Resuscitation 83 (2012) 1098–1105

Contents lists available at SciVerse ScienceDirect

Resuscitation

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

Clinical Paper

Primary respiratory arrest recognised by emergency medical technicians and followed by cardiac arrest in Japan: Identification of a subgroup of EMT-witnessed cardiac arrests with an extremely poor outcome☆

Keisuke Ohta, Taiki Nishi, Yoshio Tanaka, Yutaka Takei, Miki Enami, Hideo Inaba*

Department of Emergency Medical Science, Kanazawa University Graduate School of Medicine, 13-1 Takara-machi, Kanazawa 920-8641, Japan

ARTICLE INFO

Article history:
Received 21 February 2011
Received in revised form 30 August 2011
Accepted 27 September 2011

Keywords:
Out-of-hospital cardiac arrest
Emergency medical technician
Outcomes
Primary respiratory arrest
Chest compression
Cardiopulmonary resuscitation
Healthcare provider

ABSTRACT

Review: Some unconscious patients are found to be in primary respiratory arrest (PRA) by emergency medical technicians (EMTs). In contrast to citizens, EMTs manage PRA with artificial ventilation but not with cardiopulmonary resuscitation (CPR). This study aimed to investigate the characteristics and outcomes of PRA prior to EMT arrival and compare these data with those of a PRA-related group: patients with out-of-hospital cardiac arrests (OHCAs).
Methods: Baseline data were prospectively collected by fire departments for their adult (16 years or older) OHCA and PRA patients from April 2003 through March 2010. We extracted those who had PRA prior to EMT arrival. The EMT- and bystander-witnessed OHCA patients who underwent CPR were also extracted as control groups.
Results: There were 178 cases of PRA prior to EMT arrival. The majority (164/178) of these individuals were in a deep coma and met the criteria for the initiation of bystander CPR. Approximately 61% (108/178) of these PRAs were followed by cardiac arrests, which were classified as EMT-witnessed OHCAs by the Utstein template. The EMTs manually ventilated the patients until the cardiac arrest occurred. The 1-Y survival of this subgroup was the lowest of the PRA and PRA-related OHCA subgroups and was significantly lower than that of bystander-witnessed OHCAs with bystander CPR, when trauma and terminal illness cases were excluded (adjusted odds ratio = 3.888 (1.103–24.827)).
Conclusions: We identified a subgroup of PRAs with unexpectedly poor outcomes. The BLS guidelines for healthcare providers including EMTs should be re-evaluated by a large prospective study.

1. Introduction

Some unconscious patients are found to be in primary respiratory arrest (PRA) by emergency medical technicians (EMTs).[1] EMTs or bystanders may witness or recognise PRA in an out-of-hospital setting. Before new guidelines were published in 2000,[2,3] the recommendation was that these patients be resuscitated by citizens and healthcare providers using mouth-to-mouth or mouth-to-mask ventilation.[4,5] After the 2000 guidelines,[2,3] the recommendation for unconscious patients in PRA recognised or witnessed by citizens was changed to conventional cardiopulmonary resuscitation (CPR) or compression-only CPR. According to the 2000 guidelines and 2005 consensus, citizens no longer need to check the pulse of the patient.[6,7] Therefore, if the citizens who recognise or witness PRA act properly, CPR should be started in cases of PRA before the EMTs arrive. In contrast to recommendations for citizens, healthcare providers, including EMTs, resuscitate PRA patients using mouth-to-mouth, mouth-to-mask, or bag-valve-mask ventilation until the patient recovers from PRA or descends into out-of-hospital cardiac arrest (OHCA). It has not been reported whether the difference in indication criteria for standard CPR or compression-only CPR between citizens and healthcare providers may affect OHCA outcomes.

The diagnosis of PRA is commonly made in unconscious patients and consists of the combination of a palpable carotid pulse and either gasping, irregular respiration or the complete cessation of breathing.[1] PRA in children has been reported as a subgroup of cardiorespiratory or cardiopulmonary arrest.[8–10] Recently, advanced life support was reported to be beneficial in cases of out-of-hospital respiratory distress that may be followed by respiratory and cardiac arrests.[11] However, little has appeared in the resuscitation literature regarding adult PRA. In Japan, paramedics are not allowed to perform tracheal intubation or administer any drug to patients in PRA. PRA followed by cardiac arrest is classified as EMT-witnessed OHCA, which may have an intersystem variation in initial rhythm[12] and which has a variable prognosis.[13–15] How EMTs manage the

☆ A Spanish translated version of the abstract of this article appears as Appendix in the final online version at doi:10.1016/j.resuscitation.2011.09.036.

* Corresponding author. Tel.: +81 76 265 2825; fax: +81 76 234 4243.
E-mail address: hidinaba@med.kanazawa-u.ac.jp (H. Inaba).

0300-9572/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.resuscitation.2011.09.036

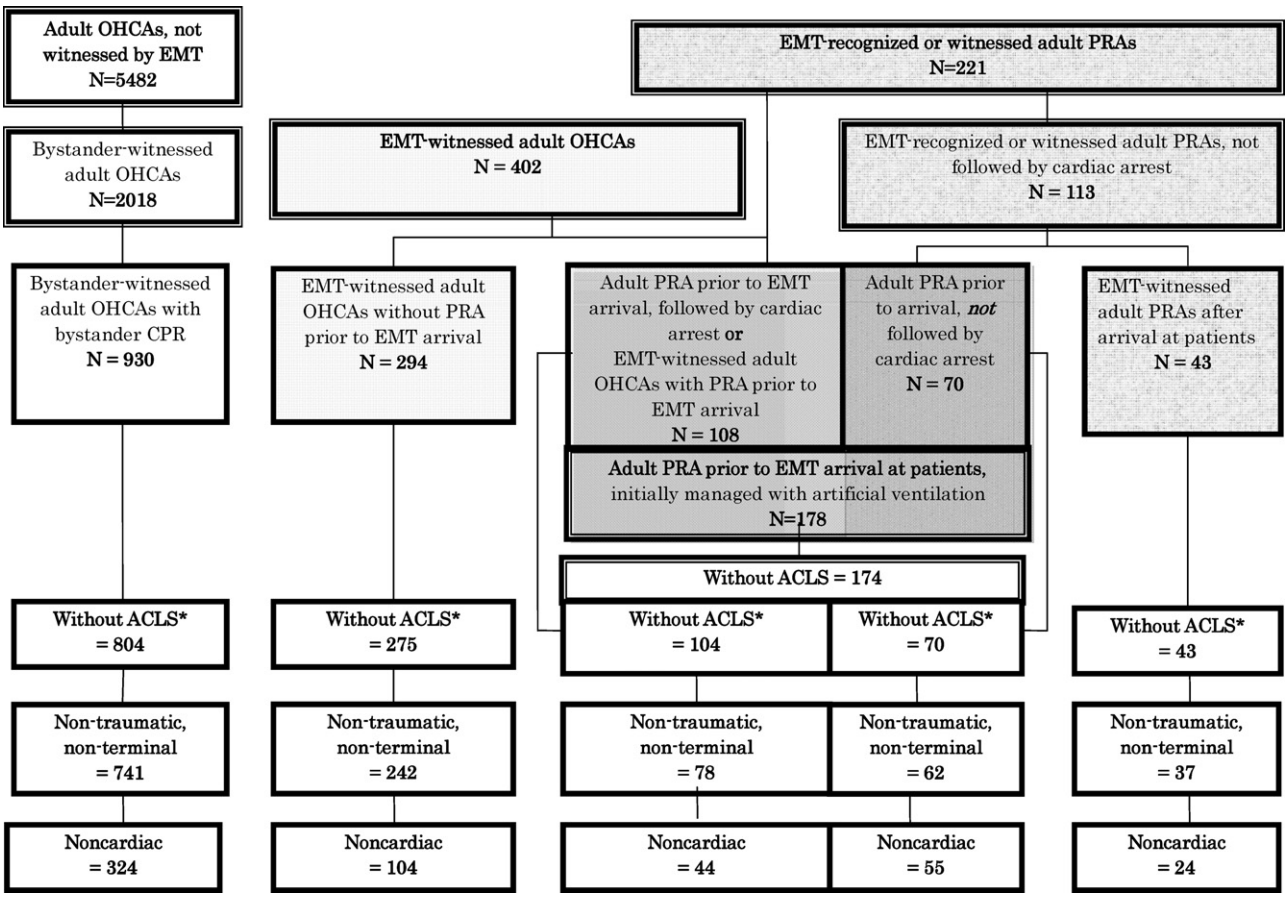

Fig. 1. The subgroups of EMT-witnessed OHCAs and EMT-witnessed or EMT-recognised PRAs in an out-of-hospital setting. Please note that EMT-witnessed cardiac arrest following primary respiratory arrest and the primary respiratory arrest (PRA) followed by cardiac arrest groups are identical. * ACLS procedure: tracheal intubation and/or adrenalin administration.

PRAs that they recognise on their arrival and whether the outcomes of PRAs differ from those of the PRA-related group of cardiac arrest patients are interesting questions. This prospective cohort study aimed to investigate the incidence, characteristics and outcomes of adult (16 years or older) PRA cases recognised by EMTs and to compare them with those of cardiac arrest cases in our community.

2. Methods

The data were collected in accordance with the national guidelines for ethics in epidemiological surveys (The Ministry of Health, Labour and Welfare in Japan: http://www.mhlw.go.jp/general/seido/kousei/i-kenkyu/index.html). This study was part of a larger study that was approved by the review board of the Ishikawa Medical Control Council (MMC).

2.1. Populations and setting

The Ishikawa prefecture encompasses an area of 4185 km^2 and has a population of 1,160,000. The prefecture is divided into four administrative regions: one central or urban region and three semi-rural or rural regions. There are 11 fire departments in the Ishikawa prefecture. Telephone-CPR is conducted by dispatchers in all fire departments. Unless the OHCA patients have post-mortem changes, the EMTs resuscitate patients in OHCA and out-of-hospital respiratory arrest (OHRA) according to the protocol developed by the Ishikawa MMC, which is based on the guidelines of the American Heart Association and the Japan Resuscitation Council. The paramedics are authorised to perform the following procedures when they resuscitate patients who have experienced OHCA or complete respiratory arrest: (1) use supra-pharyngeal airways, (2) infuse Ringer's lactate via a peripheral vein and (3) use semi-automated external defibrillators. Since July 2004, specially trained paramedics have been permitted to insert tracheal tubes, and since April 2006, they have been permitted to administer intravenous adrenalin. However, paramedics are not allowed to perform tracheal intubation or to administer adrenalin to patients in PRA. The EMTs are not permitted to terminate resuscitation in the field.

2.2. Patient data

The diagnosis of PRA consists of a combination of a palpable carotid pulse and either gasping irregular respiration or the complete cessation of breathing.[1] The baseline data were prospectively collected by the fire departments for resuscitation-attempted adult (16 y or older) OHCA cases that were witnessed or recognised by citizens (N = 5482) or EMTs (N = 402) and for PRA cases (N = 221) that were recognised or witnessed by EMTs in the period from 1 April 2003 to 31 March 2010 (Fig. 1). The collected data were based on the Utstein template[11–13] and included the backgrounds and characteristics of the OHCA and PRA cases, the estimated time of collapse, the times of CPR and chest compression initiation by bystanders and EMTs, the interval between the emergency call and arrival at the patient, the duration of transportation to the hospital, 1-month survival, 1-Y survival and 1-Y survival with a favourable neurological outcome, as determined by the Pittsburgh cerebral performance category (CPC).[16] Survival at 1-Y was defined as a