Early warning scores to detect deterioration in COVID-19 inpatients (Intelligence Review Report)

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Early warning scores to detect deterioration in COVID-19 inpatients

Healthcare system goal

To closely monitor inpatients with COVID-19 for signs of clinical deterioration, such as rapidly progressive respiratory failure and respond immediately with supportive care interventions [1].

Background

The World Health Organisation recommends that "patients hospitalised with COVID-19 require regular monitoring of vital signs and, where possible, utilisation of medical early warning scores (e.g. NEWS2) that facilitate early recognition and escalation of treatment of the deteriorating patient" [1].

NEWS2 [2] is the latest version of the National Early Warning Score (NEWS), first produced in 2012 and updated in December 2017, which advocates a system to standardise the assessment and response to acute illness. NEWS2 has received formal endorsement from NHS England and NHS Improvement to become the early warning system for identifying acutely ill patients.

A national investigation by HSIB [3] found that staff may rely on tools such as early warning scores, especially when working in a busy and complex environment. Moreover, HSIB also found that there tended to be a focus on the latest physiological observations and staff could have

been falsely reassured by the early warning score.

In response to COVID-19, HSIB are aware that a number of NHS Trusts are using NEWS for risk-stratification on admission, and to detect clinical deterioration when a patient is admitted to a general ward.

Details of referral/reference event

- Instances have been reported where the use of NEWS failed to trigger the required escalation of COVID-19 patients.

  - If a patient's oxygen requirements increase over a short period of time, as a result of a reduction in oxygen saturation, this might not change NEWS if other parameters remain "normal"/unchanged. For example, one patient had significant reduced oxygen saturation, within a period of half an hour, but this did not change their NEWS, so the patient was not escalated.

- It has been suggested that unlike 'regular sepsis' and other cases of deterioration, COVID-19 patients might not have significant changes in pulse and blood pressure, so these NEWS parameters do not alter and thus may prevent a timely escalation.

  - Changes in respiratory rate may have happened but this is poorly recorded in most instances.

- False reassurances that a patient does not need immediate escalation may be compounded by 'normal' blood

pressure and pulse measurements and NEWS not changing.

Intelligence

Systemic risk - How widespread and how common is the safety issue across the healthcare system?

Some COVID-19 patients are monitored on general wards for signs of deterioration in case they need to be transferred to an Intensive Care Unit (ICU). These wards are typically not staffed by respiratory specialists and consequently NEWS might be relied upon for escalation decision making. HSIB is aware of NHS Trusts that are training reassigned staff in the use of NEWS as a means to track deterioration in COVID-19 patients.

NEWS is a track and trigger tool which produces a composite score based on physiological measures (respiration rate, oxygen saturation, systolic blood pressure, pulse rate, level of consciousness or new confusion) to detect patient deterioration. In COVID-19 patients the prevalent indicator of deterioration, and the likely trigger for ICU care, is a sudden drop in oxygen saturations or a sudden increase in O2 requirements to maintain acceptable saturations; this can happen within an hour. Unlike sepsis or other serious conditions, the reduction in oxygen saturations is thought to be a specific feature of COVID-19 and can happen in isolation with little or no change in pulse, blood pressure, temperature, etc. It is normally the derangement of multiple parameters at the same time that produces a change in NEWS and triggers an escalation. For some COVID-19 patients where there is derangement of just one parameter (i.e., oxygen saturation), there is a risk of not getting escalated despite urgent need.

Research findings

Despite the widespread uptake of NEWS, there has been minimal prospective validation of use specific to the monitoring of inpatients for signs of imminent deterioration. This is especially the case amongst different patient cohorts with single disease deterioration patterns [4], [5]. The NEWS scoring approach, with clear escalation thresholds, is thought to work well in a setting with less highly trained staff who deliver the first layer of monitoring. However, an evaluation study on the general use of early warning systems found that staff clinical concern, in the absence of a threshold qualifying score, was responsible for escalation in 47% of cases [6].

NEWS2 has been developed to address concerns regarding the altered physiology of patients with respiratory disease. NEWS2 aimed to improve safety for patients with hypercapnic respiratory failure by suggesting a separate oxygen saturation (SpO2) parameter scoring system for such patients [7]. However, it has been argued the purpose of NEWS, detecting deterioration, may be compromised by these modifications [8]. Findings of a multi-centre retrospective observational study at five acute hospitals from two UK NHS Trusts are pertinent [9]. The study found that in NEWS2, assigning lower SpO2 thresholds together with weights for the use of supplemental oxygen at higher SpO2 values does not improve discrimination.

Although It is estimated that about 30 to 50% of COVID-19 patients have chronic comorbidities [10], many patients that go on to develop respiratory failure had hypoxemia but without signs of respiratory distress, especially in the elderly patients ("silent hypoxemia"). A review suggests that these characteristics imply that methods such NEWS may not help predict those patients who will go on to develop respiratory failure [10]. HSIB are aware of some international attempts at developing new and modified early warning scores that aim to better detect deterioration in COVID-19 inpatients.

Outcome Impact - What impact does the safety issue have on people and services across the healthcare system?

COVID-19 is a pandemic. COVID-19 case fatality rates vary from 1% to more than 7%, but these values must be interpreted with caution. In countries with large scale screening overall case fatality rates of less than 1% have been reported [11].

Learning Potential - What is the potential for an HSIB investigation to drive positive change and improve patient safety?

NEWS has been shown to be effective for tracking deterioration associated with many conditions [12] but there is uncertainty when used to monitor specific single disease deterioration patterns (e.g., COVID-19).

Research has found that artificial intelligence provides an opportunity to significantly improve early warnings for acute respiratory failure based on physiological measures. NEWS performs poorly as a predictor [13].

Irrespective of what early warning system is used, there are risks around how the scoring is being implemented in practice. Monitoring deterioration on COVID-19 general wards is challenging due to the skill mix of reassigned staff and likely lack of respiratory specialists, who more often will be working in ICU. Therefore, a complex early warning score involving blood tests and less familiar diagnostic parameters is likely to be difficult to implement due to the availability of resources and expertise.

It has been found that the successful use of early warning systems is dependent on experienced nursing staff using clinical judgement to recognise patient deterioration, and the score being a way of empowering calls for help [6]. Factors such as ward culture, workload and staffing have a significant impact on the utility of early warning scoring systems. Work is needed to understand the utility of scoring systems when responding to crisis scenarios.

Response to HSIB Concerns

The Royal College of Physicians (RCP) is responsible for the development of NEWS2 and responded to HSIB concerns. On 14/04/2020 the RCP released a statement on their Website relating to revised guidance on the use of NEWS2 for COVID-19 inpatients [14]. The RCP suggested that all staff should be aware that any increase in oxygen requirements should trigger an escalation call as the NEWS2 score might not significantly increase.

Endnotes

[1]   World Health Organisation (2020). Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected. Interim guidance. 13 March 2020. **https://www.who.int/docs/default-source/ coronaviruse/clinical-management-of-novel-cov.pdf**

[2]   Royal College of Physicians (2017). NEWS2. **https://www.rcplondon.ac.uk/ projects/outputs/national-early-warning-score-news-2**

[3]   Healthcare Safety Investigation Branch (HSIB) (2019). **https://www.hsib. org.uk/investigations-cases/recognising-and-responding-critically-unwell-patients/**

[4]   Forster, Sarah; Housley, Gemma; McKeever, Tricia M.; Shaw, Dominick E. (2018): Investigating the discriminative value of Early Warning Scores in patients with respiratory disease using a retrospective cohort analysis of admissions to Nottingham University Hospitals Trust over a 2-year period. In BMJ Open 8 (7), e020269.

[5]   Hodgson, Luke E.; Dimitrov, Borislav D.; Congleton, Jo; Venn, Richard; Forni, Lui G.; Roderick, Paul J. (2017): A validation of the National Early Warning Score to predict outcome in patients with COPD exacerbation. In Thorax 72 (1), pp. 23–30.

[6]   McGaughey, Jennifer; O'Halloran, Peter; Porter, Sam; Trinder, John; Blackwood, Bronagh (2017): Early warning systems and rapid response to the deteriorating patient in hospital: A realist evaluation. In Journal of Advanced Nursing 73 (12), pp. 3119–3132.

[7]   Hodgson, Luke E.; Congleton, Jo; Venn, Richard; Forni, Lui G.; Roderick, Paul J. (2018): NEWS 2 - too little evidence to implement? In Clinical medicine (London, England) 18 (5), pp. 371–373.

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[9]   Pimentel, Marco A. F.; Redfern, Oliver C.; Gerry, Stephen; Collins, Gary S.; Malycha, James; Prytherch, David et al. (2019): A comparison of the ability of the National Early Warning Score and the National Early Warning Score 2 to identify patients at risk of in-hospital mortality: A multi-centre database study. In Resuscitation 134, pp. 147–156.

[10] Xie, Jianfeng; Tong, Zhaohui; Guan, Xiangdong; Du, Bin; Qiu, Haibo; Slutsky, Arthur S. (2020): Critical care crisis and some recommendations during the COVID-19 epidemic in China. In Intensive care medicine. DOI: 10.1007/s00134-020-05979-7.

[11] Vincent, Jean-Louis; Taccone, Fabio S. (2020). Understanding pathways to death in patients with COVID-19. In The Lancet Respiratory Medicine.

[12] Abbott TE, Vaid N, Ip D, Cron N, Wells M, Torrence HD et al. A single-centre observational cohort study of admission National Early Warning Score (NEWS). Resuscitation. 2015;92:89-93

[13] Kim, Jeongmin; Chae, Myunghun; Chang, Hyuk-Jae; Kim, Young-Ah; Park, Eunjeong (2019): Predicting Cardiac Arrest and Respiratory Failure Using Feasible Artificial Intelligence with Simple Trajectories of Patient Data. In Journal of clinical medicine 8 (9). DOI: 10.3390/jcm8091336.

[14] Royal College of Physicians. NEWS2 and deterioration in COVID-19. April 2020. **https://www.rcplondon.ac.uk/news/news2-and-deterioration-covid-19**

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