demonstrate a lack of systematic error by each instrument. Of course if the correlation of the data from each cart is calculated, the regression may be different and that is due to the large variability in the data. Thus, any small group of patients may cause a slightly different correlation than the total data. We have evaluated patients using both carts and found a variation less than 5%.

In conclusion, we feel that this article merely points out the fact that in ICU patients there is a large variability in metabolic rate that makes prediction difficult. There is great need to examine further the various factors that influence this variability so that predictive methods, such as those used in spontaneously breathing patients with some success, may be developed. It is important to remember that a prediction is just an educated guess.

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Pulmonary Edema Following Low-dose Naloxone Administration

To the Editor:—Although early studies suggested that naloxone (Narcan™) reversal of high-dose narcotic anesthesia was not accompanied by significant cardiovascular changes,[1–3] more recent reports describe complications following naloxone administration to surgical patients. Responses ranging from severe hypertension[4–6] to tachycardias,[7] ventricular arrhythmias,[6,8] acute pulmonary edema,[9–11] and in some cases cardiac arrest[8,12] have been reported. Suggestions for the mechanism of these sporadically occurring complications have centered around centrally mediated catecholamine responses to narcotic reversal.[13]

Initial reports described complications arising in patients with preexisting cardiac disease who had received a high dose of narcotic. This resulted in recommendations to give smaller, incremental doses of naloxone when narcotic reversal was required.[9,10] Subsequently, Prough *et al.*[11] reported two cases of pulmonary edema following administration of 100 μg and 500 μg naloxone to two young healthy males undergoing minor surgical procedures. In light of these case reports and despite package inserts suggesting doses of 100–200 μg, it has been our practice to administer naloxone in aliquots of only 40 μg, and to separate doses by 3 to 5 min. We report here a case of pulmonary edema requiring intubation and positive pressure ventilation following a total naloxone dose of just 80 μg administered over 5 min.

REPORT OF A CASE

The patient, a 19-yr-old weighing 95 kg, was scheduled for incision and drainage of a five cm neck abscess. He had no previous medical history and, specifically, no history of drug abuse. Computed tomographic imaging of the neck and physical examination demonstrated no evidence of airway compromise.

The patient was anesthetized at 8:00 AM following a fast of approximately 10 h. He received sodium thiomylal 500 mg in divided doses, 200 μg fentanyl and 2 mg of metocurine followed by 120 mg succinylcholine for intubation, and a total of approximately 1,300 ml of lactated Ringer's solution. At the end of the 65-min procedure, the patient was breathing spontaneously. He was suctioned and extubated and was transferred to the recovery room receiving oxygen at 6 l/min by mask. In the recovery room, his initial respiratory rate of 16 breaths/min fell to 3–4/min, and he recieved two iv doses of 40 μg naloxone separated by 5 min. Almost immediately following the second dose, he was noted to be in considerable respiratory distress, with an oxygen saturation, measured by pulse oximeter, of less than 80%. He began to produce copious amounts of pulmonary edema fluid, which continued for more than 12 h despite reintubation and positive pressure ventilation with up to 15 cm of PEEP. Chest roentgenogram was consistent with pulmonary edema. A pulmonary artery catheter was placed, demonstrating a pulmonary artery wedge pressure of 12–14 mmHg, a systemic vascular resistance of 900 dyn $\cdot s^{-1} \cdot cm^{-5}$, and a cardiac output greater than 6 l/min. Arterial blood pressures remained at 130–140/70–80 mmHg throughout the patient's hospital stay. After 14 h, the patient was extubated, but he continued to cough up small amounts of edema fluid and maintained oxygen saturations of approximately 90% while breathing 40% oxygen administered by mask. Normal oxygen saturations were not obtained until more than 40 h after the naloxone administration. The patient suffered no lasting ill effects and was discharged home on the fourth hospital day.

Discussion

The case reported here and those referenced earlier all occurred with small amounts of narcotics (200–500 μg fentanyl or 100 mg meperidine) and brief surgical procedures (1–2 h). This case demonstrates that even doses of 40–80 μg of naloxone can precipitate pulmonary edema in otherwise healthy young people. Of six patients reported in the literature, only two have required reintubation, and only three had roentgenographic evidence of pulmonary edema. Milder cases of pulmonary edema may well go unrecognized, and without routine use of pulse oximetry in recovery rooms, the hypoxemia following naloxone administration may occur much more frequently than is recognized.

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Anesthetic Management of Acutely Ill Patients during Magnetic Resonance Imaging

To the Editor:—High field (1.5 tesla) magnetic resonance imaging (MRI) units are being widely installed throughout the United States, and anesthesiologists are becoming involved in the management of patients who require anesthesia or ventilatory support for this procedure. The problems of anesthesia for MRI in low field instruments have been discussed elsewhere,[1,2] and many of the same considerations apply to units with higher magnetic fields. One of the persistent problems in anesthetizing patients for MRI has been the presence of ferromagnetic materials in the commonly available anesthesia machines, ventilators, and monitors. This has led some individuals to ventilate patients with various manual systems using assemblages of plastic tubing, while others have ventilated patients with the ventilator or anesthesia machine at a considerable distance from the patient. This latter solution creates the problem of compensating for the compression volume of the extended circuit, which can range up to 15 m (50 feet). Recently, a ventilator specifically designed for MRI has become available, and we would like to report our experience with both the prototype and the now commercially available instrument.

The ventilator (225/SIMV® ventilator, "MRI compatible," Monaghan Medical Corp., Plattsburg, NY) is a pneumatically driven, volume cycled, fluidic ventilator that the manufacturer claims has been specifically reengineered, replacing ferric components with aluminum or other nonferric alloys, so that the ventilator contains less than 1% magnetic material (by weight). In our tests, both the prototype and the commercially available model had essentially no magnetic attraction when tested with a hand magnet and when brought to the entrance of our 1.5

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