Research Article

A Retrospective Study of Physiological Observation-reporting Practices and the Recognition, Response, and Outcomes Following Cardiopulmonary Arrest in a Low-to-middle-income Country

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Abstract

Background and Aims: In Sri Lanka, as in most low-to-middle-income countries (LMICs), early warning systems (EWSs) are not in use. Understanding observation-reporting practices and response to deterioration is a necessary step in evaluating the feasibility of EWS implementation in a LMIC setting. This study describes the practices of observation reporting and the recognition and response to presumed cardiopulmonary arrest in a LMIC. **Patients and Methods:** This retrospective study was carried out at District General Hospital Monaragala, Sri Lanka. One hundred and fifty adult patients who had cardiac arrests and were reported to a nurse responder were included in the study. **Results:** Availability of six parameters (excluding mentation) was significantly higher at admission ($P < 0.05$) than at 24 and 48 h prior to cardiac arrest. Patients had a 49.3% immediate return of spontaneous circulation (ROSC) and 35.3% survival to hospital discharge. Nearly 48.6% of patients who had ROSC did not receive postarrest intensive care. Intubation was performed in 46 (62.2%) patients who went on to have ROSC compared with 28 (36.8%) with no ROSC ($P < 0.05$). Defibrillation, performed in eight (10.8%) patients who had ROSC and eight (10.5%) in whom did not, was statistically insignificant ($P = 0.995$). **Conclusions:** Observations commonly used to detect deterioration are poorly reported, and reporting practices would need to be improved prior to EWS implementation. These findings reinforce the need for training in acute care and resuscitation skills for health-care teams in LMIC settings as part of a program of improving recognition and response to acute deterioration.

Keywords: Cardiopulmonary arrest, deterioration, early warning system, low-to-middle-income country, observation

Introduction

In high-income countries (HICs), early warning systems (EWSs) have been implemented to assist clinical teams detect patient deterioration with varying degrees of ability to stratify at-risk populations.[1-5] Seven measures remain central to such systems;[6,7] respiratory rate, urine output, saturation, temperature, systolic blood pressure, heart rate, and a measure of mentation such as Alert, Voice, Pain, Unresponsive scale or Glasgow coma scale.[4,8] In HICs, EWSs are increasingly mandatory and are often accompanied by training for nurses in the acute care skills to respond in the event of clinical deterioration or cardiac arrest.[4,8,9] Even though evidence of the impact of such systems on improving outcomes is difficult

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to interpret, their importance on the process and delivery of care is increasingly acknowledged.[10,11]

In Sri Lanka, as in most low-to-middle-income countries (LMICs), EWSs are not in use; though there is an increasing interest in adopting tools designed and validated for use in HICs.[11,12] However in LMICs, outcomes for in-hospital cardiac arrest are largely unknown,[13] availability of critical care remains limited, and dedicated cardiac arrest teams are uncommon.[14-17] Health-care services are often overcrowded and poorly resourced, making the systematic and accurate monitoring of vital parameters required to calculate multi-parameter scores impractical and difficult to implement.[18,19] Despite ongoing efforts to address inequalities, training for frontline staff in practical skills to recognize the deteriorating patient remains limited.[12,20] Understanding the current practices regarding observation reporting and response to deterioration is a necessary step in evaluating the feasibility of EWS implementation in a LMIC setting. This study describes the practices of observation reporting and the recognition and response to presumed cardiopulmonary arrest in a LMIC.

Subjects and Methods

This retrospective study was carried out at District General Hospital (DGH) Monaragala, Sri Lanka. Ethical review was obtained from the Ethical Review Board of the Faculty of Medicine, University of Colombo, Sri Lanka (EC-15-034).

All adult patients who had cardiac arrests and reported to a nurse responder were included in the study. Availability of seven physiological parameters commonly recorded as part of EWS (described above) was analyzed at admission, and at 24 and 48 h time points leading up to the cardiac arrest.[5] Figures for total hospital deaths were extracted from the hospital register of deaths. Statistical analysis was performed using Stata 13 (StataCorp LLC, No 4905, Lakeway Drive, College Station, Texas 77845-4512, USA). Chi-square test was used to compare between categorical variables. All tests were two sided; level of significance was taken as 0.05.

Results

There were a total of 393 and 417 adult deaths in the study setting in 2013 and 2014, respectively. A total of 173 patients reported to the nurse responder during the 18-month study period, of whom 150 were 18 years or older. Availability of parameters is described in Table 1.

Availability of six parameters (excluding mentation) was significantly higher at admission ($P < 0.05$) than at 24 and 48 h prior to cardiac arrest. Mentation was not reported in any patients as part of admission observations. When availability at 24 h prior to cardiac arrest was compared to 48 h, only recording of saturations was significantly higher ($P < 0.05$) at 24 h prior to arrest.

Patients in this DGH had a 49.3% immediate return of spontaneous circulation (ROSC) and 35.3% survival to hospital discharge. Nearly 48.6% of patients who had ROSC did not receive postarrest intensive care. Intubation was performed in 46 (62.2%) patients who went on to have ROSC compared with 28 (36.8%) with no ROSC ($P < 0.05$). Defibrillation, performed in eight (10.8%) patients who had ROSC and eight (10.5%) in whom did not, was statistically insignificant ($P = 0.995$). Adrenaline was administered in 38 (51.4%) patients who had ROSC, which was significantly lower ($P < 0.05$) when compared to 60 (90.8%) patients for whom there was no ROSC.

Table 1: Availability of early warning system variables

Physiological variable	Availability (%)		
	Admission ($n=150$)	Prior	
		24 h ($n=95$)	48 h ($n=96$)
Respiratory rate	44 (29.3)	10 (10.5)*	9 (9.4)
Urine output	52 (34.6)	20 (21.1)*	16 (16.7)
Saturation	86 (57.3)	19 (20.0)*	9 (9.4)*
Temperature	89 (59.3)	32 (33.7)*	28 (29.2)
Systolic (or diastolic BP)	106 (70.6)	33 (34.7)*	27 (28.1)
Heart rate	108 (72.0)	33 (34.7)*	27 (28.1)
AVPU	0	0	0

*$P < 0.05$ considered as significant. BP: Blood pressure; AVPU: Alert, Voice, Pain, Unresponsive

Discussion

This study highlights the incompleteness and limited frequency of observations in ill patients in this setting. The availability of six observations (except assessment of mentation) was significantly higher at admission compared to 24 and 48 h prior to cardiac arrest. In common with other settings,[21] respiratory rate had the lowest availability with under 30% being recorded even at admission.

Aggregate-weighted EWSs usually require the availability of at least four parameters. As these EWSs are also used as trigger and track tools, frequency of parameters being observed affects the system's ability to detection. LMIC settings are known for incompleteness and unavailability of patient observations with a multitude of contributory factors.[21,22] Large proportions of missing observations in even one parameter used in a EWS will lead to the particular parameter being imputed as normal, causing inappropriately low scores being generated. Unavailability of many of the component parameters is likely to completely disable EWS implementation.

Defibrillation was featured in only 10.6% of resuscitation attempts and was not associated with increased survival. The low use is in keeping with the majority of in-hospital cardiac arrest rhythms to be nonshockable on presentation,[23,24] however poor availability of equipment and limited training for frontline staff in practical application may be confounding factors.[12,18,19] Adrenaline use was inconsistent with resuscitation guidelines, highlighting the limited opportunity for resuscitation training.[12,20] An EWS in this

setting will need to consider utilizing measurements with the greatest availability in this setting (e.g., heart rate and systolic blood pressure). Such a trigger system, at least initially, may need to be based on admission observations and on a single parameter as opposed to an aggregate-weighted system.

Conclusions

Observations commonly used to detect deterioration are poorly reported, and reporting practices would need to be improved prior to EWS implementation. Cardiac arrests are poorly reported. Adrenaline use was not consistent with advanced life support guidelines. These findings reinforce the need for training in acute care and resuscitation skills for health-care teams in LMIC settings as part of a program of improving recognition and response to acute deterioration.

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Conflicts of interest

There are no conflicts of interest.

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