Intensive Care Medicine in Singapore: Challenges in a New Era

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Introduction

The specialty of intensive care medicine (ICM) is rapidly evolving as economic progress, ageing population, urbanisation, improved living standards, better education and rising patient expectations reshape medicine.[1,2] A recent report by the Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS) identified care of the critically ill as one area in medicine that is likely to experience a major impact from an increase in the elderly population.[3] A significant portion of health care resources is spent in the intensive care units (ICUs), with up to 2-fold variation in risk-adjusted mortality among units. Thus, it is important to identify ways of providing a service that is both scientific, appropriate and cost effective.[4,5]

On 15 November 2000, the Leapfrog Group, formed by a consortium of large corporations, announced a need for hospitals to staff ICUs with doctors who have credentials in ICM.[6] The Group's sponsor is the Business Roundtable, an association of Fortune 500 corporate chief executives. This proposal is one of several new cost-effective approaches they believe hospitals should follow to provide better standards of patient care.

The intensivist of the future needs to possess the following attributes:[4,7]

- be a highly trained clinician, well versed in advanced technology and able to meet on-call and recall requirements,
- courage in the face of legal uncertainties when he makes complex ethical decisions,
- ability to cope with stress, and
- ability to manage with limited resources.

Hence, the role of an intensivist is evolving from healthcare provider and patient's advocate to resource manager and ethicist.[8] The ICU management model in Singapore appears to be moving in the direction of "closed" ICUs with the aims of improving outcome, maintaining quality care and patient advocacy in a cost driven environment under case-mix funding.

Evolution of ICM as a Specialty

Research into critical illness has been a major stimulus to the maturation of the specialty.[9] Over the last two decades, there has been an explosion of knowledge in our understanding of critical illness. ICM is at the cutting edge of many of the technological advances in medicine and modern information technology. ICM takes on a different approach by basing patient selection on acuity, instead of age (geriatric medicine), techniques (anaesthesiology), organ (cardiology) or disease (oncology).[10] It therefore challenges the traditional concepts of responsibility for and ownership of patients.

A medical specialty regulates entry through a specific programme of postgraduate training, often associated with the award of a certified qualification, which is recognised by other specialty groups as having additional skills and knowledge in the specific field.[1,10] Currently, not many countries outside of North America, Europe and Australia/New Zealand have recognised programmes of ICM training and certification. ICM is not yet recognised as a distinct specialty in many countries, including Singapore. In many countries, it does have formal recognition either as a:

- Sub-specialty, i.e. postgraduate training and certification in a primary specialty such as anaesthesia, internal medicine, respiratory medicine, followed by a specialty specific module of training, with or without certification, in ICM.
- Supra-specialty, i.e. postgraduate training and certification in a primary specialty followed by a common postgraduate training programme in ICM and its full-time or part-time practice. [1,10]

In Singapore, internists intending to take up ICM are required to do at least one year of training in ICM during their 3-year Respiratory Medicine advanced specialist training.

Besides clinical skills, it is equally important to provide good training in non-clinical skills such as leadership and

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management training for directing an ICU, teaching and health care research.[11-13] Professional bodies such as the Society of Critical Care Medicine, the American College of Chest Physicians and the American Thoracic Society devote increasing blocks of time during their annual scientific symposia to managerial issues dealing with leadership development, cost containment and cost effectiveness.[11]

To come of age as a specialty, ICM must establish a place in the medical undergraduate curriculum which could include the basic principles of cardiopulmonary resuscitation, oxygen delivery, fluid therapy and artificial ventilation. Students could be taught how to recognise the signs and symptoms of an imminent crisis and to manage critically ill patients prior to their transfer/admission to an ICU. The ICU is a useful place to teach students about ethics, care of the dying, communication, interpersonal skills, respect, distributive justice and appropriateness of medical therapy.[10] A start has been made in Singapore with the introduction of an elective term for 4th year medical students in ICU which was offered by a few public hospitals since 1998.

The COMPACCS study[3] showed that almost 56% of ICU days were consumed by patients 65 years and older. The number of days needed per 1000 population per year was shown to rise from 37 for adults younger than 65 years, to 178 for those 65 to 74 years, and 245 for those 75 to 84 years. Intensivists today provide care to about 36.8% of all ICU patients in the USA. The report predicted that current ratio of supply to demand will remain in rough equilibrium until 2007. Subsequently, demand will outstrip supply, yielding a shortfall of specialist hours equal to 22% of demand by 2020 and 35% by 2030. Many ageing nations, including Singapore, may face similar increases in demand for intensive care services. It is imperative that prompt action be taken to recognise ICM as a specialty in Singapore.

Impact of Intensivists

Management of ICU patients by intensivists is associated with reduced resource utilisation and improved patient outcome.[3,4,7-9,14] Effective triage ("process of prioritising access to beds") ensures that resources are not wasted on patients too sick or too well to benefit from intensive care since issues of benefit or harm from ICU care, resources and bed-days available, are best known to the intensivists. However, such admission, discharge, and triage activities are often complicated, stressful, conflict ridden and associated with legal ramifications.[7] For example, Acute Physiology And Chronic Health Evaluation (APACHE) II & III, Simplified Acute Physiology Score (SAPS) II, and Sequential Organ Failure Assessment (SOFA) are generally good outcome predictors for groups of patients, but they cannot be used to accurately predict mortality in the individual. If there is any doubt with regard to a patient's prognosis, most intensivists would err on the side of caution by giving a therapeutic trial, conditional on frequent reassessment of status and re-evaluation of the desirability of continued support.[4]

Intensivists provide co-ordination, direction, and timely care. This clarity in patient treatment will minimise conflict and confusion.[14] They are in the best position to be responsible for the cost and quality of the ICU as the unit director.

The Society of Critical Care Medicine has promoted the "team model" with the following recommendations:[9]

1. Medical and nursing directors with significant authority, co-responsibility and co-operative management.
2. Nursing sophistication and highly collaborative relationship with medical staff in a team approach.
3. Extensive use of standards, protocols and guidelines to assure consistent approach to medical, nursing and technical issues.
4. Dedication to co-ordination, communication and continuity for all aspects of ICU management.
5. Emphasis on certification, research, education and peer review, as well as evidence-based care, ethical issues and patient advocacy.

Organisation of ICU

Closed versus Open ICU

At the ends of a continuum, the terms "open" and "closed" describe the increasing centralisation of management functions such as admission, treatment and discharge decision making.[7]

In the "closed" system, the intensivists, besides being a manager and economic rationalist, have a regular on-going commitment to the unit. This commitment encourages teaching, consistency of approach and teamwork directed towards the best management of critically ill patients. Families of critically ill patients also benefit, under the stressful ICU environment, from having a consistent, readily available source of information from a person skilled and experienced in talking to distressed families.[4] A good interaction of the right culture, leadership, co-ordination, communication, and conflict management inherent in the "closed" unit model, provides the most efficient care of critically ill patients. Compared to one in which multiple "single-organ" specialists manage the patient, a "closed" ICU reduces costs, risk-adjusted length of stay and standardised mortality ratio (SMR) of critically ill patients. It is also associated with a lower nurse turnover, higher evaluated technical quality of care, and greater evaluated ability to meet family member needs.[4,5,9,14] "Closed" units are the norm in most developed countries in the West and

parts of Asia.[10] Nearly all the larger ICUs in Australia and New Zealand are staffed by full time intensivists, but apart from Japan, this pattern of staffing is found in just a few units in Hong Kong, Taiwan, and Thailand.[1] In Singapore, the ICUs in most of the public hospitals are run by intensivists.

In an "open" unit, patient care rests with the primary admitting clinician. Multiple referrals or consultations, usually to organ system based specialties (e.g. respiratory medicine, cardiology, nephrology or endocrinology), result in diversity of medical input. This can produce conflicting advice to those with responsibility for co-ordinating care, usually the junior medical staff rotating through the units.[1] This model makes it difficult to have consistent management plans and does not encourage a multidisciplinary team approach.

Between the two extremes of "open" versus "closed" unit models are a variety of intermediate or transitional approaches to ICU services. A "closed" unit approach may not be feasible for all hospitals because each unit may have unique attributes and there may be insufficient intensivists to provide full-time staffing.[9] Although the cost of full-time medical staff is less than part-time staff in a large unit, a smaller unit may not have adequate work to occupy one doctor fully. Further, a full-time doctor working in ICU needs relief for nights, weekends and leave. Thus, smaller units evolve under the care of specialists from other disciplines.

Single Multidisciplinary ICU versus Multiple Specialised ICUs

With the development of ICM as a specialty, the re-engineering process should be in the direction of general ICUs staffed by full-time intensivists, providing holistic care with the best quality of services and yet at the lowest cost. Subdivision into multiple single specialty ICUs build barriers to the use of that subdivision from other users. Resources are diverted away from other areas of health care as the total number of ICU beds and resources devoted to intensive care are unnecessarily inflated.[14] Separate rostering of personnel, different drugs, equipment and management protocols between ICU subdivisions are costly and inefficient. Amid all the differences between subdivisions, there is also a tendency towards confusion and invariably a higher risk of adverse events. Training of junior doctors and nurses would also be somewhat restricted by the limited case-mix in each subdivision.

Multidisciplinary ICUs may not be suitable for all hospitals. Coronary care unit, neurosurgical ICU and burns ICU exist because they care for specific groups of patients with a narrow range of illnesses, requiring a narrow therapeutic repertoire. Nevertheless, such specialty ICUs can benefit from the leadership and co-ordination of an intensivist. Neonatal ICUs are separate since they require different staff training, drugs, equipment, co-ordination with labour ward, and have different pathologies from adults.[14]

Australia, New Zealand and Indonesia have single multidisciplinary (medical-surgical) units with separate coronary care units,[1] whereas most units in other countries of the Western Pacific region including Singapore, Thailand, Taiwan and China have followed the path of multiple specialised units.[2] To avoid duplication of services and resources, some hospitals in Singapore have a multidisciplinary ICU committee to co-ordinate the development and functioning of the ICUs, as well as review plans, manpower, training and equipment needs. Ventilators are under central control of a Respiratory Therapy Department, whose manger also sits in the ICU committee.

Each country should identify the model of intensive care practice that is the most appropriate for their needs and accord the appropriate level of priority to the specialty.[2] For many developing countries, the improvement in outcome at lower costs brought about by staffing with intensivist and "closed" ICU model should be explored, rather than seeking new and expensive equipment or drugs.[14] More often than not, advanced technology merely changes the cause of death but not the outcome. Each new drug or technical improvement is associated with diminishing returns and reduced cost-benefit ratio. The main challenge is in providing care that is appropriate.[10] More work is required to study the cost-effectiveness of various interventions.[8] It is also important to allow the units to evolve slowly with the doctors learning and respecting the value and skills of others, so that a more harmonious and efficient working environment can be fostered.[10]

Intermediate Care Units

Intermediate care units are multipurpose "progressive care units" or single-organ subspecialty floors such as cardiac telemetry, surgical (thoracic, vascular, etc), neurosurgical/neurological monitoring areas, or chronic respiratory care units.[15] This alternative makes available an added measure of monitoring and intensity of service that exceeds what is available in the general wards. This is reassuring to all concerned (patient, patient's relatives and attending clinician) that the patient who is not sick enough to be in the ICU is adequately taken care of. The intermediate care unit reduces cost, demand for ICU beds and does not negatively impact on patient outcome or increase hospital length of stay. In this era of cost containment, the concept of intermediate care unit promotes greater flexibility in patient triage, increases accessibility to limited intensive

care resources and provides a cost-effective alternative to ICU admission. Many intensivists favour that administrative control of the intermediate care unit resides with the ICU director, citing the rationale that one of the keys to successful ICU utilisation is control of the intermediate care unit.[9]

ICU Managers

Almost all ICUs have full-time nursing directors with well-delineated managerial roles overseeing ICU operations. The Joint Commission of the Accreditation of Healthcare Organisations (JCAHO) also requires that there be a medical director.[7] The medical director spends time in the unit, functioning as unit manager. His multiple roles include triage, bed allocation, discharge planning, implementation of unit policies and interaction with other departments to ensure the smooth operation of the ICU. However, reimbursement is not sufficient to compensate adequately for spending time in management activities not directly related to patient care. Hospitals must be made aware of the efficiency gains from medical directors' managerial involvement and be willing to make compensation to free the physician-manager from competing obligations in the operating room or clinics.[7]

In Singapore, most ICUs in the public hospitals have a medical director. Surgical units are usually directed/co-directed by anaesthetists/surgeons and medical units by pulmonologists/internists. Several of these ICU directors are still required to divide their time between practice of their primary specialty and care of patients in the ICU. As for ICUs in the private hospitals, the "open" unit model remains the norm of practice to this day. Skill in inter-personal relationships is an important requirement of ICU medical directors. They need to win the support of attending specialists who may perceive the presence of intensivists and re-organisation into a "closed" unit as a threat to their autonomy and right to consult or perform procedures in the ICU.[7]

Critical Care Nurse And Paramedical Health Professionals

Skilled and experienced nursing care plays an equal or greater role in determining outcome in many diseases.[10] The recognition of intensive care nursing expertise has paralleled the recognition of ICM as a medical specialty. In most countries, intensive care nurses are in short supply. This is due to several factors such as attrition, expansion of intensive care services exceeding the output from training programmes, lack of established training programmes or recognition of the expertise required.[1] In Singapore, all nurses qualify through a diploma programme administered by the Nanyang Polytechnic, a tertiary institution of learning.

Nurses solve nursing problems best. Effective clinician-nurse collaborative care management systems result in reduced mortality and a pleasant working environment. This results in better nurse satisfaction and retention of staff.[9] Nursing staff should be fully integrated into the scientific, quality, planning, educational and management activities of the unit.[10] Better units have the most comprehensive nursing education support, independent nursing responsibilities and excellent nurse/physician communication.[10] To a large extent, errors in ICU management leading to patient harm are the result of communication problems.[14]

The skilful and orchestrated performance of the different skill sets of an interdisciplinary team of physician, nurse, pharmacist, respiratory therapist and physiotherapist is crucial to achieving the best possible outcome for the patient.[11] Critical care pharmacists provide input on drug selection, proper dosing to reduce errors and costs, as well as complications due to pharmacological agents. A local study reported that a dedicated ICU team and active respiratory care by respiratory therapists was beneficial for the care of the critically ill.[16] Changes to many other aspects of ICU management and patient care, such as increased involvement by allied healthcare workers resulting from protocols and guidelines, arise under the leadership provided by the intensivist.[8]

Appropriate Care And Distributive Justice

In general, ICUs account for 15% to 20% of a hospital's budget.[7] In most countries, unit expenditure in the ICU is three times or more compared to those of an ordinary ward.[2] In the USA, critical care consumes approximately 1% of gross national product and 14% of gross domestic product, 10% of hospital beds and 30% of acute hospital costs.[11] The ICU represents a unit of the hospital, funded from the hospital's budget. Hospital administrators often find the high-cost ICU patients to be unprofitable in terms of their diagnosis-related group reimbursement. There is understandably a certain reluctance to allocate a substantial budget to the ICU.[2] Efficient use of ICU resources is achieved by:

1) gate-keeping and triage to screen out those who are "too sick" or "too well" to benefit,
2) optimising utilisation of resources and staff,
3) minimising the length of stay through efficient treatment, and
4) recognising when continued ICU care is futile and when the more humane and appropriate approach is to allow nature to take its course with minimal pain and suffering.[4,7,8]

Life and death discussions have to be handled sensitively and are time consuming. A consensus has to be achieved, based on the understanding of what are and what are not realistic outcome expectations.[17] Unfortunately, only 0%

to 10% of ICU patients have intact decision making capacity.[18] One way to circumvent this problem may be promotion of the use of advance directives to limit intensive care at the end of life.[3] The act of prolonging life when there is no hope of recovery is ethically and fiscally unjustifiable. The futility of such an exercise must be conveyed to relatives concerned.[4] Surprisingly, the SUPPORT study in the USA[19] showed that communication between physicians and patients was poor and a large proportion of clinicians disregarded the stated wish of the family and patient, including "do-not-resuscitate" orders.

Junior doctors rarely watch senior clinicians hold such "life-and-death" family conferences. Perhaps, a respected senior clinician may organise seminars and conferences on how to discuss prognosis with patients, elicit their concerns and preferences for care, and negotiate a mutually acceptable care plan. This "consultant" could help by accompanying other clinicians when they discuss such issues, address concerns and correct misunderstanding with patients.[17]

Intensive 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 forego treatment.[10] Maintenance of intensive care services must be pegged at a level that is appropriate and within the financial, medical and nursing resources of the country. Cultural and religious differences produce variations in attitudes to ageing, disability, serious illness, death and sanctity of life. These factors influence attitudes to withdrawal of futile care, acceptance of brain death and expectations in regard to outcome of intensive care.[1,2] Competing societal needs may lead to conflicts between health care providers and patients/relatives/surrogates. It is imperative that a societal consensus, based on sound medical, ethical, cultural, religious and legal bases, be reached on how to fairly allocate such expensive high-technology medical care.[18]

Research

Research in ICM is not well developed in most countries of this region. Some reasons for this include limited resources, a pool of intensivists who are predominantly part-time and the categorisation of ICM as a new specialty.[2,20] ICM is also faced with increasing pressures to contain cost. Intensivists face great challenge in terms of prioritising resources between clinical, teaching, administrative and research work. In future, non-clinical functions will most likely have to be supported independently.[11] For research to flourish, there must be adequate funding at competitive rates to pay for research time as well as the needed infrastructure support.

In an initiative announced by the Minister for Health on 30 March 2001, the two healthcare clusters that run public health services in Singapore will each get an extra $5 million for "cluster research funds" to build up their research manpower.[21] In addition, a one-year budget of $23 million was allotted to employ additional doctors to meet the hospitals' service needs, allow specialist trainees to have protected time to attend conferences, perform research and participate in other training activities.

Critical Care and Shock, the official journal of the Western Pacific Association of Critical Care Medicine (WPACCM) was officially launched in 1998. This journal aims to accommodate the aspirations of the member societies of WPACCM, advance and disseminate state of the art technology in the Western Pacific region.[22] It hopes to stimulate research, and highlight and address research problems faced by critical care practitioners in the region.[20]

One of the advances, which should improve our ability to evaluate and deliver appropriate intensive care, is standardisation through the development of clinical practice guidelines. Evidence-based medicine must be more extensively incorporated into time-honoured and innovative therapies. Inappropriate therapies applied in the ICU prolong dying and suffering, are expensive and may deprive others who are more likely to benefit.[4,8,10] Two Asia-Pacific Consensus Conferences in ICM on septic shock and acute lung injury,[23,24] in collaboration with foremost experts from North America and Europe, provide guidelines on evidence-based medicine clinical decision making. Such consensus conferences have the potential to improve delivery of the most effective and appropriate care to critically ill patients. They also serve as a powerful means of fostering regional identity.[1]

We also need to define our patients better in all clinical and health services research in ICM. If intensivists are to retain control over the future direction of the specialty, they must embrace the field of health services research. This is the science of medicine concerned with determining how therapies and programmes work in actual practice.[25] Survival alone should not be the sole indicator of positive impact of the intensivist and a "closed" ICU structure. Other concerns include: determining the optimal level of intensity of care in today's era of advanced technology and cost containment, defining which patients are appropriate for critical care, how best to measure quality of life of survivors after intensive care, and selecting the optimal model for delivery of critical care. Interpretation of data emerging from other countries requires critical appraisal for underlying differences in patient populations, existing care practices and health care funding. For example, if recombinant human activated protein C is reported to be effective in reducing mortality from severe sepsis in the West,[26] what are the implications for its use in our country?

Information Technology

Hospital administrators have begun to understand the importance of seamless electronic records and critical outcome data. ICU directors are frequently faced with the

strategic decision of selecting a database, a clinical information system, as well as the appropriate scoring system for their ICU.[11] This is to allow efficient collection of data to compare severity-adjusted mortality rate and resource utilisation of the individual hospital with internationally accepted norms. This is a strong audit tool that provides an insight into the individual ICU, allows assessment of one's performance so that one can continually seek ways to improve the delivery of care to the critically ill. Although advances in medical technology provide greater diagnostic accuracy, they also contribute to false-negative and false-positive results. It is therefore important to continually audit ICU practice. A recent autopsy study on MICU patients reported a discordance rate of 19.8% between the clinical cause of death and postmortem diagnosis. In about 44.4% of these discordant cases, knowledge of the correct diagnosis would have altered therapy.[27]

Merely providing information does not change physician behaviour. Equally important, changes in the organisation and culture of the hospital and the active support of hospital leaders are required.[17]

Conclusion

The major challenges facing the specialty of ICM in Singapore lie in finding a fine balance between determining the most cost effective way of delivering limited and expensive high quality intensive care services to meet the demands from an ageing population and rising patient expectations. A "closed" ICU ran by a multidisciplinary team has been shown to reduce cost, risk-adjusted length of stay and standardised mortality ratio of critically ill patients, improve communication and quality of care, as well as family member's needs and nurse's morale.

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