Cardiac arrest resuscitation policy and practice: a survey of Western Australian hospitals

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Conflict of interest
None declared. This research is part of a broader PhD study examining the epidemiology of in-hospital cardiac arrest.

KEY WORDS

advisory external defibrillation (AED), cardiac arrest, cardiopulmonary resuscitation (CPR), nurse, survey

ABSTRACT

Objective
To determine if cardiopulmonary resuscitation (CPR) policy and practice in Western Australian (WA) hospitals changed since the release of an operational directive from the WA Department of Health.

Design
Cross sectional postal survey conducted in 2008 compared to the results of the 2001 survey.

Setting
Western Australian public hospitals containing ten or more beds.

Subjects
66 WA hospitals in 2001; 59 WA hospitals in 2008.

Main outcome measures
Characteristics of defibrillators; CPR and defibrillation training and assessment; who was permitted to undertake defibrillation; type of cardiac arrest management team, whether data was routinely collected on cardiac arrests and outcomes and any other issues related to resuscitation policy and practice.

Results
There was a 15% increase in the number of hospitals with AEDs (15% difference; 95% CI 10%, 29%; p= 0.04) and an increase in proportion of hospitals that allowed nurses to defibrillate from 74% to 98% (24% difference; 95% CI 14%, 34%; p<0.001). There was an increase in the uptake of ARC guidelines (15% difference; 95% CI 5%, 25%; p<0.01).

Conclusions
Since the release of the operational directive following the 2001 survey more hospitals have purchased AEDs and there has been an increase in the proportion of hospitals 'allowing' nurses to defibrillate. However, given the overwhelming evidence that time to defibrillation is the major determinant of likelihood of survival in cardiac arrest, it is indefensible that that not all hospitals can provide first responder defibrillation 24 hours per day, seven days per week.

INTRODUCTION

Despite cardiopulmonary resuscitation (CPR) having been first described in the 1960s (Kouwenhoven et al 1960), the proportion of patients surviving a cardiac arrest remains poor; namely 7% to 11% in out-of-hospital arrests (Holler 2007; Finn 2001) and 17% of in-hospital arrests (Peberdy et al 2003). Nonetheless we do know the likelihood of survival is influenced by; prompt initiation of CPR, the quality of CPR and early defibrillation for ventricular fibrillation (VF) or ventricular tachycardia (VT) arrests (Deakin and Nolan 2005; Jacobs and Nadkarni 2004; Valenzuela et al 1997). Advances in technology, such as advisory external defibrillators (AEDs), have sought to minimise the time to defibrillation by reducing the training requirement for rescuers (Handley et al 2005).

Advisory external defibrillators are capable of analysing the underlying cardiac rhythm, advise that defibrillation is indicated and deliver such shock. These devices are of particular advantage as they do not rely on the rescuer having rhythm recognition skills in order to provide defibrillation. Accordingly, health professionals who infrequently encounter cardiac arrest are now in a position to provide defibrillation. For these reasons, the provision of AED is recommended by the Australian Resuscitation Council (ARC) as part of basic life support (Australian Resuscitation Council 2006a).

In hospital cardiac arrests, nurses are ideally placed to provide early CPR and defibrillation provided they have access to, are trained in and are permitted to use the equipment (Handley et al 2005). A survey conducted in 2001 of Australian hospital resuscitation policy and practice demonstrated that 97% of hospitals had a defibrillator on site; however, 16% of nurses were not permitted to undertake defibrillation and 9% were not permitted to use an AED (Finn and Jacobs 2003) . In response to these findings the Department of Health in Western Australia (WA DoH) issued an operational directive requiring that all nurses "must be trained in CPR and defibrillation" and "have access to a defibrillator 24 hours per day" (Government of Western Australia 2003 pp1-2).

The aim of this study was to determine if CPR policy and practice in Western Australian hospitals had changed since the 2001 survey and release of the operational directive and in particular if nurses were now permitted to use AEDs.

METHODS

A postal survey of all public hospitals with ten or more beds in Western Australia was undertaken in 2008. Private hospitals were not included as the operational directive affected public hospitals only. The survey instrument was based on that previously reported (Finn and Jacobs 2003). The instrument consisted of 16 items aimed at identifying the characteristics of the defibrillators, basic life support assessment, who was permitted to undertake defibrillation, composition of the cardiac arrest team, data collection and outcomes on cardiac arrests and any other issues related to resuscitation policy and practice. Respondents were required to answer 'tick box' or 'free response' questions. The responses from both surveys were collated and categorised according to the identified themes. The survey was piloted on resuscitation coordinators employed at three teaching hospitals in Perth and modified for face validity.

The Australian Hospitals Directory (The Australian Hospitals Directory 2007-2008) was used to identify hospitals meeting the inclusion criteria. The questionnaire was sent to the 'Director of Nursing' or 'Health Service Manager' and included a reply paid envelope. If no response was received within one month of the closing date a follow up survey was sent.

The Australian Bureau of Statistics 'Accessibility/ Remoteness Index of Australia' (ARIA+) was used to determine levels of remoteness of the hospital. This index categorises locations into either Major Cities of Australia, Inner Regional Australia, Outer Regional Australia, Remote Australia and Very Remote Australia (National Key Centre for Social Applications of Geographic Information Systems 2003).

The study was approved by the Human Research and Ethics Committee at the University of Western Australia.

Statistical analysis

Results are presented as proportions of the total number of hospitals that responded to each survey and the Pearson's chi square analysis was used to determine differences between proportions (with p values and 95% confidence intervals reported) . The Fisher's exact test was used for examining differences in categorical variables that had cell counts with five or fewer. Statistical significance was accepted at $p<0.05$. SPSS version 15.0 was used for the analysis (SPSS for Windows, Version 15.0.1.1 2006). Respondents were asked to comment on resuscitation issues. The comments from both surveys were collated and categorised according to the themes that became evident during the analysis.

FINDINGS

Responses were received from 59 (80%) of the 74 hospitals invited to participate in the 2008 survey, compared to 66 (90%) of the 73 hospitals invited in 2001. This was not a statistically significant difference. In 2008, the size of hospitals ranged from 10 to 833 beds (median beds 26) and two thirds of hospitals had less than 50 beds (Table 1). For hospitals that did not respond to the 2008 survey, bed size ranged from 16 to 130 beds (median beds 29) and 80% had less than 50 beds.

Table 1: Characteristics of the WA hospitals responding to the 2001 and 2008 surveys

Characteristic		2001 survey (%)	2008 survey (%)	Difference	p value
Response rate		66/73 (90)	59/74 (80)	0.1 (95% CI; 0.07, 0.27)	0.07
Bed numbers (median; IQR)		47; 21 - 107	26; 18 - 83		
Locality	Major Cities	21 (32)	13 (22)		
	Inner Regional Australia	10 (15)	6 (10)		
	Outer Regional Australia	24 (36)	21 (36)		
	Remote Australia	9 (14)	10 (17)		
	Very Remote Australia	2 (3)	9 (15)	χ^2 7.22 (df 4)	0.13
	Total	66 (100)	59 (100)		

Most hospitals in 2008 (78%) were located in regional or remote areas which is slightly higher than that observed in the 2001 survey (Table 1). In 2008, over half (53%) of the hospitals that did not respond to the survey were located in regional areas. There was no significant difference in the distribution of remoteness categories among the 2001 and 2008 surveys.

All respondents to the 2008 survey indicated that a defibrillator was located on site compared to 97% in 2001, but this was not a statistically significant difference compared to the 2001 survey results. There was a difference in the proportion of hospitals with AED capability in 2008 (86%) compared to 71% in 2001 (15% difference; 95% CI 10%, 29%; p= 0.04) (Table 2). In 2008, registered nurses were permitted to operate AEDs at 98% of hospitals where these devices were available compared to 74% in 2001 (24% difference; 95% CI 14%, 34%; p<0.001).

All hospitals in both surveys indicated CPR training was provided for registered nurses. In 2008, further details about CPR training was sought that showed training was conducted every 12 months in 86% of hospitals. One hospital offered CPR training every three months whereas three hospitals (7%) indicated that nurses were not required to attend CPR training. The 2008 survey demonstrated that nurses were likely to undertake practical rather than written CPR assessments (93% versus 68% respectively) (Table 2). This was not measured in the 2001 survey.

Training in combined (AED and manual) defibrillation for nurses was undertaken in 95% of hospitals in 2008 and in 85% of hospitals in 2001; however, this was not a statistically significant difference. There was a marked improvement in the proportion of nurses required to undertake solely AED training in 2008 (92%) compared to 2001 (52%) (40% difference; 95% CI 26%, 54%; p<0.001) (Table 2).

A medical emergency team (MET) was available in (34%) of hospitals in 2008 whereas the remainder indicated their cardiac arrest team comprised of either staff on duty or staff on call. A similar proportion of MET systems operated in 2001 (38%). An additional question in 2008 that did not appear in the 2001 survey about the availability of staff trained in defibrillation, found that competent staff were available 24 hours a day 7 days a week in 85% of hospitals. All of the sites without the ability to provide 'round the clock' defibrillation in 2008 were located in regional or remote areas. Over half (56%) of these hospitals commented that they retained an 'on call' system that summoned a nurse and / or doctor from home if required. A further half of these hospitals also did not have AED capability.

In 2008, the current ARC guidelines were used in 98% of hospitals compared to 83% in 2001 (15% difference; 95% CI 5%, 25%; p<0.01). Routine data collection on cardiac arrest events and outcomes were collected in 56% of hospitals in 2008 and 41% of hospitals in 2001.

Half of the respondents provided comments to the 2008 survey which are presented in Table 3. Categories that emerged from both surveys included training and assessment, resuscitation policy, staffing levels and equipment issues. The proportion of comments about training and assessment and equipment were similar for both surveys. There were twice as many comments about staffing and resuscitation policy in 2001 compared to 2008. Themes that emerged from the 2001 survey solely were; ethical issues and training challenges associated with the infrequent nature of medical emergencies.

Table 2: Comparison of 2001 and 2008 survey results

Category	2001 survey 66 (%)	2008 survey 59 (%)	Difference in percentage (95% CI)	p value
Hospitals with defibrillators:				
Defibrillator of any description	64 (97)	59 (100)	3 (-1, 7)	0.28
Solely AED	35 (53)	14 (24)	29 (13, 45)	<0.001
Solely manual defibrillator	52 (79)	7 (12)	67 (54, 80)	<0.001
Combination defibrillator	15 (23)	40 (68)	45 (26, 64)	<0.001
AED capability using any type of defibrillator	47 (71)	51 (86)	15 (1, 29)	0.04
Hospitals that require nurses to complete CPR training and assessment:				
Training	66 (100)	58 (97)	3 (-2, 8)	0.47
Written test	not surveyed	40 (68)	na	na
Practical test	not surveyed	55 (93)	na	na
Hospitals that require nurses to train in defibrillation:				
Solely AED	34 (52)	54 (92)	40 (26, 54)	<0.001
Solely manual defibrillator	48 (73)	39 (66)	7 (-15, 29)	0.42
Combination defibrillator	56 (85)	56 (95)	10 (-1, 10)	0.07
Hospitals that permit nurses to defibrillate:				
AED	49 (74)	58 (98)	24 (14, 34)	<0.001
Manual defibrillator	44 (67)	43 (73)	6 (-10, 22)	0.45
Combination defibrillator	not surveyed	58 (98)	na	na
Hospitals with a MET system	25 (38)	20 (34)	4 (-13, 21)	0.64
Hospitals that collect resuscitation data	27 (41)	33 (56)	15 (-2, 32)	0.09
Hospitals that use current ARC guidelines	55 (83)	58 (98)	15 (5, 25)	<0.01

Table 3: Categories used and comments made on surveys

Training and assessment	Total sites*
2001	14 (34%)
Lack of access to up-to-date training Confusion regarding AEDs Difficult to arrange training on site and maintain competencies RNs refusing to be trained in defibrillation	
2008	19 (32%)
Staff attendance poor unless mandatory; unsure of staff competency levels Lack of training resources Attempts to implement accredited ARC course as a standard for MET training hindered by limited availability of accredited instructors	
Resuscitation policy	
2001	16 (39%)
Difficulty establishing a 'not for resuscitation' policy Difficulty using current ARC policy / procedures Standard policies required for all hospitals We do not have policies	
2008	12 (20%)
Difficulty establishing a 'not for resuscitation' policy No particular department has responsibility for resuscitation policy, making changes difficult and time consuming	
Staffing	
2001	16 (39%)
Staff turnover high and large proportion of locum and agency staff Poor skill mix; limited availability staff competent in defibrillation No onsite doctors	
2008	12 (20%)
Difficulty obtaining funding for resuscitation officer Inadequate resources to release staff from clinical duties to attend training No staff development nurse to assess competencies Poor skill mix Do not always have a doctor onsite	
Equipment	
2001	5 (12%)
Lack of equipment Mix of different defibrillators onsite	
2008	7 (12%)
Limited training equipment Resuscitation area is small and does not have piped oxygen	
Ethical issues (appeared in 2001 survey only)	
We are required to resuscitate all patients, even if families object because we do not have an NFR policy	5 (12%)
Frequency of events (appeared in 2001 survey only)	
Few cardiac arrests Confidence in managing medical emergencies is low	5 (12%)

* Percentages add up to more than 100% due to multiple responses possible for each category.

LIMITATIONS

Although there was a good response rate, 15 hospitals did not return completed surveys in 2008. There was some confusion about the question related to resuscitation training. The question sought to establish training provisions for each category of

staff such as nursing, medical and allied health. Some respondents did not answer for all categories and as a result there was missing data.

DISCUSSION

This study was conducted to compare the results of resuscitation policy and practice surveys obtained in 2001 and 2008. In particular we sought to ascertain if there had been an improvement in the nurses' access to using AEDs following the WA DoH operational directive. Our results confirm that there were changes in resuscitation policy and practice within the period between the surveys. Specifically, there was an improvement in the number of hospitals with AEDs, the proportion of hospitals that allowed nurses to defibrillate and the uptake of ARC guidelines.

All hospitals had a defibrillator of some description. Eight-six percent of respondents to the 2008 survey stated their hospitals had one or more defibrillators with AED capability. This is a 15% improvement since the 2001 survey but was not statistically significant. The increase in hospitals with AEDs was possibly an effect of the operational directive and promotion of defibrillator access by the ARC, although it must be noted there has been greater acceptance of the safety and efficacy of the devices over time.

It was pleasing that 98% of the surveyed hospitals in 2008 permitted nurses to operate AEDs compared to 74% in 2001. However, a distinction is made between having access to defibrillators and being permitted to use them. One respondent to the 2008 survey indicated that staff did not have access to the AEDs located at their hospital. At the time of survey, the defibrillators would not be installed in the clinical areas until the resources could be secured to facilitate the relevant training. It is disappointing training issues were cited as the reason for not implementing AEDs at this hospital considering these devices are designed to be self explanatory and used by lay rescuers (Handley et al 2005).

According to the 2008 survey results, CPR training was offered by all hospitals in Western Australia; however, not all sites required nurses to attend (7%). This is a slightly worse result compared to the 2001 survey result but was not a statistically significant difference. Some respondents indicated they did not have the time and resources to provide the recommended training. The operational directive mandates that all staff having patient contact should be competent in performing CPR (Government of Western Australia 2003). Given that training is commonly used to measure competence, it is a concern that not all hospitals can meet this provision.

For the hospitals that required nurses to complete assessment, most sites performed CPR assessment at least annually, which is in accordance with the current recommendations (Australian College of Critical Care Nurses 2006; Australian Resuscitation Council 2006b; Baskett et al 2005) The decision by the hospitals that offered three or six monthly assessments could be attributed to the lack of evidence on the optimal time frame for assessment and that degradation of skills and knowledge occurs soon after training (Australian Resuscitation Council 2006b). No comparison is made to the 2001 survey as questions about assessment were not included.

Almost all (98%) respondents in 2008 indicated the current ARC guidelines were used in the workplace compared to 83% in 2001. It is possible that increased uptake was influenced by the decision of the ARC to make its guidelines more readily accessible from their website.

Irrespective of the type of emergency management in place, it is a major problem that some sites (15%) cannot provide immediate defibrillation for patients in cardiac arrest and rely on 'on call' staff to perform defibrillation. This is of particular concern given the delays likely to be associated with calling in staff and the clear evidence that every minute of delay reduces the likelihood of survival (Valenzuela et al 1997). Lay rescuers can be effectively trained in providing shock advisory defibrillation, it is surprising that these sites have not implemented a first responder approach toward defibrillation for the staff members that are on site (Valenzuela et al 2000).

The comments made by respondents were similar for both surveys with the exception that the 2001 survey included statements on the implementation of AEDs and reluctance of some nurses to be trained in defibrillation. This is explained by the timing of the survey. The early 2000s was a period when many sites were installing AEDS for the first time.

CONCLUSIONS

Our survey has demonstrated that CPR policy and practice in Western Australian hospitals has improved since the 2001 survey and release of the operational directive from the WA DoH. Although improvement has occurred, it is indefensible that not every nurse employed at the hospitals surveyed in 2008 is permitted to defibrillate using AEDs. It is a serious omission and concern that not all hospitals can provide immediate defibrillation 24 hours per day, seven days per week and that a proportion of these sites also do not have AED capability.

RECOMMENDATIONS

Nurses have been identified as the likely first responders to a cardiac arrest in the hospital setting; it has been recommended training and access to AEDs occur at every site (Government of Western Australia 2003; Kenward et al 2002). Training and policy must emphasise early defibrillation for VF/VT arrests improves the chance of survival of the patient in cardiac arrest.

Hospitals that do not have a trained staff member on duty to perform immediate defibrillation 24 hours a day, seven days per week are urged to consider a first responder approach towards early defibrillation in order to improve the chance of survival for patients who sustain cardiac arrest.

REFERENCES

Australian College of Critical Care Nurses. 2006. *Position statement: Adult and paediatric resuscitation by nurses*. Available from http://www.acccn.com.au/images/stories/downloads/adult__paediatric_resus.pdf [accessed 18 August 2008].

The Australian Hospitals Directory 2007-08. 2008. Doonan Queensland: ATA Professional Services Pty Ltd.

Australian Resuscitation Council. 2006a. *Guideline 7: Cardiopulmonary resuscitation*. Available from http://www.resus.org.au/ [accessed 13 February 2009].

Australian Resuscitation Council. 2006b. *Guideline 9.1.1: Cardiopulmonary resuscitation training*. Available from http://www.resus.org.au/ [accessed 4 December 2008].

Baskett, P., Nolan, P., Handley, A., Soar, J., Biarent, D. and Richmond, S. 2005. European Resuscitation Council Guidelines for Resuscitation Section 9: Principles of training in resuscitation. *Resuscitation,* 67S1:S181-S189.

Deakin, C. and Nolan, P. 2005. European Resuscitation Council Guidelines for Resuscitation Section 3: Electrical therapies: Automated external defibrillators, defibrillation, cardioversion and pacing. *Resuscitation,* 67S1:S25-S37.

Finn, J., Jacobs, I., Holman, C. and Oxer, H. 2001. Outcomes of out-of-hospital cardiac arrest patients in Perth, Western Australia, 1996-1999. *Resuscitation,* 51:247-255.

Finn, J. and Jacobs, I. 2003. Cardiac arrest resuscitation policies and practices: A survey of Australian hospitals. *Medical Journal of Australia,* 179:470-474.

Government of Western Australia. 2003. *Management of cardiac arrest [OP 1706/03]*. Available from http://www.health.wa.gov.au/circulars/pdfs/7824.pdf [accessed 31 July 2008].

Handley, A., Koster, R., Monsieurs, K., Perkins, G., Davies, S. and Bossaert, L. 2005. European Resuscitation Council Guidelines for Resuscitation 2005 Section 2: Adult basic life support and use of automated external defibrillators. *Resuscitation,* 67S1:S7-S23.

Hillman, K., Chen, J., Cretikos, M., Bellomo, R., Brown, D., Doig, G., Finfer, S. and Flabouris, A. 2005. Introduction of the medical emergency team (MET) system: a cluster-randomised controlled trial. *Lancet,* 365(9477):2091-7.

Holler, N., Mantoni, T., Nielsen, S., Lippert, F. and Rasmussen, L. 2007. Long-term survival after out-of-hospital cardiac arrest. *Resuscitation,* 75:23-28.

Jacobs, I. and Nadkarni, V. 2004. Cardiac arrest and cardiopulmonary resuscitation outcome reports. *Circulation,* 110:3385-3397.

Kenward, G., Castle, N. and Hodgetts, T. 2002. Should ward nurses be using automatic external defibrillators as first responders to improve the outcome from cardiac arrest? A systematic review of the primary research. *Resuscitation,* 52:31-37.

Kouwenhoven, W., Jude, J. and Knickerbocker, G. 1960. Closed-chest cardiac massage. *Journal of the American Medical Association,* 173:1064-1067.

National Key Centre for Social Applications of Geographic Information Systems. 2003. Accessibility / remoteness index of Australia (ARIA+), edited by Department of Health and Aged Care. Adelaide: Department of Health and Aged Care.

Peberdy, M., Kaye, W., Ornato, J., Larkin, G., Nadkarni, V., Mancini, M., Berg, R., Nichol, G. and Lane-Truitt, T. 2003. Cardiopulmonary resuscitation of adults in the hospital: a report of 14720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation. *Resuscitation,* 58(3):297-308.

SPSS for Windows, Version 15.0.1.1. 2006. Chicago Illinois: SPSS Inc.

Valenzuela, T., Roe, D., Cretin, S., Spaite, D. and Larsen, M. 1997. Estimating effectiveness of cardiac arrest interventions: A logistic regression survival model. *Circulation,* 96:3308-3313.

Valenzuela, T., Roe, D., Nichol, G., Clark, L., Spaite, D. and Hardman, R. 2000. Outcomes of rapid defibrillation by security officers after cardiac arrest in casinos. *New England Journal of Medicine,* 343(17):1206-1209.