Clinical Practice
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Respiratory

In this article...
- Why respiratory rate is a vital sign
- The reasons why nurses fail to measure respiratory rate accurately
- Negative patient outcomes from failure to identify and record changes in respiratory rate

Respiratory rate 1: why measurement and recording are crucial

Key points

Poor recording and lack of escalation of abnormal vital signs results in poor outcomes for patients

Vital signs monitoring needs to be prioritised in workload planning

A change in respiratory rate is one of the first signs of deterioration

Nurses cite poor knowledge, lack of time and reliance on clinical judgement as reasons for failing to record respiratory rate

Respiratory rate should be interpreted alongside presenting clinical features and other aspects of respiration

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Abstract Respiratory rate is a vital sign but it is frequently omitted, inaccurately measured and not recorded. This article, the first in a six-part series on respiratory rate, explores the importance of respiratory monitoring in acute care. The article also explains why nurses need education, skills and knowledge to assess this neglected vital sign.

Respiratory rate (RR), or the number of breaths per minute, is a clinical sign that represents ventilation (the movement of air in and out of the lungs). A change in RR is often the first sign of deterioration as the body attempts to maintain oxygen delivery to the tissues.

Failing to recognise the early signs of deterioration can result in poor outcomes for patients. In a review of abnormal vital signs, Cretikos et al (2008) found that more than half of patients who had a serious adverse event could have been identified as high-risk up to 24 hours previously. Jonsson et al (2011) suggested that early detection and documentation of changes in vital signs, particularly RR, could help to detect respiratory failure, which is the most common primary cause of admission to intensive care.

Studies show that increased RR can be used to help predict patients at risk of cardiac arrest. For example, a retrospective study showed that a RR of >27 breaths/min is a better predictor of a cardiac arrest within 72 hours than heart rate or blood pressure (Fieselmann et al, 1993).

Early detection of deterioration
The National Institute for Health and Care Excellence (NICE) (2007) recommends that patients in acute hospitals should have:
- Vital signs recorded on admission to hospital (Box 1);
- A written care plan outlining which observations should be recorded and their frequency.

Nevertheless, poor monitoring continues to raise concerns (Resuscitation Council (UK), 2015).

In a move to improve the early identification of deteriorating patients, NICE (2007) suggested that acute hospitals should adopt physiological track-and-trigger systems or early warning scores (EWS) for all adult patients.

In 2012, the Royal College of Physicians (RCP) published the first National Early Warning Score (NEWS) with the aim of standardising practice; an updated version (NEWS 2) was launched in 2017. NEWS 2 is based on a simple scoring system of six physiological parameters; a score is allocated to each parameter and an overall score is then aggregated. These parameters are aligned with the RCUK (2015) ABCDE

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assessment tool for critically ill patients. NEWS 2 has been validated in many settings and is endorsed by NHS England and NHS Improvement for use in England.

Failing to monitor vital signs

Measuring RR is acknowledged to be a core nursing skill, yet evidence suggests that it is an under-reported sign and is often estimated by nurses (Flenady et al, 2016). A post-operative study of 211 patients found that over 15% of RR records were undocumented (McGain, 2008). Inaccurate recording or assuming that patients' RR is within normal range is another issue. Semler et al (2013) found a significant difference between actual RR and the one that was recorded; out of 368 recordings, nearly 72% showed 18 or 20 breaths/min despite the fact that only 13% were actually within that range.

In practice it can be difficult to measure RR accurately as patients may alter their breathing if they know they are being watched; this can be addressed by techniques such as discreetly counting respirations while appearing to check the radial pulse (see part 3).

Evidence suggests that nurses' failure to record RR is due to poor knowledge, subjective assessments about whether to assess respirations and a lack of time (Elliott, 2016). Mok et al (2015) suggested that vital signs monitoring needs to be prioritised in workload planning, while Elliott et al (2016) highlighted a lack of guidance on who should measure vital signs and suggested that vital signs monitoring may be seen as "just another task".

From the evidence it appears that staff do not prioritise measurement of RR, and lack of automation is cited as a possible reason. While vital signs such as pulse and oxygen saturation can be measured using automated machines, technology is not widely available for respiratory monitoring (Elliott, 2016).

Problems defining normal RR

While there is an accepted definition for a normal pulse (60-100 beats/min) a variety of 'normal ranges' for RR is cited in the literature. The normal accepted range for an adult is 12-20 breaths/min (RCP, 2017; RCUK, 2015), however this can vary according to the patients' age and medical condition. It is generally accepted that a rate of >25 breath/min or increasing RR can indicate that a patient may deteriorate suddenly (RCUK, 2015). Likewise, a rate of <8 breaths/min, or a decreasing RR can also signify deterioration.

Box 1. **The vital signs**

Vital signs are:
- Heart rate
- Respiratory rate
- Systolic blood pressure
- Level of consciousness
- Oxygen saturation
- Temperature

Purpose of vital signs monitoring:
- Fundamental part of patient assessment
- Provide a baseline and determine the patient's usual range
- Assist in identifying deterioration or improvement in a patient's condition
- Help to determine the level of care required

Vital signs should be:
- Measured at least once every 12 hours unless specified otherwise
- Recorded on admission
- Documented clearly
- Considered as part of a holistic assessment
- Form part of an early-warning scoring system

Sources: Dougherty and Lister, 2015; NICE, 2007

The use of NEWS 2 (RCP, 2017) has helped to standardise the approach used by healthcare organisations, however it is still important that the patient's individual normal parameters are taken into account and this may require modification to the EWS. For example, a patient with chronic obstructive pulmonary disease may have a higher baseline RR or lower oxygen saturation than the normal range – in this case a modified score may be agreed by the multidisciplinary team.

Nurses need to be aware that a small change in a patient's normal RR of 3-5 breaths/min could be an early sign of deterioration (Dougherty and Lister, 2015). Respiratory monitoring should always be part of a holistic patient assessment, and patients whose RR is outside of the normal range should be closely monitored with frequent observation and recording of vital signs.

There is a concern that nurses rely on pulse oximetry as a replacement for RR to evaluate respiratory dysfunction (Mok et al, 2015). However, pulse oximetry measures oxygen saturation while RR measures ventilation. During early stages of

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deterioration patients' SpO_2 may appear to be in the normal range, but the RR will increase in response to inadequate oxygenation (Mok et al, 2015); this will be discussed in more detail in part 3.

Conclusion

The monitoring and recording of RR is part of a full patient assessment. It should be interpreted in the context of other presenting clinical features, together with other aspects of respiration, for example the depth, pattern and effort of breathing (see part 4). **NT**

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Respiratory rate series

Part 1: Why accurate measurement and recording are crucial
Part 2: Anatomy and physiology of breathing
Part 3: Procedure for measuring respiratory rate
Part 4: Respiratory rhythms and chest movement
Part 5: Respiratory rate and the deteriorating patient
Part 6: Using technology in respiratory assessment