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Frequency of vital sign assessment and clinical deterioration in an Australian emergency department

Katherine Lambe (RN, BN, MNursPrac)[a,*], Judy Currey (RN, BNHons, PhD)[b], Julie Considine (NFACN, PhD, FFCENA)[c]

[a] School of Nursing and Midwifery, Deakin University, Nursing and Midwifery Education and Strategy, Monash Health, c/- Deakin University, Geelong, Victoria, 3125, Australia
[b] School of Nursing and Midwifery and Centre for Quality and Patient Safety Research, Deakin University, c/- Deakin University, Geelong, Victoria, 3125, Australia
[c] School of Nursing and Midwifery and Centre for Quality and Patient Safety Research, Deakin University Eastern Health, Deakin University Nursing & Midwifery Research Centre, c/- Deakin University, Geelong, Victoria, 3125, Australia

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ABSTRACT

Background: Understanding of clinical deterioration of emergency department patients is rapidly evolving. The aim of this study was to investigate the frequency and nature of vital sign collection and clinical deterioration in emergency care.
Methods: A descriptive exploratory approach was used. Data were collected from the records of 200 randomly selected adults with presenting complaints of abdominal pain, shortness of breath, chest pain and febrile illness from 1 January to 31 December 2014 at a 22 bed emergency department in Melbourne, Australia.
Results: When controlled for length of stay, heart rate was the most frequently assessed vital sign per hour (median = 0.9) whilst Glasgow Coma Score was the least frequently assessed vital sign per hour (median = 0.5). Clinical deterioration (one or more vital signs fulfilling hospital medical emergency team activation criteria during emergency department care) occurred in 14.5% of patients. Of the 5466 vital sign measures, 19.6% were abnormal, 1.9% indicated clinical deterioration.
Conclusions: Clinical deterioration occurred in one in seven patients, and one in five vital signs documented were outside of accepted normal ranges. Thus, emergency department physiological status has implications for patient safety and nursing practice, in particular clinical handover for patients requiring hospital admission.

Introduction

Recognising and responding to clinical deterioration is an important issue in healthcare, both internationally and in Australia [1,2]. The importance of clinical deterioration has been acknowledged nationally in Australia by the Australian Commission on Safety and Quality in Health Care (ACSQHC) [3]; and 'Recognising and Responding to Clinical Deterioration in Acute Health Care' is one of the ten key National Safety and Quality Health Service Standards [3]. Vital sign assessment is a key nursing responsibility [4]. For the purposes of this paper, vital signs are defined as the measurement of respiratory rate, oxygen saturation, heart rate, systolic blood pressure, temperature and level of consciousness as per the ACSQHC recommendations [5]. Vital sign assessment data assists all clinicians to identify patients at risk of clinical deterioration and to develop an ongoing plan of care for each patient [4].

It is widely accepted that early recognition of, and response to, clinical deterioration can improve patient outcomes, largely by preventing high mortality events such as cardiac arrest and unplanned intensive care unit admissions [6–8]. A lack of consistent monitoring of vital signs, or failure to understand observed changes in vital signs impacts clinicians' ability to identify and respond to the deteriorating patient [3]. The majority of studies that have examined the predictive value of vital signs in relation to clinical deterioration and patient mortality have focused on hospital wards and excluded emergency care settings [9–14]. Current recommendations are that the frequency of vital sign assessment should be determined by the patients' diagnosis [5]. Often emergency department (ED) patients have no definitive diagnosis for the majority of their episode of care [15] therefore nurses' decisions regarding the frequency and nature

* Corresponding author.
E-mail addresses: k.lambe@deakin.edu.au (K. Lambe), judy.currey@deakin.edu.au (J. Currey), julie.considine@deakin.edu.au (J. Considine).

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Table 1
Normal ranges for vital sign parameters [25].

Vital Sign	Normal Range
Respiratory rate	12–22 breaths per minute
Oxygenation	>95%
Systolic blood pressure	90–139 mmHg
Heart rate	60–100 beats per minute
Glasgow Coma Scale	15
Temperature	35–37.8 °C

of vital signs are driven by factors such as clinical status, and potential or actual risk of deterioration. There are no known published standards on the optimal frequency of vital sign assessment in the emergency care context [16–18].

Research related to clinical deterioration and vital sign assessment in the emergency care context is in its infancy. There is increasing evidence that vital sign abnormalities present during ED care increases risk of in-hospital mortality, unplanned ICU admission and Rapid Response Team (RRT) activations on the wards [12,19–22]. Specifically, tachypnoea or hypotension fulfilling hospital RRT activation during ED care was associated with increased risk of RRT activation on the wards within 72 h of admission, and subsequent increases in-hospital deaths, unexpected in-hospital deaths, ICU admissions and longer length of hospital stay [23].

There is a lack of data examining the frequency of vital sign assessment specific to the Australian emergency care context. Observations of current clinical practice suggest that emergency nurses reassess the vital signs of their patients on an hourly basis, regardless of their presenting problem. In some cases frequency of vital sign assessment is tailored to the patient's clinical status but this process is clinician dependent, ad hoc and poorly understood. Despite research showing the benefits of early recognition and response to deteriorating patients, deterioration of patients in the emergency care setting remains poorly understood [24]. The aim of this study was to investigate the frequency and nature of vital sign collection and clinical deterioration in emergency care. As stated above, vital signs was defined as the measurement of respiratory rate, oxygen saturation, heart rate, systolic blood pressure, temperature and level of consciousness [5]. Normal vital sign parameters have been defined with reference to current literature [25] (Table 1).

Material and methods

Design

A descriptive exploratory approach was used and data were collected by medical record audit. Ethics approval was obtained from both the study site (15232L) and Deakin University (2015-160).

Setting

The study was conducted in one ED in metropolitan Melbourne. The study site was a 22 bed ED that managed 54555 attendances from 1 January to 31 December 2014 [26]. Patient data were managed using an electronic emergency department information system (EDIS) which was used to document all aspects of patient care and assessment, including vital signs. The RRT in place at the study hospital was the Medical Emergency Team (MET) that consisted of predefined vital sign and clinician concern criteria to define clinical deterioration, an escalation of care process, and an expected response whereby a team with expertise in the assessment and management of critical ill patients attend the point of care [27]. The hospital MET system was not used in the ED but rather there was a local system in place. The EDIS had electronic alert criteria providing a coloured visual alert when vital sign parameters fulfilling hospital MET activation criteria were entered into the system and clinicians were instructed to notify both the nurse and doctor in-charge of the shift. For the purpose of this study, clinical deterioration was defined as fulfilling the organisation's MET activation criteria (Table 2) [28].

Table 2
MET activation criteria at the study site.

Criterion	Description
Airway	Respiratory distress Concern regarding airway
Breathing	Respiratory Rate > 30/minute Respiratory Rate < 6/minute Oxygenation < 90% on oxygen
Circulation	Systolic Blood Pressure <90 mmHg Heart Rate > 130 beats/minute
Neurology	Decrease in conscious state Fitting
Other	Concern about the patient

Note. Protocol does not outline percentage or flow of oxygen delivery.

Sample

During 2014, the most common presenting systemic complaints identified at triage were: i) abdominal pain (n = 5070), ii) shortness of breath (n = 2277), iii) chest pain (n = 1990), and iv) febrile illness (n = 1858). Stratified random sampling was undertaken to select 50 adult patients from each of these groups, giving a total sample of 200 patients. Patients were identified using the EDIS and random selection was carried out using the computer programme SPSS version 22.0 [29].

Data collection

There were no published data collection tools suitable for use in this study; therefore, a data collection tool was developed by the research team. The data collection tool had three sections. In section 1, the patient's presenting problem, time of triage, time of ED discharge and overall ED length of stay were collected. In Section 2, vital sign assessment data were collected. The nature of vital sign assessment was related to which parameters were assessed and the frequency of assessment was recorded. In Section 3, episodes of clinical deterioration, defined as outlined above were recorded.

Data analysis

Descriptive statistics were used to summarise the study data. Using the Kolmogorov Smirnov test [30], data were not normally distributed, median and interquartile ranges (IQR) are presented.

Results

There were 200 patients in this study. The median ED length of stay was 4.6 h (IQR = 3.2–8).

Frequency of vital sign collection

Frequency of vital sign collection for all patients (N = 200) is shown in Table 3. As there were statistically significant differences in median ED length of stay results between groups, both the median number of vital signs collected for duration of the patients' episode of ED care and median number of vital signs per hour, along with IQRs are presented. Respiratory rate, oxygen saturation, systolic blood pressure and heart rate were assessed a median of 4 times per ED episode of care whilst Glasgow Coma Score and temperature were assessed less often (median 3 times per ED episode of care). When controlled for ED length of stay, heart rate was the most frequently assessed vital sign per hour (median = 0.9, IQR 0.7–1.2)