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Clinical Paper

Incidence and outcome of in-hospital cardiac arrest in the United Kingdom National Cardiac Arrest Audit☆

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ABSTRACT

Objective: To report the incidence, characteristics and outcome of adult in-hospital cardiac arrest in the United Kingdom (UK) National Cardiac Arrest Audit database.
Methods: A prospectively defined analysis of the UK National Cardiac Arrest Audit (NCAA) database. 144 acute hospitals contributed data relating to 22,628 patients aged 16 years or over receiving chest compressions and/or defibrillation and attended by a hospital-based resuscitation team in response to a 2222 call. The main outcome measures were incidence of adult in-hospital cardiac arrest and survival to hospital discharge.
Results: The overall incidence of adult in-hospital cardiac arrest was 1.6 per 1000 hospital admissions with a median across hospitals of 1.5 (interquartile range 1.2–2.2). Incidence varied seasonally, peaking in winter. Overall unadjusted survival to hospital discharge was 18.4%. The presenting rhythm was shockable (ventricular fibrillation or pulseless ventricular tachycardia) in 16.9% and non-shockable (asystole or pulseless electrical activity) in 72.3%; rates of survival to hospital discharge associated with these rhythms were 49.0% and 10.5%, respectively, but varied substantially across hospitals.
Conclusions: These first results from the NCAA database describing the current incidence and outcome of adult in-hospital cardiac arrest in UK hospitals will serve as a benchmark from which to assess the future impact of changes in service delivery, organisation and treatment for in-hospital cardiac arrest.

1. Introduction

The treatment of in-hospital cardiac arrest accounts for a significant workload in most acute hospitals in the United Kingdom (UK) and internationally. Despite this, there are no reliable national data to enable accurate determination of the incidence and outcome of in-hospital cardiac arrest in the UK. Data from a single UK general hospital in 1999 documented an incidence of in-hospital cardiac arrest of 3.6 per 1000 admissions (equivalent to 0.3 per 1000 population).[1] A one-off audit undertaken in 1997 of in-hospital cardiac arrest in 49 UK hospitals reported a survival rate to hospital discharge of 17.6% but the number of hospital admissions over the audit period was not documented.[2]

A review of in-hospital cardiac arrest studies internationally documented incidences in the range of 1–5 per 1000 hospital admissions but with widely variable survival rates (0–42%).[3] A recent analysis of the American Heart Association (AHA) Get with the Guidelines (GWTG)-Resuscitation registry, that included 358 hospitals with at least 50 adult in-hospital cardiac arrest cases between 2000 and 2009, documented a median incidence of 4.02 in-hospital cardiac arrests per 1000 hospital admissions (interquartile range (IQR), 2.95–5.65 per 1000 admissions).[4] The median survival rate to hospital discharge for this period was 18.8% (IQR 14.5–22.6%).

In the UK, clinical guidelines for the prevention and treatment of cardiac arrest are updated at least every five years. However, the impact of guideline changes and other interventions on the

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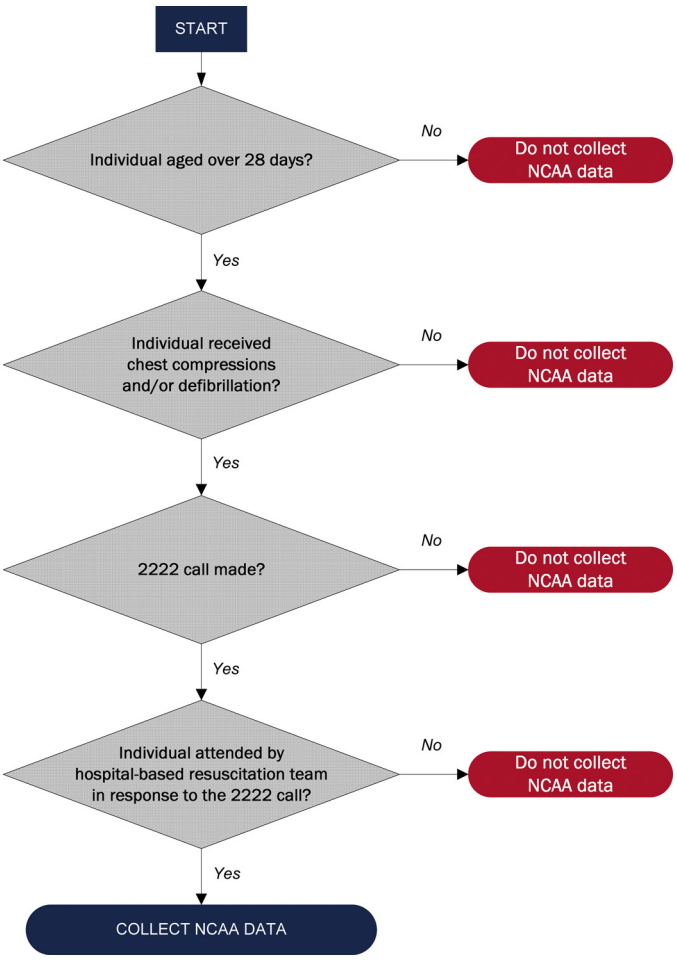

Fig. 1. Scope of data collection for the National Cardiac Arrest Audit.

incidence and outcome of in-hospital cardiac arrest can be determined only if these data can be collected consistently and reliably. Data from the AHA GWTG-Resuscitation registry indicate that risk-adjusted rates of survival to discharge after in-hospital cardiac arrest have increased from 13.7% in 2000 to 22.3% in 2009 (adjusted rate ratio per year, 1.04; 95% confidence interval (CI) 1.03–1.06; $P < 0.001$ for trend).[5]

The Resuscitation Council (UK) and the Intensive Care National Audit & Research Centre (ICNARC) have collaborated to establish the UK national clinical audit for in-hospital cardiac arrest: the National Cardiac Arrest Audit (NCAA).[6] The aim of NCAA is to promote improvements in resuscitation care and outcomes through the provision of timely, validated comparative data to participating hospitals. The aim of this analysis is to report the incidence, characteristics and outcome of adult in-hospital cardiac arrest in the UK National Cardiac Arrest Audit database.

2. Methods

2.1. The National Cardiac Arrest Audit

NCAA is a subscription-based, national clinical audit of patients greater than 28 days of age in acute hospitals in the UK who receive cardiopulmonary resuscitation (CPR) following an in-hospital cardiac arrest and are attended by the hospital-based resuscitation team (or equivalent) in response to a 2222 call (2222 is the emergency telephone number used to summon a resuscitation team in UK hospitals; Fig. 1). CPR is defined by NCAA as the receipt of chest compressions and/or defibrillation. NCAA received approval from the National Information Governance Board (now the Confidentiality Advisory Group within the Health Research Authority) to hold patient identifiable data under section 251 of the NHS Act 2006. Approval Number: ECC 2-06(n)/2009.

Table 1
National Cardiac Arrest Audit (NCAA) dataset.

Denominator data (monthly):
Total number of admissions to the hospital
Total number of 2222 calls or total number of 2222 calls solely for cardiac arrest
Patient/cardiac arrest data:
Record number (automated)
National Health Service number
Date of birth or estimated age (if date of birth not available)
Sex
Ethnicity
Date of admission to/attendance at/visit to the hospital
Reason for admission to/attendance at/visit to the hospital
Date/time of 2222 call
Status at resuscitation team arrival
Location of arrest
Presenting/first documented rhythm
Reason resuscitation stopped at end of team visit
Transient post-arrest location
Post-arrest location
Status at discharge from the hospital
Sedated at discharge from the hospital
Date of discharge from the hospital
Cerebral Performance Category at discharge from the hospital
Date/time of death
Additional information (free text)

2.2. Data collection

Standardised data are collected at the time of the cardiac arrest and from the medical records according to strict rules and definitions (Table 1) and online appendix. The precise definitions are listed in an online appendix. Staff at participating hospitals enter NCAA data onto a dedicated secure online system. Data are validated both at the time of entry and centrally, being checked for completeness, illogicalities and inconsistencies.

2.3. Inclusion and exclusion criteria

Data collection for NCAA started in November 2009 but the initial scope included only those cardiac arrest patients actually resuscitated by the resuscitation team. From April 2011 the scope changed to include any cardiac arrest that resulted in attendance by the team. Thus, we undertook a prospectively defined analysis of the NCAA database for the period 1st April 2011 to 31st March 2013. All in-hospital cardiac arrests of patients aged 16 years or over were included in the analysis. Pre-hospital cardiac arrests, included in the NCAA database because the resuscitation team is called to the emergency department to continue the resuscitation attempt, were excluded.

2.4. Statistical analysis

The incidence of in-hospital cardiac arrests per 1000 hospital admissions was calculated overall, by hospital and over time. The case mix of patients was described, including age, sex, ethnicity and reason for admission. The frequency of in-hospital cardiac arrests was calculated for day versus night (defined as 8:00–19:59 and 20:00–7:59, respectively) and weekday versus weekend (defined as Monday 08:00 to Saturday 07:59 and Saturday 08:00 to Monday 07:59, respectively). Median time from hospital admission to cardiac arrest was calculated and the presenting rhythm and