



Clinical paper

Incidence and outcome of adult in-hospital cardiac arrest in Beijing, China[☆]

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ABSTRACT

Objective: To assess the incidence and outcome of in-hospital cardiac arrests (IHCAs) in Beijing, China.

Methods: The incidence and outcome of IHCAs over a 12-month period were evaluated in this prospective study. Between January 1 and December 31, 2014, 12 Beijing hospitals prospectively participated in this study for calculation of the incidence of IHCA. Data were collected according to the Utstein style for all cases of attempted resuscitation for IHCA that occurred in the participating hospitals. Surviving patients were followed for 1 month.

Results: The total number of admissions across the 12 hospitals during this 1-year period was 582,242; the IHCA incidence was 17.5 per 1000 admissions. Of the 10,198 IHCAs recorded, cardiopulmonary resuscitation (CPR) was initiated in 26.6%. Among CPR recipients, 1292 (47.6%) had a presumed cardiac aetiology and 1255 occurred in the Emergency Department. With regards to initial rhythm, 1340 had asystole and 423 had shockable rhythms. Of those receiving CPR, 1451 (53.5%) patients received it in less than 1 min. Restoration of spontaneous circulation was achieved in 962 (35.5%) patients; 247 (9.1%) patients were discharged alive and 174 (6.4%) patients had good neurological outcomes. At 1 month after discharge, 236 patients remained alive. On multivariate regression analysis, factors associated with survival included female sex, age <60 years, and ventricular fibrillation/ventricular tachycardia as the initial rhythm.

Conclusion: The incidence of IHCA in Beijing hospitals is high and the survival is poor compared to other industrialized countries.

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Introduction

Despite the development of resuscitation protocols and increasing knowledge about cardiopulmonary resuscitation (CPR), in-hospital cardiac arrest (IHCA) is associated with significant morbidity and mortality.^{1–5}

In 1997, the Utstein style guidelines for the documentation and reporting of IHCA were published, which allowed for the

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reviewing, reporting, and conducting of research on in-hospital resuscitation across medical centres.⁶ Subsequent updating of the guideline's core variables have made this process more simplified and practical.⁷ Many studies on IHCA have been published during the past two decades, and their results have contributed extensively to the development of modern CPR science.^{8,9}

There are no previous reports regarding the incidence and outcome following IHCA in Beijing, China. In this study, we used the Utstein style guidelines to prospectively collect and analyse data on in-hospital resuscitations in Beijing during 2014. Using a systematic evaluation, we also attempted to determine which factors were associated with improved outcome following IHCA.

Methods

Study design

This was a prospective, observational multicentre study of IHCAs conducted between January 1 and December 31, 2014 in Beijing, China. Eligible cases were 14 years or older, and all surviving patients were followed out to 1 month.

Setting

We collected data on total admissions and total IHCAs from 12 Level III or Level II hospitals in Beijing over a 1-year period. The characteristics of the hospitals are shown in [Table 1](#). These hospitals are located in eight districts in Beijing, including six urban and two rural districts. Hospitals in China are classified by the National Health and Family Planning Commission of the People's Republic of China as follows: Level III hospitals refer to medical centres or tertiary hospitals that have independent emergency departments (EDs) and are also teaching hospitals; Level II hospitals, also called regional hospitals, have independent EDs but are not teaching hospitals; and Level I hospitals, which are community hospitals that do not have EDs. Among institutions surveyed in our study, 10 are Level III and 2 are Level II hospitals. A military hospital was also included in this study.

We identified patients with IHCA due to pulseless ventricular tachycardia (VT) or ventricular fibrillation (VF), pulseless electrical activity (PEA), bradycardia, or asystole. The Ethics Committee Board of Beijing Chaoyang Hospital, Capital Medical University, approved this study and waived the requirement for written informed consent.

Data collection

We collected data on total admissions during the same 1-year period from all 12 hospitals, and the total number of IHCAs was then used to calculate the incidence of IHCA per 1000 admissions.

Before commencing the study, an administrator trained in Utstein style guidelines and the handling of registration sheets was appointed at each participating hospital; this person was in charge of training the physicians in the general ward, intensive care unit (ICU), operating room, and ED. Cardiac arrest was defined as the cessation of cardiac mechanical activity as confirmed by the absence of signs of circulation. 'Treated IHCA' referred to a cardiac arrest event that received chest compressions and/or defibrillation. Details regarding treated cases were collected by the physicians and entered into a database immediately after resuscitation of the patient for evaluating IHCA outcomes. We collected information on the age and sex of the patient, presumed aetiology of the IHCA, initial ECG rhythm such as shockable rhythm (including VF and pulseless VT) or non-shockable rhythm (PEA, bradycardia, and asystole), and information on the response interval and locations. The

aetiology was categorized as cardiac, respiratory, trauma, neurological, toxicological, digestive, and other.

The primary endpoints were immediate survival with return of spontaneous circulation (ROSC) and survival to hospital discharge. ROSC was defined as a brief (approximately 30 s) restoration of spontaneous circulation that was evidence of more than an occasional gasp, occasional fleeting palpable pulse, or arterial waveform.⁷ The secondary endpoint was survival to hospital discharge; we also measured neurological status of patients at the time of hospital discharge. Surviving patients were followed for 1 month. Consistent with previous studies, we defined a favourable neurological status as a cerebral performance category (CPC) score of 1 or 2.

Statistical methods

Continuous variables were summarized as means \pm standard deviation, or median (with interquartile ranges [IQRs]). For categorical variables, the percentages of patients in each category were calculated. We stratified patients according to survival status and used the chi-square or Kruskal–Wallis tests, as appropriate, to examine baseline differences in demographics and clinical characteristics across the strata of resuscitation durations. We used multivariate logistic regression models to identify factors that predicted ROSC and survival to discharge. A two-sided *p* value of less than 0.05 was considered statistically significant. All analyses were performed using the SPSS software for Windows (release 13.0).

Results

Study population

We identified 10,198 patients who experienced an IHCA at one of the 12 hospitals during the 1-year study period. Within this patient population, CPR was not attempted in 7486 cases. A total of 2712 patients were resuscitated and documented using the Utstein template ([Fig. 1](#)). Characteristics of these CPR recipients are shown in [Table 2](#). Of these patients, over half (57.9%) were over 60 years old, and one-third (873) were women.

Incidence

The 12 hospitals had a total of 582,242 admissions combined during the 1-year study period. The total IHCA incidence rate was 17.5 per 1000 admissions. There was considerable variation in the incidence rate; ranging from 8.2 to 53 per 1000 admissions. The median incidence was 19.9 per 1000 hospital admissions (IQR 16.9–24.8) ([Table 1](#)).

Aetiology

Of the 2712 patients who were resuscitated, half had a cardiac aetiology (1292 cases); the aetiologies of the remaining cases were respiratory (461 cases), trauma (201 cases), neurological (116 cases), toxicological (24 cases), digestive (63 cases), and other causes (555 cases) ([Table 2](#)).

Location of the IHCA

Of the 2712 patients who were resuscitated, nearly half (46.3%) were in the ED at the time of IHCA, while 1137 (41.9%) of the resuscitation efforts were initiated in the general ward. There were 192 (7.1%) arrests recorded in the ICU or the operating room ([Table 2](#)).

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