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Original Article

The effect of the quality of vital sign recording on clinical decision making in a regional acute care trauma ward

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ABSTRACT

Purpose: Recording vital signs is important in the hospital setting and the quality of this documentation influences clinical decision making. The Modified Early Warning Score (MEWS) uses vital signs to categorise the severity of a patient's physiological derangement and illustrates the clinical impact of vital signs in detecting patient deterioration and making management decisions. This descriptive study measured the quality of vital sign recordings in an acute care trauma setting, and used the MEWS to determine the impact the documentation quality had on the detection of physiological derangements and thus, clinical decision making.

Methods: Vital signs recorded by the nursing staff of all trauma patients in the acute care trauma wards at a regional hospital in South Africa were collected from January 2013 to February 2013. Investigator-measured values taken within 2 hours of the routine observations and baseline patient information were also recorded. A MEWS for each patient was calculated from the routine and investigator-measured observations. Basic descriptive statistics were performed using EXCEL.

Results: The details of 181 newly admitted patients were collected. Completion of recordings was 81% for heart rate, 88% for respiratory rate, 98% for blood pressure, 92% for temperature and 41% for GCS. The recorded heart rate was positively correlated with the investigator's measurement (Pearson's correlation coefficient of 0.76); while the respiratory rate did not correlate (Pearson's correlation coefficient of 0.02). In 59% of patients the recorded respiratory rate (RR) was exactly 20 breaths per minute and 27% had a recorded RR of exactly 15. Seven percent of patients had aberrant Glasgow Coma Scale readings above the maximum value of 15.

The average MEWS was 2 for both the recorded (MEWS(R)) and investigator (MEWS(I)) vitals, with the range of MEWS(R) 0–7 and MEWS(I) 0–9. Analysis showed 59% of the MEWS(R) underestimated the physiological derangement (scores were lower than the MEWS(I)); 80% of patients had a MEWS(R) requiring 4 hourly checks which was only completed in 2%; 86% of patients had a MEWS(R) of less than three (i.e. not necessitating escalation of care), but 33% of these showed a MEWS(I) greater than three (i.e. actually necessitating escalation of care).

Conclusion: Documentation of vital signs aids management decisions, indicating the physiological derangement of a patient and dictating treatment. This study showed that there was a poor quality of vital sign recording in this acute care trauma setting, which led to underestimation of patients' physiological derangement and an inability to detect deteriorating patients. The MEWS could be a powerful tool to empower nurses to become involved in the diagnosis and detection of deteriorating patients, as well as providing a framework to communicate the severity of derangement between health workers. However, it requires a number of strategies to improve the quality of vital sign recording, including continuing education, increasing the numbers of competent staff and administrative changes in vital sign charts.

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Introduction

Recording of vital signs is an important role for nurses in the hospital setting. Previous studies have looked for ways to improve the quality of this documentation, such as that recommended by Okaisu et al in 2014[1], highlighting its important function and impact on clinical decision making.

The clinical impact of the quality of vital signs recording is difficult to quantify. One way is to utilise the Modified Early Warning Score (MEWS) system, a modification of the Early Warning Score proposed by Stenhouse et al in 2000, which uses vital signs to categorise the severity of a patient's physiological deterioration.[2] The modified score was validated in medical admissions by Subbe et al in 2001[3] and shown to be of value in assessment of high care requirements of surgical in-patients by Gardner-Thorpe et all in 2006.[4] It is a tool to detect physiological deterioration when it first appears in a patient's observation chart, but also provides a framework to act on any abnormalities found. It is thus an important tool in translating nurse recorded vital signs into clinical decision making by physicians.[4] The MEWS determines the need for intervention based on five clinical signs, namely: heart rate (HR), respiratory rate (RR), systolic blood pressure (SBP), temperature and level of consciousness (measured by the AVPU scale – noting whether the patient is alert, responding to voice, responding to pain or unresponsive).[2]

Each parameter is scored according to the extent of derangement (Table 1) and the total score for all parameters is tallied to give an indication of physiological derangement and act as a guide as to the next step in management. A score of one to two should prompt four hourly vital recordings, and a score of three to six necessitates 30 min vital checks and escalation of care to a doctor's attendance. A MEWS of seven or more is a clinical emergency.[2]

The MEWS corresponds with morbidity and mortality, with a score of five or more increasing the risk of High Care or Intensive Care Unit (ICU) admission and death.[3] A threshold of four or more is 75% sensitive and 83% specific for the requirement to step up the level of care to High Care or ICU.[4] Thus it was designed to detect critically ill patients at risk of serious deterioration.[5] It can also be used to predict hospital admission, with independent risk factors of HR more than 130 beats per minute, RR more than 30 breaths per minute, temperature greater than 38.5°C, a decreased level of consciousness and a SBP less than 100 mmHg or over 200 mmHg. It has therefore been recommended as an adjunct in triage.[5]

The MEWS thus demonstrates the importance of accurate vital sign recording and the impact that the vital signs can have on the management of patients. The importance of good quality recording and derangement detection is illustrated by the fact that physiological deterioration is a common antecedent of cardiac arrest, unplanned ICU admission and unexpected death.[6] This means that continuous monitoring of physiological parameters is essential in order to identify acute deterioration in patients, in turn making the accurate recording and interpretation of vital signs crucial to clinical management.

This study aimed to objectively measure the quality of vital signs recording in an acute care trauma setting in a regional hospital and to translate this to a MEWS to determine the impact the documentation quality had on the detection of physiological derangements and clinical decision making.

Materials and methods

This descriptive, cross sectional study was conducted from January 2013 to February 2013 over a six week period at a regional hospital in KwaZulu-Natal, South Africa. The population studied was patients in the acute care trauma wards – this is a step down ward from high care where patients that are too ill for the general ward are monitored.

All newly admitted patients to the ward (admitted the previous evening) were sampled at 8:00 a.m. each day for six consecutive weeks. At this time, the 6:00 a.m. recorded vitals were noted. The vital signs recorded in the patient charts were HR (measured manually), RR (measured manually), SBP (measured with an automated blood pressure cuff), temperature (measured with a reusable thermometer) and Glasgow Coma Scale (GCS) (measured manually). The nursing notes make use of the GCS rather than the AVPU score as in the MEWS system. It was shown by McNarry and Goldhill in 2004 that there is good correlation between the AVPU and GCS systems,[7] with each category of AVPU corresponding to GCS scores of 15, 13, 8 and 6 respectively. Thus in this study the GCS was used as a proxy for the AVPU section of the MEWS.

At the same time the RR, HR and GCS of each patient were manually measured by the investigator. These were denoted as recorded vitals (R) and investigator vitals (I). The assumption was made that the investigator recorded vitals were more controlled, with the RR and HR each counted over a full minute and the GCS score calculated after medical practitioner examination of the patient, and used as a standard against which to compare the recorded vitals. The MEWS for the recorded vitals (MEWS(R)) and investigator vitals (MEWS(I)) were calculated and compared.

There was a time delay between the recorded and investigator vitals, however during this time there were no patient-related nursing activities such as bathing, and patient activities were minimal as the nurses conducted their handover during this time. Thus external influences to change the vital signs were minimised.

Another limitation is that vital signs fluctuate constantly, so that recordings taken even directly after one another will vary. However minute to minute variation is still within a normal range, and this study identified vital signs deviating out of this normal range of variation. The MEWS compared whether recorded and investigator vitals were within the same range of derangement.

Verbal consent from each patient was obtained. Patients were not identified in the notes, rather using patient numbers, and no names were used or published. The nursing staff in the ward were not aware of the study so that the quality of observations would not be consciously or subconsciously altered, minimising observer effect on the results.

The recorded vitals and investigator vitals were compared using basic EXCEL statistical analysis, including mean, range, percentage, mode, difference and Pearson's correlation coefficient.

Table 1
Modified early warning scoring system.

Score	3	2	1	0	1	2	3
Heart rate (Beat/min)		<40	41–59	51–100	101–110	111–129	>130
Respiratory rate (Breath/min)		<8		9–14	15–20	21–29	>30
Temperature (°C)		<35.0		35.1–37.2	37.3–37.9	>38	
CNS		Confused		Alert	Responds to voice	Responds to pain	Un-responsive
Systolic blood pressure (mmHg)	<70	71–80	81–100	101–199		>200	