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# Trauma and Critical Care

## Traumatologie et soins critiques

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### TRAUMA AND CRITICAL CARE: INTRODUCTION, RECENT ADVANCES AND “OWNERSHIP” IN THE CRITICAL CARE UNIT

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When the Journal editors approached me to be the section editor for a recurring feature on trauma and critical care, I was delighted. I suppose everyone is happy to see their particular area of interest highlighted in some way. To me, the specialty of trauma and critical care is an exciting, challenging, ever-humbling area of the practice of medicine. Some of us may feel a sense of “ownership” of critically ill patients, for example the general surgeon and the multitrauma patient. Others among us have no interest in this area and probably feel little need to familiarize ourselves with any critical care issues. In the coming months, I hope to appeal to both groups of surgeons.

Regardless of how “elective” our practices may be, as long as we are seeing patients and acting as consultants in a hospital or clinic setting, we will be forced to interact and deal with patients who have been injured or who are critically ill.

I believe it is important that we have some broad understanding of the basic processes impacting upon these patients. This may involve knowledge of such things as sepsis, immunosuppression, microbiology, the ischemia-

reperfusion phenomenon, pharmacology and respiratory physiology. It may also include being comfortable with such difficult areas as family dynamics, cultural diversity and the ethics of death and dying. How can we, as surgeons, be informed and knowledgeable about such diverse and often difficult areas? There is no easy way. Let me highlight a few specific areas where our thinking has changed over the last few years so radically that if we were to practise “conventionally” we would be considered hopelessly out of date.

#### RECENT ADVANCES

Let us start with the ventilation of patients in the intensive care unit. Not so long ago the general philosophy was that ventilation is good: good for flail chests; good for adult respiratory distress syndrome (ARDS); good for chronic obstructive pulmonary disease; good for many problems. We now know there is often a tremendous price to be paid for the benefits of this technology. Volumes have been written on nosocomial and ventilator-associated pneumonia. This is often due to aggressive pathogens that are resistant to first-line antibiotics and are associated

with significant mortality. Essentially all sick, hospitalized patients are at risk if respiratory compromise or failure develops after 3 to 5 days in hospital.

Flail chests for the most part are no longer managed by intubation and ventilation but can be managed effectively by proper analgesia, chest physiotherapy and early mobilization. For years it was felt that positive-pressure ventilation would splint the chest wall and lead to improved ventilation mechanics. In fact, ventilation itself is a major risk factor for nosocomial pneumonia, and patients once intubated and ventilated are often committed to a prolonged stay in the intensive care unit. Appropriate avoidance of intubation, if possible, is best. This can usually be accomplished by careful attention to pain management and pulmonary toilet and sometimes by temporary noninvasive ventilatory techniques.

The whole phenomenon of iatrogenic lung injury specifically caused by routine, conventional modes of ventilation is another area of recent awareness. The ubiquitous order on many intensive care unit charts: “ventilate to normal ABGs” is a reflection of our previous ignorance in this regard. The attainment of “normal” blood gases

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was the goal and was felt to be the most important physiologic parameter to maintain and defend. This was often accomplished at the cost of excessively high airway pressures and volumes. Barotrauma and what is now believed to be more important “volutrauma” was the end result. By insisting on “normal” blood gas levels in these frequently very “abnormal” lungs, we were actually causing additional lung injury. These damaged lungs, when ventilated with the high pressures, volumes, positive end-expiratory pressure (PEEP) and inspired-oxygen content needed to maintain normal blood gases were further injured. We now know that the type of injury caused is very similar to what is seen in ARDS: histologic evidence of damage to the respiratory epithelium, extravasation of proteinaceous fluid into the alveolus, recruitment of inflammatory cells and air blebs within the interstitium (i.e., interstitial emphysema). To avoid this iatrogenic injury, we now try to ventilate patients by “noninjurious” lung ventilation strategies. This includes choosing the appropriate amount of PEEP, keeping ventilating volumes down (i.e., tidal volumes of 5 to 7 ml/kg as opposed to 10 to 15 ml/kg), minimizing the inspired concentration of oxygen and, if necessary, allowing “ventilation” to be compromised (i.e., allowing the partial pressure of carbon dioxide to rise and therefore the pH to drop), so as to avoid iatrogenic lung injury with high pressures and volumes. Even a few years ago in major university teaching centres, this type of lung protection strategy met with extreme resistance. It was very difficult for people to see such aberrant blood gas results placed on their patients’ charts. Now this is commonplace. Randomized controlled clinical trials in this area are ongoing, but they are somewhat difficult to sort out because

of the complexity and variability of the patient population and because of the difficulty, common to most clinical trials in intensive care unit patients, of showing differences in ultimate outcome and mortality. However, on a strictly scientific and on an intuitive basis, this ventilation strategy makes sense, and new trials will perhaps give us further direction in this area.

The intensive care unit environment has always been considered a “high tech” place, where sophisticated technology is combined with excellence in patient care to provide the best available outcome. The true value of one of our most tightly held and cherished technologies — the Swan–Ganz catheter — has recently been questioned. As with many things in medicine, it has rarely been rigorously challenged, but the drummer of evidence-based medicine marches on and even this hallowed icon of modern technology is in jeopardy. For years it was held as the answer to many of our most difficult and challenging therapeutic dilemmas in fluid management, ionotropic support, oxygen delivery and utilization, among others. A few years ago, a serious challenge to its use was made by several internationally known critical care gurus who questioned its appropriate use and interpretation by most clinicians. So profound was their belief that they proposed a moratorium on its use. This issue has still not been resolved and continues to be a source of ongoing discussion and controversy. However, the fact that this event even occurred, states volumes for two of my own firmly held beliefs: that critical care medicine is a dynamic and rapidly changing field that demands our continued attention; and that we, as surgeons, looking after critically ill trauma and surgical patients must keep ourselves at the forefront and strive to be active participants and leaders in this area.

## “OWNERSHIP” IN THE INTENSIVE CARE UNIT

This brings me to the whole issue of “ownership” in the intensive care unit. Perhaps ownership is too inflammatory a word. What I mean is, who should be looking after patients in the intensive care unit: a surgeon, an anesthesiologist, a respirologist? Should it depend on the type of patient being cared for? Should patients be segregated into intensive care units according to the discipline of their admitting physician (surgical, medical, cardiovascular, neurosurgical and so on)? For many years and in many intensive care units, the care of critically ill patients was the domain of one group or type of physician. In some hospitals, the surgeons would run the “surgical intensive care unit”; in others, the anesthesiologists would run a combined medical/surgical intensive care unit. Feelings of “ownership” ran very strong. However, what has become clear is that the discipline of critical care has become an area of subspecialization unto itself. The care of these patients has become so complex and necessitates such precise knowledge and expertise in certain areas that it is essential to have critical care-trained intensivists managing the truly critically ill patients. The Society of Critical Care Medicine has nurtured and supported the role of any physician, regardless of primary discipline, who wants to look after patients in the intensive care unit as long as a few rules are followed and dedicated critical care training is obtained. It has specifically supported the critical care unit that runs with a multidisciplinary group of intensivists. In fact, most believe this is crucial to the success of any individual unit. Patients can only benefit when a cohesive group of multi-talented, multidisciplinary intensivists join together to tackle the multiple

problems making up the complex care of these patients.

The environment of the intensive care unit is one in which interpersonal skills and communication skills are crucial allies. Aside from the administrative problems that we all have in dealing with limited resources and increasing demands, most intensivists will tell you that their next biggest challenge is in the appropriate care and management of families and their attendant social problems. People react to stress in varied and

amazing ways, and in the intensive care unit you learn to expect the unexpected. The skillful management of a family or loved one at a time of overwhelming upheaval can be as rewarding and important as that of the patient. Surgeons must also develop these skills to effectively participate in a meaningful way as critical care intensivists.

In this section, I hope to bring together important issues and knowledgeable people to write about trauma and critical care. Not only will

clinical issues pertaining to trauma and critical care be covered, but I also hope to include subjects such as ethical dilemmas, the teaching and training of physicians, the evolution of trauma and critical care in Canada, coordination of a multidisciplinary care and administrative team, and clinical and basic science research in the intensive care unit. Our goal will have been accomplished if this section serves to inform, educate, stimulate and occasionally perhaps even agitate the reader.

## Books and Other Media Received

### Livres et autres documents reçus

This list is an acknowledgement of books and other media received. It does not preclude review at a later date.

Cette liste énumère les livres et autres documents reçus. Elle n'en exclut pas la critique à une date ultérieure.

**Clinical Application of the Intra-Aortic Balloon Pump.** 3rd revised edition. Hooshang Bolooki. 470 pp. Illust. Futura Publishing Company Inc., Armonk, NY. 1998. US\$98. ISBN 0-87993-401-8

**Diseases of the Veins.** 2nd edition. Norman L. Browne, Kevin G. Burnand, Allan T. Irvine, Nicholas M. Wilson. 774 pp. Illust. Arnold, London, UK; Oxford University Press Canada, Toronto, 1999. Can\$391.50. ISBN 0-340-58894-2

**Green's Operative Hand Surgery.** Volumes 1 and 2. 4th edition. Edited by David P. Green, Robert N. Hotchkiss and William C. Pederson. 2302 pp (set). Il-

lust. Churchill Livingstone, Philadelphia; Harcourt Brace & Co, Canada, Ltd., Toronto. 1999. Can\$525 (set). ISBN 0-443-06500-4 (vol. 1), 0-443-06501-2 (vol. 2), 0-443-07955-2 (set)

**Instructions for Surgery Patients.** Steven G. Economou and Tasia S. Economou. 720 pp. Illust. W.B. Saunders Company, Philadelphia; Harcourt Brace & Co. Canada, Ltd., Toronto. 1999. Can\$104. ISBN 0-7216-7188-8

**Operating in the Dark. The Accountability Crisis in Canada's Health Care System.** Lisa Priest. 318 pp. Doubleday Canada Ltd., Toronto. 1998. Can\$34.95. US\$24.95. ISBN 0-385-25719-8

**Spine Surgery. Techniques, Complication Avoidance, and Management.** Volume 1. Edited by Edward C. Benzel. 759 pp. Illust. Churchill Livingstone,

Philadelphia; Harcourt Brace & Co. Canada, Ltd., Toronto. 1999. Can\$488. ISBN 0-443-07540-9, vol. 1 part no. 9997631668

**Surgical Disorders of the Peripheral Nerves.** Rolfe Birch, George Bonney, C.B. Wynn Parry. 539 pp. Illust. Churchill Livingstone, Edinburgh; Harcourt Brace & Co. Canada, Ltd., Toronto. 1998. Can\$247. ISBN 0-443-04443-0

**Vascular Disorders of the Upper Extremity.** 3rd revised edition. Edited by Herbert I. Machleder. 515 pp. Illust. Futura Publishing Company, Inc., Armonk, NY. 1998. US\$98. ISBN 0-87993-409-3

**Yearbook of Surgery 1998.** Editor-in-Chief: Edward M. Copeland III. 552 pp. Illust. Mosby, Inc., St. Louis; Harcourt Brace & Co. Canada, Ltd., Toronto. 1998. Can\$111. ISBN 0-8151-9743-8