Feasibility of continuous wireless monitoring of respiratory rate on the postoperative ward

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Introduction

Regarding vital parameters, change of respiratory rate (RespR) is the most powerful predictor of clinical deterioration. Brady- (RespR ≤ 8 breaths/min) and tachypnea (RespR ≥ 31 /min) are associated with intensive care admission and in-hospital mortality. Simultaneously, respiratory rate is the least accurately measured vital parameter on the ward (1,2) (see fig 1). RespR can be measured accurately by an electronic device (2). We investigated the feasibility of continuously measuring RespR up to 4 days post-operatively on the ward using wireless monitoring equipment, allowing the patient to normally mobilize after the operation.

Figure 1: Distribution of recorded respiratory rate and on day of admission among hospitalised adults

Methods

Continuous monitoring of vital parameters (heart rate, RespR, axillary temperature) using a wireless SensiumVitals patch (Sensium Healthcare, London, UK) was installed on two surgical wards. After informed consent, in all adult patients undergoing general surgery (June - August 2017) and staying at least one postoperative night on the ward, RespR was measured every 2 minutes. The monitoring system first automatically analyses the vital signals on technical accuracy before submitting data to the database. How the patch works is shown in the picture below (3).

Picture: working of the Sensium Patch (3)

Results

In 119 patients enrolled in this observational study, the system defined 171.151 of 230.997 measurements (74%) as accurate. The RespR's most frequently measured were 13-14-15-16/min (fig 3). RespR during the daytime was higher and more broadly distributed than during nighttime (fig 4).

Fig 4 distribution of respiratory rates measured on the ward for up to 4 days

Fig 5: distribution of respiratory rates measured on the ward per time frame

Bradypnea was registered in 3,7% (6266) off all measurements and tachypnea in 0,3% (1057). Both bradypnea and tachypnea were more frequently measured during the day than during the night: 3,9% vs. 3,5% for bradypnea and 1% vs. 0,4% for tachypnea, respectively.

Discussion & Conclusion

We successfully measured RespR on a post-surgical ward continuously for up to 4 days using a wireless monitoring system, thus not disabling patients to mobilize. While previous studies mentioned a digit preference of 18-22/min for RespR when measured by ward staff (1), the most frequently measured RespR's in our study were 13-16 bpm. A significant amount of patients experienced bradypnea. Because brady- and tachypnea are associated with serious adverse events and inpatient mortality, the wireless monitoring system might help to increase postoperative patient safety without leading to immobilisation of the patient by the monitoring system itself.

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