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ORIGINAL RESEARCH ARTICLES

Characterization of in-hospital cardiac arrest in adult patients at a tertiary hospital in Kenya

Caractérisation de l'arrêt cardiaque à l'hôpital chez les patients adultes dans un hôpital tertiaire au Kenya

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Background: In-hospital cardiac arrest (IHCA) is defined as a cardiac arrest that occurs in a hospital and for which resuscitation is attempted. Despite the increased morbidity and mortality, IHCA incidence and outcomes remain largely unknown especially in sub-Saharan Africa. This study describes the baseline characteristics, pre-arrest physiological parameters and the rate of survival to hospital discharge of adult patients with an IHCA at a tertiary hospital in Kenya.
Methods: This was a retrospective chart review. Data on patient characteristics, pre-arrest physiological parameters and discharge condition were collected on all patients 18 years of age or older with an IHCA at the Aga Khan University Hospital, Nairobi, from January 2013 to December 2013.
Results: The main study population comprised 108 patients. The mean age was 59.3 ± 18.4 years and 63 (58.3%) patients were men. The initial rhythm post cardiac-arrest was pulseless electrical activity (41.7%) or asystole (35.2%) in the majority of cases. Hypertension (43.5%), septicaemia (40.7%), renal insufficiency (30.6%), diabetes mellitus (25.9%) and pneumonia (15.7%) were the leading pre-existing conditions in the patients. A Modified Early Warning Score (MEWS) of 5 or more was reached in 56 (67.5%, $n = 83$) patients before the cardiac arrest. The rate of survival to hospital discharge was 11.1%. All the patients who survived to hospital discharge had a good neurological outcome.
Conclusions: Early identification of warning signs that precede many in-hospital arrests may enable institution of treatment to prevent patient deterioration. Local hospitals should be encouraged to provide patients with resuscitation services and equipment in line with evidence-based programmes.

Contexte: L'arrêt cardiaque à l'hôpital (IHCA, In-hospital cardiac arrest) se définit par un arrêt cardiaque ayant lieu dans un hôpital et pour lequel on tente une réanimation. Malgré sa morbidité et sa mortalité croissantes, l'incidence de l'IHCA et ses résultats restent très méconnus, en particulier en Afrique sub-saharienne. Cette étude décrit les caractéristiques fondamentales, les paramètres physiologiques précédant l'arrêt et le taux de survie à la sortie de l'hôpital des patients adultes ayant subi un IHCA dans un hôpital tertiaire eu Kenya.
Méthodes: Il a été procédé à un examen rétrospectif des dossiers. Les données sur les caractéristiques des patients, les paramètres physiologiques précédant l'arrêt et l'état à la sortie ont été recueillies pour tous les patients de plus de 18 ans ayant subi un IHCA à l'Hôpital Universitaire Aga Khan de Nairobi, de janvier 2013 à décembre 2013.
Résultat: La population de l'étude principale était de 108 patients. L'âge moyen était de 59,3 ± 18,4 ans et 63 (58,3%) patients étaient des hommes. Dans la majorité des cas, le rythme initial suivant l'arrêt cardiaque était une activité électrique sans pouls (41,7%) ou une asystole (35,2%). Les affections préexistantes les plus courantes chez les patients étaient l'hypertension (43,5%), la septicémie (40,7%), l'insuffisance rénale (30,6%), le diabète sucré (25,9%) et la pneumonie (15,7%). Un Score d'alerte précoce modifié (MEWS, Modified Early Warning Score) de 5 ou plus a été atteint chez 56 (67,5%, $n = 83$) patients avant l'arrêt cardiaque. Le taux de survie à la sortie de l'hôpital était de 11, 1%. Tous les patients qui ont survécu à la sortie de l'hôpital présentaient de bons résultats neurologiques.
Conclusions: L'identification précoce des signes d'alerte précédant bon nombre d'arrêts cardiaques à l'hôpital peut permettre l'instauration d'un traitement visant à prévenir la dégradation de l'état de patient. Les hôpitaux locaux devraient être encouragés à fournir aux patients des services et des équipements de réanimation conformément aux programmes fondés sur des faits probants.

African relevance

- The article demonstrates the possibility of developing hospital resuscitation teams in health facilities in Africa.
- Development of systems to identify early warning signs that precede many in-hospital arrests in Africa may enable introduction of treatment to prevent patient deterioration.
- There are gaps in current local morbidity and mortality data highlighting a need for research into the causes of in-hospital cardiac arrests.

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Introduction

Cardiac arrest is defined as the lack of a palpable central pulse, apnoea, and unresponsiveness.[1] In-hospital cardiac arrest

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(IHCA) is defined as a cardiac arrest that occurs in a hospital (whether the patient is admitted or not) and for which resuscitation is attempted with chest compressions, defibrillation, or both.[2] Despite the increased morbidity and mortality, IHCA incidence and outcomes remain largely unknown especially in sub-Saharan Africa.

Majority of the studies have focused on out-of-hospital cardiac arrest (OHCA) with a limited number of studies reporting on the incidence, patient characteristics and outcomes after IHCA. Single-institution studies have reported hospital-wide incidence rates of adult IHCA ranging from 3.8 to 13.1 per 1000 admissions.[3,4] These large variations are primarily due to the absence of standardized data sets containing uniform definitions and reliable data abstraction across hospitals. In an effort to solve this problem, the American Heart Association (AHA) recently published recommendations aimed at measuring and optimizing outcomes after in-hospital cardiac arrest (IHCA).[2]

Survival rates among patients with OHCAs have increased in the last decade due to improvements in resuscitation care.[5–8] It is commonly assumed that advances in OHCA care are directly applicable to the epidemiology and treatment of IHCA. Recent data from the Get with the Guidelines (GWTG)–Resuscitation registry based in the United States showed a rate of survival to hospital discharge for IHCA of 17.0%.[9] Whether similar rates are observable in other regions remains largely unknown due to the different causes and burden of chronic illnesses that contribute to IHCA epidemiology, team configuration, and access to resources, especially in sub-Saharan Africa.

Kenya is located on the equator in the eastern part of Africa. It has a population of over 38 million people; Nairobi, the capital, has a population of more than three million people.[10] The leading causes of death and disability in Kenya are shown in Table 1.[11]

The Aga Khan University Hospital, Nairobi (AKUH, N), is a regional tertiary referral university hospital that provides secondary and tertiary level health care services in Nairobi. It has over 300 beds with a 24-h Emergency Centre (EC), 11-bed High Dependency Unit (HDU) and a 20-bed Intensive Care Unit (ICU). The Code Blue Team is the dedicated hospital emergency response team constituted of nurses and doctors from the EC and ICU. The team handles all in-hospital cardiac arrests. It is activated by a single four-digit number from any telephone extension in the hospital, 24 h a day, seven days a week, in the event of a cardiac arrest within the hospital premises. All team members are trained in basic and advanced life support according to the American Heart Association guidelines. During the resuscitation, a pre-designated member of the Code Blue Team records all the events of the resuscitation on a specially designed resuscitation form.

This study aimed to: (i) describe the baseline characteristics and pre-arrest physiological parameters of adult patients with an IHCA at a tertiary hospital in Kenya; and (ii) determine their rate of survival to hospital discharge using the recently published recommendations from the AHA. The hope is that an improved understanding of the scope of this problem will help guide future research and implementation of strategies that will benefit healthcare delivery that pertains to IHCA.

Methods

This was a retrospective chart review. Resuscitation forms from January 1, 2013, through December 31, 2013 were used to identify all patients 18 years of age or older with an IHCA at the Aga Khan University Hospital, Nairobi (Fig. 1). Only the index pulseless cardiac arrest for each admission was included in the study.

The study sample was comprised of 108 patients. The study was approved by the Aga Khan University Faculty of Health Sciences East Africa research ethics committee (2014/REC-24).

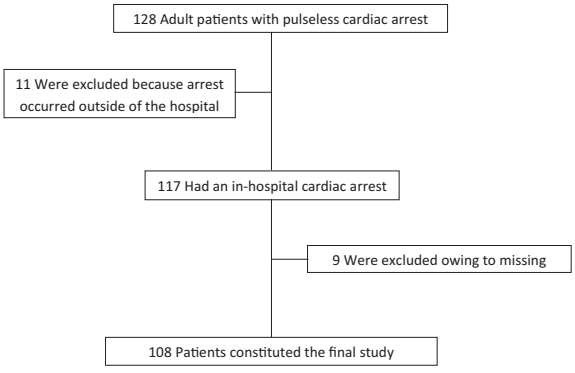

Figure 1 Study cohort.

Table 1 Leading causes of deaths and disability in Kenya.[11]

Causes of death			Causes of DALYs[a]		
Rank	Disease or injury	% total deaths	Rank	Disease or injury	% total DALY's
1	HIV/AIDS	29.3	1	HIV/AIDS	24.7
2	Conditions arising during perinatal period	9.0	2	Conditions arising during perinatal period	10.7
3	Lower respiratory infections	8.1	3	Malaria	7.2
4	Tuberculosis	6.3	4	Lower respiratory infections	7.1
5	Diarrhoeal diseases	6.0	5	Diarrhoeal diseases	6.0
6	Malaria	5.8	6	Tuberculosis	4.8
7	Cerebrovascular disease	3.3	7	Road traffic accidents	2.0
8	Ischaemic heart disease	2.8	8	Congenital anomalies	1.7
9	Road traffic accidents	1.9	9	Violence	1.6
10	Violence	1.6	10	Unipolar depressive disorder	1.5

[a] DALYs = Disability Adjusted Life Years – Time lost due to incapacity arising from ill health.