Targeting high-risk cardiac patients and their family members for basic life support training

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Publications related to this thesis

Cartledge S, Finn J, Smith K, Straney L, Stub D, Bray JE. A cross-sectional survey examining cardiopulmonary resuscitation training in households with heart disease. *Journal of Cardiovascular Nursing.* 2017. Under review.

Cartledge S, Feldman S, Bray JE, Stub D, Finn J. Understanding patients' and spouses' experience of patient education following a cardiac event and eliciting attitudes and preferences towards incorporating cardiopulmonary resuscitation training: a qualitative study. *Journal of Advanced Nursing.* Under review.

Cartledge S, Finn J, Bray JE, Case R, Barker L, Missen D, Shaw J, Stub D. Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study. *European Journal of Cardiovascular Nursing.* 2017. DOI: 10.1177/1474515117721010 [Epub ahead of print]

Cartledge S, Bray JE, Leary M, Stub D, Finn J. A systematic review of basic life support training targeted to family members of high-risk cardiac patients. *Resuscitation.* 2016; 105:70-8

Cartledge S, Bray JE, Stub D, Krum H, Finn J. Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand? *Heart, Lung and Circulation.* 2016; 25:607-612

Additional publications during candidature

Neubeck L, **Cartledge S,** Dawkes, S, Gallagher R. Is there an app for that? Mobile phones and secondary prevention of cardiovascular disease. *Current Opinion in Cardiology*. 2017. DOI: doi: 10.1097/HCO.0000000000000428 [Epub ahead of print]

Bray JE, Smith K, Case R, **Cartledge S,** Straney L, Finn J. Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation: a cross sectional survey of Victorians. *Emergency Medicine Australasia*. 2017; 29(2):158-164

Cartledge S, Finn J, Straney L, Ngu P, Stub D, Patsamanis H, Shaw J, Bray J. The barriers associated with emergency medical service use for acute coronary syndrome: the awareness and influence of an Australian public mass media campaign. *Emergency Medicine Australasia.* 2017; 34(7):466-471.

Bray JE, Stub D, Ngu P, **Cartledge S,** Straney L, Stewart M, Keech W, Patsamanis H, Shaw J, Finn J. Mass media campaigns' influence on prehospital behaviour for acute coronary syndromes: an evaluation of the Australian Heart Foundation's Warning Signs campaign. *Journal of the American Heart Association*. 2015; 4(7):e001927

Awards during candidature

- Winner, Ian Jacobs Young Investigator Award – European Resuscitation Council, Iceland, 2016
- Higgins Certificate of Achievement – Federal Member for Higgins, Victoria, 2016
- Winner, best research paper – Australasian Cardiovascular Nursing College, 2016
- People's Choice Award, Three Minute Thesis – Faculty of Medicine Nursing and Health Sciences, Monash University, 2015
- First place, Three Minute Thesis – School of Public Health and Preventive Medicine, Monash University, 2015
- Winner, Affiliate Prize – Cardiac Society of Australia and New Zealand, 2015
- Second place, free paper presentation – Australian Resuscitation Council Spark of Life Conference, Melbourne, 2015.

Grants awarded during candidature

- Travel grant – Cardiac Society of Australia and New Zealand, to attend EuroHeartCare, Sweden, 2017
- Project grant (CI) – "Improving the uptake of CPR training in Australian Cardiac Rehabilitation Programs", AUD$39,000, Laerdal Foundation, Norway, 2016
- Travel grant – Australian Cardiovascular Health and Rehabilitation Association (ACRA), to attend ACRA Annual Scientific Meeting, 2016
- Postgraduate scholarship – National Health and Medical Research Council, 2016
- Travel grant – Monash University Postgraduate Research Travel Grant, to attend European Resuscitation Council Congress in Prague, 2015
- International Mentoring Grant – American Heart Association, to attend Scientific Sessions, Chicago, 2014
- Travel Grant – Council on Cardiovascular and Stroke Nursing, to attend Scientific Sessions, Chicago, 2014
- PhD scholarship, Australian Resuscitation Outcomes Consortium, 2014–2017

Presentations during candidature

Cardiac Society of Australia and New Zealand ASM, Perth, Australia, 2017

Presentation: Education experiences of patients and spouses post an acute cardiac event- can we add cardiopulmonary resuscitation training? A qualitative study.

Poster presentation: Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation program: A feasibility study.

Australian Cardiovascular Health and Rehabilitation Association ASM, Perth, Australia, 2017

Presentation: Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation program: A feasibility study.

EuroHeartCare, European Society of Cardiology, Jönköping, Sweden, 2017

Invited presentation: New basic life support and advanced life support guidelines

Invited presentation: Targeting CPR training to high-risk cardiac patients and families

Australian Resuscitation Council, Spark of Life Conference, Adelaide, Australia, 2017

Presentation: Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation program: A feasibility study.

Presentation: Education experiences of cardiac patients and spouses – can we add cardiopulmonary resuscitation training? A qualitative study.

European Resuscitation Council Congress, Reykjavik, Iceland, 2016

Young investigator prize session: Targeting CPR training to cardiac patients and their family members.

Cardiac Society of Australia and New Zealand ASM, Adelaide, Australia, 2016

Poster presentation: Factors associated with emergency medical service use for ACS patients in Victoria.

Invited debate: Cardiac nurses just aren't what they used to be!

Australian Cardiovascular Health and Rehabilitation Association ASM, Adelaide, Australia, 2016

Presentation: Cardiac rehabilitation identified as an appropriate time and place for basic life support training: A qualitative study.

Poster presentation: A systematic review of basic life support training targeting family members of high-risk cardiac patients.

New Zealand Resuscitation Council Conference, Auckland, New Zealand, 2016

Poster presentation: Attitudes and preferences of high-risk cardiac patients and spouses towards basic life support training: a qualitative study

Poster presentation: A systematic review of basic life support training targeting family members of high-risk cardiac patients.

Australian Cardiovascular Nursing College Conference, Melbourne, Australia, 2016

Presentation: Factors associated with ambulance use for acute coronary syndrome in Victoria.

European Resuscitation Council Congress, Prague, Czech Republic, 2015

Poster presentation: Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand?

Poster presentation: A systematic review of basic life support training targeting family members of high-risk cardiac patients.

Cardiac Society of Australia and New Zealand ASM, Melbourne, Australia, 2015

Affiliate prize session: Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand?

Australian Cardiovascular Health and Rehabilitation Association ASM, Melbourne, 2015

Presentation: Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand?

Australian Resuscitation Council, Spark of Life Conference, Melbourne, Australia, 2015

Presentation: Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand?

American Heart Association Conference, Chicago, USA, 2014

Poster presentation: How does the symptom experience differ from patients' expectations of what having a heart attack is like?

Abbreviations

ACRA	Australian Cardiovascular Health and Rehabilitation Association
ACS	Acute coronary syndrome
AED	Automated external defibrillators
AHA	American Heart Association
BLS	Basic life support
CHD	Coronary heart disease
cpm	Compressions per minute
CPR	Cardiopulmonary resuscitation
D-CPR	Dispatcher-assisted telephone cardiopulmonary resuscitation instructions
EMS	Emergency medical services
GP	General practitioner
ILCOR	International Liaison Committee on Resuscitation
NAS-NRC	NAS-NRC
OHCA	Out-of-hospital cardiac arrest
RCT	Randomised controlled trial
TPB	Theory of planned behaviour
USA	United States of America
VO	Video only
VSI	Video self-instruction (training kit)

Summary

Background: Coronary heart disease (CHD) is a leading cause of death and disease burden globally. CHD requires lifelong management and repeat cardiac events are common – the most severe of which is out-of-hospital cardiac arrest (OHCA). OHCA is a sudden and time-critical condition associated with high rates of mortality. The delivery of basic life support (BLS), specifically cardiopulmonary resuscitation (CPR), by a bystander is crucial and more than doubles the chance of survival.

Bystanders are most likely to be family members of the victim, as up to 75% of OHCAs occur in a private residence, with half of these arrests witnessed. However, it is unlikely that family members have undergone recent BLS training or are proficient in BLS. Targeting training to populations who are at risk of OHCA, such as family members of cardiac patients, may be an effective strategy to increase bystander BLS rates and therefore survival from OHCA.

Methods: This thesis consists of five discrete but related studies culminating in an interventional study. Initially, a systematic review of existing evidence about targeting BLS training to family members of high-risk cardiac patients was undertaken. The second study measured the prevalence of BLS training in the Australian state of Victoria, and (for the first time) specifically investigated BLS training prevalence in households with a high-risk cardiac patient. A qualitative study was then undertaken to obtain data on the attitudes, preferences and intentions of the target population towards BLS training. Semi-structured interviews were conducted with patients and their spouses following an acute cardiac event and analysed using a thematic analysis, underpinned by phenomenology and the theory of planned behaviour. Interview participants independently confirmed that cardiac rehabilitation would be an ideal setting for BLS training. Therefore an online cross-sectional survey was conducted to assess the prevalence of BLS training in cardiac rehabilitation programs in Australia and New Zealand. Finally, these studies informed an interventional study of the feasibility of incorporating BLS training into a cardiac rehabilitation program in Melbourne, Australia.

Results: The systematic review identified the need for contemporary studies of targeted BLS training. This need is due to recent changes in international BLS guidelines and the advent of new technology for both training and assessment of BLS skills. Prevalence of BLS training in Victorian households who had a high-risk cardiac patient was 68%, but just over half (51%) of those participants were trained more than five years previously. In addition to certain skill degradation, skills would be outdated over this time. The qualitative data showed that most

cardiac patients and their spouses had positive attitudes and strong intentions to learn BLS, especially if training was incorporated within a cardiac rehabilitation program. While cardiac rehabilitation program coordinators had positive attitudes towards including BLS training in their programs, only 24% of Australian programs provided training, compared to 57% in New Zealand. Barriers identified included lack of awareness, resources and time. The final study tested video self-instruction (VSI) kits for delivering BLS training in a cardiac rehabilitation program to determine whether they were a feasible way to overcome these barriers. Key outcomes from this study were high uptake of training by cardiac rehabilitation patients (n = 56, 73% of eligible patients) and spouses (n=27). Training delivered via VSI significantly improved confidence in BLS skills (p<0.001) and willingness to use skills (p<0.001). Participants shared the VSI training kit with a further 87 participants, doubling BLS training reach to this high-risk cardiac population.

Conclusions: Cardiac patients and their spouses are interested in learning BLS after hospital discharge following an acute cardiac event. However, this population does not actively seek out training. Cardiac rehabilitation is an excellent means of targeting training and a supportive environment for learning BLS effectively. VSI BLS training kits can overcome time and resource constraints, allowing cardiac rehabilitation staff to easily implement BLS training in their programs. The use of VSI BLS training kits in cardiac rehabilitation settings enables cardiac patients and their family members to receive BLS training routinely and effectively.

General Declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes three original papers published in peer-reviewed journals and two unpublished publications. The core theme of the thesis is targeted BLS training to high-risk cardiac populations. The ideas, development and writing of all the papers in the thesis were the principal responsibility of myself, the student, working within the Department of Epidemiology and Preventive Medicine under the supervision of Professor Judith Finn. The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

In Chapters Two to Six, my contribution to the work involved the following:

Thesis chapter	Publication title	Status	Nature and % of student contribution	Co-author name(s), nature and % of co-author's contribution*	Co-author(s), Monash student Y/N*
2	A systematic review of basic life support training targeted to family members of high-risk cardiac patients.	Published	70% – responsible for designed, data extraction, data synthesis, interpretation of results and writing of manuscript.	1) Dr Janet Bray, 10% – assisted with design, data extraction and synthesis, writing of manuscript.	No
				2) Ms Marion Leary, 5% – study design, writing of manuscript.	No
				3) Dr Dion Stub, 5% – study design, writing of manuscript.	No
				4) Professor Judith Finn, 10% – study design, writing of manuscript.	No
3	A cross-sectional survey examining cardiopulmonary resuscitation training in households with heart disease.	Submitted	70% – responsible for data analysis, interpretation of results and writing of manuscript.	1) Professor Judith Finn, 5% – study design, writing of manuscript.	No
				2) Professor Karen Smith, 5% – study design, writing of manuscript.	No
				3) Dr Lahn Straney, 5% – data analysis and interpretation, writing of manuscript.	No
				4) Dr Dion Stub, 5% – study design, writing of manuscript.	No
				5) Dr Janet Bray, 10% – assisted with design, data analysis, writing of manuscript.	No

4	Understanding patients' and spouses' experiences of patient education following a cardiac event and eliciting attitudes and preferences towards cardiopulmonary resuscitation training; a qualitative study	Submitted	70% – responsible for study design, data collection and analysis, and writing of manuscript.	1) A/Professor Susan Feldman, 15% – study design, data analysis, writing of manuscript.	No
				2) Dr Janet Bray, 5% – study design, writing of manuscript.	No
				3) Dr Dion Stub, 5% – study design, writing of manuscript.	No
				4) Professor Judith Finn, 5% – study design, writing of manuscript.	No
5	Do cardiac rehabilitation programs offer cardiopulmonary resuscitation in Australia and New Zealand?	Published	70% – responsible for study design, data collection and analysis, and writing of manuscript.	1) Dr Janet Bray, 10% – study design, data analysis, writing of manuscript.	No
				2) Dr Dion Stub, 5% – study design, writing of manuscript.	No
				3) Professor Henry Krum, 5% – study design, writing of manuscript.	No
				4) Professor Judith Finn, 10% – study design, data analysis, writing of manuscript.	No

6	Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study.	Accepted, 27 June 2017	60% – responsible for study design, data collection and analysis, writing of manuscript.	1) Professor Judith Finn, 5% – study design, data analysis, writing of manuscript.	No
				2) Dr Janet Bray, 5% – study design, data collection and analysis, writing of manuscript.	No
				3) Dr Rosalind Case, 5% – study design, data collection and analysis, writing of manuscript.	No
				4) Mrs Lauren Barker, 5% – study design, writing of manuscript.	No
				5) Mrs Diane Missen, 5% – study design, data collection, writing of manuscript.	No
				6) Dr James Shaw, 5% – study design, writing of manuscript.	No
				7) Dr Dion Stub, 10% – study design, data analysis, writing of manuscript.	No

I have not renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

Student signature: [redacted] **Date:** 26/07/2017

The undersigned hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Main Supervisor signature: [redacted] **Date:** 26/07/2017

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This prior experience with the clinical pharmacology department provided a strong research environment and gave me the passion and desire to conduct my own research. I am fortunate to have colleagues who have become friends and mentors from this time. Thank you to Dr Ingrid Hopper and Mrs Marina Skiba for your continued friendship and support. Additionally, I was fortunate to meet and procure another invaluable mentor- Professor Lis Neubeck. Thank you Lis for providing a regular sounding board for ideas and for continually presenting opportunities for me to network and develop.

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Chapter One: Introduction

1.1 Background and rationale

1.1.1 Manifestations of coronary heart disease

Coronary heart disease (CHD) is a leading cause of death and disease burden globally.[1] In Australia, over 4.2 million people are affected.[2] While mortality rates have declined over the last few decades, the prevalence of those living with CHD has increased.[3] This is due to advancements in diagnosis and intervention, as well as an ageing population at increasing risk of developing the disease.[4] CHD requires lifelong management, and survivors are at high risk of further cardiac events- the most severe of which is out-of-hospital cardiac arrest (OHCA).[5–7]

Out-of-hospital cardiac arrest is a sudden, life-threatening condition characterised by abnormal electrical and mechanical heart function progressing to complete cessation.[8] CHD is the underlying aetiology responsible for approximately 80% of OHCA.[9–11] Other aetiologies include cardiomyopathy, channelopathies and pulmonary embolism.[11] Given the risk of OHCA in patients with known cardiac disease is seven times greater than that of the general population[12] and around 75% of OHCAs occur in the home,[5,10,13] it is essential that people in households containing a person or persons with CHD are trained in the emergency intervention of basic life support (BLS).

Basic life support comprises a sequence of actions that can be performed by those who witness or find a person in OHCA, known as bystanders. Bystander actions include early recognition of the condition and activation of emergency medical services (EMS), the provision of cardiopulmonary resuscitation (CPR) and, if available, defibrillation with an automated external defibrillator.[14] Unless there is return of spontaneous circulation, these actions must continue until the arrival of EMS. They constitute the initial links of the chain of survival (Figure 1).[15]

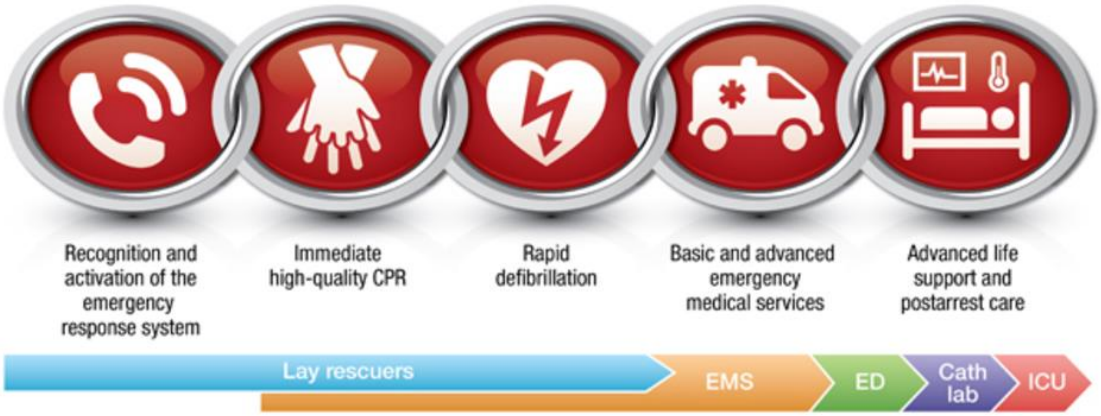

Figure 1. Out-of-hospital cardiac arrest chain of survival

The provision of the chain of survival, particularly BLS, in OHCA is significantly associated with increased survival. Overall, for every minute BLS is not implemented, the probability of survival decreases by 10%.[16] Individually, each action of BLS has associated survival benefits. Recent local data examining bystander recognition of OHCA and subsequent appropriate direction of their first call to EMS (rather than family, friend or general practitioner) was associated with a 64% increase in survival to hospital discharge.[17] The provision of CPR – the act of performing chest compressions with or without mouth-to-mouth ventilations – is associated with a two to threefold increase in survival.[18,19] Finally, providing a controlled electric shock to the heart via external defibrillation can further increase overall survival by 50–70%.[20] Each link in the chain of survival is critical, but as the chain analogy indicates, survival is maximised when all links are performed efficiently. The importance of these early links in the chain of survival is recognised in the evolution of BLS training.

1.1.2 The evolution of BLS training

It was not until the successful resuscitation of an OHCA using BLS with closed-chest compressions in 1960 that BLS training was developed.[21] Initially, only health care

professionals were trained, before the National Academy of Sciences–National Research Council (NAS-NRC) recommended a supervised trial of training lay people.[22] Finally in 1973, at the second national NAS-NRC conference, a recommendation was made for the general public to be trained in BLS.[22] Without public BLS training there would be no initial bystander treatment for those who experience an OHCA, dramatically decreasing the chance of survival.

Recommendations for BLS education and implementation are released every five years by the International Liaison Committee on Resuscitation (ILCOR).[23] These recommendations are then adapted at a local level by national and regional resuscitation councils. Guidelines pertaining to BLS changed significantly in 2010: in recognition of the importance of increasing bystander willingness to respond to an OHCA and provide CPR, compression-only CPR became an option for laypersons unwilling or unable to deliver mouth-to-mouth ventilations.[24] The focus for laypersons is now on performing high-quality chest compressions at a rate of 100–120/minute and depth of 5–6cm.[14] Providing mouth-to-mouth has long been recognised as a barrier to bystanders responding to an OHCA and subsequently performing CPR (especially on a stranger), due to fears of infection and potential litigation if the skill is performed incorrectly.[25,26] Training communities in compression-only CPR has now also been recommended in light of increasing the willingness of bystanders to be trained and to respond to OHCA.[27] However, no recommendations pertaining to frequency of BLS training exist, due to insufficient evidence.[27] It is known that skill degradation occurs within three to 12 months, but optimal retraining intervals are unknown. ILCOR currently recommends local discretion to be used when determining retraining intervals.[27]

The recipients of BLS training in the community vary internationally due to differences in legislation. For example, some countries mandate training for schoolchildren[28] or driver's licence applicants.[29] In Australia, the only legislation to stipulate mandatory first aid training (which includes BLS training) pertains to workplaces and specific professions. Australian employers must ensure sufficient first aiders are trained within a workplace, or alternatively,

that employees have access to first aid trained personnel.[30] Specific professions in Australia, such as teachers, childcare workers and fitness instructors, require BLS training as part of their employment or to fulfil insurance requirements.[31] Outside the workplace, Australians are required to seek and fund their own BLS training.

1.1.3 Are high-risk cardiac populations equipped for an OHCA event?

While public BLS training courses are available, it is known that many people don't seek training of their own volition.[25] Previous research on Australian community BLS training rates found trainees were typically young (<56 years of age), and only 11% of the sample had undergone training within the past 12 months.[32] Public BLS training rates were re-examined in a similar survey in 2016;[33] while the prevalence of trainees had increased (from 52% to 68% over 15 years), the majority (51%) had received training more than five years earlier, with only 28% trained within the last 12 months. These trends are not isolated to Australia. A recent national survey conducted in the USA[34] found that 65% reported being trained in CPR but only 18% had current CPR certification (training within the last two years). CPR training rates decrease with age in both the USA and Australia.[33,34]

Despite targeted BLS training to high-risk cardiac populations being advocated in the literature for over 30 years,[35] no research on targeted training has been conducted in Australia, nor are there any known BLS training interventions in place to reach a high-risk cardiac population. While the prevalence of BLS training in households with CHD is currently unknown, it is likely that older Australians who have left the workforce will have either outdated or no skills in BLS. Concurrently, increasing age increases the prevalence of CHD, therefore increasing the risk of OHCA and highlighting the importance of ensuring BLS training reaches this high-risk population.

1.1.4 Targeted BLS training – contemporary challenges and gaps

The International Liaison Committee on Resuscitation has recommended targeting training to high-risk populations since 2010.[24] The literature underpinning this recommendation was reviewed again in the 2015 consensus on science process.[27] While more studies were included in this recent review, there was insufficient evidence relating to critical patient outcomes such as return of spontaneous circulation or favourable neurologic outcome at hospital discharge. However, data indicated that family members of high-risk cardiac patients were capable of performing BLS skills and willing to provide BLS if necessary. Additionally, the review found that BLS training did not have any adverse effect on psychological outcomes such as anxiety.[24]

Targeted BLS training for high-risk populations was recommended in light of its high potential benefit and low rate of harm; however, significant gaps in the literature remain. A systematic review specific to high-risk cardiac patients[36] (detailed in Chapter Two) found a lack of evidence pertaining to current resuscitation guidelines. Moreover, the majority of evidence surrounding teaching high-risk populations predates the significant change of the introduction of compression-only CPR for bystanders. Therefore, it is important to reassess targeted training research in light of the simplified BLS protocol and removal of the significant barrier of mouth-to-mouth ventilations.

Other recent changes to BLS training include the availability of digital technology for training and assessment. Video self-instruction (VSI) training kits allow trainees to effectively learn BLS without an instructor in a brief timeframe- usually 30 minutes.[37,38] One such VSI kit, made by Laerdal, contains an instructional digital versatile disc (DVD) and an inflatable reusable manikin (Figure 2).[39] It has been demonstrated that skills obtained using this training are equivalent to attending a traditional three-hour face-to-face training class.[37,38] Another benefit is the ability to share these reusable kits with family and friends to further disseminate training, known as secondary training.

Figure 2. Laerdal video self-instruction training kit

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Laerdal Medical

The assessment of BLS training has also advanced in recent years. Previous targeted BLS training studies relied on subjective measurements, such as visual assessment combined with checklists, to measure the quality of CPR skills. Manikins equipped with skill recording devices, which provide objective measurement of CPR skills such as compression rate and depth, are now widely available. This technology may enable a high-risk cardiac population to learn BLS more efficiently and effectively.

Another significant gap in research relates to the attitudes, preferences and intentions of a high-risk cardiac population towards BLS training. There is a paucity of qualitative investigation of this population, including important data about how and when they would like to undertake BLS training. Behavioural theory is often used to explore behaviours in health research, and theory is required to frame any qualitative investigation. One such theory, the theory of planned behaviour (TPB),[40] provides a framework to understand predictions and intentions of behaviour using three constructs: behavioural beliefs, subjective norms (the social pressure to undertake the behaviour in question) and control beliefs (facilitators or barriers to undertaking the behaviour). The general rule of this theory is that the strength of the individuals' intention to perform the behaviour is related to how likely it is

that the behaviour will be performed. One previous study,[41] conducted in Canada, successfully employed this theory to explore intentions, barriers and facilitators towards BLS training in an older population. Informed by the constructs of this theory, the authors were able to determine strategies that would influence a high-risk older population to seek future CPR training.

In addition to intentions, it is important to understand the experience of patient education after an acute cardiac event in the context of adding BLS training to this education. This perspective could be investigated using phenomenology which aims to describe and understand the lived human experience.[42] To achieve this, data is typically collected via interviews with individuals who experienced the phenomenon- in this case cardiac patients and their family members. Analysis of interviews involves identifying narrow themes before moving to a broad focus, describing the universal essence of the experience of this population. This framework is commonly in used in health research to explore what the experience of illness or treatment means to individuals.[43]

Previous targeted training research has investigated training within hospitals,[44,45] outpatient departments[46–48] and in the home[49–51] or community setting.[52–54] Currently, in Australia, it may not be feasible to deliver training in the acute hospital environment due to decreased hospital length of stay (average three days)[55] for acute cardiac admissions. Additionally, providing training in the home is likely to not be time or cost effective, and ensuring the target population attend a community class may be difficult. New approaches to providing BLS training to high-risk cardiac populations must be devised and assessed.

Cardiac rehabilitation is a secondary prevention outpatient program designed for a range of cardiovascular disease patients. Programs in Australia are generally linked to hospitals (both public and private) or community health services.[56] Programs typically include education, risk factor modification, supervised exercise and psychological support over six to eight weeks, and

are provided by specialist cardiac nurses in addition to physiotherapists and other allied health staff.[57,58] Patient attendance at cardiac rehabilitation is imperative, as there is strong evidence that it reduces cardiovascular mortality and readmission rates by up to 30%.[58–60] Family members and significant others are also strongly encouraged to attend with patients, as their presence increases patient program participation and adherence to long-term behaviour changes. In addition, family members often have risk profiles similar to the patients.[61] While there has been one study of cardiac rehabilitation coordinators' attitudes towards the inclusion of BLS training in Scottish cardiac rehabilitation programs,[62,63] no interventional studies have been undertaken to date. As cardiac rehabilitation is a logical time and place to incorporate BLS training to a high-risk cardiac population, especially in Australia, investigation is warranted.

1.1.5 Summary and rationale

Out-of-hospital cardiac arrest is a significant public health problem; its prompt recognition and treatment by bystanders can literally mean the difference between life and death. Strengthening the chain of survival requires attention and investment not only from healthcare professionals but from society, as anyone, at any time, may be a bystander and therefore called on to provide assistance in an OHCA.

In Australia, there appears to be a disparity between those with BLS skills and those who are most likely to witness an OHCA; therefore, targeting BLS training to households with a person at high risk of OHCA should be explored. To date, there has been no targeted BLS training research conducted in Australia. In addition, most studies conducted internationally are now outdated due to significant changes in resuscitation guidelines,[64] alternate BLS training modalities (such as VSI)[38] and advances in technology permitting objective assessment of CPR skills. Contemporary Australian strategies for targeting BLS training to family members of high-risk cardiac patients are required.

1.2 Research aim and objectives

The overall aim of this doctoral research was to investigate a feasible method of targeting BLS training to family members of high-risk cardiac patients. To achieve this aim, the following research objectives were addressed:

1. describe and evaluate available evidence for targeted BLS training programs to family members of high-risk cardiac patients internationally;
2. determine current prevalence of BLS training among Victorian households containing a person or persons with CHD;
3. explore the attitudes, preferences and intentions of Victorian high-risk cardiac populations towards BLS training;
4. determine the current prevalences of BLS training in Australian and New Zealand cardiac rehabilitation programs; and
5. investigate the feasibility of incorporating BLS training into a cardiac rehabilitation program.

1.3 Scope, significance and intended outcomes

The significance of this body of work is that it produced new evidence about practical training strategies designed to increase the prevalence of BLS skills among people witnessing OHCAs and thereby improve the survival of OHCA sufferers. The ultimate goal of this research is to create an accessible, straightforward and scalable targeted BLS training program. Such a training program would increase the number of OHCA survivors, particularly among those who arrest at home, by strengthening the first links of the chain of survival. Intended outcomes from this work are new contemporary solutions to targeted BLS training strategies in an Australian context.

1.4 Thesis overview

This thesis includes five published or submitted manuscripts and consists of seven chapters (Table 1). Chapter Two contains a systematic review[36] of literature on the effectiveness of providing BLS training to family members of high-risk cardiac patients. This review found the majority of targeted BLS training studies to be outdated, highlighting a need for contemporary research that incorporates new guidelines and training modalities.

The following chapters include a background and overview, present the aims of each study, and expanded descriptions of the methods discussed in the accompanying papers (three published, two submitted and under review). Chapters Three to Five describe three discrete but related studies that informed and culminated in the interventional study presented in Chapter Six. Chapter Three details an updated examination of Victoria public CPR training rates, specifically in households containing a person or persons with CHD. Chapter Four describes an examination of qualitative data about the target population's attitudes, preferences and intentions towards BLS training. These participants identified cardiac rehabilitation as an optimal time to target BLS training to high-risk cardiac populations. Consequently, Chapter Five presents a manuscript investigating the prevalence of BLS training in cardiac rehabilitation programs in Australia and New Zealand.[56] Chapter Six brings together the knowledge gained in the previous studies, with an interventional study of the feasibility of targeting BLS training to family members of cardiac patients within a cardiac rehabilitation program in Melbourne, Australia.

Finally, in Chapter Seven a critical overview of this doctoral work is provided, including key findings and the strengths and limitations of the research. The findings are discussed with respect to other current BLS training initiatives before recommendations for practice, guidelines and future research are presented.

For consistency, the term BLS will be used throughout this thesis, except when explicitly referring to skill or performance of CPR. BLS is used as this term encapsulates the entire process of bystander actions (recognising the condition, activating EMS and performing CPR) within the chain of survival.

Table 1. Thesis overview

Chapter	Contents	Research objectives
Chapter One	Introduction	Describe the background and history of the thesis topic. Describe the rationale, aims and objectives of the thesis. Provide an overview of the thesis structure.
Chapter Two	**Manuscript:** A systematic review of basic life support training targeted to family members of high-risk cardiac patients.[36]	Systematically describe and evaluate available evidence on targeted BLS training.
Chapter Three	**Manuscript:** A cross-sectional survey examining cardiopulmonary resuscitation training in households with heart disease. *Submitted to Journal of Cardiovascular Nursing – under review.*	Determine prevalence of CPR training among households containing a high-risk cardiac patient.
Chapter Four	**Manuscript:** Understanding patients' and spouses' experiences of patient education following a cardiac event and eliciting attitudes and preferences towards cardiopulmonary resuscitation training: a qualitative study. *Submitted to the Journal of Advanced Nursing – under review.*	Explore attitudes, preferences and intentions of high-risk cardiac populations towards CPR training.

Chapter Five	**Manuscript:** Do cardiac rehabilitation programs offer cardiopulmonary resuscitation in Australia and New Zealand?[56]	Determine prevalence of CPR training in cardiac rehabilitation programs.
Chapter Six	**Manuscript:** Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study.[65]	Investigate the feasibility of incorporating CPR training into a cardiac rehabilitation program.
Chapter Seven	Discussion and conclusions.	Provide a critical overview of the thesis. Discuss the strengths and limitations of this body of work. Provide recommendations for practice, guidelines and future research.

Chapter Two: Systematic Review

2.1 Overview of Chapter Two

Chapter One provided an overview of OHCA and outlined the critical importance of the provision of BLS to ensure victims have the best chance of survival. Chapter One also discussed the need to target BLS training to the populations most likely to witness an OHCA– that is, family members of high-risk cardiac patients. While numerous studies have investigated BLS training targeted to this population, no review of the literature has been published. Therefore a systematic literature review is the initial step in this program of research.

Before conducting the review, the methods were developed and published in PROSPERO, the international prospective register of systematic reviews (Appendix A).[66] Consistent with the ILCOR, Grades of Recommendation, Assessment, Development and Evaluation (GRADE) were used to assess the quality of evidence at the outcome level.

2.2 Manuscript, Paper One

The following paper, "A systematic review of basic life support training targeted to family members of high-risk cardiac patients", was published in *Resuscitation* in 2016.

Resuscitation 105 (2016) 70–78

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Review article

A systematic review of basic life support training targeted to family members of high-risk cardiac patients☆

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ABSTRACT

Aim: Targeting basic life support (BLS) training to bystanders who are most likely to witness an out of hospital cardiac arrest (OHCA) is an important public health intervention. We performed a systematic review examining the evidence of the effectiveness of providing BLS training to family members of high-risk cardiac patients.
Methods: A search of Ovid MEDLINE, CINAL, EMBASE, Informit, Cochrane Library, Web of Science, Scopus, ERIC and ProQuest Dissertations and Theses Global was conducted. We included all studies training adult family members of high-risk cardiac patients regardless of methods used for cardiopulmonary resuscitation (CPR) or BLS training. Two reviewers independently extracted data and evaluated the quality of evidence using GRADE (Grades of Recommendation, Assessment, Development and Evaluation).
Results: We included 26 of the 1172 studies identified. The majority of studies were non-randomised controlled trials ($n = 18$), of very low to moderate quality. Currently, there is insufficient evidence to indicate a benefit of this intervention for patients; largely because of low numbers of OHCA events and high loss to follow-up. However, the majority of trained individuals were able to competently perform BLS skills, reported a willingness to use these skills and experienced lower anxiety.
Conclusion: Whilst there is no current evidence for improvement in patient outcomes from targeted BLS training for family members, this group are willing and capable to learn these skills. Future research may need to examine longer periods of follow-up using alternate methods (e.g. cardiac arrest registries), and examine the effectiveness of training in the modern era.

Introduction

Out of hospital cardiac arrest (OHCA) affects more than 300,000 people in the US each year[1] and is often fatal. Survival to hospital discharge is less than 10%.[2] The critical initial steps in the treatment of OHCA are: (1) prompt recognition of the condition and activating emergency medical services (EMS), (2) high quality cardiopulmonary resuscitation (CPR), (3) early defibrillation and (4) early advanced care from EMS. This sequence of steps forms the chain of survival with steps one to three known as basic life support (BLS). In the case of OHCA, as distinct from in-hospital cardiac arrest, the first of these steps need to be performed by lay bystanders at the scene.

Unfortunately BLS is not implemented immediately or competently for every OHCA case. In particular, bystander CPR rates in OHCA are low, rarely exceeding 20%.[3] A possible explanation for these low rates is that community CPR and BLS training programmes often attract younger participants who are less likely to be required to use their skills.[4,5] The majority (75%) of OHCAs occur in the home and often witnessed by an older family member, who is unlikely to have had recent, if any, prior BLS training.[6,7]

Given the disparity between those trained in BLS and those most likely to witness a cardiac arrest, it may be more effective to target training to specific populations at high-risk of OHCA. This would include patients with a cardiac history or recent cardiac event. Targeted training of high-risk cardiac groups has been advocated for over three decades[3,4,8,9] and was recommended in a

☆ A Spanish translated version of the abstract of this article appears as Appendix in the final online version at http://dx.doi.org/10.1016/j.resuscitation.2016.04.028.

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systematic review conducted in 2008 broadly examining methods to increase bystander CPR.[3] To date there have been no reviews of this evidence. Therefore, this systematic review aims to examine the evidence of the effectiveness of providing targeted BLS training to family members of high-risk cardiac patients.

Methods

The plan for this review was registered with PROSPERO (CRD42014010297) before commencing the literature search.[10] We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA),[11] in the preparation of this manuscript.

PICO question

Our Population, Intervention, Comparator, Outcome (PICO)[12] question was: "Is targeting family members of high-risk cardiac patients (P) for BLS training (I) compared to no such training or differing training methods (C) effective (O)?"

Eligibility criteria

Participants: We included studies that reported training family members of high-risk cardiac patients or other adults with a close association to the patient. High-risk patients were defined as any person aged over 16 years who is at high-risk of OHCA due to any cardiac aetiology such as coronary heart disease, structural heart disease, life threatening arrhythmias or prior cardiac arrest.

Interventions: All methods of BLS training were included.

Comparison: The intervention was compared to no training or against different methods of training between groups.

Outcomes: The critical outcomes were (1) cardiac arrest survival (2) bystander BLS performance operationally defined as subsequent utilisation of skills by family members for OHCA events. Important outcomes were (1) CPR/BLS skills performance, (2) skills retention, (3) willingness to use BLS skills, (4) anxiety related to BLS training and (5) perceived rates of control post BLS training.

Types of studies: We included published original research articles or conference abstracts on randomised and non-randomised interventional studies and observational studies. There were no publication date or language restrictions imposed. Commentary, editorial papers, reviews and animal studies were excluded.

Information sources

Searches for relevant publications were conducted in the following databases from their earliest record until 15th July 2015: Ovid MEDLINE (1946-), CINAHL (1937-), EMBASE (1966-), Informit, Cochrane Library, Web of Science (1990-), Scopus (1960-), ERIC (1966-) and ProQuest Dissertations and Theses Global. Key word and MeSh terms included 'cardiopulmonary resuscitation', 'basic life support', 'resuscitation/ed [Education]', 'death, sudden' and 'family/ed [Education]' (full search strategy see http://www.crd.york.ac.uk/PROSPEROFILES/10297_STRATEGY_20140519.pdf).[10]

Study selection

Titles and abstracts were screened against the inclusion criteria by one reviewer (SC) to identify eligible studies for inclusion. Full text articles and included abstracts were then fully appraised by two authors (SC and JB) independently; with consensus reached on discordant selections. In cases where there were research studies with multiple publication of research results we used the more recent or complete publication. Reference lists of included studies were visually scanned for additional papers not found through the search strategy.

Data extraction

One reviewer (SC) independently extracted data using a pre-piloted data extraction form based on minimum requirements recommended in the Cochrane Handbook for Systematic Reviews.[13] A second reviewer (JB) independently extracted data utilising the same form on a random sample of studies. Major categories on the data extraction form included: author(s), title, publication year, study location and design, response rates, number of participants (families and patients), type of BLS training and identification and adjustment for confounders. Data extraction for these studies was then cross checked. The primary author was contacted in four instances due to missing data, the need for additional data or for clarification.

Assessment of risk of bias

Risk of bias at a study level for both randomised controlled (RCT) trials and non-randomised controlled trials (non-RCTs) was assessed using the 'Cochrane Collaborations' tool for assessing risk of bias.[13] Risk of bias at the outcome level was then conducted using the GRADE (Grades of Recommendation, Assessment, Development and Evaluation) system.[14] The GRADE approach judges the quality of evidence (from low quality to high quality), at an outcome level. The quality of evidence can be downgraded or upgraded. An example where evidence would be downgraded is in instances where there is a lack of blinding. Where a large effect size is seen evidence may be upgraded.[15] Outcomes are pre-specified and categorised as "critical" or "important" outcomes. Discrepancies or disagreements regarding data extraction or quality assessment were resolved through consultation with a third author (JF).

Results

Study selection

After the initial search, 1169 studies were identified from the search strategy (Fig. 1). Three studies[16–18] were identified from the reference list search of included studies. Once duplicates were removed 807 studies remained for title and abstract screening. Of these, 34 studies were reviewed and a further eight were excluded, leaving 26 studies for inclusion. Reasons studies were excluded following full text review were: duplicate publication of research results ($n = 1$), outcomes reported for patients only and not family members ($n = 4$), or outcomes solely focussed on recruitment strategies of the target population ($n = 3$).

Study characteristics

Of the 26 included studies, eight were RCTs and 18 were observational studies, including three conference abstracts[19–21] (Tables 1 and 2). Only one study was an international multicentre clinical randomised controlled trial, for which there were three publications examining different outcomes.[16,22,23] Nine studies were multicentre studies conducted in the USA[21,24–30] and Italy.[31] The remaining studies were single centre studies conducted in the USA,[32,33] China,[20,34,35] Austria,[36–38] Korea,[39] Pakistan,[40] United Kingdom,[41] and Greece.[19] Finally, two studies recruited patients from Washington, USA via a cardiac arrest surveillance system that identified all pre-hospital cardiac arrests.[17,42] One study conducted a secondary analysis from randomised controlled trial data.[30]

In most studies, target populations for BLS training were family members of heart disease patients[16,19,20,22–31,33,34,36,40] or cardiac

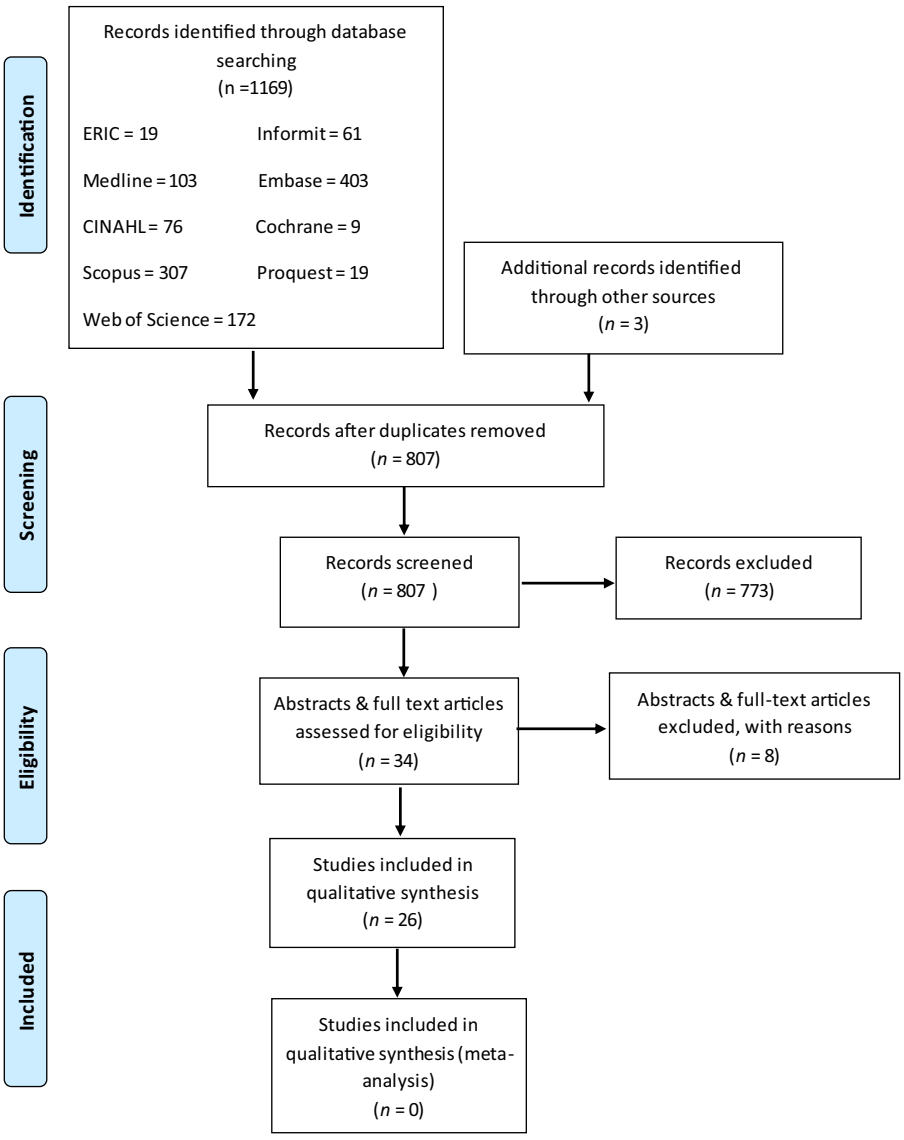

Fig. 1. PRISMA flow chart.

Table 1
Summary of characteristics of included studies for randomised controlled trials.

Study	Design	Country	Sample size (family members)	Type of training	Training location	Outcomes measured
Bardy et al. 2008[16]	RCT	International, multicentre	>7001	Unknown	Home	Cardiac arrest survival Subsequent utilisation of skills
Blewer et al. 2012[24]	RCT	USA, multicentre	406	AHA	Hospital – inpatients	CPR/BLS skills performance Skills retention Willingness to use BLS skills
Dracup et al. 1986[25]	RCT	USA	69	AHA	Hospital – outpatients	Cardiac arrest survival CPR/BLS skills performance Anxiety related to BLS training
Dracup et al. 1997[27]	RCT	USA	337	AHA	Hospital – outpatients	Anxiety related to BLS training
Li et al. 2012[a,20]	RCT	China	262	Unknown	Community	CPR/BLS skills performance Skills retention
Mark et al. 2010[23]	RCT	International, multicentre	948	Unknown	Home	Willingness to use BLS skills Anxiety related to BLS training
Moser et al. 2000[28]	RCT	USA	196	AHA	Hospital – outpatients	Perceived rates of control post BLS training
Thomas et al. 2011[22]	RCT	International, multicentre	460	Unknown	Home	Anxiety related to BLS training

[a] Abstract only.
[b] Article translation unavailable, English abstract only; RCT, randomised controlled trial; CPR, cardiopulmonary resuscitation; BLS, basic life support; AHA, American Heart Association.

Table 2
Summary of characteristics of included studies for non-randomised controlled trials.

Study	Design	Country	Sample size (family members)	Type of training	Training location	Outcomes measured
Blewer et al. 2012[21]	Non-RCT	USA	120	AHA	Hospital – inpatients	Willingness to use skills
Cheng et al. 1994[34]	Non-RCT	China	868	Unknown	Community	Willingness to use skills
Cokkinos et al. 2012[a,19]	Non-RCT	Greece	228	ERC	Community	Willingness to use skills
Dracup et al. 1989[26]	Non-RCT	USA	83	AHA	Hospital – outpatients	Cardiac arrest survival Subsequent use of skills Family members can learn CPR/BLS
Dracup et al. 1994[30]	Non-RCT[b]	USA	337	AHA	Hospital – outpatients	Cardiac arrest survival Subsequent utilisation of skills CPR/BLS skills performance Willingness to use BLS skills
Eisenberg et al. 1989[17]	Non-RCT	USA	97	AHA	Home	Cardiac arrest survival Subsequent use of skills
Hao et al. 2001[35]	Non-RCT	China	150	AHA	Community	Family members can learn CPR/BLS
Haugk et al. 2006[36]	Non-RCT	Austria	115	Unknown	Home	Cardiac arrest survival Subsequent use of skills Family members can retain skills Willingness to use skills
Kang et al. 2005[b,39]	Non-RCT	Korea	38	ILCOR	Unknown	Family members can learn CPR/BLS
Khan et al. 2010[40]	Non-RCT	Pakistan	300	AHA	Hospital	Family members can learn CPR/BLS
Kliegel et al. 2000[38]	Non-RCT	Austria	71	Unknown	Home, hospital – outpatients	Family members can learn CPR/BLS Willingness to use skills
McDaniel et al. 1988[32]	Non-RCT	USA	26	Unknown	Unknown	Cardiac arrest survival Subsequent utilisation of skills CPR/BLS skills performance Willingness to use BLS skills Anxiety related to BLS training
McLauchlan et al. 1992[41]	Non-RCT	UK	22	Unknown	Unknown	Cardiac arrest survival Subsequent use of skills Rate of related anxiety
Moore et al. 1987[42]	Non-RCT	USA	34	Unknown	Home	Family members can learn CPR/BLS Family members can retain skills
Moser et al. 1990[29]	Non-RCT	USA	31	AHA	Home	Cardiac arrest survival Subsequent use of skills Family members can learn CPR/BLS Family members can retain skills Willingness to use skills
Sanna et al. 2006[31]	Non-RCT	Italy	56	ILCOR	Hospital	Cardiac arrest survival Subsequent use of skills Family members can learn CPR/BLS Family members can retain skills Rate of related anxiety
Schneider et al. 2004[37]	Non-RCT	Austria	85	AHA	Home, hospital – outpatients	Family members can learn CPR/BLS Rate of related anxiety
Sigsbee et al. 1990[33]	Non-RCT	USA	50	AHA	Community, hospital – inpatients	Family members can learn CPR/BLS Rate of related anxiety

[a] Abstract only.
[b] Secondary analysis from randomised controlled trial data combining groups; Non-RCT, non-randomised controlled trial; CPR, cardiopulmonary resuscitation; BLS, basic life support; AHA, American Heart Association; ERC, European Resuscitation Council; ILCOR, International Liaison Committee on Resuscitation.

arrest survivors.[17,36–38,42] Two studies included family members of patients with a history of life threatening arrhythmias[32,41] and two studies had poorly described inclusion criteria of the high-risk patient group.[35,39] Training was largely delivered based on guidelines or recommendations from the American Heart Association (AHA),[43] the International Liaison Committee on Resuscitation (ILCOR)[44] or the European Resuscitation Council (ERC)[45] (Tables 1 and 2). A more recent study[24] utilised the AHA "Family and Friends CPR Anytime" video self-instruction (VSI) kit. Training took place predominantly in homes, hospital outpatients or in the community (Tables 1 and 2).

Participation rates were available for eight studies[17,21,23–25,29,32,36] and ranged between 39 and 100%, indicating that if eligible, family members were generally happy to be trained. Eligibility rates were only reported in three studies[17,24,29] and ranged between 50 and 72%, however it would be expected that these rates would differ between institutions and the location of recruitment (Supplementary tables).

Risk of bias within studies

The risk of bias was assessed at a study level for both randomised and non-randomised studies as summarised in Supplementary

Table 3
Summary of findings.

Outcomes	Study design	No. of studies	Quality of the evidence (GRADE)	Anticipated absolute effects	Importance
Cardiac arrest survival	RCT	2[16,25]	⊙⊙OO Low[2]	Not estimable[3]	Critical
	Non-RCTs	7[17,29–32,36,41]	⊙OOO Very low[1,2,4]		
Bystander BLS performance (subsequent use of skills)	RCT	2[16,25]	⊙⊙OO Low[1,2]	Not estimable[3]	Critical
	Non-RCTs	7[17,29–32,36,41]	⊙OOO Very low[1,2,4]		
Family members can effectively learn CPR/BLS	RCTs	3[20,24,25]	⊙⊙⊙O Moderate[6]	Not estimable[3]	Important
	Non-RCTs	14[17,19,26,29–33,35,37–40,42]	⊙⊙OO Low[1,4,6,7]		
Family members can retain skills	RCTs	2[20,24]	⊙⊙⊙O Moderate[6]	Not estimable[3]	Important
	Non-RCTs	4[29,31,36,42]	⊙OOO Very low[1,4,7]		
Family members are willing to use skills	RCTs	2[23,24]	⊙⊙⊙O Moderate[1,8]	Not estimable[3]	Important
	Non-RCTs	8[19,21,29,30,32,34,36,38]	⊙⊙OO Low[1,4]		
Family members have a reduced rate of related anxiety	RCTs	4[22,23,25,27]	⊙⊙⊙O Moderate[9]	Not estimable[3]	Important
	Non-RCTs	5[31–33,37,41]	⊙OOO Very low[4,7,10]		
Family members have an increased perceived rate of control	RCTs	1[28]	⊙⊙OO Low[9,11]	Not estimable[3]	Important

GRADE Working Group Grades of Evidence
High quality: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of the effect.
1. Large loss to follow up
2. Scant number of events, lack of power
3. The heterogeneous nature of data prevents pooling
4. Confounders not adjusted
5. Small sample size
6. Upgraded for strong association
7. Lack of detail in methods
8. Incomplete outcome data
9. High or unclear risk to blinding participants
10. High risk to exposure/outcome
11. Lack of, or unclear allocation generation

RCT, randomised controlled trial; non-RCT, non-randomised controlled trial; BLS, basic life support; CPR, cardiopulmonary resuscitation.

tables. Bias in the randomised studies ($n = 8$) was predominantly due to an inadequate description or lack of: allocation concealment[20,23,25,27,28,30] and blinding of assessors.[23–25,28] All but four[26,31,33,42] non-randomised studies ($n = 18$) were at either high or unclear risk of confounding. Confounders include prior BLS training, age, sex and education level. Eligibility criteria was unclear in seven non-randomised studies[21,26,32,36,38,39,41] and loss to follow up was either high or unclear in nine studies.

Outcomes

The summary of findings are given in Table 3 and briefly reported below. The heterogeneous nature of the studies prevented pooling of data for any outcome.

Cardiac arrest survival

A low level of evidence, was found from two RCTs[16,25] which followed patients after training and reported on the critical outcome of OHCA rates and survival. The overall quality of evidence for this outcome was low, downgraded for a scant number of events during follow up.

Bardy et al. randomised 7001 patients to automatic defibrillation (AED) placement in the home, with both the control and intervention groups of the study receiving regular video CPR training. The overall mortality and incidence of OHCA in the Bardy sample were lower than predicted in sample size calculations. Of the patients who did suffer a cardiac arrest at home ($n = 38$), less than half of them had a witnessed arrest ($n = 13$) and four survived.

A smaller RCT conducted by Dracup et al.[25] randomised 24 family members of 65 cardiac patients to CPR training. At six-month follow-up, they did not report the number of OHCA events, but reported four patient deaths. Two of these deaths occurred in the CPR trained group.

A very low level of evidence was found from seven non-RCTs,[17,29–32,36,41] downgraded for risk of bias, lack of power and adjustment for confounders. The majority of these studies relied on

self-reported outcomes, had very small sample sizes and did not adjust for confounding. There was also varying length of follow-up durations, ranging from three months[31] to four years.[17] Four studies[30,32,36,41] reported single OHCA events during follow-up after training, all of whom died. Eisenberg et al.[17] conducted the longest follow-up (up to four years), and reported 14 OHCA (in 97 patients) of whom only two survived. Rates of CPR performance were not reported.

Bystander BLS performance – subsequent utilisation of skills

A low level of evidence was found from two RCTs for the critical outcome of bystander CPR performance, where family members used their learned skills. The evidence was downgraded due to a large loss to follow up and a scant number of events.

The study intervention of applying an AED followed by CPR performance in the Bardy et al.[16] study occurred in 32 patients. This made up less than 1% of the intervention group, however it was noted that there were also seven additional uses of the AED on neighbours and visitors. CPR performance occurred in 13 reported instances in the control group, eight of these were in the home. In the RCT conducted by Dracup et al.[25] family members did not use their training at all in the six-month follow up period.

A very low level of evidence, downgraded for the same criteria as the RCTs in addition to a lack of adjustment for confounders, was found from seven non-RCTs.[17,29–32,36,41] One of the larger studies by Dracup et al.[30] ($n = 337$) describes trained family members using CPR on four occasions, three with success. From the 14 OHCA patients in the study by Eisenberg et al.[17] 10 had an AED available (intervention group) which was used in six cases. It is not clear if these patients also received CPR from the trained spouses. Of the four that did not have an AED available, one patient received successful resuscitation from their spouse who had been trained in CPR (control group).

In two small studies, there were single OHCA events and trained individuals were either not present at the time[32] or physically unable to perform CPR.[41] In three studies, family members did not use training at all[29,31,41] despite two of these studies having longer follow-up periods of two[41] to three[31] years.

CPR/BLS skills performance

For the important outcome of learning CPR and BLS skills, there was a moderate level of evidence, from three RCTs[20,24,25] and a low quality of evidence from 14 non-RCTs,[17,19,26,29–33,35,37–40,42] upgraded for a strong association. Although these studies used different methods for BLS training and assessment, they all report a competent level of CPR performance and knowledge immediately following training.

Skills retention

A moderate level of evidence, upgraded for a strong association, was found from two RCTs[20,24] for the important outcome of retention of skills. These studies showed that there was little skill degradation in the short term. Blewer et al.[24] used no retention strategies and reassessed skills at three and six months, however Li et al.[20] used supervised reinforcement of skills via telephone and reassessed at a year.

A very low level of evidence was found from four non-RCTs[29,31,36,42] which had differing retention strategies and follow-up times. These studies showed that overall retention was poor in the longer term, and if retention strategies were offered, attendance at retraining sessions decreased over time.[31] One study[36] reported high retention rates, however this was assessed only by self-report of the perception of the participants own skills after retraining at 12 months.

Willingness to use BLS skills

For the important outcome of willingness to use skills, a moderate level of evidence was found from two RCTs.[23,24] This data demonstrated that family members felt "very comfortable" with the idea of performing CPR.[24] In the quality of life study by Mark et al.[23] those who were assigned a home AED and CPR training, responded more positively to their assigned intervention than those who only received CPR training.

A low level of evidence was found from eight non-RCTs,[19,21,29,30,32,34,36,38] upgraded for a strong association. These studies used assessments such as "willingness to perform/resuscitate/use an AED"[19,34,36] a "readiness" to use skills,[38] "confidence" to recognise a cardiac arrest or handle an emergency.[21,32,38] The heterogeneous nature of these studies prevents pooling of data, but a strong signal towards willingness to provide CPR/BLS if required was seen in all studies.

Anxiety related to BLS training

A moderate level of evidence from four RCTs,[22,23,25,27] upgraded for a strong association, was found for the important outcome of anxiety post BLS training.

Two RCTs[22,23] that used subsets of participants from the Bardy et al. study found that the additional responsibility of having an AED in addition to CPR training did not increase anxiety. These studies used differing tools to assess anxiety levels. Two RCTs, both by Dracup et al.[25,27] in different cohorts, found that the intervention groups had an increase in anxiety or a more negative psychosocial trajectory over time, however these did not reach statistical significance in either study.

A very low quality of evidence was found from five non-RCTs.[31–33,37,41] The non-RCTs demonstrated that family members had a decrease in anxiety[32,33,37,41] or "remained stable or reduced over time"[31(p.685e.4)] over the course of the study. These studies however were at high risk of confounding, had high risk to exposure/outcome or a lack of methodological detail.

Perceived rates of control post BLS training

One RCT,[28] of low quality, examined the intervention of CPR training (plus either social support or risk factor education) on the important outcome of perceived rate of control. Moser et al.[28] found that the perceived rate of control increased significantly for spouses of cardiac patients in the intervention groups where CPR training was delivered.

Discussion

In this systematic review of targeted BLS training to family members of high-risk cardiac patients we found an overall low quality of evidence. However a moderate level of evidence and strong positive signals were found for three important outcomes: (1) CPR/BLS skills performance (2) willingness to use BLS skills and (3) anxiety related to BLS training.

For the critical outcomes of cardiac arrest survival and subsequent utilisation of BLS skills, high quality data were difficult to obtain. Such outcomes require very large sample sizes to ensure enough events for adequate power. As seen in the largest RCT study in this review, the study by Bardy et al.[16] it is difficult for an intervention in this group to influence survival. Despite the low number of OHCA events seen in these studies, targeting BLS training to this group can still be of benefit. As demonstrated in this review, the target population can learn CPR and BLS skills with no negative impact on anxiety levels as once previously hypothesised.[46] BLS training not only provides skills to act in the event of a cardiac arrest, but also to recognise prodromal warning signs such as chest pain and dyspnoea. This educates and gives permission for people to activate help early, an essential step of the chain of survival. These steps alone

may prevent an OHCA from occurring and future studies should consider exploring this outcome.

Nearly thirty years ago, Dracup and Moser pioneered targeted BLS training research. Few advances, or translation into practise has occurred since their studies. This is despite calls from ILCOR in 2010 that more research on targeted training strategies is needed.[47] Contemporary research is required to assess modern methods of CPR delivery and training. A significant guideline change occurred in 2008 when the American Heart Association released a science advisory statement[48] emphasising quality "hard and fast" chest compressions. Mouth to mouth ventilation was deemphasised for untrained rescuers or those who lacked confident resuscitation skills. The majority of studies ($n = 17$) included in this review were conducted before 2008, therefore do not reflect modern CPR practice or the age of dispatcher assisted CPR.

Dispatcher assisted CPR provides verbal CPR instructions during the emergency call. While its use has increased rates of bystander CPR and survival,[49] it does not negate the need for BLS training. It is widely recognised that bystanders have difficulty identifying victims who are in cardiac arrest, due to the presence of agonal breathing,[50] and therefore a significant number of OHCA cases do not receive CPR instructions. It is also likely to be the first time many people will have ever performed CPR skills, and such instruction may not suit everyone. As Kellerman et al.[51] demonstrated in a simulated dispatcher assisted cardiac arrest scenario, rescuers with past CPR training gave a significantly better overall performance, with 33% of their resuscitation cycles being considered adequate compared to 14% of those not trained in CPR.

Another recent change to BLS is the advent of new training modalities, most notably video self-instruction (VSI) training kits. Early evidence suggests that this simplified technique of BLS training is equivalent in skill acquisition and is an effective method for sharing training with family and friends.[24] These kits routinely contain an inflatable resuscitation manikin and an instructional DVD of less than 30 mins duration.[52] VSI kits may assist in overcoming barriers to attending BLS training such as time and location of training. More research is needed to determine if VSI training is successful in training this target population. In addition to decreasing barriers for the learner, VSI also increases opportunities for secondary training, with learners taking kits home and training more participants whom are also likely to be within the target population.

In addition to assessing the impact of guideline changes and new training modalities, CPR skills can now be more rigorously assessed. The 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care emphasises high quality CPR including chest compressions with a required minimum depth of at least 5 centimetres, at a rate of at least 100–120 compressions per minute with full chest recoil and minimal interruptions.[53] New technology of skill reporting resuscitation manikins can be utilised to objectively measure CPR skills and compare to these guideline standards. More CPR metrics data is required to assess whether this high-risk target group are physically capable to perform BLS to guideline standards therefore increasing a victims' chance of survival.

Future studies may also need to examine alternate timing and location of providing such training. Recruitment strategies and training locations varied between existing studies. The majority of studies delivered training via hospital outpatients, however some studies delivered training in public[19,33–35] or private home locations.[16,22,23,29,36,42] These strategies of encouraging the target population to attend a public training session or delivering training in private homes are very labour intensive and may not be easily sustained in practice. Blewer et al.[21,24] and Sigsbee et al.[33] were the only studies to conduct training before hospital discharge from the cardiology ward. While this is a novel approach to capture and deliver training to the target population, this may not be feasible in regions where the length of hospital stay is short. In addition, families may not be open to training at this acute phase of the trajectory of the patients' recovery. Other sustainable recruitment and delivery strategies need to be explored, utilising existing hospital infrastructure and at differing stages of a patients recovery, for example in cardiac rehabilitation.

Limitations and strengths

This review conducted an extensive search of the literature. We searched nine databases, from both health and education disciplines. Studies included in this review span three decades, eight countries and employ a variety of BLS training techniques. However, we did not include grey literature. Additionally, complete information from every study was not available, despite contacting authors. Outcome measurement and length of follow-up varied considerably between studies. Due to this heterogeneous nature of studies a meta-analysis could not be performed.

Implications

It is unlikely that there will be large RCTs of this nature undertaken in the future, therefore the best available future evidence will come from observational studies. Observational studies that assessed the two critical outcomes of cardiac arrest survival and bystander BLS performance – subsequent utilisation of skills[17,29–32,36,41] were of very low quality and often relied on self-reported measures with high loss to follow up. Studies that are powered for these outcomes are difficult to undertake. Future observational studies could consider using multiple follow up methods, including using death or OHCA registry data. However, this review has demonstrated the need for high quality studies that assess important outcomes such as skill performance, utilising contemporary training and skill measurement technologies. It is also important that future studies adjust for known confounders. Clearly reported training and outcome measurement methodologies are required to facilitate study replication in differing populations and translation of research into practice, including into future policy and guidelines.

Conclusions

Whilst there is no current evidence for improvement in patient outcomes due to targeted BLS training, there are very positive indications that family members of high-risk adult cardiac patients are accepting of such training and are capable and willing to use their skills. This can be achieved with no increase to anxiety. However, the majority of data is now outdated. Therefore, further contemporary high quality data is required to assess these clinical outcomes with the advent of new CPR guidelines, new training modalities and new technology to measure skill acquisition.

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Conflict of interest statement

JF is co-chair of the ILCOR Education, Implementation and Teams (EIT) Task-Force. JB, ML and DS are EIT Task-Force collaborators.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.resuscitation.2016.04.028.

References

1. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics – 2011 update: a report from the American Heart Association. Circulation 2011;123:e18–209.
2. Sasson C, Rogers MAM, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes 2010;3:63–81.
3. Vaillancourt C, Stiell IG, Wells GA. Understanding and improving low bystander CPR rates: a systematic review of the literature. CJEM 2008;10:51–65.
4. Goldberg RJ, Gore JM, Love DG, Ockene JK, Dalen JE. Layperson CPR – are we training the right people? Ann Emerg Med 1984;13:701–4.
5. Cobb LA, Hallstrom AP, Thompson RG, Mandel LP, Copass MK. Community cardiopulmonary resuscitation. Annu Rev Med 1980;31:453–62.
6. Brennan R, Braslow A. Are we training the right people yet? A survey of participants in public cardiopulmonary resuscitation classes. Resuscitation 1998;37:21–5.
7. Pane GA, Salness KA. Targeted recruitment of senior citizens and cardiac patients to a mass CPR training course. Ann Emerg Med 1989;18:152–4.
8. Mandel LP, Cobb LA. CPR training in the community. Ann Emerg Med 1985;14:669–71.
9. Eisenburger P, Safar P. Life supporting first aid training of the public – review and recommendations. Resuscitation 1999;41:3–18.
10. Cartledge S, Bray J, Finn J. A systematic review of basic life support training targeted to family members of high-risk patients. Resuscitation 2015;96:59. PROSPERO 2014crd42014010297. (Accessed at http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014010297).
11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med 2009;151:264–9.
12. Richardson WS, Wilson MC, Nishikawa J, Hayward RS. The well-built clinical question: a key to evidence-based decisions. ACP J Club 1995;123:a12–3.
13. Higgins J, Green S, Cochrane Collaboration. Cochrane handbook for systematic reviews of interventions. Chichester, West Sussex/Hoboken NJ: John Wiley & Sons; 2008.
14. Atkins D, Best D, Briss P, et al. Grading quality of evidence and strength of recommendations. BMJ 2004;328:1490.
15. Goldet G, Howick J. Understanding GRADE: an introduction. J Evid Based Med 2013;6:50–4.
16. Bardy GH, Lee KL, Mark DB, et al. Home use of automated external defibrillators for sudden cardiac arrest. N Engl J Med 2008;358:1793–804.
17. Eisenberg MS, Moore J, Cummins RO, et al. Use of the automatic external defibrillator in homes of survivors of out-of-hospital ventricular fibrillation. Am J Cardiol 1989;63:443–6.
18. Chadda KD, Kammerer R. Early experiences with the portable automatic external defibrillator in the home and public places. Am J Cardiol 1987;60:732–3.
19. Cokkinos P, Tasouli A, Nikolaou N, et al. Layperson trainees improve their resuscitation knowledge and confidence of providing bystander CPR in ERC-accredited BLS/AED courses. Resuscitation 2010;81:s102.
20. Li J, Xu Y, Yue P, et al. Remote Supervised reinforcement of cardiopulmonary resuscitation skills by telephone improves one-year retention: a randomized-controlled trial. Circulation 2012;126:a19508.
21. Blewer AL, Le J, Buckler D, et al. Feasibility of using hospital personnel to create a sustainable CPR training program for family members of hospitalized patients. Circulation 2012;126:a81.
22. Thomas S, Friedmann E, Lee H, Son H, Morton P, HAT Investigators. Changes in anxiety and depression over 2 years in medically stable patients after myocardial infarction and their spouses in the Home Automatic External Defibrillator Trial (HAT): a longitudinal observational study. Heart 2011;97:371–81.
23. Mark DB, Anstrom KJ, McNulty SE, et al. Quality of life effects of automatic external defibrillators in the home: results from the Home Automatic External Defibrillator Trial (HAT). Am Heart J 2010;159:627–34.e7.
24. Blewer AL, Leary M, Esposito EC, et al. Continuous chest compression cardiopulmonary resuscitation training promotes rescuer self-confidence and increased secondary training: a hospital-based randomized controlled trial. Crit Care Med 2012;40:787–92.
25. Dracup K, Guzy P, Taylor S, Barry J. Cardiopulmonary resuscitation (CPR) training. Consequences for family members of high-risk cardiac patients. Arch Intern Med 1986;146:1757–61.
26. Dracup K, Heaney D, Taylor S, Guzy P, Breu C. Can family members of high-risk cardiac patients learn cardiopulmonary resuscitation? Arch Intern Med 1989;149:61–4.
27. Dracup K, Moser DK, Taylor SE, Guzy PM. The psychological consequences of cardiopulmonary resuscitation training for family members of patients at risk for sudden death. Am J Public Health 1997;87:1434–9.
28. Moser DK, Dracup K. Impact of cardiopulmonary resuscitation training on perceived control in spouses of recovering cardiac patients. Res Nurs Health 2000;23:270–8.
29. Moser DK, Dracup K, Guzy PM, Taylor SE, Breu C. Cardiopulmonary resuscitation skills retention in family members of cardiac patients. Am J Emerg Med 1990;8:498–503.
30. Dracup K, Moser DK, Guzy PM, Taylor SE, Marsden C. Is cardiopulmonary resuscitation training deleterious for family members of cardiac patients? Am J Public Health 1994;84:116–8.
31. Sanna T, Fedele F, Genuini I, et al. Home defibrillation: a feasibility study in myocardial infarction survivors at intermediate risk of sudden death. Am Heart J 2006;152:685.e1–7.
32. McDaniel CM, Berry VA, Haines DE, Dimarco JP. Automatic external defibrillation of patients after myocardial infarction by family members: practical aspects and psychological impact of training. Pacing Clin Electrophysiol 1988;11:2029–34.
33. Sigsbee M, Geden EA. Effects of anxiety on family members of patients with cardiac disease learning cardiopulmonary resuscitation. Heart Lung J Crit Care 1990;19:662–5.
34. Cheng YC. Targeted mass CPR training for families of cardiac patients – experience in Taipei city. Tzu Chi Med J 1997;9:273–8.
35. Hao Y, Zhu J, Wang M, et al. CPR training methods in family members of patients at high risk of sudden cardiac death. Cardiology 2011:112–4.
36. Haugk M, Robak O, Sterz F, et al. High acceptance of a home AED programme by survivors of sudden cardiac arrest and their families. Resuscitation 2006;70:263–74.
37. Schneider L, Sterz F, Haugk M, et al. CPR courses and semi-automatic defibrillators – life saving in cardiac arrest? Resuscitation 2004;63:295–303.
38. Kliegel A, Scheinecker W, Sterz F, Eisenburger P, Holzer M, Laggner AN. The attitudes of cardiac arrest survivors and their family members towards CPR courses. Resuscitation 2000;47:147–54.
39. Kang K, Lee I. [Evaluation of a self-efficacy-based basic life support program for high-risk patients' family caregivers]. Taehan Kanho Hakhoe Chi 2005;35:1081–90.
40. Khan J, Shafquat A, Kundi A. Basic life support skills: assessment and education of spouse and first degree relatives of patients with coronary disease. J Coll Physicians 2010;20:299–302.
41. McLauchlan CA, Ward A, Murphy NM, Griffith MJ, Skinner DV, Camm AJ. Resuscitation training for cardiac patients and their relatives – its effect on anxiety. Resuscitation 1992;24:7–11.
42. Moore JE, Eisenberg MS, Cummins RO, Hallstrom A, Litwin P, Carter W. Lay person use of automatic external defibrillation. Ann Emerg Med 1987;16:669–72.
43. Berg RA, Hemphill R, Abella BS, et al. Part 5: adult basic life support 2010 American Heart Association Guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 2010;122:s685–705.
44. Sayre MR, Koster RW, Botha M, et al. Part 5: adult basic life support 2010 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Circulation 2010;122:s298–324.
45. Nolan JP, Soar J, Zideman DA, et al. European Resuscitation Council Guidelines for resuscitation 2010 section 1: executive summary. Resuscitation 2010;81:1219–76.

46. Goldberg RJ. Physicians and CPR training in high-risk family members. Am J Public Health 1987;77:671–2.
47. Hazinski MF, Nolan JP, Billi JE, et al. Part 1: executive summary 2010 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Circulation 2010;122:s250–75.
48. Sayre MR, Berg RA, Cave DM, Page RL, Potts J, White RD. Hands-only (compression-only) cardiopulmonary resuscitation: a call to action for bystander response to adults who experience out-of-hospital sudden cardiac arrest. a science advisory for the public from the American Heart Association Emergency Cardiovascular Care Committee. Circulation 2008;117:2162–7.
49. Rea TD, Eisenberg MS, Culley LL, Becker L. Dispatcher-assisted cardiopulmonary resuscitation and survival in cardiac arrest. Circulation 2001;104:2513–6.
50. Ruppert M, Reith MW, Widmann JH, et al. Checking for breathing: evaluation of the diagnostic capability of emergency medical services personnel, physicians, medical students, and medical laypersons. Ann Emerg Med 1999;34:720–9.
51. Kellermann AL, Hackman BB, Somes G. Dispatcher-assisted cardiopulmonary resuscitation. Validation of efficacy. Circulation 1989;80:1231–9.
52. Potts J, Lynch B. The American Heart Association CPR anytime program. J Cardiopulm Resusc 2006:346–54.
53. Perkins GD, Travers AH, Berg RA, et al. Part 3: adult basic life support and automated external defibrillation: 2015 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Resuscitation 2015;95:e43–69.

2.3 Updated Literature Review

The initial search strategy that identified the literature reviewed in the preceding paper was run on 15th July 2015; it was re-run on the 15th of June 2017 to identify any new research. Three new studies of BLS training targeted to family members of high-risk cardiac patients were found that satisfied the eligibility criteria described in the systematic review; they are outlined in Table 2.

Table 2. Summary of characteristics of studies identified in the updated literature review

Study	Design	Country	Sample size (Family members)	Type of training	Training location	Outcomes measured
Blewer et al. 2016[67]	RCT	USA	1464	AHA	Hospital	Skills retention
Kim et al. 2016[68]	RCT	South Korea	54	AHA	Outpatients	Family members can learn CPR/BLS CPR/BLS skills performance
Varalakshmi 2016[69]	Non-RCT	India	60	Unknown	Hospital	Family members can learn CPR/BLS CPR/BLS skills performance- unclear

RCT, randomised controlled trial; AHA, American Heart Association

The studies listed in Table 2 used a variety of methods to deliver training to family members or care givers. Blewer et al.[67] investigated the retention and quality of compression-only CPR skills at six months, comparing VSI to video only (VO) training. While compression rate was similar and adequate in the two groups (VSI 89.3 compressions per minute [cpm], VO 87.7cpm) a significant difference was found for compression depth, with shallower

compressions seen in the VO group (VSI 45.8mm, VO 40.2mm). While the mean compression rates and depths measured in this study did not meet guideline standards in either group,[14] it must be remembered that VO training has the potential for wide dissemination and therefore large population effect. While this study shows that this benefit of VO training comes at the expense of decreased compression depth, this issue could be remedied with targeted messaging accompanying the video training.

Kim et al.[68] investigated a patient-centred approach to delivering CPR training to caregivers of cardiac patients in the hospital setting. The intervention group received "interactive instructor-guided training" and a two-week follow-up telephone call; the control group was given VSI kits and a booklet. While both groups demonstrated increases in knowledge and skill, the patient-centred approach group recorded greater improvement in skills. While this approach is more time-consuming than simple VSI BLS training, it may have a place for some family members of high-risk cardiac patients who prefer or require extra face-to-face support to effectively learn BLS.

The third study, by Varalakshmi (2016), was conducted in India.[69] Unfortunately this study is poorly described, making it impossible to review the intervention and subsequent outcomes.

2.4 Summary of Chapter Two

Chapter Two demonstrated that while studies of targeted BLS training to high-risk cardiac populations have been conducted, there is considerable heterogeneity in methods of BLS training, location of training, assessment and outcome measures. Nevertheless, the capability and willingness of this population to be trained was a consistent finding. Furthermore, the review determined that anxiety was not increased with training.

Most of the papers included in the systematic review are now outdated due to significant changes in international resuscitation guidelines and development of new technology for both training modalities and skills assessment. More recently, Blewer et al. addressed this need for contemporary research, conducting several studies[44,67,70] of targeted CPR training in the USA. These studies investigated incorporating CPR training via VSI before hospital discharge. As the average length of hospital stay in the USA is five days,[71] compared to just three days[55] in Australia, this time point of training may not be suitable for an Australian population.

While the review included studies from many countries, none were conducted in Australia. Findings of previous studies may not be generalisable to the Australian context due to differences in health care systems, patient preferences, beliefs and cultures, therefore an Australian perspective is required.

The systematic review also demonstrated the lack of evidence on the critical patient outcome of OHCA survival. The Home Automatic External Defibrillator Trial (HAT)[72] demonstrated the difficulty of ensuring a sample size enabling sufficient statistical power for this outcome. Despite a lack of evidence about patient outcomes, the 2015 ILCOR evidence review recommended targeted training based on high potential benefit and low risk of harm.[27] ILCOR identified other knowledge gaps, including studies comparing innovative BLS training and conventional BLS training, and the use of standardised and objective methods for assessment of BLS performance. These gaps were considered during the development of the program of research conducted in this thesis.

Chapter Three: Prevalence of basic life support training in high-risk cardiac households in Victoria

3.1 Overview of Chapter Three

The systematic review[36] and updated literature review presented in Chapter Two demonstrated the need for contemporary Australian-specific research into targeted BLS training for high-risk cardiac populations. This chapter addresses the second research objective of this thesis, which was to determine the current prevalence of BLS training in Victorian households that contain a person or persons with CHD.

3.2 Background and context

The provision of bystander BLS more than doubles OHCA survival chances,[18,19] but is reliant on bystanders taking action. Previous research has demonstrated a relationship between areas with high bystander BLS rates and high rates of BLS training.[73,74] This is logical, as those who have received training are more likely to be equipped and feel confident to act in an OHCA emergency. Other than for people who require BLS or first aid certification as a requirement of their work, there is no mandatory community-level training in Victoria or other parts of Australia, which affects training rates and the age distribution of those trained.

While BLS training rates in the Australian state of Victoria have been examined previously,[26,32,75] these data are now over 14 years old. Contemporary data are required, especially in light of new resuscitation guidelines allowing bystanders the option to perform compression-only CPR.[24] Whether the public is aware of these guideline changes is unknown. Compression-only CPR could be influential in increasing bystanders' willingness to undertake BLS training and render assistance in an OHCA, because it removes the requirement for mouth-to-mouth ventilations, which pose a barrier for many.[25,26]

The prevalence of BLS training in high-risk households containing a person with CHD is also unknown. While previous studies have investigated BLS training rates within cardiac populations, these have been limited to surveys of cardiac patients, with some studies including family members.[76–78] To date BLS training rates within households that contain a person or persons with CHD have not been conducted at a public level in Australia or internationally. It is important to learn the prevalence of BLS training in this high-risk population, and the barriers to training compared to the general public, to inform future interventions in this population.

3.3 Research aims

The aims of the paper presented in Chapter Three were to describe BLS training rates in Victorian households that contain a person or persons with CHD. Self-rated BLS knowledge, confidence and willingness to provide BLS were assessed. In addition, barriers to undertaking BLS training were collected and compared between those people living with and without a CHD.

3.4 Methods overview

The study presented in Chapter Three is a sub-study of a recent, large public telephone survey of adults, residing in the state of Victoria.[33] This main study was published in *Emergency Medicine Australasia* (2017) and this paper is included in Appendix B.

The survey instrument of the main study included a question asking the respondent if "anyone in their current household has or has had heart disease". Respondents who resided with a person with CHD constituted 19.3% (n = 78) of the overall sample. This is similar to the Australian prevalence of CHD (22%),[79] indicating the sample is representative of the Victorian

population. The comparison of those with and without CHD in their households was the focus of the sub-study presented below. Due to the small sample size of respondents with CHD in their household and consequent lack of power (as the main study was powered according to overall CPR training rates), the results are primarily descriptive, although some tests of association were performed.

3.5 Manuscript, Paper Two

The following paper, "A cross-sectional survey examining cardiopulmonary resuscitation training in households with heart disease" is currently under review at the *Journal of Cardiovascular Nursing*.

A cross-sectional survey examining cardiopulmonary resuscitation training in households with heart disease.

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What's new?

- The overall prevalence of CPR training has increased in the Australian state of Victoria, however training was not recent for the majority of respondents.
- In households containing a person or persons with heart disease, CPR training significantly increased knowledge and willingness to perform CPR.
- Discussions with cardiac patients and their family members about the need and importance of CPR training should be provided from cardiac health professionals and training could be targeted through environments such as cardiac rehabilitation.

Abstract

Background: Heart disease significantly increases the risk of further cardiac events including out-of-hospital cardiac arrest (OHCA). Given the majority of OHCAs occur in the home, family members of those with heart disease should be trained in cardiopulmonary resuscitation (CPR).

Objective: To describe CPR training rates in households with heart disease, and examine if training increases knowledge, confidence and willingness to perform CPR in this population.

Methods: A cross-sectional, telephone survey was conducted with adults residing in Victoria, Australia.

Results: Of 404 respondents, 78 (19.3%) reported the presence of heart disease in their household. Prevalence of CPR training was the same among households with (67.9%) and without (67.8%) heart disease, with the majority (51.5%) receiving training more than five years ago. There were no significant differences in barriers to training- the most prevalent barrier was lack of awareness to seek training. Among households with heart disease, physical ability was the most common concern relating to the provision of CPR, while households without heart disease described decreased confidence. Those with heart disease in their household who were CPR trained, had higher self-ratings of CPR knowledge and confidence, and were more willing to perform CPR (all $p<0.05$).

Conclusions: A large proportion of Victorians with heart disease in their household did not have recent CPR training. CPR training should be targeted to high-risk households containing a member with heart disease, as knowledge and confidence in skills are increased. Cardiac health professionals are well placed to provide CPR training information during patient contacts.

Key words: Cardiopulmonary resuscitation; coronary heart disease; education; heart arrest.

Introduction

Cardiovascular disease (CVD) is the leading cause of death and disability internationally. In Australia for example, an estimated 4.2 million people are affected, most commonly in the form of heart disease.[1] This population are at risk of repeat cardiac events including, in the most extreme form, cardiac arrest. Research indicates the risk of cardiac arrest in those with clinically recognised heart disease is seven times greater than the general public,[2] and as many as 74% of out-of-hospital cardiac arrest (OHCA) cases have a history of heart disease.[3] Given this greater risk, households with heart disease need to be prepared to act in the event of an OHCA.

As cardiac arrest is an extremely time dependent condition, it is essential that activation of emergency medical services (EMS) and the provision of cardiopulmonary resuscitation (CPR) occur immediately. Given the majority (70-76%) of OHCAs occur in the home,[4–6] members of households with heart disease should be trained in how to recognise OHCA and perform CPR. Targeting CPR training to such high-risk groups is recommended by the International Liaison Committee on Resuscitation,[7] however there is a lack of reporting of CPR training rates in these groups.

Previous research has investigated overall CPR training rates and barriers to receiving training in members of the public internationally.[8–14] Surveys targeting cardiac patients and their family members[15–18] investigating CPR training rates have been conducted but are limited to patient populations and have not been conducted at a public level.

This group may have different rates of CPR training and reasons for not being trained compared to the general public. Such information is important, particularly in Australia and countries such as the USA where CPR training is not mandatory for adults. Additionally in Australia CPR training is not recommended in acute coronary syndrome guidelines[19] or prevalent in cardiac rehabilitation programs.[20]

The majority of the previous survey research examining CPR training rates in cardiac populations was conducted over 15 years ago.[15–17] Since these studies there have been significant international resuscitation guideline changes, deemphasising mouth-to-mouth ventilations for lay rescuers (who are unwilling or unable to perform ventilations) in favour of quality chest compressions known as compression-only CPR.[21] It is not known if these changes have been disseminated into households with heart disease and driven changes in attitudes towards CPR.

This sub-study, of a larger CPR survey[22] focuses on households with heart disease to examine: CPR training rates, barriers to receiving training and the effect of training on knowledge, confidence and willingness to perform CPR.

Methods

Design and setting

We conducted a cross-sectional telephone survey in April 2016.[22] The Australian state of Victoria has a population of 5.9 million, of which 4.5 million reside in the capital city of Melbourne.[23] This study was approved by the Monash University Human Research Ethics Committee (CF16/801-2016000389).

Data collection

Data collection is detailed elsewhere,[22] with the survey including English-speaking adults, who resided in Victoria. Sampling was restricted by location to 75% from Melbourne and 25% from regional and rural regions. Data collection was undertaken by an independent Survey Research Centre who were experienced in conducting computer-assisted telephone surveys. Calls were made to both mobile and landlines over one week, including evenings and weekends.

Survey instrument

The survey instrument (available from authors) used questions from a range of previous surveys[12,24] and comprised of four sections: participant demographics; knowledge of CPR; CPR training status (defined as ever received CPR training); and willingness to perform CPR. In addition, respondents were asked if any person in their current household has, or has had heart disease. An expert panel consisting of health care professionals, resuscitation researchers and first aid trainers reviewed the survey for face and content validity and the survey was then piloted amongst co-workers and lay-people (n=10) .

Statistical analysis

The sample is described using proportions for categorical variables. Tests of association were examined using the chi-squared statistic to compare a priori defined sub-groups of 1) households with a member who had heart disease to those without and 2) households with heart disease with and without CPR training. Statistical significance level was set at $p<0.05$. Analysis was conducted with SPSS v20 (Armonk, NY: IBM corp).

Results

As previously described,[22] a total of 404 (45%) of 901 eligible households participated in the survey. Overall, the majority of respondents were female (58.7%) and over a third were aged between 55-74 (38.1%) years. Most had completed at least 12 years of education (80.8%) (Table 1).

Table 1. Demographics of participants and CPR training status presented by presence of heart disease in the household (n=404).

	Total n (%)	**Household with heart disease n (%)**	**Household with no heart disease n (%)**	***p value***
	404	78 (19.3%)	326 (80.6%)	
Male sex	167 (41.3%)	28 (35.9%)	139 (42.6%)	0.28
Age				
18-34 years	47 (11.6%)	3 (3.8%)	44 (13.5%)	
35-54 years	141 (34.9%)	25 (35.1%)	116 (35.6%)	
55-74 years	154 (38.1%)	28 (35.9%)	126 (38.7%)	<0.001
>75 years	62 (15.3%)	22 (28.2%)	40 (12.3%)	
Education				
Some high school	70 (17.3%)	18 (23.1%)	52 (16.0%)	
High school graduate	100 (24.8%)	14 (17.9%)	86 (26.4%)	
Technical college / some university	55 (13.6%)	9 (11.5%)	46 (14.1%)	0.26
University degree/diploma	136 (33.7%)	24 (30.8%)	112 (34.4%)	
Post graduate	35 (8.7%)	11 (14.1%)	24 (7.4%)	
Refused to answer	8 (2.0%)	2 (2.6%)	6 (1.8%)	
Born in English speaking country	317 (78.6%)	61 (78.2%)	256 (78.8%)	0.95
From rural location	110 (27.2%)	25 (32.1%)	85 (26.1%)	0.29
Of those with CPR training n(%)	**274 (67.8%)**	**53 (67.9%)**	**221 (67.8%)**	**0.98**
Time since last training (n = 274)				
Trained < 12 months ago	78 (28.5%)	15 (28.3%)	63 (28.5%)	
Trained 1 – 5 years ago	51 (18.6%)	8 (15.1%)	43 (19.5%)	0.41
Trained >5 years ago	141 (51.5%)	28 (52.8%)	113 (51.1%)	
Can't recall	4 (1.5%)	2 (3.8%)	2 (0.9%)	
Location of training (n = 274)				
First aid class	119 (43.3%)	23 (43.4%)	96 (43.4%)	
Work	111 (40.5%)	22 (41.5%)	89 (40.3%)	0.28
School	25 (9.1%)	3 (5.7%)	22 (10.0%)	
Other	19 (6.9%)	5 (9.4%)	14 (6.3%)	

A total of 78 (19.3%) respondents stated a member of their household had heart disease. These respondents were more likely to be over 75 years of age (28.2% versus 12.3%, p <0.001), but no other differences were observed when compared to households without heart disease.

CPR training

Overall the majority of respondents (67.8%) had been trained in CPR in the past, and this was consistent between both households with (67.9%) and without (67.8%) heart disease. There was little difference in time since training between the two groups, with the majority (51.5%) receiving training more than five years ago. Most respondents received training through a first aid class (43.3%) or workplace (40.5%) (Table 1).

There were no significant differences in the reasons for not being trained in CPR between households with and without heart disease. The primary reason was "never having thought about it" (48.2%) followed by time (19.5%), not knowing where to go to learn (11.6%) and cost (7.3%).

Respondents were asked if they would be willing to learn CPR using a new training modality of video self-instructional (VSI) training, and 49.3% of respondents stated they would be willing to undertake this training in their own home. However when comparing groups, slightly less of those respondents with heart disease in their household were willing to use this modality (44.9% versus 50.3%, p = 0.38). Overall, willingness to be trained using VSI training decreased with age (18-24 year olds = 82.4% versus >75 years 24.2%, p = 0.005).

CPR self-rated knowledge and confidence

Households with heart disease were less likely to identify clinical situations for commencing CPR (e.g. abnormal or absent breathing, 70.5% versus 77.0%, p = 0.23) and more likely to rate their knowledge and confidence to perform CPR as poor to fair (Table 2). Overall, 47.3% of respondents were not aware of compression-only CPR, with a further 3% being unsure.

In the respondents who were in households with heart disease, CPR training was significantly associated with higher self-ratings of CPR knowledge (p = 0.003) and confidence (p = 0.02) in ability to perform CPR (Table 3). A post-hoc analysis adjusting for age did not change these findings (data not shown).

Table 2. CPR knowledge and confidence presented by presence of heart disease in the household (n=404).

	Total	Household with heart disease	Household with no heart disease	*p* value
Total sample n(%)	404 (100%)	78 (19.3%)	326 (80.6%)	
Self-rated overall knowledge				
Excellent/Good	184 (45.5%)	34 (43.6%)	150 (46.0%)	
Fair	137 (33.9%)	25 (32.1%)	112 (34.4%)	0.65
Poor/very poor	83 (20.5%)	19 (24.4%)	64 (19.6%)	
Self-rated confidence to perform effective CPR				
Very confident/confident	145 (35.9%)	27 (34.6%)	118 (36.2%)	
Somewhat confident	127 (31.4%)	23 (29.5%)	104 (31.9%)	0.79
Not confident/Don't know	132 (32.7%)	28 (35.9%)	104 (31.9)	
Aware of compression-only CPR				
Yes	201 (49.8%)	41 (52.6%)	160 (49.1%)	
No	191 (47.3%)	36 (46.2%)	155 (47.5%)	0.56
Not sure	12 (3%)	1 (1.3%)	11 (3.4%)	
Clinical identification to commence CPR*				
Abnormal /absent breathing	306 (75.6%)	55 (70.5%)	251 (77.0%)	0.23
No pulse	189 (46.8%)	36 (46.2%)	153 (46.9%)	0.90
Collapse	79 (19.6%)	19 (24.4%)	60 (18.4%)	0.23
Unresponsive	146 (36.1%)	29 (37.2%)	117 (35.9%)	0.83
Heart attack/chest pain	60 (14.9%)	13 (16.7%)	47 (14.4%)	0.61
Other	4 (1.0%)	1 (1.3%)	3 (0.9%)	0.76
Don't know	21 (5.2%)	4 (5.1%)	17 (5.2%)	0.98

*multiple responses allowed

Table 3. Self-rated knowledge and confidence of households with heart disease presented by CPR training status (n=78).

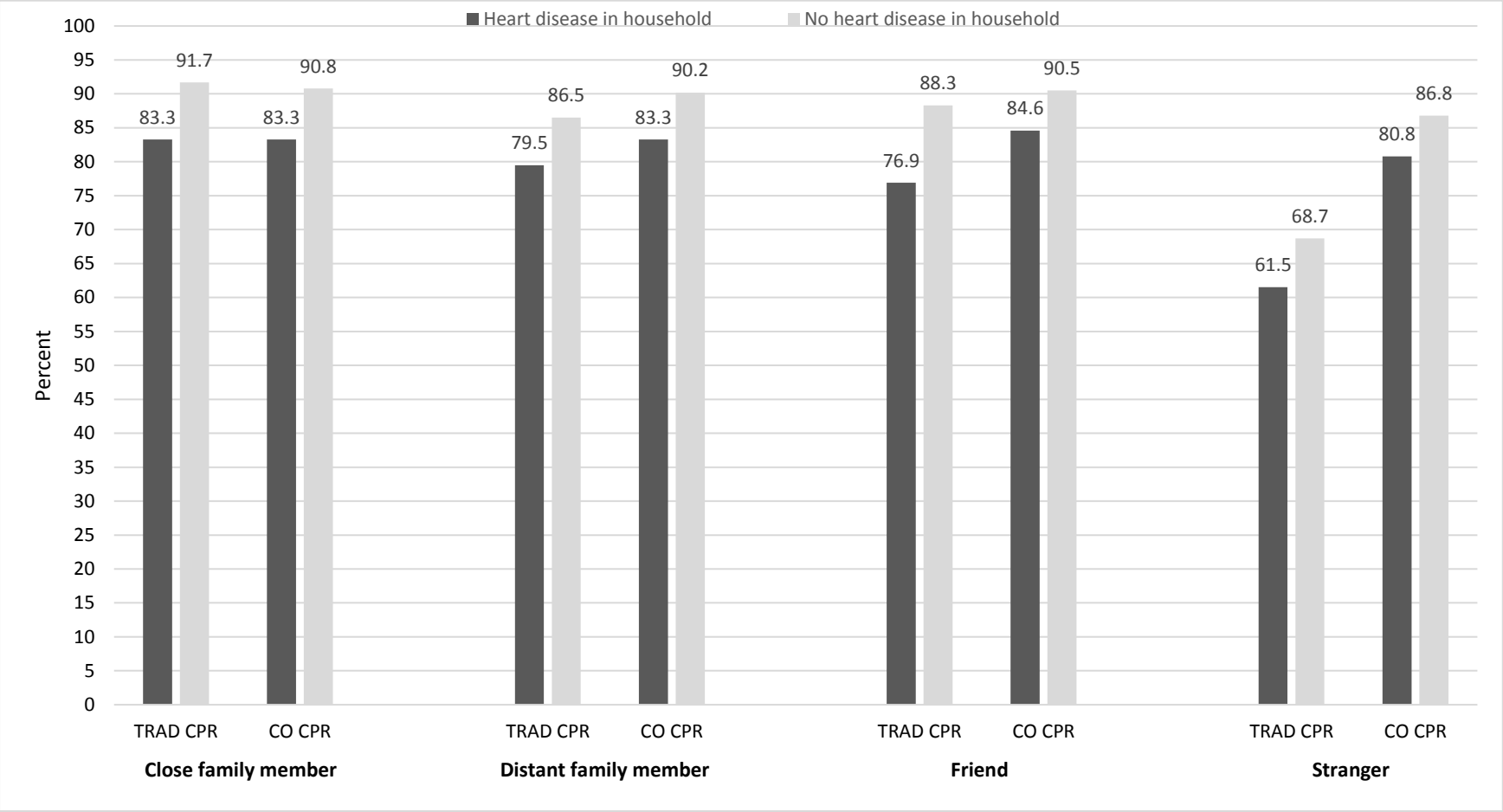
	Total	CPR Trained	Not CPR Trained	*p* value
Heart disease in household	78 (100%)	53 (67.9%)	25 (32.1%)	
Self-rated overall knowledge				
Excellent/Good	34 (43.6%)	30 (56.6%)	4 (16%)	
Fair	25 (32.1%)	12 (22.6%)	13 (52%)	0.003
Poor/very poor	19 (24.4%)	11 (20.6%)	8 (32%)	
Self-rated confidence to perform effective CPR				
Very confident/confident	27 (34.6%)	23 (43.4%)	4 (16%)	
Somewhat confident	23 (29.5%)	16 (30.2%)	7 (28%)	0.020
Not confident/Don't know	28 (35.9%)	14 (26.4%)	14 (56%)	

Willingness to perform CPR

Respondents were asked if they were willing to commence traditional CPR (mouth-to-mouth ventilations and chest compressions) and compression-only CPR on four different categories of people: a close family member; a distant family member; a friend and a stranger. Rates of commencing CPR became lower as the relationship from the respondent grew more distant, (Figure 1).

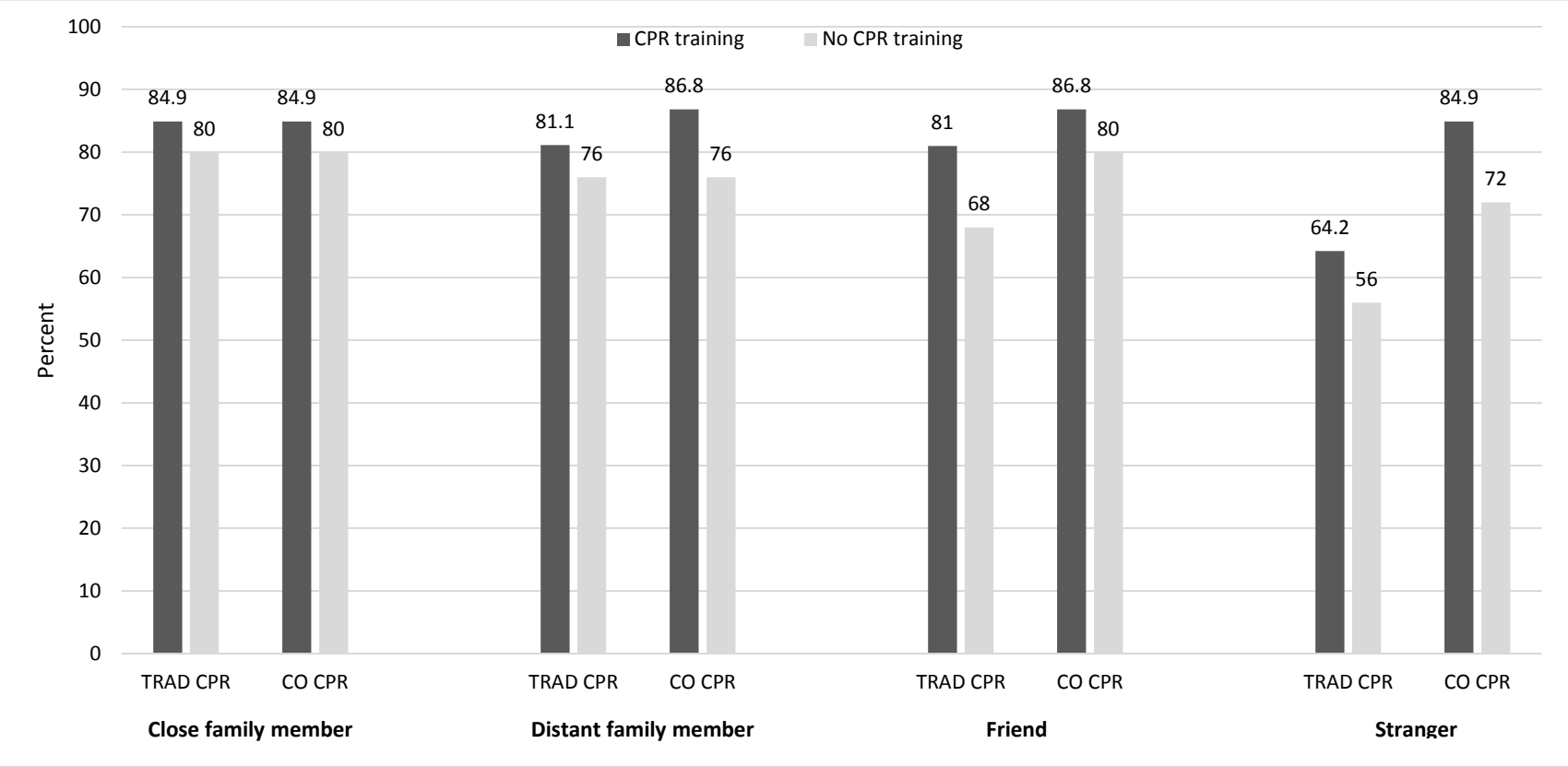
Respondents in households with heart disease were less likely to state they would commence CPR compared to those without heart disease (Figure 1). However willingness rates increased in both groups when asked if they would be willing to commence compression-only CPR. These differences were significant for strangers for both the heart disease group and non-heart disease group (61.5% versus 80.8% $p = 0.08$; 68.7% versus 86.8% $p < 0.001$) (Figure 1). When the subset of households with heart disease were examined by CPR training status, those with CPR training were more willing to provide CPR compared to those without CPR training (Figure 2).

Figure 1. Comparison of willingness to perform cardiopulmonary resuscitation in households with and without heart disease (n = 404)



TRAD CPR, traditional cardiopulmonary resuscitation (mouth to mouth ventilations and chest compressions); CO CPR, compression-only cardiopulmonary resuscitation

Figure 2. Willingness to provide cardiopulmonary resuscitation in households with heart disease, compared by those with and without cardiopulmonary resuscitation training. (n = 78)



TRAD CPR, traditional cardiopulmonary resuscitation (mouth to mouth ventilations and chest compressions); CO CPR, compression-only cardiopulmonary resuscitation

Barriers to performing CPR

Respondents who answered maybe or no to providing traditional or compression-only CPR were asked to identify barriers in a follow up question –with multiple responses accepted. These were different when examined by presence of heart disease in the household.

The highest ranked barriers for respondents with heart disease in their household were: concerns over physical ability (n = 20), concerns performing mouth-to-mouth (n = 20) and concerns about performing CPR incorrectly (n = 17). There were no concerns about performing mouth-to-mouth on close or distant family members in this group.

Respondents without heart disease in their household also listed concerns about their physical ability (n = 51) and performing CPR incorrectly (n = 47); however the primary concern in this group was a lack of confidence to perform CPR (n = 62).

Other concerns from respondents with heart disease in their household listed were: not feeling confident to perform CPR (n = 12), concerns about harming the victim (n = 5), not knowing how to perform CPR (n = 3), concerns about contract a disease from the victim (n = 3), concerns about legal consequences (n = 2) and commencing if the victim had a do not resuscitate order (n = 1).

Discussion

This is the first time a public survey of this kind has provided CPR training data, and a comparison between households containing a person or persons with and without heart disease. Overall, it is promising to see the high proportion (67.8%) of respondents who have received prior CPR training. This has remained stable or increased from past reports in the Australian public[12–14] and the USA.[25] More recently, the largest study (n = 9022) in the USA to examine CPR training prevalence to date,[10] found 65% of survey participants had received

previous CPR training. Of these, 18% reported having current training, which was defined as receiving training within the last two years.

Our findings demonstrated there were no unique reasons for not receiving training in households with heart disease, however this group were more likely to describe a reluctance to perform CPR because of their physical abilities, concerns about mouth-to-mouth and their competence to provide CPR correctly. CPR training in households with heart disease was associated with increased ratings of knowledge and confidence, and willingness to perform CPR.

Understandably, the public are more willing to provide CPR to close family members or friends compared to strangers, and this is a trend that persists from previous reports.[11,13,14,16] Mouth-to-mouth remains the most prevalent barrier to providing traditional CPR to non-family members, and while barriers to performing this skill were not specifically elicited from respondents in our survey, it is likely that known barriers such as fear of infection from the victim persist.[13,14] Although traditional CPR is the preferred method of delivery for all victims in Australia, lay rescuers can perform compression-only CPR where they feel unwilling or unable to perform mouth-to-mouth.[26] The public, and in particular cardiac patients and their family members should be made aware of this recent change in guidelines.

Previous CPR training was associated with increased self-rated CPR knowledge and confidence and this finding is consistent with other studies.[13,14] Furthermore, previous CPR training in respondents with heart disease in their household demonstrated increased willingness to provide CPR to relatives, friends and strangers, highlighting the importance of ensuring this group receive training. A past concern with providing training to this group is the risk of increased anxiety,[16,27] however a recent systematic review demonstrated that anxiety levels in this group do not increase, in fact the majority of studies demonstrated a decrease in anxiety after training.[28]

While not mandatory, Australian resuscitation guidelines recommend undertaking CPR training annually.[29] Therefore while prevalence of CPR training has improved, less than one third of the sample have had training within the last 12 months and would be deemed "current". Undertaking annual CPR training is a widespread issue identified in all previous public[10] and cardiac specific samples.[15–18] Because a significant amount of CPR training is undertaken at work, opportunities will be lost as people retire and leave the workforce. The older respondents in our sample may not have had training for an extremely long period, especially if they were relying on workplace training. It is known that skill degradation occurs within two to three months for health professionals,[7] and this could be even more pronounced for lay people. Importantly, as CPR guidelines simplify and change it is important that skills and knowledge be refreshed. This is especially important as mouth-to-mouth, a known barrier to performing CPR, is now optional for lay rescuers in Australia and not required at all in countries such as the USA.[26,30] New training modalities, such as VSI training, may provide an alternative training method.

Video self-instruction training can effectively teach CPR skills in 30 minutes using an inflatable manikin while watching an instructor on a video recording. It has been demonstrated that skills acquired from this modality are comparable to traditional face to face training.[31,32] VSI training could facilitate community access to training as barriers such as time and cost would also be overcome as skills can be learnt quickly and in the comfort of the trainee's home. While nearly half of the sample would be willing to use this method of training, less of the respondents with heart disease in their household would be willing- most likely because of their older age. It may be more appropriate to support this older high-risk group with an element of face-to-face training or reach them through supportive environments such as cardiac rehabilitation programs.

Additionally, consideration of including referral for CPR training within acute coronary syndrome or cardiac rehabilitation guidelines should be considered. The effect of inclusion of training in guidelines can be seen in a recent survey of cardiac rehabilitation programs comparing Australia and New Zealand, where New Zealand guidelines list CPR training.[20] Prevalence of training was significantly increased in New Zealand (57%) compared to Australia (24%). As a precursor to training, conversations with cardiac patients and their families should be provided during inpatient and outpatient contact by nursing and medical staff.[17,18] Previous research has demonstrated that knowing what to do in an emergency is of high priority to cardiac patients and their family members.[33]

Our results need to be considered with the following potential limitations. As calls were only made to residents in one state of Australia there may be a lack of representativeness, and respondents with CPR training may have been more likely to complete the survey. As described previously, the sample size for the survey was determined based on overall CPR training rates[22] and not for this sub-study. In addition, participants may have misinterpreted the question of "Does any person in your current household, including yourself, have or has had heart disease?". However, the prevalence of heart disease in our sample (19.3%) is similar to that of the Australian public (22%),[34] therefore we feel confident that the question was answered correctly by the majority of participants. We also did not illicit the demographics of who in the household had heart disease. Finally, recall bias must be considered as respondents were asked to recall past training timeframes.

Conclusion

In conclusion, we have demonstrated that although a large proportion of the Victorian community, including households containing a person or persons with heart disease, have undertaken prior CPR training, this training is often not recent or up to date with significant

guideline changes. Given that CPR training was associated with improved knowledge and confidence, it is important that the public, and in particular those who live in households who have a resident with heart disease, have recent CPR training so they are equipped for potential future health emergencies.

References

1. Australian Institute of Health and Welfare. Australia's health series. [Internet]. Canberra, Australia; 2014. Available from: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129548150

2. Rea TD, Pearce RM, Raghunathan TE, Lemaitre RN, Sotoodehnia N, Jouven X, et al. Incidence of Out-of-Hospital cardiac arrest. The American Journal of Cardiology. 2004 Jun 15;93(12):1455–60.

3. Herlitz J, Eek M, Holmberg M, Engdahl J, Holmberg S. Characteristics and outcome among patients having out of hospital cardiac arrest at home compared with elsewhere. Heart. 2002;88(6):579–82.

4. Ambulance Victoria. Victorian Ambulance Cardiac Arrest Registry 2015 - 2016 Annual Report [Internet]. Doncaster, Victoria: Ambulance Victoria; 2017 Jan [cited 2017 Feb 1]. Available from: http://s3-ap-southeast-2.amazonaws.com/prod.assets.ambulance.vic.gov.au/wp-content/uploads/2017/03/VACAR-Annual-Report_2015-2016.pdf

5. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R, et al. Heart Disease and Stroke Statistics—2017 Update: A Report From the American Heart Association. Circulation. 2017 Jan 1;135(10):e146–603.

6. Goldberg RJ, Gore JM, Love DG, Ockene JK, Dalen JE. Layperson CPR--are we training the right people? Annals of Emergency Medicine. 1984 Sep;13(9 Pt 1):701–4.

7. Finn JC, Bhanji F, Lockey A, Monsieurs K, Frengley R, Iwami T, et al. Part 8: Education, implementation, and teams: 2015 International Consensus on Cardiopulmonary

Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2015 Oct;95:e203–24.

8. Anderson ML, Cox M, Al - Khatib SM, Nichol G, Thomas KL, Chan PS, et al. Rates of cardiopulmonary resuscitation training in the United States.(Report). JAMA Internal Medicine. 2014;174(2):194.

9. Garcia-Barbero M, Caturla-Such J. What are we doing in cardiopulmonary resuscitation training in Europe? An analysis of a survey. Resuscitation. 1999 Aug;41(3):225–36.

10. Blewer AL, Ibrahim SA, Leary M, Dutwin D, McNally B, Anderson ML, et al. Cardiopulmonary Resuscitation Training Disparities in the United States. Journal of the American Heart Association. 2017 May 1;6(5):e006124.

11. Cheskes L, Morrison LJ, Beaton D, Parsons J, Dainty KN. Are Canadians more willing to provide chest-compression-only cardiopulmonary resuscitation (CPR)?—a nation-wide public survey. Canadian Journal of Emergency Medicine. 2016 Jul;18(4):253–63.

12. Smith KL, Cameron PA, Meyer ADM, McNeil JJ. Is the public equipped to act in out of hospital cardiac emergencies? Emergency Medicine Journal. 2003 Jan 1;20(1):85–7.

13. Johnston TC, Clark MJ, Dingle GA, FitzGerald G. Factors influencing Queenslanders' willingness to perform bystander cardiopulmonary resuscitation. Resuscitation. 2003 Jan;56(1):67–75.

14. Jelinek GA, Gennat H, Celenza T, O'Brien D, Jacobs I, Lynch D. Community attitudes towards performing cardiopulmonary resuscitation in Western Australia. Resuscitation. 2001 Dec;51(3):239–46.

15. Thoren A, Axelsson A, Herlitz J. Possibilities for, and obstacles to, CPR training among cardiac care patients and their co-habitants. Resuscitation. 2005 Jun;65(3):337–43.

16. Chu KH, May CR, Clark MJ, Breeze KM. CPR training in households of patients with chest pain. Resuscitation. 2003 Jun;57(3):257–68.

17. Platz E, Scheatzle MD, Pepe PE, Dearwater SR. Attitudes towards CPR training and performance in family members of patients with heart disease. Resuscitation. 2000 Nov;47(3):273–80.

18. Cariou G, Pelaccia T. Are they trained? Prevalence, motivations and barriers to CPR training among cohabitants of patients with a coronary disease. Internal and Emergency Medicine. 2016 Jun 27;1–8.

19. Chew DP, Scott IA, Cullen L, French JK, Briffa TG, Tideman PA, et al. National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016. Heart, Lung and Circulation. 2016 Sep;25(9):895–951.

20. Cartledge SH, Bray JE, Stub D, Krum H, Finn J. Do Cardiac Rehabilitation Programs Offer Cardiopulmonary Resuscitation Training in Australia and New Zealand? Heart, Lung and Circulation. 2016 Jun;25(6):607–12.

21. Hazinski MF, Nolan JP, Billi JE, Bottiger BW, Bossaert L, de Caen AR, et al. Part 1: Executive Summary 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2010;122(16):S250–75.

22. Bray JE, Smith K, Case R, Cartledge S, Straney L, Finn J. Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation:

a cross-sectional survey of Victorians. Emergency Medicine Australasia. 2017;29(2):158–164.

23. 2016 Data: Melbourne [Internet]. Australian Bureau of Statistics. [cited 2017 Jul 17]. Available from: http://www.censusdata.abs.gov.au/CensusOutput/copsub2016.nsf/All%20docs%20by%20catNo/Data-in-pictures/$FILE/melER.html

24. Urban J, Thode H, Stapleton E, Singer AJ. Current knowledge of and willingness to perform Hands-Only™ CPR in laypersons. Resuscitation. 2013 Nov;84(11):1574–8.

25. Sasson C, Haukoos JS, Bond C, Rabe M, Colbert SH, King R, et al. Barriers and facilitators to learning and performing cardiopulmonary resuscitation in neighborhoods with low bystander cardiopulmonary resuscitation prevalence and high rates of cardiac arrest in Columbus, OH. Circulation Cardiovascular Quality and Outcomes. 2013 Sep 1;6(5):550–8.

26. Australian and New Zealand Committee on Resuscitation. ANZCOR Guideline 8, cardiopulmonary resuscitation [Internet]. 2016 [cited 2016 Nov 14] p. 1–5. Report No.: Section 8, Cardiopulmonary resuscitation. Available from: https://resus.org.au/guidelines/

27. Goldberg RJ. Physicians and CPR training in high-risk family members. Am J Public Health. 1987 Jun;77(6):671–2.

28. Cartledge S, Bray JE, Leary M, Stub D, Finn J. A systematic review of basic life support training targeted to family members of high-risk cardiac patients. Resuscitation. 2016 Aug;105:70–8.

29. Australian and New Zealand Committee on Resuscitation. ANZCOR Guideline 10.1, basic life support training [Internet]. 2016 [cited 2016 Nov 14] p. 1–5. Report No.: Section 8, Cardiopulmonary resuscitation. Available from: https://resus.org.au/guidelines/

30. Kleinman ME, Brennan EE, Goldberger ZD, Swor RA, Terry M, Bobrow BJ, et al. Part 5: Adult Basic Life Support and Cardiopulmonary Resuscitation Quality. Circulation. 2015 Nov 3;132(18 suppl 2):S414–35.

31. Batcheller AM, Brennan RT, Braslow A, Urrutia A, Kaye W. Cardiopulmonary resuscitation performance of subjects over forty is better following half-hour video self-instruction compared to traditional four-hour classroom training. Resuscitation. 2000 Jan;43(2):101–10.

32. Braslow A, Brennan RT, Newman MM, Bircher NG, Batcheller AM, Kaye W. CPR training without an instructor: development and evaluation of a video self-instructional system for effective performance of cardiopulmonary resuscitation. Resuscitation. 1997 Jun;34(3):207–20.

33. Moser, Dracup K, Marsden C. Needs of recovering cardiac patients and their spouses: compared views. International Journal of Nursing Studies. 1993;30(2).

34. Australian Institute of Health and Welfare. Cardiovascular disease, diabetes and chronic kidney disease— Australian facts: Prevalence and incidence. [Internet]. Canberra: AIHW; 2014 [cited 2014 Dec 18]. (Cardiovascular, diabetes and chronic kidney disease series no. 2.). Report No.: Cat. no. CDK 2. Available from: http://www.aihw.gov.au/cardiovascular-health/prevalence/

3.6 Summary of Chapter Three

The study presented in Chapter Three is the first to provide insight into BLS training rates in households containing a person or persons with CHD and therefore a high-risk cardiac patient(s) in Victoria, Australia. The results indicate that BLS training rates were no higher in these high-risk households than in the general population. While BLS training has increased in prevalence, for the majority this training has not been undertaken recently. Therefore BLS skills and knowledge are likely to be predate the current guidelines, and skill degradation is likely to have occurred. Increases in BLS knowledge and confidence to perform BLS were significantly increased in those who had undertaken BLS training. Importantly, this study also provided data on the barriers to undertaking training, demonstrating no difference in barriers between respondents who had a high-risk cardiac patient in their household and those without. This information is important to inform future studies and strategies to overcome these barriers.

Chapter Four: Attitudes, preferences and intent of the target population towards basic life support training

4.1 Overview of Chapter Four

The cross-sectional survey outlined in Chapter Three established that the prevalence of BLS training in high-risk cardiac households was the same as in the general population of Victoria. These results highlight the need to target BLS training to high-risk cardiac populations. This chapter addresses the third research objective of this thesis: to explore the attitudes, preferences and intentions of high-risk cardiac patients and spouses towards BLS training.

4.2 Background and context

In order to understand the meaning of the experience of an acute cardiac event for cardiac patients and spouses, and the role of BLS training in their overall cardiac health management, a qualitative study was undertaken. According to Hansen (2006, p.1) qualitative research "allows researchers to explore issues from the perspectives of the individuals directly involved"[80] Given that targeted BLS training requires engagement from the target population, this study sought to obtain qualitative data to inform the future studies described in this thesis and to tailor an intervention to meet the needs and preferences of the target group. To date there are no previous qualitative studies with family members of cardiac patients with respect to BLS training.

As the program of research in this thesis was concerned with cardiac patients and their family members, it was important to include their educational experience in this study and identify how BLS training could be incorporated into this experience. While there is international evidence about the experiences of cardiac patients[81–83], their educational experiences are largely unknown. There is also little contemporary Australian data on general cardiac

populations, with the most recent study investigating experiences of heart disease following hospital discharge for Chinse Australians.[84] The length of hospital stay in Australia is decreasing,[85] leaving less time for patient and family education; it is important that the consequences of this be examined to ensure patient education continues to be delivered in a way that responds to modern health care challenges.

While there has been quantitative surveys investigating the attitudes and interest of cardiac patients[86] and family members[77,78,87] towards BLS training, there is only one qualitative study focused on CPR training, conducted by Vaillancourt et al. (2014).[41] These authors conducted semi-structured interviews with a population likely to witness cardiac arrest (adults aged 55 years or older) to examine, through use of the theory of planned behaviour (TPB) constructs,[40] barriers and facilitators to both learning and performing BLS. Their results indicated that participants were interested in BLS training and thought it was a skill everyone should have. Through the constructs of the TPB (described further in section 4.4.1), the authors were able to identify specific positive and negative determinants of behaviour that would enable BLS training to be tailored to this population. This group felt pressure to be prepared for a future emergency situation for a spouse or a grandchild, which was identified as a lever to encourage this group to attend BLS training. However it was also noted that BLS training would need to be easily accessible in terms of location and cost to facilitate attendance. Concerns over skill degradation and physical ability were common negative determinants of behaviour.

Scarce information about the preferences and attitudes of the high-risk cardiac population, in addition to a need for local contemporary data on the experiences of this group, represent a significant gap in the literature. This qualitative data is essential in planning future interventions for the target population. The study presented in this chapter was designed to fill the gap in relation to qualitative data about BLS training for a high-risk cardiac population.

4.3 Research aims

The qualitative study outlined in Paper Three aimed to understand the attitudes, preferences and future intentions of high-risk cardiac patients and their spouses towards undertaking BLS training. This research was conducted in the context of understanding the educational experience of this population following hospitalisation for an acute cardiac event.

4.4 Methods overview

4.4.1 Theoretical approaches

The purpose of any theoretical framework is to make sense of the data and to provide some coherent explanation for "why people are doing or saying what they are saying or doing."[88(p68)] In addition, a theoretical framework moves a research project beyond the descriptive into the realm of the explanatory. This qualitative study was underpinned by two theoretical approaches: phenomenology and the TPB. When combined, these perspectives provided a broad framework for understanding how participants make sense of BLS training and how BLS training might fit within education following an acute cardiac event. Because the overall aim of my doctoral research was to investigate the feasibility of targeting BLS training to family members of high-risk cardiac patients, it was important that the experience of an acute cardiac event and the education and information received during and after hospitalisation be understood and considered.

Phenomenology

The idea behind phenomenology dates back to 1859 and the work of Edmund Husserl, whose focus was on the 'thing' or phenomenon.[89] Phenomenology is both a philosophical perspective and a method in itself. The aim is to describe the lived experience of a groups of individuals who have all experienced the phenomenon- in this case, the experience of an acute cardiac

event.[42,43] Data is typically collected through interviewing the individuals, followed by systematic data analysis of interview transcripts to find common themes.[42] This approach is appropriate for a range of health care research, as it allows researchers to investigate the experience of illness from the patients' perspective.[80]

Theory of planned behaviour

This theory, developed by Ajzen[40] originates from the discipline of psychology and serves as a means of undertaking the complex task of explaining human behaviour. It was developed as an extension to the theory of reasoned action by adding an extra construct of perceived behavioural control in order to increase predictive power.[40] The theory has been applied successfully to predict a variety of behaviours such as smoking or drug use cessation, weight loss and exercise behaviours.[90,91] Three constructs are used to predict behaviour based on the general rule that the stronger an individuals' intention to perform the behaviour is, the more likely it is that the behaviour will be performed (Figure 3). The first construct, behavioural beliefs, refers to the individuals' positive or negative attitude toward the behaviour. The second, subjective norms, is the perceived social pressure to undertake the behaviour; this could include the pressure or judgement from spouses, family, friends or the community. The third added construct, of control beliefs – or perceived behavioural control – is particularly important, as it describes personal beliefs about the ease or difficulty of performing a behaviour. It also reflects the external control (such as cost or time) and internal control (such as skill or ability) over the behaviour. This third construct is directly related to the control over undertaking the behaviour, as depicted in Figure 3. These three constructs were applied to predict the intentions of high-risk cardiac patients and their family members to undertake future BLS training.

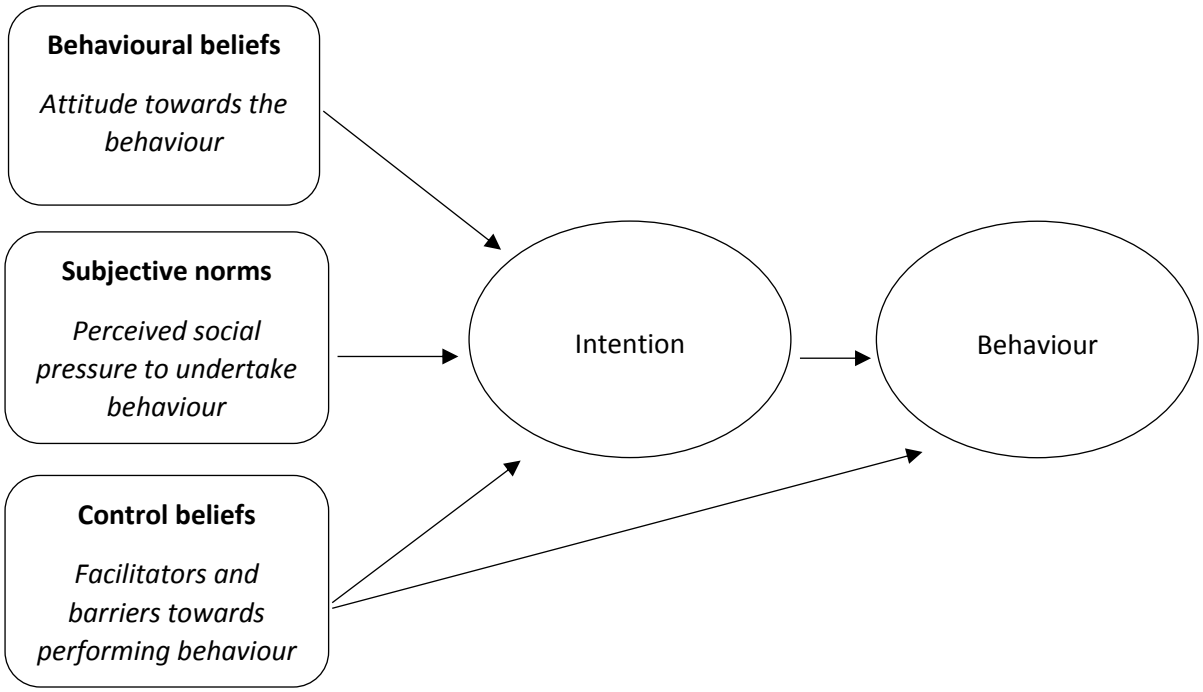


Figure 3. The theory of planned behaviour

Adapted from Ajzen (1991)[40]

4.4.2 Recruitment and setting

Both patients and their spouses or family member were recruited for this study. This was due to the fact that targeted BLS training studies to date trained both patients (if physically capable) and family members, and that this was the preferred mode of the participants in those studies.[76] Cardiac patients were recruited from The Alfred Hospital, a large public metropolitan hospital in the Victorian city of Melbourne (population 4.5 million). The Alfred is a tertiary referral centre with over 500 beds, and provides a 24-hour emergency coronary and cardiac surgical intervention service for approximately 1200 cardiac patients per annum. The ward itself is a mixed cardiothoracic ward and admits cardiology, heart failure (including heart transplant) and cardiothoracic patients. Nursing staff on this ward range from graduates to cardiac critical care specialist nurses.

Recruitment took over a year, due to the purposive nature of sampling. Recruitment commenced in March 2015, with nine participants and their spouses recruited by June 2015. According to the sampling strategy, where the variables of age and sex were considered, a further two female patients and one older male patient (and their respective spouses) were still required for the study. It took a further 10 months to recruit these final three participants. Interestingly, female participants were the most challenging to recruit. While cardiac disease affects fewer women than men (2% compared to 4%),[79] many eligible women who were approached declined because they did not want to burden their husbands or partners with study participation. In contrast, eligible male patients eagerly accepted the patient and information consent form to pass onto their wives or partners to read, with the intention of them both participating. This likely reflects the caring role of women discussed in Paper Three, and demonstrates that this may extend to women taking on this role even throughout their cardiac hospital admission. More detail about the participants is provided in Appendix C, where vignettes of each patient–spouse pair are provided.

This project aimed to undertake all interviews face-to-face, but one participant (who lived five hours' drive from the hospital) suggested the use of Skype instead. This allowed his interview to take place within four to six weeks following discharge as specified in the study protocol. Skype provided both voice and face-to-face components, making the interview as similar as possible to the other interviews conducted. All interviews were audio recorded.

4.5 Critical reflexivity

An important element of the study presented in Paper Three was the rigour related to the role that I, the practitioner-research, played in the overall research process.[80] I had to consider the fact that as a nurse with 13 years of experience (10 years specialising in cardiothoracic nursing) and as a passionate community BLS instructor, I would bring my own experiences, opinions

and beliefs to the group that I was researching. Reflexivity, however, involves more than inspection of potential sources of bias and their control; it demands that the enquirer recognises that he or she is part of the setting, context and phenomenon that they seek to understand.[92]

In all qualitative research undertakings, as stated eloquently by Freshwater and Rolfe, "rather than attempt to eliminate the effects of the researcher, the reflexive researcher tries to understand and utilise them..."[93(p533)] In this research, it was my experience that there were benefits to being a practitioner–researcher and having the ability to draw on years of clinical experience. In this way I found it easy to develop a rapport with patients and family members. In addition, if asked by the participants, and if relevant at the conclusion of our interviews, I was able to provide educational information or follow-up of missing referrals to cardiac rehabilitation. I saw this as part of my duty of care as a practitioner.

4.5.1 Before the study

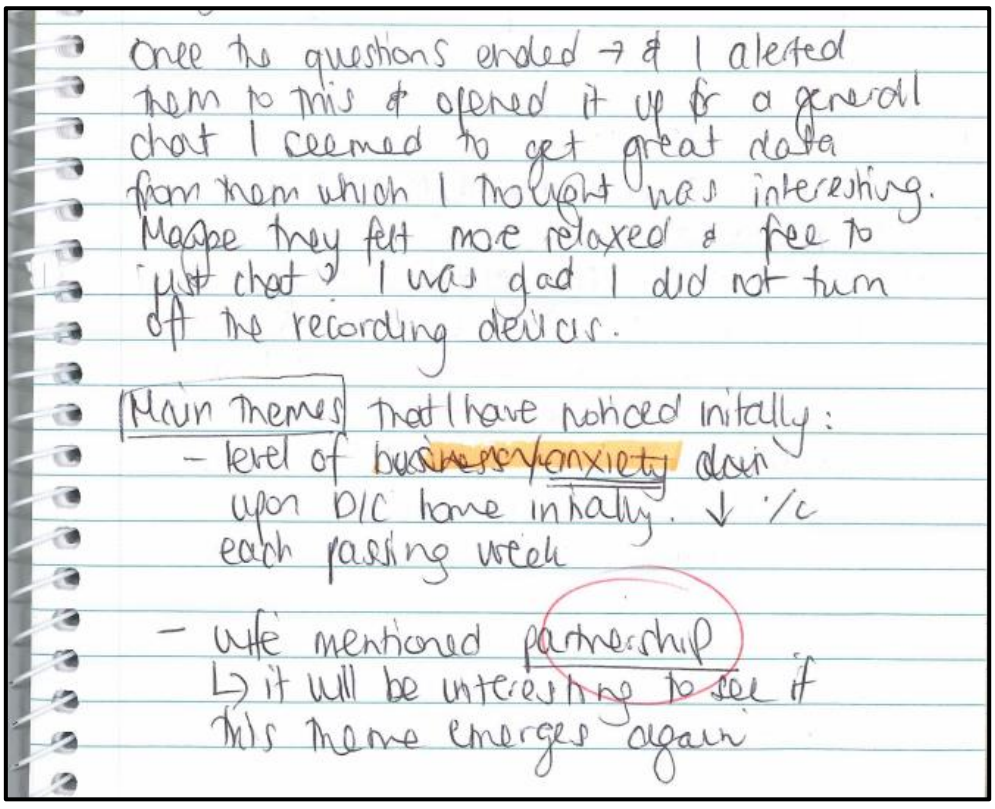
As already noted, the literature review, in addition to my clinical experience as a cardiac nurse, indicated a need for qualitative investigation of BLS training with the target population. In my work in the busy public health system, with decreasing lengths of hospital stay and increased patient acuity, I was continually confronted by the inadequacies of patient and family education throughout their brief hospital admission. I was eager to take on this qualitative project as part of the larger program of research for this thesis. It was a privilege to listen and then to tell the stories of these participants, and give the role of targeted BLS training a dimension that had not existed to this extent before.

While I have strong positive beliefs that BLS training is important, not only for this cardiac population but for entire communities, I was also extremely keen to hear the participants' views, thoughts and feelings on BLS training. I recognised that this would allow me to gain an understanding of their perceptions and experiences and therefore their preferences towards

BLS training. Consequently, the data would allow me to develop an appropriate intervention strategy (see Chapter Six) as a response to the findings of this study.

4.5.2 During the study

During the course of this qualitative study I took a reflexive approach in two ways: by keeping a journal, and meeting regularly with the research team to discuss and reflect on the data. To ensure maximum recall, journaling was completed within 12 hours of each interview. The journal was used for reflection on how my roles in the fields of nursing and BLS training had impacted on the interviews and subsequent data. I also used the journal to reflect on my own interviewing techniques and make notes on aspects that might be improved on in subsequent interviews (Figure 4).


Once the questions ended → & I alerted them to this & opened it up for a general chat I seemed to get great data from them which I thought was interesting. Maybe they felt more relaxed & free to just chat? I was glad I did not turn off the recording devices.

Main themes that I have noticed initially:
- level of business/anxiety down upon D/C home initially. ↓ %c each passing week
- wife mentioned partnership
  ↳ it will be interesting to see if this theme emerges again

Figure 4. Excerpt from journal, interview 001

After three interviews, the recordings were transcribed verbatim and were discussed in detail with the senior qualitative specialist author (SF). In addition to initial themes, interviewing techniques and the interview guide were discussed and reviewed. While one question was added ("Would you want BLS? Under what circumstances would you want BLS?"), overall it was ascertained that the interview schedule was appropriate and that good quality data were being collected.

4.5.3 After the study

My clinical work at The Alfred Hospital continued (on a casual basis) at the conclusion of the interviews and during data analysis. Every time I was on shift, I noticed my increased awareness of the emotional and educational issues surrounding an acute cardiac admission, and that this affected my nursing priorities. I began to take more time to ensure that my patients and their family members had a good understanding of their diagnosis and how to manage their health after discharge. In the modern mixed cardiothoracic setting, which was the setting of this study, all of this can easily get lost – as one spouse stated eloquently: "I mean, we were treated very well and mechanically everything was done, but as for anything else, no, definitely not" (Spouse 004, female, 69 years).

My concern as a practitioner with an interest in the management of cardiac patients is that other nursing and medical personnel have not been fortunate enough to have the time to *really* listen to the experiences of these generous participants who gave me their time, their honesty and their stories. This quote from Gubrium et al. (2003) encapsulates my feelings towards undertaking this study: "other researchers discuss how they gained insight into themselves and were changed in the process of interviewing others."[94(p161)]

4.6 Manuscript, Paper Three

The following paper, "Understanding patients' and spouses' experiences of patient education following a cardiac event and eliciting attitudes and preferences toward incorporating cardiopulmonary resuscitation training: a qualitative study" is currently under review at the *Journal of Advanced Nursing*.

Understanding patients' and spouses' experiences of patient education following a cardiac event and eliciting attitudes and preferences towards incorporating cardiopulmonary resuscitation training: a qualitative study.

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Conflicts of Interest: SC is a first aid trainer and director of City to Surf First Aid.

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Viertel Clinical Investigator Grant.` JB and JF receive salary support from the NHMRC Aus-ROC CRE. JF receives salary support from St John Ambulance Western Australia.

Abstract

Aim: To gain a comprehensive perspective about the experience of patient and spousal education following an acute cardiac event. The second objective was to elicit an understanding of their attitudes, preferences and intentions towards future cardiopulmonary resuscitation (CPR) training.

Background: Patients with cardiovascular disease require comprehensive patient and family education to ensure adequate long-term disease management. As cardiac patients are at risk of future cardiac events, including out-of-hospital cardiac arrest, providing CPR training to patients and family members has long been advocated.

Design: We conducted a qualitative study underpinned by phenomenology and the theory of planned behaviour (TPB).

Methods: Semi-structured interviews were conducted with cardiac patients and their spouses between March 2015 to April 2016 purposively sampled from a cardiology ward of a public tertiary hospital. Interviews were transcribed verbatim and thematic analysis undertaken.

Findings: Nine male patients and three female patients and their spouses were recruited. Ages ranged from 47 to 75 years. Three strongly interrelated themes emerged: information (perceived lack of information for majority), feeling in and out of control and the caring responsibility of spouses. There was evidence of positive attitudes and intentions from the TPB towards undertaking CPR training in the future. Only the eldest patient spouse pair were not interested in CPR training.

Conclusions: Findings suggest cardiac patients and spouses have unmet education needs following an acute cardiac event. Information increased control and decreased negative emotions associated with diagnosis. Participants' preferences were for inclusion of CPR training in cardiac rehabilitation programs.

Keywords: Qualitative, interviews, cardiopulmonary resuscitation, cardiovascular disease, patient education

SUMMARY STATEMENT

Why is this research needed?

- As length of hospital stay following an acute cardiac event is decreasing, this study provides contemporary data on the education experience of cardiac patients and spouses.
- While cardiac patients and their spouses are a logical group to be trained in cardiopulmonary resuscitation (CPR), there is a paucity of qualitative data on their attitudes, preferences and intentions towards CPR training.
- Having a better understanding of the experience of patient education following an acute cardiac event and preferences towards CPR training allows future education and training interventions to be tailored to the needs of this group.

What are the key findings?

- Cardiac patients and spouses experienced a complex range of emotions following an acute cardiac event and described unmet education and information needs.
- The majority of patients and spouses had positive attitudes towards CPR and strong intentions towards undertaking CPR training in the future.
- Preferences were for CPR training to be included in a cardiac rehabilitation program.

How should the findings be used to influence policy/practice/research/education?

- New strategies for effective patient and family education are urgently required due to decreased length of hospital stay and thus decreased opportunities for nurses to provide education.

- Cardiac patients and their spouses are interested in CPR training and therefore conversations and education about CPR training should be incorporated into patient and family education early in recovery.
- Consideration should be given for cardiac rehabilitation programs to include CPR training into their programs where possible and appropriate.

INTRODUCTION

Cardiovascular disease (CVD) is a significant cause of illness, disability and premature death, affecting 22% of Australian adults (Australian Institute of Health and Welfare, 2013). While there have been many advances with the medical management of CVD, it is essential that patients also take an active role in disease management. This includes managing medications, recognising future symptoms and participating in aggressive risk factor modification (Chew et al., 2016). In order for this to occur, comprehensive patient and family education is required, beginning in the acute hospital phase through to secondary prevention outpatient programs such as cardiac rehabilitation (Chew et al., 2016). Patient education is a component of guideline standard care with patients themselves identifying that receiving information after an acute cardiac event is of high priority (D. Moser, Dracup, & Marsden, 1993; Thompson, Ersser, & Webster, 1995).

A proposed topic of education for cardiac patients and family members has been cardiopulmonary resuscitation (CPR) training. This is due to the risk of repeat events for cardiac patients, including in the most extreme form, cardiac arrest. As the majority of cardiac arrests occur in private residences, and half of these will be witnessed, family members of cardiac patients have been identified as a logical target group for CPR training.

BACKGROUND

Nurses are a crucial provider of patient education, from the hospital setting through to secondary prevention (Campbell, 2009). As such it is important that nurses have an understanding of both patients and spouses perceptions and experiences of patient education, particularly in the contemporary Australian cardiology setting which is characterised by rapid treatment pathways and decreasing lengths of hospital stay. Currently the inpatient stay for an

acute coronary syndrome admission is a median of three days (Chew et al., 2013). This is not only isolated to Australia, with some countries in Europe having similar short lengths of hospital stay (Wilkins et al., 2017).

Targeting CPR training to cardiac patients and their family members has been advocated in the literature for over 30 years (Goldberg, 1987) with the most recent study investigating the provision of CPR training to cardiac patients and spouses before hospital discharge (Blewer et al., 2016). There have been many quantitative studies examining methods and locations of targeted CPR training (Dracup, Heaney, Taylor, Guzy, & Breu, 1989; Haugk et al., 2006; Schneider et al., 2004), however there has been a paucity of qualitative data examining the attitudes and preferences of the target population which could then be used to inform future interventions.

In this study a qualitative design was underpinned by two theoretical approaches: 1) phenomenology and 2) the theory of planned behaviour. Phenomenologists endeavour to look for meaning by taking note of what and how an individual observes, hears and understands. This they achieve by carefully describing the actions of others and as such ask how as a researcher they can then interpret and understand these ordinary events and actions (Schwandt, 2007). In this way our phenomenological study differs from previous quantitative studies which collected empirical data around targeting CPR training for cardiac patients and their family members (Blewer et al., 2016; Cheng, 1997; Dracup et al., 1989).

We applied the theory of planned behaviour (TPB) (Ajzen, 1991) (Table 1) as a means to explore intent towards undertaking CPR training, post an acute cardiac event. The theory proposes to predict intentions to perform behaviours by examining: 1) attitudes towards the behaviour 2) the social pressures (subjective norms) to undertake the behaviour and 3) perceived behavioural control - that is the participants beliefs as to how easy or difficult performing the behaviour is likely to be. The TPB has been successfully applied to behaviours

under volitional control (in our case CPR training) and thus has successfully been applied to many health research applications (Godin & Kok, 1996).

Table 1. The theory of planned behaviour

1) Behavioural beliefs Attitude towards the behaviour; positive or negative support towards undertaking the behaviour	Effect on intent
2) Subjective norms The social pressure towards undertaking the behaviour	Effect on intent
3) Control beliefs The facilitators and barriers towards performing the behaviour which can also reflect on past experiences of the behaviour	Effect on intent and behaviour

Combined, these two theoretical approaches allow for a more complex understanding of patients' and spouses' lived experiences of patient education and their attitudes, preferences and intentions towards the inclusion of CPR training in patient education following an acute cardiac event. In this qualitative study a phenomenological approach generated important knowledge for nurses and healthcare professionals so that they might gain a more comprehensive understanding and be able to plan and tailor future education interventions for patients and family members alike.

THE STUDY

Aims

The purpose of this study was to firstly gain a comprehensive perspective about the experience of patient and spousal education following an acute cardiac event. The second purpose was to elicit an understanding from cardiac patients and their spouses of their attitudes, preferences and intentions towards future CPR training.

Design

This was a qualitative, interview study underpinned by phenomenology and using TPB to examine intentions towards undertaking CPR training in the future. This study is part of a targeted CPR training program of and was used to inform an interventional feasibility study (Cartledge et al., 2017).

Participants and recruitment

Between March 2015 and April 2016 a purposive sampling strategy was used to recruit a heterogeneous sample of 12 cardiac patients and their spouses or partners. Sex and age of patients were considered in the sampling strategy as CVD is more likely to affect men (4% vs 2% of women) and older age groups, (occurring more frequently from 55 years of age) (Australian Institute of Health and Welfare, 2014).

Participants were recruited from the cardiology ward of a large metropolitan tertiary hospital in Melbourne, Australia. This hospital receives both metropolitan (80%) and rural (20%) patients. Daily screening of cardiology inpatient lists were used to identify eligible patients who were aged over 18 years, English speaking, had chest pain associated with a confirmed troponin rise, lived permanently with a spouse or cohabitant and had planned outpatient follow up appointment at the same hospital. Eligible spouses or cohabitants were required to be over 18 years and English speaking.

After gaining permission from nursing staff, eligible patients were approached by an investigator (SC) who was not involved in the patients care. Information about the study was provided to the patient and spouse (if present) and if interested in the study, participant information and consent forms were provided. After allowing time to read the information and ask questions, consent forms were signed. Arrangements were then made to undertake the interview on the same day as the patients' first outpatient appointment.

Data collection

Four types of data were collected: clinical data, survey data, interview data and field notes. After consent was obtained, basic clinical data were extracted from the patients' inpatient medical record. A short pre-interview questionnaire (supplemental materials) was completed by both patients and spouses. This included demographic information such as country of birth and level of education not available in the medical record, and prior CPR training status. All participants were assigned a study number and were offered to select a pseudonym.

A semi-structured interview schedule was developed by two investigators (SC, SF), informed by previous research (Hanssen, Nordrehaug, & Hanestad, 2005; Vaillancourt et al., 2014) and approved by the co-authors. Questions were open ended and included a 'warm-up' question which asked patients to describe the reason for their hospital admission. This was followed by open ended questions about education experiences, attitudes and preferences towards CPR training and plans for cardiac rehabilitation. The interview guide is outlined in Table 2.

Table 2. Interview guide

	Topics or questions asked
Opening	Re-introduction of interviewer. Explanation of interview process. Opportunity to ask questions.
Warm up question	Can you please tell me why you were in hospital on XX date?
Education questions	Would you like to talk to me about the pateint education you have receive during and since your admission?
	Can you please tell me if you received any information on what to do in the following emergency: Your spouse/partner experiences chest pain?
	Your spouse/partner collapses?
CPR specific questions	Would you be willing to learn cardiopulmonary resuscitation skills?
	Would you want CPR? Under what circumstance would you want CPR? *(Question added after three interviews)*
	If so, what are your preference for when in your recovery period you would like to learn, where and modality?
Cardiac rehabilitation	Are you planning on attending cardiac rehabilitation?

Interviews were conducted by an investigator (SC) at the patients' first outpatient cardiology appointment, which typically occurred four to six weeks post hospital discharge. Most interviews were conducted within or as close as possible to this time frame. All interviews were face to face, with the exception of one rural patient - spouse pair which was conducted via Skype. Interviews were conducted in a hospital (n = 8), in private cardiology consulting

rooms (n = 1), at a community centre (n = 1) and at a private residence (n = 1), all in a private room, away from clinical or busy areas.

To complement the interviews, three different forms of field notes were kept (by SC) during the interview process: 1) short notes made at the time of the interview; 2) a fieldwork journal and 3) a running sheet outlining preliminary ideas and themes as each interview was completed. The fieldwork journal recorded thoughts, problems and ideas that arose and was completed within 12 hours of each interview for maximum recall.

Interviews were audio recorded and then transcribed verbatim by one investigator (SC). Once the initial three interviews were complete, two investigators (SC, SF) reviewed the transcripts to assess the quality of the interview questions and to discuss interviewing techniques. Following this review an additional interview question was added to the schedule so as to capture the thoughts of those participants not interested in participating in CPR training.

Ethical considerations

This study was approved by Alfred Hospital (72/15) and Monash University ethics committees (CF15/2015000359).

Data analysis

Recruitment of new participants into the study ceased once analysis of the transcripts indicated that there were no new themes or ideas emerging from interviews. Upon completion of each interview typed transcripts were read to identify and record recurring themes. This analytical strategy was applied to all interviews until no further participants were recruited into the study and all interviews were completed (Grbich, 1999; Hansen, 2006).

Following established conventions of thematic analysis, the initial process of engaging with the qualitative data was an iterative one, which involves repeatedly moving between the different stages of research- from data collection to transcription, reading, reflecting and

interpretation (Grbich, 1999; Hansen, 2006). Analysis of all of the qualitative interview data was undertaken by one investigator (SC) who conducted and transcribed all interviews and was therefore immersed in the data. Data were coded and themes identified following established processes by Grbich and Hansen (Grbich, 1999; Hansen, 2006). First, audio of transcribed interviews was played so as the transcription could be checked and any other auditory information could be noted on the transcript, such as anger, laughter or crying. Secondly, transcripts were then re-read, important sections of text underlined and thematic codes developed. Thirdly, codes were then sorted and refined through the use of several processes such as reflection, re-reading and re-listening to interviews. This provided the opportunity for further reflection and finding new insights. Mind maps were also used as a visual representation of themes, which allowed the researcher to begin considering codes, overarching themes and their relationship (Braun & Clarke, 2006). During this process regular review of transcripts and discussion of themes was conducted with a second investigator (SF). Finally, major themes were identified along with interconnecting sub themes and transcripts were marked up and colour coded by hand. Discussion of key themes and presentation of data rich transcripts was conducted with the research team at regular intervals.

A further step of data analysis was then initiated – the development of a matrix in order explore the pattern of themes. Pre-identified categories were examined: sex of patient, age of participants, support level of relationship, clinical acuity and overall patient education experience (positive or negative). Where categories had commonalities of themes, these are reported below.

Rigour

Qualitative researchers are "active participants in the research process" (Hertz, 1997, p. viii) bringing personal values, beliefs and experiences (Hamberg, Johansson, Lindgren, & Westman, 1994; Hewitt, 2007). In addition, self-reflection and reflexivity are vital components

to achieve high quality data analysis and findings. In other words, views of and choices a researcher makes has an impact on the research questions, theoretical framework, data collection and how these data are analysed (Grbich, 2013).

In this research, the interviewer (SC) was a practitioner-researcher, being both a specialist cardiothoracic nurse and a CPR instructor with experience and knowledge of the field. In addition the interviewer also has experience as a researcher and has undertaken training in qualitative research and interviewing techniques.

Rapport was easily developed with participants due to the interviewers' extensive professional experience with this patient group. Once rapport and trust had been established it was possible for the researcher to pose probing questions regarding attitudes and preferences towards CPR training (Table 2). While it was possible that participants were likely to assume that the interviewer had strong beliefs about the topics under discussion, the interviewer did not offer her own opinions during the interviews. Both the fieldwork journal and regular research team meetings provided additional data and also allowed the interviewer to reflect on the process of each interview. We have further addressed rigour of this study through undertaking this process of critical reflexivity, in addition to purposive sampling techniques and our transparent and detailed description of the methods and data analysis (Hansen, 2006).

RESULTS

Sample characteristics

During recruitment 120 patients were screened to assess study eligibility. Common reasons for exclusion were patients living alone, English as a second language or having a follow up appointment elsewhere due to being private or rural patients. Twenty-four patients were

approached, six refused and six were unavailable to participate. Of the 12 patients enrolled, nine were male, three were female with an average age of 62 years (range 47 to 75 years) (Table 3, Table 4). All participants were in heterosexual relationships of married or de-facto (hitherto referred to as spouse) status. Five patients each suffered a ST-elevation myocardial infarction (STEMI) or a non-ST elevation myocardial infarction (NSTEMI) and two patients were diagnosed with Takotsubo cardiomyopathy. On average, interviews were conducted seven weeks post discharge (range 1 – 12 weeks) and were of 32 minutes duration (range 21 – 63 minutes).

Table 3. Characteristics of participants

Patients, n = 12	
Mean age, years (range)	62 (42 – 75)
Male sex, n	9
Median hospital length of stay, (IQR)	3.8 (1)
Previous CPR training	6
Spouses/Partners , n = 12	
Mean age, years (range)	59 (42 – 72)
Male sex, n	3
Previous CPR training	7
All participants, n = 24	
Marital status	
Spouse	22
Defacto	2
Location of residence	
Metro	22
Rural	2

IQR, interquartile range

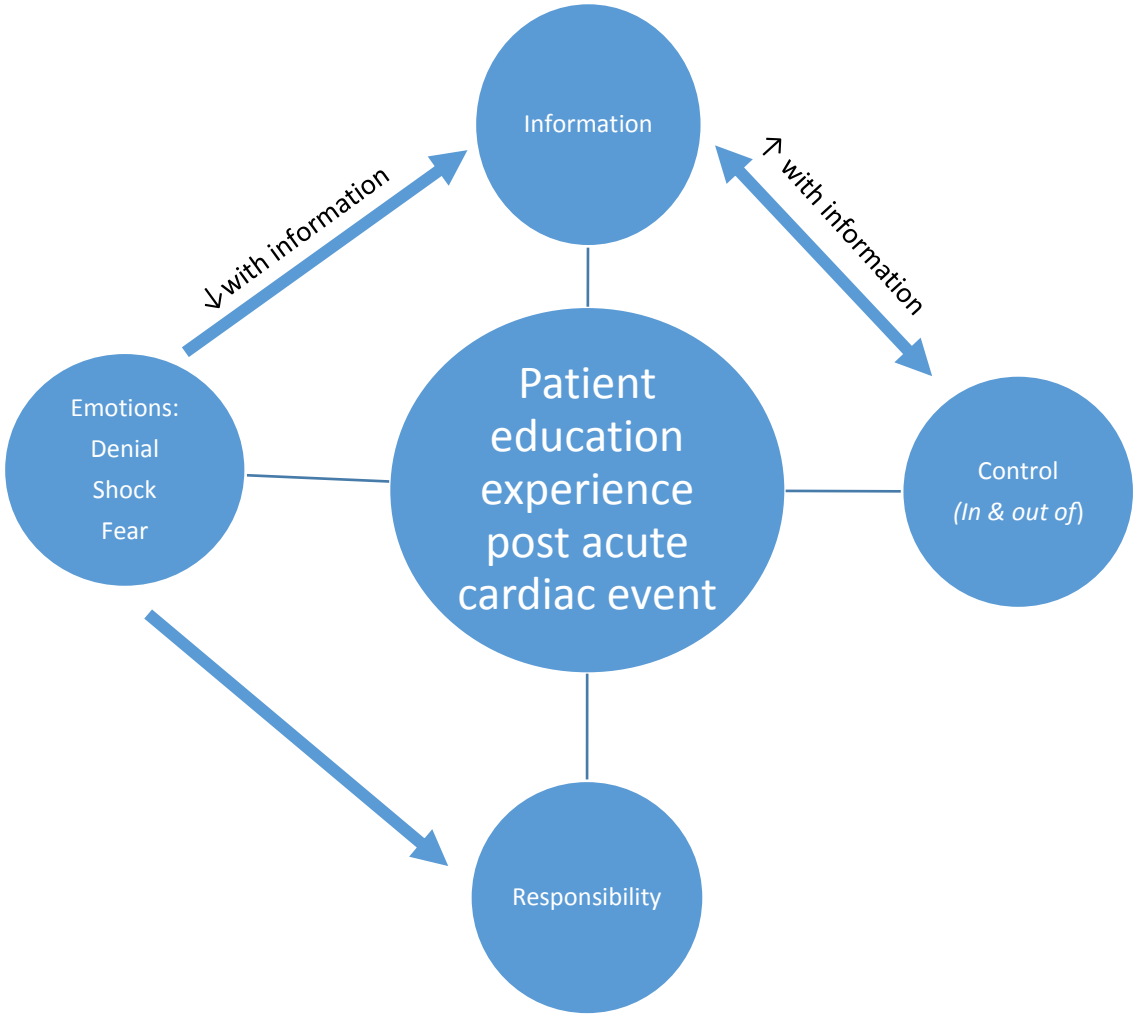
Table 4: Participant pseudonyms, age and patient diagnosis.

	Patients			**Partner or Spouse**	
Participant number	**Pseudonym**	**Age (years)**	**Diagnosis**	**Pseudonym**	**Age (years)**
001	Larry	64	STEMI	Helen	63
004	Jimmy	55	STEMI	Nadia	55
005	Karl	69	NSTEMI	Marg	69
006	Markus	75	NSTEMI	Olivia	65
007	Liz	56	Takotsubo Cardiomyopathy	Sam	60
010	John	57	STEMI	Bernadette	57
012	Dan	61	STEMI	Rhonda	57
014	Martin	47	NSTEMI	Daphne	42
015	Sally	59	STEMI	Tim	59
017	Paul	70	NSTEMI	Tia	42
018	Jen	63	Takotsubo Cardiomyopathy	Brad	68

STEMI, ST-elevation myocardial infarction; NSTEMI, non-ST elevation myocardial infarction

Analysis of the interviews indicated that there were recurring themes particularly related to the acute cardiac event. Through their discussions and reflections on experiences of the patient education they had received from symptom onset to the day of interview, three key themes were identified from the interviews: information, control and responsibility. The relationship between these three themes is displayed in Figure 1. In addition, the attitudes and intentions towards CPR training, in relation to the participants' experience of patient education, are presented.

Figure 1: Schematic of major themes of the experience of patient education following an acute cardiac event



Emotional response to an acute cardiac event

Participants reflected on their acute cardiac admission and trajectory of recovery, and described a complex range of emotions linked to these events. Denial featured as an initial response for both patients and their spouses, followed quickly by the emotions of shock upon diagnosis of a myocardial infarction or Takotsubo cardiomyopathy. Strong visual metaphors such as bombs and explosions were used by many participants when describing their acute cardiac event. For example one male spouse described how it was obvious to him that his female partner had suffered a heart attack, and recalled speaking about the state of her health the weekend before with friends:

> "[She's on] depression tablets, high blood pressure tables, diabetes, overweight, smokin', that's it. It's going to blow up one day, and it was only a week later." (Spouse 015, male, 59 years).

Similar visual metaphors were also used by this spouse, demonstrating the effect an acute cardiac event had on the entire family unit.

> "...it's not something minor that happened to somebody's family, it was a detonation. ...there's an awful lot of, um, debris in the wake of an incident like this.... It goes off right in the middle of your family. And there's causalities all around." (Spouse 005, female, 69 years).

Information

Participants talked about the importance of receiving information as part of their post cardiac event care. During the acute hospital phase, information and education were received from nurses and printed literature (Heart Foundation, "My Heart, My Life" booklet). The majority of participants however, described a lack of both verbal and written information in this phase,

with some having to find answers to health management questions for themselves. As one female spouse, the wife of a NSTEMI patient reflected:

> "It annoyed me, because I knew there was more information that we could have got and, um, once you were done, you were very quickly out of there [discharged home]." (Spouse 005, female, 69 years).

Another participant reflected on the lack of knowledge about her cardiac event in this way:

> "And I didn't know what I'd had, and I didn't really understand Takotsubo till Tuesday morning, when Brad actually googled it all and read it to me about what it was... So I didn't understand that all, the Takotsubo side of it. And I had to ask for literature. Could you print me out something so I can read it and absorb it?" (Patient 018, female, 63 years).

Clinical acuity emerged in relation to the level of information participants received. With the exception of one, all STEMI patients had a positive experience of patient education early in the acute hospital phase. Rather than just delivering the "mechanical" nature of nursing care (described by Spouse 005, female, 69 years), STEMI participants described nurses regarding it as part of their role to educate patients and family members. While patient 004, who had suffered a STEMI, couldn't recall all of the interactions with nurses upon his transfer from the catheter lab to the ward (as could be expected), his wife could recall the professional and informative manner in which one nurse related to them:

> "Yeah, I felt like he [the nurse] was really taking it [patient education] on as a really important part of his care and he'd been really assuring to you and explaining everything that was going on, as his brief." (Spouse 004, female, 55 years).

Another spouse described the importance of specific qualities for the delivery of information:

> "...but she [the nurse] was just exceptional. She was learned and she explained to him, and patient and seemed to enjoy that part of it." (Spouse 008, female, 72 years)

On average, patients were discharged at day 4 (Table 2) with some reflecting that they did not feel ready to leave hospital or sufficiently informed about their condition. At the time of interview some patients had started (n = 3) or completed cardiac rehabilitation (n = 1). Three patients did not receive a referral to cardiac rehabilitation and this was rectified by the interviewer. For those yet to start, the wait for more information, education and support seemed lengthy. As one patient put it:

> "I think they [hospital staff] were really leaving it [patient education] up to rehab and they say don't do much for a couple of weeks..." (Patient 004, male, 55 years).

This view was reiterated by another spouse who was eagerly awaiting the commencement of her husbands' cardiac rehabilitation, yet had not received a referral and thus had an extended wait. She said:

> "...in the meantime you've got this two months where we've had... we felt dangled. Maybe rehabilitation should start sooner." (Spouse 005, female, age 69).

Control

Analysis of the interview data indicated information that participants received about their condition had a direct influence on the level of control participants felt. In addition, information had a positive effect on the emotional response to the event (Figure 1). This idea is reflected in the following comment:

> "...and because of all the information we've been given I'm, I'm not so panic stricken that you know he's going to have another [heart attack], he's got a fragile heart or anything. Because we've been very well informed as to um, what happened and what's been done and what signs to look out for." (Spouse 010, female, 57 years)

Having a sense of control was demonstrated in opposing forms; participants feeling both in and out of control. In the first instance, if an ambulance was activated for the acute cardiac event, control of the event was transferred to the paramedics, which was a relief to the patient in an uncertain and stressful time. On the other hand at other times the health system had control of the patient and their circumstances, with one patient, who lived rurally, describing:

> "I was captured by my local nurse…. She checked my blood pressure and she said I might give you an ECG, and when she gave me the ECG she was very concerned, she said "this is not how it was before, there's been a definite change. You are not going home. We're not letting you go, we're going to put you in an ambulance and send you to hospital." So I was quite shocked." (Patient 017, male, 70 years).

The health system also controlled the way some patients described the symptoms of their acute cardiac event. One spouse described feeling frustrated about the way the nurses insisted on reclassifying the chest "discomfort" her husband experienced:

> "From the minute he came in here… they kept saying, "So how's the pain?" And he kept trying to say to them "I don't have any pain." And one of the nurses said, "While you're in here, if anything changes we regard it as pain." (Spouse 005, female, 69 years)

In other examples patients and their spouses attempted to take control of their circumstances and of the system, particularly regarding follow up cardiology appointments or confirming a place at cardiac rehabilitation. As one Takotsubo patient who was unsure of her prognosis after discharge and attempted to move her next appointment said:

> "…the waiting was the hard part. I did try and move my appointments forward, um, but that was to no avail, obviously busy! Um, I even tried to make an appointment with the doctor at his um, private rooms but it just didn't work out with everything. So the waiting was the big thing." (Patient 007, female, 56 years).

A constant question raised by participants was *why* an acute cardiac event had happened to them. The underlying motivation for this question appeared to be in order to gain control over the cause by modifying future behaviour and risk factors. This position was particularly evident for female spouses. When participants were asked what the most important issue was for them right now, one spouse replied in this way:

> "I'm wanting to know how that heart attack came about, how it was driven, that's what I want to know. So that we can work on that, or if it was food or whatever it was, I don't know." (Spouse 012, female, 57 years).

Taking responsibility for controlling diet also featured as a strong recurring theme and is described eloquently by this spouse:

> "Well for me now [the most important issue] is to make sure that he takes his medications and take the medication on time, and also the diet, and I'm watching his diet now, and he said I'm cruel to him, not making enough cakes like before. I really watch his diet so much." (Spouse 017, female, 42 years).

Responsibility

The notion of taking control was also coupled with shouldering responsibility (Figure 1). This sense of control was demonstrated particularly by female spouses who took on the responsibility for the health of their partners as early as the acute hospital phase as described by this spouse:

> "I was pretty much here [hospital ward] 24/7. So anything they had to say I heard. Um, and all the booklets and I read them from cover to cover and made sure I asked questions…" (Spouse 014, female, 42 years).

The level of responsibility increased as patients were discharged home, away from medical care as illustrated by the following:

> "Yeah, the first week or so was really bad, yeah. Yeah and because if he got up in the middle of the night, oh my *[laughs]*... I was checking [on him], which was really bad for him, but he had a lot of trouble sleeping." (Spouse 001, female, 63 years).

While female spouses adopted a caring role and the associated responsibility, doctors also transferred responsibility to spouses. This was seen in several cases related to smoking cessation and one spouse in particular was given this message by two separate cardiologists:

> "And he [the cardiologist] goes, "Oh, you're with Jimmy... Don't let him smoke ever again." So that was a really amazingly strong message I thought from these quite authoritative kind of figures." (Spouse 004, female, 55 years).

Attitudes and intentions towards CPR training

Participants were asked a two stage question relating to the patient education they had received around chest pain management and should chest pain escalate- emergency management, with the need for CPR (Table 2).

Most patients had received glyceryl trinitrate spray and had basic education on how and when to use it. Patients then went onto educate their spouses about chest pain management. No participants in this research were provided with education on what to do should chest pain escalate to a serious emergency. However, all patients, with the exception of one, had positive attitudes towards learning CPR. CPR training was described as a "worthy" undertaking thus supporting the first intention of the TPB (Table 1). For the second intention, the social pressures to undertake the behaviour of CPR training were framed in a positive manner of having a duty to the community. When speaking about his recent CPR refresher training at work, this participant describes a level of social pressure:

> "Well I think it's something you should know. You should know basic CPR if nothing else." (Patient 001, male, 64 years).

One patient-spouse pair, who had recently undergone CPR training together at cardiac rehabilitation discussed the positive social pressure to be trained amongst each other:

> "I don't know, how did you feel, did you feel that it [CPR training session] was relevant to you…?" (Spouse)
>
> "I don't think that way. Anyone in the street [should be trained]!… (Patient)
>
> "So do I." (Spouse)
>
> "That's a good citizen basically…" (Patient)
>
> (Spouse 008, female, 72 years & Patient 008, male, 65 years)

Finally the third intention of the theory of planned behaviour (TPB)- control beliefs (including facilitators and barriers towards undertaking CPR training), were also threaded through the data. One participant aptly recognised that linking concepts together would be a facilitator for this group to learn CPR skills:

> "I think it would be worth doing [CPR training], but having said that, we haven't gone out actively and sought to do that. So it hasn't triggered… Probably if it was easier to get a hold of, [and there was] clearer linkage between the problem … if we better understood it, maybe we'd be more inclined to do it." (Patient 012, male, 61 years).

In regards to timing of the training, cardiac rehabilitation was consistently identified by the majority of participants as the right time and place to facilitate CPR training.

> "Well, I think [cardiac] rehab would be [the right time]. You know, you want to be empowered pretty much, er, the sooner the better." (Patient 010, male, 57 years)

Cardiac rehabilitation was also identified by this patient:

> "It [CPR training] would be a good thing to learn at this stage [cardiac rehabilitation]. Because you're going along, you're there, your mind is open, you're there to learn. I'm in [cardiac] rehab, what do we do?" (Patient 004, male, 55 years).

Participants who were currently attending or had completed cardiac rehabilitation at the time of interview and undertaken CPR training at the program, overall had very positive experiences.

> "I was surprised it [the CPR training] came. I mean I didn't know what was in the session, I just turned up and it was a very welcome opportunity. ...it gives you confidence, to me, anyway, that if I see someone collapsing I can do something. May not accurately but I'll do something." (Patient 008, male, 65 years).

There were differences in how participants viewed CPR training with the oldest patient (age 75) and spouse not interested in CPR training. In comparison, the youngest patient (age 47) and spouse did want to learn CPR, and learn it as soon as possible- while in the acute phase. This difference in opinion may indicate the urgency for information to preserve life at the younger end of the age spectrum compared to those in their seventh decade of life.

What was not talked about in the interviews also needs to be considered. The potential fear and responsibility that spouses in particular may have felt, when thinking about their future health and any potential need for them to perform CPR on the patient was not raised often. One spouse however nervously broached the topic:

> "Oh yeah, I'm willing to give the refresher or relearn but in the back of your mind is ohhh I just hope I don't have to use it on Larry. But if it's anyone else I think you know the adrenaline kicks in and you think I've got to do it because there is no-one else. But yeah, a little bit nervous." (Spouse 001, female, 63 years).

DISCUSSION

This study has addressed a gap in the literature related to the qualitative investigation of the attitudes, preferences and intentions of cardiac patients and spouses towards targeted CPR training. We also explored their experiences and perceptions of patient education in the contemporary Australian cardiology setting. Our study found that while an acute cardiac event is an unexpected, emotional and stressful event, patients valued receiving patient education and information. For those that received adequate information, there appeared to be less negative emotions associated with their cardiac event and having relevant information increased their sense of control (Figure 1). In addition to standard patient education, the majority of participants would value the opportunity to undertake CPR training after an acute cardiac event, displaying strong beliefs, positive attitudes and a clear intent towards training. Preferences for undertaking CPR training were for later in the trajectory of recovery, in cardiac rehabilitation.

For some of the study participants, especially those who were yet to attend cardiac rehabilitation, participation in the interview process may have provided the first opportunity for in-depth reflection on their cardiac event. The interview provided participants with an opportunity to openly discuss their emotions and thoughts about their cardiac experiences with their spouse. For most of the participants this appeared to be the first time they had engaged in such discussions as it was observed to be a new dialogue between them. Participants were sometimes surprised by what their spouse had said, seeking out more information by asking questions of each other. Participants appeared to enjoy and appreciate the chance to be heard, especially by a specialist cardiac nurse and for the opportunity to clarify any outstanding questions. It has been suggested that chronic illness participants do receive therapeutic benefits from participating in qualitative interviews (Hutchinson, Wilson, & Wilson, 1994).

For some, the interview became quite emotional as they relived the cardiac event and shared their feelings and fears with their spouse and the interviewer. The range of the emotional themes identified in our analysis are consistent with other reports of this population, including the use of strong language and metaphors such as 'bombs' when describing their cardiac event (Fleury & Moore, 1999; Pattenden, Watt, Lewin, & Stanford, 2002; Thompson et al., 1995; Vosbergen et al., 2013).

This study provides contemporary data on the education experience of cardiac patients and spouses following an acute cardiac event. This is particularly important given length of hospital stay is decreasing, therefore providing less opportunity and time for education. The majority of participants in our study described having information deficits upon discharge, persisting through to outpatient follow-up. This is a long standing problem also described in previous studies (Fleury & Moore, 1999; Thompson et al., 1995). It may be the case that information and education were provided during the inpatient stay, however were unable to be absorbed in such a short time period. New strategies for patient and family education at later stages of recovery are required. This could include the use of technology such as smart phone applications or text message interventions which are proving successful in other cardiac applications for behaviour change (Chow et al., 2015; Redfern et al., 2014).

In contrast to what is discussed in the interviews, an important aspect of qualitative research is to also consider what was not talked about by participants (LeCompte, 2000). While participants very easily expressed their views on the patient education they received, there was little discussion about any fear or anguish they may have felt thinking about the potential for performing CPR on their spouse in the future. Even though questions related to CPR training were later in the interview, once rapport and trust had been established, fear of performing CPR on a spouse was not a major theme found in the data. While the interviews gave patients and spouses the space and opportunity to discuss emotions felt after the acute cardiac event,

the same was not seen for fear felt towards future emergencies, ill health or the need to perform CPR. It may be that these feelings were not felt by the majority, as CPR training was described by two participants as "empowering", or it may be a self-protecting behaviour to simply not talk about it.

Spouses may also feel a personal pressure to be skilled in CPR after experiencing their spouse being affected by an acute cardiac event. The theory of planned behaviour acknowledges that personal feelings of moral obligation or responsibility will also impact all constructs of the theory, making a potentially significant contribution to the intention (Ajzen, 1991). Additionally, the construct of perceived behavioural control takes into account past experience as well as anticipated obstacles. As the majority of participants had undergone previous CPR training (n = 13), this may also have shaped their perceptions. Most importantly, when people are eager to undertake CPR training it is important that there are few obstacles and they are presented with the opportunity to easily engage in training, such as including training in a cardiac rehabilitation program.

The level of responsibility felt by spouses is not surprising. The gendered nature of care has been well documented not only in cardiovascular health but in other domains (Allen, 1994; Thompson et al., 1995). Male spouses in our sample did not appear to feel the same level of responsibility however. While spouses did feel a responsibility to care for their partners, the desire to learn CPR did not always directly stem from the feeling of responsibility as training was seen as a worthy skill to have. Previous research with this population has identified that knowing what to do in an emergency is of high priority to both patients and spouses (D. Moser et al., 1993). Further to this it has been demonstrated that knowing CPR aids in increasing a sense of control around the patients' condition (D. K. Moser & Dracup, 2000) and is important in preventing delays in treatment so often seen for this population (Bray et al., 2015; McKinley et al., 2011), should a future event take place. The role a spouse plays in a

patients' recovery and care poses important questions and implications as what the experience is like for patients who live alone or who don't have extended family networks to rely on.

The only other qualitative work surrounding attitudes and intentions towards CPR training has been conducted by Vaillancourt et al (2014). Positive attitudes and intentions were also found in their sample of urban and rural Canadians aged 55 years and older. This study also used the TPB and similar to our study found positive outcomes for each construct for both undertaking CPR training and performing CPR for a victim. The authors identify that facilitators to training would be to increase the peer pressure to learn for those who live with a spouse or care for grandchildren. In addition, making training convenient, or in our case, routinely part of secondary prevention programs is important.

Our study needs to be considered with the following limitations. The sample may be subject to bias as those who participated are likely to be more proactive and motivated individuals. Participants however, received no compensation for their time, other than the chance to speak with a health care professional who undertook the interviews and is from the acute care setting. We also only included English speaking patients- further research is required with those from non-English speaking backgrounds. While our sample was small and from one hospital, we are confident that the themes we identified reflect the most typical emotions and intentions of patients as they are consistent with international literature.

CONCLUSION

Cardiac patients and their spouses described unmet patient education and information needs following an acute cardiac event. New strategies are required to ensure adequate education both during the inpatient phase and beyond hospital discharge. Information appeared to decrease negative emotions associated with the event and increase feelings of control.

Including CPR training is an element of information this population would like included in patient education. Participants demonstrated positive attitudes and intent towards learning CPR training if included within a cardiac rehabilitation program.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Allen, S. M. (1994). Gender Differences in Spousal Caregiving and Unmet Need for Care. *Journal of Gerontology*, *49*(4), S187–S195. https://doi.org/10.1093/geronj/49.4.S187

Australian Institute of Health and Welfare. (2013). *How many people have cardiovascular disease?* Canberra: AIHW. Retrieved from http://www.aihw.gov.au/cardiovascular-health/prevalence/

Australian Institute of Health and Welfare. (2014). *Cardiovascular disease, diabetes and chronic kidney disease— Australian facts: Prevalence and incidence.* (Cardiovascular, diabetes and chronic kidney disease series no. 2. No. Cat. no. CDK 2.). Canberra: AIHW. Retrieved from http://www.aihw.gov.au/cardiovascular-health/prevalence/

Blewer, A. L., Putt, M. E., Becker, L. B., Riegel, B. J., Li, J., Leary, M., … Delany, S. (2016). Video-Only Cardiopulmonary Resuscitation Education for High-Risk Families Before Hospital Discharge A Multicenter Pragmatic Trial. *Circulation: Cardiovascular Quality and Outcomes*, *9*(6), 740–748.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/http://dx.doi.org.ezproxy.lib.monash.edu.au/10.1191/1478088706qp063oa

Bray, J. E., Stub, D., Ngu, P., Cartledge, S., Straney, L., Stewart, M., … Finn, J. (2015). Mass Media Campaigns' Influence on Prehospital Behavior for Acute Coronary Syndromes: An Evaluation of the Australian Heart Foundation's Warning Signs Campaign. *Journal of the American Heart Association*, *4*(7), e001927.

Campbell, E. (2009). Nurse as Educator: Principles of Teaching and Learning for Nursing Practice. *AORN Journal*, *90*(6, Supplement), S122–S123. https://doi.org/10.1016/j.aorn.2009.11.012

Cartledge, S., Finn, J., Bray, J. E., Case, R., Barker, L., Missen, D., … Stub, D. (2017). Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study. *European Journal of Cardiovascular Nursing*, In press. https://doi.org/10.1177/1474515117721010

Cheng, Y. C. (1997). Targeted mass CPR training for families of cardiac patients - Experience in Taipei city. *Tzu Chi Medical Journal*, *9*(4), 273–278.

Chew, D. P., French, J., Briffa, T. G., Hammett, C. J., Ellis, C. J., Ranasinghe, I., … others. (2013). Acute coronary syndrome care across Australia and New Zealand: the SNAPSHOT ACS study. *The Medical Journal of Australia*, *199*(3), 185–191.

Chew, D. P., Scott, I. A., Cullen, L., French, J. K., Briffa, T. G., Tideman, P. A., … Aylward, P. E. G. (2016). National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016. *Heart, Lung and Circulation*, *25*(9), 895–951. https://doi.org/10.1016/j.hlc.2016.06.789

Chow, C. K., Redfern, J., Hillis, G. S., Thakkar, J., Santo, K., Hackett, M. L., … Thiagalingam, A. (2015). Effect of Lifestyle-Focused Text Messaging on Risk Factor Modification in Patients With Coronary Heart Disease: A Randomized Clinical Trial. *JAMA*, *314*(12), 1255–1263. https://doi.org/10.1001/jama.2015.10945

Dracup, K., Heaney, D., Taylor, S., Guzy, P., & Breu, C. (1989). Can family members of high-risk cardiac patients learn cardiopulmonary resuscitation?. *Archives of Internal Medicine*, *149*(1), 61–4.

Fleury, J., & Moore, S. M. (1999). Family-centered care after acute myocardial infarction. *Journal of Cardiovascular Nursing*, *13*(3), 73–82.

Godin, G., & Kok, G. (1996). The Theory of Planned Behavior: A Review of Its Applications to Health-related Behaviors. *American Journal of Health Promotion*, *11*(2), 87–98. https://doi.org/10.4278/0890-1171-11.2.87

Goldberg, R. J. (1987). Physicians and CPR training in high-risk family members. *American Journal of Public Health*, *77*(6), 671–672.

Grbich, C. (1999). *Qualitative Research in Health*. NSW: Allen & Unwin.

Grbich, C. (2013). *Qualitative data analysis: an introduction* (2nd ed.). London ; Thousand Oaks, Calif.: SAGE Publications.

Hamberg, K., Johansson, E., Lindgren, G., & Westman, G. (1994). Scientific Rigour in Qualitative Research—Examples From a Study of Women's Health in Family Practice. *Family Practice*, *11*(2), 176–181. https://doi.org/10.1093/fampra/11.2.176

Hansen, E. C. (2006). *Successful qualitative health research: a practical introduction*. NSW: Allen & Unwin.

Hanssen, T. A., Nordrehaug, J. E., & Hanestad, B. R. (2005). A Qualitative Study of the Information Needs of Acute Myocardial Infarction Patients, and Their Preferences for Follow-up Contact After Discharge. *European Journal of Cardiovascular Nursing*, *4*(1), 37–44. https://doi.org/10.1016/j.ejcnurse.2004.11.001

Haugk, M., Robak, O., Sterz, F., Uray, T., Kliegel, A., Losert, H., … Domanovits, H. (2006). High acceptance of a home AED programme by survivors of sudden cardiac arrest and their families. *Resuscitation*, *70*(2), 263–274. https://doi.org/10.1016/j.resuscitation.2006.03.010

Hertz, R. (1997). *Reflexivity & Voice*. United States of America: SAGE Publications, Inc.

Hewitt, J. (2007). Ethical Components of Researcher—Researched Relationships in Qualitative Interviewing. *Qualitative Health Research*, *17*(8), 1149–1159. https://doi.org/10.1177/1049732307308305

Hutchinson, S. A., Wilson, M. E., & Wilson, H. S. (1994). Benefits of Participating in Research Interviews. *Image: The Journal of Nursing Scholarship*, *26*(2), 161–166. https://doi.org/10.1111/j.1547-5069.1994.tb00937.x

LeCompte, M. D. (2000). Analyzing Qualitative Data. *Theory Into Practice*, *39*(3), 146.

McKinley, S., Aitken, L. M., Marshall, A. P., Buckley, T., Baker, H., Davidson, P. M., & Dracup, K. (2011). Delays in presentation with acute coronary syndrome in people with coronary artery disease in Australia and New Zealand. *Emergency Medicine Australasia*, *23*(2), 153–161. https://doi.org/10.1111/j.1742-6723.2011.01385.x

Moser, D., Dracup, K., & Marsden, C. (1993). Needs of recovering cardiac patients and their spouses: compared views. *International Journal of Nursing Studies*, *30*(2).

Moser, D. K., & Dracup, K. (2000). Impact of cardiopulmonary resuscitation training on perceived control in spouses of recovering cardiac patients. *Research in Nursing & Health*, *23*(4), 270–278.

Pattenden, J., Watt, I., Lewin, R. J. P., & Stanford, N. (2002). Decision making processes in people with symptoms of acute myocardial infarction: qualitative study. *BMJ*, *324*(7344), 1006. https://doi.org/10.1136/bmj.324.7344.1006

Redfern, J., Thiagalingam, A., Jan, S., Whittaker, R., Hackett, M., Mooney, J., … Chow, C. (2014). Development of a set of mobile phone text messages designed for prevention of recurrent cardiovascular events. *European Journal of Preventive Cardiology*, *21*(4), 492–499. https://doi.org/10.1177/2047487312449416

Schneider, L., Sterz, F., Haugk, M., Eisenburger, P., Scheinecker, W., Kliegel, A., & Laggner, A. N. (2004). CPR courses and semi-automatic defibrillators — life saving in cardiac arrest? *Resuscitation*, *63*(3), 295–303. https://doi.org/10.1016/j.resuscitation.2004.06.005

Schwandt, T. (2007). *The SAGE Dictionary of Qualitative Inquiry*. 2455 Teller Road, Thousand Oaks California 91320 United States of America: SAGE Publications, Inc. https://doi.org/10.4135/9781412986281

Thompson, D. R., Ersser, S. J., & Webster, R. A. (1995). The experiences of patients and their partners 1 month after a heart attack*. *Journal of Advanced Nursing*, *22*(4), 707–714. https://doi.org/10.1046/j.1365-2648.1995.22040707.x

Vaillancourt, C., Charette, M., Kasaboski, A., Brehaut, J. C., Osmond, M., Wells, G. A., … Grimshaw, J. (2014). Barriers and facilitators to CPR knowledge transfer in an older population most likely to witness cardiac arrest: a theory-informed interview approach. *Emergency Medicine Journal*, *31*(9), 700–705. https://doi.org/10.1136/emermed-2012-202192

Vosbergen, S., Janzen, J., Stappers, P. J., van Zwieten, M. C. B., Lacroix, J., Idema, K., … Peek, N. (2013). A qualitative participatory study to identify experiences of coronary heart disease

patients to support the development of online self-management services. *International Journal of Medical Informatics*, *82*(12), 1183–1194. https://doi.org/10.1016/j.ijmedinf.2013.09.001

Wilkins, E., Wilson, L., Wickramasinghe, K., Bhatnagar, P., Leal, J., Luengo-Fernandex, R., … Townsend, N. (2017). *European Cardiovascular Disease Statistics 2017 edition* (pp. 1–192). Belgium: European Heart Network.

4.7 Summary of Chapter Four

Obtaining and analysing qualitative data played an important role in understanding the experiences and the perspectives of this high-risk cardiac population, who, as the data in this study show, have been through a stressful event provoking fear and generating unknowns. The importance of the role that information plays in decreasing negative emotions, increasing control and decreasing the level of responsibility felt by spouses reinforces the need for patients as well as their family members to attend cardiac rehabilitation. Even after this stressful experience, most participants (11 of 12 patient–spouse pairs) expressed the view that they would like to undertake BLS training, and suggested that the right time to learn would be during cardiac rehabilitation. High value was placed on education and information in disease management, and this extended to knowing the necessary steps to take should a future cardiac arrest emergency occur – not only for their immediate family but for others. Strong intentions to undertake future BLS training were evident.

Chapter Five: Prevalence of basic life support training in Cardiac Rehabilitation Programs in Australia and New Zealand

5.1 Overview of Chapter Five

The qualitative study described in Chapter Four found that cardiac patients and their family members identified cardiac rehabilitation as the right setting to undertake BLS training. This chapter addresses the fourth objective of this thesis – to determine the current prevalence of BLS training in cardiac rehabilitation programs in Australia and New Zealand.

5.2 Background and Context

Cardiac rehabilitation is an essential component of the recovery from an acute cardiac event. These secondary prevention outpatient programs aim to support the recovery of cardiac patients and their family members and to improve quality of life.[95] Programs typically incorporate supervised exercise, followed by education on topics including medication management, diet, smoking cessation and risk factor modification.[57,58] As modifiable risk factors account for approximately 80% of CHD,[96] it is imperative that patients with cardiovascular disease are educated in long-term self-management strategies to reduce the risk of further cardiac events, hospital readmissions and premature death.[97] All major international evidence-based acute coronary syndrome (ACS) guidelines[85,98,99] include referral and attendance at cardiac rehabilitation with a class I recommendation. Classes of recommendations are generally linked to robust levels of evidence and provide guidance to clinicians that a procedure or treatment is effective or beneficial. Class I denotes the highest possible level of recommendation.

In Australia, a class I recommendation is informed by systematic reviews and meta-analyses of randomised controlled trials.[100] The most recent meta-analysis, conducted in 2016,

demonstrated that exercise-based cardiac rehabilitation reduced the risk of cardiovascular mortality significantly.[58] An overview of six Cochrane systematic reviews of cardiac rehabilitation, conducted in 2014, concluded that exercise-based cardiac rehabilitation improved health-related quality of life, decreased hospital admissions and *may* reduce long-term mortality.[101] However, studies have shown a clear reduction in mortality in certain groups of patients attending cardiac rehabilitation, such as those following percutaneous coronary intervention[102] and patients with stable angina, myocardial infarction or post-coronary artery bypass grafting.[103]

In Australia, ACS guidelines are developed for both Australia and New Zealand by The Cardiac Society of Australia and New Zealand and the National Heart Foundation of Australia.[85] However, while New Zealand has specific evidence-based cardiac rehabilitation guidelines (2002),[104] Australia does not. Instead Australia has many documents that provide guidance or recommendations.[95,105] Most recently, the Australian Cardiovascular Health and Rehabilitation Association (ACRA) – the national cardiac rehabilitation health professional organisation – released a document providing a summary of current evidence to establish core components for Australian cardiac rehabilitation services.[57]

Both Australian recommendations and New Zealand guidelines highlight the importance of family attending cardiac rehabilitation with the patient;[57,106] it encourages and supports patient program participation and aids in long-term behaviour changes.[61] Additionally, family members may have the same risk profile as the patient, and can therefore benefit from the education and support provided at cardiac rehabilitation.[61] Family members attending cardiac rehabilitation enables delivery of BLS training to both the patient and family, in a supportive environment and at an opportune time, when health education is being delivered. While BLS training is specifically included in New Zealand cardiac rehabilitation guidelines,[104] it is not included in any of the Australian recommendation documents.

As Australia and New Zealand are neighbouring countries, both with significant indigenous populations and shared ACS guidelines, research projects such as the study presented in this chapter are often conducted across both countries. While there are many similarities between the countries, the effect of differing cardiac rehabilitation recommendations and guidelines was important to consider and examine.

5.3 Research aims

The principal aim of this study was to measure the prevalence of BLS training in cardiac rehabilitation programs in Australia and New Zealand. Barriers to providing BLS training were also investigated, and attitudes of cardiac rehabilitation coordinators were examined towards BLS training in general.

5.4 Methods overview

This cross-sectional, anonymous survey was conducted with cardiac rehabilitation coordinators between October 2014 and January 2015. The survey instrument was administered online through SurveyMonkey®,[107] but a paper version was available on request.

The survey instrument for each country (Appendix D) consisted of 33 questions in three sections: 1) characteristics of cardiac rehabilitation programs and demographics of the respondent; 2) current provision of BLS training within the program and barriers to training; and 3) coordinators' attitudes towards BLS training. These questions were based on previous research conducted in Scotland by Richardson and Lie,[62,63] thus strengthening content validity. Additionally, the instrument was assessed for face validity by two senior cardiac rehabilitation coordinators.

The trustworthiness of the survey was further strengthened through ACRA endorsement (Appendix D). As many Australian cardiac rehabilitation coordinators are members of ACRA, it was anticipated that endorsement would increase the response rate, especially in Australia. In order to achieve endorsement, the project is reviewed by the ACRA president, in addition to two ACRA members with expertise in the area (one academic member and one senior health professional). Once questions are satisfied, the ACRA executive committee then makes a final endorsement decision.

In addition to obtaining endorsement, it was essential for me to engage with the cardiac rehabilitation community in Australia through attendance at both state and national ACRA events. This provided invaluable opportunities to discuss the research with the potential respondents while the study protocol was under development.

Upon completion of the survey, many coordinators emailed me directly with messages about the survey's effect of increasing awareness of the need to target BLS training to their clients. This was an unanticipated but positive effect of this study.

5.5 Manuscript, Paper Four

The following paper, "Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand?" was published in *Heart, Lung and Circulation* in 2016.

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ORIGINAL ARTICLE

Do Cardiac Rehabilitation Programs Offer Cardiopulmonary Resuscitation Training in Australia and New Zealand?

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Background Cardiac rehabilitation may provide an ideal environment to train high-risk cardiac patients and their families in cardiopulmonary resuscitation (CPR). However, whether this training is currently offered is unknown. The aims of this study were to: 1) describe the prevalence of CPR training in cardiac rehabilitation programs in Australia and New Zealand (NZ); and 2) examine perceived barriers and attitudes of cardiac rehabilitation coordinators towards providing CPR training.

Methods We conducted a cross-sectional online survey of Australian and NZ cardiac rehabilitation coordinators.

Results We received 253 completed surveys (46.7% response rate) (Australia n=208, NZ n=45). Cardiopulmonary resuscitation training was included in 23.9% of Australian programs and 56.6% in NZ. Common barriers to CPR training included lack of resources (49.7%) and a lack of awareness to provide CPR training for this high-risk group (33.7%). The majority of coordinators believed that lay people should be trained in CPR (96.3%) and were comfortable with recommending CPR training to this high-risk group (89.4%).

Conclusions While cardiac rehabilitation coordinators have positive attitudes towards CPR training, it is not currently part of most programs – particularly in Australia. Organisations formulating cardiac rehabilitation recommendations and guidelines should give consideration to include the provision of CPR training.

Keywords Cardiopulmonary resuscitation • Rehabilitation • Education • Cardiovascular nursing • Heart arrest • Death • Sudden cardiac

Introduction

Out of hospital cardiac arrest (OHCA) is a major public health problem [1]. Global incidence of OHCA is estimated at 95.9 per 100,000 person-years [2]. Despite advances in pre- and post-resuscitation therapies, for example, increasing access to public defibrillators, survival remains low and is variable between countries [2]. In Australia and New Zealand (NZ) survival to hospital discharge after OHCA ranges between 6 – 13% [2].

Survival from OHCA is often dependent on bystanders performing Basic Life Support (BLS), prior to an ambulance arriving [3]. The sequence of steps in BLS includes, recognition of the condition, calling for help and commencing

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cardiopulmonary resuscitation (CPR) [4]. The concept of targeting BLS training, and specifically CPR training, to those persons most likely to witness a cardiac arrest has been advocated for over 25 years [5]. One identified target group is the family members of patients who have suffered a heart attack, as they are at high-risk of repeat events including OHCA [5,6].

There have been many attempts to target CPR training to cardiac patients and their family members [7–10]. These studies have included public training sessions [7] and programs conducted during or after hospitalisation [8–10]. However, such strategies are resource intensive and have had low rates of recruitment. Future programs must consider the timing of training, which must be balanced with consideration of the patient's condition and potential overload with other health information [11]. In addition, strategies that utilise existing infrastructure are likely to be more feasible.

Cardiac rehabilitation provides education about secondary prevention of heart disease for patients who have suffered an acute cardiac event and is usually conducted in the outpatient setting. Such programs provide an ideal point of capture for cardiac patients in a less acute phase of recovery. Currently, cardiac rehabilitation guidelines vary widely in their recommendations for BLS or CPR training [12–16]. Furthermore, it is unknown if cardiac rehabilitation programs are actually offering CPR training. Our study aims to measure the prevalence of CPR training in cardiac rehabilitation programs across Australia and NZ. In addition, we sought to identify the barriers to providing CPR training, as well as cardiac rehabilitation coordinators' attitudes towards bystander CPR and CPR training.

Subjects and Methods

An online, anonymous, cross sectional survey was conducted from October 2014 to January 2015. This study was approved by Monash University Human Ethics Research Committee (CF14/2889 – 2014001596). Contact details for 575 coordinators of cardiac rehabilitation programs across Australia and NZ were identified from two national public registers. Coordinators were invited via email to complete the survey, with 542 email invitations successfully sent.

We developed survey questions based on previous research conducted by Richardson and Lie in the UK [17,18]. Our survey consisted of 33 questions in three sections; (1) characteristics of the cardiac rehabilitation program and demographics of the coordinators; (2) current provision of CPR training and barriers to training; and (3) coordinators' attitudes towards CPR training using a five-point Likert-scale. We added an additional question to ascertain whether coordinators would consider using a self-instructional CPR training kit.

Two local cardiac rehabilitation coordinators reviewed the survey for face validity and the survey was piloted on 30 participants. Only minimal changes were required; the addition of categories to response options and re-wording of some questions. The survey took coordinators 10 – 15 minutes to complete. A paper-based version of the survey was also provided if requested.

Statistical Analysis

Following descriptive analysis, we performed tests of association using the chi-squared statistic to compare a priori defined sub-groups: Australia and NZ, rural and metropolitan regions, and the presence or absence of a resuscitation coordinator at the rehabilitation site. Statistical significance level was set at $p<0.05$. Analysis was conducted with SPSS v20 (Armonk, NY: IBM corp).

Results

Of the 542 cardiac rehabilitation coordinators who were successfully emailed, 253 (46.7%) participated in the survey. There were similar response rates achieved in Australia (45.6%) and NZ (52.3%). Responses were received from every state and territory in Australia and 13 of 16 regions in NZ. Data from two coordinators were excluded as there was no cardiac rehabilitation program currently running at these sites. The majority of respondents were nurses (81.5%) and female (89.1%)(Table 1).

Characteristics of Cardiac Rehabilitation Programs

The characteristics of cardiac rehabilitation programs were similar for both countries. Most cardiac rehabilitation programs were conducted outside of a major capital city (67%) and were in the public sector (86%). Most programs were well-established, with 63% operating for more than 10 years, and most were linked to hospitals (59%) or community health services (35%). Several differences between the two countries were observed, with NZ having higher rates of independent programs not linked to hospitals (24.4% vs 2.9%, $p<0.001$) and more regular family attendance in the program (48.9% vs 28.9%, $p = 0.01$).

CPR Training and Information Provision

Overall, CPR training was conducted in 74 (29.7%) cardiac rehabilitation programs, and was offered in more NZ programs than Australian (56.6% vs. 23.9%, $p<0.001$)(Table 2). Most commonly the training was a component of the cardiac rehabilitation program (81.1%), as opposed to an optional (9.5%) or stand-alone (2.7%) session. The majority of programs provided education on the other components of BLS, namely, the warning signs of a heart attack (94%) and how to call for an ambulance (90%). Verbal or written information about CPR or where to receive training was provided in 26.3% of programs, and more often in NZ (47.4% vs 23.7%, $p=0.05$).

In programs conducting CPR training, it was primarily offered to patients (97%) and immediate family members (85.1%). In most programs the duration of CPR training was one hour or less (79%), and was given by cardiac

Table 1 Characteristics of cardiac rehabilitation coordinators.

		Australia n = 206 %	New Zealand n = 45 %	Total n = 251 %
Role	Nurse	85.8	61.4	81.5
	Physiotherapist	8.3	4.5	7.7
	Exercise Physiologist	2.5	9.1	3.6
	Other	3.4[a]	25.0[a] (p<0.001)	7.2
Sex	Female	91.1	79.5	89.1
	Male	8.9[a]	20.5[a] (p=0.034)	10.9
Age	21-34 years	8.3	11.4	8.9
	35-44 years	23.0	9.1	20.6
	45-54 years	37.3	34.1	36.7
	>55 years	31.4	45.5	33.8
Total time worked in CR	1 – 5 years	32.8	31.8	32.6
	6 – 10 years	34.8	31.8	34.3
	11 – 20 years	32.4	36.4	33.1

[a]comparison between countries
CR - cardiac rehabilitation

Table 2 Cardiopulmonary resuscitation training provision in cardiac rehabilitation.

	Australia n = 206 %	New Zealand n = 45 %	Total n = 251 %
CPR training provided[b]	23.9[a]	56.6[a] (p=<0.001)	29.7
Part of the CR program	85.7	72.0	81.1
Part of patient support group	6.1	20.0	10.8
Additional optional training	6.1	16.0	9.5
Stand-alone training	2.0	4.0	2.7
Mode of training[b]			
Face to face	69.4	52.0	63.5
Self-instructional kit	30.6[a]	8.0[a] (p=0.029)	23.0
Accredited course	6.1	8.0	6.8
Non-accredited course	14.3	20.0	16.2
Training provided to[b]			
Patients	97.8	95.2	97.0
Family	82.6	90.5	85.1
Extended family	30.4	42.9	34.3
Friends	32.6	33.3	32.8

[a]comparison between countries
[b]multiple answers allowed
CR - cardiac rehabilitation

rehabilitation staff (62.2%) or a Registered Nurse (33.8%). Most classes were delivered face-to-face (63.5%), with self-instructional CPR training kits more commonly used in Australia (30.6% vs 8%, p = 0.03). Specifically, the Ambulance Victoria ''4 Steps for Life'' training kit [19] was used at almost half (46.7%) of these Australian sites.

Overall, the majority of coordinators would consider using a self-instructional CPR training kit. Over 66% of

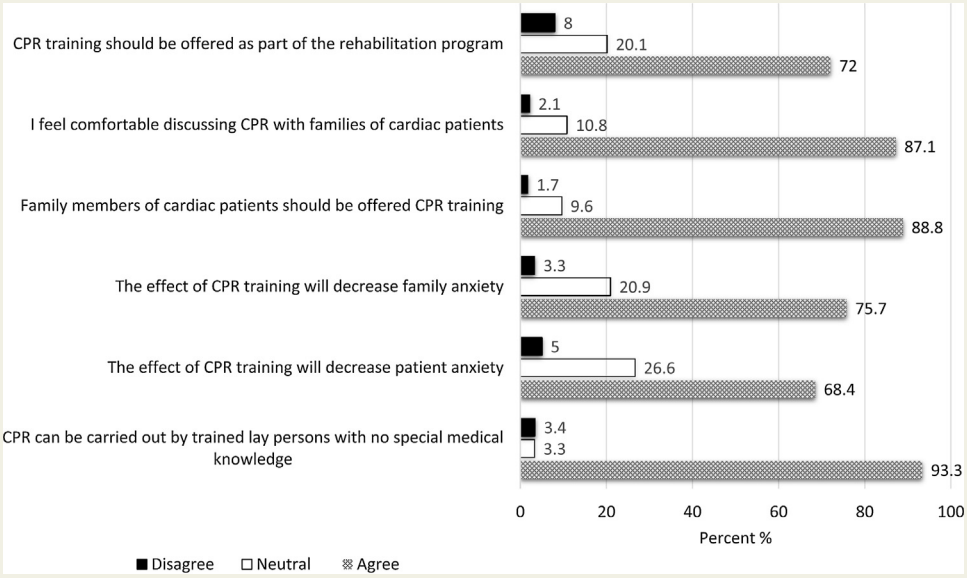

Figure 1 Attitudes of cardiac rehabilitation coordinators towards cardiopulmonary resuscitation training and provision (%).

coordinators agreed they would use a kit during the cardiac rehabilitation program (66.9%), to give to patients and families to take home (53.9%), or both (29.9%). Those who would not utilise this type of training (11.4%) cited cost as the most prohibitive factor.

Of the cardiac rehabilitation programs providing CPR training, the majority had been delivering CPR training for between three to 10 years (40.3%), with 31.3% for over 10 years and the remaining 28.3% for one to two years. When coordinators at these sites were asked to estimate the number of patients and family members trained in the previous calendar year, the median numbers trained were 50 patients (IQR25-150) and 20 family members (IQR10-50).

There was no significant difference in CPR training provision by the location of programs (metropolitan 33.3% vs non-metropolitan 66.7%, $p = 0.36$), or the presence of a designated resuscitation coordinator at the site (resuscitation coordinator present 64.3% vs. no resuscitation coordinator 30.9%, $p = 0.07$).

Barriers to CPR Training and Information Provision

Of the 175 programs not providing CPR training, the most common barriers were lack of resources (49.7%), having ''never thought'' of including CPR training in the program (33.7%), and lack of time (11.4%). However, 10.5% of coordinators planned to include CPR training in the future.

Attitudes of Coordinators towards CPR Training and Provision

The majority of coordinators agreed that lay people should be trained in CPR (96.3%) and were capable of carrying out CPR (93.3%) (Figure 1). Over two-thirds of coordinators believed that CPR training would decrease both patient and family anxiety.

Attitudes towards targeting CPR training in this high-risk cardiac population were largely positive, with 66.1% of respondents agreeing that training could be suggested by hospital staff before discharge and 88.8% agreeing that family members of cardiac patients should be offered training. There was a positive response to having CPR training as part of the cardiac rehabilitation program (72% agreed) and feeling comfortable discussing (87.1% agreed) and recommending CPR training to families of cardiac patients (89.4% agreed).

Discussion

Our study is the first to describe the prevalence of CPR training and education in cardiac rehabilitation programs across Australia and NZ. Our results show that although cardiac rehabilitation coordinators have positive attitudes towards CPR training, it is not routinely provided in cardiac rehabilitation programs–particularly in Australia.

Differences in cardiac rehabilitation recommendations and healthcare systems between Australia and NZ may explain some of the variation in training practices between the two countries. Australian recommendations state that patients and family should have an action plan for ''early response to symptoms of a possible heart attack'',[15 p4] whereas NZ guidelines state that CPR training should be provided to ''spouse, partner, whānau [Māori extended family] and family as well as the patient''.[16 p64] In NZ there is also a larger cultural emphasis on families being involved in health

care [20], and this may explain why more relatives attended cardiac rehabilitation programs than in Australia.

Our findings are supported by the only other study to survey CPR training prevalence in cardiac rehabilitation programs, which was conducted in Scotland nearly 20 years ago [17,18]. Surprisingly, little has changed since then, with a similar prevalence of CPR training reported. This low prevalence was despite a Scottish Health Service Advisory Committee report suggesting training be offered in cardiac rehabilitation programs five years earlier [21]. Furthermore, the Scottish survey also found other BLS information, about warning signs of heart attack and accessing emergency services, was not provided in 100% of programs. Recognition of a heart attack and activating help are the crucial first steps in BLS and are essential education components to include in cardiac rehabilitation programs.

The barriers to providing CPR training in Australian and NZ cardiac rehabilitation programs were also consistent with those described in the Scottish survey; with resources, time and a lack of awareness of targeting CPR training to this high-risk group commonly cited. Some of these barriers may now be overcome with the use of self-instructional training kits, which are currently used in only a small proportion of Australian and NZ programs. This is a new approach to CPR training, allowing participants to learn CPR in 30 minutes independently. These kits are as effective as traditional face-to-face classes in learning CPR [22–24] and can be shared with significant others in the patient's household and social circle. The cardiac rehabilitation coordinators in our survey indicated that they would consider using a self-instructional kit such as the ''Family and Friends CPR Anytime'' kit [25] for CPR training. This would be an easy to implement, effective training modality to employ across all cardiac rehabilitation programs. It may also prove to be a cost-effective solution as one kit can train multiple people and there is no need to employ a specific trainer or purchase expensive training manikins. A similar, lower fidelity training kit (''4 Steps For Life'') is already in use in a small number of Australian programs.

Our findings do need to be considered with the following limitations. Although we achieved a reasonable response rate to the survey, there may have been some selection bias. Coordinators whose programs provided CPR training may have been more willing to complete the survey. Responses were anonymous, and while this may have aided the response rate, we could not go back and clarify any conflicting or missing responses. A small group (n = 17) of cardiac rehabilitation coordinators were responsible for more than one site. This was not captured in the data collection, nor if there were differences in responses between each site.

Conclusion

In summary, our study identified that while CPR training and education is included in some cardiac rehabilitation programs in Australia and NZ, the prevalence is low, especially in Australia. While cardiac rehabilitation coordinators have positive attitudes towards the provision and training of CPR, barriers such as awareness, resources and time will need to be addressed, in order to implement training consistently. Organisations formulating cardiac rehabilitation recommendations and guidelines should give consideration to include the provision of this training, as this has been somewhat successful in NZ. As there are now many CPR training modalities available, future research should address which training modality is most appropriate for a cardiac rehabilitation environment. Cardiac rehabilitation programs are a currently underutilised, supportive environment in which to provide CPR training to high-risk cardiac patients and families.

Disclosures

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Dedication

Ms Cartledge would like to dedicate this manuscript to the memory of Professor Henry Krum, one of the finest cardiovascular researchers in the world. His memory will live on through his immense contribution to the field. It was a privilege to work alongside him and he was instrumental in my transition from Research Nurse to PhD Candidate. His knowledge, mentorship, humour and friendship will be greatly missed.

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References

[1] Ornato JP, Becker LB, Weisfeldt ML, Wright BA. Cardiac Arrest and Resuscitation An Opportunity to Align Research Prioritization and Public Health Need. Circulation 2010;122:1876–9.
[2] Berdowski J, Berg RA, Tijssen JGP, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation 2010;81. 1479–87d.
[3] Sasson C, Rogers MAM, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes 2010;3:63–81.

[4] Berg RA, Hemphill R, Abella BS, Aufderheide TP, Cave DM, Hazinski MF, et al. Part 5: Adult Basic Life Support 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2010;122:S685–705.
[5] Goldberg RJ, Gore JM, Love DG, Ockene JK, Dalen JE. Layperson CPR–are we training the right people? Ann Emerg Med 1984;13:701–4.
[6] Hazinski MF, Nolan JP, Billi JE, Bottiger BW, Bossaert L, de Caen AR, et al. Part 1: Executive Summary 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation 2010;122.
[7] Cheng YC. Targeted mass CPR training for families of cardiac patients - Experience in Taipei city. Tzu Chi Med J 1997;9:273–8.
[8] Blewer AL, Leary M, Decker CS, Andersen JC, Fredericks AC, Bobrow BJ, et al. Cardiopulmonary resuscitation training of family members before hospital discharge using video self-instruction: a feasibility trial. J Hosp Med Off Publ Soc Hosp Med 2011;6:428–32.
[9] Dracup K, Guzy P, Taylor S, Barry J. Cardiopulmonary resuscitation (CPR) training. Consequences for family members of high-risk cardiac patients. Arch Intern Med 1986;146:1757–61.
[10] Dracup K, Moser DK, Taylor SE, Guzy PM. The psychological consequences of cardiopulmonary resuscitation training for family members of patients at risk for sudden death. Am J Public Health 1997;87:1434–9.
[11] Hanssen TA, Nordrehaug JE, Hanestad BR. A Qualitative Study of the Information Needs of Acute Myocardial Infarction Patients, and Their Preferences for Follow-up Contact After Discharge. Eur J Cardiovasc Nurs 2005;4:37–44.
[12] Guidelines EC, for S, Corrà U, Piepoli MF, Carré F, Heuschmann P, Hoffmann U, et al. Secondary prevention through cardiac rehabilitation: physical activity counselling and exercise training. Eur Heart J 2010;31:1967–74.
[13] Balady GJ, Williams MA, Ades PA, Bittner V, Comoss P, Foody JM, et al. Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: 2007 Update A Scientific Statement From the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee, the Council on Clinical Cardiology; the Councils on Cardiovascular Nursing, Epidemiology and Prevention, and Nutrition, Physical Activity, and Metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation. Circulation 2007;115:2675–82.
[14] The British Association for Cardiovascular Prevention and Rehabilitation. The BACPR Standards and Core Components for Cardiovascular Disease Prevention and Rehabilitation 2012 (2nd Edition) 2012. British Cardiovascular Society; 2012. Available at: http://www.bacpr.com/resources/46C_BACPR_Standards_and_Core_Components_2012.pdf Accessed April 29, 2015.
[15] National Heart Foundation of Australia, Australian Cardiac Rehabilitation Association. Recommended Framework for Cardiac Rehabilitation 2004. Available at: http://heartfoundation.org.au/images/uploads/publications/Recommended-framework.pdf Accessed August 19, 2014.
[16] New Zealand Guidelines Group. Best Practice Evidence-based Guideline Cardiac Rehabilitation. Wellington (NZ): New Zealand Guidelines Group; Aug 2002. 163 p.
[17] Lie KG, Richardson M. Attitudes of health professionals towards cardiopulmonary resuscitation training for family members of cardiac patients. Coron Health Care 1999;3:91–8.
[18] Richardson ME, Lie KG. Cardiopulmonary resuscitation training for family members of patients on cardiac rehabilitation programmes in Scotland. Resuscitation 1999;40:11–9.
[19] Ambulance Victoria. 4 Steps for Life 2011. Available at: http://ambulance.vic.gov.au/community-education/education/4-steps-for-life-plus-cpr-and-aed-awareness/ Accessed 30 March, 2015.
[20] New Zealand by Mauri Ora Associates. Best health outcomes for Maori: Practice implications 2008.
[21] Scottish Health Service Advisory Committee. Report of the Working Group on Cardio-Pulmonary Resuscitation. London: 1993.
[22] Isbye DL, Rasmussen LS, Lippert FK, Rudolph SF, Ringsted CV. Laypersons may learn basic life support in 24 min using a personal resuscitation manikin. Resuscitation 2006;69:435–42.
[23] Todd KH, Braslow A, Brennan RT, Lowery DW, Cox RJ, Lipscomb LE, et al. Randomized, Controlled Trial of Video Self-Instruction Versus Traditional CPR Training. Ann Emerg Med 1998;31:364–9.
[24] Lynch B, Einspruch EL, Nichol G, Becker LB, Aufderheide TP, Idris A. Effectiveness of a 30-min CPR self-instruction program for lay responders: a controlled randomized study. Resuscitation 2005;67:31–43.
[25] Potts J, Lynch B. The American Heart Association CPR anytime program. J Cardiopulm Resusc 2006;346–54.

5.6 Summary of Chapter Five

The study presented in Chapter Five was the first enquiry into the inclusion of BLS training in cardiac rehabilitation programs in Australia and New Zealand. The results demonstrated a moderate prevalence of BLS training in New Zealand cardiac rehabilitation programs and low prevalence in Australian programs. This significant difference between Australia and New Zealand may be due to the inclusion of BLS training within New Zealand cardiac rehabilitation guidelines and differences in family cultures between countries.

Generally, cardiac rehabilitation coordinators lacked awareness of the importance of providing BLS training to this high-risk cardiac population. Barriers identified by the cardiac rehabilitation coordinators were consistent with those identified in previous research,[62,63] but may be overcome by contemporary BLS training modalities.

Chapter Six: The feasibility of incorporating basic life support training into a cardiac rehabilitation program

6. 1 Overview of Chapter Six

Chapter Five demonstrated that BLS training was provided in less than a quarter of cardiac rehabilitation programs in Australia. However, cardiac rehabilitation coordinators had positive attitudes towards providing training if barriers could be overcome. Informed from the findings from all previous studies presented in this thesis, Chapter Six presents a feasibility study of incorporating BLS training into a cardiac rehabilitation program in the state of Victoria, Australia.

6.2 Background and context

The concept of targeting BLS training to high-risk cardiac populations has been discussed in the literature for over three decades.[35] While a moderate amount of research has been conducted, there is a paucity of contemporary research incorporating new resuscitation guidelines and advances in training modalities and objective skill measurement technology. Many different locations have been trialled as a point of capture for high-risk cardiac patients and their family members, such as private homes,[49–51] outpatient departments[46–48] and community settings,[52–54] More recently, Blewer et al. successfully trialled the provision of training to cardiac patients and their family members in hospital cardiac units in the USA.[44,67,70] However, the research presented in the previous chapters of this thesis demonstrates that the preference of a sample of high-risk cardiac patients and spouses in Victoria, Australia is for BLS training to be incorporated into cardiac rehabilitation programs (Chapter Four). Moreover, cardiac rehabilitation coordinators have positive attitudes towards including BLS training (Chapter Five) if current barriers to delivering training can be

overcome. While cardiac rehabilitation has been proposed as an appropriate setting for targeted BLS training to a high-risk cardiac population,[62,63] to date no interventional study investigating the feasibility of this has been undertaken.

6.3 Research aims

The aims of this research were to investigate the feasibility of incorporating BLS training into a cardiac rehabilitation program for cardiac patients and their family members. The primary outcome was uptake of training by patients and family members, measured by attendance at the scheduled training sessions. Secondary outcomes were willingness and confidence to use CPR skills, psychological distress before and after training, skills assessment, and rate of secondary training.

6.4 Methods overview

This feasibility study was conducted at a private hospital-based cardiac rehabilitation program in Melbourne, Victoria. A public cardiac rehabilitation program was scouted initially, but the large number of studies already underway at this site raised concerns about overburdening both cardiac rehabilitation participants and staff.

Study recruitment was conducted between April and June in 2016. Five BLS training classes were scheduled into the normal education timetable of the program. Class sizes varied considerably across the study period (from an initial five to 24 participants); this was due to a change in practice at the site, in which three groups of cardiac rehabilitation patients were merged into two, thus increasing class sizes. The small initial class size (before the change in practice) was used to advantage of the study, serving as a test of study procedures. These data was included in the analysis.

Like recent targeted BLS training studies,[44,67,70] this study used video self-instruction (VSI) training kits. VSI training was supported by cardiac nurses in face-to-face interactions, as this preference was described by participants in the qualitative study (Chapter Four).

Video self-instruction training kits have many advantages over traditional face-to-face classes: training can be completed in any location, can be repeated (as kits are reusable), and kits can be shared (known as secondary training).[39] Additionally, training is fast (30 minutes) and all required equipment is included, overcoming barriers identified by cardiac rehabilitation coordinators (Chapter Five). Most importantly, however, it has been demonstrated that skills obtained from VSI BLS training are the same as those obtained in a traditional three-hour face-to-face class.[37,38]

To assess skills obtained from the VSI training, a skill-reporting manikin (Resusci Anne QCPR and wireless SimPad Skillreporter, Laerdal Medical) was used. This manikin collects data on CPR metrics such as rate, depth and hand position. The use of objective methods for skill assessment was recommended by ILCOR in the 2015 resuscitation guidelines.[27] Initially there were concerns that study participants might see the skills assessment as a test, but this was disproved at one-month follow-up. Many positive comments were made at this time-point expressing how helpful participants found this aspect of the study, giving them confidence that they were performing skills correctly and safely, and to guideline standards.

6.5 Manuscript, Paper Five

The following paper, "Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: a feasibility study" was published in the *European Journal of Cardiovascular Nursing* in 2017.

European Journal of Cardiovascular Nursing

EUROPEAN SOCIETY OF CARDIOLOGY®

Original Article

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SAGE

Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study

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Abstract

Background: Patients with a cardiac history are at future risk of cardiac events, including out-of-hospital cardiac arrest. Targeting cardiopulmonary resuscitation (CPR) training to family members of cardiac patients has long been advocated, but is an area in need of contemporary research evidence. An environment yet to be investigated for targeted training is cardiac rehabilitation.

Aim: To evaluate the feasibility of providing CPR training in a cardiac rehabilitation programme among patients, their family members and staff.

Methods: A prospective before and after study design was used. CPR training was delivered using video self-instruction CPR training kits, facilitated by a cardiac nurse. Data was collected pre-training, post-training and at one month.

Results: Cardiac patient participation rates in CPR classes were high (n = 56, 72.7% of eligible patients) with a further 27 family members attending training. Patients were predominantly male (60.2%), family members were predominantly female (81.5%), both with a mean age of 65 years. Confidence to perform CPR and willingness to use skills significantly increased post-training (both p<0.001). Post training participants demonstrated a mean compression rate of 112 beats/min and a mean depth of 48 mm. Training reach was doubled as participants shared the video self-instruction kit with a further 87 people. Patients, family members and cardiac rehabilitation staff had positive feedback about the training.

Conclusions: We demonstrated that cardiac rehabilitation is an effective and feasible environment to provide CPR training. Using video self-instruction CPR training kits enabled further training reach to the target population.

Keywords

Cardiac rehabilitation, cardiopulmonary resuscitation, basic life support, training, out of hospital cardiac arrest

Date received: 9 March 2017; accepted: 27 June 2017

Introduction

Cardiopulmonary resuscitation (CPR) training targeted to high-risk populations has been identified by the International Liaison Committee on Resuscitation (ILCOR) as requiring further research evidence.[1] As patients with a cardiac history are at future risk of cardiac events, including out-of-hospital cardiac arrest (OHCA),[2] the concept of targeting CPR training to family members of cardiac patients has long been advocated.[3–6]

Up to 75% of OHCAs occur in a private residence[7–9] and nearly half of these events are witnessed, often by a family member. Bystander CPR is a critical step in the chain of survival for OHCA victims and is associated with a 2.4-fold increase in survival.[10] However, a recent

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systematic review[11] identified that the majority of targeted CPR training studies are now outdated due to recent significant changes in resuscitation guidelines and training modalities. Furthermore, the ideal timing and location of training have not been determined.

To date, targeted CPR training to high-risk cardiac populations has been trialled in environments such as inpatient wards,[12] outpatient clinics,[13,14] private residences[15,16] and public classes.[17,18] An environment yet to be investigated is secondary prevention cardiac rehabilitation programmes. The combination of exercise and education in cardiac rehabilitation programmes has proven to significantly reduce mortality and readmission rates by up to 30%,[19–21] thus cardiac patients are strongly encouraged to attend. Family members are also invited to attend the education component. Cardiac rehabilitation is a logical catchment point for CPR training for both cardiac patients and their family members; however, existing evidence suggests CPR training is often not included.[22]

As there have been no trials of targeted CPR training in cardiac rehabilitation to date, this study aims to evaluate the feasibility of providing CPR training in a cardiac rehabilitation programme among cardiac patients, their family members and staff.

Methods

Design and setting

We conducted a prospective before and after interventional study in a hospital-based cardiac rehabilitation programme, located in Melbourne (population 4.5 million) in the state of Victoria, Australia. This study was approved by Cabrini (02-02-05-16) and Monash University (CF16/1323 - 2016000702) Human Ethics Research Committees and conforms with the principles outlined in the Declaration of Helsinki.

Cabrini Hospital (Malvern site) is a 508 bed acute care hospital. Cardiac rehabilitation is provided on site. Typically 300–350 patients attend the programme annually, which is run by six dedicated nurses, two physiotherapists and other health professionals such as dieticians and psychologists. Cardiac patients, who are typically 4–6 weeks post an acute cardiac admission, attend the programme in groups of 15–20. The programme comprises 1 h of supervised exercise followed by 1 h of cardiac specific education and runs twice weekly for 4–6 weeks. Family members are invited and encouraged to attend education sessions with patients.

Participants

Participants were recruited from April to July 2016. Three groups of participants were enrolled into the study: cardiac rehabilitation patients, family members of patients and cardiac rehabilitation programme staff. We chose to include patients in the training sessions as previous research has shown patients and family members prefer to be trained together.[23]

Cardiac rehabilitation groups (patients and family members) were briefed by an investigator (SC) at the completion of a cardiac rehabilitation session, two weeks before each scheduled CPR training class. The briefing included an overview of the CPR session, an opportunity to ask questions and provision of the patient information and consent forms.

Eligible patients were: enrolled in the cardiac rehabilitation programme; aged >18 years; spoke fluent English; were competent to provide consent; medically stable; and physically able to participate in the training (i.e. no major back or knee injuries). The same criteria applied for family members, in addition to living permanently with the patient enrolled in the cardiac rehabilitation programme.

Cardiac rehabilitation staff were also invited to complete a brief survey once CPR training sessions were complete. Staff were eligible for the study if they had a direct role within the programme.

Study materials

All participants received, at no cost, one Laerdal ‘CPR Now’ video self-instruction (VSI) CPR training kit. This kit uses a ‘practise-as-you-watch’ approach and contains: a 30 min instructional DVD demonstrating traditional 30:2 CPR technique; an inflatable resuscitation manikin with consumables (lungs, cleaning wipes) to allow reuse; a cardboard mock automated external defibrillator with mock adhesive pads; and a cardboard mock mobile phone printed with the Australian emergency telephone number. Participants were also provided with an Australian Resuscitation Council basic life support flow chart.[24]

Intervention

CPR training was introduced into the cardiac rehabilitation programme as a scheduled education session from May to July 2016. Five classes were conducted during this time.

The CPR training session was facilitated by a cardiac nurse (SC). The facilitator introduced the session, answered questions and then played the DVD. The facilitator along with cardiac rehabilitation nurses assisted participants with using the manikin, CPR technique or to pause the DVD and answer questions. Training sessions lasted 30–40 min. At the conclusion of the training the facilitator answered any further questions, and then instructed study participants about the next stage of data collection.

Patients and family members were able to attend the CPR training session and receive the VSI CPR training kit irrespective of study participation.

Data collection

Patient and family data were collected at three time points: pre-training, immediately post-training and at one month post-training via telephone follow-up call. Data were collected on paper-based surveys (Supplementary Material online). In addition, a retrospective chart review of patients' cardiac rehabilitation medical records was conducted to collect demographic and clinical information. Staff surveys were completed once patient and family recruitment was complete.

CPR skill data were collected from a skill-reporting manikin (Resusci Anne QCPR and wireless SimPad SkillReporter, Laerdal Medical) immediately post-training. All manikins were calibrated prior to data collection by an approved technician to ensure accuracy. Participants were asked to perform 1 min of chest compression only CPR, with no instruction or assistance from the facilitator or cardiac rehabilitation nurses. Skill performance feedback was given at the end of 1 min and participants were offered another minute of skill recording, particularly if they had performed poorly. Technique coaching was provided before and during the second attempt. Not all participants were physically able to participate in skill recording due to their cardiac condition (i.e. recent sternotomy).

Outcome measures

The primary outcome was willingness of cardiac patients and their family members to participate in CPR training at cardiac rehabilitation sessions. This was measured by attendance of patients and family members at the scheduled CPR training sessions. Secondary outcomes were: 1) willingness and confidence to use CPR skills (measured at all time points on five-point Likert scales), 2) psychological distress pre- and post-training (measured by the Kessler 10 L3D psychological distress scale[25,26] pre-training and at one month, where 10 is the lowest score, indicating no distress, and 50 is the highest score, indicating severe distress), 3) skills assessment post-training (measured on skill-reporting manikin) and 4) number of times VSI CPR is kit shared by participants. In addition, general feedback about the training using Likert scales and an open ended question was sought at post-training and one month time points.

Cardiac rehabilitation staff also provided feedback on a five-point Likert scale about: 1) feasibility of including CPR training in the programme and 2) how comfortable and confident they were to run CPR training classes. Staff were also able to provide free text feedback about barriers they had identified towards providing CPR training and general comments.

Statistical analyses

Categorical variables are described using proportions and compared using the chi-squared statistic. Continuous variables are presented as mean with standard deviation or median with interquartile range as appropriate. When comparing a continuous outcome over three study time points the Friedman test was used. Post-hoc testing was then conducted using the Wilcoxon Signed Rank Test to assess at which time points significant differences occurred. Effect size (r) was calculated using z scores and dividing z by the square root of the number of cases. Loss to follow-up remained small (Figure 1), with descriptive statistics performed on remaining participants at each time point. Statistical analyses were performed with SPSS v.24 (Armonk, NY: IBM Corp) and p values <0.05 were considered statistically significant.

Open ended questions were coded manually and then grouped according to main themes by one investigator (SC). Themes were then validated by a second investigator (RC).

Results

Participant uptake of training

Of the 77 patients who were eligible, 56 (72.7%) patients enrolled in the study, with a further four observing the training class (Figure 1). Three participants refused as they had undertaken CPR training recently. Patients invited 30 family members to the training sessions and of these 27 enrolled in the study and three observed. This represents a 60.0% capture of attendance from a family member in households where patients lived with others ($n = 50$). Class sizes varied; the first class served as a test and had five participants. The remaining four classes ranged from 14 to 24 participants.

Participant demographics

The mean age of patients was 65 years and 60.2% were male (Table 1). Patients were predominantly married (86.7%), born in Australia (76.8%) and completed education beyond high school level (75.0%). Over one-third of patients ($n = 22$, 39.3%) had undergone percutaneous coronary intervention and 30.4% ($n = 17$) were post-coronary artery bypass grafting surgery. The remaining patients were post-valve repair ($n = 6$, 10.7%), permanent pace maker or implantable cardioverter defibrillator insertion ($n = 4$, 7.1%), coronary angiography ($n = 3$, 5.4%), aortic surgery ($n = 2$, 3.6%), non-ST elevation myocardial infarction ($n = 1$, 1.8%) and Takotsubo cardiomyopathy ($n = 1$, 1.8%).

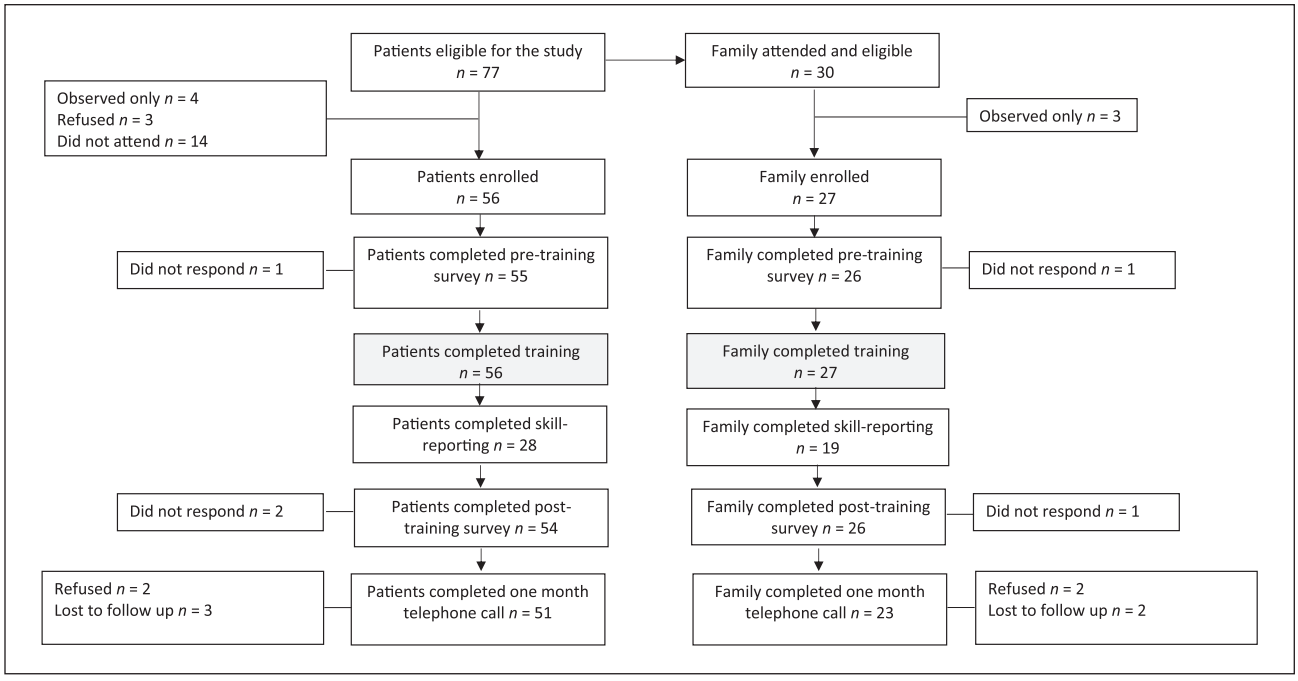

Figure 1. Participant flow and study completion.

The mean age of family members was 65 years and 81.5% were female. Family members were spouses (96.3%) or de facto partners (3.7%), with 59.2% completing education beyond high school level.

Prior CPR training

The majority of participants had heard of CPR (94.0%) and at pre-training ranked their overall knowledge as fair (39.8%) or poor (25.3%). Less than half (45.8%) of all participants had previously undertaken CPR training (Table 1); however, this training was typically not recent with 68.4% of participants trained more than five years ago. Identified barriers to undertaking CPR training were a lack of awareness ('never thought about it') (42.9%), lack of time (28.6%) or not knowing where to go for training (16.7%). Barriers were similar between patients and family members.

Confidence and willingness to use CPR skills

Confidence to perform CPR significantly changed (p <0.001) across the three time points (χ^2 (2, n = 82) = 70.9, p <0.001) (Figure 2). Further analysis revealed a significant increase in confidence (z = −6.46, p < 0.001) from pre- to post-training, with a large effect size (r = 0.54) and remained constant to one month (z = −1.03, p = 0.30).

Willingness to use CPR skills followed a similar pattern. Willingness significantly changed (p <0.001) across the three time points (χ^2 (2, n = 69) = 52.21, p <0.001) (Figure 3). Further analysis revealed a significant increase in willingness (z = −5.321, p < 0.001) from pre- to post-training, with a medium effect size (r = 0.44) and remained constant to one month (z = −1.31, p = 0.19).

Psychological distress

Pre-training levels of psychological distress (n = 75) were low (Table 2). The majority of participants experienced no distress (scores 10–19, n = 67, 89.3%) or mild distress (scores 20–24, n = 7, 9.3%). The median pre-training Kessler-10 score was 14 (interquartile range (IQR) = 5). Only one (1.3%) participant, who was a patient, was experiencing moderate distress (scores 25–29).

A statistically significant decrease (z = −4.345, p < 0.001) in Kessler-10 scores was seen at one month (n = 68), with a median score of 11 (IQR = 3). Scores indicated no distress in 79.3% of participants (n = 65) with only 4.4% (n = 3) experiencing mild distress.

Skill ascertainment and assessment

A total of 47 (56.6%) participants (28 patients, 19 family members) completed 1 min of uninstructed compression only CPR on a skill-reporting manikin. Patients who had a recent sternotomy or device insertion and family members with an injury did not undergo skills assessment. Overall, the rate of compressions were within guideline standards[27] of 110–120/min (112.4/min), with family members generally compressing faster than patients (115.5/min *vs*. 110.3/min) (Table 3). Depth of compressions were mostly just below guideline standards of 50–60mm overall (48.2mm),

Table 1. Characteristics of participants, CPR knowledge, training status and training barriers.

	Total *n* = 83	Patient *n* = 56	Family *n* = 27
Mean age, years (SD)	65.1 (10.5)	65.1 (10.1)	65.2 (11.6)
Male, *n* (%)	50 (60.2)	45 (80.4)	5 (18.5)
Marital status, *n* (%)			
Married	72 (86.7)	47 (83.9)	26 (96.3)
De facto	2 (2.4)	1 (1.8)	1 (3.7)
Single	3 (3.6)	3 (5.4)	0 (0)
Widow	1 (1.2)	1 (1.8)	0 (0)
Did not respond	5 (6.0)	4 (7.1)	1 (3.7)
Lives, *n* (%)			
With someone	69 (83.1)	47 (83.9)	27 (100)
Alone	5 (6.0)	4 (8.9)	0 (0)
Did not respond	9 (10.8)	5 (8.9)	0 (0)
Born, *n* (%)			
Australia	63 (75.9)	43 (76.8)	20 (74.1)
English-speaking country	7 (8.4)	4 (7.1)	3 (11.1)
Non-English speaking country	10 (12.0)	7 (12.5)	3 (11.1)
Did not respond	3 (3.6)	2 (3.6)	1 (3.7)
Education, *n* (%)			
Some high school	5 (6.0)	4 (7.1)	1 (3.7)
High school graduate	15 (18.1)	9 (16.1)	8 (29.6)
Tech college/some university	18 (21.7)	14 (25.0)	4 (14.8)
University diploma/degree	20 (24.1)	14 (25.0)	6 (22.2)
Postgraduate	20 (24.1)	14 (25.0)	6 (22.2)
Did not respond	3 (3.6)	1 (1.7)	2 (7.4)
Have heard of CPR, *n* (%)			
Yes	78 (94.0)	53 (94.6)	25 (92.6)
Did not respond	3 (3.6)	1 (1.8)	2 (7.4)
Overall knowledge of CPR, *n* (%)			
Very poor	11 (13.3)	9 (16.1)	2 (7.4)
Poor	21 (25.3)	14 (25.0)	7 (25.9)
Fair	33 (39.8)	22 (39.3)	11 (40.7)
Good	13 (15.7)	8 (14.3)	5 (18.5)
Excellent	1 (1.2)	1 (1.8)	0 (0)
Did not respond	4 (4.8)	2 (3.6)	2 (7.4)
Previous CPR training, *n* (%)			
Yes	38 (45.8)	24 (42.9)	14 (51.9)
No/unsure	42 (50.6)	31 (55.4)	11 (40.7)
Did not respond	3 (3.6)	1 (1.8)	2 (7.4)
Of those with previous CPR training	*n* = 38	*n* = 24	*n* = 14
Time since last training, *n* (%)			
Trained < 12 months ago	1 (2.6)	0 (0)	1 (7.1)
Trained 1–5 years ago	9 (23.7)	7 (29.2)	2 (14.3)
Trained > 5 years ago	26 (68.4)	16 (66.7)	10 (71.4)
Did not respond / unknown	2 (5.3)	1 (4.2)	1 (7.1)
Of those with no prior CPR training	*n* = 42	*n* = 31	*n* = 11
Reason for not having CPR training, *n* (%)			
Never thought about it	18 (42.9)	14 (45.2)	4 (36.4)
Time	12 (28.6)	9 (29.0)	3 (27.3)
Do not know where to go for training	7 (16.7)	5 (16.1)	2 (18.2)
Cost	1 (2.4)	0 (0)	1 (9.1)
Other	2 (4.8)	2 (6.5)	1 (9.1)
Did not respond	1 (2.4)	1 (3.2)	0 (0)

CPR: cardiopulmonary resuscitation; SD: standard deviation.

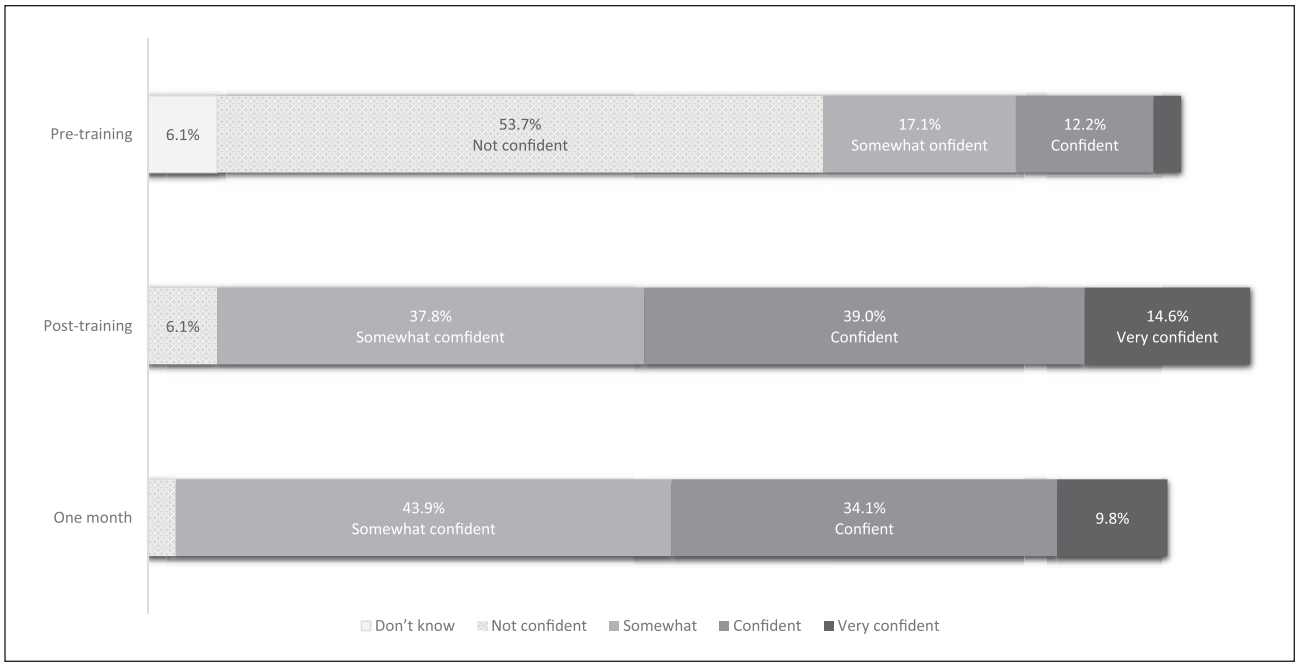

Figure 2. Levels of confidence to perform cardiopulmonary resuscitation skills (n = 82), measured on a five-point Likert scale at three time points. Confidence significantly increased from pre-training to post-training (p <0.001) and with no significant changes from post-training to one month (p = 0.30).

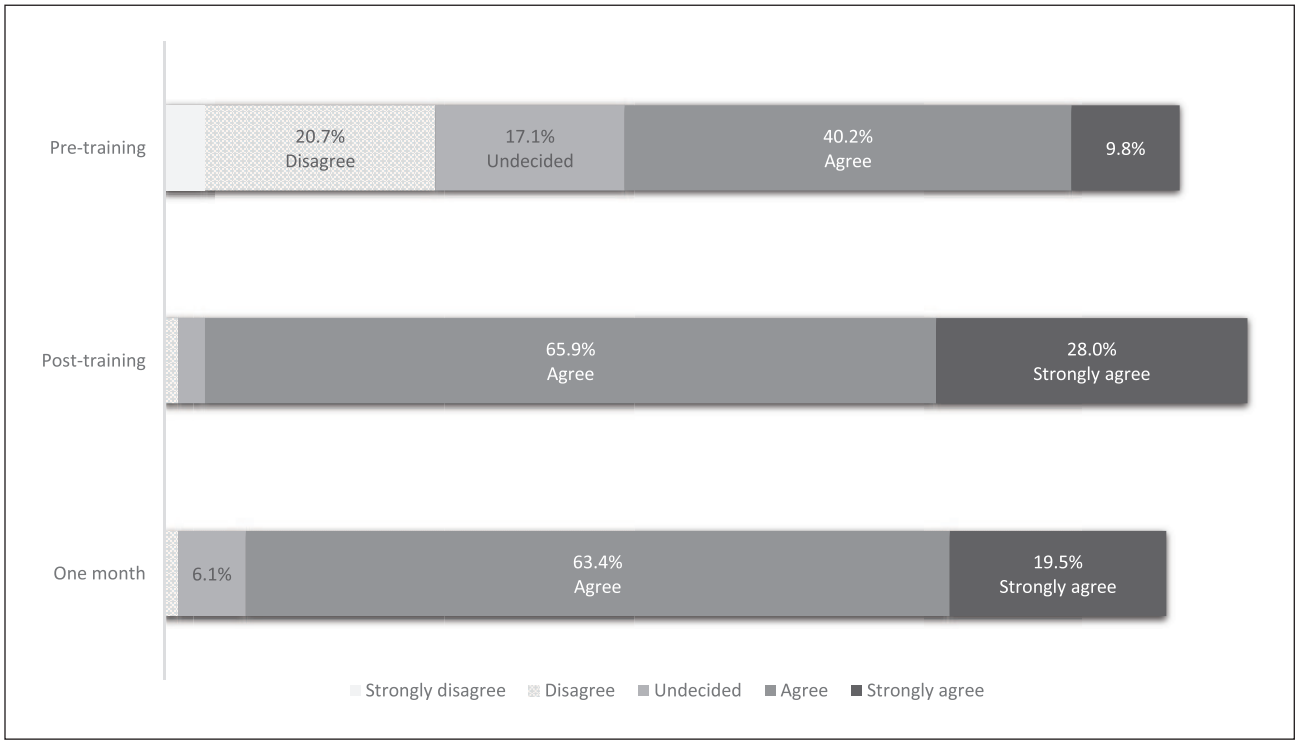

Figure 3. Willingness to use cardiopulmonary resuscitation skills (n = 82), measured on a five-point Likert scale at three time points. Willingness significantly increased from pre-training to post-training (p <0.001) and with no significant changes from post-training to one month (p = 0.19).

with patients achieving a greater depth than family members (50.1mm *vs*. 45.3mm). Overall correct hand position was achieved 84% of the time.

Nine participants (six patients and three family members) elected to complete a second minute of compression only CPR on the skill-reporting manikin following brief

Table 2. Kessler-10 L3D psychological distress scores.

	Total	Patients	Family
Pre-training, *n* = 75, median (IQR)	14 (5)	14 (6)	12 (4)
One month post-training, *n* = 68, median (IQR)	11 (3)*	12 (3)	11 (3)

Scores 10–19: may not be feeling significant feelings of distress; scores 20–24: mild levels of distress; scores 25–29: moderate levels of distress; scores 30–50: severe levels of distress.
*Significant difference ($p<0.001$).
IQR: interquartile range.

Table 3. Skill-reporting data, first attempt.

First attempt	Total *n* = 47	Patient *n* = 28	Family *n* = 19
Rate, beats/min, mean (SD)	112.4 (22.6)	110.3 (26.2)	115.5 (16.1)
Depth, mm, mean (SD)	48.2 (12.3)	50.1 (11.5)	45.3 (13.2)
Average correct hand position, %	84.0	83.6	85

SD, standard deviation; mm: millimetre.

technique instruction. Overall, when compared with the first attempt rate, depth and hand position improved (Table 4).

Training feedback

At the post-training time point participants were asked to rate their satisfaction with the training modality. Most (98.7%) strongly agreed or agreed that the training was easy to follow. Only one participant (1.3%) strongly disagreed. The majority (96%) also strongly agreed or agreed that training ran for an appropriate amount of time, with only 2.7% of participants undecided and one participant (1.3%) who disagreed. Three major themes emerged from coding of free text responses ($n = 27$) on training feedback: 1) overall it was excellent or very good, 2) it was informative and 3) the training was easy.

Feedback remained positive at one month. Comments ($n = 69$) were focused on the value of practising skills on a skill-reporting manikin. Participants found using the skill-reporting manikin more realistic and appreciated the chance to get feedback from the device. This in turn increased confidence in skills. Other major themes that emerged were a desire for smaller class sizes and appreciation for having the opportunity to undertake training, with some stating they had 'been meaning to do it for years'.

Secondary training

The majority (96%) of participants strongly agreed or agreed that they would share the VSI CPR kit post-training and this increased further at one month (98.6%). From the 35 (42.2%) participants who shared the VSI kit, a further 87 people were trained (known as secondary training). On average, study participants trained 3.2 people with a maximum of 15 additional people trained by one patient–spouse pair. Eight (10.8%) participants had plans to share it with others in the future. Of the households with multiple-persons ($n = 50$) at one month, 44% ($n = 22$) had all household members trained, either from attending the training class or through sharing the VSI CPR kit. A further 6% ($n = 3$) of households had only one person in the household who remained untrained.

The ways in which people shared the VSI kit differed. Of the 35 participants, only four (11.4%) reported that those who they shared the kit with used the kit in its entirety, using the manikin and 'practising-as-they-watched' with the DVD. The majority ($n = 27$, 77.1%) reported that they shared only the manikin and demonstrated CPR skills themselves, while two (5.7%) participants reported that secondary trainees took the kit away and trained elsewhere.

Of those that did not share the VSI CPR kit ($n = 39$) the main identified barrier was time (79.5%). Other identified barriers were having no one appropriate to share the VSI kit with (15.4%), they had not thought about sharing the kit (5.1%) or they had been unwell (2.6%).

Staff attitudes

A total of five cardiac rehabilitation staff completed surveys. Staff strongly agreed ($n = 4$, 80.0%) or agreed ($n = 1$, 20.0%) that CPR training was an appropriate addition to their cardiac rehabilitation programme. Similarly, staff either strongly agreed or agreed that the use of the VSI kits and the training duration were also suitable. The following barriers to continuing CPR training within their programme were identified once each: class size, cost of the VSI training kits and future access to skill-reporting manikins. Importantly, all staff indicated that they would be happy to continue running CPR training

Table 4. Skill-reporting data comparison of participants who had two attempts: first attempt (no instruction) and second attempt (with instruction) (n = 9).

	Total n = 9	Patient n = 6	Family n = 3
First attempt (no instruction)			
Rate, beats/min, mean (SD)	103.6 (39.0)	96.7 (44.7)	117.3 (25.3)
Depth, mm, mean (SD)	44.8 (13.8)	46.2 (12.9)	42.0 (18.2)
Average correct hand position, %	73.2	59.8	100
Second attempt (with instruction)			
Rate, beats/min, mean (SD)	115.7 (18.1)	118.2 (20.6)	110.7 (14.0)
Depth, mm, mean (SD)	48.8 (15.2)	50.7 (15.8)	45.0 (16.5)
Average correct hand position, %	97.4	96.2	100

SD: standard deviation; mm: millimetre.

sessions and 80% (n = 4) of staff would feel comfortable and confident to run the sessions themselves with one staff member undecided.

Discussion

This feasibility study provides contemporary data in a previously untested environment for targeted CPR training. Our study found that cardiac rehabilitation is a feasible environment to provide CPR training to cardiac patients and their family members, as demonstrated by the high participation rates of patients (72.7%) and their spouses or partners (n = 27). Additionally, training reach was doubled through secondary training, via VSI CPR training kits, of family members, friends and neighbours. We also demonstrated that using VSI CPR training in this environment significantly increased levels of confidence and willingness to use CPR skills which were maintained at one month. Skills obtained were close to guideline standards, with the exception of depth, which is commonly reported as underperformed, even by health professionals.[12,28]

This is the first time cardiac rehabilitation has been trialled for targeted CPR training to high-risk cardiac patients. We have demonstrated that the cardiac rehabilitation environment could capture a high attendance rate of family members in the initial face to face training session with more captured by secondary training. At one month, nearly half of the multiple-person households had all members trained. This is a very positive result given that it is known that this high-risk and older population do not have recent, if any, prior CPR training, nor do they seek training themselves.[29] Through providing CPR training at cardiac rehabilitation programmes, in addition to reaching the high-risk cardiac target population, we were able to reach more males and older participants; this is in comparison with a recent survey on rates of public CPR training conducted in the same state.[29] However, our sample also showed similarities to the Victorian survey in terms of time since last CPR training (majority >5 years) and the common barriers to undertaking training. This training had a high rate of acceptability from cardiac rehabilitation staff who felt confident and comfortable to continue the training sessions; and, as such, CPR training using VSI CPR kits has now been translated into practice at the study site. Similar to our study, recent studies in the USA[12,30] also used VSI CPR training targeting family members of cardiac patients, but before hospital discharge. These studies also demonstrated positive results for increasing CPR skills, willingness to perform CPR and secondary training. However, the inpatient environment may not be feasible in countries, such as Australia, where there is a short length of hospital stay for cardiac conditions (three days in Australia[31] versus 5.4 days in the USA[32]) and family members may not be able or willing to take on training in such an acute phase of the patients' treatment. Cardiac rehabilitation is one such platform that may be feasible both in Australia and internationally; however, it is known that uptake of cardiac rehabilitation is sub-optimal[31] in Australia and therefore several approaches to targeting this population for CPR training may be needed. Previous strategies that have been used for this population have been hospital outpatient CPR training sessions[13,14] (independent of cardiac rehabilitation) or, for some, simply providing a VSI CPR training kit to take home after hospital discharge may be sufficient.

Cost is another consideration of using VSI CPR training kits. Currently in Australia, the cost of one kit is approximately AUD$25. While the participants in this study received them at no charge, it is unlikely that future costs would be absorbed by the cardiac rehabilitation programme, and therefore participants would need to purchase kits at their own expense. This cost, however, is significantly less than attending a certified CPR class, which are usually around AUD$50–60 per participant. In addition, the cost of one standard CPR manikin used in certified CPR training courses is several hundred dollars, which may not be feasible for cardiac rehabilitation programmes to purchase. Therefore, while there is a cost

associated with VSI CPR kits, it is the least expensive training option with the benefits of one family being able to use and reuse the kit and undertake training anywhere and at any time.

In addition to learning skills quickly and effectively, secondary training is another major benefit of using VSI CPR training kits. The average number of people who received secondary training from our participants were slightly higher compared with other reports.[30,33] We are the first to investigate how the VSI kits were shared with secondary trainees. As our results demonstrate, it cannot be assumed that secondary trainees are using the kit in full and completing the 'practise-as-you-watch' training as it is intended. While sharing only the manikin and demonstrating skills would at least increase awareness and knowledge for secondary trainees, it may be beneficial for primary trainees to be instructed on the importance and value of ensuring the kit is shared in full.

As suggested in the 2015 ILCOR recommendations[1] we also incorporated the use of objective real time skill-reporting manikins. Since their advent, skill-reporting manikins have been primarily utilised for research purposes and medical staff training and assessment,[34] but not widely used as a method for training and assessment for lay people. Being able to provide real time skill data had a positive and unexpected effect on our participants. While we set out to use these manikins for the exclusive purpose of obtaining skills data, we underestimated the training benefit for participants. As demonstrated from the one-month data, participants found using these manikins extremely helpful to gauge their CPR performance, giving them confidence that compressions were performed safely and correctly. These manikins also provided a more realistic CPR experience due to their lifelike size and high fidelity. Using skill-reporting manikins or other feedback devices where available should be a future consideration for training lay people.

The results of our study need to be considered with the following limitations. As this was a feasibility study, no control group was used in the study design. We acknowledge that the sample size is small; however, it is appropriate for the purpose of a feasibility study and similar to past targeted training studies.[14,33] The study was conducted at a private metropolitan hospital where the cardiac rehabilitation programme is onsite, therefore the results may not be relevant to all cardiac rehabilitation programmes. Recall bias and the accuracy of self-report data must be considered for data collected at one month. However, these factors should not have large effects as one month is a relatively short follow-up time frame. This short follow-up time may, however, affect the primary outcomes of confidence and willingness, therefore future studies should include a longer follow-up. It also must be noted that while no financial or other incentive was offered to participants, training kits were received at no cost, and this may have influenced participation rates.

Conclusions

This feasibility study provides targeted training data to fill the knowledge gap identified by ILCOR. We found that cardiac rehabilitation is a suitable environment for providing CPR training to high-risk cardiac patients and their family members using VSI CPR training kits. This was demonstrated by high participation rates in training classes, significant increases in confidence and willingness to use skills post-training, high rates of secondary training and positive feedback from staff. Future studies can now assess whether this strategy of targeted training is suitable in different cardiac rehabilitation programmes such as public, rural and stand-alone programmes. The large number of cardiac rehabilitation programmes in Australia (N = ~434) and internationally may provide an underutilised platform through which CPR training can easily and successfully target high-risk cardiac patients and their families.

Implications for practice

- Where possible, providing cardiopulmonary resuscitation training at cardiac rehabilitation should be considered as it provides an ideal time and place for cardiac patients and their family members to undertake training.
- Cardiopulmonary resuscitation training does not cause an increase in anxiety therefore healthcare practitioners should not discount talking to high-risk patients and their family members about this important training.
- Cardiopulmonary resuscitation training should be recognised and integrated at every possible opportunity, such as during hospital discharge education, at cardiac rehabilitation or in discussion with a general practitioner, as older and high-risk cardiac populations generally do not seek cardiopulmonary resuscitation training themselves.
- As there are now different ways to learn cardiopulmonary resuscitation (i.e. face to face, via video-self instruction) learning preferences should be taken into account and suitable options discussed with high-risk populations.

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Declaration of conflicting interests

SC is a first aid trainer and Director of City to Surf First Aid.

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References

1. Finn JC, Bhanji F, Lockey A, et al. Part 8: Education, implementation, and teams: 2015 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2015; 95: e203–e224.
2. Deo R and Albert CM. Epidemiology and genetics of sudden cardiac death. *Circulation* 2012; 125: 620–637.
3. Vaillancourt C, Stiell IG and Wells GA. Understanding and improving low bystander CPR rates: A systematic review of the literature. *CJEM* 2008; 10: 51–65.
4. Goldberg RJ, Gore JM, Love DG, et al. Layperson CPR – are we training the right people? *Ann Emerg Med* 1984; 13: 701–704.
5. Mandel LP and Cobb LA. CPR training in the community. *Ann Emerg Med* 1985; 14: 669–671.
6. Eisenburger P and Safar P. Life supporting first aid training of the public—review and recommendations. *Resuscitation* 1999; 41: 3–18.
7. Smtih K and Lijovic M. Victorian Ambulance cardiac arrest registry annual report 2014–2015. *Doncaster, Victoria: Ambulance Victoria*, http://s3-ap-southeast-2.amazonaws.com/prod.assets.ambulance.vic.gov.au/wp-content/uploads/2016/03/vacar-annual-report-2014–2015.pdf (2016, accessed 2 July 2016).
8. Nehme Z, Andrew E, Cameron PA, et al. Population density predicts outcome from out-of-hospital cardiac arrest in Victoria, Australia. *Med J Aust* 2014; 200: 471–475.
9. Herlitz J, Eek M, Holmberg M, et al. Characteristics and outcome among patients having out of hospital cardiac arrest at home compared with elsewhere. *Heart* 2002; 88: 579–582.
10. Sasson C, Rogers MAM, Dahl J, et al. Predictors of survival from out-of-hospital cardiac arrest: A systematic review and meta-analysis. *Circ Cardiovasc Qual Outcomes* 2010; 3: 63–81.
11. Cartledge S, Bray JE, Leary M, et al. A systematic review of basic life support training targeted to family members of high-risk cardiac patients. *Resuscitation* 2016; 105: 70–78.
12. Blewer AL, Putt ME, Becker LB, et al. Video-only cardiopulmonary resuscitation education for high-risk families before hospital discharge. A multicenter pragmatic trial. *Circ Cardiovasc Qual Outcomes* 2016; 9: 740–748.
13. Dracup K, Moser DK, Taylor SE, et al. The psychological consequences of cardiopulmonary resuscitation training for family members of patients at risk for sudden death. *Am J Public Health* 1997; 87: 1434–1439.
14. Schneider L, Sterz F, Haugk M, et al. CPR courses and semi-automatic defibrillators – life saving in cardiac arrest? *Resuscitation* 2004; 63: 295–303.
15. Bardy GH, Lee KL, Mark DB, et al. Home use of automated external defibrillators for sudden cardiac arrest. *N Engl J Med* 2008; 358: 1793–1804.
16. Haugk M, Robak O, Sterz F, et al. High acceptance of a home AED programme by survivors of sudden cardiac arrest and their families. *Resuscitation* 2006; 70: 263–274.
17. Hao Y, Zhu J, Wang M, et al. CPR training methods in family members of patients at high risk of sudden cardiac death. *Cardiology* 2011; 112–114.
18. Cheng YC. Targeted mass CPR training for families of cardiac patients – experience in Taipei city. *Tzu Chi Med J* 1997; 9: 273–278.
19. Clark AM, Haykowsky M, Kryworuchko J, et al. A meta-analysis of randomized control trials of home-based secondary prevention programs for coronary artery disease. *Eur J Cardiovasc Prev Rehabil* 2010; 17: 261–270.
20. Davies EJ, Moxham T, Rees K, et al. Exercise training for systolic heart failure: Cochrane systematic review and meta-analysis. *Eur J Heart Fail* 2010; 12: 706–715.
21. Anderson L, Thompson DR, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews* 2016; 1: CD001800.
22. Cartledge SH, Bray JE, Stub D, et al. Do cardiac rehabilitation programs offer cardiopulmonary resuscitation training in Australia and New Zealand? *Heart Lung Circ* 2016; 25: 607–612.
23. Thoren A, Axelsson A and Herlitz J. Possibilities for, and obstacles to, CPR training among cardiac care patients and their co-habitants. *Resuscitation* 2005; 65: 337–343.
24. Australian and New Zealand Committee on Resuscitation. ANZCOR basic life support flow chart, https://resus.org.au/guidelines/flowcharts-3/ (2016, accessed 14 December 2016).
25. Australian Mental Health Outcomes and Classification Network. Kessler-10, training manual, http://www.amhocn.org/sites/default/files/publication_files/kessler_10_manual.pdf (2005, accessed 13 January 2017).
26. Andrews G and Slade T. Interpreting scores on the Kessler Psychological Distress Scale (K10). *Aust N Z J Public Health* 2001; 25: 494–497.
27. Australian and New Zealand Committee on Resuscitation. *ANZCOR Guideline 8, cardiopulmonary resuscitation*. Section 8, Cardiopulmonary resuscitation, https://resus.org.guidelines (accessed 14 November 2016).
28. Stiell IG, Brown SP, Nichol G, et al. What is the optimal chest compression depth during out-of-hospital cardiac arrest resuscitation of adult patients? *Circulation* 2014; 130: 1962–1970.

29. Bray JE, Smith K, Case R, et al. Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation: A cross-sectional survey of Victorians. *Emerg Med Australas* 2017; 29: 158-164.
30. Blewer AL, Leary M, Decker CS, et al. Cardiopulmonary resuscitation training of family members before hospital discharge using video self-instruction: a feasibility trial. *J Hosp Med Off Publ Soc Hosp Med* 2011; 6: 428–432.
31. Chew DP, French J, Briffa TG, et al. Acute coronary syndrome care across Australia and New Zealand: The SNAPSHOT ACS study. *Med J Aust* 2013; 199: 185–191.
32. Centres for Disease Control and Prevention. National Hospital Discharge Survey: 2010 table, average length of stay and days care – number and rate of discharges by first-listed diagnostic categories, http://www.cdc.gov/nchs/data/nhds/2average/2010ave2_firstlist.pdf#x2013 (2013, accessed 15 November 2016).
33. Blewer AL, Leary M, Esposito EC, et al. Continuous chest compression cardiopulmonary resuscitation training promotes rescuer self-confidence and increased secondary training: A hospital-based randomized controlled trial. *Crit Care Med* 2012; 40: 787–792.
34. Oermann MH, Kardong-Edgren SE and Odom-Maryon T. Effects of monthly practice on nursing students' CPR psychomotor skill performance. *Resuscitation* 2011; 82: 447–453.

6.6 Summary of Chapter Six

The paper presented in this chapter was the first study to investigate the provision of targeted BLS training to a high-risk cardiac population through a cardiac rehabilitation program. The feasibility of this approach was demonstrated by high attendance and engagement from cardiac patients and their spouses, and positive attitudes towards providing training from cardiac rehabilitation staff. In those who undertook testing, skills were close to guideline recommendations. Importantly, VSI training kits were shared further by the participants, at least doubling the reach of the index training sessions; however, the way in which they were shared might not be as the VSI kits were intended as only a small amount of secondary trainees viewed the DVD and used the manikin, fulfilling the 'practice-as-you-watch' approach. Despite this, sharing kits must increase awareness of BLS training at the very least. In addition, awareness and importance of BLS training were further increased from this study, through local media coverage in Melbourne (Appendix F).

Chapter Seven: Discussion and Conclusions

7.1 Introduction

This chapter provides a summary of the key findings and presents the strengths and limitations of this program of doctoral research. Following this, the implications of the findings with respect to current BLS initiatives are discussed. Based on the key findings, recommendations for practice and future research are made. Finally, the local implementation of targeted BLS training that has arisen as a result of this research is described.

The overall aim of this research was to investigate the feasibility of targeting BLS training to family members of high-risk cardiac patients in Victoria, Australia. This issue is important for several reasons. Coronary heart disease is the dominant cause of adult OHCA in Australia, and while CHD mortality rates have declined,[3] the prevalence of those living with CHD has increased both in Australia and internationally.[4] In order to ensure OHCA victims have the best chance of survival, it is critical that bystander BLS is delivered, in addition to prompt activation of the entire chain of survival.[15] Currently, in Australia, there is no mandatory BLS training at a community level, nor has there been research into targeted BLS training or strategies implemented for groups at high risk of OHCA.

To begin this program of research, a systematic literature review was first undertaken. The findings from this review[36] (Chapter Two) informed the aims and methods used in the subsequent studies described in this thesis. These aims and objectives were first addressed using cross-sectional and qualitative study designs, which ultimately informed an interventional study of the feasibility of incorporating BLS training into a cardiac rehabilitation program.

7.2 Summary of key findings

This program of doctoral research sought to address five key objectives, as follows:

1. Describe and evaluate available evidence for targeted BLS training programs internationally.

Findings from the systematic review found a lack of evidence for improved patient outcomes from targeting BLS training to family members of high-risk cardiac patients. However, a moderate level of evidence and positive outcomes were found for: BLS skills performance; willingness to use BLS skills should an emergency arise; and reduction in anxiety after BLS training. These positive results demonstrated that cardiac patients and their family members found BLS training acceptable and are capable and willing to use their skills. Importantly, the review demonstrated that BLS training does not increase anxiety.

However, the majority of the reviewed research was conducted before the significant guideline changes in 2010 – most notably, allowing lay bystanders to perform compression-only CPR.[64] Contemporary high-quality data was required in light of these guideline changes, in addition to new training modalities and new technology for assessment of BLS skills. The updated literature review presented in Chapter Two found an additional large, high-quality RCT that produced results supporting the use of such technology in training high-risk cardiac households.[67] This study, and most other high-quality studies, were conducted in the USA, and may not be applicable to other health care settings. As no targeted BLS training studies had been conducted in Australia, it was important to investigate the topic from an Australian perspective.

2. Determine current prevalence of BLS training among households containing a person or persons with coronary heart disease.

The study presented in Chapter Three was the first internationally to investigate BLS training prevalence at a public level, specifically in households containing a person or persons with CHD. This study of the Victorian public indicated that the prevalence of BLS training in high-risk cardiac households (67.9%) was no different to the prevalence in the general community (67.8%). Additionally, while overall prevalence of BLS training had increased in Victoria from the previous measurement of 52% in 2001,[32] this was likely a reflection of capturing participants' past BLS training, as most training was not recent (51% had not received training for five years or more) for the majority of respondents. Consequently, only 53% of respondents were aware of the recent guideline changes allowing compression-only CPR to be performed. The dissemination of new resuscitation guidelines is crucial, as the removal of mandatory mouth-to-mouth ventilations[108] (a known barrier to performing BLS)[25,26] was shown to increase willingness to commence BLS for all study respondents.

The low prevalence of recent BLS training is concerning, as people living with someone with CHD may be more likely to witness an OHCA. Barriers to BLS training were not significantly different between households with and without CHD. The most common barrier in both groups was a lack of awareness to seek training ("never thought about it [CPR training]"). Importantly, those with heart disease in their household who had undergone BLS training had significantly higher self-ratings of knowledge and confidence in their ability to perform BLS, demonstrating the value of BLS training in this population.

3. Explore the attitudes, preferences and intentions of high-risk cardiac patients and their family members towards BLS training.

The qualitative study presented in Chapter Four was the first study internationally to provide qualitative data from high-risk cardiac patients and their spouses on their attitudes,

preferences and intentions towards BLS training. Interviews conducted approximately six weeks after hospital discharge revealed that cardiac patients and spouses believe BLS training to be a worthy undertaking. Three interrelated themes emerged from participants' experience of an acute cardiac event: a lack of information, feeling in and out of control, and the caring responsibilities of spouses. Patients and spouses who received more information after their acute cardiac event had decreased feelings of denial, shock and fear, demonstrating the positive effects that information can provide to this population. The (unprompted) preference of the majority of those interviewed was for BLS training to be included in cardiac rehabilitation. This environment was considered a better setting for learning than the short, acute, hospital stay. Through the application of theory of planned behaviour (TPB) to the data, positive intentions for all three constructs within the theory (attitudes towards the behaviour, social pressure to undertake the behaviour and perceived behavioural control) were found, demonstrating strong intention to undertake future BLS training in the future.

4. Determine current prevalence of BLS training in cardiac rehabilitation programs

The cross-sectional survey[56] presented in Chapter Five found a low prevalence of BLS training within cardiac rehabilitation programs in Australia (24%) and a moderate prevalence within programs in New Zealand (57%).

As was found in a survey of cardiac rehabilitation programs in Scotland,[62,63] Australian and New Zealand cardiac rehabilitation coordinators had low awareness of the importance of including BLS training in their programs. Australian and New Zealand program coordinators identified lack of resources and time as barriers to providing training; however, two thirds of coordinators surveyed would consider the use of VSI BLS training as a means to overcome these barriers. The majority (89%) of cardiac rehabilitation coordinators had positive attitudes towards family members of cardiac patients being offered BLS training, and a smaller but still

substantial majority (72%) believed this training could be offered as part of a cardiac rehabilitation program.

5. Investigate the feasibility of incorporating BLS training into a cardiac rehabilitation program.

The systemic review (Chapter Two) and three subsequent studies (Chapters Three, Four and Five) were used to inform the feasibility study presented in Chapter Six. This was the first targeted BLS training study to trial the use of the cardiac rehabilitation environment to reach a high-risk cardiac population, and the first to investigate targeted BLS training in Australia, in this patient group.

This study demonstrated that providing BLS training to high-risk cardiac patients and their family members using VSI training kits within a cardiac rehabilitation program was feasible and well received by participants. High attendance rates were achieved in the five classes offered for both patients (72.7%) and spouses (n=27), and feedback was overwhelmingly positive. Furthermore, the training reach was doubled as the participants shared VSI training kits with an additional 87 people. Skills gained from VSI training, coupled with face-to-face assistance from the cardiac rehabilitation staff, were close to guideline standards in those that were tested.

Importantly, as other international studies have found,[48,49,109–114] psychological distress scores were not increased at the end of the study period, thus BLS training does not come at the expense of increased distress among this population. This finding is supported by the positive feedback received from participants during post-training and one month follow-ups.

The key findings of this thesis are summarised below.

Summary of key findings

- The prevalences of BLS training in high-risk cardiac populations and the general population of Victoria, Australia were not significantly different.
- While the prevalence of BLS training in Victoria has increased, training in the majority was more than five years old and therefore not in line with current guidelines.
- There are no unique barriers for family members of cardiac patients to undertake BLS training, compared to the general public.
- High-risk cardiac populations are unlikely to seek BLS training themselves, but consider BLS a worthy skill.
- Preferences of cardiac patients and their spouses are to learn BLS within a cardiac rehabilitation program.
- The prevalence of BLS training within cardiac rehabilitation programs is low in Australia (24%) and moderate in New Zealand (57%).
- Cardiac rehabilitation coordinators have positive attitudes towards offering BLS training as part of a cardiac rehabilitation program.
- Uptake of BLS training incorporated into a cardiac rehabilitation program was high (72% of eligible patients).
- Video self-instruction training kits can overcome barriers such as time and resources to deliver BLS training at cardiac rehabilitation, and can more than double training reach through sharing of kits with family and friends.
- Cardiac rehabilitation is a feasible setting in which to provide BLS training to high-risk cardiac patients and their family members. This setting provides a practical solution for targeted BLS training strategies in Australia, given short lengths of hospital stay for cardiac admissions.

7.3 Strengths and limitations of the research

The strengths and limitations of each discrete study are discussed within the manuscripts presented in Chapters Two to Six. This section discusses the broad strengths and limitations of this program of doctoral research as a whole.

This research has three main strengths. Firstly, the final interventional study was the first of its kind in Australia and in the environment of cardiac rehabilitation, thereby producing new knowledge about the feasibility of including BLS training within this setting. The intervention was informed by several preceding studies, allowing optimisation of the study design. Second, the qualitative study within this program of research provided the first insights into the attitudes and perceptions of high-risk cardiac patients and their family members towards BLS training. In the world of resuscitation research, the view of the patient or consumer is becoming an increasingly recognised and important aspect.[115] Third, this research aimed to address knowledge gaps identified by ILCOR in the 2015 treatment recommendations for BLS training for high-risk populations.[27] Specifically, innovative BLS training and the use of objective methods of assessment for BLS performance were employed in the final interventional study.

The findings of this thesis should be interpreted with the following potential limitations in mind. The studies were primarily conducted in the Australian state of Victoria. The Australian health care system comprises mixed public and private health care services, with increasing overall demand.[116] Length of hospital stay for acute cardiac admissions has decreased significantly in Australia in recent years,[117]- likely due to advancement in interventional cardiac procedures, improved early secondary prevention measures, and possibly in part to increasing patient demand for hospital beds.[116] These findings may not be generalisable to other countries with different health care systems, longer inpatient stays, or other models of cardiac rehabilitation. However, a reducing length of acute hospital stay is also currently

common in European countries.[118] Additionally, the feasibility study was conducted in a cardiac rehabilitation program within a private hospital and therefore may not be generalisable to public or stand-alone programs.

7.4 Implications of findings in relation to recent basic life support initiatives

Several recent advancements in BLS have been implemented by ambulance services to improve bystander CPR and early defibrillation. However, as discussed below, these do not negate the need for BLS training.

7.4.1 BLS training in the age of dispatcher-assisted telephone CPR

One method intended to overcome the challenges of increasing bystander BLS for OHCA is dispatcher-assisted telephone CPR (D-CPR, also referred to as telephone CPR). This involves the provision of phone instructions by EMS dispatchers for both CPR and if available, defibrillation, once OHCA is identified.[119] While D-CPR studies have shown mixed results for survival, a meta-analysis[120] of three RCTs demonstrated that compression-only D-CPR instructions provided an absolute survival benefit of 2.4%. More importantly, there is a strong association between D-CPR and the provision of bystander CPR.[121–125] Despite low-quality evidence, D-CPR using compression-only CPR instructions was recommended in the 2015 ILCOR treatment recommendations.[14]

Inclusion in ILCOR's treatment recommendations does not imply that D-CPR is an infallible intervention, and it should not be used in isolation or to replace BLS training for lay persons. Most studies have shown D-CPR does not significantly reduce the time to commence CPR compared to bystander CPR without dispatcher instructions.[122,124,126] It could be hypothesised that trained rescuers are able to recognise an OHCA more swiftly and therefore start BLS with minimal delay, rather than waiting for the dispatcher to recognise the event and relay

instructions. Additionally, a manikin simulation study testing D-CPR pre- and post-BLS training found rescuers performed higher-quality compressions with less delay after training.[127] While the aforementioned study had significant limitations, such as not having a control group, these findings are logical, should not be discounted and warrant further research.

Another benefit of prior BLS training is that it provides education about the need to call an ambulance early when experiencing chest pain. This education is important, as many people hesitate to activate EMS, especially in chest pain emergencies.[128] Early use of EMS in this situation has been shown to decrease the incidence of OHCA and associated mortality.[129]

7.4.2 The use of technology in out-of-hospital cardiac arrest interventions

Recent technological advances in OHCA research include dispatching trained volunteers via mobile phones[130] and automated external defibrillators (AED) via drones to OHCAs.[131] Smartphone applications ("apps") can alert BLS-trained bystanders to a nearby OHCA, in addition to identifying the location of the nearest defibrillator.[132] The aim of these apps is to increase the rate of bystander CPR and defibrillation for OHCA before the arrival of EMS. Dispatching trained volunteers could prove to be an extremely effective intervention for OHCAs occurring in private residences, especially for the elderly, who may be physically unable to perform BLS on a family member. Despite this intervention and as with D-CPR, BLS training still plays an important part in lay rescuers being trained to recognise an OHCA and activate EMS, even if they are unable to physically perform BLS.

Strengthening the third link of the chain of survival through delivering AEDs to the OHCA scene may now be possible. This would especially benefit those arresting at home where an AED is not in close proximity like it may be in a public place. A recent small study in Stockholm demonstrated that drones could deliver AEDs significantly faster than traditional

EMS.[131] New technology provides exciting opportunities to enhance OHCA interventions, and will no doubt develop rapidly over time and improve OHCA survival rates.

7.5 Recommendations arising from the research

A number of recommendations arose from the key findings of this research. Recommendations for high-risk cardiac populations are presented first, followed by recommendations for the general public, and finally by recommendations for future research.

7.5.1 Recommendations to increase BLS training in high-risk cardiac populations

1. Incorporate BLS training into cardiac rehabilitation programs

As demonstrated in Chapter Five, cardiac rehabilitation is a feasible environment for the delivery of BLS training. It is also the preferred environment for Australian cardiac patients and their family members to learn BLS (Chapter Four), in a less acute phase of recovery following a cardiac event.

Cardiac rehabilitation programs provide a large platform for delivery of BLS training to high-risk cardiac populations (over 400 programs operate in Australia); the next step is to investigate the inclusion of BLS training in both public and stand-alone programs. This program of research into targeted BLS training through cardiac rehabilitation programs will continue with the assistance of a Laerdal Foundation project grant. This project will investigate an effective method to enable and empower cardiac rehabilitation coordinators in Victoria (working in approximately 147 programs) to include BLS training in their programs.

2. Increase awareness of BLS training in cardiac health professionals

As the results in Chapter Five show, a significant proportion of cardiac rehabilitation coordinators had not thought to include BLS training within their programs. Therefore,

increasing awareness of the need for BLS training in high-risk cardiac populations also requires education for cardiac health professionals. In addition, coordinators were unaware of new training modalities such as VSI BLS training kits. It is unlikely that other health care professionals, such as nurses and doctors, provide education or information about where to seek training to these patients and families.

All cardiac health professionals are in a unique positon to educate and encourage cardiac patients and their family members to undertake BLS training during patient contacts; this process should begin during hospital admission for a cardiac event through to outpatient care. However, health professionals have to be alerted the importance of providing this information, and where and how cardiac patients and their family members can learn BLS. Such awareness-raising could occur through workshops and seminars conducted by national professional organisations, such as ACRA. It should also be highlighted to cardiac health professionals that cardiac patients and their family members are interested in BLS training and that training does not increase levels of distress.

3. Include BLS training in clinical cardiac guidelines

Inclusion of BLS training in cardiac guidelines should prompt and support health professionals to offer BLS information and training during their contact with and care of cardiac patients. Currently, while Australian ACS guidelines state hospital discharge education should include chest pain management,[85] they do not include other elements of BLS, such as CPR training. This is included in ACS guidelines in other countries, such as the USA, as part of the recommended plan of care.[133]

BLS training should be a core component of education within Australian cardiac rehabilitation recommendations. This may aid the incorporation of BLS training into cardiac rehabilitation programs in Australia, as evidenced by the inclusion of BLS in New Zealand's guidelines and the higher prevalence of BLS training within their cardiac rehabilitation programs.[104]

4. **Investigate alternative methods to reach high-risk cardiac populations for BLS training**

We need multiple ways to reach the high-risk cardiac population for BLS training. While strategies are in place to bolster the attendance of cardiac patients at cardiac rehabilitation, it is known that attendance is sub-optimal, with only a third of eligible cardiac patients attending programs in Australia[55] and other countries, such as the USA.[134] Many barriers underlie poor attendance at cardiac rehabilitation, including physical barriers such as lack of referral or transport and personal barriers such as financial cost, embarrassment about participation, or a lack of patient education and thus awareness of the importance of attending.[55,135] Demand for cardiac rehabilitation programs will only increase with the rising prevalence of CHD,[4] and the need for BLS training will increase likewise.

General practitioners (GPs) represent another avenue for reaching high-risk cardiac patients in Australia. It is guideline standard for cardiac patients to have a GP consultation after hospital discharge,[85] serving as another point of contact for the recommendation of BLS training and in a sub-acute phase of recovery. This recommendation could come in the form of a "prescription" for BLS training, either via traditional face-to-face methods or via a VSI training kit. The use of doctors to "prescribe" BLS training was moderately successful in a previous study.[136]

7.5.2 Recommendations to increase BLS training in the general public

1. **Increase awareness of BLS training in the general public**

Out-of-hospital cardiac arrest is a major public health problem that affects all members of the community as potential bystanders. Therefore, public awareness of this condition and widespread BLS training are essential. As the results of this research indicate, awareness of the

need to undertake BLS training is low in both family members of cardiac patients (Chapter Five) and the general public (Chapter Three).

To date, there have been no national campaigns about OHCA or BLS training in Australia. A campaign to increase public awareness of OHCA and BLS training is warranted, especially given only 50% of those surveyed (Chapter Three) were aware of compression-only CPR. Highlighting the simplification of BLS through the removal of mandatory mouth-to-mouth ventilations should encourage more people to render assistance in an OHCA and to undertake training. As traditional TV, radio and print mass media campaigns are very costly, dissemination of these messages via social media should be investigated. These approaches could be successful now that smartphones and other digital mobile devices are almost ubiquitous in Australia,[137] including among older Australians.[138]

2. Improve access to BLS training in the general public

Improved access to BLS training should also extend to the general public; large-scale training approaches should be considered. Australia currently has no mandatory community-level BLS training. Strategies similar to those used in the USA, where BLS training is mandatory in schools in certain states,[28] or Germany, where training is mandatory when applying for a driver's licence,[29] could be used. These strategies require cooperation from many governing bodies, such as the Australian Resuscitation Council, the education board, and licensing bodies, in addition to government. Nevertheless, they should not be overlooked, as they could ensure a large proportion of the community receives BLS training at least once.

Opportunities to engage the community in brief BLS training interventions are limited in Australia, but some strategies are emerging. In 2015, Take Heart Australia conducted a community awareness and training day across three states.[139] In 2016, the international CPR awareness campaign "Restart A Heart Day"[140] was adopted in Australia for the first time,

championed by Ambulance Victoria,[141] with plans for wider dissemination with each successive year.

Strategies that use scalable brief training interventions have proven successful for training lay people. Bowbrow et al. (2011)[142] demonstrated that viewing a very short Hands-Only CPR video could increase CPR skills and willingness in laypeople who had no recent CPR training. All intervention groups (60-second video training, 5-mintue video training and 8-mintue video training with manikin practice) also had significantly higher average compression rate and depth compared to control. More recently, a brief training intervention was shown to increase low (15.4%) bystander CPR rates in Jefferson County, Kentucky, USA.[143] Alive in Five is a novel, multisensory CPR training intervention delivered in five minutes, which can be implemented at large public events such as state fairs, hospital lobbies and sports games. Participants acquired high-quality CPR skills (compression rate at guideline standard, depth near to guideline standard) and increased their self-reported knowledge of and confidence in CPR. The Alive in Five program had impressive reach, with 1,000 people receiving hands-on training before a large basketball game and a further 29,000 through demonstration during the half-time break. As the authors state, the program "has become part of our institutional culture" [143(p3)] – a culture to which all countries should aspire.

In the absence of mandatory community-level training, further research into strategies is required to identify effective methods for education and training for both the Australian community and high-risk populations. A narrow approach to ensuring people are aware and are trained in BLS is not sufficient. For example, we cannot rely solely on workplace training or targeted training strategies to increase bystander BLS rates, especially for OHCA occurring in private residences. BLS training needs to become an accepted and valued part of society; training must commence when people are young and at school, be refreshed in the workforce, and be continued as people age and their cardiac risk increases.

7.5.3 Recommendations for future research

As the feasibility study was conducted in a cardiac rehabilitation program within a private hospital meaning it may not be generalisable to all programs; therefore, targeted training within public and stand-alone cardiac rehabilitation programs also needs to be investigated. Patients within these programs may differ in demographic characteristics such as education levels, language, cultures and socioeconomic status. Further research is required to understand if the intervention tested in this research is suitable in other cardiac rehabilitation programs and populations. In addition to incorporating CPR training within cardiac rehabilitation, other rehabilitation settings should also be considered. For example, stroke is a highly prevalent condition[5] reflecting underlying vascular disease. Stroke patients often require rehabilitation,[5] sometimes for extensive periods of time. This may represent an ideal time for CPR training to family members for an additional high-risk population.

Future targeted BLS training studies should employ long-term follow-up of participants to examine subsequent use of BLS skills and skill retention. It is unlikely, however, that further large BLS training studies examining outcomes at the patient level will be conducted. As evidenced by the Home Automatic External Defibrillator Trial,[72] which enrolled over 7000 participants, it is difficult to obtain a sample size sufficiently large to power the outcome of all-cause mortality. To overcome the need for large sample sizes, other innovative options could be employed, such as the use of registry data to provide information on OHCA events and bystander CPR details. Bystander CPR details are already included in Korea's EMS BLS registry.[144] A registry such as this, linked with other data such as hospital separations may be able to provide long-term patient outcomes with more success than following each patient and family member. Similarly, Nehme et al.[129] used data from the Victorian Ambulance Cardiac Arrest Registry to assess the impact of a public awareness campaign on OHCA incidence.

7.5.4 Summary of Recommendations

The recommendations arising from this research are summarised in Table 3.

Table 3. Summary of recommendations

Recommendations to increase BLS training in high-risk cardiac populations
1. Incorporate BLS training into cardiac rehabilitation programs.
2. Increase awareness of BLS training in cardiac health professionals.
3. Include BLS training in cardiac clinical guidelines (acute coronary syndrome guidelines), and as a core component of education in cardiac rehabilitation recommendations.*
4. Investigate alternative methods to reach high-risk cardiac populations for BLS training- such as through General Practitioners.
Recommendations to increase BLS training in the general public
1. Increase awareness of BLS training in the general public via mass media and/or social media campaigns.
2. Increase access to BLS training in the general public via mandatory training and large-scale brief community training interventions.
Recommendations for future research
1. Investigate the feasibility and efficacy of incorporating BLS training in public and stand-alone cardiac rehabilitation programs.
2. Long-term follow-up research into use of BLS skills and patient outcomes is required; registry data could be used.

* Currently, there is no guideline document for cardiac rehabilitation in Australia. Key documents are National Heart Foundation's Recommended Framework for Cardiac Rehabilitation (2004)[105] and more recently a core component paper authored by the Australian Cardiovascular Health and Rehabilitation Association (2014).[57]

7.6 Translation into practice

Some of these research findings from my doctoral research have already been translated into practice. After completion of participant recruitment for the feasibility study, the study site (Cabrini Hospital) incorporated BLS training permanently into the education component of its cardiac rehabilitation program. Due to my strong communication with ACRA throughout this program of research and regular presentation of study findings to ACRA members at state and national levels, three cardiac rehabilitation coordinators (two from public programs and one from a private program) have made contact to discuss how best to incorporate BLS training into their programs. Additionally, I will continue to work with practitioners and peak governing bodies to advocate that the findings of this research are put into both guidelines and practice.

As previously discussed, this program of research into targeted BLS training through cardiac rehabilitation will continue through a Laerdal Foundation project grant to support investigation of an effective method to enable and empower cardiac rehabilitation coordinators to include BLS training in their programs.

7.7 Concluding remarks

The aim of this research was to investigate the feasibility of targeting BLS training to family members of high-risk cardiac patients in Australia. Currently, there are no strategies in place to ensure BLS training reaches this population. This thesis has filled a gap in evidence identified by ILCOR by providing new knowledge and an Australian perspective on the prevalence of BLS training in high-risk cardiac patients and family members, and their attitudes and preferences with respect to training. The prevalence of and barriers to including BLS training within cardiac rehabilitation were determined and the feasibility of providing

training in this setting was demonstrated at one site. Based on this work, recommendations have been developed that are applicable to healthcare settings in Australia and internationally. It is hoped that the findings of this research can be used to decrease the disparity between those with BLS skills and those most likely to witness an OHCA, ultimately saving more lives.

References

1. World Health Organization. WHO | Cardiovascular diseases (CVDs) [Internet]. WHO. 2017 [cited 2017 Mar 5]. Available from: http://www.who.int/mediacentre/factsheets/fs317/en/

2. Australian Institute of Health and Welfare. Australia's health series. [Internet]. Canberra, Australia; 2014. Available from: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129548150

3. Ford ES, Ajani UA, Croft JB, Critchley JA, Labarthe DR, Kottke TE, et al. Explaining the decrease in US deaths from coronary disease, 1980–2000. New England Journal of Medicine. 2007;356(23):2388–2398.

4. Astley CM, Neubeck L, Gallagher R, Berry N, Du H, Hill MN, et al. Cardiac rehabilitation: unraveling the complexity of referral and current models of delivery. Journal of Cardiovascular Nursing. 2017;32(3):236–243.

5. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R, et al. Heart Disease and Stroke Statistics—2017 Update: A Report From the American Heart Association. Circulation. 2017 Jan 1;135(10):e146–603.

6. Soo LH, Gray D, Hampton JR. Pathological features of witnessed out-of-hospital cardiac arrest presenting with ventricular fibrillation. Resuscitation. 2001 Dec 1;51(3):257–64.

7. Solomon SD, Zelenkofske S, McMurray JJV, Finn PV, Velazquez E, Ertl G, et al. Sudden Death in Patients with Myocardial Infarction and Left Ventricular Dysfunction, Heart Failure, or Both. New England Journal of Medicine. 2005 Jun 23;352(25):2581–8.

8. Jacobs I, Nadkarni V, Outcomes the ITF on CA and CR, Participants C, Bahr J, Berg RA, et al. Cardiac Arrest and Cardiopulmonary Resuscitation Outcome Reports Update and

Simplification of the Utstein Templates for Resuscitation Registries: A Statement for Healthcare Professionals From a Task Force of the International Liaison Committee on Resuscitation (American Heart Association, European Resuscitation Council, Australian Resuscitation Council, New Zealand Resuscitation Council, Heart and Stroke Foundation of Canada, InterAmerican Heart Foundation, Resuscitation Councils of Southern Africa). Circulation. 2004 Nov 23;110(21):3385–97.

9. Herlitz J, Eek M, Holmberg M, Engdahl J, Holmberg S. Characteristics and outcome among patients having out of hospital cardiac arrest at home compared with elsewhere. Heart. 2002;88(6):579–82.

10. Ambulance Victoria. Victorian Ambulance Cardiac Arrest Registry 2015 - 2016 Annual Report [Internet]. Doncaster, Victoria: Ambulance Victoria; 2017 Jan [cited 2017 Feb 1]. Available from: http://s3-ap-southeast-2.amazonaws.com/prod.assets.ambulance.vic.gov.au/wp-content/uploads/2017/03/VACAR-Annual-Report_2015-2016.pdf

11. Deo R, Albert CM. Epidemiology and Genetics of Sudden Cardiac Death. Circulation. 2012 Jan 31;125(4):620–37.

12. Rea TD, Pearce RM, Raghunathan TE, Lemaitre RN, Sotoodehnia N, Jouven X, et al. Incidence of Out-of-Hospital cardiac arrest. The American Journal of Cardiology. 2004 Jun 15;93(12):1455–60.

13. Gräsner J-T, Lefering R, Koster RW, Masterson S, Böttiger BW, Herlitz J, et al. EuReCa ONE 27 Nations, ONE Europe, ONE Registry: A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe. Resuscitation. 2016 Aug;105:188–95.

14. Perkins GD, Travers AH, Berg RA, Castren M, Considine J, Escalante R, et al. Part 3: Adult basic life support and automated external defibrillation: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2015 Oct;95:e43–69.

15. Cummins R, Ornato J, Thies W, Pepe P, Billi J, Seidel J, et al. Improving survival from sudden cardiac-arrest - the chain of survival concept - a statement for health-professionals from the advanced cardiac life-support subcommittee and the emergency cardiac care committee, American-Heart-Association. Circulation. 1991;83:1832–47.

16. Larsen MP, Eisenberg MS, Cummins RO, Hallstrom AP. Predicting survival from out-of-hospital cardiac arrest: a graphic model. Annals of Emergency Medicine. 1993;22(11):1652–1658.

17. Nehme Z, Andrew E, Cameron P, Bray JE, Meredith IT, Bernard S, et al. Direction of first bystander call for help is associated with outcome from out-of-hospital cardiac arrest. Resuscitation. 2014;85(1):42–48.

18. Sasson C, Rogers MAM, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circulation Cardiovascular quality and outcomes. 2010;3(1):63–81.

19. Hasselqvist-Ax I, Riva G, Herlitz J, Rosenqvist M, Hollenberg J, Nordberg P, et al. Early Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest. New England Journal of Medicine. 2015 Jun 11;372(24):2307–15.

20. Berg RA, Hemphill R, Abella BS, Aufderheide TP, Cave DM, Hazinski MF, et al. Part 5: Adult Basic Life Support 2010 American Heart Association Guidelines for

Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010 Nov 2;122(18 suppl 3):S685–705.

21. Kouwenhoven WB. The development of the defibrillator. Annals of Internal Medicine. 1969;71(3):449–458.

22. Paraskos JA. History of CPR and the role of the National Conference. Annals of Emergency Medicine. 1993 Feb 1;22(2):275–80.

23. Nolan JP, Hazinski MF, Aickin R, Bhanji F, Billi JE, Callaway CW, et al. Part 1: Executive summary 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2015 Oct 1;95:e1–31.

24. Soar J, Mancini ME, Bhanji F, Billi JE, Dennett J, Finn J, et al. Part 12: Education, implementation, and teams: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2010 Oct;81(1, Supplement):e288–332.

25. Sasson C, Haukoos JS, Bond C, Rabe M, Colbert SH, King R, et al. Barriers and facilitators to learning and performing cardiopulmonary resuscitation in neighborhoods with low bystander cardiopulmonary resuscitation prevalence and high rates of cardiac arrest in Columbus, OH. Circulation Cardiovascular Quality and Outcomes. 2013 Sep 1;6(5):550–8.

26. Jelinek GA, Gennat H, Celenza T, O'Brien D, Jacobs I, Lynch D. Community attitudes towards performing cardiopulmonary resuscitation in Western Australia. Resuscitation. 2001 Dec;51(3):239–46.

27. Finn JC, Bhanji F, Lockey A, Monsieurs K, Frengley R, Iwami T, et al. Part 8: Education, implementation, and teams: 2015 International Consensus on Cardiopulmonary

Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2015 Oct;95:e203–24.

28. Cave DM, Aufderheide TP, Beeson J, Ellison A, Gregory A, Hazinski MF, et al. Importance and implementation of training in cardiopulmonary resuscitation and automated external defibrillation in schools. Circulation. 2011;123(6):691–706.

29. Bossaert LL. The complexity of comparing different EMS systems—A survey of EMS systems in Europea. Annals of Emergency Medicine. 1993 Jan 1;22(1):99–102.

30. Safe Work Australia. First Aid in the Workplace. Code of Practice [Internet]. Canberra, Australia; 2016 Feb [cited 2017 Apr 7] p. 1–28. Available from: http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/693/First%20aid%20in%20the%20workplaceV3.pdf

31. Australian Government Department of Education and Training. Certificate III in Early Childhood Education and Care - CHC30113 - MySkills [Internet]. myskills. 2017 [cited 2017 Jun 29]. Available from: https://www.myskills.gov.au/courses/details?Code=CHC30113&locationId=5064&distance=25

32. Smith KL, Cameron PA, Meyer ADM, McNeil JJ. Is the public equipped to act in out of hospital cardiac emergencies? Emergency Medicine Journal. 2003 Jan 1;20(1):85–7.

33. Bray JE, Smith K, Case R, Cartledge S, Straney L, Finn J. Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation: a cross-sectional survey of Victorians. Emergency Medicine Australasia. 2017;29(2):158–164.

34. Blewer AL, Ibrahim SA, Leary M, Dutwin D, McNally B, Anderson ML, et al. Cardiopulmonary Resuscitation Training Disparities in the United States. Journal of the American Heart Association. 2017 May 1;6(5):e006124.

35. Goldberg RJ, Gore JM, Love DG, Ockene JK, Dalen JE. Layperson CPR--are we training the right people? Annals of Emergency Medicine. 1984 Sep;13(9 Pt 1):701–4.

36. Cartledge S, Bray JE, Leary M, Stub D, Finn J. A systematic review of basic life support training targeted to family members of high-risk cardiac patients. Resuscitation. 2016 Aug;105:70–8.

37. Batcheller AM, Brennan RT, Braslow A, Urrutia A, Kaye W. Cardiopulmonary resuscitation performance of subjects over forty is better following half-hour video self-instruction compared to traditional four-hour classroom training. Resuscitation. 2000 Jan;43(2):101–10.

38. Braslow A, Brennan RT, Newman MM, Bircher NG, Batcheller AM, Kaye W. CPR training without an instructor: development and evaluation of a video self-instructional system for effective performance of cardiopulmonary resuscitation. Resuscitation. 1997 Jun;34(3):207–20.

39. Potts J, Lynch B. The American Heart Association CPR anytime program. Journal of Cardiopulmonary Resuscitation. 2006;(26):346–54.

40. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991 Dec;50(2):179–211.

41. Vaillancourt C, Charette M, Kasaboski A, Brehaut JC, Osmond M, Wells GA, et al. Barriers and facilitators to CPR knowledge transfer in an older population most likely to

witness cardiac arrest: a theory-informed interview approach. Emergency Medicine Journal. 2014 Sep 1;31(9):700–5.

42. Creswell, John W. Qualitative inquiry and research design: choosing among five approaches. 3rd ed. Thousand Oaks, Calif.: SAGE Publications; 2013. xxi+448.

43. Finlay L. Phenomenology for therapists researching the lived world. Hoboken, N.J.: JWiley; 2011. xi+299.

44. Blewer AL, Leary M, Decker CS, Andersen JC, Fredericks AC, Bobrow BJ, et al. Cardiopulmonary resuscitation training of family members before hospital discharge using video self-instruction: a feasibility trial. Journal of Hospital Medicine: an official publication of the Society of Hospital Medicine. 2011 Sep;6(7):428–32.

45. Khan J, Shafquat A, Kundi A. Basic life support skills: assessment and education of spouse and first degree relatives of patients with coronary disease. Journal of the College of Physicians. 2010 May;20(5):299–302.

46. Dracup K, Guzy P, Taylor S, Barry J. Cardiopulmonary resuscitation (CPR) training. Consequences for family members of high-risk cardiac patients. Archives of Internal Medicine. 1986 Sep;146(9):1757–61.

47. Moser DK, Dracup K. Impact of cardiopulmonary resuscitation training on perceived control in spouses of recovering cardiac patients. Research in Nursing & Health. 2000 Aug;23(4):270–8.

48. Schneider L, Sterz F, Haugk M, Eisenburger P, Scheinecker W, Kliegel A, et al. CPR courses and semi-automatic defibrillators — life saving in cardiac arrest? Resuscitation. 2004 Dec;63(3):295–303.

49. Mark DB, Anstrom KJ, McNulty SE, Flaker GC, Tonkin AM, Smith WM, et al. Quality of life effects of automatic external defibrillators in the home: results from the Home Automatic External Defibrillator Trial (HAT). American Heart Journal. 2010 Apr;159(4):627–634.e7.

50. Eisenberg MS, Moore J, Cummins RO, Andresen E, Litwin PE, Hallstrom AP, et al. Use of the automatic external defibrillator in homes of survivors of out-of-hospital ventricular fibrillation. The American Journal of Cardiology. 1989 Feb 15;63(7):443–6.

51. Haugk M, Robak O, Sterz F, Uray T, Kliegel A, Losert H, et al. High acceptance of a home AED programme by survivors of sudden cardiac arrest and their families. Resuscitation. 2006 Aug;70(2):263–74.

52. Cheng YC. Targeted mass CPR training for families of cardiac patients - Experience in Taipei city. Tzu Chi Medical Journal. 1997;9(4):273–8.

53. Hao Y, Zhu J, Wang M, Yang Y, Tan H, Lui G, et al. CPR training methods in family members of patients at high risk of sudden cardiac death. Cardiology. 2011;112–4.

54. Li J, Xu Y, Yue P, Wang Y, Wu F, Zhou L, et al. Remote Supervised Reinforcement of Cardiopulmonary Resuscitation Skills by Telephone Improves One-Year Retention: A Randomized-Controlled Trial. Circulation. 2012 Nov 20;126(21 Supplement):A19508.

55. Chew DP, French J, Briffa TG, Hammett CJ, Ellis CJ, Ranasinghe I, et al. Acute coronary syndrome care across Australia and New Zealand: the SNAPSHOT ACS study. The Medical Journal of Australia. 2013;199(3):185–191.

56. Cartledge SH, Bray JE, Stub D, Krum H, Finn J. Do Cardiac Rehabilitation Programs Offer Cardiopulmonary Resuscitation Training in Australia and New Zealand? Heart, Lung and Circulation. 2016 Jun;25(6):607–12.

57. Woodruffe S, Neubeck L, Clark RA, Gray K, Ferry C, Finan J, et al. Australian Cardiovascular Health and Rehabilitation Association (ACRA) Core Components of Cardiovascular Disease Secondary Prevention and Cardiac Rehabilitation 2014. Heart, Lung and Circulation.

58. Anderson L, Thompson DR, Oldridge N, Zwisler A-D, Rees K, Martin N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database of Systematic Reviews. 2016 Jan 5;(1):Art. No.: CD001800.

59. Clark AM, Haykowsky M, Kryworuchko J, MacClure T, Scott J, DesMeules M, et al. A meta-analysis of randomized control trials of home-based secondary prevention programs for coronary artery disease. European Journal of Cardiovascular Prevention & Rehabilitation. 2010 Jun 1;17(3):261–70.

60. Davies EJ, Moxham T, Rees K, Singh S, Coats AJS, Ebrahim S, et al. Exercise training for systolic heart failure: Cochrane systematic review and meta-analysis. European Journal of Heart Failure. 2010 Jul 1;12(7):706–15.

61. Jennings CS, Collier T, Mead A, Jones J, Holden A, Connolly SB, et al. EUROACTION: Concordance for Cardiovascular Risk Factors between Patients and Partners Participating in a Multidisciplinary Family Based Cardiovascular Prevention and Rehabilitation Programme. European Heart Journal Supplements. 28(S1):848.

62. Richardson ME, Lie KG. Cardiopulmonary resuscitation training for family members of patients on cardiac rehabilitation programmes in Scotland. Resuscitation. 1999 Jan;40(1):11–9.

63. Lie KG, Richardson M. Attitudes of health professionals towards cardiopulmonary resuscitation training for family members of cardiac patients. Coronary Health Care. 1999 May;3(2):91–8.

64. Nolan JP, Hazinski MF, Billi JE, Boettiger BW, Bossaert L, de Caen AR, et al. Part 1: Executive summary: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Resuscitation. 2010 Oct;

65. Cartledge S, Finn J, Bray JE, Case R, Barker L, Missen D, et al. Incorporating cardiopulmonary resuscitation training into a cardiac rehabilitation programme: A feasibility study. European Journal of Cardiovascular Nursing. 2017;In press.

66. Cartledge S, Bray J, Finn J. A systematic review of basic life support training targeted to family members of high-risk patients. [Internet]. PROSPERO. 2014. Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014010297

67. Blewer AL, Putt ME, Becker LB, Riegel BJ, Li J, Leary M, et al. Video-Only Cardiopulmonary Resuscitation Education for High-Risk Families Before Hospital Discharge A Multicenter Pragmatic Trial. Circulation: Cardiovascular Quality and Outcomes. 2016 Oct 4;9(6):740–8.

68. Kim HS, Kim H-J, Suh EE. The Effect of Patient-centered CPR Education for Family Caregivers of Patients with Cardiovascular Diseases. Journal Korean Academic Nursing. 2016;46(3):463–474.

69. Varalakshmi E. Asses the effectiveness of training module on knowledge and skill in basic life support (BLS) among the care givers of clients. International Journal of Pharma and Bio Sciences. 7(4):574–8.

70. Blewer AL, Leary M, Esposito EC, Gonzalez M, Riegel B, Bobrow BJ, et al. Continuous chest compression cardiopulmonary resuscitation training promotes rescuer self-confidence and increased secondary training: a hospital-based randomized controlled trial*. Critical care medicine. 2012 Mar;40(3):787–92.

71. Centres for Disease Control and Prevention. National Hospital Discharge Survey: 2010 table, average length of stay and days care - Number and rate of discharges by first-listed diagnostic categories [Internet]. [cited 2016 Nov 15]. Available from: http://www.cdc.gov/nchs/data/nhds/2average/2010ave2_firstlist.pdf#x2013; Number and rate of discharges by first-listed diagnostic categories [PDF - 58 KB]

72. Bardy GH, Lee KL, Mark DB, Poole JE, Toff WD, Tonkin AM, et al. Home Use of Automated External Defibrillators for Sudden Cardiac Arrest. New England Journal of Medicine. 2008;358(17):1793–804.

73. Anderson ML, Cox M, Al - Khatib SM, Nichol G, Thomas KL, Chan PS, et al. Rates of cardiopulmonary resuscitation training in the United States.(Report). JAMA Internal Medicine. 2014;174(2):194.

74. Ro YS, Do Shin S, Song KJ, Hong SO, Kim YT, Lee D-W, et al. Public awareness and self-efficacy of cardiopulmonary resuscitation in communities and outcomes of out-of-hospital cardiac arrest: A multi-level analysis. Resuscitation. 2016;102:17–24.

75. Johnston TC, Clark MJ, Dingle GA, FitzGerald G. Factors influencing Queenslanders' willingness to perform bystander cardiopulmonary resuscitation. Resuscitation. 2003 Jan;56(1):67–75.

76. Thoren A, Axelsson A, Herlitz J. Possibilities for, and obstacles to, CPR training among cardiac care patients and their co-habitants. Resuscitation. 2005 Jun;65(3):337–43.

77. Chu KH, May CR, Clark MJ, Breeze KM. CPR training in households of patients with chest pain. Resuscitation. 2003 Jun;57(3):257–68.

78. Platz E, Scheatzle MD, Pepe PE, Dearwater SR. Attitudes towards CPR training and performance in family members of patients with heart disease. Resuscitation. 2000 Nov;47(3):273–80.

79. Australian Institute of Health and Welfare. Cardiovascular disease, diabetes and chronic kidney disease— Australian facts: Prevalence and incidence. [Internet]. Canberra: AIHW; 2014 [cited 2014 Dec 18]. (Cardiovascular, diabetes and chronic kidney disease series no. 2.). Report No.: Cat. no. CDK 2. Available from: http://www.aihw.gov.au/cardiovascular-health/prevalence/

80. Hansen EC. Successful qualitative health research: a practical introduction. NSW: Allen & Unwin; 2006. 211 p.

81. Fors A, Dudas K, Ekman I. Life is lived forwards and understood backwards – Experiences of being affected by acute coronary syndrome: A narrative analysis. International Journal of Nursing Studies. 2014 Mar 1;51(3):430–7.

82. Esmaeili M, Cheraghi MA, Salsali M. Cardiac patients' perception of patient-centred care: a qualitative study. Nursing in Critical Care. 2016 Mar 1;21(2):97–104.

83. Hasankhani H, Gholizadeh L, Mohammadi E, Zamanzadeh V, Allahbakhshian A, Ghaffari S, et al. The lived experiences of patients post coronary angioplasty: A qualitative study. Journal of Vascular Nursing. 2014;32(4):144–150.

84. Davidson PM, Daly J, Leung D, Ang E, Paull G, DiGiacomo M, et al. Health-seeking beliefs of cardiovascular patients: A qualitative study. International Journal of Nursing Studies. 2011 Nov 1;48(11):1367–75.

85. Chew DP, Scott IA, Cullen L, French JK, Briffa TG, Tideman PA, et al. National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016. Heart, Lung and Circulation. 2016 Sep;25(9):895–951.

86. Thorén A-B, Axelsson A, Herlitz J. The attitude of cardiac care patients towards CPR and CPR education. Resuscitation. 2004 May;61(2):163–71.

87. Cariou G, Pelaccia T. Are they trained? Prevalence, motivations and barriers to CPR training among cohabitants of patients with a coronary disease. Internal and Emergency Medicine. 2016 Jun 27;1–8.

88. Anfara VA, Mertz NT, editors. Theoretical Frameworks in Qualitative Research. 2 edition. Los Angeles: SAGE Publications, Inc; 2014. 264 p.

89. Grbich C. Qualitative Research in Health. NSW: Allen & Unwin; 1999. 312 p.

90. Conner M, Armitage CJ. Extending the theory of planned behavior: A review and avenues for further research. Journal of Applied Social Psychology. 1998;28(15):1429–1464.

91. Godin G, Kok G. The Theory of Planned Behavior: A Review of Its Applications to Health-related Behaviors. American Journal of Health Promotion. 1996 Nov 1;11(2):87–98.

92. Hertz R. Reflexivity & Voice. United States of America: SAGE Publications, Inc.; 1997. 336 p.

93. Freshwater D, Rolfe G. Critical reflexivity: A politically and ethically engaged research method for nursing. NT Research. 2001 Jan 1;6(1):526–37.

94. Gubrium JF, Holstein JA. Postmodern Interviewing. London: SAGE Publications; 2003. 280 p. (Chapter 9 Their Story/My Story/Our Story: Including the Researcher's Experience in Interview Research).

95. National Heart Foundation. Secondary prevention of cardiovascular disease A call to action to improve the health of Australians [Internet]. 2010 [cited 2015 Jun 20]. Available from: https://heartfoundation.org.au/images/ uploads/publications/Secondary-Prevention-of-cardiovasculardisease.pdf

96. World Health Organization. Non-communicable diseases factsheet [Internet]. Geneva; 2015. Available from: http://www.who.int/mediacentre/factsheets/fs355/en/

97. Chew DP, Amerena JV, Coverdale SG, Rankin JM, Astley CM, Soman A, et al. Invasive management and late clinical outcomes in contemporary Australian management of acute coronary syndromes: observations from the ACACIA registry. Medical Journal of Australia. 2008;188(12):691.

98. Kwan G, Balady GJ. Cardiac Rehabilitation 2012. Circulation. 2012 Feb 21;125(7):e369–73.

99. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts) Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). European Heart Journal. 2016 Aug 1;37(29):2315–81.

100. National Health and Medical Research Council. NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. [Internet]. [cited 2017 Jul 21]. Available from: www.nhmrcgovau/publications/synopses/cp65syn.htm 2014.

101. Anderson L, Taylor RS. Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews. In: Cochrane Database of Systematic Reviews [Internet]. John Wiley & Sons, Ltd; 2014 [cited 2017 Feb 19]. Available from: http://onlinelibrary.wiley.com.ezproxy.lib.monash.edu.au/doi/10.1002/14651858.CD011273.pub2/abstract

102. Goel K, Lennon RJ, Tilbury RT, Squires RW, Thomas RJ. Impact of cardiac rehabilitation on mortality and cardiovascular events after percutaneous coronary intervention in the community. Circulation. 2011;136(4):2344–52.

103. Hammill BG, Curtis LH, Schulman KA, Whellan DJ. Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. Circulation. 2010;121(1):63–70.

104. New Zealand Guidelines Group. Best Practice Evidence-based Guideline Cardiac Rehabilitation. 2002.

105. National Heart Foundation of Australia, Australian Cardiac Rehabilitation Association. Recommended Framework for Cardiac Rehabilitation. 2004.

106. New Zealand by Mauri Ora Associates. Best health outcomes for Maori: Practice implications [Internet]. Medical Council of New Zealand; 2008. Available from: https://www.mcnz.org.nz/assets/News-and-Publications/Statements/Best-health-outcomes-for-Maori.pdf

107. SurveyMonkey: Free Online Surveys (LP5b) [Internet]. SurveyMonkey. [cited 2017 Jun 20]. Available from: https://www.surveymonkey.com/mp/lp/sem-lp-5b/

108. Australian and New Zealand Committee on Resuscitation. ANZCOR Guideline 8, cardiopulmonary resuscitation [Internet]. 2016 [cited 2016 Nov 14] p. 1–5. Report No.: Section 8, Cardiopulmonary resuscitation. Available from: https://resus.org.au/guidelines/

109. Dracup K, Moser DK, Taylor SE, Guzy PM. The psychological consequences of cardiopulmonary resuscitation training for family members of patients at risk for sudden death. American Journal of Public Health. 1997 Sep;87(9):1434–9.

110. Thomas S, Friedmann E, Lee H, Son H, Morton P, HAT Investigators. Changes in anxiety and depression over 2 years in medically stable patients after myocardial infarction and their spouses in the Home Automatic External Defibrillator Trial (HAT): a longitudinal observational study. Heart. 2011 Mar;97(5):371–81.

111. McDaniel CM, Berry VA, Haines DE, Dimarco JP. Automatic External Defibrillation of Patients After Myocardial Infarction by Family Members: Practical Aspects and Psychological Impact of Training. Pacing and Clinical Electrophysiology. 1988;11(11):2029–34.

112. McLauchlan CA, Ward A, Murphy NM, Griffith MJ, Skinner DV, Camm AJ. Resuscitation training for cardiac patients and their relatives--its effect on anxiety. Resuscitation. 1992 Sep;24(1):7–11.

113. Sanna T, Fedele F, Genuini I, Puglisi A, Azzolini P, Altamura G, et al. Home defibrillation: A feasibility study in myocardial infarction survivors at intermediate risk of sudden death. American Heart Journal. 2006 Oct;152(4):685.e1-685.e7.

114. Sigsbee M, Geden EA. Effects of anxiety on family members of patients with cardiac disease learning cardiopulmonary resuscitation. Heart Lung. 1990 Nov;19(6):662–5.

115. Bossaert LL, Perkins GD, Askitopoulou H, Raffay VI, Greif R, Haywood KL, et al. Section 11: The ethics of resuscitation and end-of-life decisions. 2015; Available from: http://ercguidelines.elsevierresource.com/european-resuscitation-council-guidelines-resuscitation-2015-section-11-ethics-resuscitation-and-end/fulltext

116. Willis E, Reynolds L, Keleher H. Understanding the Australian Health Care System. Elsevier Health Sciences; 2016. 518 p.

117. Australian Institute of Health and Welfare. Monitoring Acute Coronary Syndrome using national hospital data: an information paper on trends and issues [Internet]. Canberra: AIHW; 2011 [cited 2017 Jun 11]. Available from: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=10737420971

118. Wilkins E, Wilson L, Wickramasinghe K, Bhatnagar P, Leal J, Luengo-Fernandex R, et al. European Cardiovascular Disease Statistics 2017 edition. Belgium: European Heart Network; 2017 p. 1–192.

119. Carter WB, Eisenberg MS, Hallstrom AP, Schaeffer S. Development and implementation of emergency CPR instruction via telephone. Annals of Emergency Medicine. 1984 Sep;13(9, Part 1):695–700.

120. Hüpfl M, Selig HF, Nagele P. Chest-compression-only versus standard cardiopulmonary resuscitation: a meta-analysis. The Lancet. 2010 Nov 6;376(9752):1552–7.

121. Bray JE, Deasy C, Walsh J, Bacon A, Currell A, Smith K. Changing EMS dispatcher CPR instructions to 400 compressions before mouth-to-mouth improved bystander CPR rates. Resuscitation. 2011 Nov;82(11):1393–8.

122. Eisenberg MS, Hallstrom AP, Carter WB, Cummins RO, Bergner L, Pierce J. Emergency CPR instruction via telephone. American Journal of Public Health. 1985 Jan 1;75(1):47–50.

123. Vaillancourt C, Verma A, Trickett J, Crete D, Beaudoin T, Nesbitt L, et al. Evaluating the Effectiveness of Dispatch-assisted Cardiopulmonary Resuscitation Instructions. Academic Emergency Medicine. 2007;14(10):877–883.

124. Culley LL, Clark JJ, Eisenberg MS, Larsen MP. Dispatcher-assisted telephone CPR: Common delays and time standards for delivery. Annals of Emergency Medicine. 1991 Apr 1;20(4):362–6.

125. Akahane M, Ogawa T, Tanabe S, Koike S, Horiguchi H, Yasunaga H, et al. Impact of telephone dispatcher assistance on the outcomes of pediatric out-of-hospital cardiac arrest. Critical Care Medicine. 2012;40(5):1410–1416.

126. Rea TD, Eisenberg MS, Culley LL, Becker L. Dispatcher-Assisted Cardiopulmonary Resuscitation and Survival in Cardiac Arrest. Circulation. 2001 Nov 20;104(21):2513–6.

127. Navarro-Patón R, Freire-Tellado M, Pavón-Prieto M del P, Vázquez-López D, Neira-Pájaro M, Lorenzana-Bargueiras S. Dispatcher assisted Cardiopulmonary Resuscitation (CPR): Is it still important to continue teaching lay bystander CPR? The American Journal of Emergency Medicine [Internet]. [cited 2017 Jan 20]; Available from: //www.sciencedirect.com/science/article/pii/S0735675716309135

128. Finnegan JR, Meischke H, Zapka JG, Leviton L, Meshack A, Benjamin-Garner R, et al. Patient Delay in Seeking Care for Heart Attack Symptoms: Findings from Focus Groups Conducted in Five U.S. Regions. Preventive Medicine. 2000 Sep 1;31(3):205–13.

129. Nehme Z, Andrew E, Bernard S, Patsamanis H, Cameron P, Bray JE, et al. Impact of a public awareness campaign on out-of-hospital cardiac arrest incidence and mortality rates. European Heart Journal. 2017 Jun 1;38(21):1666–73.

130. Ringh M, Rosenqvist M, Hollenberg J, Jonsson M, Fredman D, Nordberg P, et al. Mobile-Phone Dispatch of Laypersons for CPR in Out-of-Hospital Cardiac Arrest. New England Journal of Medicine. 2015 Jun 11;372(24):2316–25.

131. Claesson A, Bäckman A, Ringh M, Svensson L, Nordberg P, Djärv T, et al. Time to Delivery of an Automated External Defibrillator Using a Drone for Simulated Out-of-Hospital Cardiac Arrests vs Emergency Medical Services. JAMA. 2017 Jun 13;317(22):2332–4.

132. GoodSAM Platform -Saving Lives Through Technology. GoodSAM [Internet]. 2017 [cited 2017 Jul 11]. Available from: https://www.goodsamapp.org/

133. Amsterdam EA, Wenger NK, Brindis RG, Casey DE, Ganiats TG, Holmes DR, et al. 2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes. Circulation. 2014 Dec 23;130(25):e344–426.

134. Balady GJ, Ades PA, Bittner VA, Franklin BA, Gordon NF, Thomas RJ, et al. Referral, enrolment, and delivery of cardiac rehabilitation/secondary prevention programs at clinical centers and beyond. Circulation. 2011;124(25):2951–2960.

135. Neubeck L, Freedman SB, Clark AM, Briffa T, Bauman A, Redfern J. Participating in cardiac rehabilitation: a systematic review and meta-synthesis of qualitative data. European Journal of Preventive Cardiology. 2012 Jun 1;19(3):494–503.

136. Greenberg M, Barr GC Jr, Rupp V, Patel N, Weaver K, Hamilton K, et al. Cardiopulmonary resuscitation prescription program: a pilot randomized comparator trial. Journal of Emergency Medicine. 2012 Jul;43(1):166–71.

137. Mackay MM, Weidlich O. Australian mobile phone lifestyle index [Internet]. 2013 [cited 2017 Mar 20]. Available from: http://www.sponsor-ed.com.au/app/webroot/uploaded_files/media/Ampli%202013%20Report_Final_October%2024.pdf

138. Australian Communications and Media Authority. Digital lives of older Australians [Internet]. 2016 [cited 2016 Mar 20]. Available from: http://www.acma.gov.au/theACMA/engage-blogs/engage-blogs/Research-snapshots/Digital-lives-of-older-Australians

139. Take Heart Australia Day 2015 [Internet]. takeheartaustralia.org. [cited 2017 Jul 11]. Available from: http://takeheartaustralia.org/signup/

140. Resuscitation Council (UK). Restart A Heart Day 2017 [Internet]. 2017 [cited 2017 Jun 28]. Available from: https://www.resus.org.uk/events/rsah/

141. Hearts pumping across Victoria as thousands learn how to restart a heart – Ambulance Victoria [Internet]. [cited 2017 Jun 28]. Available from: http://ambulance.vic.gov.au/hearts-pumping-across-victoria-as-thousands-learn-how-to-restart-a-heart/

142. Bobrow B, Vadeboncoeur T, Spaite D, Potts J, Denninghoff K, Chikani V, et al. The effectiveness of ultrabrief and brief educational videos for training lay responders in hands-only cardiopulmonary resuscitation: implications for the future of citizen cardiopulmonary resuscitation training. Circulation. 2011 Mar;4(2):220–6.

143. Brown LE, Bottinor W, Tripathi A, Carroll T, Dillon WC, Lokits C, et al. A Novel, 5-Minute, Multisensory Training Session to Teach High-Quality Cardiopulmonary Resuscitation to the Public. Circulation: Cardiovascular Quality and Outcomes. 2017 Jun 1;10(6):e003404.

144. Park YM, Shin SD, Lee YJ, Song KJ, Ro YS, Ahn KO. Cardiopulmonary Resuscitation by Trained Responders Versus Lay Persons and Outcomes of Out-of-Hospital Cardiac Arrest: A Community Observational Study. Resuscitation. 2017;In press.

Appendices

PROSPERO International prospective register of systematic reviews

A systematic review of basic life support training targeted to family members of high-risk cardiac patients

Susan Cartledge, Janet Bray, Judith Finn, Dion Stub, Marion Leary

Citation

Susan Cartledge, Janet Bray, Judith Finn, Dion Stub, Marion Leary. A systematic review of basic life support training targeted to family members of high-risk cardiac patients. PROSPERO 2014:CRD42014010297 Available from http://www.crd.york.ac.uk/PROSPERO_REBRANDING/display_record.asp?ID=CRD42014010297

Review question(s)

Is basic life support training targeting family members of high-risk cardiac patients effective?

Searches

Searches for relevant publications will be conducted in the following databases: Ovid MEDLINE (1946-), CINAHL (1937-), EMBASE (1966-), Informit, Cochrane Library, Web of Science (1990-), Scopus (1960-), ERIC (1966-) and ProQuest Dissertations and Theses Global.

There will be no restriction on date of publication or language. Reference lists of included studies will be scanned for additional papers not found through the initial search strategy.

Link to search strategy

http://www.crd.york.ac.uk/PROSPEROFILES/10297_STRATEGY_20140519.pdf

Types of study to be included

Randomised controlled trials, cohort, case control, case series studies, before and after studies and non-randomised intervention studies will be included. Commentary and editorial papers, reviews and animal studies will be excluded.

Condition or domain being studied

When cardiac arrest occurs outside of a hospital it is termed out-of-hospital cardiac arrest (OHCA) and is a leading cause of death around the world. Up to 75% of cardiac arrests occur in the home setting (Brennan & Braslow, 1998). Patients who are at high-risk of having an OHCA are those with coronary heart disease, cardiomyopathy or history of a cardiac event, including prior myocardial infarction, cardiac arrest or ventricular arrhythmia. The initial emergency treatment of cardiac arrest is cardiopulmonary resuscitation (CPR) and defibrillation (where required).

Training in CPR and basic life support (BLS) has been widely taught to lay communities since the early 1970s (Eisenburger & Safar, 1999). In addition to CPR training, BLS training includes the recognition of prodromal symptoms of major life threatening events, including myocardial infarction, through to defibrillation using an automated external defibrillator.

Despite the availability of public CPR and BLS training, bystander initiated CPR remains around 20% and is lower for OHCAs occurring in the home (Platz, Scheatzle, Pepe, & Dearwater, 2000; Vaillancourt, Stiell, & Wells, 2008). Without timely commencement of CPR, survival is greatly reduced. Given the high proportion of cardiac arrests that occur in the home, targeted CPR and BLS training to family members of high-risk patients appears to be a logical use of training resources which needs to be evaluated.

Participants/ population

Participants will include any person 16 years or over deemed to be at high-risk of OHCA (due to any cardiac aetiology such as coronary heart disease, structural heart disease, life threatening arrhythmias or prior cardiac arrest) and their family members (or those with a close association to the patient).

Intervention(s), exposure(s)
The intervention will include all methods of CPR or BLS training.

Comparator(s)/ control
The intervention was compared to no training or against different methods of training between groups.

Context
High-risk patients are any persons aged over 16 years deemed as high-risk for OHCA due to any aetiology. CPR or BLS training can be in any format.

Outcome(s)
Primary outcomes
Patient survival post arrest

Family member performs CPR if patient arrests

Secondary outcomes
Family members can effectively perform CPR on a training manikin

Family members are more willing to provide CPR should their family member require it

Family members can retain skills

Family members have a reduced rate of related anxiety

Family members have an increased perceived rate of control

Data extraction, (selection and coding)
One reviewer will independently screen the title and abstract of studies for inclusion (SC). Full text articles will then be fully appraised by two authors (SC and JB). Research studies with duplicate publication of research results will be screened and the publication which is more recent or has the most complete results will be used. The process of study selection will be documented using a PRISMA flow chart of included and excluded studies.

Data will be extracted independently by one author (SC) using a pre-piloted data extraction form based on minimum requirements recommended in the Cochrane Handbook for Systematic Reviews (Julian Higgins, Sally Green, & Cochrane Collaboration, 2008). A second author (JB) independently extracted data utilising the same form on a random sample of studies. Data extraction for these studies was then cross checked. Authors of primary studies will be contacted to provide missing or additional data if required.

Risk of bias (quality) assessment
The GRADE system will be used to assess bias in individual studies by two authors (SC and JB) independently.

Strategy for data synthesis
There is expected to be a large variability between studies in terms of populations, settings, outcomes, interventions and study designs. Therefore considerable heterogeneity is expected. Meta-analysis will only be considered if there are sufficient data and when a group of studies is sufficiently homogeneous in terms of participants, interventions and outcomes to provide a meaningful summary.

If a meta-analysis is not possible all relevant findings of included studies will be reported separately. We will provide a narrative synthesis of the findings from the included studies, structured around the population characteristics, type of exposure and type of outcome.

Analysis of subgroups or subsets
If data are available, subgroup analysis will be performed on the following groups: age groups (young adults versus older adults) and subgroups of cardiac disease (coronary heart disease, cardiomyopathy, arrhythmias).

Dissemination plans
The results of this review are intended for publication in a peer-reviewed journal and presentation at a scientific conference.

Contact details for further information
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Anticipated or actual start date
23 June 2014

Anticipated completion date
22 December 2014

Funding sources/sponsors
Ms Susan Cartledge scholarship funding from the Australian Resuscitation Outcomes Consortium (Aus-ROC) - a NHMRC Centre of Research Excellence (#1029983); Dr Janet Bray and Prof Judith Finn partial salary support from Aus-ROC

Conflicts of interest
None known

Language
English

Country
Australia

Subject index terms status
Subject indexing assigned by CRD

Subject index terms

Cardiopulmonary Resuscitation; Family; Humans; Patient Education as Topic

Stage of review
Completed but not published

Date of registration in PROSPERO
19 June 2014

Date of publication of this revision
01 February 2016

DOI
10.15124/CRD42014010297

Stage of review at time of this submission	Started	Completed
Preliminary searches	No	Yes
Piloting of the study selection process	No	Yes
Formal screening of search results against eligibility criteria	No	Yes
Data extraction	No	Yes
Risk of bias (quality) assessment	No	Yes
Data analysis	No	Yes

2. Search strategy

Ovid MEDLINE Search Strategy

1. Cardiopulmonary Resuscitation/
2. Cardiopulmonary Resuscitation/ed [Education]
3. exp Resuscitation/
4. Resuscitation/ed [Education]
5. Cardio-pulmonary resuscitation.mp.
6. CPR certification.mp.
7. CPR training.mp.
8. 1 or 2 or 3 or 4 or 5 or 6 or 7
9. exp First Aid/
10. First Aid/ed [Education]
11. Basic life support.mp.
12. BLS training.mp.
13. 9 or 10 or 11 or 12
14. exp Education, Nonprofessional/
15. exp Education/
16. exp Health Education/
17. Teaching/
18. Learning/
19. 14 or 15 or 16 or 17 or 18
20. 8 and 13 and 19
21. ((CPR or cardiopulmonary resuscitation or BLS or basic life support or resuscitation) adj3 (train* or teach* or educate* or learn*)).mp.
22. 20 or 21
23. exp Family/
24. Family/ed [Education]
25. exp Spouses/
26. Spouses/ed [Education]
27. exp Friends/
28. exp Caregivers/
29. exp Caregivers/ed [Education]
30. (friend* or caregiver* or famil* or spouse*).mp.
31. 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30
32. 22 and 31
33. exp Risk/
34. exp Risk Factors/
35. exp Coronary Disease/
36. exp Myocardial Infarction/
37. exp Death, Sudden/
38. exp Heart Arrest/th
39. exp Heat Arrest/pc [Prevention & Control]
40. (high risk patient* or cardiac patient* or heart disease or cardiac arrest or myocardial infarction or chest pain).mp.
41. 33 or 34 or 35 or 36 or 27 or 38 or 39 or 40
42. 32 and 41

3. Risk of bias tables

Supplementary Table 1 Bias assessment (randomised controlled trials).

						RCT bias assessment						
Study	**Year**	**Design**	**Participants: Family**	**Participants: Patients**	**Industry Funding**	**Allocation: Generation**	**Allocation: Concealment**	**Blinding: Participants**	**Blinding: Assessors**	**Outcome: Complete**	**Outcome: Selective**	**Other Bias**
Bardy	2008	RCT	>7001	7001	Partly	Low	Low	Low	Low	Low	Low	Low
Blewer	2012	RCT	406	0	No	Low	Low	Low	Unclear	Low	High	Low
Dracup	1986	RCT	69	65	No	Unclear	High	High	Unclear	Low	High	Low
Dracup	1997	RCT	337	337	No	High	Unclear	High	Low	Low	Low	Low
Li[a]	2012	RCT	262	0	Unclear	Unclear	Unclear	Low	Low	Unclear	Low	Unclear
Mark	2010	RCT	948	948	Partly	Low	Unclear	Unclear	Unclear	High	Low	Low
Moser	2000	RCT	196	0	No	High	Unclear	Unclear	Unclear	Low	Low	Low
Thomas	2011	RCT	460	460	No	Low	Low	Low	Low	Low	Low	Low

[a] Abstract only

Supplementary Table 2 Bias assessment (non-randomised controlled trials).

Study	Year	Design	Participants: Family	Participants: Patients	Industry Funding	Non-RCT bias assessment			
						Eligibility criteria	Exposure/ Outcome	Confounding	Follow-up
Blewer[a,]	2012	Non-RCT	120	0	Unclear	Unclear	Low	Unclear	Low
Cheng	1997	Non-RCT	868	0	Unclear	Low	High	High	Low
Cokkinos[a,]	2012	Non-RCT	228	0	Unclear	Low	Low	High	Low
Dracup	1989	Non-RCT	83	0	Unclear	Unclear	Low	Low	Low
Dracup	1994	Non-RCT	337	0	No	Low	Low	Unclear	Unclear
Eisenberg	1989	Non-RCT	97	0	Partly	Low	Low	High	Low
Hao	2011	Non-RCT	150	0	Unclear	High	Low	High	Low
Haugk	2006	Non-RCT	115	0	Partly	Unclear	Low	Unclear	High
Kang[b]	2005	Non-RCT	38	0	Unclear	Unclear	Low	High	Low
Khan	2010	Non-RCT	300	0	No	Low	Unclear	Unclear	Unclear
Kliegal	2000	Non-RCT	71	30	No	Unclear	Low	Unclear	Unclear
McDaniel	1988	Non-RCT	26	16	Partly	Unclear	High	Unclear	Unclear
McLaughlan	1992	Non-RCT	22	27	No	Unclear	High	High	Unclear

						Non-RCT bias assessment			
Study	**Year**	**Design**	**Participants: Family**	**Participants: Patients**	**Industry Funding**	**Eligibility criteria**	**Exposure/ Outcome**	**Confounding**	**Follow-up**
Moore	1987	Non-RCT	34	0	Partly	Low	Low	Unclear	Unclear
Moser	1990	Non-RCT	31	0	No	Low	Low	High	High
Sanna	2006	Non-RCT	56	33	Unclear	Low	Low	Low	High
Schnieder	2004	Non-RCT	85	27	Unclear	Low	Low	Low	Low
Sigsbee	1990	Non-RCT	50	0	No	Low	Low	Low	Low

[a] Abstract only; [b] Article translation unavailable, English abstract only

4. Supplementary Tables

Supplementary Table 3 Response rates, frequency of reassessment and return rates (randomised controlled trials)

Study	Design	Response rate	Time of reassessment	Critical Outcomes (if included)	Loss to follow up / return rate: critical outcomes	Loss to follow up / return rate: general
Bardy et al. 2008[16]	RCT	Not reported	Annually for 2 years	Cardiac arrest survival	Nil for vital status data within 3 months before study closure	
				Subsequent utilisation of skills	Not reported	
Blewer et al. 2012[24]	RCT	71.7% eligibility 38.7% enrolment	1 month 3 months (sub-study)			Follow up for sub-study not reported (outcome: skills retention)
Dracup et al. 1986[25]	RCT	Eligibility not reported 7% patient enrolment	3 months 6 months	Cardiac arrest survival	Not clearly reported	18.8% return rate at 3 months; 21.7% return rate at 6 months (outcome: anxiety related to BLS training)
				CPR/BLS skills performance	Not clearly reported	
Dracup et al. 1997[27]	RCT	Not reported	2 weeks 3 months 6 months			Not fully reported 74% participants completed all four data collection points
Li et al. 2012[a, 20]	RCT	Not reported	12 months			Not reported

Study	Design	Response rate	Time of reassessment	Critical Outcomes (if included)	Loss to follow up / return rate: critical outcomes	Loss to follow up / return rate: general
Mark et al. 2010[23] (Sub-study of Bardy 2008 study)	RCT	Eligibility NA (as sub-study) 94% enrolment	12 months 24 months			80% return rate at year 1 73.9% return rate at year 2 (outcome: anxiety related to BLS training)
Moser et al. 2000[28]	RCT	Not reported	1 month			90% return rate (outcome: perceived control post BLS training)
Thomas et al. 2011[22] (Sub-study of Bardy 2008 study)	RCT	85.5% eligible (from main study) Enrolment NA- target of 440 couples	1 month 1 year 2 years			89.7% return rate at 1 month; 82.4% return rate at 1 year; 58.9% return rate at 2 years (outcome: anxiety related to BLS training)

[a] Abstract only; [b] Article translation unavailable, English abstract only; NA – not applicable; RCT, randomised controlled trial; CPR, cardiopulmonary resuscitation; BLS, basic life support

Supplementary Table 4 Response rates, frequency of reassessment and return rates (non-randomised controlled trials)

Study	Design	Response rate	Time of reassessment	Critical outcomes (if included)	Number lost to follow up / return rate	Adjusted confounders
Blewer et al. 2012[21]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Cheng et al. 1994[34]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Cokkinos et al. 2012[a,19]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Dracup et al. 1989[26]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Education Anxiety Depression Hostility Marital adjustment Age CPR skills attainment
Dracup et al. 1994[30]	Non-RCT[b]	Not reported	2 weeks 6 months	Cardiac arrest survival Subsequent utilisation of skills	72% return rate of CPR trained group at 6 months	Not reported

Study	Design	Response rate	Time of reassessment	Critical outcomes (if included)	Number lost to follow up / return rate	Adjusted confounders
Eisenberg et al. 1989[17]	Non-RCT	Eligibility 51.5% Enrolment 82.2%	Up to four years	Cardiac arrest survival Subsequent utilisation of skills	Not reported	Not reported
Hao et al. 2001[35]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Haughk et al. 2006[36]	Non-RCT	Eligibility 18.9% Enrolment 95%	1 year	Cardiac arrest survival Subsequent utilisation of skills	Not clearly reported	Not reported
Kang et al. 2005[b, 39]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Khan et al. 2010[40]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Kliegel et al. 2000[38]	Non-RCT	Not fully reported	Baseline only		NA	Not reported

Study	Design	Response rate	Time of reassessment	Critical outcomes (if included)	Number lost to follow up / return rate	Adjusted confounders
McDaniel et al. 1988[32]	Non-RCT	64.8% patients eligible initially 61.9% patients later excluded 14.2% patients had physician refusal Of the final sample approached for consent (n=25) 64% patients enrolled therefore n=26 family members trained	3 months	Cardiac arrest survival Subsequent utilisation of skills	76.9% return rate	Not reported
McLauchlan et al. 1992[41]	Non-RCT	Eligibility not reported Enrolment not reported	3 months 2 years	Cardiac arrest survival Subsequent utilisation of skills	100% return rate at 3 months; 77.5% return rate at 2 years (family members and patients, no breakdown provided)	Not reported
Moore et al. 1987[42]	Non-RCT	Eligibility not reported Enrolment not reported	6 weeks 3 months		Not reported	Not reported

Study	Design	Response rate	Time of reassessment	Critical outcomes (if included)	Number lost to follow up / return rate	Adjusted confounders
Moser et al. 1990[29] (Sub-study of Dracup 1989 study)	Non-RCT	Eligibility 50.6% Enrolment 73.8%	7 months 12 months	Cardiac arrest survival Subsequent utilisation of skills	51.6% return rate at 7 months; 48.4% return rate at 12 months	Not reported
Sanna et al. 2006[31]	Non-RCT	Eligibility not reported Enrolment not reported	3 months 6 months 9 months 12 months	Cardiac arrest survival Subsequent utilisation of skills	100% return rate at 3 months; 93% return rate at 6 months; 76% return rate at 9 months; 72% return rate at 12 months	Not reported
Schneider et al. 2004[37]	Non-RCT	Eligibility not reported Enrolment not reported	Baseline only		NA	Not reported
Sigsbee et al. 1990[33]	Non-RCT	Eligibility not reported Enrolment not reported	2 months		100% return rate	Not reported

[a] Abstract only; [b] Secondary analysis from randomised controlled trial data combining groups; NA – not applicable; non-RCT, non-randomised controlled trial; CPR, cardiopulmonary resuscitation; BLS, basic life support

5. PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	4
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5 & via link
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5

Section/topic	#	Checklist item	Reported on page #
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	n/a
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	n/a
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	5
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n/a
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	6-,
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Supplementary tables 1 & 2, Table 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	8 – 11 Table 3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	5
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a

Section/topic	#	Checklist item	Reported on page #
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	14
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	15
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	15

MONASH University
Monash University Human Research Ethics Committee (MUHREC)
Research Office

Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

Project Number:	CF16/801 - 2016000389
Project Title:	A survey of the Victorian public's perceptions and willingness to provide cardiopulmonary resuscitation (CPR)
Chief Investigator:	Dr Janet Bray
Approved:	**From:** 15 April 2016 **To:** 15 April 2021

Terms of approval - ***Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.***

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

[redacted]

Professor Nip Thomson
Chair, MUHREC

cc: Assoc Prof Karen Smith, Dr Lahn Straney, Prof Judith Finn, Ms Susie Cartledge

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ORIGINAL RESEARCH

Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation: a cross-sectional survey of Victorians

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Abstract

Objectives: To provide contemporary Australian data on the public's training in cardiopulmonary resuscitation (CPR) and awareness of hands-only CPR.

Methods: A cross-sectional telephone survey in April 2016 of adult residents of the Australian state of Victoria was conducted. Primary outcomes were rates of CPR training and awareness of hands-only CPR.

Results: Of the 404 adults surveyed (mean age 55 ± 17 years, 59% female, 73% metropolitan residents), 274 (68%) had undergone CPR training. Only 50% (n = 201) had heard of hands-only CPR, with most citing first-aid courses (41%) and media (36%) as sources of information. Of those who had undergone training, the majority had received training more than 5 years previously (52%) and only 28% had received training or refreshed training in the past 12 months. Most received training in a formal first-aid class (43%), and received training as a requirement for work (67%). The most common reasons for not having training were: they had never thought about it (59%), did not have time (25%) and did not know where to learn (15%). Compared to standard CPR, a greater proportion of respondents were willing to provide hands-only CPR for strangers (67% *vs* 86%, $P < 0.001$).

Conclusion: From an Australian perspective, there is still room for improvement in CPR training rates and awareness of hands-only CPR. Further promotion of hands-only CPR and self-instruction (e.g. DVD kits or online) may see further improvements in CPR training and bystander CPR rates.

Key words: *cardiac arrest, cardiopulmonary resuscitation, survey.*

Key findings

- Only one-quarter of Victorians surveyed had recent CPR training.
- Only half had heard of hands-only CPR.
- Previous CPR training was associated with greater confidence and willingness to perform CPR.

Introduction

The delivery of bystander cardiopulmonary resuscitation (CPR) is a crucial element in the chain of survival for out-of-hospital cardiac arrest (OHCA).[1] Bystander CPR is associated with increased rates of paramedics attempting a resuscitation, patients being found in a shockable rhythm on arrival of paramedics, survival of the event and survival to hospital discharge.[2] Communities that have seen increases in bystander CPR rates have also seen associated with increases in OHCA survival rates.

For example, in our region (Melbourne, Australia) simplification and a change to compression-focused dispatcher CPR instructions in 2009 was associated with an immediate increase in rates of bystander CPR and OHCA survival.[3] Interestingly though, bystander CPR rates have continued to improve beyond this initial increase.[4] Potential explanations for this occurrence are a change in CPR awareness, improved willingness to perform CPR and increases in CPR training rates across our population.

Existing data on Australia's CPR training rates are more than a decade old. Jelinek *et al.*,[5] Smith *et al.*[6] and Johnson *et al.*[7] found approximately 50% of Australians surveyed had received CPR training at least once. These and most international studies report a reluctance to perform CPR on strangers, particularly mouth-to-mouth ventilation. Reasons for this reluctance include fear of: disease transmission, being incapable, legal implications and causing injury.[5–10] Some of these barriers may no longer apply, with the proven efficacy[11] and

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TABLE 1. *Demographics of the sample and comparison by CPR training*

Demographics	Overall *n* (%)	Previous CPR training		
		Yes *n* = 274	No *n* = 130	*P*
Sex, *n* (%)				
Male	167 (41.3)	108 (39.4)	59 (45.4)	0.255
Female	237 (58.7)	166 (60.6)	71 (54.6)	
Age (years), *n* (%)				
18–24	17 (4.2)	13 (4.7)	4 (3.1)	0.005
25–34	30 (7.4)	23 (8.4)	7 (5.4)	
35–44	58 (14.4)	42 (15.3)	16 (12.3)	
45–54	83 (20.5)	59 (21.5)	24 (18.5)	
55–64	83 (20.5)	63 (23.0)	20 (15.4)	
65–74	71 (17.6)	45 (16.4)	26 (20.0)	
75+	62 (15.4)	29 (10.6)	33 (25.4)	
Education, *n* (%)				
Primary/grade school	9 (2.2)	2 (0.7)	7 (5.4)	0.001
Some high school	61 (15.1)	38 (13.9)	23 (17.7)	
High school graduate	100 (24.8)	57 (20.8)	43 (33.1)	
Technical/some tertiary	55 (13.6)	42 (15.3)	13 (10.0)	
Tertiary graduate	136 (33.7)	103 (37.6)	33 (25.4)	
Postgraduate	35 (8.7)	28 (10.2)	7 (5.4)	
Refused to answer	8 (2.0)	4 (1.5)	4 (3.1)	
Advanced education, *n* (%)				
High school or below	178 (44.1)	101 (36.9)	77 (59.2)	<0.001
Advanced (tertiary and above)	226 (55.9)	173 (63.1)	53 (40.8)	
Country of birth, *n* (%)				
Australia	285 (70.5)	208 (75.9)	77 (59.2)	0.001
Non-Australia	119 (29.5)	66 (24.1)	53 (40.8)	
English-speaking country	318 (78.9)	227 (82.8)	91 (70.5)	0.005
Non-English speaking	85 (21.1)	47 (17.2)	38 (29.5)	
Location				
Metropolitan	294 (72.8)	194 (70.8)	100 (76.9)	0.197
Rural	110 (27.2)	80 (29.2)	30 (23.1)	
Member of household with heart disease, *n* (%)				
Yes	78 (19.3)	53 (19.3)	25 (19.2)	0.547
No/not sure	326 (80.7)	221 (80.7)	105 (80.1)	

CPR, cardiopulmonary resuscitation.

recommendations[12] for hands-only (also known as compression-only) bystander CPR. Given the significance of bystander CPR to OHCA survival, the aim of this present study is to provide contemporary Australian data on CPR training rates and awareness of hands-only CPR. Such information is important to the development of future programmes to promote and train the Australian community in CPR.

Methods

Study design

In April 2016, we conducted a cross-sectional, computer-assisted telephone interviewing (CATI) survey of Victorian adults. The study was approved by the Monash University Human Ethics Committee.

Study setting and subjects

The study was conducted in the Australian state of Victoria (population of 5.7 million). The study sample consisted of consenting adults, aged 18 years or older, residing in Victoria who were English speaking.

The sampling frame was designed to reflect the distribution of the Victorian population (75% participants from within metropolitan Melbourne and 25% from other areas of Victoria). A total sample size of 400 Victorians was based on an estimated prevalence of CPR training in the population of 52%,[6] a confidence level of 95% and a margin of error of 5%.

Data collection

The data collection was outsourced to the Edith Cowan University Survey Research Centre (ECU-SRC). The ECU-SRC is experienced in conducting Australia-wide surveys, with a high level of expertise in the sampling methods and the CATI system. Calls to households were made across the whole week, including weekends and evenings. ECU-SRC conducted the survey and provided a de-identified dataset to the investigators. To assess for response bias we compared the demographics of the final sample to the adult population of Victoria.[13]

Survey

The survey instrument (available from the authors) contained questions regarding the respondent's demographics (e.g. age group, sex, highest level of education); knowledge of CPR (awareness of CPR,

TABLE 2. *Previous CPR training*

	n = 274
When was last training?	
<1 year	78 (28%)
1–5 years ago	51 (18%)
>5 years ago	141 (51%)
Cannot recall	4 (2%)
Where did last training take place?	
In first-aid class (e.g. St John's)	119 (43%)
At school	25 (9%)
At work	111 (40%)
Via DVD or video	1 (0.4%)
Other	15 (5%)
Cannot recall	3 (1%)
Why did you undertake training?	
Requirement of job	183 (66%)
Requirement of community/sport club	32 (12%)
Self-initiated	44 (16%)
Other	15 (5%)
Reasons for not having training†	*n* = 130
Never thought about it	77 (59%)
Cost	12 (9%)
Time	32 (24%)
Did not know where to go to learn	19 (14%)
Other	12 (9%)

†Multiple responses allowed. CPR, cardiopulmonary resuscitation.

sources); CPR training (e.g. date of most recent CPR training, type of CPR training); and willingness to perform CPR. Willingness to perform CPR was tested across five groups (close family member, distant family member, young child not related, friend, a stranger) and examined for traditional and hands-only CPR. The survey instrument used questions from similar published surveys[6,14] and was reviewed by an expert panel and piloted among non-medical colleagues for face and content validity.

Data analysis

All data were categorical and expressed as percentages. Statistical comparisons were made using the χ^2 statistic. All data were analysed using the statistical package Stata 12.1 (Release 12, College Station, TX, USA). A *P*-value <0.05 was considered statistically significant.

Results

Sample

Contact was made with 901 eligible households. Of these, 404 (45%) participated and 497 (55%) refused. Interviews were conducted on numbers from landlines (75%) and mobile phones (25%). Demographics of those surveyed are provided in Table 1.

Cardiopulmonary resuscitation awareness and training

The majority of respondents had heard of CPR (*n* = 387, 96%), and 13% reported performing CPR in a real-life emergency. Only 50% (*n* = 201) of respondents had heard of hands-only CPR, with respondents citing first-aid courses (41%), media (35%: social media/online = 19%, television/print/radio = 16%), word of mouth (6%) and work (4%) as sources of information. The only characteristic of the participants that was associated with increased awareness of hands-only CPR was CPR training (39% *vs* 25%, *P* = 0.004).

Over two-thirds of respondents had undergone CPR training (*n* = 274, 68%), with most trained in a formal first-aid class (*n* = 119, 43%) and as a requirement of employment (*n* = 183, 67%) (Table 2). Of those trained, the majority were last trained more than 5 years ago (*n* = 141, 51.5%), and only 28% had received training or refreshed training in the past 12 months. Common reasons for not having undertaken training (*n* = 130) were: never thought about it (59%), time (25%), did not know where to learn (15%) and cost (9%). Compared to those without CPR training, those trained were more likely to be middle-aged, be tertiary educated and be born in Australia or an English-speaking country (Table 1).

Overall, almost half rated their knowledge of CPR as good to excellent (*n* = 184, 46%) and one-third were confident or very confident in their ability to perform CPR (*n* = 145, 36%) (Table 3). Both knowledge and confidence were higher in those with previous CPR training (*P* < 0.001). Those trained were also more likely to describe cardiac arrest (no pulse or heart stops beating) as a reason for giving CPR (51% *vs* 38%, *P* = 0.012); however, similar proportions in both groups described heart attack or chest pain (14% *vs* 17%, *P* = 0.42).

Willingness and barriers to providing cardiopulmonary resuscitation

Willingness to provide standard CPR was higher for family members (close family, 90%; distant family,

TABLE 3. *CPR knowledge and attitudes*

	Overall $n = 404$	Previous CPR training		P
		Yes $n = 274$	No $n = 130$	
Overall knowledge				
Excellent	47 (11%)	45 (16%)	2 (1%)	<0.001
Good	137 (34%)	119 (44%)	18 (14%)	
Fair	137 (34%)	87 (32%)	50 (38%)	
Poor	58 (14%)	19 (7%)	39 (30%)	
Very poor	25 (6%)	4 (1%)	21 (16%)	
Confidence				
Very confident	41 (10%)	39 (14%)	2 (1%)	<0.001
Confident	104 (26%)	104 (38%)	13 (10%)	
Somewhat confident	127 (31%)	90 (33%	37 (28%)	
Not confident	120 (30%)	48 (17%)	72 (55%)	
Do not know	12 (3%)	6 (2%)	6 (5%)	
Understanding of when CPR required				
Not breathing	306 (76%)	213 (78%)	93 (72%)	0.174
Cardiac arrest	189 (47%)	140 (51%)	49 (38%)	0.012
Collapsed	79 (20%)	47 (17%)	32 (25%)	0.077
Unresponsive/ unconscious	146 (36%)	104 (38%)	42 (32%)	0.270
Heart attack/chest pain	60 (15%)	38 (14%)	22 (17%)	0.420
Other	4 (1%)	2 (1%)	2 (3%)	0.443
Does not know	21 (5%)	9 (3%)	12 (9%)	0.012

CPR, cardiopulmonary resuscitation.

85%) and lowest for strangers (67%) (Fig. 1). Those with CPR training were more willing to provide standard CPR across all five scenarios (all $P < 0.05$). Common barriers to providing standard CPR varied across the scenarios, but included concerns about performing mouth-to-mouth ventilation on strangers, being physically unable, and a lack of confidence (Table 4).

Compared to standard CPR, a greater proportion of respondents were willing to provide hands-only CPR for most scenarios – particularly for strangers (67% *vs* 86%, $P < 0.001$). Those with CPR training were still more willing to provide hands-only CPR to family and friends, and although higher, there was no statistically significant difference seen in the willingness to provide hands-only CPR for an unrelated child (87% *vs* 82%, $P = 0.13$) or a stranger (88% *vs* 81%, $P = 0.05$).

Discussion

Our study suggests that CPR training rates in adults residing in Victoria have increased over the last decade, with over two-thirds of respondents having received some form of training. However, most of those trained had not received recent training, and only half of the respondents were aware of hands-only CPR. Having CPR training and use of hands-only CPR was associated with greater willingness to perform CPR.

Given that CPR-trained individuals are more willing[14] and likely to perform bystander CPR,[15] it is probable that the increase in bystander CPR rates seen in our region over the last decade are related to our finding of increased rates of CPR training. Although we do acknowledge that CPR training decays over time and training received greater than 12 months may not be retained,[16] we included any CPR training to enable comparisons to previous reports, which generally used a definition of training at least once. We also saw an increase in those with recent training compared with the previous report from our region (11%[6] *vs* 28%); however, the need for CPR refresher courses may need to promoted in our population.

Other countries have also reported temporal increases in rates of CPR training, although these were usually following large, public health initiatives promoting CPR training.[17] To our knowledge, there has been no large-scale CPR awareness campaigns in our region since the last survey, and there is no mandatory CPR training requirements across the whole population (e.g. to obtain a drivers licence). It is possible that smaller initiatives may be responsible for the increase, such as increased first-aid training in workplaces related to occupational health and safety as 66% of our respondents received CPR as an employment requirement. Unfortunately, we did not ask about type of employment – something that should be considered in future research. Another explanation could be differences in those sampled; however, the demographics of those sampled in the earlier Victorian study were not published to enable comparison.[6]

Knowledge of hands-only CPR in our region was high when compared with recent international reports.[14] Most of our respondents reported either first-aid courses or the media as the source of this information. It is possible that international campaigns, such as the popular British Heart Foundation's 'Hard and Fast Hands-Only' CPR advertising,[18] were seen by our population via social media. Improving the Australian public's awareness of

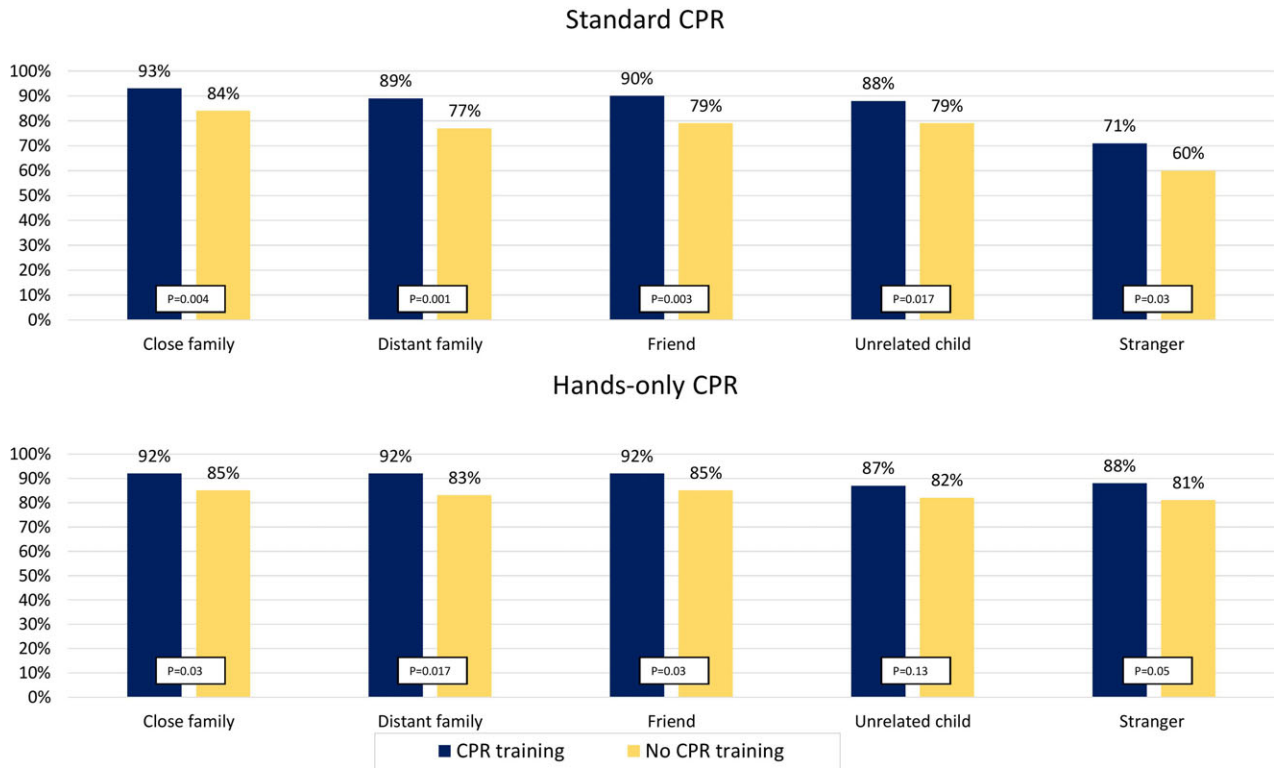

Figure 1. *Willingness to provide standard and hands-only cardiopulmonary resuscitation (CPR) overall and by CPR training. (■), CPR training; (■), no CPR training.*

hands-only CPR and encouraging CPR training/update of training may be the next public health initiative required to further improve rates of bystander CPR and OHCA survival.

In our region, such interventions could specifically target those with low rates of CPR training and regions recently identified as high risk[19] (i.e. those with highest OHCA incidence and lowest bystander CPR) to maximise the effectiveness.[20] Particularly, as these high-risk regions may also have lower rates of CPR awareness and training as identified by a recent Korean study.[21] Such training is likely to need a multi-faceted approach. Similar to previous reports,[22] reasons for not receiving CPR training in our region include a lack of consideration and time. Use of online and self-instructional CPR training in our cohort was low, yet are proven to be effective methods for CPR training[23] and could assist in training large proportions of the population.

Newer forms of CPR access, such as mobile-phone dispatch of trained laypersons, are innovative and also have exciting potential to improve CPR rates and OHCA outcomes.[24] However, studies to date have shown that they are not activated/applicable to all OHCA cases, may not be suitable in some regions, and rely heavily on large numbers of CPR-trained volunteers.[25] As such, these strategies do not negate the need to improve and maintain CPR awareness and training in the public.

Limitations

Our study has a number of limitations. Data from this study only provides a Victorian perspective, and therefore may not be generalisable to the wider Australian public. As with any survey, the final sample may not be representative – particularly as the data collection used only telephone, and was restricted to adults and English-speaking Victorians. Compared with the adult Victorian population,[13] our sample was made up of a slightly higher proportion of older people (>65 years 33% *vs* ~19% in adult Victorian population) and less younger people (<34 years 12% *vs* ~28% in adult Victorian population). It is possible that older Victorian's were more likely to have undergone CPR training at least once in their lifetime, and as a result our rate may be inflated. However, the sample was fairly similar for all other demographics (sex, education, Australian-born and location), and prevalence of heart disease.[26] It is also possible that people with CPR training and those who had performed CPR in a real-life emergency may have been more willing to participate. Although the proportion of the later on our sample is similar to other reports (~10%).[8]

Given these limitations our data may present a best case scenario, but still suggests there is room for improvement in CPR training/update of training and awareness of hands-only CPR. Further promotion of hands-only CPR, self-instruction (e.g. DVD kits or online) and focused interventions in regions with low bystander CPR may see further improvements in CPR training and bystander CPR rates in our region.

TABLE 4. *Reasons for not performing CPR*

	Standard CPR					Hands-only CPR				
	Close family (*n* = 23)	Distant family (*n* = 31)	Unrelated child (*n* = 43)	Friend (*n* = 37)	Stranger (*n* = 87)	Close family (*n* = 32)	Distant family (*n* = 23)	Unrelated child (*n* = 38)	Friend (*n* = 23)	Stranger (*n* = 32)
Does not know how	1 (4%)	3 (9%)	5 (11%)	4 (11%)	5 (5.7%)	1 (4%)	2 (9%)	3 (8%)	3 (13%)	3 (9%)
Does not feel confident	8 (35%)	10 (29%)	11 (25%)	12 (32%)	12 (14%)	8 (35%)	8 (35%)	8 (21%)	8 (35%)	10 (31%)
Concern: mouth to mouth	4 (17%)	6 (17%)	8 (18%)	10 (27%	25 (40%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	3 (9%)
Concern: harming person	0 (0%)	2 (6%)	14 (32%)	2 (5%)	6 (7%)	1 (4%)	1 (4.3%)	15 (39%)	2 (9%)	3 (9%)
Concern: legal consequences	0 (0%)	0 (0%)	4 (9%)	0 (0%)	7 (8%)	0 (0%)	0 (0%)	5 (13%)	0 (0%)	3 (9%)
Concern: improper CPR	6 (26%)	6 (17%)	8 (18%)	8 (21%)	16 (19%)	6 (26%)	6 (26%)	8 (21%)	6 (26%)	8 (25%)
Physically unable	8 (35%)	9 (26%)	10 (23%)	8 (21%)	11 (12%)	7 (30%)	9 (39%)	8 (21%)	8 (35%)	9 (28%)
Other	1 (4%)	4 (12%)	2 (5%)	3 (8%)	21 (24%)	4 (17%)	3 (13%)	4 (10%)	3 (13%)	4 (12%)

CPR, cardiopulmonary resuscitation.

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Author contributions

All authors satisfy the recommendations outlined in the ICMJE Recommendations 2013. All authors have made substantial contributions to the following: (i) the conception and design of the study (JEB, KS, SC, LS, JF), or acquisition of data (JEB), or analysis (JEB, RC, LS) and interpretation of data (JEB, KS, SC, RC, LS, JF); (ii) drafting the article (JEB, RC) or revising it critically for important intellectual content (JEB, KS, SC, RC, LS, JF); and (iii) final approval of the version to be submitted (JEB, KS, SC, RC, LS, JF).

Competing interests

JEB, SC and JF have received in-kind research equipment from Laerdal and are committee members for the Australian Resuscitation Council. KS is employed by Ambulance Victoria and JF receives salary support from St John Ambulance Western Australia. SC is Director of City to Surf First Aid.

References

1. Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circ. Cardiovasc. Qual. Outcomes* 2010; **3**: 63–81.
2. Fridman M, Barnes V, Whyman A *et al.* A model of survival following pre-hospital cardiac arrest based on the Victorian Ambulance Cardiac Arrest Register. *Resuscitation* 2007; **75**: 311–22.
3. Bray JE, Deasy C, Walsh J, Bacon A, Currell A, Smith K. Changing EMS dispatcher CPR instructions to 400 compressions before mouth-to-mouth improved bystander CPR rates. *Resuscitation* 2011; **82**: 1393–8.
4. Nehme Z, Bernard S, Cameron P *et al.* Using a cardiac arrest registry to measure the quality of emergency medical service care: decade of findings from the Victorian Ambulance Cardiac Arrest Registry. *Circ. Cardiovasc. Qual. Outcomes* 2015; **8**: 56–66.
5. Jelinek GA, Gennat H, Celenza T, O'Brien D, Jacobs I, Lynch D. Community attitudes towards performing

cardiopulmonary resuscitation in Western Australia. *Resuscitation* 2001; **51**: 239–46.
6. Smith KL, Cameron PA, Meyer AD, McNeil JJ. Is the public equipped to act in out of hospital cardiac emergencies? *Emerg. Med. J.* 2003; **20**: 85–7.
7. Johnston TC, Clark MJ, Dingle GA, FitzGerald G. Factors influencing Queenslanders' willingness to perform bystander cardiopulmonary resuscitation. *Resuscitation* 2003; **56**: 67–75.
8. Coons SJ, Guy MC. Performing bystander CPR for sudden cardiac arrest: behavioral intentions among the general adult population in Arizona. *Resuscitation* 2009; **80**: 334–40.
9. Donohoe RT, Haefeli K, Moore F. Public perceptions and experiences of myocardial infarction, cardiac arrest and CPR in London. *Resuscitation* 2006; **71**: 70–9.
10. Savastano S, Vanni V. Cardiopulmonary resuscitation in real life: the most frequent fears of lay rescuers. *Resuscitation* 2011; **82**: 568–71.
11. Bobrow BJ, Spaite DW, Berg RA *et al.* Chest compression-only CPR by lay rescuers and survival from out-of-hospital cardiac arrest. *JAMA* 2010; **304**: 1447–54.
12. Kleinman ME, Brennan EE, Goldberger ZD *et al.* Part 5: adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association Guidelines Update for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation* 2015; **132**(Suppl. 2): S414–35.
13. Australian Bureau of Statistics. The National Regional Profile-Victoria, 2016. [Cited 1 Sep 2016.] Available from URL: http://stat.abs.gov.au/itt/r.jsp?RegionSummary&region=2&dataset=ABS_REGIONAL_ASGS&geoconcept=REGION&measure=MEASURE&datasetASGS=ABS_REGIONAL_ASGS&datasetLGA=ABS_REGIONAL_LGA&regionLGA=REGION&regionASGS=REGION
14. Urban J, Thode H, Stapleton E, Singer AJ. Current knowledge of and willingness to perform Hands-Only CPR in laypersons. *Resuscitation* 2013; **84**: 1574–8.
15. Tanigawa K, Iwami T, Nishiyama C, Nonogi H, Kawamura T. Are trained individuals more likely to perform bystander CPR? An observational study. *Resuscitation* 2011; **82**: 523–8.
16. Finn JC, Bhanji F, Lockey A *et al.* Part 8: education, implementation, and teams: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Resuscitation* 2015; **95**: e203–24.
17. Lee MJ, Hwang SO, Cha KC, Cho GC, Yang HJ, Rho TH. Influence of nationwide policy on citizens' awareness and willingness to perform bystander cardiopulmonary resuscitation. *Resuscitation* 2013; **84**: 889–94.
18. British Heart Foundation. Hard and fast hands-only CPR. Secondary hard and fast hands-only CPR. 2016. [Cited 1 Nov 2016.] Available from URL: https://www.youtube.com/watch?v=hcQG2MMegXw
19. Straney LD, Bray JE, Beck B *et al.* Regions of High Out-Of-Hospital Cardiac Arrest Incidence and Low Bystander CPR Rates in Victoria, Australia. *PLoS One* 2015; **10**: e0139776.
20. Sasson C, Meischke H, Abella BS *et al.* Increasing cardiopulmonary resuscitation provision in communities with low bystander cardiopulmonary resuscitation rates: a science advisory from the American Heart Association for healthcare providers, policymakers, public health departments, and community leaders. *Circulation* 2013; **127**: 1342–50.
21. Ro YS, Shin SD, Song KJ *et al.* Public awareness and self-efficacy of cardiopulmonary resuscitation in communities and outcomes of out-of-hospital cardiac arrest: a multilevel analysis. *Resuscitation* 2016; **102**: 17–24.
22. Sasson C, Haukoos JS, Bond C *et al.* Barriers and facilitators to learning and performing cardiopulmonary resuscitation in neighborhoods with low bystander cardiopulmonary resuscitation prevalence and high rates of cardiac arrest in Columbus, OH. *Circ. Cardiovasc. Qual. Outcomes* 2013; **6**: 550–8.
23. Lynch B, Einspruch EL, Nichol G, Becker LB, Aufderheide TP, Idris A. Effectiveness of a 30-min CPR self-instruction program for lay responders: a controlled randomized study. *Resuscitation* 2005; **67**: 31–43.
24. Rumsfeld JS, Brooks SC, Aufderheide TP *et al.* Use of mobile devices, social media, and crowdsourcing as digital strategies to improve emergency cardiovascular care: a scientific statement from the American Heart Association. *Circulation* 2016; **134**: e87–108.
25. Ringh M, Rosenqvist M, Hollenberg J *et al.* Mobile-phone dispatch of laypersons for CPR in out-of-hospital cardiac arrest. *N. Engl. J. Med.* 2015; **372**: 2316–25.
26. Victorian Government. Victorian public health and wellbeing plan 2015–2019, 2015. [Cited 1 Sep 2016.] Available from URL: www.health.vic.gov.au/prevention

ETHICS COMMITTEE CERTIFICATE OF APPROVAL

This is to certify that

Project No: 72/15

Project Title: Attitudes, beliefs and knowledge of high-risk cardiac patients and their families towards Basic Life Support Training- a qualitative study.

Principal Researcher: Professor Judith Finn

was considered for Low Risk Review and ***APPROVED*** *on* **10/3/2015**

It is the Principal Researcher's responsibility to ensure that all researchers associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Secretary of the Ethics Committee, via amendment or report, of

- Any significant change to the project and the reason for that change, including an indication of ethical implications (if any);
- Serious adverse effects on participants and the action taken to address those effects;
- Any other unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role, or any other change in research personnel involved in the project;
- A delay of more than 12 months in the commencement of the project; and,
- Termination or closure of the project.

Additionally, the Principal Researcher is required to submit

- A Final Report on completion of the project.

Approval covers the project as described in the application (including any modifications made prior to approval). Low Risk projects are subject to audit and ethical approval may be withdrawn if the project deviates from that proposed and approved.

SPECIAL CONDITIONS

None

SIGNED:

Professor John J. McNeil
Chair, Ethics Committee

Please quote project number and title in all correspondence

Monash University Human Research Ethics Committee (MUHREC)
Research Office

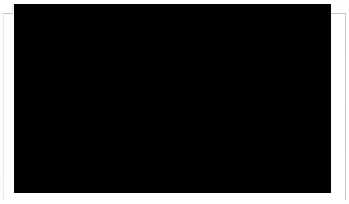
Confirmation of Registration

This is to certify that the project below is now registered with the Monash University Human Research Ethics Committee under the Memorandum of Agreement with the Alfred.

Project Number	CF15/794 - 2015000359
Project Title	Attitudes, beliefs and knowledge of high-risk cardiac patients and their families towards Basic Life Support Training- a qualitative study.
Chief Investigator	Prof Judith Finn
Valid until	12 March 2020

Notes:

1. Registration is valid whilst you hold a position at Monash University and approval at the primary HREC is current.
2. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
3. **End of project:** Notification should be provided at the conclusion of the project. MUHREC should also be notified if the project is discontinued before the expected date of completion.
4. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to the project in accordance with The *Australian Code for the Responsible Conduct of Research*.



Professor Nip Thomson
Chair, MUHREC

Cc: Ms Susan Cartledge; Dr Janet Bray; Assoc Prof Susan Feldman; Prof Henry Krum

Postal – Monash University, Vic 3800, Australia
Building 3E, Room 111, Clayton Campus, Wellington Road, Clayton
Telephone
Email
ABN CRICOS Provider #00008C

3. Pre-interview questionnaire

Section A. Administrative Section	
1. Study ID no: ☐☐	2. Date of interview ☐☐-☐☐-201☐ (Day Month Year)

Section B. Clinical data from medical record		
1. Date and time of symptom onset	☐☐-☐☐-201☐ (Day Month Year) ___:___hrs	
2. Date and time of presentation to hospital	☐☐-☐☐-201☐ (Day Month Year) ___:___hrs	
3. Presenting history of AMI per medical record *(as described by Cardiology admission notes)*		
4. AMI subtype	☐ STEMI ☐ Non-STEMI	
5. AMI severity	Peak Tnt I level: _____ Q waves present on ECG: ☐ Yes ☐ No Ejector fraction (if avail): _____%	
Cardiovascular Risk Factors	**No**	**Yes**
1. Myocardial Infarction		
2. Angina		
3. History of angina		
4. Percutaneous coronary intervention		
5. Coronary artery bypass surgery		
6. Diabetes on medical therapy		
7. **Hypertension**		
8. Hypercholesterolemia		
9. Depression		
10. Current smoking		
11. History of smoking		

Instructions: To be completed by the patient and their relative / cohabitant prior to discharge and collected by Susie Cartledge.

Section B. Pre-interview questionnaire	
Patient	**Relative / cohabitant**
Age:	Age:
	Relationship to patient:
Country of birth:	Country of birth:
Marital status: ☐ Married ☐ Not currently married	
What is the highest level of education you have completed? ☐ Some high school ☐ Completed high school ☐ Technical college or some university ☐ University degree	What is the highest level of education you have completed? ☐ Some high school ☐ Completed high school ☐ Technical college or some university ☐ University degree
Have you ever completed a Cardiopulmonary Resuscitation Course (CPR)? ☐ Yes Approx Year: ☐ No	Have you ever completed a Cardiopulmonary Resuscitation Course (CPR)? ☐ Yes Approx Year: ☐ No
Would you be interested in learning CPR in the future? ☐ Yes ☐ No	Would you be interested in learning CPR in the future? ☐ Yes ☐ No

4. **Table 1.** Qualitative participant interview details

Participant number	Interview order	Patients			Partner or Spouse		Interview duration (min:sec)
		Pseudonym	Age (years)	Diagnosis	Pseudonym	Age (years)	
001	1	Larry	64	STEMI	Helen	63	28:32
004	4	Jimmy	55	STEMI	Nadia	55	45:28
005	6	Karl	69	NSTEMI	Marg	69	56:19
006	2	Markus	75	NSTEMI	Olivia	65	33:18
007	3	Liz	56	Takotsubo Cardiomyopathy	Sam	60	21:26
008	7	Ravi	65	NSTEMI	Glenda	72	44:57
010	5	John	57	STEMI	Bernadette	57	21:36
012	10	Dan	61	STEMI	Rhonda	57	39:25
014	9	Martin	47	NSTEMI	Daphne	42	44:29
015	8	Sally	59	STEMI	Tim	59	63:20
017	11	Paul	70	NSTEMI	Tia	42	51:38
018	12	Jen	63	Takotsubo Cardiomyopathy	Brad	68	61:56

STEMI, ST-elevation myocardial infarction; NSTEMI, Non ST-Elevation myocardial infarction

5. Vignettes of participants –Chapter Four and Paper Three

Participants were interviewed between 7th May 2015 and 18th June 2016. Most interviews were conducted in the autumn (Fall) and winter months. Below is a brief description of each patient–spouse pair, outlining their demographics, BLS training history and the patients' cardiac diagnoses, in the order in which they were interviewed. These vignettes add a human dimension to the profile of the participants in the qualitative study (Chapter Four). To provide clinical context, the hospital troponin ranges are given below.

Alfred Hospital Troponin I (Tnt) Ranges:
Female: normal range = ≤ 16ng/L
Male: normal range = ≤ 26ng/L

001: Larry and Helen are a married couple, both born in Australia. At the time of the interview Larry was 64 and Helen was 63 years old. Larry had a university education and Helen a technical college education. Larry was working full time and undertook annual BLS training at work. Helen last had BLS training in 2000 and stated she would be interested in learning again.

Larry's only risk factor and past medical history was current smoking. He had suffered a ST-elevation myocardial infarction (STEMI) (peak Tnt 69,130ng/L), with chest pain developing while he was out cycling alone. After realising that the pain was not indigestion when it migrated to his jaw, he called an ambulance.

006: Markus and Olivia are a married couple, both born in Poland. At the time of the interview, Markus was 75 and Oliva 65 years old. Markus had a university degree and Olivia a technical college degree. This was a second marriage; they had no children together. Markus has an extremely dry sense of humour and loved to joke around during our interactions. While Polish was their first language, Markus had an excellent command of English and Olivia could

certainly communicate effectively in English. Neither had ever undertaken a BLS course, nor was interested in doing one in the future.

Markus had multiple medical conditions, including diabetes. He had suffered a small non-ST-elevation myocardial infarction (NSTEMI) (peak Tnt 400ng/L) after experiencing chest pain that did not resolve after 30 minutes.

007: Liz and Samuel are a married couple, both born in Australia. At the time of the interview Liz was 56 and Sam was 60 years old; they had a university degree and a technical college education respectively. Both were working and had learnt BLS the previous year as part of their jobs, but were interested and invested in keeping their skills current.

Liz had suffered a sudden onset of chest pain with an associated Tnt rise of 1,33Ing/L. She was initially managed as an NSTEMI before Takotsubo cardiomyopathy was diagnosed. The probable cause of this condition was the stressful event of a loved family pet being suddenly killed. The interview took place shortly after her outpatient cardiology follow-up appointment, at which she had just been given the all clear as her ejection fraction had returned to baseline and she remained symptom free. Both Liz and Sam were very relieved to hear this after six weeks of waiting between hospital discharge and follow-up appointment.

004: Jimmy and Nadia are a married couple, both aged 55 years at the time of the interview, and were born in Australia. Both have a university education; Jimmy worked full time and Nadia worked in social work. Jimmy appeared very business-like and distracted at the commencement of the interview, but gradually became more engaged and relaxed. This was the longest interview to date (45 mins).

Jimmy had experienced two episodes of chest pain, the second occurring in the morning while he was at work. As he had associated dizziness and felt unwell, an ambulance was called. Jimmy was diagnosed with an inferior STEMI (peak Tnt 94,000ng/L).

Nadia had learnt BLS a long time ago. Jimmy had never learnt BLS, but both were interested in learning.

010: John and Bernadette are a married couple, both born in Mauritius. At the time of the interview they were both aged 57 years. They had completed university degrees. John ran his own recruitment business. John had awakened with central chest pain; after it did not subside following a dose of esomeprazole, Bernadette drove John to hospital emergency where he was diagnosed with an inferior STEMI (peak Tnt 36,459ng/L).

Bernadette had learnt BLS approximately 5–6 years ago through her work as a school teacher and John had never learnt. Both were very interested in learning and being prepared.

005: Karl and Marg are a married couple, both born in Australia. Marg is a theatre nurse who had undertaken hospital-based training in addition to assisting Karl with their pet products business. Karl had completed a high school education. At the time of the interview Karl was aged 69 years; he had experienced multiple episodes of chest tightness over a few days before having a longer episode that prompted him to drive to the emergency department. He suffered an NSTEMI (peak Tnt 2,625ng/L) and had an acute myocardial infarction 11 years prior.

While his wife had learnt BLS for her nursing work, Karl had never learnt BLS before, but stated that he would be interested in learning in the future.

008: Ravi and Glenda are a married couple, both with a university education, who were born in Israel. At the time of the interview Ravi was 65 years of age and Glenda 72. Ravi experienced chest discomfort, described as a burning feeling. He was diagnosed with an NSTEMI (peak Tnt 2,951). This was Ravi's second acute myocardial infarction; the first time he had been offered and attended cardiac rehabilitation. Both had completed BLS training in the past and were happy to learn it again.

015: Sally and Tim are a de facto couple who live together with their adult daughter. At the time of the interview they were both aged 59 years. They were born in Australia and had completed technical college. Sally worked part time at a primary school, teaching gardening and cooking. Tim was currently unemployed.

Sally had suffered chest pain while at work and was then transferred to hospital in an ambulance, with Tim following in his car. She suffered an inferior STEMI (peak Tnt 44,400ng/L). When I met them, Sally had just completed cardiac rehabilitation and undertaken BLS training there. Tim had never completed BLS training but "felt that he should".

014: Martin and Daphne are a married couple with university educations who worked in the police force. This was a second marriage for both of them, with children from previous relationships and one of their own, meaning they lived in a blended family with five children. At the time of the interview Martin was 47 years old and Daphne 42 years. Both had undertaken BLS training regularly as part of their professions, and were keen to keep their training updated.

Martin experienced back pain with associated chest pain early in the morning. When the pain increased at work and radiated further he asked a colleague to drive him to hospital. Martin was diagnosed with an NSTEMI (peak Tnt 433ng/L). After this admission, Martin had another episode of chest pain which required a subsequent angiogram.

012: Dan and Rhonda are a married couple; at the time of interview Dan was 61 years of age and Rhonda 57. Dan has a university degree, while Rhonda had completed high school. Neither of them had undertaken BLS training but were very interested to learn together in the near future.

Dan self-presented to hospital emergency overnight with chest pain radiating through to his back, following intermittent chest pain in the two weeks prior. Dan was diagnosed with an inferior STEMI with a peak Tnt of 55,610ng/L.

017: Paul and Tia are a married couple with two young children who reside 4.5 hours' drive north-east of Melbourne. Paul was transferred to The Alfred Hospital from one of the rural hospitals in his area and was scheduled to have all his follow-up completed at The Alfred. At the time of the interview Paul, a retired school teacher, was 70 years of age and Tia, who was training to be a school teacher, was 42. Both had university degrees. While Paul had completed BLS training as part of his employment, Tia was yet to complete training. Both were keen to learn, and were aware that it was important due to the rural environment in which they lived.

Paul experienced a "heavy feeling" overnight at home. As they were heading into town he decided to visit the local nurse, who performed an ECG and transferred him to the closest hospital. Upon transfer to The Alfred Hospital Paul was diagnosed with an NSTEMI (peak Tnt 410ng/L).

018: Jen and Brad are a married couple who live in a small coastal town south-west of Melbourne, where they run the local newspaper. At the time of interview Jen was 63 years of age and Brad 68. Jen is a journalist and had completed a university degree, while Brad had completed high school and worked on all the formatting and graphics for the newspaper.

They had been visiting family in Melbourne when Jen experienced severe central chest pain with associated diaphoresis and malaise at rest. An ambulance was called and Jen was taken to the closest private hospital in Melbourne before being transferred to The Alfred Hospital. Jen was diagnosed with Takotsubo cardiomyopathy (peak Tnt 3,440ng/L) at The Alfred. The precipitating event was unknown; a possibility was that Jen had gone sailing for the first time a couple of weeks earlier and it proved an extremely strenuous day. After discharge from The

Alfred Jen went on to have further chest pain, this time being admitted to a local hospital and diagnosed with ischaemic heart disease.

MONASH University

Monash University Human Research Ethics Committee (MUHREC)
Research Office

Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

Project Number:	CF14/2889 - 2014001596
Project Title:	A descriptive study of Basic Life Support training for patients and families at Cardiac Rehabilitation Programs in Australia and New Zealand.
Chief Investigator:	Prof Judith Finn
Approved:	**From:** 30 September 2014 **To:** 30 September 2019

Terms of approval - *Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.*

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Professor Nip Thomson
Chair, MUHREC

cc: Dr Janet Bray, Ms Susan Cartledge

Postal – Monash University, Vic 3800, Australia
Building 3E, Room 111, Clayton Campus, Wellington Road, Clayton
Telephone
Email
ABN 12 377 614 012 CRICOS Provider #00008C

MONASH University

Susie Cartledge [redacted]

RE: ACRA -- CPR training at cardiac rehab research

Steve Woodruffe [redacted] 17 September 2014 at 11:11
To: Susie Cartledge [redacted]

Hi Susie

Thanks for your follow-up feedback and sorry for not responding sooner. The next link in the endorsement chain is for me to provide an update of the process to the wider EMC for final agreement to endorse/support your work. This is essentially a formality as the review panel are quite happy to endorse your study. The next step is for me to then provide you with our logo to be included in any correspondence and terminology to be included, as per the policy.

Could you advise what level of action you prefer from ACRA with regards dissemination of the Survey. E.g. do you want the committee to diseminate via our statewide networks, or do you want to use our directories to directly contact coordinators?

We can assist either way.

I will be in touch.
Steve

Stephen Woodruffe ESSAM

Accredited Exercise Physiologist

Ipswich Cardiac Rehabilitation Service | Community Health

West Moreton Hospital and Health Service | **Queensland Government**

[redacted]

www.health.qld.gov.au

President - Australian Cardiovascular Health and Rehabilitation Association (ACRA) ~ 2013-2015

From: Susie Cartledge [redacted]
Sent: Wednesday, 17 September 2014 9:31 AM
To: Steve Woodruffe
[Quoted text hidden]

[Quoted text hidden]

Basic Life Support training at Cardiac Rehabilitation (AUS)

Program Demographics

This section of the survey will collect current demographic data on your cardiac rehabilitation program. All information is anonymous and will be reported at state or territory level.

*1. Please indicate which state or territory you work in

2. Please indicate if your program is located:

- In a major capital city
- Not in a major capital city

3. Please indicate if your program is in:

- Public sector
- Private sector

*4. How many participants attended your cardiac rehabilitation program in 2013?

5. Is your program

- Part of a hospital
- Part of a community centre
- Stand alone

Other (please specify)

6. What programs do you currently offer? (tick all that apply)

- Phase 1
- Phase 2
- Phase 3

Other (please specify)

7. The patients catered for in your program are (tick all that apply):

- [ ] AMI
- [ ] Cardiac Surgery
- [ ] PCI
- [ ] Angina
- [ ] CHF
- [ ] Risk factor modification

Other (please specify)

8. What program components do you currently offer? (tick all that apply)

- [ ] Written information
- [ ] Exercise
- [ ] Face-to-face education sessions

Other (please specify)

9. How many years has your rehabilitation service been providing cardiac rehabilitation?

10. In general, do family members of the patients take part in the rehabilitation program?

- ○ Never
- ○ Only on admission
- ○ Occasionally, only for education
- ○ Occasionally, for education or other activities
- ○ Regularly

11. Do you currently have a Resuscitation Officer/Coordinator (a staff member assigned to organise resuscitation training, equipment and auditing of processes) at your institution?

- Yes
- No
- No, because we are a small stand alone program
- Unsure

Basic Life Support training at Cardiac Rehabilitation (AUS)

Respondent demographics

*12. Please indicate your current role within the rehabilitation service

- Nurse unit manager
- Cardiac rehabilitation nurse
- Physiotherapist
- Occupational therapist
- Other (please specify)

13. Please indicate the TOTAL time you have worked in cardiac rehabilitation:

- <1 year
- 1 - 5 years
- 5 - 10 years
- 10 - 20 years

14. What is your age group?

- 21 - 34 years
- 35 - 44 years
- 45 - 54 years
- 55 - 64 years
- 65 years and over

15. Are you:

- Female
- Male

Basic Life Support training at Cardiac Rehabilitation (AUS)

BLS and CPR Training

This section of the survey will collect information on what Basic Life Support (BLS) or Cardiopulmonary Resuscitation (CPR) training your program offers. If no CPR training is offered you will be directed to the next appropriate question.

16. Do you provide information/education to participants on... (tick all that apply)

- [ ] CHD risk factors
- [ ] Warning signs of a heart attack
- [ ] How to access emergency services (ie. ambulance)

*17. Is any Cardiopulmonary Resuscitation (CPR) training currently provided to patients or families? (tick all that apply)

- [ ] No
- [ ] As part of the rehabilitation program
- [ ] As part of patient support group
- [ ] Additional optional training
- [ ] Stand-alone training program

Other (please specify)

Basic Life Support training at Cardiac Rehabilitation (AUS)

CPR training provision

18. What type of CPR training is currently provided in your program? (tick all that apply)

- [ ] Face to face training
- [ ] Self-instructional video training
- [ ] Accredited course (ie. Red Cross, St Johns etc)
- [ ] Non-accredited course

Other (please specify)

19. Who is CPR training offered to? (tick all that apply)

- [ ] Patients
- [ ] Family
- [ ] Extended family
- [ ] Friends

Other (please specify)

20. Is the same CPR training program offered to patients and family members?

- ○ Yes
- ○ No (please describe different programs)

Name/Description of programs

21. Who currently provides the CPR training? (tick all that apply)

- [ ] Cardiac rehabilitation staff
- [ ] Paramedic
- [ ] Internal volunteer
- [ ] Registered Nurse
- [ ] Certified external trainer
- [ ] Doctor
- [ ] External volunteer

Other (please specify and include qualification)

22. What is the duration of the CPR training program?

23. How long have you been providing CPR training as part of your program?

24. How many patients and/or families from your cardiac rehabilitation program would received CPR training in 2013?

Approximate number of patients

Approximate number of family members/friends

***25. What are the reasons for not providing CPR training? (tick all that apply)**

- ☐ Never thought about it
- ☐ Don't know how to organise it
- ☐ Don't agree with it
- ☐ Have no time to discuss this with patients or relatives
- ☐ Lack of resources (ie. equipment, training facilities, trained staff)
- ☐ Patients/families are referred elsewhere for training
- ☐ We intend to establish training in the future
- ☐ Not applicable (CPR training IS provided)

Other (please specify)

Basic Life Support training at Cardiac Rehabilitation (AUS)

CPR training information provision

***26. Is any INFORMATION on CPR Training provided during your Rehabilitation Program?**

- Yes
- No

Basic Life Support training at Cardiac Rehabilitation (AUS)

CPR training information provision

27. How is CPR training INFORMATION provided? (tick all that apply)

- [ ] Verbally during the rehabilitation program
- [ ] Through literature (brochures, information sheets etc.)
- [ ] Through advertising (ie. of external courses available etc.)

Other (please specify)

28. What are the reasons CPR training INFORMATION is not provided? (tick all that apply)

- [ ] Never thought about it
- [ ] Don't know what information to provide
- [ ] Don't agree with it
- [ ] Don't have enough time to issue information and discuss
- [ ] Don't know where to refer people to
- [ ] Not applicable (CPR training information IS provided)

Other (please specify)

*29. A new method of CPR training utilising video self-instruction is now available. The kit comes complete with reusable manikin, DVD and information booklet. Undertaking this type of training takes less than 30 minutes and does not require a trainer, nor any extra equipment and has been demonstrated to be as effective as attending a traditional 4 hour face to face class. Would this be something you would consider....? (tick all that apply)

- [ ] To give to patients and families to take home
- [ ] To run during your program
- [ ] I would not utilise this option of training- please provide reason

Reason

Basic Life Support training at Cardiac Rehabilitation (AUS)

Attitudes towards BLS & CPR training

This final section of questions asks you rate your attitudes or beliefs towards statements to do with CPR training and provision.

30. Bystander CPR

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
CPR can be carried out by trained lay persons with no special medical knowledge	○	○	○	○	○
The initiation of CPR by a trained lay person can increase a victims' chances of survival	○	○	○	○	○
Trained lay persons providing CPR may do more harm than good	○	○	○	○	○

31. The effect of CPR training will

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Decrease patient anxiety	○	○	○	○	○
Decrease family anxiety	○	○	○	○	○
Increase patient anxiety	○	○	○	○	○
Increase family anxiety	○	○	○	○	○

32. CPR training provision

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Members of the public should be trained in CPR	○	○	○	○	○
Family members of cardiac patients should be offered CPR training	○	○	○	○	○
CPR training should be offered as part of the rehabilitation program	○	○	○	○	○
CPR training should only be given if prescribed by the patients' doctor	○	○	○	○	○
Hospital staff should inform the family of the benefits of CPR training before the patient is discharged	○	○	○	○	○

33. Discussing CPR training

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I feel comfortable discussing CPR with families of cardiac patients	○	○	○	○	○
I would be happy to recommend CPR training to families of cardiac patients	○	○	○	○	○

Thank you for your time and participation in this survey, it is greatly appreciated.

Cabrini Institute
183 Wattletree Road
Malvern Vic 3144
Australia
[redacted]

20 April 2016

Dr Dion Stub
C/- Susie Cartledge
Dept of Epidemiology & Preventative Medicine
Monash University
The Alfred Centre
99 Commercial Road
Melbourne VIC 3004

Dear Dr Stub

02-02-05-16
Basic life support training for patients and their family members at cardiac rehabilitation: A feasibility study

Thank you for requesting approval to conduct this study.

This study is now approved. This project was approved under our expedited approval process for projects assessed as being of low or negligible risk.

If the study does not commence before the anniversary of approval, approval will lapse. Approval is ongoing for the life of the project, subject to satisfactory compliance and reporting.

In accordance with section 5.5 on monitoring of the NHMRC's *National Statement on Ethical Conduct in Human Research* (2007), you are obliged to:

- provide the CHREC with annual reports on the anniversary of this approval;
- provide the CHREC with a final report on study completion;
- be available for audits/site visits/interviews as requested.

In addition, you are obliged to inform the CHREC of:

- any change to the protocol, participant information or consent form;
- any adverse events that occur during the process of this trial as per CHREC guidelines;
- any changes to the research team;
- study completion;
- any change in the financial arrangements regarding the study.

Cabrini should be acknowledged in all papers developed from this study.

We wish you well with your project.

Yours sincerely

[redacted]

Dr Margaret Staples
Chair
Cabrini Human Research Ethics Committee

MONASH University
Monash University Human Research Ethics Committee (MUHREC)
Research Office

Confirmation of Registration

This is to certify that the project below is now registered with the Monash University Human Research Ethics Committee under the Memorandum of Agreement with the Cabrini Health HREC.

Project Number	CF16/1323 - 2016000702		
Project Title	Basic life support training for patients and their family members at Cardiac Rehabilitation: A feasibility study.		
Chief Investigator	Prof Judith Finn		
Date Approved:	27 April 2016	**Valid until:**	27 April 2021

Terms:

1. Registration is valid whilst you hold a position at Monash University and approval at the primary HREC is current.
2. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
3. **End of project:** Notification should be provided at the conclusion of the project. MUHREC should also be notified if the project is discontinued before the expected date of completion.
4. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to the project in accordance with The *Australian Code for the Responsible Conduct of Research*.

[redacted]

Professor Nip Thomson
Chair, MUHREC

cc: Ms Susan Cartledge, Dr Dion Stub, Dr Janet Bray

Human Ethics Office
Monash University
Room 111, Chancellery Building E
24 Sports Walk, Clayton Campus, Wellington Rd, Clayton VIC 3800, Australia
Telephone +[redacted]
Email [redacted] http://intranet.monash.edu.au/researchadmin/human/index.php
ABN 12 377 614 012 CRICOS Provider #00008C

3. Survey instrument (Spouse/Family version)

Spouse/family pre-training survey	
Q1. Relationship to the patient	☐$_1$ Spouse ☐$_4$ Child ☐$_2$ Defacto ☐$_5$ Parent ☐$_3$ Friend ☐$_6$ Neighbour ☐$_7$ Other: _____
Q2. Age (years)	_____ years
Q3. Country of birth:	_____
Q4. What is your best contact telephone number for the **one month telephone follow up**?	Ph: _____
Q5. What is the **highest level** of education you have completed?	☐$_1$ Primary or grade school ☐$_2$ Some high school ☐$_3$ High school graduate ☐$_4$ Technical college or some university ☐$_5$ University diploma or degree ☐$_6$ Postgraduate
Q6. Have you **ever heard of** cardiopulmonary resuscitation, also known as CPR or mouth-to-mouth?	☐$_1$ Yes ☐$_0$ No ☐$_2$ Not sure
Q7. Which of the following options reflects how you would **rate your overall knowledge** of CPR?	☐$_1$ Excellent ☐$_2$ Good ☐$_3$ Fair ☐$_4$ Poor ☐$_5$ Very poor

Q8. Have you **ever** completed CPR training?	☐$_1$ Yes Approx Year: _____ **Go to Q9** ☐$_0$ No ☐$_2$ Unsure
Q8. a) If No, which of these statements best describes your reason for not receiving CPR training?	☐$_1$ Have never thought about it ☐$_2$ Cost ☐$_3$ Time ☐$_4$ Don't know where to go to learn ☐$_5$ Other: _____

Cardiopulmonary resuscitation (CPR) involves chest compressions and mouth-to-mouth breathing. It is performed for a victim where it is suspected that their heart has stopped beating and they are breathing abnormally, known as cardiac arrest.

Q9. Currently, which of the following options reflects **how confident** you currently feel about your **ability to perform effective CPR** in an emergency?

Don't know	Not confident	Somewhat confident	Confident	Very Confident
☐$_1$	☐$_2$	☐$_3$	☐$_4$	☐$_5$

Q10. Currently, I am **willing** to **use** CPR skills:

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
☐$_1$	☐$_2$	☐$_3$	☐$_4$	☐$_5$

Q11. For research purposes and **future** planning, we would like to know whether you would be **willing** to continue to be part of the research study which would involve only **annual** contact over an extended period of time (ie. 5 – 20 years).

a) Would you be willing to be followed up long term?

☐$_0$ No ***If No, the survey is complete*** ☐$_1$ Yes ☐$_2$ Unsure

b) If YES or UNSURE to **Q10a)**
I would be happy to be contacted regularly (ie. every year) by **phone call**:

☐$_0$ No ☐$_1$ Yes ☐$_2$ Unsure

c) I would be happy to be contacted regularly (ie. every year) by **text message or email**:

☐$_0$ No ☐$_1$ Yes ☐$_2$ Unsure

Spouse/family Kessler 10 L3D Pre-Training					
The following 10 questions ask about how you have been feeling in the **last three days**. For each question, choose the option that best describes the amount of time you felt that way.					
In the last three days…	None of the time	A little of the time	Some of the time	Most of the time	All of the time
About how often did you feel tired out for no good reason	☐1	☐2	☐3	☐4	☐5
About how often did you feel nervous	☐1	☐2	☐3	☐4	☐5
About how often did you feel so nervous that nothing could calm you down	☐1	☐2	☐3	☐4	☐5
About how often did you feel hopeless	☐1	☐2	☐3	☐4	☐5
About how often did you feel restless or fidgety	☐1	☐2	☐3	☐4	☐5
About how often did you feel so restless you could not sit still	☐1	☐2	☐3	☐4	☐5
About how often did you feel depressed	☐1	☐2	☐3	☐4	☐5
About how often did you feel that everything was an effort	☐1	☐2	☐3	☐4	☐5
About how often did you feel so sad that nothing could cheer you up	☐1	☐2	☐3	☐4	☐5
About how often did you feel worthless	☐1	☐2	☐3	☐4	☐5

Spouse/family post-training survey	Training Date :			
Q1. Currently, which of the following options reflects **how confident** you feel about your **ability to perform effective CPR** in an emergency?				
Don't know	**Not confident**	**Somewhat confident**	**Confident**	**Very confident**
☐1	☐2	☐3	☐4	☐5
Q2. Currently,				
a) I am **willing** to **use** CPR skills:				
Strongly disagree	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
☐1	☐2	☐3	☐4	☐5
b) I am willing to **maintain** CPR skills (ie. Attend another class or review the training kit at least annually):				
Strongly disagree	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
☐1	☐2	☐3	☐4	☐5
c) I am willing to **share** the training kit with others:				
Strongly disagree	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
☐1	☐2	☐3	☐4	☐5
Q3. Did you find the training:				
a) Easy to follow:				
Strongly disagree	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
☐1	☐2	☐3	☐4	☐5
b) Went for the right amount of time:				
Strongly disagree	**Disagree**	**Undecided**	**Agree**	**Strongly agree**
☐1	☐2	☐3	☐4	☐5
Q4. Please feel free to provide **any** other feedback about the training				

Spouse/family one month follow-up	**Date:**

Q1. Currently, how many people live in your household? N = _____

Q2. Which of the following options reflects **how confident** you **currently** feel about your **ability to perform effective CPR** in an emergency?

Don't know	Not confident	Somewhat confident	Confident	Very confident
☐1	☐2	☐3	☐4	☐5

Currently,

a) I am **willing** to use CPR skills:

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
☐1	☐2	☐3	☐4	☐5

b) I am willing to **maintain** CPR skills (ie. Attend another class or review the training kit at least annually):

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
☐1	☐2	☐3	☐4	☐5

c) I am willing to **share** the training kit with others:

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
☐1	☐2	☐3	☐4	☐5

Q3. Sharing the training kit:

a) Did you share the kit with others? ☐0 No ☐1 Yes

b) How many people did you share the training kit with? N = _____

Q4. How did you share the kit?

a) Did you **only** share the manikin? ☐1

b) Did you show them the CPR skills yourself? ☐2

c) Did you show them the full kit (ie. Watched the DVD and used the manikin) ☐3

d) Did you allow them to take the entire kit away? ☐4

e) Only mentioned it to them, haven't yet actioned it.	☐5
f) Only I have reviewed it.	☐6

Q5. Who did you share the kit with?

☐1 Family	☐3 Neighbours	☐5 Work colleagues
☐2 Friends	☐4 Extended family	☐6 Other:_____
		☐7 N/A- no one

Q6. If you did not share the training kit, what were the reasons?

☐1 Too busy	☐2 No one appropriate to share it with
☐3 Hadn't thought of it	☐4 N/A
☐5 Other: _____	

Q7. Have you had to use any CPR skills in the last month?	☐0 No ☐1 Yes

Q8. *(Only ask if did not complete skill reporting station at intervention)* Thinking back to the CPR training session at Carbini Cardiac Rehabilitation, can you remember if there was a specific reason you did not complete the skill reporting manikin station?

☐1 Was not physically able

☐2 Had to leave early

☐3 Felt nervous about undertaking the skill station

☐4 Can't remember

Other comments:

Spouse/family Kessler 10 L3D One Month					
The following 10 questions ask about how you have been feeling in the **last three days**. For each question, choose the option that best describes the amount of time you felt that way.					
In the last three days…	None of the time	A little of the time	Some of the time	Most of the time	All of the time
About how often did you feel tired out for no good reason	☐1	☐2	☐3	☐4	☐5
About how often did you feel nervous	☐1	☐2	☐3	☐4	☐5
About how often did you feel so nervous that nothing could calm you down	☐1	☐2	☐3	☐4	☐5
About how often did you feel hopeless	☐1	☐2	☐3	☐4	☐5
About how often did you feel restless or fidgety	☐1	☐2	☐3	☐4	☐5
About how often did you feel so restless you could not sit still	☐1	☐2	☐3	☐4	☐5
About how often did you feel depressed	☐1	☐2	☐3	☐4	☐5
About how often did you feel that everything was an effort	☐1	☐2	☐3	☐4	☐5
About how often did you feel so sad that nothing could cheer you up	☐1	☐2	☐3	☐4	☐5
About how often did you feel worthless	☐1	☐2	☐3	☐4	☐5

MALVERN

Pumped up to save more lives

RESUSCITATION RESEARCH LEADING THE WAY

CARDIAC nurse Susie Cartledge of Prahran has a heartfelt interest in helping people care for their health.

She said the medical profession had spoken of the need for targeted cardiopulmonary resuscitation training for at-risk groups – namely heart attack survivors and their families – for more than 20 years.

But until now, no such program had been designed, so when it came to picking a topic for her PhD, Ms Cartledge's decision to work with heart attack victims and their families was a no-brainer, she said.

Especially when studies showed 75 per cent of out-of-hospital cardiac arrests occurred at home in front of witnesses, but less than half of those received by-stander assistance – often because people were too scared to act in case they did something wrong.

"There is a huge opportunity for that witness to step in and do something," Ms Cartledge said.

"Doing something is better than doing nothing. You really want to get high-quality CPR started within the first three to four minutes (while waiting for emergency services to arrive)."

Ms Cartledge's PhD research has her providing training kits containing an instructional DVD, an inflatable CPR training mannequin and a mock cardboard defibrillator, to heart attack survivors and their families taking part in a cardiovascular rehabilitation program at Cabrini Hospital in Malvern.

She said her aim was to investigate whether training family members of heart attack victims using these tools made them better prepared to perform CPR, and whether her kit was the best way to deliver that training.

"The point of the course is to try and save lives for out-of-hospital cardiac arrests," she said.

Russell Gecelte and cardiac nurse Susie Cartledge show how the training kit is used. Picture: STEPHEN HARMAN

Life saving CPR skills

HEART attack survivor Russell Gecelter of Glen Eira and his wife Mandy could not be thankful enough for the CPR training provided as part of the rehabilitation program at Cabrini Hospital.

After suffering a heart attack in May, Mr Gecelter said he felt safer in the knowledge those closest to him now had the skills to administer CPR should a future emergency occur.

"We both have been very impressed with the program," Mr Gecelter said.

"I've actually taken it (the CPR training kit) to my work and I've trained them to the best of my abilities."

Mr Gecelter urged other people to learn what to do in the event of a cardiac arrest.

"(It's) one of these things you know that you should do, like eating healthy and exercising, but never do," he said.

Improving survival odds with targeted CPR training

Kate Windon and Jocelyn Wright

Every year in Australia there are 25,000 out-of-hospital cardiac arrests (OHCA), and fewer than 10 per cent of those will survive. Monash University PhD candidate Susie Cartledge hopes to improve the odds with targeted cardiopulmonary resuscitation (CPR) training to high-risk groups and their families at Cabrini's Cardiac Rehabilitation Program with her Australian-first research.

Given that 75 per cent of OHCAs occur in the home, and currently less than 40 per cent of those OHCAs receive bystander CPR, Susie is investigating whether training family members of those patients attending a cardiac rehabilitation program following a heart attack or cardiac event, will better equip them with skills to deliver CPR in the event of a future cardiac emergency in the home.

Cardiac rehabilitation is a service routinely offered to patients and their family members, who have been diagnosed with cardiovascular disease or have suffered a recent cardiac event such as a heart attack. The program provides supervised exercise, education and support. Surprisingly however, not many programs across Australia provide CPR training as part of the education component.

As a registered nurse and first aid instructor, Susie first saw a need for this training to be included in the program after realising that many people who attend cardiac rehabilitation have not received CPR training recently, if ever.

"The aim is to ensure that not only more people are being trained in life-saving skills but that the people who are most likely to witness an out-of-hospital cardiac arrest are targeted and offered the opportunity to train," she said.

Cabrini has partnered with the Australian Resuscitation Outcomes Consortium (Aus-ROC) based at SPHPM to trial CPR training to both patients and their family members in the cardiac rehabilitation program at the hospital.

Susie's PhD research has involved three separate but related studies that then informed this feasibility study to assess whether CPR training, can be incorporated into a cardiac rehabilitation outpatient program for cardiac patients and their family members.

"Delivering CPR from bystanders more than doubles the chance of survival, but bystanders often lack training and fear harming the victim — providing CPR training to households at higher risk of OHCA has the opportunity to contribute to better survival outcomes for patients.

Susie Cartledge pictured with Laerdal "CPR Now" training DVD & kits

"This is the first time this has been researched and put into practice in Australia and most likely internationally, so it is very exciting. I have held three classes so far and recruited nearly fifty participants who have had very positive feedback about the training," Susie said.

The training that is being trialled is a new form of self-instructional video training. Participants receive a training kit that includes an instructional DVD, an inflatable reusable CPR training mannequin and a mock cardboard defibrillator.

Using this kit, they learn the skills of CPR while having the support of the cardiac rehabilitation nurses there to correct their technique and answer questions. They can then take the kit home and train other family members and friends.

"From the data collected so far it is clear that participants are coming out of the training with new found skills, are more confident and willing to provide CPR should the need arise. The majority of these have gone on to train at least one or two other people." Susie said.

Susie Cartledge with Russell Gecelter, a cardiac rehabilitation patient at Cabrini

"This is the first time this has been researched and put into practice in Australia

HAVING THE HEART FOR CPR

Most people give their heart little thought – it is a reliable pump and we think its constancy is a given. Until that pump stumbles.

For this reason, we are largely unprepared if we or a loved-one suffer a cardiac event such as a heart attack – and most will not conveniently occur within the walls of a well-equipped hospital. If left untreated, some heart attacks can escalate to an out-of-hospital cardiac arrest (OHCA). In fact 25,000 OHCAs occur every year in Australia, and 75 per cent of them happen to people while they are at home. Bystanders will only attempt CPR in 40 per cent of cases, despite the repeated message from medical professionals that trying CPR is better that doing nothing at all.

Susie Cartledge, registered nurse and PhD candidate, is hoping to change that. Working out of the Australian Resuscitation Outcomes Consortium (Aus-ROC) based at Monash University, her research recently targeted an at-risk group of people attending Cabrini's cardiac rehabilitation program – people who had suffered a heart attack and their partners. Beginning in May 2016, Ms Cartledge conducted sessions in which she introduced participants to kits donated by emergency medical equipment company Laerdal, each comprising a 30-minute video, an inflatable manikin and a mock card-board defibrillator.

First, participants watched the instructional video, then each practised CPR on their manikin. At the end of the session, participants demonstrated their new skill on a special, high-tech manikin that recorded the pressure of their cardiac compressions to ensure that everyone left confident that their technique was sound. They were invited to ask family and friends to try the kit too.

"By delivering CPR, a bystander more than doubles someone's chance of survival, but unprepared bystanders often fear harming the victim," says Ms Cartledge. "By providing CPR training to households at higher risk of OHCA, we give them the confidence to use CPR in a cardiac emergency and improve survival outcomes."

The 84 Cabrini patients and family members recruited for the program seem convinced of its worth. Each received a follow-up phone call a month after the class and there has been overwhelmingly positive feedback. Asked how confident they now felt in using CPR if required, everyone reported feeling much more confident since the training.

They were also asked if they had used the kit to instruct others and most reported that they had passed the knowledge on to at least one other person. One particularly proactive couple told their story having a birthday party dinner after which all 12 guests watched the video and practised on the manikin.

Ms Cartledge believes that once her results are published, the CPR session will take its logical place within cardiac rehabilitation programs and that nurses running those programs will be more empowered in its instruction. "This is the first time this has been researched and put into practice in Australia and most likely internationally," she says. "It is very exciting."

TOP TIP!
Use the beat of 'Staying Alive' by the Bee Gees to time your CPR chest compressions. It's the perfect rhythm

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