the largest and most in-depth evidence dealing with healthcare issues across multiple disciplines. Medline produced a more expansive search containing journals, books and abstracts covering a variety of science related topics. Additionally, the ProQuest database was searched to gain content related specifically to nursing and allied health disciplines (Melnik & Fineout-Overholt, 2015).

As a starting point for the literature review, key search terms were developed to outline the scope of the literature to include in the review. All keywords were directly related to the clinical question which allowed for a quick way to find relevant evidence to support areas of topic. Synonyms were identified for each portion of the clinical question prior to performing the search. In addition, key words found in relevant articles and search terms preprogrammed into the specific databases were also used. Boolean phrases such as ‘AND’ and ‘OR’ were used. Refer to Appendix A for a complete search trail summary.

A literature review was compiled from a multiple number of information sources such as books, internet resources, professional journals and periodicals. Searches were limited to articles published within the last five years, in peer reviewed journals, and with full-text availability in English. Editorials, letters, abstracts and unpublished reports were not included. However, selected review articles were included for background material. Types of studies included: systemic reviews, meta-analyses, qualitative studies, and quantitative studies.

The literature review was aimed at analyzing the relationship between CPR education and secondary students; studies concerning elementary school students and college students were not considered. Inclusion criteria involved studies relevant to CPR training in secondary schools, barriers to implementation, efficacy and retention of CPR education, knowledge and attitudes towards CPR among students along with strategies used to implement CPR programs, and recommendations for future studies.

A total of 10 articles were found that met the search parameters specifically identified practices that could be utilized by CPR educators in secondary schools to promote CPR training (Appendix B). The overall quality of the articles used in the literature review varied. The most trustworthy findings are represented by the double-blind randomized controlled trials with a

representative sample of sufficient size to detect the smallest worthwhile effects. Broad representation of schools and interviewees were obtained for most articles to portray different positions and reach data saturation.

Synthesis of Evidence

The discussion of implementing CPR education in to school curriculums has rapidly evolved over the past 5 to 10 years, with a significant amount of literature occurring within the last 5 years. While CPR education is essential for students to learn, 12 states in the U.S. have not adopted mandatory CPR training within secondary schools' curriculum (American Heart Association News, 2018). Additionally, there are no standard protocols or policies in place that would help facilitate the implementation of CPR education. Therefore, the literature used to support this project was based on barriers, facilitators, education, implementation strategies and the need for future research.

Barriers. Common barriers that affected CPR implementation in schools included: lack of funding, limited time in the school curriculum, and the uncertain benefits of just a few hours of CPR training (Sorets & Mateen, 2015). While there are many common barriers, lack of funding is considered the major setback to implementing CPR in schools. When introducing the idea of a CPR training program, school systems are faced with the budgetary task of obtaining the funds necessary to purchase the required training equipment and materials. Dworkin (2016) suggests involving the community and other service clubs and foundations that would most likely be interested in contributing money or equipment for the program. Other organizations like local police, fire, or ambulance agencies, along with the Red Cross or Heart Association may have available equipment.

Facilitators. The original AHA aim and goal was to train school teachers through their CPR in Schools campaign. However, the AHA found that students successfully performing CPR on adults led to a wider campaign to include students as potential CPR providers (Sorets & Mateen, 2015). Hansen et al. (2017) found that CPR training was three times more likely to be completed if there was a CPR certified teacher at the school. The authors also concluded that it is necessary to ensure that those who are responsible for CPR training be qualified, feel competent to train students and have access to good training material. The availability of CPR training material and teacher instructor skills may help facilitate a successful CPR training program (Hansen et al., 2017). Zinckernagel et al., (2016) suggested supplying teachers with training kits that included a video-based self-instruction, facilitator tips, a lesson plan, and equipment.

Education. Brown, Lynes, Carroll, and Halperin (2017) found that many of the schools used a variety of CPR training methods but found that most used either an instruction plus hands-on material or material from any AHA program. Following proper CPR training and education, students serve as multipliers. Bottiger et al. (2017) suggested assigning homework that would require students to show 10 additional people how to do CPR within a specified time period (2 weeks for example).

Brown et al. (2017), found that a majority of schools provide CPR training during regular school hours, most commonly starting in ninth grade, and utilized both health and PE classes for training purposes. Watanabe et al. (2016), indicated a significant increase in CPR knowledge and skills following a one-time 45 minute session. Further instruction suggested repeating CPR education yearly to ensure widespread CPR knowledge with minimal cost and loss of school time.

Additionally, some CPR programs used quizzes that were administered prior to and post CPR training to evaluate the effectiveness of CPR knowledge and skills (Watanabe et al., 2016). Other retention strategies included response sequences for emergency situations (easy to remember) and various emergency scenarios in which students role played (Reveruzzi, Buckley, & Sheehan, 2016).

Implementation Strategies. To train the broader public, CPR training should be made part of a regular school curriculum. Training should focus on the quality of education, refresher training and frequent assessment (Van Raemdonck, Aerenhouts, Monsieurs, & De Martelaer, 2013). The Journal of the American Heart Association (2016) released an article indicating many factors that contributed to schools completing CPR training: believing other schools were conducting training, awareness of legislative mandates, the presence of a CPR training coordinator at the school, feeling competent to train students in CPR, and having easy access to good training material.

Training should be age appropriate and integrated into the school curriculum during the primary years and refreshed annually. Watanabe et al. (2016), noted that children approaching middle school age were noted to be the most efficient in learning and application. Students at this age enjoyed school and were more likely to share their gained knowledge of CPR education beyond the school setting with friends and family, thus increasing awareness (Watanabe et al., 2016). Additionally, middle school age also provides the opportunity for repeated training through high school. Topics for education include: when to call for help, bleeding, choking, burns, unconsciousness, and resuscitation -- all within the framework of being confident and prepared to help others (Wilks & Pendergast, 2017).

Strengths & Limitations. Common limitations within research articles, involved the lack of a practical test used as an evaluation tool. Although many studies included a written test to evaluate efficacy, this should not replace the practical test on an individual assessment. A practical test can be a viable tool used to compare the efficacy of psychomotor skills (Gonçalves Fernandes et al., 2014). Practical testing allows for close evaluation of quality of chest compression and hands on skills. Other limitations, such as grant funding, make it difficult for schools who work on low budget spending and would need fundraising to support the addition of CPR training to the curriculum.

Strengths identified throughout the literature include barriers to avoid, implementation approaches and efficient learning techniques and application (Watanabe et al., 2016).

Summary of Findings

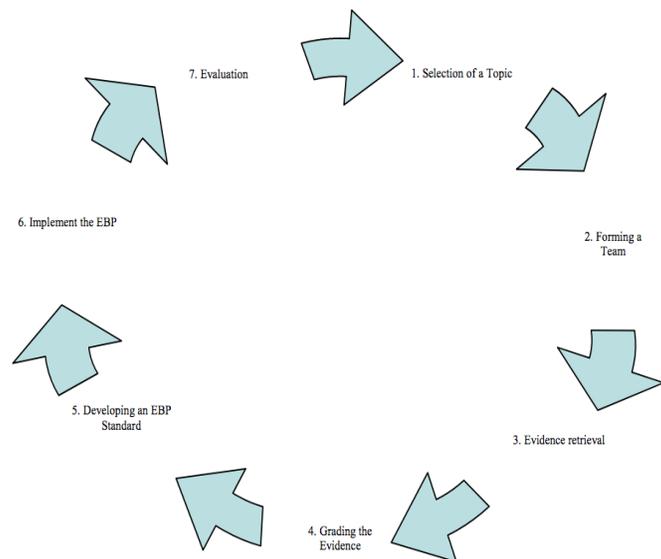
CPR training is one of many important, beneficial health behaviors that can be taught to high school students. Surprisingly, before 2015 mandatory CPR education was seldom required for students to graduate. The choice to partake in CPR training among competing health care education priorities is influenced by many factors. Factors may include the efficacy of the intervention, the financial and time investment of a participant or institution, the likelihood of an intervention being needed, and the appropriateness of enforcing training (Sorets & Mateen, 2015).

Theoretical Framework

The Iowa Model of Evidence-Based Practice to Promote Quality Care is used to guide the design and implementation of approaches intended to strengthen evidence-based decision making and help implement an evidence-based change in practice. It was developed and originally implemented at the University of Iowa Hospitals and Clinics to serve as a guide for

nurses and other health care providers to use research findings for improving patient care (Titler et al., 2002). The model revolves around a pragmatic multiphase change process with feedback loops based on problem-solving steps in the scientific process. It has become widely recognized due to applicability and ease of use by multidisciplinary health care teams. In using the Iowa model, there are seven steps to follow. These are outlined in Figure 1 (Doody & Doody, 2011).

Figure 1. Seven Steps of the IOWA Model



Overview of the Iowa model includes: identifying “triggers,” clinical applications, organizational priorities, forming a team, piloting a practice change, evaluating the pilot, and evaluating practice changes and dissemination of results (Melynck & Finout-Overholt, 2015).

Evidence-based practice has gained increasing popularity in all healthcare settings. Fortunately, evidence-based practice is not only used in healthcare settings and can be utilized throughout the community to ensure better patient outcomes, inform decisions, actions and interactions with patients, and to deliver the best possible care (Melynck & Finout-Overholt, 2015).

Application of Framework to Clinical Question & Clinical Problem

The Iowa Model focuses on knowledge and problem-focused triggers, leading researchers to question current practices and whether care can be improved using current research findings. Each step uses theoretical-process and is designed to sequence and organize thinking about clinical activities and ways to improve them (Doody & Doody, 2011).

Identifying “Triggers.” When selecting a topic for evidence-based research, there are several factors that need to be considered such as: what is the priority and magnitude of the problem, its application to all areas of practice, its contribution to improving care, the availability of data and evidence in the problem area, the multidisciplinary nature of the problem, and the commitment of all involved (Melynk & Finout-Overholt, 2015). Problems could focus on lack of education, resources, financial data, barriers to implementation, fears and emotions associated, as well as numerous other options.

Clinical applications & organizational priorities. The next step is to identify important and clinically relevant practice questions that can be addressed through the EBP process. Questions can include topics along the lines of how to implement a program, who is going to teach the program, whether AED education will be provided, etc. Other questions will involve the population of concern (students), what the intervention will be (CPR education), and what changes need to be made. Identification of these priority issues will facilitate gathering the support needed to complete an EBP project (Melynk & Finout-Overholt, 2015). These priorities will also aid in focusing on resources that may influence the project such as key stakeholders.

Forming a team. Once a topic has been addressed, a team is formed to develop, implement, and evaluate the practice change. The success of mandatory CPR training within school curriculums is the result of advocacy by several stakeholders including students, parents,

teachers, coaches, police officers, firefighters, EMS providers, medical/health department directors, and other community resources who are willing to work with schools in their local communities to conduct the training (American Heart Association, 2017). In addition, the American Heart Association, the American Red Cross, the Department of Health and Human Services, and the National Safety Council of Nebraska are also available to contribute resources and help schools implement the process.

The purpose of a community team is to raise SCA awareness by educating parents, educators, and coaches about the incidence of SCA in youth, warning signs and risk factors, and how everyone can be prepared to save a life. Community team members can also implement emergency response protocols by creating a tool kit that includes a plan template that is personalized to their school to share with staff, parents, volunteers (Parent Heart Watch, 2017).

Piloting a practice change & evaluating the pilot. For implementation to occur, a written policy, including procedures and guidelines that are evidence-based, needs to be considered when developing a cardiac emergency response plan. Evidence should be diffused and focus on strengths and benefits of the program. A trial of practice change is essential for identifying issues before instituting a house-wide rollout. A pilot involves multiple steps when planning for both implementation and evaluation (Melynk & Finout-Overholt, 2015).

For this project, a pilot of CPR education was implemented into the rural Nebraska high school curriculum during the spring semester. CPR education focused on training 7th grade students during their physical education (PE) course. The high school's curriculum currently requires students to take a PE course each year until they are juniors. In their junior year, students have the option to take PE or take it their senior year. Therefore, the pilot was held during seventh grade PE classes to determine the success of the pilot, effectiveness of the EBP

protocol, and need for modification of the implementation process before it is rolled out for all grades 7-12.

Evaluating practice changes and dissemination of results. Ongoing evaluation is ideally incorporated into quality or performance improvement programs to promote integration of the practice into the yearly school curriculum. By monitoring and reporting trends of structure, process, and outcomes, feedback can be used to promote sustained integration of the practice change (Melynk & Finout-Overholt, 2015). Evaluation focused on the effectiveness of the program, flow of the design, and implementation strengths and weaknesses. By evaluating the program, changes can be made to ensure that the high school can modify the program to fit school curriculum needs and they can implement CPR education during the following fall semester for all students.

In summary, when implementing practice change, the effectiveness of policies and procedures is central to the quality of CPR education and providing a high-quality care based on best practice. The model includes several feedback loops, reflecting analysis, evaluation, and modification based on evaluative data of both process and outcome indicators (Melynk & Finout-Overholt, 2015). By using the Iowa Model, researchers must actively stay engaged to help guide design, implementation, and evaluation of CPR and public health interventions to increase bystander CPR use and improve health outcomes for all (Graham, McCoy, & Schultz, 2015).

Organizational Assessment

The organizational assessment discussed the rural Nebraska high school's environment and their readiness for change, stakeholders, facilitators and barriers, and risks and/or unintended consequences associated with the implementation of CPR education. Additional information was

gathered through needs assessment surveys sent out to high school principals in the state of Nebraska to evaluate the need for statewide CPR education.

Readiness for Change

The high school's administration team was ready to make a change by incorporating CPR education into their school curriculum. At the time of the project, CPR education was currently being offered as a health elective course in which many students do not elect to take. The CPR coordinator for the school and health course teacher, noted there are was on average, 10 students who partake in her health course each year. When comparing the number of students within the high school, the average number of students being trained in CPR education was far below average class size. As a result, the CPR coordinator along with the school's Principal, would like to see a more robust program that ensures all the students in grades seven through twelve receive CPR training.

In efforts to gain more knowledge regarding Nebraska's CPR education/training within secondary schools, a needs assessment survey was sent to all Nebraska secondary schools. Data collected from the Nebraska Department of Education (2017) indicates there is a total of 470 districts/systems within the state of Nebraska. Of those school districts, the AHA has noted that approximately 207 districts do not have equipment in place for CPR education and training.

Stakeholders

Key stakeholders for this capstone topic included students, teachers, coaches, and parents. In addition, the American Heart Association agreed to partner with primary investigator by providing the CPR in Schools kit to help the high school implement CPR education.

Key responsibilities of stakeholders include: developing a program budget, creating a cardiac emergency response team, AED maintenance, facilitation of annual cardiac emergency

response drills and staying up-to-date on CPR-AED training for staff and students (Parent Heart Watch, 2017). The collaboration between stakeholders helps engage more community members in the assessment planning and implementation.

Facilitators & Barriers

Possible determinants of health that may influence CPR implementation revolve around communities, neighborhoods, socioeconomic status and individual considerations. Lack of education is commonly the number one reason CPR is not initiated when a cardiac arrest is witnessed. Key barriers to learning CPR (financial, lack of information, and motivation), barriers to performing CPR (consequences, emotions, knowledge, and environment) and possible facilitators to learning and teaching CPR (knowledge/self-preservation, emotional factors, and economic incentives) are all vital aspects to investigate before implementing CPR education (Sasson et al., 2013). Tables 1, 2, and 3 (Sasson et al., 2013) outline a detailed list of key barriers and facilitators.

Table 1. *Key Barriers to Learning CPR*

Major Themes	Barriers
Financial	<ol style="list-style-type: none"> 1. Cost (class and materials) 2. Child care 3. Transportation
Informational	<ol style="list-style-type: none"> 1. Lack of understanding about what a cardiac arrest is and how CPR can save a life 2. Lack of advertising about upcoming classes 3. Lack of access to technology (e.g., Internet) 4. Few resources for non-English-speaking people
Motivational	<ol style="list-style-type: none"> 1. Personal health concerns 2. Financial disincentive to learn 3. Not required

Table 2. *Key Barriers to Performing CPR*

Major Themes	Barriers
Fear of legal consequences	<ol style="list-style-type: none"> 1. Fear of lawsuit 2. Misunderstanding of Good Samaritan laws 3. Age of cardiac arrest victim (adult performing mouth-to-mouth on child)
Emotional disconnection from community knowledge	<ol style="list-style-type: none"> 1. Lack of community cohesion 2. Questioning if other residents would stop to assist
Knowledge	<ol style="list-style-type: none"> 1. Unsure of how and when to perform CPR 2. Confusion from frequent CPR guideline changes 3. Fear of doing it incorrectly
Risk to personal health	<ol style="list-style-type: none"> 1. Administering mouth to mouth to a stranger 2. Unsafe setting

Table 3. *Key Facilitators to Learning and Teaching CPR*

Major Themes	Barriers
Family/self-preservation	<ol style="list-style-type: none"> 1. Save a life of a family member (especially children) 2. Save one's own life by learning and teaching others 3. Tie into basic first aid to assist in traumatic arrest situation
Combined CPR and first aid training attributable to violence in community	<ol style="list-style-type: none"> 1. Cardiac arrest more likely to be traumatic than cardiac 2. Build social capital and potentially lower violent crime in the community
Economic incentives	<ol style="list-style-type: none"> 1. Material goods (gift cards, food) 2. Certification card 3. Job skill 4. No fees to learn CPR 5. Academic credit

Other barriers include: inability to recognize warnings signs followed by a delayed reactivation of emergency medical services, lack of adequate CPR training and resources

(AEDs), concerns about liability, and psychological factors, rescuer confusion, and health concerns (Graham et al., 2015).

One major concern for the implementation of CPR education within the rural Nebraska high school's curricula was financial restrictions. Since the AHA advocates for hands-only CPR education with psychomotor practice and AED education, the education has nominal cost for schools to implement. There are resources available (CPR in Schools kit, local fire and EMS, Red Cross) that are no or low cost. The CPR in Schools kit (Appendix C) which allows a classroom teacher to implement hands-only CPR training to a typical classroom in one class period with no specialized training (video-led) is \$649. Included manikins are rated for 300,000 compressions and last up to three years. Each kit can train 10-20 people at one time. In addition, the CPR in Schools kit does not require the trainer to be certified in CPR (American Heart Association, 2018).

Risks and/or Unintended Consequences

While CPR training can be a life-saving measure, it may have financial and ethically-deleterious, unintended consequences. As part of the implementation process, it is necessary to ensure that learners take away the appropriate skills needed to perform CPR. Taking shortcuts within the educational design of the course could result in significant unintended consequences such as not having the appropriate skills to perform CPR in a life-threatening emergency.

Methodology

There are two distinct components to this capstone, and each were completed simultaneously and independent of each other. Each are described within the methodology.

Setting

The setting for the pilot study focused on a rural Nebraska high school which included

grades six through twelve; a Class C-2 school within Nebraska. The school is in a rural community with a total population of 1,213. The school is located 45 minutes from two major cities in Nebraska. There are approximately 227 students in grades 7 – 12. There are 19 full-time teachers.

The setting for the needs assessment incorporated all high schools across the state of Nebraska. The state population as of 2017 was 1.92 million people. There is a total of 328 secondary schools resulting in a total of 156,808 students in grades 7-12 (Nebraska Department of Education, 2017). More data was obtained through the survey including, demographics of responding schools and characteristics of CPR training programs including school size, faculty size, staff members trained in CPR, start-up cost, maintenance cost, and time commitment.

Sample

The primary focus for the pilot was 7th graders within a rural Nebraska high school. There was two 7th grade sections, with a total of 20 students in each section. For the purpose of the pilot study, grades 8-12 was not included.

The primary focus for the surveys was principals within Nebraska secondary schools. There is a total of 326 principals for Nebraska secondary schools. There are two principals who oversee two schools.

Implementation & Data Collection Procedures

Once approval was obtained from the Nebraska Methodist College (NMC) Institutional Review Board (IRB), the “CPR in Schools” facilitator binder and lesson plan (Appendix D) was used to implement the pilot during the 7th grade physical education curriculum taught by the school’s CPR coordinator. A pre-test (Appendix E) from the AHA’s “CPR in Schools” kit was administered prior to CPR education and was filled out by each individual participant. The test

was compiled of 12 multiple-choice questions. The same test was then administered post CPR education to evaluate the effectiveness of the “CPR in Schools” training program. An answer key was provided by the AHA to facilitators of the program (Appendix F).

A school survey from the state of Iowa was used as the template to create a needs assessment survey to evaluate the need for CPR programs throughout Nebraska (Hoyme & Atkins, 2017). Dianne Atkins, MD, author of the study *‘Implementing cardiopulmonary resuscitation training programs in high schools: Iowa’s experience,’* was contacted via email to further evaluate validity/reliability of the study. There was no testing of the survey to evaluate validity/reliability. The survey included, demographics of responding schools and characteristics of CPR training programs in addition to school size, faculty size, number of staff members trained in CPR, start-up cost, maintenance cost, and time commitment to aid in the assessment of statewide CPR education.

Survey Monkey was utilized to send the Nebraska High School Survey needs assessment to the Nebraska secondary school principals (Appendix G). The email addresses of each secondary school principal were obtained from the Nebraska Department of Education and the Nebraska High School Survey was sent to each principal via Survey Monkey with instruction to return the completed survey within a 2-week time frame. Reminder emails were sent 1 week after initial contact. The purpose of the survey was to collect data about school demographics, details of CPR programs, costs, logistics, and barriers to implementation, as well as AED training and availability.

Ethical Considerations

The NMC IRB approval was obtained prior to initiating the capstone project. The primary investigator and project mentor successfully completed Collaborative Institutional Training Initiative (CITI) training as well.

Written consent was obtained from the Nebraska rural high school's principal to conduct the pilot study within the school system. All participants in the pilot study were informed about the aim of the study and assured that participation was voluntary, results were kept anonymous and that refusal to participate would be without consequences. Only persons connected to the research team had access to the data.

Confidentiality of the Nebraska High School Survey data was protected in several ways. A cover letter with consent form explaining the survey was included in the email to all Nebraska secondary school principals. Responding to the survey was completely voluntary. By responding, the respondent consented to be a part of the capstone project. All answers remained confidential, identifiable only by school name, and analyzed in collection. Survey answers were kept electronically on a password-protected device. Only research personnel were allowed access to the data and any identifying information. An online survey creator, Survey Monkey, was used to ensure confidentiality and to collect the respondent data.

Data Analysis

Data analysis included correlation of how the pilot study addressed or overcame issues that were identified from the Nebraska High School Survey. This provided a template for ways Nebraska secondary schools can successfully integrate CPR education in to physical education curriculum.

Survey Monkey, an internet-based survey software system, was used to view and complete across multiple platforms, to distribute, collect, and analyze the data. Survey responses were recorded and presented in real time; submitted data could be viewed as individual responses or collectively for ease of analysis.

Results

A total of 33 students participated in the pilot study. Among the 33 students, all completed the pre-test prior to taking CPR education and finished the post-test after participating in the CPR education course. As a result, 100% of the students successfully passed a written test on CPR and operation of an AED.

Completed surveys were received from 109 high schools across Nebraska, a response rate of 34%. At the time of the survey 92% of responding schools had successfully implemented CPR training. Responding high schools were distributed throughout the state and represented a range of student body sizes, from fewer than 100 and up to 1000-2500 students (Figure 2). The table provides the school demographics and characteristics of CPR training programs.

Figure 2. Map of responding Nebraska high schools. Pins indicate location of responding schools.

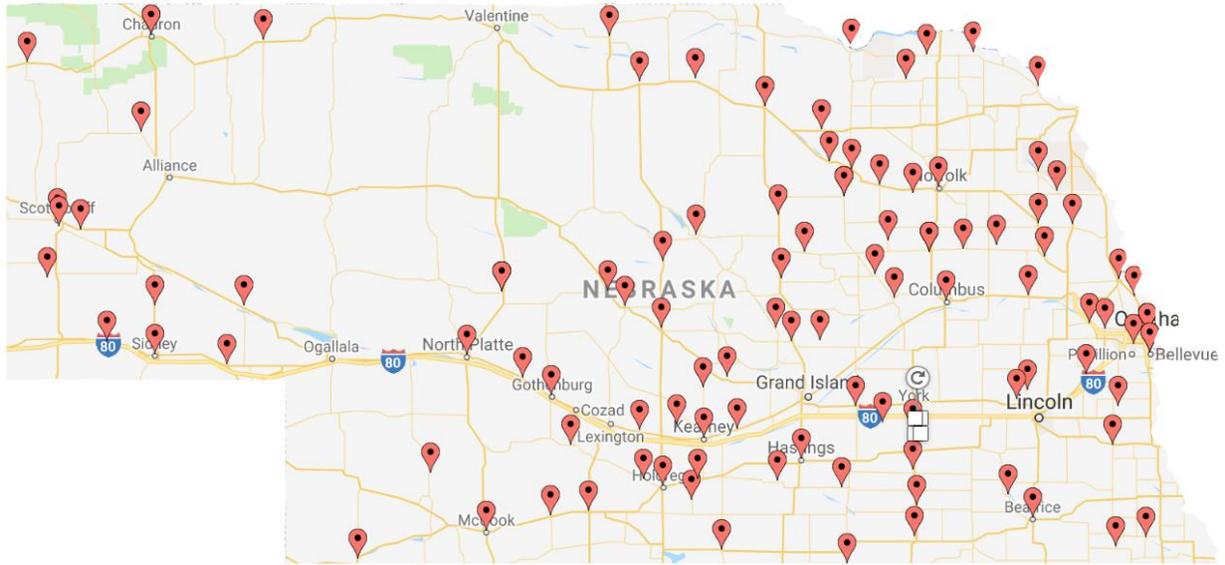
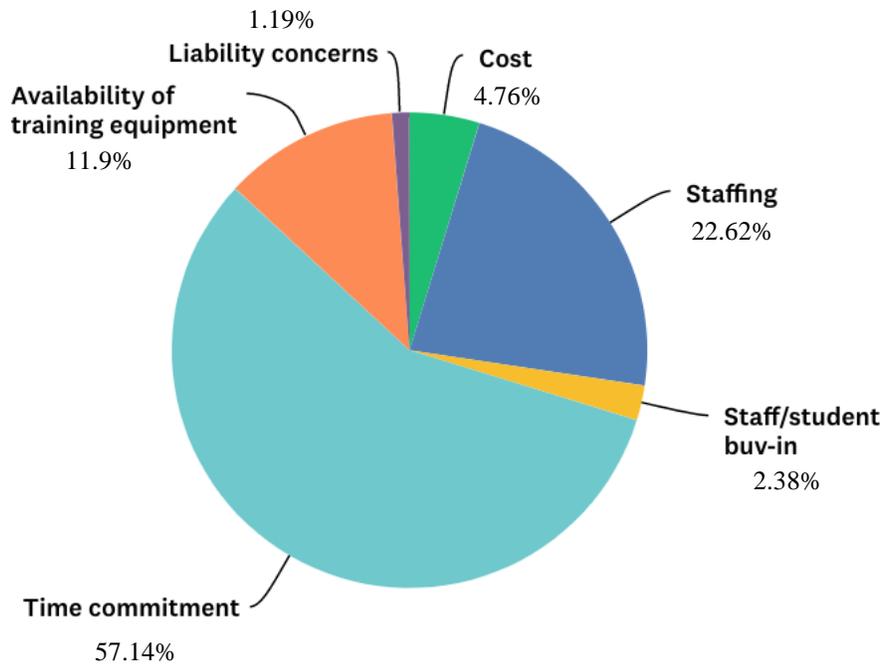


Table 4. Demographics of responding schools and characteristics of CPR training programs.

Demographics of responding schools and characteristics of CPR training programs		
	Mode	Range
School size	100-500	< 100 to 2500-5000
Faculty size	25-50	< 25 to 100-250
Staff members training in CPR	10-25	< 10 to > 50
Start-up cost	< \$500	< \$500 to > \$5000
Maintenance cost	< \$500	< \$500 to > \$2500-\$5000
Time commitment	> 2 hours	< 30 minutes to > 2 hours

Perceived barriers to implementation, ranked by number of responses were: time commitment, staffing, availability of training equipment, cost, staff/student buy-in and liability concerns in decreasing order (Figure 3).

Figure 3. Perceived barriers to implementation.



The training facilitator was a health teacher or physical education teacher in 80% of schools; 25% reported a paid instructor. Average estimated time commitment for training was greater than 2 hours and training most commonly occurred during classroom time or during a physical education course; only 4% of schools responded that their students and staff participated in training outside of established school hours (Figure 4, A). Students were taught CPR training as early as 6th grade and continued until 12th grade with the most common grade level for training being in the 9th grade (Figure 4, B). The most common estimated startup costs were less than \$500 and the yearly maintenance costs were less than \$500, with funds typically allocated from school district funds (Figure 4, C). Training equipment was obtained from diverse sources. The

AEDs are available in 98% of responding schools, 85% of schools include AED instruction in their training curriculum. The AEDs were purchased or obtained from various sources but most commonly from school district funds (Figure 4, D). Schools were also asked if there had been a sudden cardiac arrest on their campus since 2010; 7% of schools responding to the survey reported that there had been a witnessed cardiac arrest on their school ground.

(Graph below enlarged on the final page of this document.)

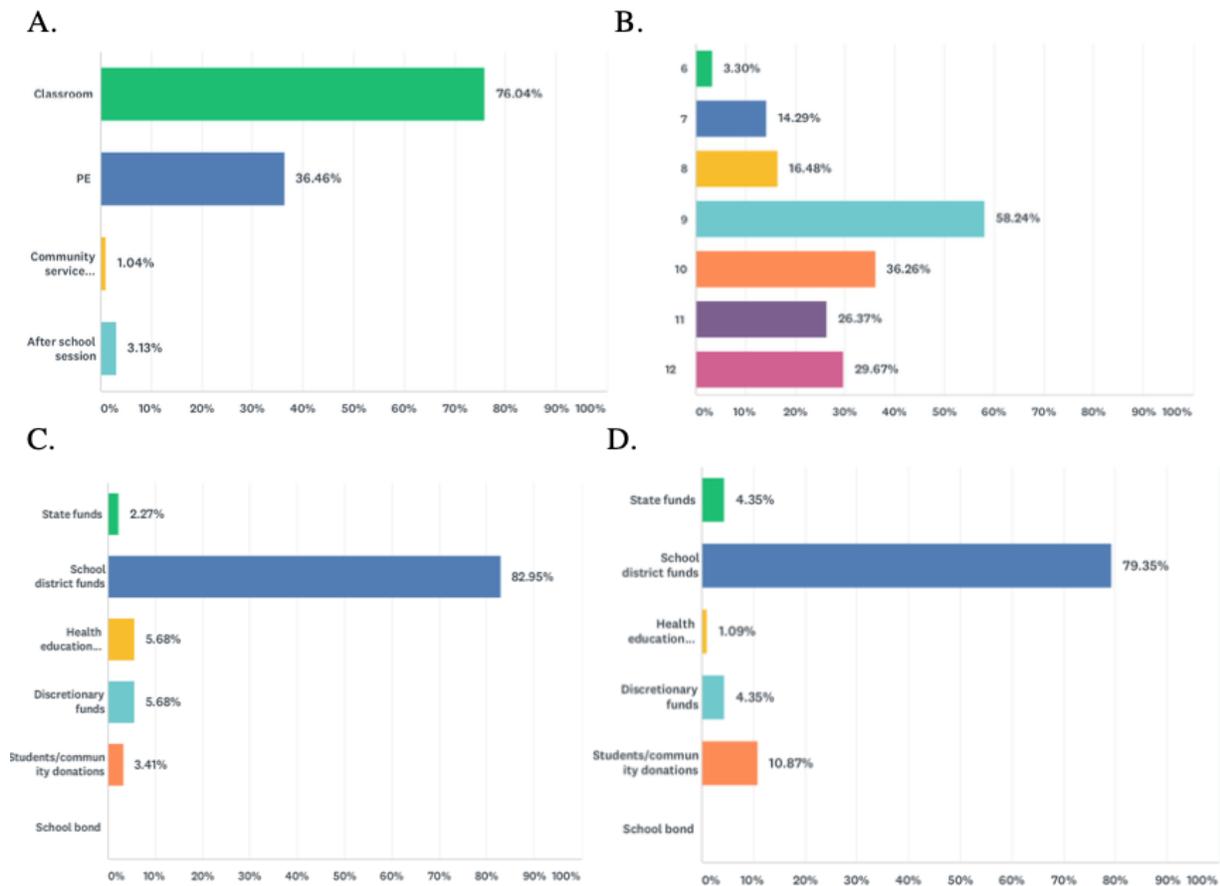


Figure 4. Responses to survey questions. A., Setting of high school CPR training. B., Grade level for CPR training. C., Sources of funding for high school CPR training programs. D., Sources of funding for purchase of AEDs.

Survey results also show a high proportion of staff is trained in CPR: 44% of schools have 10-25 staff members who are CPR trained. However, 63% of schools do not ask about CPR training during the faculty hiring process.

Discussion

The outcomes associated with this capstone project were twofold; 1) conduct a pilot study of the AHA's "CPR in Schools" kit and curriculum development within the rural Nebraska high school and 2) determine attitudes towards CPR education, potential barriers, efficacy and retention of CPR education and program development strategies by evaluating data from the Nebraska High School Survey. As a result, the rural Nebraska high school has successfully completed the pilot study for CPR education and look to implement the CPR in Schools training kits during the fall of 2019 school curriculum. Outcome 1 measurement indicated that 100% of the students successfully passed a written test on CPR and operation of an AED.

The results of the survey of Nebraska high schools show that once CPR training programs were initiated, the anticipated obstacles did not align with the reality of implementation. The perceived barriers identified by the responses to the multiple choice survey were time commitment, staffing, availability of training equipment, cost, staff/student buy-in, and liability concerns in descending order. Surveys demonstrated that over 50% of responses indicated that time commitment was the biggest barrier to CPR program initiation. With a lack of formal guidance, it is difficult for individual schools to implement CPR training programs. However, this survey demonstrates that the burden on individual schools to start and maintain these programs was minimal.

With time commitment being the biggest barrier, CPR in Schools training kits enable students to learn the lifesaving skills of CPR in just one class period without the use of a certified

CPR instructor. The kit also provides additional educational material on how to use an AED and easy-to-follow steps for choking relief. The easy-to-use kit is designed specifically for the needs of schools in efforts to train hundreds of people. Survey results indicate that the majority of schools are employing CPR training programs from well-established sources such as the American Heart Association and the American Red Cross, speculating that CPR training was excellent. As a result, any training helps to improve bystander response and may provide an added benefit and chance of survival to the victims of sudden cardiac arrest.

Furthermore, schools reported that the estimated start-up costs to getting a CPR program initiated were less than \$500 highly suggesting that it is financially possible to allocate school districts funds. It is essential that schools focus on awareness of sudden cardiac arrest and the implementation of CPR programs by utilizing school district funds and educational grants.

Limitations

Limitations to the study focused primarily on response bias through surveys. Out of 321 survey invitations, only one-third of the high schools responded demonstrating a broad regional and size distribution of the responding schools. While not fully understood, it is possible that the schools that did not respond had more difficulty implementing CPR programs or encountered significant barriers during the implementation process.

Schools responded that a majority of their students were trained in the 9th grade. For project purposes, the pilot study for CPR education was conducted with a group of 7th graders. Further review of appropriate grade levels for CPR implementation is highly recommended due to maturity level in relation to physical ability to perform CPR in a life-threatening situation. In addition, the survey focused on CPR training programs within the state of Nebraska with no attempt to justify qualitative measures of individual programs.

Plan for Sustainability

Sustainability is defined as the ability of an organization to continue its mission or program far into the future (Alonzi, 2018). While most programs do not last forever, the impact should remain ongoing. In an effort to continue the program, it must be sustainable in three categories: community, financial, and organizational sustainability.

Community sustainability is the community's ability to carry out the project outside of the school curriculum (Alonzi, 2018). As communities increase implementation of CPR education in high schools, there is potential for a multiplier effect that may reach into priority communities with low bystander CPR rates. A study based on a program titled "pay-it-forward," CPR education was taught to high school students with homework instructions to use the training kit to teach CPR to their friends and family (Del Rios et al., 2018). As a result, students will be able to take what they have learned during CPR education and relay the knowledge to those around them.

Financial sustainability is how the financial support required for the project will continue once the pilot study has ended (Alonzi, 2018). Part of a financial plan includes a fiscal note that appropriates the cost for all supplies and training material need for the CPR education program. Based on data collected, an estimated fiscal note will be created to determine final costs. In efforts to sustain the financial aspect of the program, the rural Nebraska high school has set up a grant foundation specifically for CPR education so that members of the community can donate. Additionally, the school works closely with teacher grant programs such as the Carl D. Perkins grant to qualify for additional grant money to fund essential programs such as CPR Education. However, the AHA is actively looking for foundation/individual donor funding to provide these resources to combat the concern of the "unfunded mandate" in the legislature.

Organizational sustainability is how the program will continue to function after the capstone project has been implemented (Alonzi, 2018). A stable organization is characterized by a solid structure, routine, standard policies, etc., to remove uncertainty from the environment. As mentioned previously, a cardiac emergency response plan (CERP) will be placed within the school to ensure goals are clear and people understand their roles and responsibilities in case of an emergency. A structured response to cardiac emergencies will reduce deaths in school settings and ensure that chaos does not lead to improper or no response (Rose et al., 2016). Preparation is the essential key to saving lives.

Implications for Practice

Practical implications are the results associated or implied when a plan or scenario is put into real-life practice. The main aim in this project was to introduce a CPR education program into the rural Nebraska high school. There is not a change to nursing practice for this project. However, a coalition of community nurses could be built to help support this initiative in all school districts.

By addressing the problem, CPR programs will increase the number of witnesses to cardiac arrest events who are capable of providing CPR, in return increasing the likelihood of the victim receiving bystander CPR and improve survival rates. By implementing CPR in Schools programs, students will learn how to provide high-quality hands-on CPR training and develop best practices for out of hospital cardiac events. In addition, the program helps to train educators to organize CPR training programs and facilitating partnerships with the local healthcare/public safety community.

Future Research. There is a need for future research to aid in identifying best practice approaches for implementing CPR education. To implement a successful CPR training program

within school curriculums, clear sources of funding should be included along with a source of information that provides schools with relevant information: who may conduct CPR training of students, what proficiency level is required, what training material is necessary and where to find it, which grades may be trained, how often training should take place, and which elements should be included in the curriculum (Hansen et al., 2017). Furthermore, Hansen et al. (2017) emphasized that all curriculum material should be thoroughly explained and include hands-on CPR and hands-on AED training.

Conclusion

CPR training is an important, beneficial health behavior that can be taught to school students in efforts to raise bystander CPR and decrease SCA fatalities. In order to increase bystander CPR rates, one of the most effective ways is by educating school students in CPR. Even though CPR education in high schools is a growing number in many of the U.S. states, there is currently no standardized method of implementation that is effective, efficient, financially feasible and leads to increased nationwide rates of bystander CPR and survival following OHCA (Brown et al., 2017).

When a person experiences SCA, every minute's delay in emergency treatment decreases the chances of survival by 10%. If CPR is performed immediately, it can double or triple a person's chance of survival (American Heart Association, 2017). By incorporating CPR into school curriculums, a difference can be made, and lives can be saved. The bell has rung, it's time to make a change!

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Appendix A: Search Trail Summary

Population/Problem	Intervention	Comparison	Outcome	Comments
<ul style="list-style-type: none"> • Middle and High Schoolers • Secondary Students • Athletes • Teachers • Parents • Schools 	<ul style="list-style-type: none"> • CPR Education • CPR Training • AED Education • CPR Programs • School Curriculum • Basic Life Support 	<ul style="list-style-type: none"> • No CPR/AED Education 	<ul style="list-style-type: none"> • CPR/AED Knowledge, Skills, Attitudes • Barriers • Strategies used to implement programs 	
<p>Database: CINAHL (C), Medline (M), and ProQuest (PQ). Limiters: Filter for peer-reviewed, publications dates 2013-present with full-text availability. Boolean phrases such as ‘AND’, ‘OR, and ‘NOT’ were used.</p>				
Searches			Results	
High School AND CPR Education			(C) 25 (M)72 (PQ) 1,098	
High School AND CPR Education AND School Curriculum			(C) 6 (M) 13 (PQ) 288	
High School AND CPR Education AND School Curriculum			(C) (M) (PQ)	
Exclusion Criteria: Articles that included elementary school students or college students				Results: 10 articles
Inclusion Criteria: Studies relevant to CPR training in secondary schools, barriers to implementation, efficacy and retention of CPR education, attitudes towards CPR among students with strategies used to implement programs.				

Appendix B: Reference Matrix

PICOT

What is the impact of CPR/AED education on CPR/AED knowledge, skills, and attitudes among middle and high schoolers compared to no CPR/AED education?

Citation/Level of Evidence	Participants/Setting/ Sample Size	Purpose/ Background	Methods/Design & Limitations	Findings/Summary Strengths/Weaknesses	Applicability to own Research
<p>Zinckernagel, L., Hansen, C., Rod, M., Folke, F., Torp-Pedersen, C., & Tjornhoj-Thomsen, T. (2016). What are the barriers to implementation of cardiopulmonary resuscitation training in secondary schools? A qualitative study. <i>BMJ Open</i>, 6.</p> <p>Level II evidence based on qualitative study done with interviews</p>	<p>8 Secondary schools in Denmark</p>	<p>To explore barriers to implementation of CPR training in Danish secondary schools.</p>	<p>Qualitative study based on individual interviews. Thematic analysis used.</p>	<p>Important for implementation and sustainability of CPR training. Preferred external instructors to train students. Necessary to have clear guidelines for CPR training in schools. - Did not study how schools who currently provide CPR implemented and conducted the training.</p>	<p>Discussed barriers for teachers teaching CPR along with reasons CPR training has been unsuccessful in schools despite mandatory legislature.</p>

<p>Aaberg, A. M., Larsen, C. E., Rasmussen, B. S., Hansen, C. M., & Larsen, J. M. (2014). Basic life support knowledge, self-reported skills and fears in Danish high school students and effect of a single 45-min training session run by junior doctors; a prospective cohort study. <i>Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine</i>, 22(24).</p> <p>Level II evidence based on a prospective cohort study, qualitative research</p>	<p>Six-hundred-fifty-one students included in a Danish high school</p>	<p>To evaluate current knowledge on BLS in Danish high school students and benefits of a single training session run by junior doctors.</p>	<p>Students underwent a 45-minute BLS training session including theoretical aspects and hands-on training with mannequins. Pre- and post-test completed for evaluation of BLS knowledge, self-assessed BLS skills and evaluation of fear.</p>	<p>63% participated in previous BLS training. 28% knew how to correctly recognize normal breathing. Majority afraid of exacerbating the condition or causing death by intervening as first responder. Proportion of students feeling well prepared to perform BLS increased from 30% to 90%. The level of fear of being first responder was decreased. - Only examined one high school.</p>	<p>Helps to determine effective length of BLS training course in efforts to increase bystander rates and decrease fears.</p>
<p>Stanly, S., Babu, A., & Unnikrishnan, R. (2017). Basic life support skills for high school students pre-and post-cardiopulmonary resuscitation training - An interventional study. <i>Indian Journal of Respiratory Care</i>, 6(1), 786-790.</p> <p>Level II based on an interventional study with comparative studies and qualitative research</p>	<p>16 participants were included in the study by convenience sampling method</p>	<p>Assessing the emergency preparedness level, training feasibility and knowledge retention of BLS skills among High School students.</p>	<p>A SCA scenario was presented and students were asked to perform CPR on a manikin. Assessment was done by a checklist. Following the session, a theoretical background and</p>	<p>Post-training scores and the one week recall scores were similar which implies students have good short-term knowledge retention of BLS skills. - Further recommendation would be to assess again later. - Small sample study due to cost and finances.</p>	<p>Helped determine barriers such as understanding scientific terms, remembering the algorithm stepwise, and effective compression with intense strength and wrist pain. Helps determine at what age students can</p>

			hands-on training was given to the students by an AHA certified instructor. Students skills were reassessed 1 week post training.		effectively perform CPR.
<p>Brown, L. E., Lynes, C., Carroll, T., & Halperin, H. (2017). CPR instruction in U.S. high schools: What is the state in the nation? <i>American College of Cardiology</i>, 70(21), 2688-2695.</p> <p>Level II of evidence based on qualitative research using surveys</p>	32 states with CPR laws directed towards school superintendents	To assess a method for implementing CPR education	Surveys were sent to superintendents asking about practices regarding CPR instruction such as course content, instructor, and method.	CPR laws differ, although almost all require hands-on training. Although hands-on practice during CPR instruction in high school is required by law in most U.S. states, there is currently no standardized method of implementation. - Low response rate	Explores course content, instructors, and methods to implementing CPR education.
<p>Berger, S. (2017). Survival from out-of-hospital cardiac arrest: Are we beginning to see progress? <i>Journal of the American Heart Association</i>, 1-3.</p> <p>Doi:10.1161/JAHA.117.007469</p>	n/a	To assess the progress of survival from out-of-hospital cardiac arrest	Publications reviewed and analyzed for data collection	Goal is to target CPR-AED education for every high school student by the tie of graduation. Education and training must include recognition of cardiac arrest, and the skills needed to	Ways to implement CPR training into schools and raise bystander awareness.

<p>Level II of evidence based on qualitative research comparing studies</p>				<p>provide high-quality CPR and use an AED, with focus on factors to overcome hesitation to act</p>	
<p>Iserbyt, P. (2016). The effect of Basic Life Support (BLS) education on secondary school student's willingness to and reasons not to perform BLS in real life. <i>Acta Cardiologica</i>, 7(15), 519-526.</p> <p>Level ____ of evidence based on qualitative research using questionnaires</p>	<p>313 secondary school children</p>	<p>To investigate the effect of a skill-focused BLS course on secondary school children's self-reported willingness to and reasons not to perform BLS in real life and the relation of this willingness with simulated BLS performance</p>	<p>Questionnaires were filled out by students to assess their willingness and fears concerning the performance of BLS in real life. Questionnaire included demographics. Standardized 45-min BLS course by PE teacher.</p>	<p>Willingness to perform BLS on a friend or a stranger was unaffected by the BLS course. Reasons for not performing BLS in a real-life situation: panic, doing something wrong, fear of infections, being unable, not willing to perform mouth-to-mouth ventilation, fear of law suit</p>	<p>Addresses main fears for not performing BLS despite implementing a BLS training course.</p>
<p>Watanabe, K., Lopez-Colon, D., Shuster, J., & Philip, J. (2016). Efficacy and retention of basic life support education including automated external defibrillator usage during a physical education period. <i>Preventive Medicine Reports</i>, 5.</p> <p>Level I of evidence based on prospective, randomized study</p>	<p>Middle School in Florida</p>	<p>Aim was to investigate a low-cost, time effective method to educate students on BLS, including reeducation</p>	<p>Education was performed by AHA certified providers during a 45-minute physical education class. -- Age selection provides opportunities for reinforcement through high</p>	<p>Significant increase in CPR knowledge and skills following a one-time 45-minute session. Reeducation may be useful, but the interval needs further investigation.</p>	<p>Determining effectiveness of a 45-minute BLS course and retention rates post education.</p>

			school. Students received pre- and post-tests after initial education and repeated 2 and 4 months later to assess retention.		
<p>Alismail, A., Massey, E., Song, C., Daher, N., Terry, M. H., Lopez, D., ...Lo, T. (2018). Emotional impact of cardiopulmonary resuscitation training on high school students. <i>Frontiers in Public Health</i>, 5(362), 1-7.</p> <p>Level II of evidence based on qualitative research using questionnaires</p>	60 students with mean age of 15 from a high school in Southern California	To measure the emotional impact of CPR training on high school students using two approved AHA courses	Subjects were divided into two groups, BLS and Hands-Only CPR. Emotional impacts were assessed by having each subject answer a questionnaire based on given scenarios before and after their training session.	Both AHA programs have positive effects on students' emotional response. - Students were grouped based on an administrator's decision potentially creating bias. An in-depth study that includes interviews with focus groups may be a better way to understand emotions.	Helps to see how student's emotions
<p>Hoyme, D. B., & Atkins, D. L. (2017). Implementing cardiopulmonary resuscitation training programs in high schools: Iowa's experience. <i>Journal of Pediatrics</i>, 181, 172-176.</p>	84 high schools in Iowa	To understand perceived barriers to providing CPR education, implementation processes, and practices in high schools	Surveys were sent to Iowa high schools to collect data about school demographics, details of CPR programs, cost, logistics, and barriers to	When law took effect, 51% of schools had training in place. At the time of the study, 96% had successfully implemented CPR training. Barriers: staffing, time commitment, equipment availability,	Discusses implementation strategies, barriers, facilitators, and associated times and cost.

<p>Level II of evidence based on cross-sectional study performed through multiple choice surveys, qualitative research</p>			<p>implementation, as well as AED training and availability.</p>	<p>and cost. Average estimated startup cost was < \$1000 and yearly maintenance cost was < \$500 with funds allocated from existing school resources. Facilitator: school official or volunteer. Training time < 2 hours. AED available in 98% of schools, and 61% include AED training in curriculum.</p>	
<p>Jayaraman, R., Reinier, K., Sandeep, N., Aro, A. L., Uy-Evanada, A., Rusinaru, C., ...Chugh, S. S. (2018). Risk factors of sudden cardiac death in the young. <i>Circulation</i>, 137, 1561-1570.</p> <p>Level II of evidence based on a population-based study from a single large US community, over multiple years, qualitative research</p>	<p>Assessed 3775 cardiac arrests in age groups 5-34</p>	<p>To assess etiology of SCA in the young</p>	<p>Cases of SCA in the community were explored in collaboration with EMS systems, the state Medical Examiner's office, and regional hospitals. All available medical records were obtained for each potential case of SCA, including the EMS</p>	<p>Of the 3775 cardiac arrests in all age groups, 186 occurred in the young. Of the latter, 26 were associated with sports and the remainder occurred in non-sport settings. 5% of all SCA case affected the young, and only 14% of SCA cases in the young occurred during sports activity. The clear majority of SCA cases in the young occurred without warning symptoms.</p>	<p>Highlights the importance of prevention efforts that extend beyond pre-participation athletic screen and could be applied to routine preventative visits for children and young adults. Screening and management of conventional cardiovascular risk factors such as smoking, obesity, hypertension, and hyperlipidemia</p>

			<p>prehospital care report, Medical Examiner's report, autopsy if available, death certificates from Oregon State vital statistics records, and complete medical records from the region's hospital systems.</p>	<p>Sports-related SCA cases were more likely to present with shockable rhythms and to survive their cardiac arrests. No single predominant sporting activity associated with SCA. Established cardiovascular risk factors in these SCA cases in the young were significantly higher than previously anticipated, 58% with at least 1 risk factors and 38% prevalence of obesity.</p>	<p>could have a significant beneficial impact on SCA in the young.</p>
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Appendix C: CPR in Schools Training Kit Overview

CPR in Schools Training Kit™



The CPR in Schools Training Kit empowers students to learn the core skills of CPR, choking relief, and AED skills – all in one class period. This easy-to-use educational kit developed by the American Heart Association is designed to specifically meet the needs of schools. It is portable and reusable, allowing for easy storage and convenient transportation from classroom to classroom.

**WHAT IS TAUGHT**

- Adult CPR with breaths
- Adult Hands-Only CPR
- Child CPR
- Adult Choking
- Child Choking
- General AED Awareness

COURSE DELIVERY

Learn the skills to save a life in a school setting led by a facilitator.



IN-SCHOOL



FACILITATED GROUP

HOW IT WORKS

Any educator or student can facilitate the training session in one class period. During the training session, students practice on a Mini Anne® Plus manikin while watching and learning CPR skills on the DVD. The kit comes complete with a facilitator guide and a facilitator binder that include a Lesson Plan, pre- and post-tests, a certificate of participation, and additional resources. This method is a research-proven way for students to learn and retain the lifesaving skills of CPR.

KIT CONTENTS

The CPR in Schools Training Kit (AHA product #15-1015) includes

- 1 wheeled classroom carry bag
- 10 Mini Anne Plus inflatable manikins
- 10 individual carry bags
- 1 hand pump for manikin inflation
- 5 practice-while-watching training DVDs
- 1 Facilitator Guide
- 1 Facilitator Binder that contains the Lesson Plan, pre- and post-test, and additional supplementary material
- 10 AED training simulators
- 2 mesh collection and storage bags
- 10 replacement airways
- 10 replacement face masks
- 50 manikin wipes

The all-in-one kit contains everything needed to facilitate CPR in Schools training for 10-20 students at once. The process can be easily repeated to train an entire class, grade, or even entire school. One kit can train hundreds of students!

Order Today!

Learn more
heart.org/cprinschools

School Health
 866-323-5465 | schoolhealth.com

Appendix D: CPR in Schools Lesson Plan

Preparing for the Course

Introduction

The **CPR in Schools Training Kit™** is a turnkey educational program designed specifically for schools. Core modules can be facilitated by any student or teacher within 1 class period. The CPR in Schools Training Kit can meet your state's legislative requirements for cardiopulmonary resuscitation (CPR) training with a psychomotor component (hands-on practice on a manikin).

The course is designed to be completely self-facilitated, with no additional training required for the trainer. The educational program can be conducted over 1 classroom session or can be incorporated into a more in-depth course that covers basic health and science topics. This allows the facilitator the flexibility to design the course as needed to fit the educational needs of the students. In addition, it allows for a multitude of additional educational activities that can be added to the core curriculum included in the DVD.

CPR in Schools Overview

The course has 5 modules and an optional activity:

1. Life Is Why® Activity (optional)
2. Adult Hands-Only CPR and AED (required)
3. Adult CPR With Breaths (optional)
4. Choking in Adults (optional)
5. Child CPR and AED (optional)
6. Choking in Children (optional)

The modules cover CPR, choking, and using an automated external defibrillator (AED) when appropriate. You can facilitate each module on its own or facilitate multiple modules together, depending on the needs of your students.

Role of the Facilitator

Any motivated person who wants to share the lifesaving skill of CPR can be a CPR in Schools Facilitator.

Remember, you do not have to be an American Heart Association (AHA) Instructor or have a CPR course completion card to be a facilitator. This is a video-based course, and the lessons in the course video will teach students the skills of CPR. As a facilitator, you'll help the class run smoothly. Your responsibilities include

- Creating a positive learning experience
- Preparing before the class, including the planning of all logistics
- Setting up equipment and the room
- Successfully managing the course as outlined in this Facilitator Guide

Course Equipment

Equipment needed for each CPR in Schools class is listed below. All equipment needs to be in proper working order and good condition.

Included in CPR in Schools Training Kit	1 wheeled classroom carry bag
	10 Mini Anne® Plus inflatable manikins
	10 kneel mats
	10 individual carry bags
	5 practice-while-watching training DVDs
	1 hand pump for manikin inflation
	2 mesh collection and storage bags
	10 replacement airways
	50 manikin wipes
	10 replacement face masks
	10 AED training simulators
Additional equipment needed	1 facilitator binder that contains the Facilitator Guide, Lesson Plans, pre- and post-test, and supplementary material
	A DVD player, a remote control, and a monitor or screen big enough for all students to see
	1 table in case a student can't kneel on the ground to practice CPR
	A room where you and the video can be heard easily and with enough space

Storage of Manikins

Store inflated manikins in the mesh collection bags between classes, or deflate the manikins and store them in the individual carry bags with each kneel mat.

Store the individual carry bags, mesh collection bags, DVDs, replacement airways, replacement faces, and unused manikin wipes in the large classroom bag until the next use.

Manikin Maintenance

If students will be practicing how to give breaths, replace the airway assembly after each student. Follow these steps to replace the airway assembly:

1. Release the airway straps at the bottom edge of the manikin and at the neck.
2. Remove the face by releasing the ear connectors.
3. Unclip the airway from the face support. Pull the airway from under the chest plate.
4. Attach a new airway to a clean face and fasten the neck tabs.
5. Slide the airway under the chest plate.
6. Reattach the bottom tab.
7. Reattach the face to the ear connectors.

Sanitize faces between classes by using the manikin wipes provided (do not use antibacterial wipes, baby wipes, tissues, or paper towels).

Ordering Materials

To order additional or replacement CPR products, call 1-866-935-5484 or email us at cpainschools@heart.org.

For more information about CPR in Schools, including additional educational materials, visit www.heart.org/CPRinSchoolsToolkit.

Replacement items include the following:

106-10400	Manikin Mini Anne® Plus (single)
106-10050	Airway Assembly Mini Anne® Plus (pkg. 50)
106-10800	Mini Anne® Plus Chest Plate
106-10401	CPR in Schools DVD
106-10250	Mesh Collection Bags (× 2)
106-10550	Kneel Mat (pkg. 10)
106-13101	AHA Mini Anne® Plus Wheeled Carry Bag
106-10101	Instructor Pump
106-12000	Face Mini Anne® Plus (pkg. 5)
152400	Resusci® Manikin Wipes (pkg. 50)
152401	Resusci® Manikin Wipes (pkg. 1200)
106-13350	AED Simulator (pkg. 10)

Facilitating the Course

Using Lesson Plans

You will use Lesson Plans to prepare for and help facilitate the course as students follow along with the video.

When	How to Use
Before the course	Review the Lesson Plans to understand <ul style="list-style-type: none"> • Precourse responsibilities • Objectives for each CPR in Schools module • Your role in the course • Resources that you need for the course
During the course	<ul style="list-style-type: none"> • Follow the Lesson Plans as you conduct the course to know what to do next. • Help the students achieve the objectives identified for each lesson.

The Lesson Plans in this Facilitator Guide are

- Precourse Lesson Plan
- Life Is Why Activity Lesson Plan (optional)
- CPR in Schools Lesson Plan
 - Includes instructions for all adult and child modules

Understanding Icons

The icons in the Lesson Plans remind you to take certain actions during the course. The Lesson Plans include the following icons:

Icon	Action
	Discussion
	Play video
	Pause video
	Practice while watching
	Repeat segment

Practice While Watching

The practice-while-watching method is used to teach skills in the CPR in Schools Course. Practice while watching is an effective approach for building skills mastery.

Practice while watching aids the learning experience by organizing content into the following format:

- Tell students what they will learn
- Show them
- Allow them to practice
- Provide coaching
- Summarize what they learned

Facilitators should use the video to demonstrate correct performance of skills. Allow students time to practice while following the video demonstration. Observe students' performance of the skills and provide corrective feedback. Finally, give students the option to practice without the video, if needed.

Lesson Plans

Precourse Lesson Plan

Facilitator Tips

Prepare for your role as a CPR in Schools Facilitator. Review the Facilitator Guide, including the Preparing for the Course and Facilitating the Course sections. The time you invest in this part of your preparation is important to students' success and will allow the course to run smoothly.

2 Weeks Before the Course

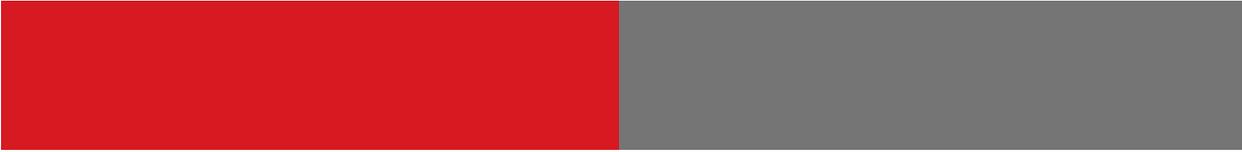
- Watch the CPR in Schools video.
 - Read the entire Facilitator Guide.
-

1 Week Before the Course

- Confirm classroom/space reservations.
 - If you can, tell students to wear comfortable clothes.
-

1 Day Before the Course

- Review the Lesson Plans.
 - Make copies of the pre- and post-tests for all students (optional).
 - Make copies of the Life Is Why activity if conducting this activity (1 per student).
 - Know the location of the AED(s) in your school.
 - Make sure that all technology and equipment are working properly. This will allow you to fix anything that doesn't work before class.
 - Make sure there are extra batteries for the video remote control.
-




Day of the Course

Get to class early to set up the room and get the manikins ready. The room setup is the key to a successful class. Here are some tips for setting up a room:

- You should be at the front of the room. Leave yourself space.
 - Move desks to the walls so students can be seated comfortably, arm's length apart, on the floor.
 - All students must be able to see and hear the video. Put the manikins in a place so that even when students are on their knees practicing, they can still see the video.
 - Inflate the manikins by using the hand pump or the pump bag.
 - Insert the 1-way valve into the manikin tube. Ensure that the manikin valve is assembled.
 - If inflating with the hand pump, insert the hand pump nozzle into the 1-way valve and inflate. If inflating with the pump bag, insert the manikin valve onto the pump bag nozzle and inflate according to the directions printed on the pump bag.
 - *Do **not** inflate the manikins by mouth or with the use of an air compressor.*
 - When using manikins on the floor, place 1 kneel mat by each manikin.
 - The manikins should ideally all face the same way, with their heads lining up with the manikin's head in the video (so that students can do exactly what is in the video).
- 
- Have chairs and tables for those students who have difficulty kneeling to practice CPR.



Next

Life Is Why
Activity Lesson Plan

Optional

Life Is Why® Activity Lesson Plan

8 minutes

Facilitator Tips

- Before facilitating this lesson, complete the Life Is Why activity in the Facilitator Guide. Have your “_____ Is Why” prepared to share with students.
- Make additional copies of the Life Is Why activity from the Facilitator Guide for students to use.

**Pause Video**

- Pause the video after the Life Is Why section plays to complete this activity with students.

**Discussion**

- To engage the class, after viewing the Life Is Why video, take 2 to 3 minutes to share your Why with the class, based on your completed Life Is Why activity in the Facilitator Guide.
- Then, encourage students to participate in the following activity:
 - Hand out the “_____ Is Why” activity page to each student. Tell students:
 - Complete this activity by filling in the blank with the word that describes your Why.
 - Tell your family and friends about your “_____ Is Why”, and ask them to discover their Why

Facilitator Notes

NextCPR in Schools
Lesson Plan

CPR in Schools Lesson Plan

Facilitator Tips

- Put students at ease by talking with them as they come in.
- Be enthusiastic! Enthusiasm is contagious.
- Stay focused. Keep the course on track. This gives students the best chance of really learning CPR. Also, it's polite to start and end the course on time. Keeping the course on track respects everyone's time.
- When students are practicing during the practice-while-watching segments, keep everyone doing exactly what the video is showing, at the same time.
- Students may have questions. Facilitators are not expected to know all the answers. When students have questions, refer them to the AHA.
- Help overcome fear. Many students are afraid of doing CPR wrong and may be reluctant to give CPR in real life. Doing CPR well is very important to saving lives, but any CPR is better than no CPR.



Discussion: Introduction

- Thank students for their time.
- Let students know they'll be practicing CPR on manikins.
- Inform students of when they will have a break.
 - If more than 1 module is being facilitated, you may want to have quick breaks between each module.
- Administer the pretest (optional) with students before beginning the course.
- Refer to the table below to remind students what they will learn during the course, how long each module is, and the skills practiced in each section.

Module	Learning Objectives	Practice While Watching
Adult Hands-Only CPR and AED (required) 25 minutes	<ul style="list-style-type: none"> • Describe the important differences between heart attack and cardiac arrest • Describe the steps to perform Hands-Only CPR for an adult • Perform Hands-Only CPR for an adult • Demonstrate how to use an AED on an adult 	<ul style="list-style-type: none"> • Steps leading up to CPR • Compressions • Putting It All Together • Using an AED
Adult CPR With Breaths (optional) 6 minutes	<ul style="list-style-type: none"> • Describe the steps to perform CPR with breaths for an adult 	<ul style="list-style-type: none"> • Putting It All Together (optional practice)

(continued)

(continued)

Module	Learning Objectives	Practice While Watching
Choking in Adults (optional) 5 minutes	<ul style="list-style-type: none"> • Discuss when and how to help a choking adult • Describe how to help a choking adult who stops responding 	• No skills practice
Child CPR and AED (optional) 7 minutes	<ul style="list-style-type: none"> • Describe the steps to perform CPR for a child • Describe how to use an AED on a child 	• Putting It All Together (optional practice)
Choking in Children (optional) 5 minutes	<ul style="list-style-type: none"> • Discuss when and how to help a choking child • Describe how to help a choking child who stops responding 	• No skills practice

You will complete the following steps for each module in the CPR in Schools Course that you are facilitating.

Play Video

- The Adult Hands-Only CPR and AED module includes instruction and required practice for skills.
- The Adult CPR With Breaths and Child CPR and AED modules include instruction and optional practice for skills.
- For the choking modules, the video will show only instructions for how to perform skills. Practice is not included.

Video Pauses

- For the modules that include practice, the video will pause for each skill that is practiced after the instruction of the skill.
- During each pause, have students position themselves at the side of their manikins per the video instructions.
- Tell students that they will now practice along with the video for the skill they just learned and that they should do exactly what they see in the video at the same time as it's being demonstrated.
 - As an option, allow students to view the practice segment before they practice as a review of the steps.
- Before practice while watching, ask each student to clean the surface of the manikin face and the mouth cavity with a manikin wipe before beginning, using the manikin wipes provided (do not use antibacterial wipes, baby wipes, tissues, or paper towels).



Practice While Watching: Skills Practice

- Students will follow along with the video to complete the steps for each skill.
 - If someone has trouble bending down or getting on his or her knees, accommodate that person (for example, you can place the manikin on a table).
 - If a student can't push deep enough for compressions, have the student lean over the manikin more and straighten his or her arms if needed.
 - If completing the optional Putting It All Together practice segments for the Adult CPR With Breaths and Child CPR and AED modules, refer to the Manikin Maintenance section of this Facilitator Guide.



Repeat Segment

- Each student will need to complete the Compressions and the Putting It All Together practice segments twice in the required Adult Hands-Only CPR and AED module.
- For any module that includes practice, continue to select Repeat until all students have had the chance to practice and have mastered each skill.
- If a student wants or needs extra practice on a manikin, let him or her practice after the class ends.



Play Video

- Play the video to continue the module, or to move to the next module that you are facilitating.



Discussion: Conclusion

At the end of class, discuss the following with students:

- Administer the post-test (optional) with students upon completion of the course.
 - Be sure to review the post-test with students, emphasizing what they have learned since taking the pretest at the beginning of the course.
- Encourage lots of practice. Students get better at CPR through practice. Practice makes a real difference in learning CPR and being willing to give CPR in real life. If a student wants extra practice on a manikin, let him or her practice after the class ends.
- Encourage the students to refresh their skills often and share skills with their loved ones to bring this lifesaving information to more people.
- Thank the students for their time and congratulate them on completing the course.
- Complete the training record. Scan or take a picture and send it back to the AHA's Community CPR Tracker at www.heart.org/communitycprtracker.

Appendix E: CPR in Schools Pre/Post-Test

CPR in Schools



Fill in the box for the **1 best** answer for each question. Do not make any other marks on this page.

1. During cardiac arrest, what happens to a person?

- The heart is still beating and pumping blood, and the person is still alive
- The heart stops beating, the person doesn't respond, and the person isn't breathing normally
- The heart is still beating, the person isn't breathing normally, and blood stops moving
- The heart is still beating and pumping blood, but the person isn't breathing normally

2. Which is the correct first step when you arrive at a scene where a person has collapsed?

- Tap and shout
- Phone 9-1-1 and get an AED (if available)
- Make sure the scene is safe
- Check for breathing

3. When you do Hands-Only CPR, how many chest compressions should you perform each minute?

- About 50
- 100 to 120
- 130 to 150
- 150 to 200

4. How deep should you push on the chest of an adult when you do Hands-Only CPR?

- At least 1 inch
- At least 2 inches
- At least 3 inches
- At least 4 inches

5. Once you shout for help, what are the next steps for providing Hands-Only CPR?

- Phone 9-1-1 and get an AED (if available), check for breathing, and begin compressions
- Begin compressions, check for breathing, and phone 9-1-1 and get an AED (if available)
- Phone 9-1-1 and get an AED (if available), begin compressions, and check for breathing
- Check for breathing, begin compressions, and phone 9-1-1 and get an AED (if available)

6. What does an AED do?

- Reads the heart rhythm and tells you if a shock is needed
- Automatically phones 9-1-1 and calls for help
- Tells you if a shock is needed and gives the heart rate
- Automatically phones 9-1-1 and tells you if a shock is needed

7. Do you know where the AED is located in your school?

- Yes No

8. Would you feel comfortable performing Hands-Only CPR if someone had a cardiac arrest?

- Yes No

Optional Questions

9. Which is the correct first step to help a choking adult who stops responding?

- Shout for help
- Lay the person on the ground
- Phone 9-1-1 and get an AED (if available)
- Give 30 compressions

10. What is the most important thing to remember when performing CPR on a child?

- Children need breaths with compressions
- Child CPR is similar to adult CPR
- A child is 1 year or older but not a teenager
- Children usually have healthy hearts

11. What are the signs of a child who is choking?

- The child can speak and play
- The child can't speak but can cough
- The child can cough and laugh
- The child can't cough, speak, or breathe

12. When you perform CPR with breaths on an adult, how many breaths do you give after every 30 compressions?

- 2 breaths
- 4 breaths
- 6 breaths
- 8 breaths

www.heart.org/cprinschools

Appendix F: CPR in Schools Test Answers

CPR in Schools



Pretest/Post-test Answer Key

1. During cardiac arrest, what happens to a person?

- The heart is still beating and pumping blood, and the person is still alive
- The heart stops beating, the person doesn't respond, and the person isn't breathing normally
- The heart is still beating, the person isn't breathing normally, and blood stops moving
- The heart is still beating and pumping blood, but the person isn't breathing normally

2. Which is the correct first step when you arrive at a scene where a person has collapsed?

- Tap and shout
- Phone 9-1-1 and get an AED (if available)
- Make sure the scene is safe
- Check for breathing

3. When you do Hands-Only CPR, how many chest compressions should you perform each minute?

- About 50
- 100 to 120
- 130 to 150
- 150 to 200

4. How deep should you push on the chest of an adult when you do Hands-Only CPR?

- At least 1 inch
- At least 2 inches
- At least 3 inches
- At least 4 inches

5. Once you shout for help, what are the next steps for providing Hands-Only CPR?

- Phone 9-1-1 and get an AED (if available), check for breathing, and begin compressions
- Begin compressions, check for breathing, and phone 9-1-1 and get an AED (if available)
- Phone 9-1-1 and get an AED (if available), begin compressions, and check for breathing
- Check for breathing, begin compressions, and phone 9-1-1 and get an AED (if available)

6. What does an AED do?

- Reads the heart rhythm and tells you if a shock is needed
- Automatically phones 9-1-1 and calls for help
- Tells you if a shock is needed and gives the heart rate
- Automatically phones 9-1-1 and tells you if a shock is needed

7. Do you know where the AED is located in your school?

- Yes
- No

8. Would you feel comfortable performing Hands-Only CPR if someone had a cardiac arrest?

- Yes
- No

Optional Questions

9. Which is the correct first step to help a choking adult who stops responding?

- Shout for help
- Lay the person on the ground
- Phone 9-1-1 and get an AED (if available)
- Give 30 compressions

10. What is the most important thing to remember when performing CPR on a child?

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11. What are the signs of a child who is choking?

- The child can speak and play
- The child can't speak but can cough
- The child can cough and laugh
- The child can't cough, speak, or breathe

12. When you perform CPR with breaths on an adult, how many breaths do you give after every 30 compressions?

- 2 breaths
- 4 breaths
- 6 breaths
- 8 breaths

Appendix G: Nebraska High School Survey

- 1) **How many students are enrolled in your school?**
- Less than 100
 - 100-500
 - 500-1000
 - 1000-2500
 - 2500-5000
 - Greater than 5000
- 2) **How many faculty members are employed in your school?**
- Less than 25
 - 25-50
 - 50-100
 - 100-250
 - Greater than 250
- 3) **Do you ask about CPR training/do you have a CPR requirement as part of your staff hiring process?**
- Yes
 - No
- 4) **How many of your staff members are certified in CPR?**
- Less than 10
 - 10-25
 - 25-50
 - Greater than 50
 - Unknown
- 5) **What year did you implement CPR training in your school?**
- Before 2015
 - 2016
 - 2017
 - 2018
 - Working out logistics of implementation
- 6) **What (grade level) are your students trained? (Check all that apply)**
- 9
 - 10
 - 11
 - 12
- 7) **Who provides the CPR training to your high school students? (Circle all that apply)**
- Physical education teacher
 - Team coach
 - Health teacher
 - Other teacher
 - Unpaid volunteer
 - Paid instructor
- 8) **In what setting are your students trained?**
- Classroom
 - PE
 - Community service requirement
 - After school session
 - Other (please specify)
-
-
- 9) **Where did you purchase/acquire the materials for training?**
- American Heart Association (AHA)
 - American Red Cross
 - Other (please specify)
-
-
- 10) **How do you report successful training as a requirement for graduation?**
- Report to the board of education
 - Report to the superintendent
 - Report to the legislature/state official
 - There is no formal reporting procedure in place
 - Other (please specify)
-
-

11) How much time is allocated for the training/how much time does the training take?

- a. Less than 30 minutes
- b. 30-60 minutes
- c. 60-90 minutes
- d. 90-120 minutes
- e. Greater than 2 hours

12) What were the estimated start-up costs in getting the CPR training program in place?

- a. Less than \$500
- b. \$500-\$1000
- c. \$1000-\$2500
- d. \$2500-\$5000
- e. Greater than \$5000

13) What is the estimated cost of training per school year?

- a. Less than \$500
- b. \$500-\$1000
- c. \$1000-\$2500
- d. \$2500-\$5000
- e. Greater than \$5000

14) How do you allocate funding for CPR training?

- a. State funds
 - b. School district funds
 - c. Health education budget
 - d. Discretionary funds
 - e. Students/community donations
 - f. School bond
 - g. Other (please specify)
-
-

15) Do you provide AED (Automated External Defibrillator) training as part of your CPR training?

- a. Yes
- b. No
- c. No, but we are interested in including it in our training

16) Do you have AEDs available in your school?

- a. Yes
- b. No
- c. Not currently, but we would like to have them available

17) If so, where does the funding come from to purchase the AEDs?

- a. State funds
 - b. School district funds
 - c. Health education budget
 - d. Discretionary funds
 - e. Students/community donations
 - f. School bond
 - g. Other (please specify)
-
-

18) What has been the biggest barrier to implementation of CPR training in your school?

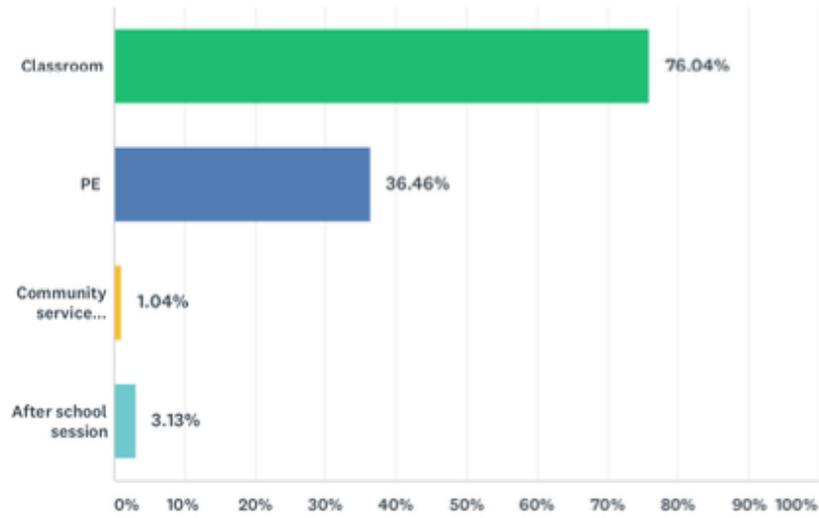
- a. Cost
 - b. Staffing
 - c. Staff/student buy-in
 - d. Time commitment
 - e. Availability of training equipment
 - f. Liability concerns
 - g. Other (please specify)
-
-

19) To your knowledge, has there been a sudden cardiac arrest on your school grounds since 2010?

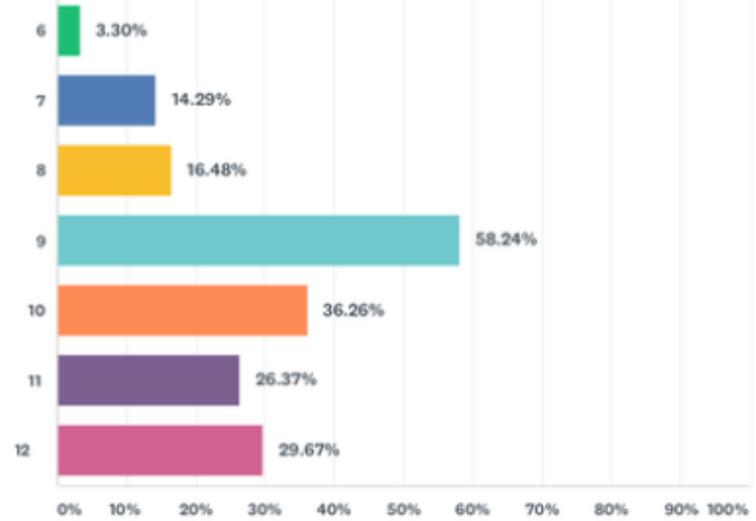
- a. Yes
- b. No

20) If you have additional comments, please add them below:

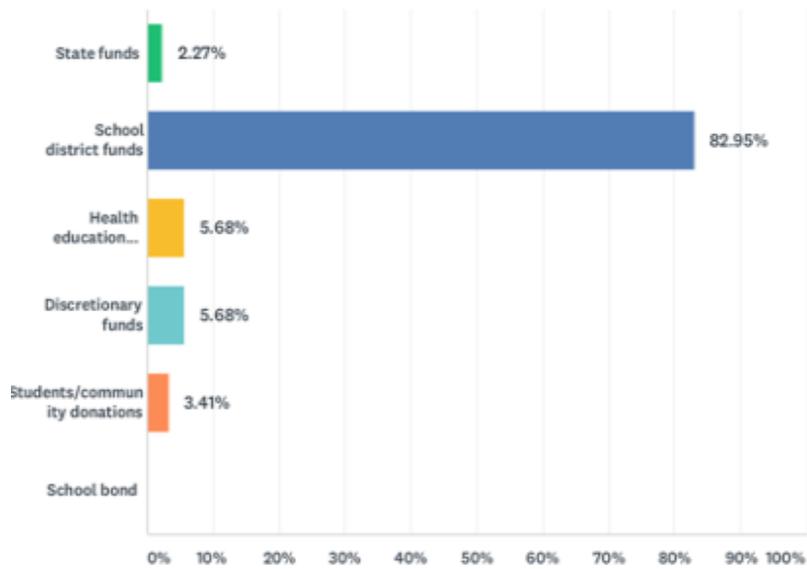
A.



B.



C.



D.

