European Journal of Internal Medicine 30 (2016) 61–67

Contents lists available at ScienceDirect

European Journal of Internal Medicine

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

Original Article

Association of initial rhythm with neurologically favorable survival in non-shockable out-of-hospital cardiac arrest without a bystander witness or bystander cardiopulmonary resuscitation☆,☆☆

Tatsuma Fukuda *, Naoko Ohashi-Fukuda, Takehiro Matsubara, Kent Doi, Yoichi Kitsuta, Susumu Nakajima, Naoki Yahagi

Department of Emergency and Critical Care Medicine, Graduate School of Medicine, The University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113-8655, Japan

ARTICLE INFO

Article history:
Received 10 October 2015
Received in revised form 7 January 2016
Accepted 25 January 2016
Available online 2 March 2016

Keywords:
Out-of-hospital cardiac arrest
Cardiopulmonary resuscitation
Asystole
Pulseless Electrical Activity
Non-shockable rhythm

ABSTRACT

Background: Out-of-hospital cardiac arrest (OHCA) has a predominantly non-shockable rhythm. Non-shockable rhythm, and the absence of a bystander witness or bystander cardiopulmonary resuscitation (CPR) are associated with poor outcomes. However, the association between the type of non-shockable rhythm and outcomes is not well known.

Objective: To examine the association between the initial rhythm and neurologically favorable outcomes after non-shockable OHCA without a bystander witness or bystander CPR.

Methods: In a nationwide, population-based, cohort study, we analyzed 213,984 adult OHCA patients with a non-shockable rhythm who had neither a bystander witness nor bystander CPR. They were identified through the Japanese national OHCA registry data from January 1, 2005 to December 31, 2010. The primary outcome was neurologically favorable survival.

Results: Among 213,984 patients, the initial rhythm was Pulseless Electrical Activity (PEA) in 31,179 patients (14.6%) and Asystole in 182,805 patients (85.4%). The neurological outcome was more favorable in PEA than in Asystole (1.4% vs. 0.2%, $p < 0.0001$). After adjusting for age, sex, etiology of arrest, epinephrine administration, advanced airway management, time from call to contact with patient, and calendar year, PEA was associated with an increased neurologically favorable survival rate (odds ratio 7.86; 95% confidence interval 6.81–9.07). In subgroup analysis stratified by age group (18–64, 65–84, or ≥85 years), the neurologically favorable survival rate was ≥1% in PEA, even for patients aged ≥85 years, but <1% in Asystole among all age groups.

Conclusion: PEA and Asystole should not be considered to be identical to non-shockable rhythm, but rather should be clearly distinguished from each other from the perspective of quantitative medical futility.

1. Introduction

Out-of-hospital cardiac arrest (OHCA) is generally divided into shockable rhythm and non-shockable rhythm, as the prognoses between the two greatly differ [1–8]. However, just as some OHCA patients with shockable rhythm have poor outcomes, some OHCA patients with non-shockable rhythm have favorable outcomes [9]. Well-known prognostic factors for OHCA include not only shockable rhythm but also a bystander witness and bystander cardiopulmonary resuscitation (CPR) [7,8,10–15]. OHCA with non-shockable rhythm and neither bystander witness nor bystander CPR is considered to have the worst prognosis, and can thus be eligible for the termination of resuscitation (TOR) [12,16–20]. However, considering that OHCA patients predominantly have non-shockable rhythm and more than half of them do not have a bystander witness and bystander CPR, it is important to further stratify OHCA patients with non-shockable rhythm who have neither a bystander witness nor bystander CPR [6,9,10].

☆ Contributors: T. Fukuda, the principal investigator, participated in the study conception, design and completion, the data collection, management, and analysis, the interpretation of results and the revision of the manuscript and contributed to the final report. N. Ohashi-Fukuda, T. Matsubara, K. Doi, Y. Kitsuta, S. Nakajima, and N. Yahagi participated in the study con- ception, the data collection and management, and the interpretation of results. T. Fukuda performed the statistical analysis. All of the authors approved the final version. T. Fukuda takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

☆☆ Role of the funding source: We received no funding for this study. There were no sponsors who played a role in the data analysis, the data interpretation, or the composition of the report. The FDMA collected and managed the data, but played no role in the design or performance of the study. The corre- sponding author had full access to all of the data in the study and had final responsibility for the decision to submit the manuscript for publication.

* Corresponding author. Tel.: +81 3 3815 5411; fax: +81 3 3814 6446.
E-mail address: tatsumafukuda-jpn@umin.ac.jp (T. Fukuda).

http://dx.doi.org/10.1016/j.ejim.2016.01.022
0953-6205/

The aim of this study was to assess additional prognostic factors for adult OHCA patients with non-shockable rhythm who have neither a bystander witness nor bystander CPR to optimize the allocation of medical resources by more detailed risk stratification using Japanese national OHCA registry data from 2005 to 2010.

2. Methods

2.1. Data source

The All-Japan Utstein Registry of the Fire and Disaster Management Agency (FDMA) is a nationwide, prospective, population-based clinical registry of patients with OHCA in Japan. The design of the registry has been described in detail previously [9,14]. Briefly, all patients with a confirmed OHCA (defined as the absence of a palpable central pulse, apnea, and unresponsiveness) of all causes and for whom resuscitation is attempted are identified and followed, including those with do-not-resuscitate (DNR) orders. Data are collected from three sources that together define the continuum of emergency cardiac care: 119 dispatch centers, emergency medical services (EMS) agencies, and receiving hospitals. The registry uses standardized Utstein-style definitions for clinical variables and outcomes to ensure uniformity [21,22]. The completeness and accuracy of the data are ensured by rigorous certification of hospital staff and the use of standardized software with internal data checks.

This study was conducted in accordance with the amended Declaration of Helsinki. The Institutional Review Board at The University of Tokyo approved this study with a waiver of informed consent because of the anonymous nature of the data (No. 10096).

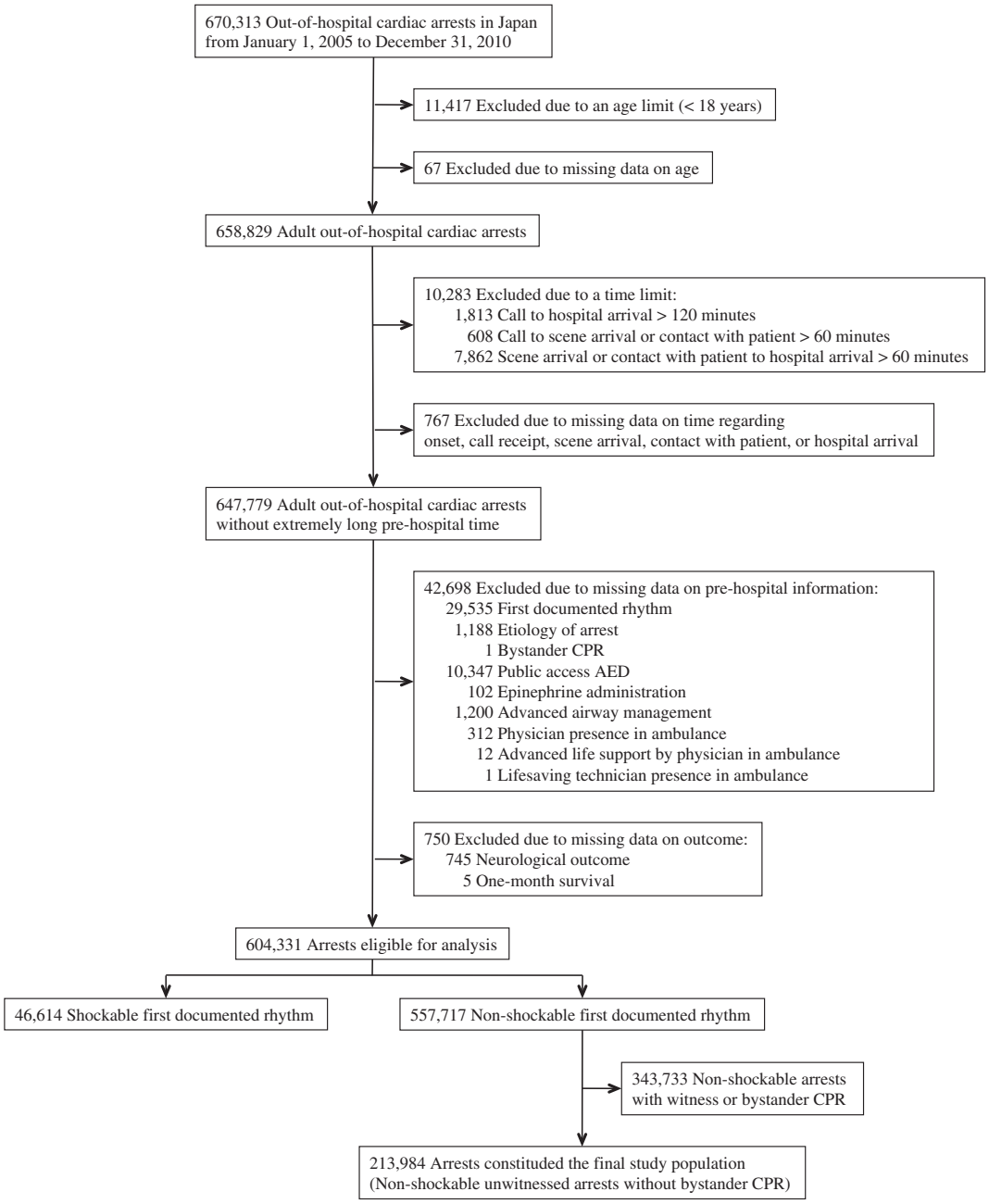

Fig. 1. Study population selection. Abbreviations: CPR, cardiopulmonary resuscitation; AED, automated external defibrillator.