

Critical Care-The Worldwide Perspective

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Abstract

The development of the specialty of critical care and the intensivist is outlined and the data that favours critically ill patients being cared for by intensivists are reviewed. The future challenges for intensive and critical care are dealing with the new ethical dilemmas raised by intensive care, providing appropriate intensive care in both developed and developing countries and applying the principles of evidence-based medicine to intensive therapy.

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Introduction

Although special areas for postoperative patients existed 50 years ago, the modern specialty of Critical Care began during the polio epidemic of the 1950s. Prolonged hand ventilation, and positive or negative pressure ventilation, enabled maintenance of oxygenation until some patients developed sufficient recovery or compensatory processes to enable separation from artificial ventilation or continued survival on permanent or intermittent ventilation. The technique of controlled ventilation was extended to patients with drug overdoses, tetanus, and chest trauma with improvement in survival.¹ However, the impact of intensive care on healthcare was not so much in the improvement in survival in a few conditions but in the increased range of diseases it made treatable, and in particular the increased range of surgical procedures it made possible. It was in the area of postoperative support more than any other that artificial ventilation and subsequently circulatory support allowed rapid developments which improved survival in diseases previously deemed inoperable.

Development of Intensive Care Units

It was inevitable therefore that special units to concentrate equipment and medical and nursing expertise would be formed. In New South Wales, Australia, an Intensive Care Unit (ICU) is defined as “a specifically staffed, specially equipped, separate section of a hospital dedicated to the observation, care, and treatment of patients with life-threatening illnesses, injuries, or complications from which recovery is possible. It provides special expertise and facilities for the support of vital

functions and utilises the skill of medical nursing and other staff experienced in the management of these problems”.² Such units may be “open” in which care is carried out by the primary team in consultation with the “intensivist”, or “closed” where the “intensivist” becomes the primary care physician. The term Critical Care is used to cover the whole continuum of care of the seriously and critically ill from the site of accident to discharge or death.

Development of the Intensivist

Such units were usually initially staffed by charismatic enthusiasts who attracted others who established their own ICUs. Indeed in parts of Africa the solo enthusiast is still the norm.³ This led to the establishment of a new specialist: the intensivist.

A medical specialty is a group of doctors with an interest in a particular patient population who regulate the intake into their group, provide educational and clinical standards, and award certification qualifications which are recognised by other specialties as identifying the group as having the major expertise in the area of which the specialty has ownership.⁴

In addition a medical specialty is likely to have a share of the medical undergraduate curriculum, its own journals, and deal with Government and Professional bodies with respect to matters pertaining to the specialty.⁴

The Society of Critical Care Medicine (USA) defines the intensivist as “the qualified critical care practitioner is physically available without competing obligations and possesses knowledge, skill, judgement, attitude and

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compassion acquired through training, experience and focus to achieve the best outcome for patients suffering from critical illness and injury. Critical care practitioners plan and manage the environment in which critical care occurs. This environment includes physical plant, equipment, supplies, personnel and the organisation within which they function."⁵

The evolution of the new specialty posed problems. The specialty transgressed the traditional borders of medical specialties which were based on age (geriatrics), technique (anaesthetics), organ (cardiology) or disease (oncology). Intensive Care took a different approach by basing patient selection on acuity, which challenged the traditional concepts of responsibility for (and ownership of) patients. Successful responses to these challenges resulted in the development of medical, nursing and support teams who recognised the abilities and skills of one another. Unsuccessful responses led to turf wars associated with a belief that excellent care of the critically ill could be delivered by doctors from the traditional specialty. The intensivist, with special training in and commitment to Intensive Care and overall responsibility for the running of an ICU, is the norm in most developed countries outside the USA and parts of Asia, where the turf wars continue.^{6,7}

The Value of the Intensivist

Pinsky⁸ describes the intensivist as providing the most efficient primary care for the critically ill, bringing some aspects of all specialties to the bedside and allowing titration of resources in a patient-specific fashion. The evidence suggests that critically ill patients have improved survival in closed units run by intensivists.

Safar and Grenvik⁹ were the first to show that an intensivist led to improved outcomes, particularly in patients in the middle range of severity. When on site, physicians were employed in a community hospital ICU. Li et al¹⁰ showed an improved survival rate in patients with intermediate risk of death. However, Hainer and Lawler¹¹ suggested that a difference in survival did not occur when patients were cared for by a family physician or a general internist, implying that both were as good, but perhaps suggesting that both were as bad. Reynolds et al¹² showed that providing intensive care trained doctors in a medical ICU had a favourable impact on outcome in septic shock, and Brown and Sullivan¹³ showed a full time intensivist produced a significant reduction in mortality in a general ICU. Pollack et al¹⁴ showed improved outcomes in children after the arrival of a paediatric intensivist and in paediatric units ran by intensivists compared to "open" units.¹⁵ A more recent study, which compared 200 randomised surgical patients managed by either the general surgeon or the dedicated critical care service, showed the intensivist-treated group had significantly higher APACHE II scores,

fewer ICU days, ventilated days, equipment days, blood products, blood gases, and had one-third the number of complications.¹⁶ There is further evidence that outcomes may be more related to organisational aspects of intensive care rather than available technology.⁷

The management of intensive care patients by doctors who consider their primary function as intensivists and who are recognised as such by their colleagues, favourably influences survival. The study of Knaus and colleagues¹⁷ study showed a Standard Mortality Ratio, a calculation measurement based on observed survival/predicted survival ranged between 0.65 to 1.81 ($P = 0.0001$ which was highly significant) in a number of US ICUs. The best of the units studied relied on clinical protocol rather than technology, and on carefully designed protocols implemented by in-unit specialists. It also had the most comprehensive nursing education support, independent nursing responsibilities and excellent nurse/physician communication.

It was inevitable that those who worked in intensive care would seek recognition as an independent specialty and the degree of success in this area varies between countries with critical care being a sub-specialty of anaesthesia or internal medicine in most.

From which discipline the intensivist comes from is of little relevance if training, ethos, and commitment are adequate. The intensivist needs knowledge, technical skill, interpersonal skills, and the ability to work on a team. The place of the intensivist is in the unit at the bedside. It is here that the team is coordinated. It is here that the right to care for other patients is earned.

Units which evolve slowly with the doctors learning the value and skills of others, are more likely to be harmonious and efficient than when control of the unit is handed to an individual by bureaucratic edict.

In spite of evidence that an intensivist and full-time staff carry benefits, this is not the way that ICUs are likely to be run outside major centres. While the cost of full-time medical staff is less than part-time staff in a large unit, a small unit may not have sufficient work by day to occupy one doctor fully. Further, a full-time doctor working in intensive care needs relief for nights, weekends and leave. Thus smaller units evolve under the care of specialists from other disciplines. Data from Australia suggest that if appropriate liaison, triage and transport facilities are in place, such units are associated with less ill patients but not adverse outcomes.⁷

Nursing

Nurses are key players in the ICU. Indeed with many diseases the nursing aspects of care play an equal or greater role in determining outcome than the medical input. Collaboration and integration of medical and nursing staff must be optimal and the ICU often becomes

a very tribal place where nurses and doctors see each other as professional colleagues, more so than members of their specialty who work outside the unit. Changes in the role of women and nurses meant that the old patronising and controlling roles are no longer valid. Nurses solve nursing problems best, and the role of a medical unit leader is to facilitate and assist when requested. Nursing staff should be fully integrated into the scientific, quality, planning, educational and management activities of the unit.

Allied Health Professionals

There are other important team players although their presence and role vary from country to country and unit to unit. Larger units require scientific officers with expertise in calibration, cleaning, and maintenance of equipment and complex measurement. Dieticians, pharmacists and physiotherapists are usual in most ICUs.

The Respiratory Care Technician who manages ventilation is a team member in the ICU in some countries, while in others, the work is shared among doctors, nurses, technical officers and physiotherapists. Their value, like the value of other ancillary workers, has not been established by scientific study and it seems to this author that their role, as with other groups, will largely depend on the gaps in expertise in other staff they are able to fill. Thus a respiratory therapist is likely to have a much greater role in an open unit staffed by rotating residents than in a closed unit staffed by intensivists.

Future Challenges

Appropriateness and Distributive Justice

The main challenge for the future in ICUs throughout the world is in providing care that is appropriate. While the place of the new technology used in intensive care was being established, it became apparent that it was possible to keep many patients alive almost indefinitely, often when there was no hope of a survival. Much of the new technology changes the cause of death but not the outcome. Each new drug or technical improvement is associated with diminishing returns and reduced cost benefit.

In attempting to walk the tightrope between the responsibility to individuals and rational use of the healthcare budget, complex and simple predictive scoring systems such as APACHE II and III, SAPS II and III, and Riyadh have been introduced.¹⁸ These systems can predict accurately the outcome in large groups but still do not accurately predict the outcome in an individual.¹⁸ In one UK study it was shown that of the 137 patients predicted to die, there were 6 survivors, of whom 4 were alive with good quality of life a year later. The cost of treating the patients predicted to die made up 16.7% of total ICU costs and the cost of a survivor was £129,651.¹⁹

Critical Care has opened an ethical Pandora box which is about how much of a healthcare budget does one individual have a right to, and who has ownership of the decision to proceed with or withdraw active treatment. Western societies accept largely that withdrawal of artificial forms of life support, even when it will be followed by certain death, does not equate with murder. The ownership of the decision making prior to this act, particularly when a patient is not competent to make decisions for himself, is a current area of debate. Whether such decision making should be carried out by lawyers, governments, healthcare workers or families is a major societal issue in which medical involvement in, if not leadership of, the debate is mandatory.

In developing countries, what is appropriate intensive care is an even more complex issue. In poor countries, the life expectancy and quality of life of the population are far more likely to be influenced by water management, agriculture, birth control, vaccination, education, hygiene, peace, and removal of landmines than the provision of ICUs. In the USA, heart transplantation is performed in people with muscular dystrophy, while in poorer countries, infectious diseases, many easily treatable, and starvation are the dominant causes of death. Fifty-three million people die each year—a third die of infectious diseases, 4 million children die of lung infections and 3 million people die of gastroenteritis and tuberculosis.²⁰ Yet in developing countries, there are numbers of identifiable young people who could be returned to a productive life with simple intensive care. The factor most likely to lead to improved survival in developing countries returns us to where intensive care began—mechanical ventilation. The ability to manage a ventilated patient is the one technique most likely to save lives. The use of oxygen compressors has extended the range of areas where mechanical ventilation may be used. There is a need for much simpler ventilators in such areas, where technical support and repairs may be virtually impossible.

An even more difficult question arises in countries with a small wealthy population and a large poor population. It is difficult from a “Western” perspective to understand the fairness of the wealthy having access to high cost medicine in their own or other countries when the incidence of poverty is high. However those who provide such services defend them on the basis that it is better to provide access for the wealthy in their own country and develop those facilities to be more encompassing.

Intensive care aid must be appropriate. Maintenance of the unit should be within the financial, medical, and nursing resources of the country and reflect the ethnic, social and religious mores of the country.

Undergraduate Medicine

To come of age as a specialty, intensive care must

establish a place in the undergraduate curriculum. A suggested role for intensive care includes teaching students to recognise the signs and symptoms which indicate that a crisis is imminent, to manage that crisis until help comes, including the principles of oxygen delivery, fluid therapy, artificial ventilation and cardiopulmonary resuscitation.

The ICU is a useful place to teach students about ethics, care of the dying, distributive justice and appropriateness.

An International Role: Shrinking the Global Community

Intensive and Critical Care today mirror the effects of improved travel and communication on other specialties. Indeed, because intensive care is a relatively small specialty, many of the key players are personally known to each other.

Research

At an international level intensivists are bonded by international journals, the Internet, particularly user groups in critical care, paediatric intensive care, neurosurgical intensive care and trauma, and more recently, a commercial intensive care website "Critical Care Forum", which produces a journal in electronic and print format. The website, in particular, provides a valuable source of support and advice to those who use it, although such advice is often unsubstantiated opinion. A more recent exciting development is the provision of evidence-based reviews of topics through the University of Western Ontario and McMaster University (<http://absn.lhsc.on.ca/cat>). .

Indeed the application of evidence-based medicine to both the time-honoured and innovative techniques and therapies used in intensive care is a major challenge for the future, as inappropriate therapies applied in ICUs prolong dying and suffering, are expensive, and may deny access to the unit to more appropriate patients. Because of unresolved issues regarding whether patients in trials should be grouped by basic disease or intensive care syndromes of, for example, multisystem organ failure or acute lung injury, and what outcomes other than survival are valid, intensive care research is difficult.

Controlled randomised trials are difficult in intensive care. The difficulties are compounded by the range of variables in the patients and the different associated therapies in different units. When small margins of improvement are expected, studies must be multicentred in order to obtain adequate numbers. Unless randomisation within individual units is carried out, and individual units enter enough patients to make the data for that unit meaningful, multicentred studies are more likely to measure the efficacy of the unit than the intervention under study.

Societies of Intensive Care

Collaboration between societies of Intensive Care is increasing. Initially limited to the traditional cross pollination provided by overseas speakers at meetings, many groups have formed regional societies such as the Western Pacific, European, and Pan Iberian Societies. Consensus meetings between the US and European Societies have been held, largely on the initiatives of the European Group, and the International Round Table meetings associated with the annual Brussels Scientific Meeting have produced valuable monographs reflecting an international view.

Training

Other collaborative international efforts have been related to training and aid. For example, the Australian and New Zealand Intensive Care Society has a government-supported liaison with Indonesia involving supported trainees coming to Australia, and medical and nursing teachers visiting Indonesia.

Training is probably the most valuable area in which developed countries may assist developing countries. The United States has been a Mecca for medical graduates wishing to train in intensive care as in other specialties.

Until recently however a major problem occurred when doctors trained in the USA or other countries choose to remain in these countries which lead to a source of cheap medical graduates which were often of greater pecuniary value than the total cost of the aid packages sent by the developed country to the supplier of graduates. Recently accrediting bodies and immigration departments in many countries such as Australia and the United States have moved to restrict entry of foreign graduates and their ability to remain after their training period.

Aid

Apart from providing training for nurses and doctors, traditional aid to developing countries ranges from new or second-hand (often useless) equipment, journals and text books, and providing jobs for trainees. The provision of surgical teams to perform head and neck or cardiac surgery is a valuable form of aid, particularly in countries where the economy or population size makes local provision of such services impossible or inappropriate. The major priorities in providing programmes for developing countries are to train leaders, provide facilities, and continuing support. An important preliminary step is to obtain commitment from the local government to maintain the facility. The establishments of such units must be appropriate. The critical care resource factor most likely to lead to improved survival in developing countries returns us to where intensive care began-mechanical ventilation. Even without in-

vasive pressure monitoring, the ability to manage a ventilated patient is the one technique most likely to save lives. The use of oxygen compressors has extended the number of areas where mechanical ventilation may be used, although there is a need for much simpler ventilators for such areas.

Intensive care aid must be appropriate. Maintenance of the unit should be within the financial, medical, and nursing resources of the country. Further, to be appropriate, intensive care must reflect the ethnic, social and religious mores of the country.

There must be a continuing support system with respect to equipment maintenance, and continuing nursing, medical and technical education.

An International Body

The World Federation of Societies of Intensive and Critical Care Medicine was formed in 1981 and its membership comprises 60 national societies. Its main roles at present are associated with the World Congress (held in Ottawa in 1997 and to be held in Sydney in 2001) and in its association with the United Kingdom publisher, King and Wirth, who sends the journal *Intensive Care World* to medical members of affiliated societies. The Federation is a new body with as yet a limited financial capacity to achieve its goals. In terms of aid to developing countries it is less likely to be as effective as national societies, at least in the immediate future.

Conclusion

Intensive care has achieved much. The specialty is changing as economic pressures and patient demands reshape medicine. Schienkestal²¹ noted that in countries such as Australia where the concept of an intensivist with control of the ICU is accepted, the role is evolving from healthcare provider to economic rationalist and ethicist, as we struggle to provide a service that is both scientific and appropriate.

The consolidation of the specialty will increasingly place the intensivist in the role of patient advocate. And yet there has been no real change since Dunstan wrote in 1985 "The success of intensive care is not to be measured only by the statistics of survival, as though each death were a medical failure. It is to be measured by the quality of lives preserved or restored, the quality of the dying of those in whose interest it is to die and by the quality of relationships involved in each death".²²

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