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Surf Lifeguard Perceptions and Practice of Cardiopulmonary Resuscitation (CPR)

Kevin Moran and Jonathon Webber

While the importance of lifeguards in providing immediate and effective basic life support (BLS) in drowning has been well reported, not a lot is known about how lifeguards perceive the relative value of CPR as a lifeguard skill, their training in it, and the likelihood of resuscitation being successful. A self-complete questionnaire was done by 252 volunteer surf lifeguards at 16 surf beaches in the Greater Auckland NZ region. Results show that most lifeguards (65%) had received training in the 3 months before the survey, 83% were willing to perform CPR, few (9%) had used CPR in an emergency, and many had a realistic expectation of the likelihood of CPR being successful. Recall of CPR compression rates (86%) was very good but initial steps at an emergency scene were less accurately recalled. Ways to address the misconceptions reported in the survey through enhanced training programs are discussed.

Keywords: drowning prevention, lifeguard supervision, cardiopulmonary resuscitation (CPR), CPR training

In the context of drowning prevention, victims are more likely to survive as a consequence of immediate and effective application of cardiopulmonary resuscitation (CPR) (Layon & Modell, 2009). The value of lifeguards in providing basic life support (BLS) in drowning has been well reported (for example, in the U.S. by Branche & Stewart, 2001 and in Australia by Fenner, Harrison, Williamson, & Williamson, 1995 and Manolios & Mackie, 1988). In spite of comprehensive reporting of surf lifeguard rescue activity (for example, Surf Life Saving New Zealand, 2011; United States Lifesaving Association, 2010), not a lot is known about how lifeguards perceive the relative value of CPR as a lifeguarding skill, its likely success when used in an emergency, their competency and willingness to perform CPR skills, the recency of their training, and their recall of conceptual understanding of CPR protocols.

Several recent studies have reported on the technical aspects of lifeguards' performance of CPR (Adelborg, Dalgas, Grove, Jørgensene, Al-Mashhadib, & Løfgren, 2011; Claesson, Karlsson, Thoren, & Herlitz, 2010), while others have reported on various forms of lifeguard CPR training/retraining (de Vries, & Bierens,

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2010). Such is deemed the importance of the skill that Shaw (1996) advocated that new lifeguards and lifeguards returning from a long winter season should have CPR skills reinforced several times a week in the early part of the lifeguarding season. Frequent training would appear judicious since the opportunity to apply CPR skills is relatively rare, and the decline in CPR skill levels over time is well documented in the health literature (Chamberlain, Smith, Woollard et al., 2002; Garcia-Barbero & Caturla-Such, 1999; Fossel, Kiskaddon & Sternbach, 1983: Niles, Sutton, Donoghue et al., 2009). Faddy (2002) reported that most lifeguards (74%) surveyed at northern Sydney beaches had not undertaken CPR in an emergency and that the experience of those who had did not affect their expectation of successful resuscitation compared with those who had never used CPR in an emergency. Faddy also found that many lifeguards (80%) expected better than 36% chance of return of spontaneous circulation (ROSC), which is an exaggerated expectation of successful CPR following cardiac arrest.

It was anticipated that this study would provide some indication of how lifeguards view the importance of CPR in comparison with the other requisite lifeguard skills (such as swimming and rescue skills). It was also anticipated that CPR perceptions and competency would vary according to the recency of training, gender, age, and previous use of CPR. The aim of the study was to comprehensively analyze volunteer surf lifeguards' real and perceived competencies in CPR, an important aspect of a lifeguard's role and function in emergency response situations. It is a further purpose of this paper to report on the lifeguard recall of CPR major concepts and their beliefs, training, and experience of CPR and to make recommendations on how to address any misconceptions identified.

Method

The research design was a mixed method, cross-sectional study using a questionnaire survey and practical assessment of CPR skills on a manikin. This paper reports on the written feedback received from lifeguards upon completing the survey. Before the commencement of the study, ethics approval was obtained from the University of Auckland Human Ethics Committee (Project number 2010/400). Informed consent in writing was obtained from each participant after written and verbal explanations of the study were provided to club administrators, patrol captains, and volunteer surf lifeguards who had agreed to take part in the study.

Participants

The participants in the study were volunteer surf lifeguards in the Auckland region who agreed to take part in the study during early season patrols on 10 weekends between November 2010 and January 2011. The management of Surf Life Saving New Zealand (Northern region) and the 16 surf lifesaving club management boards in the greater Auckland region were asked to participate in the project. The patrol captains of each randomly selected weekend patrol were contacted in the week before the visit requesting their assistance in allowing patrol members to participate in the study during patrol hours. Lifeguards with a health-profession background or who were employed as professional lifeguards in the Auckland region (requires additional CPR training) were excluded from the study.

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Research Instrument

The research instrument used to gather data on lifeguard beliefs, training, and experience of CPR was a written self-complete survey. To overcome the potential inaccuracy of self-report data, participation in the study was voluntary and anonymous. The questionnaire was pilot tested on 10 qualified lifeguards not associated with the study two months before the start of the patrol season. Content validity was determined by consensus through a peer review process that included the input of four experienced surf lifeguards (involved in lifeguard examination and instruction at a national and regional level), two CPR instructors (involved in the tertiary training of medical personnel), and an emergency medicine research expert.

The self-complete questionnaire consisted of 14 questions, the first seven of which sought demographic information such as age, gender, length of lifeguard service, first aid and CPR training, and previous use of CPR in emergency response. Two questions used Likert-type responses to determine lifeguards' perceptions of their competency to perform CPR, how willing they would be to perform CPR in an emergency, and another two questions asked lifeguards to estimate (using percentages) how often they thought CPR was successful in achieving ROSC during out-of-hospital cardiac arrest (OHCA) and how successful they thought the public would think CPR was in OHCA. Lifeguard recall of CPR protocols was tested in one multiple choice question and a battery of 10 statements that required True/False responses. A final question asked lifeguards to rank in order of priority a list of lifeguard-related skills including swimming skills, rescue boat skills, CPR skills, tube rescue skills, and first aid skills. It was anticipated that the questionnaire would take 10–15 min to complete.

Procedures

Standardized test procedures were developed and tested before the commencement of the data collection using a patrol of 10 lifeguards who were not taking part in the study. A team of three field assistants with extensive instructor backgrounds and who were fully conversant with the standardized test procedures were randomly rostered to a patrolled beach in either a morning or afternoon timeslot for 10 weekends from November 2010-January 2011. Upon arrival at the beach, the assistants first introduced themselves to the patrol captain and then introduced themselves to the patrol members. After handing out participant information sheets explaining the purpose of the study, lifeguards were invited to voluntarily take part in the study. Those who agreed to take part completed a consent form and then were asked to complete the written survey independently without consultation with other patrol members.

Data Analysis

Data from the completed questionnaires were downloaded into SPSS Version17 for statistical analysis. Descriptive statistics were used to describe or characterize all numerical variables using frequency and percentages. Five independent variables—gender, age, length of service, time from last CPR training/retraining, and experience with use of CPR in an emergency were reported using frequencies and percentages. Five dependent variables related to lifeguard beliefs and CPR knowl-

edge were tabulated using frequencies percentages and cumulative percentages. Chi-square statistics were used to test associations between the sociodemographic influences of age, gender, length of lifeguard service against CPR beliefs, and knowledge. Box plots were used to graphically describe estimates of success of CPR by lifeguards in the study and lifeguard predictions of public expectation of success of CPR as differentiated by age group.

Results

Of the 280 volunteer surf lifeguards invited to participate in the study, a sample of 262 lifeguards from 16 clubs in the greater Auckland region completed the survey and practical skills test, a response rate of 93%. Of these, 10 participants were excluded from the final analysis because of a manikin malfunction (second part of the study) on one day of testing, leaving a total sample size of 252 lifeguards.

Lifeguard Demographics, Length of Service, and CPR Training

The sample population included more males than female participants (male 57%, female 43%), almost two-thirds of lifeguards were less than 20 years of age (63%), and three-quarters (77%) had less than 6 years of lifeguard experience (see Table 1).

Table 1 Characteristic of Sample Population (*N* = 252)

Variable	n	%
Gender		
Male	144	57.1%
Female	108	42.9%
Age		
< 19 years	158	62.7%
20-29 years	48	19.0%
30 + years	46	18.2%
Length of lifeguard service (N= 252)		
1 year or less	76	30.2%
2-5 years	117	46.4%
6-10 years	27	10.7%
> 10 years	32	12.7%
Last Lifeguard CPR training (N = 250)		
< 3 months	162	64.8%
4-6 months	31	12.4%
7-12 months	37	14.8%
> 1 year	20	8.0%
Use of CPR in emergency response		
Yes	23	9.2%
No, but my patrol has	25	10.0%
No	203	80.9%

Almost two-thirds (65%) of participants had received lifeguard CPR training in the 3 months before taking part in the study. When asked how effective their CPR training was, most lifeguards (83%) thought it was effective or highly effective, with a small percentage (4%) suggesting it was fair/poor. Almost two thirds (62%) of the lifeguards had also received additional first aid training and of these 156 lifeguards, almost two-thirds (65%) reported receiving intermediate (37%) or advanced (28%) levels of training. Few lifeguards (n = 23; 9%) reported having used CPR in an emergency situation or having observed its use when on patrol (n = 26; 10%). Of the 26 patrol incidents when CPR had been used, lifeguards reported that most had successful outcomes (n = 16; 61%).

No significant differences were observed when the recency of training was analyzed by gender. When analyzed by age, younger lifeguards (< 30 years of age) were significantly more likely (χ^2 = 6.854, df = 18, p = < 0.001) than older lifeguards (> 30 years of age) to have had training within the previous 6 months (< 30 years of age, 80%; > 30 years of age, 62%). Significant differences were noted when previous emergency use of CPR while on surf patrol was analyzed by gender (χ^2 = 49.373, df = 2, p = 0.032) and age (χ^2 = 56.878 df = 6, p = < 0.001). More males than females reported having used CPR when on patrol (males 13%; females 4%), and more lifeguards over 30 years of age reported having used CPR in an emergency (< 30 years of age, 5%; > 30years of age, 26%).

Lifeguard Perceptions of CPR

Table 2 shows that one half (51%) of respondents considered their CPR skills were highly effective or effective and a further 40% thought their skill level was satisfactory. No significant differences in self-estimates of CPR competency were reported by gender and age, although slightly more males than females (males, 54%; females, 48%), and older lifeguards (< 30 years of age, 50%; > 30 years of age, 56%) estimated that their skill level was highly effective or effective.

Almost all lifeguards (83%) were willing to perform CPR, although 17% reported that they were hesitant about performing CPR. Significant differences were found in lifeguard willingness to perform CPR in an emergency when analyzed by both gender (χ^2 = 13.340, df = 2, p = 0.001) and age (χ^2 = 54.983, df = 6 p = < 0.001). More females than males (females 18%; males, 11%) and more younger lifeguards (< 30 years of age, 20%; > 30 years of age, 7%) felt hesitant about having to perform CPR in an emergency.

Lifeguards were also asked to rank five lifeguard-related skills to determine how much they valued each of the skills in relation to CPR. Swimming competency was considered the most important skill by 41% of respondents, followed in descending order by CPR skills (23%), first aid skills (22%), tube rescue skills (7%), and rescue craft skills (6%). No significant differences were found when the skills rankings were analyzed by gender, by age group, by length of service, or recency of training.

No significant differences were found when estimates of successful CPR when performed by lifeguards in an emergency were analyzed by gender, but significantly more younger lifeguards (χ^2 = 110.142, df = 84, p = 0.029) than older lifeguards were confident of a success rate greater than 35% (< 30 years of age, 46%; > 30 years of age, 41%). When asked what they thought the public expectation of suc-

Table 2 Lifeguard Perceptions of CPR

Lifeguard Perceptions	*n* (%)	Cumulative %
Self-rated ability		
Highly effective	11 (4.4%)	4.4%
Effective	118 (46.8%)	51.2%
Satisfactory	101 (40.1%)	91.3%
Fair	15 (6.0%)	97.2%
Poor	2 (0.8%)	98.0%
Don't know	5 (3.3%)	100.0%
Willingness to perform CPR		
Definite	99 (39.3%)	39.3%
Fairly certain	109 (43.3%)	82.5%
Hesitant	44 (17.5%)	100.0%
Lifeguard belief of success rate of CPR use in Out-of-Hospital-Cardiac- Arrest (OHCA)		
0-25% success rate	120 (48.4%)	48.4%
26-50% success rate	75 (30.2%)	78.6%
51-75% success rate	23 (9.3%)	87.9%
76-100% success rate	30 (12.1%)	100.0%
Lifeguard estimate of public belief of success rate of CPR use in OHCA		
0-25% success rate	15 (6.1%)	6.1%
26-50% success rate	64 (25.9%)	32.0%
51-75% success rate	33 (13.4%)	45.4%
76-100% success rate	135 (54.7%)	100.0%

cess of CPR in OHCA was, most lifeguards thought that the public would be overly optimistic about the rate of ROSC in OHCA ($M = 71\%$ success rate, $SD = 25.177$). No significant differences were found when lifeguard estimates of public expectations of success were analyzed by age or gender (see Figures 1 & 2).

Theoretical Knowledge of CPR

Table 3 shows that most lifeguards (86%) could accurately recall the correct compression rate of 100 per minute. Most lifeguards correctly responded to statements about clearing the airway before starting CPR (98%), when to stop CPR (93%), correct compression depth (89%), duration of initial breathing check (79%), when to leave the patient and go for help (71%), the correct initial response at the scene of a medical emergency (69%), and the duration of rescue breaths (66%). Less than half correctly responded to statements related to AEDs advising shocks for all cardiac arrest victims (49%), initial rescue breaths before commencement of cardiac compression in drowning (44%), and reassessing victim during CPR (34%).

No significant differences were found when responses to the 10 statements were summed as a measure of recall of CPR theory and analyzed by gender, age, length of service, or recency of training.

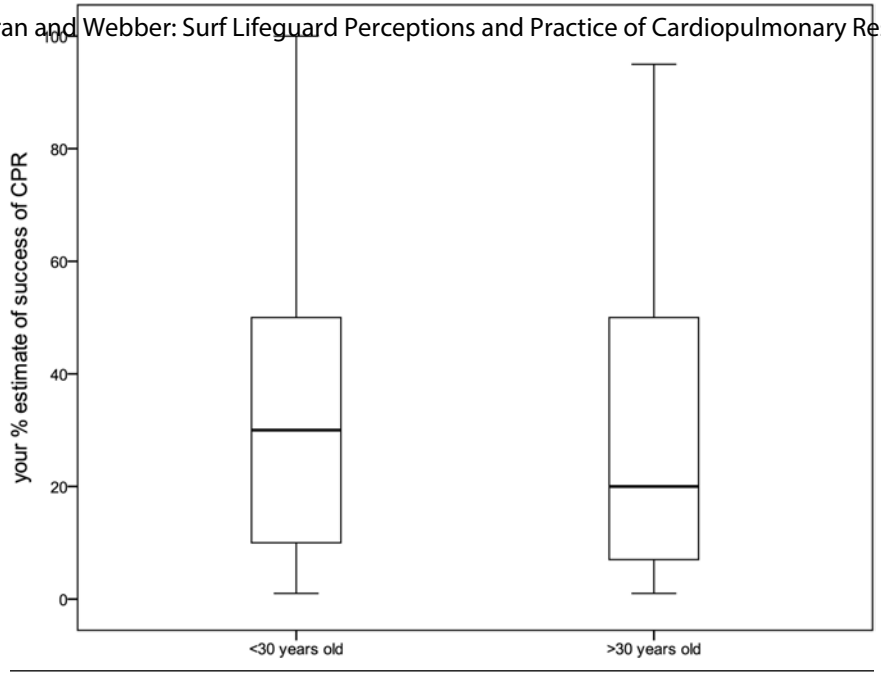

Figure 1 — Estimation of lifeguard CPR success by age of lifeguard. The boxes represent the interquartile range and median values. The protruding whisper lines show the smallest and largest values. The boxes show that younger lifeguards (< 30 years) estimated higher levels of CPR success than older lifeguards.

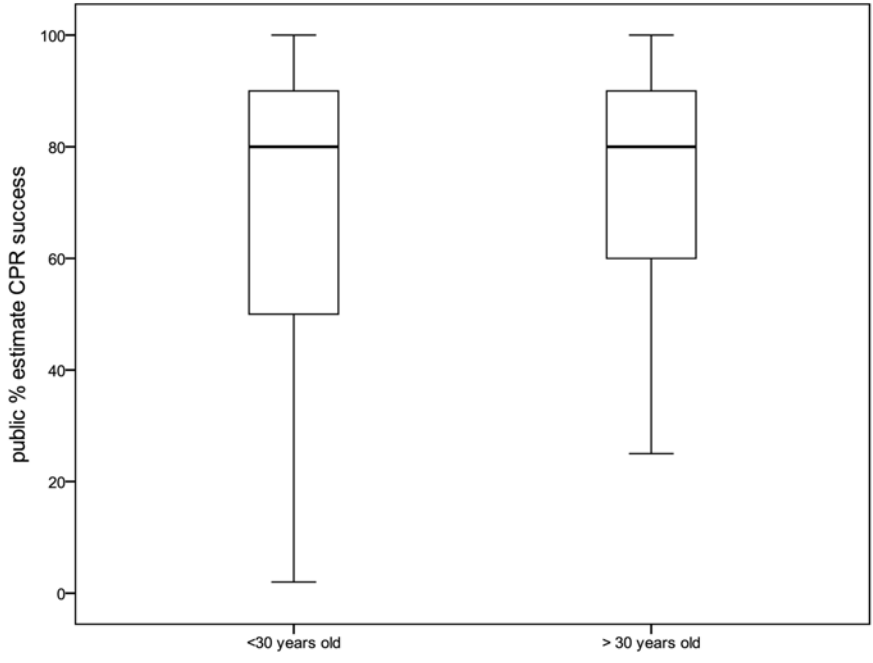

Figure 2 — Estimation of public expectation of CPR success by age of lifeguard. The boxes represent the interquartile range and median values. The protruding whisper lines show the smallest and largest values. The boxes show lifeguards, irrespective of age, predict overly optimistic CPR success rates by the public.

Table 3 Lifeguard Knowledge of CPR Protocols

Correct Response to the Following Statements	n	%
What is the correct compression rate per min?	214	85.6%
Each rescue breath should be given over 1 second.	161	66.0%
If alone with an adult patient, go for help before starting CPR.	178	71.2%
Stop CPR if the patient has not recovered after 15-20 minutes of resuscitation.	235	93.3%
The automated external defibrillator (AED) will advise a shock for all victims of cardiac arrest.	120	49.4%
Take no longer than 10 seconds to check for breathing.	195	77.4%
Reassess the victim after every 4 cycles of CPR to see if they have recovered.	84	34.3%
Give all victims of drowning 5 initial rescue breaths before starting chest compressions.	110	44.0%
The first step at the scene of a medical emergency is to check victim responsiveness.	172	68.8%
If the airway is blocked by foreign objects or vomit, start CPR first before clearing.	245	97.6%
The recommended compression depth for adults is 4-5cm.	224	89.2%

Discussion

It was the purpose of this study to explore the beliefs, experience, training, and conceptual knowledge that underpin volunteer surf lifeguards' capacity to provide BLS and perform CPR when required. The relative recency of CPR training among lifeguards that took part in the study (77% had received training less than 6 months before completing the survey), together with their high level of conceptual knowledge of CPR suggest that volunteer lifeguards who took part in the study were well trained in BLS and CPR. Almost all lifeguards (83%) were willing to perform CPR, although 17% reported that they were hesitant about performing CPR. Lifeguards have a duty of care to respond in an effective and timely manner when called upon to perform CPR. Resuscitation is a core, not optional, skill for any lifeguard. The fact that almost one-fifth of those surveyed were hesitant about performing CPR warrants further investigation. More research is required to determine if this hesitancy relates to inadequate training (a concern that they wouldn't know what to do), fear of doing harm to the patient, risk of infection, or a perception/belief that can be altered through education.

Most lifeguards had a realistic view of the success of CPR in out-of-hospital cardiac arrest (OHCA) with one almost one-half (48%) believing that the chances of success were 25% or less. This finding is in contrast to that reported by Faddy (2002) who found an exaggerated expectation of the chances of successful CPR following cardiac arrest among North Sydney surf lifeguards, where 80% expected better than 36% chance of success. While the perceptions of lifeguards in the current study more accurately mirrors reality, it is important senior lifeguards and patrol captains who may be in charge of a resuscitation scene remember that the only person who can legally certify a patient as deceased in New Zealand is a doctor or

paramedic. Therefore, if the patient is found within 60 min of being reported missing, resuscitation should commence (Brewster, 2003) and continue until the patient recovers or professional help arrives, no matter how poor the prognosis may seem.

Several misconceptions in lifeguard understanding of CPR protocols were evident and need addressing in future training. More than one quarter (29%) of lifeguards surveyed did not know that if alone, they needed to go for help. The basis for doing this is to ensure a defibrillator is en route to the scene and ambulance personnel are summoned. While on duty, it would be unlikely for a lifeguard to be alone with a collapsed patient; however, resuscitation skills may be called upon off duty, at home, or at work. Therefore, it is important lifeguards know that they cannot manage a cardiac arrest situation on their own and should know when it is appropriate to leave the patient to call for help.

Nearly one-third (31%) of lifeguards did not check if it was safe to approach the scene or don personal protective equipment (PPE) when it was made available to them. Clearly, the rationale for ensuring that lifeguards do not injure themselves while attending to a casualty or risk contracting an infectious disease is self-explanatory but requires reinforcement during training/retraining.

One-third of lifeguards (34%) surveyed did not know that the minimum time they should take to deliver each rescue breath was 1 s. The rationale for taking at least one second is to minimize excessive inflation pressures and reduce the risk of gastric insufflation (air in the stomach). The use of manikins that can give real-time feedback in training may help lifeguards know when they are delivering a breath too fast or too forcefully.

Nearly half (49%) of those surveyed thought the AED (automated external defibrillator) would advise a shock for all patients in cardiac arrest. This perception suggests that some lifeguards have limited knowledge of the etiology of cardiac arrest, which can be due to primary (cardiac) or secondary (noncardiac) causes. Patients who benefit most from defibrillation are those who have a cardiac arrest due to *cardiac* problems (e.g., heart attack) as opposed to those whose heart has stopped due to hypoxia, as is the case in drowning.

Limitations

The written survey responses in this study may enhance understanding of lifeguard beliefs and recall of knowledge about CPR, but several limitations should be considered. First, the study was confined to volunteer surf lifeguards patrolling the greater Auckland region; it did not include paid lifeguards who patrol on weekdays during peak times in the summer season or those from other regions of New Zealand. Second, the study was confined to surf lifeguards on patrol at the beginning of the summer season, so the influence of recent training may bias the recall of CPR theory. Third, the study included only volunteer surf lifeguards, so generalization of the results to others such as the paid lifeguards or the general public is not warranted. Fourth, the written responses on CPR training, its use in an emergency, and estimates of competency were self-estimates and may not provide a valid measure of actual competency and/or actual CPR experience as has been reported in other studies of health behaviors (Mickalide,1997; Nelson, 1996; Watson, Kendrick, & Coupland, 2003).

Conclusions

This study of lifeguard beliefs, training, and knowledge of CPR has provided a better understanding of the perceptions of lifeguards and their role as providers of BLS in emergencies at the beach. Lifeguards who took part in this study had a sound grasp of CPR with respect to compression and ventilation protocols but were less accurate in their recall of the primary survey protocols. It would appear prudent to provide additional training on when to leave a patient to go for help and on the observance of initial safety precautions at the scene of an emergency. Further research on practical CPR performance in simulated emergency practices would be a logical next step toward a greater understanding of the role of lifeguards in providing the quality life support as a first responder.

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