Nellcor™ Respiration Rate Software: An Evaluation

Background
While it has been shown to be an important indicator of illness and complications, respiration rate (RR) is often poorly measured and recorded in hospital patients.1 This paper explores the observations of a medical teaching hospital that used Nellcor™ Respiration Rate technology from Covidien to closely monitor respiration rate in a select group of patients.

Situation
Clinicians completed a thorough evaluation of Nellcor Respiration Rate technology running on a Nellcor™ bedside patient monitoring system in the San Matteo Hospital in Pavia, Italy. The evaluation was led by Dr. Massimo Allegri, an assistant professor and head of research in acute and chronic pain with the University of Pavia and San Matteo Hospital.

The evaluation involved 17 subjects:
• Eight patients post major surgery receiving post-operative analgesia with PCA
• Four patients post major surgery treated with continuous infusion of low-dose opioids
• Four patients undergoing minor procedures under conscious sedation (intraoperative monitoring)
• One patient mechanically ventilated (intraoperative monitoring*)

Solution
The clinicians used Nellcor Respiration Rate technology to measure respiration rate in patients during the recovery phase after major surgery. Prior to the application of Nellcor Respiration Rate technology, the clinicians typically monitored only heart rate, blood pressure and oxygen saturation in post-operative patients.
The Nellcor™ Respiration Rate software is designed to use the hospital's existing technology, sensors and workflows to derive respiration rate based on the changes in the pulse oximetry signal that occur as a result of breathing. The patient's respiration rate is displayed on the bedside monitor alongside the measurements of pulse rate and arterial oxygen saturation.

Clinicians found it beneficial to have respiration rate included in a single view of patient values. In a post-evaluation interview, Dr. Allegri noted: “It is really important to have a single monitor in which you have all your values. Because if you have a lot of devices, it's really difficult for nurses to manage post-operative care and for patients to be comfortable. With Nellcor™ Respiration Rate, we have all the data in the same monitor.”

The clinicians found that Nellcor Respiration Rate software was accurate, feasible, and compared well with manual counting.

They manually measured RR five times over 48 hours for 12 post-op patients (60 measures total).
The clinicians identified the following differences between RR values manually measured and the values indicated by the Nellcor Respiration Rate software:

<table>
<thead>
<tr>
<th>Breaths per minute</th>
<th>(Number of measurements) Percent of total sample</th>
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<tbody>
<tr>
<td>+/- 1</td>
<td>(52 of 60) 86.7%</td>
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<tr>
<td>+/- 2</td>
<td>(4 of 60) 6.7%</td>
</tr>
<tr>
<td>+/- 3</td>
<td>(1 of 60) 1.6%</td>
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<tr>
<td>+/- 4 or more</td>
<td>(3 of 60) 5%*</td>
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*This percentage includes a case of an unstable hypovolemic patient.

Additionally, the investigators compared the Nellcor Respiration Rate software reading to the set rate during mechanical ventilation and found good agreement.*

Observations
This preliminary evaluation showed the accuracy and usefulness of respiration rate measurement in different settings. Clinicians emphasized the value of having a trend from Nellcor™ Respiration Rate, as opposed to the static measurements of manual counting. Looking ahead, the researchers noted that more patients are required to better evaluate the advantages of the use of respiration rate monitoring in particular cases (such as difficulty of pain control, pleural effusion, lung diseases, mild to severe hypovolemia, arrhythmias, and non-operating room anesthesia) and to better appreciate the relationship between respiratory patterns and the clinical status of the patient.

Conclusion
Continuous patient surveillance with pulse oximetry and heart rate monitoring in general care settings can facilitate early recognition of deteriorating patient condition, leading to fewer rescue interventions and a decreased need to escalate care to the ICU setting.³ Respiration rate provides additional information that SpO₂ alone cannot provide.⁴,⁵

Dr. Allegri noted: “Based on our experience, I can say that in my opinion Nellcor™ Respiration Rate could be really helpful.”
To learn more
Contact your local Covidien representative.

View this evaluation video.
http://solutionscontent.covidien.com/asset/permalink/id/11177/file.mp4

View Nellcor Respiration Rate video to better understand how this technology works.
http://solutionscontent.covidien.com/asset/permalink/id/11175/file.mp4

Explore Nellcor pulse oximetry products.
http://www.covidien.com/rms/products/pulse-oximetry

* Not indicated for use on mechanically ventilated patients


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