ORIGINAL ARTICLE

The rural CPR outreach project: Medical students teach bystander CPR to secondary school students

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Abstract

Introduction: Prompt bystander cardiopulmonary resuscitation (CPR) can double the chance of cardiac arrest survival. Rural and remote communities experience longer emergency service wait times and have lower rates of bystander-CPR compared to their urban counterparts. Our study addresses this disparity.

Methods: We designed a 1.5-h free hands-only CPR course tailored to secondary school students in rural and remote communities taught by medical students. We evaluated our course using pre-test and post-test surveys.

Results: We taught over 300 secondary students in 5 days. Less than one-third of students had previously taken a CPR course. We found that brief CPR instruction taught by medical students was effective in both improving students' knowledge of CPR (t[528] = –26, $P < 0.01$) and perceived comfort in performing CPR (t[548] = –12, $P < 0.01$).

Conclusion: CPR courses taught by medical students are effective, low cost, and may help address regional health care disparities. Teaching CPR to rural/remote communities may have secondary benefits such as promoting health care careers to rural youth. We encourage other health professional programmes to consider engaging students in CPR outreach projects.

Keywords: Cardiopulmonary resuscitation, medical student, remote, rural, secondary school, youth

Résumé

Introduction: Une réanimation cardio-pulmonaire rapide peut doubler les chances de survie en cas d'arrêt cardiaque. Les communautés rurales et éloignées connaissent des temps d'attente plus longs dans les services d'urgence et ont des taux plus faibles de RCP par rapport à leurs homologues urbains. Notre étude porte sur cette disparité.

Méthodes: Nous avons conçu un cours de RCP pratique et gratuit d'une heure et demie, adapté aux élèves du secondaire des communautés rurales et isolées et dispensé par des étudiants en médecine. Nous avons évalué notre cours à l'aide d'enquêtes pré-test et post-test.

Résultats: En 5 jours, nous avons enseigné à plus de 300 élèves du secondaire. Moins d'un tiers des élèves avaient déjà suivi un cours de RCP. Nous avons constaté qu'une brève formation à la RCP dispensée par des étudiants en médecine était efficace pour améliorer les connaissances des élèves en matière de RCP (t[528] =

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–26, $P < 0,01$) et la perception de leur aisance à pratiquer la RCP (t[548] = –12, $P < 0,01$).
Conclusion: Les cours de RCP dispensés par les étudiants en médecine sont efficaces, peu coûteux et peuvent contribuer à lutter contre les disparités régionales en matière de soins de santé. L'enseignement de la RCP aux communautés rurales/éloignées peut avoir des avantages secondaires tels que la promotion des carrières dans le domaine de la santé auprès des jeunes ruraux. Nous encourageons d'autres programmes professionnels de santé à envisager d'engager leurs étudiants dans des projets de sensibilisation à la RCP.

Mots-clés: École secondaire, éloigné, étudiant en médecine, jeune, réanimation cardio-pulmonaire, rural

INTRODUCTION

An estimated 40,000 out-of-hospital cardiac arrests (OHCAs) occur each year in Canada and fewer than 10% of patients who receive care from emergency services survive.[1] Prompt bystander cardiopulmonary resuscitation (CPR) can double the chance of survival,[2] yet bystander delivery of CPR is estimated to be lower than 40%.[3] In British Columbia (BC), the highest rates of OHCA occur in the most rural and remote regions of the province. Compared to the Vancouver Coastal Health region, the incidence rates of OHCA are increased by 30% and 40% in the Vancouver Island and the Northern Health regions, respectively.[4] Moreover, rural and remote regions often experience longer delays for emergency services[5,6] and have the lowest rate of bystander-CPR training compared to other regions.[7] This creates a paucity of bystander-CPR skills in areas that would benefit the most. This disparity is likely to worsen with climate change as extreme temperatures are associated with increased OHCA.[8]

The current Heart and Stroke Policy Guidelines call upon Provincial/Territorial Governments to implement mandatory CPR training for all school-aged children; however, most provinces/territories have yet to implement such curricula.[3,9] In BC, one component of Grade 10 Physical and Health Education curriculum is the 'basic principles for responding to emergencies' (which includes: 'following safety guidelines, having an emergency response plan and knowing how to get help'); however, CPR is not currently a requirement before graduation.[10]

Despite the lack of established programmes that train school-aged children in CPR, numerous studies have shown that youth are adequate providers of CPR.[11] CPR training has been shown to not only improve students' CPR skills and willingness to help in an emergency but also increases their confidence, self-esteem and sense of community.[11] Moreover, children are known to be catalysts for change in their community and may disseminate the CPR skills they have learned.[11] Finally, in addition to the World Health Organization[12] and American Heart Organization,[13] recent high school graduates themselves support mandatory CPR training in schools.[14] Meta-analysis of school CPR programmes found that brief training can be effective and that hands-on practice is superior to other forms of CPR instruction.[15]

Medical students have previously been documented to successfully teach CPR to secondary school students.[16,17] However, we are the first programme to focus on training students in rural and remote settings to our knowledge.

METHODS

Programme design

We created the 'Rural CPR Outreach Programme' (RCOP), a basic CPR skills programme specific to rural and remote secondary school students (grades 8–12) in B.C. Four medical students acted as CPR instructors teaching a pilot course and then a 4-day outreach programme on Northern Vancouver Island. As part of the University of British Columbia (UBC) Medical Undergraduate Curriculum, medical students are required to participate in a research or community outreach project, thus allowing medical students to use their time teaching CPR as course credit. In addition, medical students are required to maintain Basic Life Support (BLS) certification, and some medical student CPR instructors are certified Heart and Stroke BLS instructors trained through the peer-led BLS training programme.[18]

The planning phase of this project was completed by the lead medical student instructor

over a 3-month period. A small amount of time was allocated (15–30 min per week) to contact schools through e-mail and assess their interest in participating in the RCOP programme. Contacts typically included high-school principals, who then directed the instructors towards relevant teachers and classes. Interested teachers had their students participate as a mandatory, non-incentivised part of their daily classroom curriculum with the option for students to opt out of the teaching. The initial pilot was done with a physical education class, and subsequent classes included grade 8–12 science classes (biology, chemistry and anatomy) and physical/outdoor education classes. Coordination was required to provide interested schools with dates and times that aligned with the medical student instructors allocated research block and to ensure no conflict with travel requirements.

CPR mannequins and automated external defibrillators (AEDs) were borrowed from the Victoria Centre for Interprofessional Clinical Simulation Learning, Heart and Stroke Foundation and St. John's Ambulance. After completing a pilot project of our course in Sooke, BC, we ran a 4-day outreach programme in the rural Northern Vancouver Island communities of Port Hardy, Port McNeill and Campbell River which took place in April 2022. To mitigate the costs of accommodations associated with this project, a small bursary of $1,000 was obtained from the Rural Health Services Research Network of BC. This funding is specifically allocated for students participating in research projects that involve rural and remote health. This covered the costs of fuel and nightly accommodations over the 4-day teaching period.

Curriculum design

We designed a 1.5-h long CPR course designed to have 2 medical student instructors teach 20–25 secondary school students. It consisted of three parts: an oral slide presentation, hands-on practice with mannequins and AED trainers and a team-based simulation.

The slide presentation reviewed the indications for CPR and the 4 steps of CPR, as outlined by the Heart and Stroke Hands-Only Bystander CPR guidelines.[19] Instructors then demonstrated CPR compressions and AED administration. Our presentation included community-specific information (e.g. outlining the location of AEDs in each community) and incorporated popular music and video clips related to CPR to engage students.

Students were then instructed to split up into groups of 4–5 students for hands-on practice. Each class was allocated 5 CPR mannequins and 5 AED trainers. Two of the 5 mannequins allowed students to receive real-time quantitative feedback regarding their compressions. Instructors circulated throughout the room providing feedback and assistance. Time permitting the course concluded with a team-based simulation. Three student volunteers were given a basic scenario where they worked together to call 911, provide CPR and retrieve and use an AED.

Given the current opioid epidemic in North America, we also included a brief discussion regarding opioid overdose and naloxone kits during the presentation. We reviewed the indications to use a naloxone kit and briefly discussed how to use a kit and where to access one in the community. No hands-on naloxone training was provided to students.

Surveys and programme evaluation

Pre-test and post-test surveys were used to assess the efficacy of our course and were administered either on paper or online through Qualtrics software. The multiple-choice pre-test survey consisted of four questions assessing students' knowledge of CPR, one question regarding students' perceived comfort level providing hands-only CPR and one question assessing students' previous exposure to CPR training. The information required to answer the CPR knowledge questions was then taught as part of the RCOP course, but the answers to the questions were never explicitly stated. After completion of the RCOP course, the post-test surveys were then administered. The post-test survey was identical to the pre-test survey with the omission of the previous exposure to CPR training. The survey questions were based on the AHA CPR in Schools Questionnaire.[20] Students were given approximately 5 min before and after the course to complete each survey.

Statistical analysis of survey responses was performed using Microsoft Excel. Two-sample

t-tests assuming unequal variances were performed to compare the pre-test and post-test answers for specific survey questions. The mean average of specific questions (cumulative CPR knowledge) was also compared using two-sample t-tests assuming unequal variances.

RESULTS

After completing a pilot project of our course in Sooke, BC, we ran a 4-day outreach programme in the rural Northern Vancouver Island communities of Port Hardy, Port McNeill and Campbell River which took place in April 2022 [Table 1].

Four medical students with an interest in emergency medicine (2 with experience in paramedicine and 2 in BLS) taught the CPR courses.

Over 5 days (1-day pilot course and 4-day outreach projects), 17 CPR courses were completed with 307 high school students in attendance. Of the students instructed, 72% of students (n = 221/307) reported that they had never taken a CPR course. Five mannequins for every 20–25 students were found to be effective.

RCOP significantly improved students' CPR knowledge test scores and self-reported perceived comfort performing CPR [Table 2]. Cumulative test scores improved from 46.4% pre-test to 90.3% post-test ($P < 0.01$). In addition, the self-reported comfort level of performing CPR increased from 41.7% pre-test to 86.3% post-test ($P < 0.01$). Of the 599 question responses collected, 57 question responses (1.9%) were marked incorrect because they were left unanswered, or more than one multiple-choice answer was selected.

Table 1: Number of students and classes taught in each location

Community	*N*	Classes taught
Sooke	50	2
Campbell River	164	8
Port McNeill	33	3
Port Hardy	60	4
Total	307	17

n is based on the number of pre-test surveys received. A small number of students chose not to participate in the survey but still participated in the course

Table 2: Pre-test versus post-test scores††

	Pre-test mean (*n*=307)	Post-test mean (*n*=292)	*P*†
Question			
CPR steps	57.0	80.1	<0.01
CPR rate	21.2	93.8	<0.01
CPR depth	57.3	93.5	<0.01
AED function	50.5	93.8	<0.01
Cumulative score	46.4	90.3	<0.01
Perceived comfort	41.7	86.3	<0.01

†Two sample *t*-test assuming unequal variances with significance value P=0.05, ††43 pre-test and 14 post-test questions were marked incorrect because the questions were left blank or multiple answers were selected. AED: Automated external defibrillator, CPR: Cardiopulmonary resuscitation

DISCUSSION

This article describes a unique model of CPR instruction in BC which may be replicated in other health professional schools (e.g. nursing and allied health). We propose a model of CPR instruction that is cost-effective and benefits both medical students and rural/remote communities. Medical students are effective CPR instructors and many schools have dedicated curricular time for community projects. Training equipment, such as mannequins and AED trainers, is often owned by medical schools and may be loaned from community organisations. Although we found a small number of mannequins effective (5 mannequins per 20–25 students), other low-cost, self-constructed, alternatives have been proposed.[21] The only funding required for our programme was for the transport of medical students between rural/remote communities.

In addition to exposing medical students to rural and remote communities, involvement as a CPR instructor fosters skills specific to the physician CANMEDs roles.[22] As an instructor, medical students gain skills in communication, collaboration, advocacy and leadership. Moreover, teaching CPR has been found to be a superior method to improve medical students' own CPR skills, as compared to taking a BLS course alone or shadowing emergency medical services.[17]

We hypothesise that a secondary benefit of our programme is exposing rural/remote secondary students to health care careers. Given the current shortage of rural physicians, emphasis has been placed on recruiting students from rural/remote communities. Numerous studies have shown that rural physicians are more likely to come from a rural background as opposed to their urban counterparts and that Canadian students from rural areas are more likely to indicate they plan

to practise in rural communities.[23] During our outreach course, it was common for instructors to answer many questions regarding post-secondary education, paramedicine and medical school. Although the benefit of this exposure was not directly assessed in our programme, it has been shown in other studies that targeting health care exposure programmes to rural communities often increases rural youth's positive perception and interest in careers in health care.[24] To begin to assess this benefit, future studies could include an assessment of secondary students' occupational direction or choice of post-secondary training before and after the RCOP course, and in the years following the RCOP session.

Although most likely representative, the secondary students taught in this study were from a limited region of B.C. The four medical student instructors had an interest in emergency medicine (two had experience in paramedicine and two in BLS Instruction). In addition, the pre-test–post-test methodology was limited to assessing students' factual knowledge of CPR and hands-on CPR performance was not evaluated. Finally, retention of CPR skills is a documented challenge when teaching CPR to school children.[25] Our study did not measure retention of CPR skills and we are unable to comment on how our course would translate to future scenarios where CPR is required. A future study has been planned to measure the skill retention of participants. We aim to do this by offering repeat annual RCOP sessions to interested schools, with an option for past participants to opt-in to an assessment of CPR skill retention before taking a refresher course. However, not all students taught in the initial sessions will be able to be assessed for skill retention, as some students will graduate before subsequent sessions can be taught.

CONCLUSION

We propose a low-cost method of teaching CPR that benefits both rural and remote communities and medical students. CPR courses taught by medical students are effective and can help address regional health care disparities. Additional secondary benefits of medical student-led CPR outreach programmes may include promoting health care careers to rural youth and improving medical students' own proficiency in providing CPR.[17] We encourage leaders of other health professional programmes to consider engaging their students in CPR outreach projects.

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Conflicts of interest: There are no conflicts of interest.

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