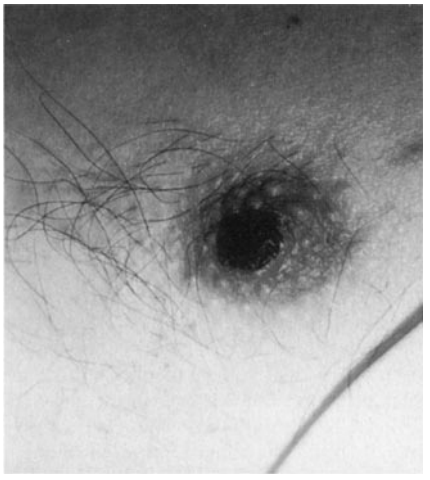

Fig. 3 Localized nipple necrosis in patient 2

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Major reduction in alarm frequency with a new pulse oximeter

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Sir: Intensive care monitor alarms are a major burden on both nurses and patients. Between 44 and 63 % of alarms are caused by pulse oximeters, with 94 % of these being non-significant [1, 2]. Pulse oximeters should, therefore, be the prime target when aiming to reduce alarm rates in the intensive care unit (ICU). Recently, a new technique for measuring pulse oximeter saturation (SpO_2) has been developed (Masimo SET (signal extraction technology), Masimo, Irvine, Calif., USA). This technique uses mathematical manipulation of the pulse oximeter's red and infrared light absorbance to identify and subtract the noise components associated with these signals [3].

We compared the alarm frequency of the new Masimo SET with that of a conventional pulse oximeter in 17 unsedated preterm infants [median birthweight 1000 g (range 360–2400), age at study 11 days (3–151)]. All infants had two SpO_2 sensors attached, one to each foot, and the signals from both sensors were measured using two SpO_2 modules fitted into the housing of a standard modular intensive care monitoring system (Kolormon, Kontron, Watford, UK). One module contained conventional (Kontron 7278), the other the new oximeter technology (Kontron/Masimo SET). Averaging times were 16 beats for the conventional and 8 s for the new pulse oximeter. SpO_2 alarms in both modules were set at 85 and 100 %. Heart rate alarms were set at 90 and 210 bpm, respectively. Pulse rate alarms were muted. The occurrence of an alarm was recorded by the monitoring system, printed and analysed for periods of approximately 24 h per infant. The frequency and cause(s) of alarms were analysed separately for each patient and expressed as per hour of monitoring.

During a total duration of documented monitoring of 329 h, 2241 alarms occurred. Of these, 1884 (84 %) were caused by the conventional pulse oximeter, 136 (6 %) by the new oximeter and 221 (10 %) by the electrocardiographic (ECG) monitor. Median frequency of occurrence of alarms per hour of monitoring was 4.0 (2.6–15.0) for the conventional pulse oximeter, 0.3 (0.0–1.9) for the new pulse oximeter and 0.6 (0.1–1.6) for the ECG monitor ($p < 0.0001$, new vs conventional oximeter).

Thus, the new technology oximeter assessed in this study generated 93 % fewer alarms than the conventional pulse oximeter with which it was compared, suggesting a major improvement in the differentiation between signal and noise during SpO_2 measurements in patients with frequent body movements. The low alarm rate of the new pulse oximeter investigated in this study may, theoretically, have been the result of a higher number of hypoxaemic episodes that were not detected by this device. Clinically, however, there was nothing to suggest this. Moreover, previous studies comparing the performance of the Masimo SET during hypoxaemia and simulated motion showed that it was even more reliable in the detection of hypoxaemia than a conventional pulse oximeter [3, 4]. We are, therefore, reasonably certain that the reduced overall alarm rate observed with the new oximeter investigated in the current study was not due to a higher proportion of undetected hypoxaemic episodes.

Environmental noise such as that produced by intensive care monitor alarms can be associated with adverse events, e. g. bradycardias, episodes of hypoxaemia and sleep deprivation [5, 6]. Frequent monitor alarms also pose considerable stress on the staff working in an intensive care unit (ICU). They may, moreover, result in potential delays in response; in a recent study, 67 % of monitor alarms in the neonatal ICU were ignored [1]. Desensitisation of nursing staff to alarms carries the risk of intervention in a severe event occurring too late. It can best be avoided by reducing the number of false alarms. The results of this study are encouraging, as they suggest that incorporation of advanced pulse oximeter technology into current ICU monitoring systems will result in a considerable reduction in the frequency of alarms and may thereby contribute to better patient care as well as to a less noisy atmosphere on these units.

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Continuous syringe pumps

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Sir: Since the publication of our report describing potential problems with continuous syringe pumps (ICM 1997; 23: 998–1001) we have received numerous appreciative comments from our colleagues for alerting the intensive care community about this problem. However, it has come to our attention that data from this paper have been used for commercial marketing purposes. It should be remembered that the published data are derived from a "worst-case scenario" situation intended to focus on a design problem allowing "internal motion" of the syringe parts when the infusion device is exposed to an elevation manoeuvre. However, the bolus injection volume resulting from such an elevation manoeuvre will not only be influenced by this design problem but can, to a certain extent, be modified by other factors, e.g. syringe type and size. Thus, this issue is multifactorial, and the use of our recently published data for commercial marketing purposes might give a somewhat misleading picture.

To our delight, our communication has provoked activity by certain manufacturers, which will hopefully provide a solution to the elevation problem. In the meanwhile, we hope that readers have become aware of this potential problem and that the most simple solution to this problem from a clinical point of view is to remember to keep the syringe pump at the same level relative to the patient at all times when infusing potent drugs at low infusion rates.

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Peristomal infection after translaryngeal tracheostomy: a risk linked to the colonization of the oropharynx?

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Sir: The article by Fantoni and Ripamonti [1] recently published in *Intensive Care Medicine* presents a new non-surgical tracheostomy technique, the translaryngeal tracheostomy (TLT), which was successfully performed on 109 intensive care patients. With this technique, the use of a single dilator appears to be an important factor to prevent bleeding and contamination of the stoma site. In particular, infections of the stoma site are reported to be absent in this study. In another clinical trial by Vigneri et al. [2], TLT was performed on 77 adult patients (48 males, 29 females, mean age 67.7 ± 14.6 years) admitted to the intensive care unit (ICU) of the Feltre Hospital from October 1994 to December 1996. Even in this sample, no local infections were observed. We performed TLT on 14 patients (12 males, 2 females, mean age 57.3 ± 18.3 years) admitted to the neurosurgical ICU of Treviso Hospital from March to July 1997. The procedure was scheduled when translaryngeal intubation lasting more than 7 days was expected [3]. Furthermore, the risk of elevation of intracranial pressure induced by the extension of the neck and the increase in airways pressure due to the presence of the tracheoscope were evaluated when assessing the time of performing a tracheostomy in brain-injured patients. Unlike the previous series, a severe procedure-related infection developed in 2 patients.

In case 1, a 32-year-old male with multiple injuries, the pre-TLT length of stay (LOS) in the neurosurgical ICU was 10 days, whereas in case 2, a 57-year-old female with a brain tumor, it was 20 days. Clinical diagnosis was confirmed by computed tomography of the neck, which showed paratracheal effusion in both cases. Appropriate antibiotic therapy was promptly begun and microbiological cultures of specimens from the infected sites were obtained. In both cases, non-methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa* were isolated. Additionally, in case 1, surgical drainage of the paratracheal abscess was needed. In both cases, treatment of the infection was successful. We noticed that our mean pre-TLT LOS (9.5 ± 6.6 days) was significantly higher ($p < 0.05$) compared to both the whole Vigneri's sample (5.3 ± 3.8 days) and a subgroup of 16 patients (4 ± 2.7 days) belonging to the same series affected by head injury or stroke as in our cases. Unfortunately, in the article by Fantoni and Ripamonti there is no mention of when they performed TLT.

Based on these observations, we raise the question whether contamination of the oropharynx by aerobic gram-negative bacilli and *S. aureus* in critically ill patients [4] should be considered as a risk factor for post-TLT infection when TLT is performed approximately 1 week after admission to the ICU.

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