



## Original article

# How, when, and where have rental automated external defibrillators been used in Japan?



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## ABSTRACT

**Objective:** Automated external defibrillators (AEDs) have been rented in various places in Japan. When rental AEDs are placed in locations where the probability of sudden cardiac arrest is high and permanent placement of AEDs is difficult, the possibility of improving survival rates might increase. In this preliminary study, we investigated how, when, and where rental AEDs have been used in Japan to clarify their characteristics when used in actual situations and to facilitate better usage in the future.

**Methods:** We investigated the total number of AEDs rented, the duration of rental of each AED, the total number of AEDs rented monthly, the rental sites, the frequency and location of use, the number of defibrillations, and the time to defibrillation success for devices rented between January 2008 and December 2010 by a single company in Japan.

**Results:** The number of AEDs rented annually was 590 at 391 sites in 2008, 767 at 465 sites in 2009, and 847 at 477 sites in 2010. More AEDs were rented during the summer. The devices were actually used on 17 individuals, of whom 2 individuals (at a beach and a marathon) underwent defibrillation, and 1 individual (at a marathon) survived.

**Conclusion:** Rental AEDs can play an important role in emergency cases occurring during seasonal and temporary outdoor events. The provision of rental AEDs in locations where permanent AEDs would be unfeasible may offer a useful strategy for efficiently improving survival rates in the future.

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## Introduction

The provision of automated external defibrillators (AEDs) in various locations was advocated by the American Heart Association (AHA) in their guidelines published in 2000. These guidelines recommend placing AEDs in locations where cardiac arrest events are relatively likely (i.e. a probability of 1 AED use in 5 years, or an estimated event rate of 1 sudden cardiac arrest per 1000 person-years) [1].

In July 2004, AEDs were approved for use by laypersons in Japan. The efficacy of public-access defibrillation (PAD) on a national scale was described soon after this in Japan by Kitamura et al. [2].

AEDs are more useful at sites where there is a high density of both potential victims and resuscitators [3]. The survival rate is

improved when more AEDs are available. However, the primary obstacle to acquiring an AED is financial resources [4]. AEDs have been rented in various places in Japan, however there are to date no reports based solely on the characteristics of rental AEDs in actual situations, particularly during seasonal events. We therefore investigated how, when, and where rental AEDs have been used in Japan to clarify the characteristics of rental AEDs when used in actual situations and to facilitate better usage in the future.

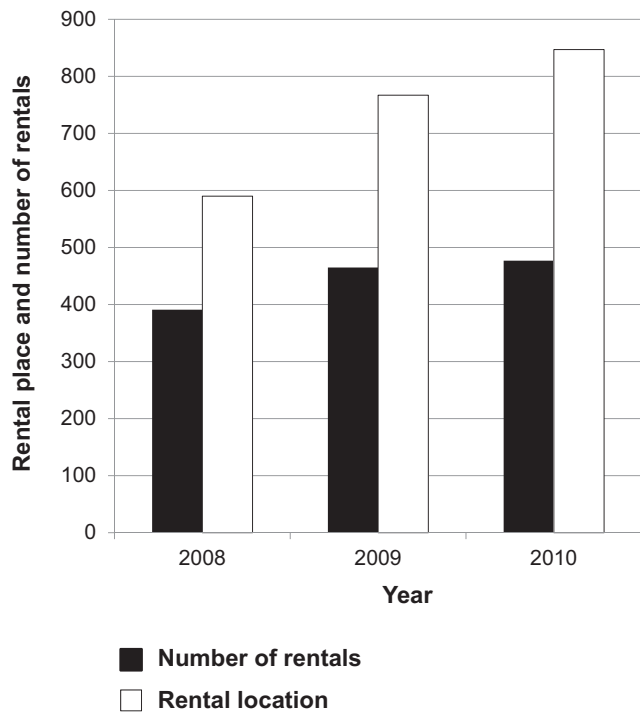
## Methods

We investigated data obtained by a company that rents AEDs to users all over Japan, but does not manufacture them. Anyone can rent fully maintained AEDs through the Internet. The rental fee is approximately 9240–14,700 Japanese yen for a 3-day period. There is a special rate for long-term rental. An AED is generally sold at approximately 300,000 Japanese yen in Japan.

The rented AEDs were Heart Start HS1, FR2, and FRx (Philips, Amsterdam, The Netherlands). The parameters investigated included the total number of AEDs, the rental days for

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**Fig. 1.** Rental location and number of rentals between 2008 and 2010. ■, total number of places where automated external defibrillators (AEDs) were rented between 2008 and 2010: 1333. □, total number of rental AEDs between 2008 and 2010: 2204.

each AED, the total number of rental AEDs per month, the rental sites, the frequency and location of use, the number of defibrillations, and the duration period from turning on the power supply to the attachment of the AED pad to the patient. The data obtained covered 3 years from January 2008 to December 2010.

The data were entered into a Microsoft Excel 2007 spreadsheet (Microsoft Corporation, Redmond, WA, USA). Images were prepared using Photoshop Elements 6.0 (Adobe, San Jose, CA, USA) and Microsoft PowerPoint 2007 (Microsoft Corporation). Statistical analysis was performed using PASW Statistics 18 software (Chicago, IL, USA).

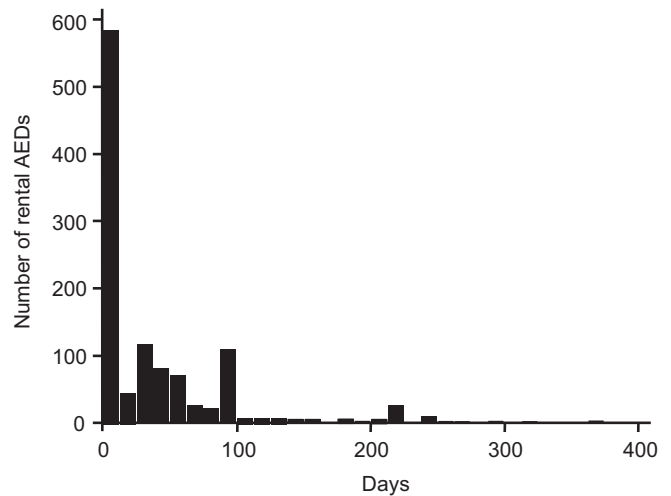
## Results

One of the rental AEDs company in Japan rented 590 AEDs to 391 sites in 2008, 767 AEDs to 465 sites in 2009, and 847 AEDs to 477 sites in 2010. The total number of rental sites and that of AED rentals have been increasing every year (Fig. 1).

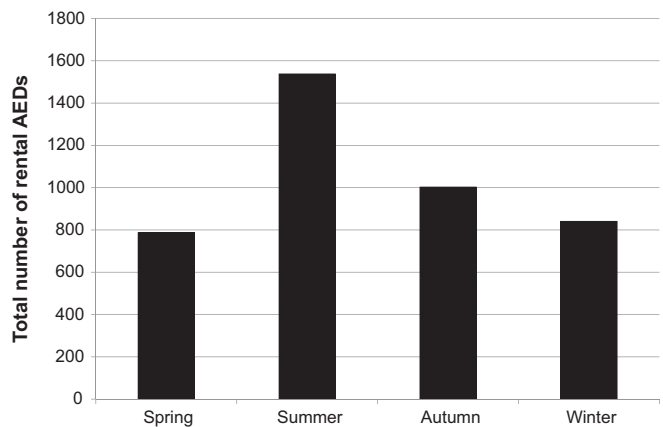
The mean number of AEDs rented per site was 1.7 (range, 1–71), and 80% of the rentals involved only 1 AED rented to 1 event or location.

The median duration of rental per AED was 13 days, and the quarter duration was 56 days (Fig. 2). The most common type of rental (30%) was a 3-day short-term rental, followed by periods of 1–3 months (28%), and 3–7 days (21%).

The rental situation according to season showed that most AEDs were rented out during the summer (36.9%) (Fig. 3). A rented AED was actually used on 17 individuals, among which 14 were used at waterside locations, such as a beach or a pool. Defibrillation was applied to 2 of these 17 individuals, 1 at a beach and the other at a marathon. The individual treated at the marathon survived (Tables 1 and 2).



**Fig. 2.** Total rental numbers and the days in 2008–2010 ( $n=4223$ ). Median duration: 13.0, quarter duration: 56.0, max: 366, min: 1.0 (day) of rental per AED. AED, automated external defibrillator.



**Fig. 3.** Total number of rentals by season between 2008 and 2010 ( $n=4223$ ). Spring: March, April, May. Summer: June, July, August. Autumn: September, October, November. Winter: December, January, February. AED, automated external defibrillator.

In the 17 cases of use, the mean duration period from turning on the power supply to the attachment of the AED pad to the patient was 24 s (range, 3–117 s), with a duration of 28 s for the single survival case.

**Table 1**  
Situations in which rental AEDs were used.

	2008	2009	2010	Total
Number of AEDs	1183	1427	1613	4223
AEDs used	6	6	5	17
Location				
Seaside	5	4	4	13
Poolside		1		1
Mountain		1		1
Public facility	1			1
Marathon			1	1
Defibrillation applied	0	1	1	2
Seaside		1		1
Marathon			1	1
Number of survivors	0	0	1	1
Marathon			1	1

AED, automated external defibrillator.

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