Special Article

The recovery room in the 1980's

Laurence Landow MD FRCPC

Anaesthetists today are witnessing important changes affecting our specialty. Medical advances now allow more elective surgery, often very major and complex, to be successfully performed on medically complicated and elderly patients. Secondly, anaesthesia has become the career choice of many of the best and brightest of medical school graduates. More physicians already certified in other specialties are entering anaesthesia programs. One result of these changes has been a dramatic improvement in the intraoperative management of patients with minimal physiological reserves.

Along with the changes taking place in the operating room has come a transformation of the postanesthetic recovery room into an "intensive-care recovery room." Much of the impetus for this change is a response to the increased needs of the patients undergoing surgery. Anaesthesia as practiced today can be safe for the high-risk or elderly patient. Unfortunately, these same patients do not tolerate well emergence from general anaesthesia. The increased oxygen demands imposed by the tachycardia due to pain, or by shivering, can result in myocardial ischaemia or infarction, and death if not treated promptly and appropriately. In the past, when only the fit could undergo surgery, postoperative pain was undesirable, but not lethal.

One of the principal arguments this paper will make is that the recovery room in the large, tertiary care hospital should be modified so that it resembles an intensive care unit, if geriatric mortality and morbidity are to decrease. One key step in upgrading any recovery room is establishment of an

organizational structure. In 1984 the author was charged with reorganizing the existing recovery room in a tertiary care teaching hospital in which over 19,000 surgical procedures and 3,000 deliveries are performed annually in ten operating rooms. The only major surgery not performed is open-heart, transplantation and paediatric surgery.

Our recovery room admits all surgical patients except those who have undergone aortic aneurysm repair or pneumonectomy, or those of ASA physical status IV scheduled for major surgery. Following surgery patients in these categories are admitted directly to the intensive care unit. In the recovery room we have 23 beds staffed by 15 nurses who work on a staggered schedule. In addition to the 19 beds where we admit the majority of the patients who are medically fit, we have four designated beds for those patients thought to be at risk for major postoperative complications. This is our "intermediate care area" where we utilize volume ventilators, three channel ECG and pressure monitors and other devices traditionally found in the ICU. Laboratory tests, including arterial blood gas analyses, can be performed on a 24-hour basis.

Many articles have been written concerning postoperative complications and their management, but few have addressed the problems of the organization and administration of the recovery room. This paper will discuss the basic organization and the management protocols which we have implemented. While the changes made were specific to the needs of our institution, and may not apply generally, they do illustrate one approach to a common problem facing large anaesthesia departments.

Definition and function – recovery room

The recovery room (RR) is a high-care area that provides supervision of patients as they emerge from anaesthetics. The recovery room should not be used as a preanaesthetic induction room, mini-

From the Department of Anaesthesia, The Sir Mortimer B. Davis Jewish General Hospital, 2755 Chemin de la Côte Ste-Catherine, Montreal, Quebec

Address correspondence to: Dr. L. Landow, Department of Anesthesiology, New England Medical Center, 171 Harrison Ave, Box 298, Boston, MA, USA, 02111

operating room, step-down CCU, or the facility where procedures such as cardioversion or electroconvulsive therapy (ECT) are performed. Those patients ill enough to require more than 24 hours of intensive nursing and medical care should be identified preoperatively by the anaesthetist and surgeon and admitted directly to an ICU following surgery. In our unit any patient who remains overnight (usually because they are too sick to return to the ward on the day of surgery but not sick enough for admission to the ICU) is accepted in the recovery room. This is with the understanding that by the day following surgery, the patient will be transferred either to the ICU or to the ward, possibly with special arrangements for a private duty nurse. It is essential that the operating room coordinator be fully aware of this concept so that misunderstandings as to the immediate destination of the patient following surgery be minimized. Although there is some flexibility, we try to accept no more than four overnight patients in the recovery room at any one time. Approximately five per cent of our patients remain in the RR more than 24 hours, until an ICU bed becomes available or the patient is well enough to return to the ward.

Role of the director

The director of the RR is preferably an anaesthetist with ICU training or experience beyond that required for admission to specialty examinations in anaesthesia. An ICU background assists in the immediate management of such problems as chest tube insertion for tension pneumothorax, supervision of a cardiac arrest protocol, etc.

The duties of the director of the RR have included establishing protocols for overnight admissions, establishment of protocols for monitoring and laboratory investigation, the teaching of nursing and physician staff, both in bedside and didactic sessions and serving as an arbitrator when conflicts arise. Clearly no single individual can provide the primary care to all recovery room patients. Actual patient care must be delegated and in our unit is carried out by the surgical house staff. However, the director is available as a consultant to the surgical service, on a 24 hour basis, as in any other critical care setting.

Nursing coverage

Recovery room nurses require special training and

skill. They must be expert in recognizing airway problems, knowledgeable of the effects of anaesthetic agents and at all times extremely vigilant. Ideally RR nurses should have prior ICU/ER/OR experience. In our unit all new nurses, regardless of previous experience, undertake a six-week initial orientation and training period. There is also an ongoing educational program designed to, over a period, cover all subjects relevant to the care of the patient in the RR. At least once a year each RR nurse works with the author in the operating room for one day in order to keep better exposed to the problems faced by the anaesthetist.

The ratio of nurses to patients in our RR varies from a maximum of three nurses for one patient at the time of admission following major surgery, to one nurse for three patients in stable patients who have had minor surgery. In the intermediate care area, patients often require 1:1 nursing coverage for prolonged periods.

Admission criteria

Requests for overnight admission to the intermediate care area of the recovery room must be made by the surgical service, directly to the director. As a guide to establishing risk, the multifactorial index of cardiac risk of Goldman *et al.*¹ is employed. Additional factors considered include the specific surgery planned and its expected duration. On the day before a planned elective overnight admission, a summary sheet with the details of the patient's diagnosis and special needs is submitted to the head nurse of the RR. This information is reviewed by the director and discussed directly with the surgical service. An attempt is made to assign nurses to the care of the specific patients, allowing them the opportunity to become familiar with the details of the patients and their anticipated problems.

Protocols

As part of the reorganization of the recovery room in 1984, a number of specific protocols were developed. The following summaries of protocols for laboratory studies, respiratory care and pain relief are presented as examples. Interested readers may write to the author for a complete listing of protocols in use.

Laboratory studies

Following immediate stabilization, all patients ad-

mitted to the intermediary care unit have the following performed:

- CBC, platelets, PT, PTT
- Haematocrit q12H
- Biochemistry (Na, K, Cl, glucose, BUN, CO₂)

A twelve-lead EKG and a chest x-ray are obtained as indicated. Specific indications for the chest x-ray include presence of a central line, endotracheal tube or nasogastric tube. Arterial blood gases are done q6H and 20 minutes after any change in ventilator settings or change in FiO₂.² Urine output is monitored as appropriate.

Respiratory protocols

All patients receive oxygen following surgery and all patients over 60 years of age plus those younger who have had major surgery are transported to the ward with oxygen therapy continued during transport.³⁻⁶

Special procedures are followed for the securing of endotracheal tubes, to minimize the chance of unintentional extubation. Normally, a minimum of 5 cm H₂O PEEP is maintained in all intubated patients.^{7,8} The intermittent mandatory ventilation (IMV) approach is used for weaning from mechanical ventilation. No patient is extubated unless they meet conventional extubation criteria: tidal volume > 5 ml·kg⁻¹, negative inspiratory force > -20 cm H₂O, vital capacity > 10 ml·kg⁻¹.⁹

Pain relief

Patients requiring analgesics are given either morphine 0.1 mg·kg⁻¹ or meperidine 1 mg·kg⁻¹ IM, q1-2H prn for pain. Hospital policy at present does not allow nurses to administer narcotic analgesics intravenously.

Discharge from the recovery room

We employ traditional criteria based on skin colour, blood pressure, response to commands, ability to cough, and alertness (two points each, total ten). A maximum score of ten must be achieved before discharge. Additional criteria include a minimum of one hour delay following the administration of narcotic analgesics, and full recovery of motor power following epidural analgesia. Discharge of patients at scores less than ten requires a specific order from the director or the surgical service.

Conclusions

The 1980's have become an era of elective major surgery in geriatric patients. In our hospital, without a designated director of the RR, patient care in this area was inconsistent, and at times chaotic, and the cause of considerable unnecessary stress for the nursing staff.

Establishment of a revised organizational structure, and of strict protocols and of recovery room staff educational programs has promoted improved patient care and an esprit de corps amongst RR staff. The availability of the director for consultations on a 24-hour basis has assisted these processes.

While we accept that the policies and procedures we have established will not be appropriate in all settings, we encourage others to consider similar solutions to similar problems. The reward will be improved patient care.

References

- 1 Goldman L, Caldera D, Nussbaum S *et al.* Multifactorial index of cardiac risk in non-cardiac surgical procedures. *N Engl J Med* 1977; 297: 845-50.
- 2 Nunn JF. *Applied Respiratory Physiology*. 2nd edition, London: Butterworths, 1977; 413.
- 3 Kitamura H, Sawa T, Ikezono E. Postoperative hypoxemia: contribution of age to maldistribution of ventilation. *Anesthesiology* 1972; 36: 244-52.
- 4 Craig DB. Postoperative recovery of pulmonary function. *Anesth Analg* 1981; 60: 46-52.
- 5 Nunn JF. Hypoxia after general anaesthesia. *Lancet* 1962; 2: 631-2.
- 6 Marshall B, Wyche M. Hypoxemia during and after anaesthesia. *Anesthesiology* 1972; 37: 178-209.
- 7 Quan S, Falltrick R, Schlobohm R. Extubation from ambient or expiratory positive airway pressure in adults. *Anesthesiology* 1981; 55: 53-6.
- 8 Anest S, Gottlieb M, Paloski W *et al.* Detrimental effect of removing end-expiratory pressure prior to endotracheal extubation. *Ann Surg* 1980; 191: 539-45.
- 9 Sahn S, Lakshminarayan S, Petty T. Weaning from mechanical ventilation. *JAMA* 1976; 235: 2208-12.