



A Questionnaire Survey of Perceptions of Basic Life Support (BLS) among Radiological Technologists: Radiological Technologists Often Encounter Patients with Cardiopulmonary Arrest during Diagnostic Imaging Examinations

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Authors' contributions

This work was carried out in collaboration between all authors. Author MI designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript and managed literature searches. Authors Shunsuke Nakano, TY, Satoshi Nakanishi, YU, NT and YI managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The present study aims to investigate the perceptions of basic life support (BLS), motivations for learning BLS and self-evaluations of the ability to practice BLS skills in radiological technologists clinically working in Mie prefecture, Japan.

Methods: A cross-sectional questionnaire survey was conducted on 489 radiological technologists (RTs) living in Mie prefecture, Japan, from August to December 2014. The responded questionnaire was collected from 158 RTs (recovery rate: 32%) with written informed consent.

Results: Almost one third of the RTs (32.3%) had encountered cardiopulmonary arrest during a radiological examination. The percentage of those who 'understood' the purpose and method of BLS reached 71.5%. Approximately half of the respondents considered the ability to practice BLS 'practicable', while the remaining half considered it to be 'difficult'.

All RTs knew of the term 'AED', and 98.7% 'understood' the purpose of AEDs and how to handle them. Similarly, 92.4% of them responded that they were 'practicable' to use AEDs. Although sixty percent of RTs had undertaken a BLS training course, only three quarters of them considered themselves 'practicable' BLS and 65.6% had no confidence in their BLS skills. Moreover, 39.2% of RTs had not undertaken a BLS training course, and only 9.7% responded 'practicable' for practice of BLS among those with training course experience. None of RTs who had not undertaken a BLS training course answered 'fully confident' and 95.2% had no or little confidence in their BLS skills.

Conclusion: In this study, it is considered that many RTs understand the purpose and handling of AEDs and have the ability to use an AED. The majority of the RTs participating in a BLS training course are 'practicable' to practice BLS, though they felt 'little confidence' about their BLS skill level. In contrast, the majority of RTs with no experience of attending a BLS training course were not able to practice BLS. Therefore, a BLS training course is very crucial for obtaining the ability to practice BLS, although there is a necessity to improve the content of BLS training course.

Keywords: Radiological technologists; BLS; AED; clinical safety.

1. INTRODUCTION

Radiological technologist (RT) certification is issued by the Ministry of Health, Labor and Welfare, and occupational licensing (except for doctors and dentists) for exposing radial rays including X-rays, alpha rays, beta rays, gamma rays, proton rays, neutron rays, and so on against the human body in Japan. RTs are specialists in radiation related diagnostic imaging including ultrasound and nuclear medicine imaging examinations, and radiation therapy in medical institutes. Not only do they engage in radiological diagnostic imaging or radiation therapy under direction from doctors and dentists, but also practice optimization of irradiated radiation against patients, quality controls of medical apparatus, safety care and education for clients and medical staff. Thus, RTs have an important responsibility to serve safe and high-quality radiation medicine as a specialist, and to work together cooperatively with other medical professions, as a member of a medical team.

Although radiation medicine ranges widely, we have focused on emergency medicine in this study. Diagnostic imaging in current emergency medicine has a tendency of increased

importance, due to the improvement in diagnostic accuracy. Information from radiological images is indispensable because of accuracy improvement and the large amount of information. The RT must cooperate and communicate with doctors, nurses, and other medical staff as the member of a medical care team, in a medical emergency.

Moreover, emergency care has many characteristics, and the most important is a limitation of time. In an emergency care unit, each professional works as a team; they practice their own work independently, but they share medical treatment information. Since emergency medicine treats patients with severe symptoms, it is possible that patients undergoing diagnostic imaging examinations may suffer from cardiopulmonary arrest. Speedy implementation of Cardiopulmonary Resuscitation (CPR) is needed for sudden cardiac arrest (SCA). If patients suffer from ventricular fibrillation, which occurs commonly among SCA patients, their probability of survival (POS) decreases by 5.5% every minute [1-3]. If the patient receives CPR within a short time of onset, the POS degradation curve becomes moderate, with up to 3 or 4% every one minute [4-6]. The factors concerning survival discharge, early alert, early start of CPR

and early practice of defibrillation all significantly contribute to the outcome of patients health, wellbeing etc [7]. For these reasons, the importance of basic life support (BLS) including awareness of SCA, practice of CPR, defibrillation using an Automated External Defibrillator (AED) is increasing.

RT education course consists of not only lecture and practice at school and hospital about diagnostic imaging, but also general medical science including emergency medicine. The students of RT education course learn that there is a possibility of SCA anytime and anywhere, and an initial response to CPR patients affects convalescence and prognosis of patients. Furthermore, since CPR is absolutely imperative for SAC patients to save them, acquisition of CPR technique is specified in the RT national examination criteria. Regrettably, the BLS training course carrying out at present for radiological technologists in Japan is not always practical. The lectures and practical training using patient models are major contents. Thus, there is almost no opportunity for experience real CPR in RT training course.

Based on this information, it is essential for RTs to acquire knowledge and techniques of BLS, and be able to perform CPR to a high degree. However, there have been no previous studies about regional RTs' awareness or motivation for learning BLS or CPR. In this study, we investigated attitudes about BLS among RTs living in Mie prefecture, Japan.

2. MATERIALS AND METHODS

A we questionnaire survey was conducted on 489 RTs belonging to the Radiological Technologist Association of Mie prefecture, Japan. A self-administered questionnaire was sent by postal mail with relevant written explanations about the research content in August, 2014. The survey was performed anonymously to protect the privacy and to obtain the confidentiality of respondents. After the questionnaire was completed it, was collected by postal mail from each respondent by December, 2014. The duration of survey was between August and December 2014 and no reminder was sent to the participants during the period.

The questionnaire consisted of items such as demographic characteristics, knowledge of BSL and AEDs, participant's experiences of emergency situations, participation in BSL or

AED training courses, and other questions related to BSL and AED. Concrete questionnaire items were as followed;

1. Do you know 'basic life support'?
2. Do you know the term BLS?
3. Do you know the methods and purpose of BLS?
4. Can you practice BLS?
5. Do you have confidence in your BLS skills?
6. Do you think a BLS training course is necessary?
7. Have you ever attended a BLS training course?
8. Do you want to attend a BLS training course?
9. Do you know the term AED?
10. Do you know the objective of usage and procedures of AED?
11. Can you use an AED?
12. Have you ever experienced a patients' cardiopulmonary arrest during examinations you were involved in?

SPSS ver.22 was employed for statistical analyses. Free description by respondents was considered by all researchers to analyze what they want to reveal.

The Research Ethics Committee of Chubu University (approval number: 260034) approved this study.

3. RESULTS

3.1 Encounter with Cardiopulmonary Arrest during Radiological Examination

The survey recovery rate was only 32.3%, as responses were collected from only 158 out of 489 radiological technologists (RTs). Out of the 158 living in Mie prefecture in Japan, 51 RTs (32.3%) responded that they had encountered cardiopulmonary arrest during a radiological examination (data not shown), indicating that it is important and essential for RTs to acquire knowledge and technique of BLS and high quality CPR.

3.2 Responses to the Items Concerning BLS

The results concerning BLS show that ninety-four respondents (59.5%) knew the term BLS, and 36 (22.8%) had heard of the term BLS (Fig. 1). More

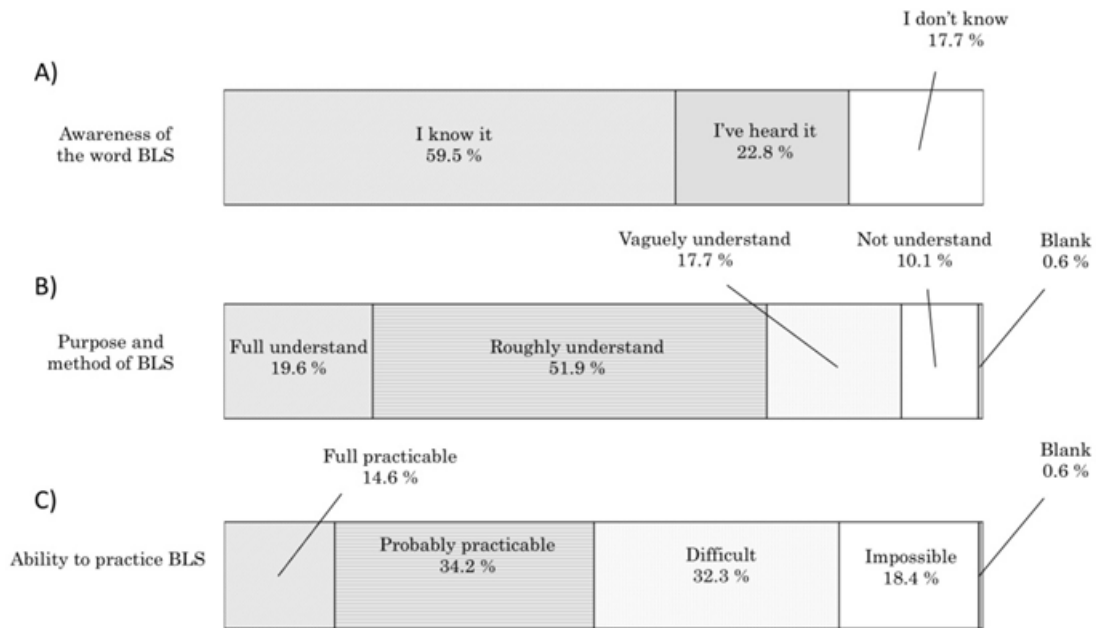


Fig. 1. Responses to questions concerning BLS

A: Summary of answers to questionnaire item #2 of materials and methods

B: Summary of answers to questionnaire item #3 of materials and methods

C: Summary of answers to questionnaire item #4 of materials and methods

than 70% of RTs considered themselves to fully or fairly understand the purpose and methods of BLS. Concerning the ability to practice BLS, almost half of RTs felt 'fully' or 'probably' practicable. However, another half answered 'difficult' or 'impossible'.

3.3 Responses Related to AED

The results relating to AED are shown in Fig. 2. All RTs knew the term AED. Almost all RTs (99%) regarded themselves as being able to 'fully' or 'fairly' understand the purpose and handling of an AED, concerning the ability to use AEDs, 75(47.5%) and 71(44.9%) of RTs answered 'fully practicable' and 'probably practicable' respectively.

3.4 Relation between Participation in a BLS Training Course and the Ability to Practice BLS

As shown in Table 2, 95 (60.1%) RTs had participated in a BLS training course, and 21(22.1%) and 50(52.6%) out of them answered 'fully practicable' and 'probably practicable' to practice BLS. In contrast, 22(23.2%) and 2(2.1%)

of RTs participating in BLS training course answered 'difficult' and 'impossible', respectively. Meanwhile, 62(39.2%) RTs had had no experience of participating in a BLS training course, and among them, only 2(3.2%) and 4(6.5%) RTs answered 'fully practicable' and 'probably practicable'. The majority of RTs, who have not attended a BLS training course, do not have confidence in practicing BLS. Two groups were compared using a chi-square test and there was a significant difference between groups ($p < 0.01$). These findings indicate that a BLS training course is crucial for the ability of practicing BLS.

3.5 The Relation between Participation in a BLS Training Course and Confidence in BLS Skills

As shown in Table 2, 6(6.5%) and 26(27.9%) of RTs attending at BLS training course answered 'feel fully confident' and 'reasonably confident' about their BLS skill. The majority of RTs who participated in a BLS training course answered that they were 'a little' or 'not' confident. Sixty-two RTs (40%) did not attend BLS training courses,

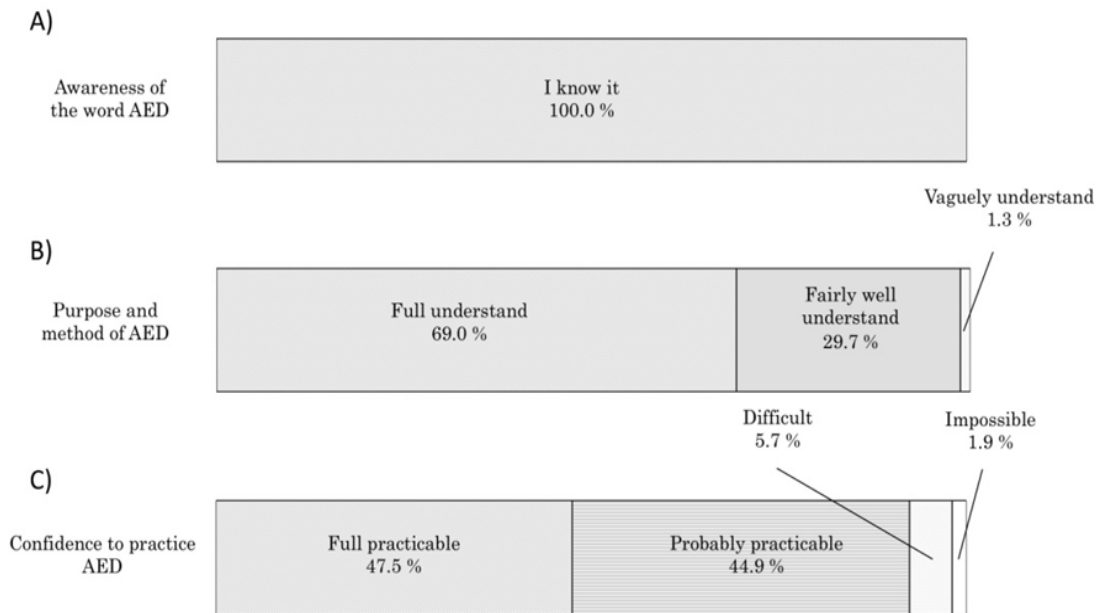


Fig. 2. Responses related to AED

A: Summary of answers to questionnaire item #10 of materials and methods

B: Summary of answers to questionnaire item #11 of materials and methods

C: Summary of answers to questionnaire item #12 of materials and methods

and among them, nobody answered 'fully confident'. Furthermore, 28(45.2%) and 31(50.0%) RTs, who had not attended a BLS training course, had 'little' or 'no' confidence. The difference in the distribution of RTs with full or reasonable confidence with or without the BLS training experience was confirmed using a chi-square test. This showed a significant difference between the groups ($p < 0.01$). These results mean that participation in a BLS training course contributes toward confidence to subject's BLS skill. However, 65.6% of RTs attending a BLS training course reported having little or no confidence in BLS skill, indicating that the content in a BLS training course should be improved.

4. DISCUSSION

In this survey, 32.3% of responded RTs answered that they had encountered cardiopulmonary arrest during radiological examination.

The 2010 guidelines for cardiopulmonary resuscitation and emergency cardiovascular care insists that hospitals must install an adequate number of AEDs, so that any cardiopulmonary arrested patient can receive a first counter shock within three minutes after attack. The guideline

claims that hospital staff are regularly educated to ensure that the first responder can use an AED [8]. A nationwide study on the effects of AEDs diffusion in public, concluded that the rate of patients who recovered within one month, that were suffering less nerve damage had increased; as did the rate of ordinary citizens carrying out CPR to SCA patients, and the number of AED usage in public places [9].

Prior reports about the quality evaluation of CPR in a resuscitation situation suggested that sufficient CPR was not completed, even though cardiac compression was performed by well-trained staff [10-13]. The present study revealed that half of the RTs were aware they could not practice BLS in a situation encountering SCA. However, 92.4% of RTs stated that they could use AEDs. Though 59.5% of RTs knew BLS procedures, only 14.6% were capable of practicing them. Therefore, there might be differences between 'practice in training courses' and 'practice toward real patients'.

The results of the survey about relationship regarding the subject's relationship between experience of a BLS training course and self-confidence in BLS skill, strongly suggest that training content is important. The significance of proper training was reaffirmed in response to the

Table 1. Experience of undertaking a BLS training course and the ability to practice BLS

Experience of BLS training course	Practicable		Impracticable	
	Fully practicable	Probably practicable	Difficult	Impossible
+	21(22.1) [#]	50(52.6)	22(23.2)	2(2.1)
-	2(3.2)	4(6.5)	29(46.8)	27(43.5)

[#]numbers (%)

Table 2. Experience of undertaking a BLS training course and confidence in BLS skill

	Confident		Unconfident	
	Fully confident	Some-what confident	A little confident	Not confident
Experienced	6(6.5) [#]	26(27.9)	54(58.1)	7(7.5)
Not experienced	0(0.0)	3(4.8)	28(45.2)	31(50.0)

[#]numbers (%)

subject's requirement to practice appropriate resuscitation. To practice high quality CPR correctly, reading guidelines or books is inadequate. For instance, the purpose of AHA-BLS healthcare provider course focuses to training medical staff including RT about three early items of chain of survival for CPR patients, such as early notification, early CPR practice, and early AED use. To achieve the purpose, more positive participation of medical staff including RT to the training course of BLS is needed.

Additionally, the emotional trauma of persons who practiced CPR should be noted. Forty nine RTs (32.3%) experienced cardiopulmonary arrest event during diagnostic imaging examinations. According to the reports about emotional trauma experienced by the CPR practitioners as described by Axelsson [14], there must exist some reasons to refuse practicing CPR, such as; 'feelings of panic', 'feelings of fear over the transmission of disease', 'having no confidence to perform CPR', 'embarrassed appearance', 'patient being suspected as a drug abuser', 'bleeding', and 'vomiting' [15]. It was also reported that although more than one third of patients who received CPR suffered rib or sternum fractures [16], no patients suffered critical internal bleeding resulting in death [17]. These facts may promote unwillingness of RTs to perform CPR. Furthermore, it is important to explain not only the necessity of frequent high quality cardiac compression, but also about the legal responsibilities and complications to RTs.

This study resulted in a low response rate (32%), and the low response rate may be a limitation of this study. Researchers sent questionnaires to all

RTs working in Mie prefecture including general hospitals and clinics. However, many of them did not participate in emergency medicine, so we hypothesized that this might be the reason for a low response rate. Therefore, the results obtained from our study may reflect trends of a small group of RTs, who are concerned in emergency medicine, and may not reflect trends of all RTs. Therefore, continued study and efforts are required by all RTs for crucial education concerning the knowledge and manner that is essential in the practice of high quality emergency medicine.

This study showed that frequent training is required for RTs to practice medicine adequately, even when they encounter a complicated situation. We also emphasize the importance to create a proper environment for RTs, where RTs can easily attend the initial training course and re-training courses of BLS and CPR technique.

5. CONCLUSION

The results of this study identified the current state of RTs' awareness and motivation to acquire the knowledge and technique of BLS. All RTs know the term AED, and that a considerable percentage of RTs understand the objectives and way to handling an AED, and have reported ability to use an AED. The majority of RTs participating in a BLS training course asserted that they are 'practicable' in BLS methods, while they responded 'little/no confidence' in their BLS skill.

However, the majority of RTs who have had no experience of participating in a BLS training

course stated 'impracticable' for the practice of BLS. Therefore, the BLS training course is crucial for obtaining the ability to practice BLS. However, there is considerable room for improvement in the content of BLS training courses [18-20].

The BLS training course carrying out at present for RTs (radiological technologists) in Japan is not always practical. This study suggested information about improvement of BLS training course. In the future, BLS training course for RTs should include the practical training using real patients and the newest simulator system. Moreover, there will be a need of improvement about not only specialized knowledge and skill, but also effective communication ability and good teamwork.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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