



Contents lists available at ScienceDirect

European Journal of Internal Medicine

journal homepage: www.elsevier.com/locate/ejim

Special Article

Make vital signs great again – A call for action

John Kellett^{a,*}, Frank Sebat^b^a Department of Emergency Medicine, Hospital of South West Jutland, Esbjerg, Denmark^b Faculty Internal Medicine, Mercy Medical Center, Redding, CA, USA

ARTICLE INFO

Article history:

Received 5 September 2017

Accepted 14 September 2017

Available online xxx

Keywords:

Vital signs

Failure to rescue

Early warning scores

Quality of care

Patient safety

ABSTRACT

Vital signs are the simplest, cheapest and probably the most important information gathered on patients in hospital. In this narrative review we present a large amount of evidence that vital signs are currently little valued, not regularly or accurately recorded, and frequently not acted on appropriately. It is probable that few hospitals would keep their accreditation with regulatory bodies if they collected and acted on their laboratory results in the same way that they collect and act on vital signs. Professional societies and regulatory bodies need to address this issue: if vital signs were more accurately and frequently measured, and acted on promptly and appropriately hospital care would be safer, better and cheaper.

© 2017 European Federation of Internal Medicine. Published by Elsevier B.V. All rights reserved.

1. Introduction

Numerous studies have reported that the deterioration of patients is often missed [1–4] even though it is usually preceded by worsening vital signs [1,5–16]. Many medical tragedies result from either poor vital sign recording or abnormal vital signs not being noticed or responded to appropriately [17–20]. Poor clinical monitoring has been implicated in 31% of preventable deaths in hospitals in England [21], and several studies and systematic reviews have highlighted this issue as a worldwide problem [22–24].

Vital signs are the simplest, cheapest and probably the most important information gathered on patients in hospital, and the major components of early warning scores and other “track and trigger” systems [25] for the detection of clinical deterioration from sepsis and other causes, which are now part of routine practice in several countries [25–28]. Their ability to predict outcome, monitor clinical course and indicate the need for treatment is firmly established and cannot be overstated. In a study of one million vital signs patients with one abnormal value had an in-hospital mortality of 0.9%, whereas the mortality rate of those with three abnormal values was 24% [29]. These and the numerous other results cited above notwithstanding, concerns have consistently been raised that nurses do not regard vital sign measurement and reporting as a priority and often neglect them [30–33]. In contrast laboratory tests are highly valued by nursing staff; 80% of nurses consider that they should be performed daily on all patients in hospital even though there is no evidence that such a policy is of clinical benefit [34].

The routine recording of vital signs has become a task oriented ritualistic practice [35,36] often delegated to healthcare assistants [36]. As a

result recordings are often absent or infrequent [36–39] and performed without the required skill and knowledge [35,36]. Many nurses do not know that a drop in blood pressure is a late and not an early sign of deterioration, which is usually preceded by a compensatory increase in pulse and respiratory rate [40–42]. It is, therefore, not surprising that the importance of increased respiratory rate as a key indicator of deterioration is often not appreciated [30,41,43] and why one study found that a fall in blood pressure was the most common reason to call a medical emergency team and respiratory rate never was [43]. Doctors also have been found to have inadequate knowledge of vital signs and critical care [44].

2. History of vital signs

The four classic vital signs are respiratory rate, body temperature, pulse rate and blood pressure were introduced into clinical practice between 1860 and 1900. Although ancient physicians were aware of the association between fever and rapid heart rates, it was not until the mid-nineteenth century that the measurement of these vital signs first became part of routine medical practice. In 1863 John Davy (1790–1868), while Inspector General of Army Hospitals in the West Indies, noticed and intimate connection between pulse, temperature and respiratory rate. At about the same time, Joseph Jones (1833–1896), while serving as a surgeon with the Confederacy during the American Civil War, included temperature, pulse and respirations together in his case reports on malaria. In May 1866 Edward Seguin and William Draper, while interns at New York Hospital, published an Article in the Chicago Medical Journal reporting three cases of pneumonia that included a chart of “Vital Signs” used at the bedside to make the daily record of temperature, pulse-beats and respirations [45]. By the mid-19th century, the medical thermometer was still a foot long (30.28 cm) and took as

* Corresponding author at: Ballinacloough, Nenagh, Ireland.
E-mail address: jkkellett@eircom.net (J. Kellett).

long as twenty minutes to take an accurate temperature reading; between 1866 and 1867 Sir Thomas Clifford Allbutt (1836–1925) designed a much more portable, six inches long medical thermometer that took only five minutes to record a patient's temperature [46]. At the same time railways had increased the demand for pocket watches to time the accurate departures and arrival of trains [47]. As a result affordable pocket watches with second hands became widely available and allowed every physician, from hospital consultants to country doctors, to accurately record the pulse rate at the bedside.

Blood pressure was adopted as a vital sign more recently. The easy-to-use cuff-based version of the mercury sphygmomanometer was invented by Scipione Riva Rocci (1863–1937) an Italian internist, pathologist and paediatrician [48]. The American neurosurgeon, Harvey Cushing (1869–1939) visited him at Pavia in 1901 and made drawings of his device [49]. On his return to the US he made a similar device and used it successfully in Johns Hopkins Hospital, most notably in intracranial surgery [50]. In 1905 Dr. Nikolai Korotkoff, a Russian physician working at the Imperial Medical Academy in St Petersburg, described the sounds associated with systolic and diastolic blood pressure [51]. The use of these Korotkoff sounds and other technical improvements allowed Cushing to play a major role in popularizing Riva Rocci's mercury sphygmomanometer [49]. Nevertheless, the adoption of blood pressure as a vital sign was slow, and it was not until 1970 that it was included in most hospital vital sign charts [45].

Despite their long use, the medical profession has carried out very little research into vital signs, has been reluctant to recognize and utilize their value, slow to adopt new technology that would enhance their collection and usefulness, and cared little about their accuracy, precision and how frequently they were measured. Until recently the largest study of respiratory rate was performed by Hutchinson in 1846 [52] and the largest studies on fever remain those performed by Wunderlich in the nineteenth century [53]. Amazingly the ominous significance of low temperatures has only recently been appreciated [54,55], and the mortality risk associated with transient hypotension only reported for the first time in 2006 [56]. It was not until 1966 that the prognostic significance of the relationship between a high heart rate and low blood pressure (i.e. the Shock Index) was recognized [57], and not until 1997 that combining vital signs into early warning scores was proposed [14]. It has only just become apparent that a fast resting heart rate is a risk factor for cardiovascular mortality [58–63].

3. How well are vital signs measured?

Concerns over the poor documentation of vital signs correctly are well founded. Although taking a radial pulse is considered to be an essential clinical skill [64] there is little practice-based evidence on how well it is measured. The only practice-based evidence studies on the accuracy of heart rate measured on unselected acutely ill medical patients showed a poor correlation between heart rate recorded by nurses and the actual heart rate recorded by ECG [65,66]. Oliver et al. reviewed 9075 vital sign recordings on 1000 hospitalized children and found only 25% had blood pressure measured and only 53% had a full set of measurements recorded [67]. A cross-sectional study of 43,232 visits to Veteran's Administration emergency departments found blood pressure was not obtained in 14.4%, respiratory rate in 15.1%, pulse in 14.4%, temperature in 16.8% and oxygen saturation in 33.0% [68]. A quasi-experimental study in Holland found only 70% of nurses complied with the protocol that required vital signs to be measured 3 times per day [69]. A retrospective audit in Australia of patient records following major surgery found only 17% had complete documentation of vital signs; respiratory rate was the most commonly omitted observation, being undocumented in 15.4% of records [70]. In a Canadian study nearly all (99.6%) of 18,853 acutely ill medical patients admitted to hospital had all four vital signs, their oxygen saturation and the use of supplemental oxygen recorded on admission [71]. Although the hospital's policy was for every patient to have their vital signs recorded six hourly,

only 82% had a complete second set of observations, and only 66% had a third set recorded. The 7717 patients who never had a third set recorded were significantly younger, sicker and had a longer length of hospital stay than the other patients. Although less of these patients had cancer or a stroke they were also more likely to die in hospital (odds ratio 1.16, 95% CI 1.04–1.29, Chi-square 7.1, p 0.008). In a similar study of 18,827 surgical patients admitted to the same hospital, it had been hoped to analyze changes in vital signs at six hourly intervals for up to between 48 and 72 h after admission [72]. This, however, turned out not to be possible. Although the number of vital signs recorded per day was far more than anticipated (i.e. 27 per patient), they were not entered into the hospital electronic medical record system at the same time. It is probable that many patients had their vital signs measured by clinical staff and temporarily recorded on paper, and only entered into the computer system at a convenient later time, such as at the end of a shift. Moreover, many more sets of vital signs might have been measured, but never recorded in the electronic system. Other researchers have also noted that the use of electronic health records results in the delayed and inaccurate recording of vital signs [73].

Some studies have shown a higher collection rate of vital signs, with some reporting collection rates of 85% [74] to 90% [75]. The electronic collection of manually recorded respiratory rate, arterial oxygen saturation, use of supplementation oxygen, pulse rate, systolic blood pressure, level of consciousness, and body temperature has been mandatory in Copenhagen since 2013. A study of 2,835,331 of these records found only 271,103 (10%) had one or more missing values; body temperature, the most frequently omitted variable, was missing in 79,991 (66%) of them [75]. However, both pulse rate and systolic blood pressure records, which were read from automatic or semi-automatic devices, showed a preference for numbers divisible by 10. If the readings from devices had been entered unmodified into the electronic record these digit preferences should not have occurred. Moreover, pulse rates were biased to values below 91 beats per minute, a value that would have triggered more nursing tasks and other clinical interventions. These findings suggest that nurses may have manipulated vital sign values in order to make the patients appear less sick, possibly in an attempt to reduce their workload. When vital signs are used to calculate early warning scores similar errors that bias values toward normal are made, with as few as 20% of early warning scores being correctly calculated [69,76].

Vital sign measurements may be further limited by significant inter-observer variability, but only a few studies have addressed this issue. Respiratory rate measurements [77–79] have been reported to have an inter-observer variability of up to 6 breaths per minute, and Edmonds et al. reported an expected range of agreement between observers of ± 10.6 beats per minute for heart rate, ± 6.2 breaths per minute for respiratory rate and ± 24.2 mm Hg for systolic blood pressure [80].

4. How often should vital signs be measured?

Although around 40% of critical vital sign findings occur early within 48 h of admission, another 40% occur much later and more than five days after admission [29]. Therefore, ongoing monitoring of the patient is essential. There is, however, no consensus on how often vital sign observations should be made [35,81]. Outside of intensive care units, clinical practice currently relies on the periodic, manual observation of vital signs, which typically occurs every four to six hours in most hospital wards in North America and less frequently elsewhere [81]. Present recommendations vary widely with little evidence to support them and are based on compromises between patient safety and local work load issues [23]. The frequency of vital signs monitoring should be determined based on a patient-centred approach to care [82,83]. Current practices of vital signs monitoring, based on tradition rather than evidence, may place unrealistic demands on nurses [31,41,84]. When nurses are taking vital signs they are frequently distracted or interrupted [36], and demanding excessive vital signs monitoring will affect how nurses

Download English Version:

<https://daneshyari.com/en/article/8758235>

Download Persian Version:

<https://daneshyari.com/article/8758235>

[Daneshyari.com](https://daneshyari.com)