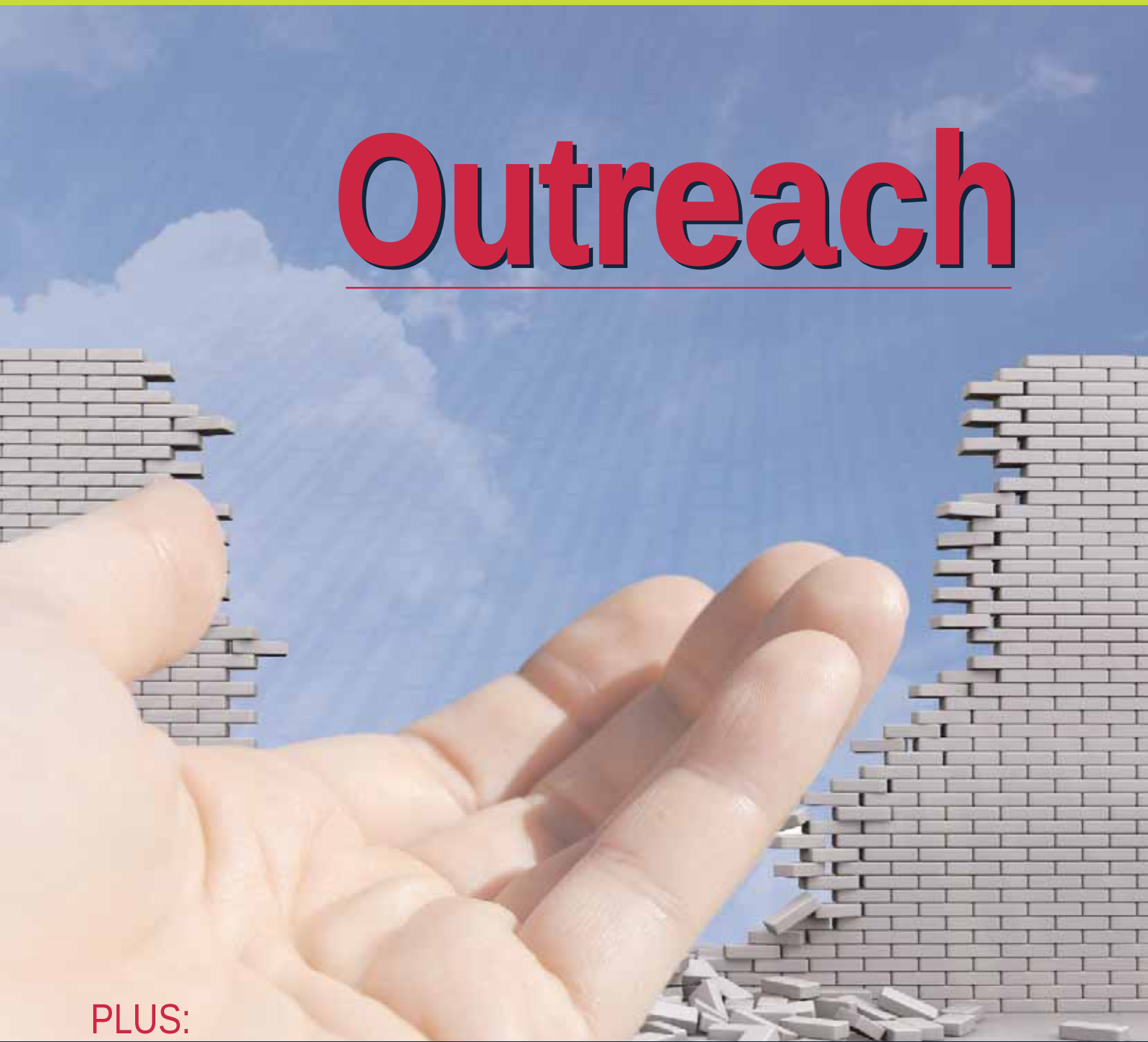
ICU MANAGEMENT

Volume 8 - Issue 1 - Spring 2008

The Official Management and Practice Journal

Outreach



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Outreach

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To many, the mere idea of an intensive care unit encompasses a vision of a well-run, sterile and enclosed space. When ICUs were first established, this idea of isolation was central to its' premise. But what we in ICU Management have learned, is that our patients' care often stretches beyond the sterile walls of our units, and their outcomes are often dependant on the actions that begin before they reach our ward and continue long after they depart.

The 'ICU without walls' is a modern inclination that leaves itself open to endless possibilities and options. Of course cost effectiveness aside, we all wish there was a way to improve outcomes and lower length of stay rates without deviating too far from the central and at times, complex roles we play in our ICUs. From Australia to Italy and further still, to Canada, intensive care managers are pushing back the walls of their own units, embracing new initiatives which strive to increase the quality of care provided to their patients while contending with the endless challenge of limited resources.

Whether they are referred to as Medical Emergency Teams (MET), Rapid Response Teams (RRT) or Critical Care Response Teams (CCRT); and are nurse-led, intensivist-led or some other combination, at the core of all of these initiatives is the need of practitioners to improve response time and save lives.

Prof. Ken Hillman, one of the pioneers of the Outreach initiative in his native Australia provides us with a brief overview; while Mary Ellen Salenieks and Dr. Stuart Reynolds describe in detail the comprehensive and innovative Outreach projects underway in the province of Ontario, Canada; and Dr. Maurizia Capuzzo and Dr. Barbara Vaccarini of Italy highlight some key considerations with regards to the practical implementation of Outreach programmes in our intensive care units. In our Interview this issue, Prof. Antonio Artigas describes the well-established Vital Risk Team (VRT) programme at work in his own hospital, and he shares his views on the future of intensive care.

Our Matrix begins with part one of an in depth look at the current controversies in ventilator-associated pneumonia submitted by Karen Pickett; Dr. Mariam Alansari discusses the use of peripherally inserted central catheters in the ICU; and in our Hypothermia Series, Dr. Dalton Dietrich focuses on therapeutic hypothermia for spinal cord injury.

In ICU Management, we must be ever mindful of the need to continuously evaluate and strive to improve the quality of care we provide within our units as well as transitory care provided for our patients when they venture outside of our direct scope of care. With this in mind, Dr. Patrick Van de Voorde outlines recent studies bent on improving the quality of care in general and specifically in paediatric emergencies; while Dr. Christy Dempsey utilises her background in intensive care and emergency services management to shed some light on collaborative flow models to improve communication within and between departments.

With the advent of new technologies and advances, come innovative ideas and strategies. As we strive to improve response times and improve overall patient outcomes, we in ICU Management need to incorporate these new techniques, as well as evaluate and share our progress. Whether it is introducing an Outreach programme to our critical care strategy, adding training courses to improve quality or using communication models, we must embrace progressive approaches to maintain and enhance the high quality of care we provide.

Letters to the Editor & Requests for References Cited in ICU Management
editorial@icu-management.org

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ICU Management is the Official Management and Practice Journal of the International Symposium on Intensive Care and Emergency Medicine and was previously published as Hospital Critical Care.

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News

News World

World Health Organization Reports Highest Rates Of Drug-Resistant Tuberculosis To Date

www.who.int

Multidrug-resistant tuberculosis (MDR-TB) has been recorded at the highest rates ever, according to a new World Health Organization (WHO) report that presents findings from the largest survey to date on the scale of drug resistance in tuberculosis.

The report, Anti-Tuberculosis Drug Resistance in the World, is based on information collected between 2002 and 2006 on 90 000 TB patients in 81 countries. It also found that extensively drug-resistant tuberculosis (XDR-TB), a virtually untreatable form of the respiratory disease, has been recorded in 45 countries.

The report also found a link between HIV infection and MDR-TB. Surveys in Latvia and Donetsk, Ukraine found nearly twice the level of MDR-TB among TB patients living with HIV compared with TB patients without HIV.

Based on analysis of the survey data, WHO estimates there are nearly half a million new cases of MDR-TB--about 5% of the total nine million new TB cases--worldwide each year. The highest rate was recorded in Baku, the capital of Azerbaijan, where nearly a quarter of all new TB cases (22.3%) were reported as multidrug-resistant. Proportions of MDR-TB among new TB cases were 19.4% in Moldova, 16% in Donetsk in Ukraine, 15% in Tomsk Oblast in the Russian Federation and 14.8% in Tashkent in Uzbekistan. These rates surpass the highest levels of drug resistance published in the last WHO report in 2004. Surveys in China also suggest that MDR-TB is widespread in that country.

News Research

HIV Breakthrough: Protein That Fights Immunodeficiency Identified

www.umontreal.ca

A Canada-U.S. research team has solved a major genetic mystery: How a protein in some people's DNA guards them against killer immune diseases such as HIV. In an advance online edition of Nature Medicine, the scientists explain how the protein, FOX03a, shields against viral attacks and how the discovery will help in the development of a HIV vaccine.

"HIV infection is characterised by the slow demise of T-cells, in particular central memory cells, which can mediate lifelong protection against viruses," said lead researcher Rafick-Pierre Sékaly, at Université de Montréal.

The breakthrough emerged by studying three groups of men: One HIV-negative sample, a second HIV-positive group whose infection was successfully controlled through tritherapy and a third group whose HIV did not show any symptoms. Called elite controllers, this third group fended off infection without treatment because their immune system, which would normally be attacked by HIV, maintained its resilient immune memory through the regulation of the FOX03a protein.

News Industry

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Covidien is proud to sponsor the www.vapaway.eu website developed by a panel of European key opinion leaders with the ambitious goal of enhancing education on and improving global awareness of VAP. The VAPAWAY questionnaire is the first ever online European evidence-based educational survey for the prevention of VAP.

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Reducing Diagnostic Uncertainty – Procalcitonin and Bacterial DNA: Professor Stephan Harbarth, MD MS
Glucose Control in Severe Sepsis – How Tight? Professor Frank Martin Brunkhorst, MD
Concluding Remarks: Professor Jean François Timsit, MD Ph.D.

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Overview of Outreach

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Intensive care medicine arguably began in Copenhagen in the early 1950s. Mortality from poliomyelitis was reduced from 80 to 40% as a result of intubation and artificial ventilation. Dedicated Intensive Care Units (ICUs) were soon established and the experience gained by clinicians in caring for seriously ill patients with poliomyelitis was used to support other patients such as patients after major surgery and those with a wide range of serious medical conditions. These patients would almost certainly have died prior to the establishment of ICUs.

The speciality of intensive care was nurtured within the four walls of the ICU. Nurses, and then medical practitioners, were specifically trained in the speciality of intensive care. The speciality blossomed in the 1970s and 1980s. Specific textbooks and journals were published and thriving national and international societies were established, in addition to well-organised training and research initiatives. The physical space of the ICU enabled much of the speciality to be defined. However, it gradually became apparent that patient outcome from intensive care was determined by their management before their admission to the ICU as well as by management within the ICU.

The serious impact of delayed resuscitation was noted in 1989 when "lead-time bias" was emphasised as influencing hospital outcome, independent of the severity of illness on admission to the ICU. There is good evidence that multi-organ failure begins at an early stage of untreated ischaemia and hypoxia. During the 1990s there was a trend to provide supranormal oxygen delivery on admission to the ICU. It soon became evident that this did not influence patient outcome, as serious and sometimes irreversible organ damage had already occurred. Later we learnt that early resuscitation, beginning in the Emergency Department, did improve outcome.

Moreover, there is a high incidence of potentially preventable antecedents in the hours before serious adverse events such as deaths, cardiac arrests and unanticipated admissions to ICUs. It is also clear that the management of seriously ill patients prior to their admission to the ICU was often delayed and managed by unskilled staff. The number of potentially at-risk patients in general wards is increasing as the nature of hospitals change. Patients are now older, with increasing co-morbidities and having more complex surgery and other treatments.

In order to improve patient outcomes throughout the whole hospital, intensive care specialists established the Medical Emergency Team (MET) system. The system consists of criteria, which define at-risk patients such as vital sign and observational abnormalities; as well as a rapid response to those patients.

Many variations on this initial concept have now been developed, using different criteria and levels of response. Examples of these include the patient-at-risk team; a system based on a modified early warning score. One of the unanticipated advantages of establishing such systems is that they increase the awareness of staff around the significant problem of seriously ill patients outside the ICU. The concept of 'Critical Care Without Walls' is now common in many countries. Along with specific responses to potentially at-risk patients, intensive care staff are also becoming involved in strategies such as educational initiatives and consultation services.

Broadly, the extension of intensive care skills and experience outside of the ICU is sometimes known as Outreach. The speciality of intensive care obviously does not have a monopoly on the management of seriously ill patients. Other specialities such as emergency medicine and acute general medicine are increasingly being involved in hospital systems designed to recognise and resuscitate the seriously ill at the earliest stage possible.

Before and after and case controlled studies have demonstrated significant improvement in the incidence of serious adverse events as a result of introducing a MET-type system. Outreach systems have also been shown to have a beneficial effect on patient outcome.

The largest study using cluster randomisation (MERIT Study) of 23 hospitals was inconclusive. However, the study provided insight into the important of implementation of the system across a whole hospital. Evaluation of the effects of a complex system on patient outcome is more challenging than, for example, comparing a new drug against a placebo. For example, in the MERIT study, less than 50% of patients with criteria identifying them as being seriously at risk had a call made and many patients did not have their vital signs measured in a timely fashion. Obviously, response to seriously ill patients cannot occur if a team is not alerted or if the vital signs that trigger calls are not measured.

Many hospitals in North America, Europe and Australasia now have some sort of rapid response or outreach programme in operation. Like the establishment of ICUs themselves, we may never be able to accurately assess its impact on serious illness. Nevertheless, few intensive care clinicians would advocate delayed treatment of hypoxia and ischaemia. ■

For references please write to: editorial@icu-management.org

Critical Care Response Teams

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Background

Ontario's 12.54 million residents constitute 38.9 % of Canada's population (Statistics Canada 2005). The province is one of 10 Canadian provinces responsible to deliver federally mandated healthcare. Three Canadian territories receive federally managed health services. The Ministry of Health in Ontario (MOH) funds acute care hospitals across the province ranging from small community sites to large multi-site and Academic Health Science Centres (AHSC). Critical care resources and expertise are accessed, when required, through organised referral and transfer systems.

The tipping point for Ontario's much needed critical care transformation was reached in 2003 through the convergence of key factors: the crisis of severe acute respiratory syndrome (SARS), and the advancing demographic wave of 'boomers'. The result was the creation of a provincially funded Critical Care Strategy.

Critical Care Response Teams

Critical Care Response Teams (CCRTs) in Ontario are a major component of Ontario's critical care strategy. Currently, there are 3 distinct branches of the critical care response team initiatives. The first and largest branch is intensivist-led teams at select adult acute care hospitals. The second is a paediatric CCRT demonstration project and the third is a demonstration of three distinct alternative model CCRTs, with variable funding and responder processes.

Intensivist-Led CCRTs

Ontario's intensivist led critical care response team structure is a hybrid of successful rapid response system models from the UK and Australia. The CCRT incorporates the outreach and education functions of many UK teams and the rapid response function of Australian medical emergency teams. The Ministry of Health and Long Term Care engaged clinical experts who had been involved in the pilot projects as well as many other clinical initiatives. This resulted in a project plan and budget for a four site demonstration project, which within a year was expanded to a 23 site roll out of critical care response teams which has now expanded to a total of 27 intensivist led teams across Ontario.

The first focus of CCRTs was on the hospitals that served as provincial critical care resources. This decision was consistent with the critical care strategy's focus on access, quality and having the resources work as a system as opposed to a collection of independent entities with mutually exclusive responsibilities.

The ICUs needed to be:

- Closed and intensivist managed
- Composing 12 or more beds capable of supporting mechanical ventilation
- Offer 2 ICU based services: (1) A designated trauma centre, neuro-critical care or transplant centre (2) Have advanced ventilation capacity, large ICU (> 19 beds, ICU based renal replacement therapy
- Have strong clinical leadership
- Have enough nurses to operate the ICU and a CCRT
- Be open to CritiCall, the agency that locates resources (speciality, physician, diagnostics, bed) for critical care patients who require transfer

The intensivist led teams in Ontario are funded to provide the staffing compliment to successfully implement a Rapid Response System within participating hospitals. An awarded CCRT funds a physician leader, a Co-Lead, 4 – 5 full time CCRT responders and the availability of a 24/7 intensivist. In addition, the MOH commissioned the Canadian Resuscitation Institute to develop and deliver a two-day CCRT course for CCRT responders (ICU RN's or Registered Respiratory Therapists (RRT's). The course provided review and practice of the assessment and resuscitation skills as well as crisis resource management skills, which are likely to be needed in dealing with a deteriorating patient on the ward.

The implementation of the teams across the newly funded sites attempted to balance structure with flexibility, and central control with local application. A phased implementation was mandated. The first six months (Phase I), were devoted to team selection, CCRT responder education, physician engagement, and hospital-wide education and marketing.

Phase II was a twelve-week preceptorship period where an intensivist was funded to provide service and focus on assessment and resuscitation skills of the team in the ward setting; funding for three of the CCRT responders to work with the intensivist each day was put in place to optimise individual and group learning opportunities. The CCRT service was available weekdays from Monday through Friday. The CCRT during this period responded to consults, followed patients discharged from the ICU and continued to in-service ward staff. Phase III was the start of 24/7 service.

Throughout the first year regular biweekly teleconferences were held to provide a forum for sites to learn about and discuss many issues and decisions related to their CCRTs. Although there were clear

expectations for the team it was also acknowledged that this was and remains a new service model in Ontario. The rapid response of critical care experts to the bedside is believed to be a model of teamwork and mutual education; and this may impact how other hospital care teams function. CCRT's also put patient safety initiatives at the fore for each hospital and impacted many hospital services and activities.

The effectiveness and success of many patient safety initiatives, including CCRT's, require a change in culture. Sharing strategies and techniques, continued engagement of stakeholders, data analysis and feedback are integral to shift culture. All sites were required to submit baseline data of their cardiac arrest rates (defined as the provision of CPR), mortality rates, ICU Length of Stay (LOS) rates and 48-hour readmission to the ICU rates. Once service began, every patient visit required a small data set be entered on a provincial web based Critical Care Information System. Data analysis and report development are an ongoing process and will lead to development of benchmarks.

Results

Uptake of service, which is the number of consults per 1000 inpatient admissions, averaged over 30 consults per month from the beginning of 24/7 service. This is an important key indicator. What has been consistent in the literature regarding Rapid Response Services is that the teams must be utilised in order to have an impact.

Although not all sites that began full service February 2007 have had changes in key indicators (cardiac arrest, mortality, 48-hour readmit, ICU LOS), most sites have had changes in at least one indicator. Deeper review and understanding as to what the data is telling us about the project overall and about specific sites will be undertaken iteratively and in discussion with sites. In addition, sites have begun to do data analysis of their own data linked with other internal data around issues and found a variety of benefits they believe are attributable to the CCRT.

Paediatric CCRTs (PCCRTs)

Ontario has five paediatric AHSC's, four of which are in their second year of a demonstration project. The implementation, education, practice and intensivist leadership mirror the adult CCRTs.

Early review of the initiative led to the development of an extramural PCCRT service component outside of their immediate hospital. The CCRT intensivist receives calls, from community hospital physicians seeking management and transport advice regarding critically ill children. The extramural PCCRT service processes have been developed and refined in partnership with CritiCall and ORNGE. CritiCall is Ontario's service that supports physicians to access urgent and emergent care and is reached through a toll free telephone number. ORNGE provides transport for critically ill people in Ontario.

In addition to ensuring that no emergency room physician is left without consultant support when caring for an urgent or emergent critically ill child, the evaluation of the service will provide opportunity for quality improvement and critical incident review to further strengthen processes.

Alternative Model CCRTs

The essential ingredients of a rapid response system are: increase early recognition of deterioration; develop processes for alerting a responder, and designation of skilled responder.

A demonstration model is underway to test the feasibility of three different ways to provide critical care response services. The goal of the alternative model demonstration project is to develop service models that will improve patient outcomes through the timely access to critical care expertise and provide the ministry with a clear understanding of the cost for each model and what deliverables can be expected.

Five community hospitals with varying ICU resources are working with the ministry:

- Three hospitals are implementing a nurse education model
- One hospital is implementing a hospitalist led response model
- One hospital is implementing an ICU MD model.

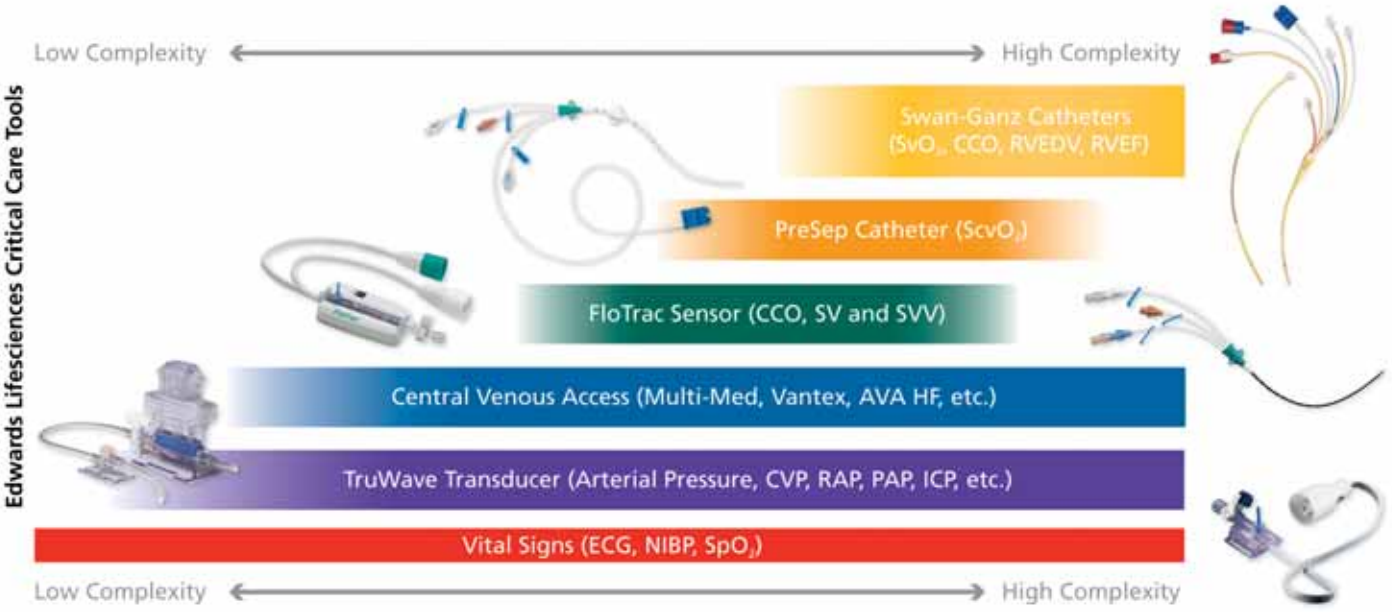
All models have a site lead physician and a site co-lead nurse or respiratory therapist. The sites are working closely with the ministry to develop evaluations particular to their alternative model.

Conclusion

The rapid uptake of CCRT services at all hospitals within the project and the universally positive feedback from providers and users supports the belief that the introduction of these teams meets a significant need in hospital wards. The commitment of stakeholders in Ontario is to stay the course while we await evidence of long-term clinical improvements. At the same time we will work to continuously strengthen the quality and sustainability of the service through collaborative development, quantitative and qualitative evaluation. ■

The Continuum of Critical Care

The Critical Care Patient



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Effects of Outreach: An Alternative View

Outreach should improve the outcome of ward patients whose conditions deteriorate. The introduction of any outreach team includes ward staff education, definition of calling criteria, and availability of the team at least in daytime. Studies and reviews do not give clear definite information, so at present we remain unsure as to how to educate ward staff and how much ICU workload will be required to front ward calls.

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Patients admitted to the hospital may develop clinical deterioration and/or present serious adverse events while in the ward. Many things are required to face those situations: a) ward staff should rapidly identify the patient at risk, and alert staff with experience in emergency medicine (afferent limb); b) alerted staff should promptly arrive at the patient bedside, and institute the life-saving treatments required (efferent limb) (De Vita et al. 2006). Ideally, such a Rapid Response System (RRS) consisting of early recognition and rapid intervention should allow better outcome. The recent first consensus conference on Medical Emergency Teams (De Vita et al. 2006) has categorised the three most common reported terms to describe the efferent limb of RRS:

- Critical Care Outreach (CCO), generally staffed by Intensive Care Unit (ICU) trained nurses and introduced in the UK according to the Comprehensive Critical Care paper by the Department of Health (2000);
- Medical Emergency Team (MET), which includes a physician expert in emergency medicine and a ICU nurse, and allows instituting immediately life saving intensive treatments and prescribing diagnostic tests;
- Rapid Response Team, recently promoted in the USA, usually being nurse-led.

Whichever name is used, RRS should improve the outcome of the patients treated. If this occurs, the introduction of RRS in all hospitals will become compelling, and an economic analysis necessary. Therefore, the first step is to demonstrate whether RRS improves patient outcomes. Despite some good results published in scientific literature (Ball et al. 2003, Bellomo et al. 2003, Bellomo et al. 2004, Buist et al. 2002, Priestley et al. 2004), recent systematic reviews (Åneman and Parr 2006, Esmonde et al. 2006, McGaughey et al. 2007, Winters et al. 2007) stressed that evidence was insufficient to conclusive demonstration of the efficacy of RRS, due to methodological problems. One of the studies evaluated in the Cochrane review, (McGaughey et al. 2007) was performed by Priestley and colleagues (2004) in 16 wards, where the ward staff received training in the care of the acutely ill patient and the CCO nurse visited every patient admitted within 24 hours. The mortality in general hospital wards was reduced, but the design of the study did not focus on the specific effects of having the CCO nurse visit at the time of initial assessment, staff education, and calling (trigger) criteria.

"Despite some good results published in scientific literature recent systematic reviews stressed that evidence was insufficient to conclusive demonstration of the efficacy of RRS..."

The design of a MET system could be more effective than CCO, due to the ability of MET staff to institute intensive treatments and to prescribe diagnostic tests and therapy. We may hypothesise that it should be the best candidate for lowering incidences of outcome measures, such as in-hospital unexpected deaths, cardiac arrests and unplanned ICU admissions. In one of the before-after studies, the rate of unexpected cardiac arrests significantly decreased (Buist et al. 2002), but the increased number of Do-Not-Resuscitate orders after the introduction of MET, a trend towards a reduced incidence of cardiac arrests

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already present and the different case mix may have influenced the result (Smith and Nolan 2002). Also another before-after study, comparing two 4-month periods, separated by 12 months devoted to education and 2 months to run-in, reported that the number of both unexpected cardiac arrests and inpatient deaths were reduced

"…we have yet to determine which Rapid Response System is optimal, how education should be organised, and which trigger criteria are suitable."

(Bellomo et al. 2003). Interestingly, in a reply to a letter (Tibballs and Kinney 2004), Bellomo and colleagues (2004) demonstrated that the number of cardiac arrests had already dropped during the education period.

A concurrent study where the MET system was introduced in one hospital, leaving two hospitals as control, did not find any statistically significant difference in cardiac arrest or death rates after case mix adjustment, but reported a significantly reduced number of unplanned ICU admissions at the MET intervention hospital over the 6-month period of the study (Bristow 2000). This lack of efficacy of the MET may have been related to lack of sensitivity of calling criteria (too late identification) or MET underutilisation, because no special efforts regarding staff education in the study period were made.

Finally, the MERIT study, a Randomised Controlled Trial performed in Australia, evaluated the effects of MET system which was implemented in 12 hospitals, leaving other 11 allocated to control (Hillman et al. 2005). The MERIT study showed that the MET system did not affect the incidence of serious clinical events. Moreover, the fact that nearly half of the calls in the control hospitals were made without cardiac arrest or unexpected death provides evidence that factors other than MET, possibly ICU staff, effectively attended the patient at risk in control hospitals. Furthermore, the high number of calls recorded in the MERIT study, despite the low sensitivity of calling criteria, may be the result of increased awareness, and increased awareness may be the result of ward staffing education, which was maintained in the control hospitals.

The conclusions of studies and reviews raise new concerns because the introduction of any RRS must include at least the following things:

- Ward staff education;
- Definition of calling or trigger criteria;
- Availability of the team.

Considering that the number of RRS calls is higher in day than in night time (Galhotra et al. 2006), the economical burden may be limited. Nevertheless, we have yet to determine which RRS is optimal, how education should be organised, and which trigger criteria are suitable. It is possible that the effects of staff education are attributed to the efferent limb of the RRS (CCO or MET). In fact, training on signs of clinical deterioration may improve staff ability in early detection of patients at risk, making definite calling criteria less useful, as demonstrated by the high number of calls due to staff concerns in the MERIT study. Accordingly, a detailed program of education, feedback and decision support for nursing and medical staff before, during and after implementation of a MET system increased the number of monthly MET calls from 25 to 79 over 3.5 years (Jones D et al. 2006).

If these findings are confirmed, the new issues will be how to educate ward staff and how much ICU workload will be required to front ward calls. The Italian Regional Health Agency of Emilia-Romagna has recently funded a project (General Hospital mortality & Education Sepsis-Targeted, acronym GHEST) to show the pure effect of staff education to early detection and treatment of sepsis on the outcome of hospital patients. We also expect information about the calls to the intensivist teams and the clinical severity of the patients attended, and, additionally, about the clinical outcome of unplanned ICU admissions from ward or emergency department, with and without severe sepsis. ■

Current Controversies in Ventilator-associated Pneumonia

Part I: Epidemiology and Pathophysiology

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Ventilator-associated pneumonia (VAP) is a common complication in mechanically ventilated patients and is associated with a considerable increase in morbidity and costs. Despite many years of research and important advances in our understanding of the pathogenesis of VAP, many issues surrounding the diagnosis and management of VAP remain unresolved. Indeed, even the terminology provides a point for debate with some experts preferring the term "endotracheal-tube-associated pneumonia" or even "artificial-airways-associated pneumonia", particularly with the increased use of non-invasive ventilation.

The ongoing controversies surrounding VAP were the focus of a summit meeting just prior to the ESICM congress last October in Berlin, which gathered six European experts (Dr. Jean-Yves Fagon, France; Dr. Salvatore Maggiore, Italy; Dr. Jordi Rello, Spain; Dr. Antonio Torres, Spain; Dr. Jean-Louis Vincent, Belgium; and Dr. Tobias Welte, Germany) in this field to present an overview of the key aspects currently under debate. In this article, we will focus on ongoing controversies in the areas of epidemiology and pathophysiology discussed during that meeting, and in the next issue of ICU Management, we will concentrate on the diagnosis and management of VAP.

Agreement and Controversy in the Epidemiology of VAP

General Agreement

One aspect for which there seems to be universal agreement is that VAP is a frequent complication in mechanically ventilated patients. A recent systematic review, which included 89 studies that assessed the incidence of VAP, reported that 10-20% of patients receiving mechanical ventilation for more than 48 hours will develop VAP (Safdar et al. 2005). Meta-analyses group results from various study types, studies of different sizes, different populations, and even using different definitions, and their conclusions are therefore limited by the nature of the studies included. Nevertheless, the 10-20% incidence seems to be fairly representative of the figures quoted in individual, high quality, prospective studies. There is also general agreement that VAP is associated with increased durations of ICU and hospital stay, with increased resource use, and increased costs, which have been calculated to be in excess of $10,000 per patient (Safdar et al. 2005).

Risk factors for VAP have been fairly widely reported and are so numerous that it is almost not worth while listing them; generally, the sicker the patient the more likely he or she is to develop VAP. Importantly, the incidence rate of VAP seems to increase with increasing duration of mechanical ventilation, reaching a peak daily risk of developing VAP of 3.3% on day 5, and then decreasing to a risk of just 1.3% by day 15 (Cook et al. 1998). More controversially, the use of antibiotics prior to intubation has been associated with a reduced risk of developing VAP, depending on the underlying microorganism.

Ongoing Controversy

In terms of epidemiology, perhaps the topic that generates most controversy is the so-called "attributable mortality". Attributable mortality refers to the mortality that occurs directly as a result of the development of VAP. Multiple studies have assessed this issue over the last twenty years or so and provided widely differing results, with some studies reporting no increase in mortality rates and, therefore, no attributable mortality, while others suggest an increase in mortality of more than 40%! One of the problems with assessing mortality in intensive care unit (ICU) patients as a whole and in VAP patients in particular, is that multiple

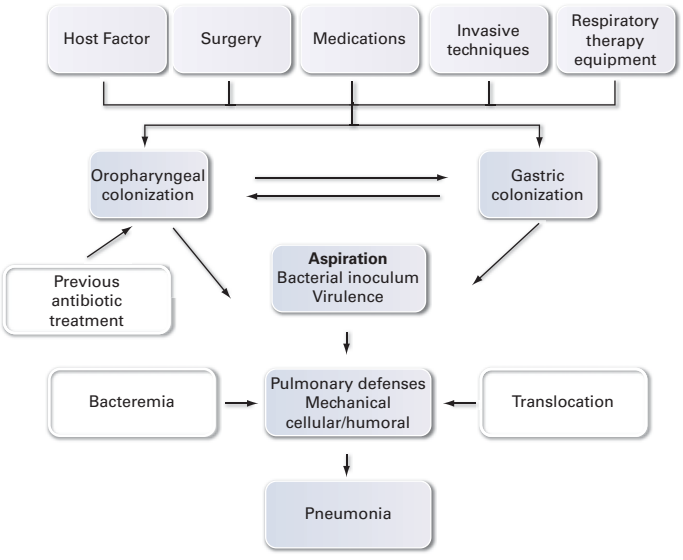

Figure 1. Factors involved in the pathogenesis of VAP

factors can influence outcomes in this group of seriously ill patients, including the presence of comorbid diseases, the specific infecting organism, the time of onset of disease, the severity of the host response, and whether or not the patient has received appropriate and timely antibiotic therapy. In studies assessing the impact of VAP on mortality, it is difficult to control for all the possible exogenous and endogenous factors that may influence outcomes, making interpretation of attributable mortality rates challenging.

Agreement and Controversy in the Pathophysiology of VAP

General Agreement

The classical, generally accepted factors involved in the pathophysiology of VAP are presented in Figure 1. Colonisation of the oropharyngeal cavity with abnormal hospital-acquired pathogens is considered one of the most important factors in the development of VAP. Sinus colonisation, body position, and dental plaque may also play a role. The role of gastric colonisation and aspiration is more controversial.

Importantly, the endotracheal tube can influence the development of VAP by several mechanisms, including a direct impact of the cuff on the local mucosa, an enhanced capacity of tracheobronchial cells to bind Gram-negative organisms, the creation of additional binding sites for bacteria due to exposure of the basement membrane of the bronchial tree, the creation of a biofilm in the endotracheal tube serving as a reservoir for bacteria, and the presence of pooled subglottic secretions that accumulate between the cuff of the endotracheal tube and the tracheal wall leading to increased aspiration.

Focussing on the last two factors, several studies have demonstrated reduced VAP rates in patients who undergo continuous subglottic suctioning of secretions. Similarly, low cuff pressures may be associated with increased rates of VAP as this facilitates leakage of colonised subglottic secretions around the tube (Rello et al. 1996), and continuous cuff pressure monitoring may be better than manual monitoring as it provides more stable cuff pressures.

Biofilms are aggregates of microorganisms and form in endotracheal tubes over 24-72 hours, and perhaps even sooner. The bacteria in biofilms can be inoculated into the distal lower airways by aspiration or by positive pressure ventilation and can be projected up to 45 cm. This phenomenon occurs in all tube types and is most manifest at the tip of the tube. Biofilm formation is a dynamic phenomenon with several phases including attachment, growth, and detachment. Antimicrobial penetration and leukocyte function are impaired within biofilms. Several prospective studies have demonstrated that microorganisms causing VAP coincide with those cultured from biofilms (Adair et al. 1999; Feldman et al. 1999).

Ongoing Controversy

Although the formation of biofilms is widely acknowledged, a definite causal link between biofilm formation and development of VAP has still not been clearly demonstrated. Indeed, some would argue that if biofilm formation is important, why does the risk of VAP not continue to increase with time? One reason for this apparent discrepancy is that biofilm formation is just one of the many factors influencing the development of VAP.

However, if biofilms are important, should we be replacing endotracheal tubes at regular intervals? This would be practically difficult as reintubation in itself is associated with risks. Another approach may be to perform a tracheostomy; the shorter tube length and better oral hygiene reduce the problem of biofilm formation in such patients. A recent retrospective study suggested that early tracheostomy was indeed associated with a reduced incidence of VAP (Nseir et al. 2007), but other studies have suggested increased rates of VAP in patients with tracheostomy (Ibrahim et al. 2001).

Summary

Despite considerable research in the field of VAP, many areas remain controversial. In Part I of this report, we have focused on some of the ongoing controversies in the epidemiology and pathophysiology of VAP. In Part II, we will concentrate on controversies in diagnosis and antimicrobial management. Whatever the field, controversy generally suggests a lack of adequate available evidence in support of one or other argument, and results of ongoing studies should help resolve some of the current debates. ■

Acknowledgement: The symposium was supported by an educational grant from Kimberly-Clark.

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[1] Smulders K., van der Hoeven H., Weers-Pothoff I., Vandenbroucke-Grauls C. A randomized clinical trial of intermittent subglottic secretion drainage in patients receiving mechanical ventilation. Chest. 2002;121:858-862

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Peripherally Inserted Central Catheters: Potential For Use In the ICU

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Central venous catheters (CVCs) are widely used in critically ill patients. They permit haemodynamic monitoring and allow access for the administration of fluids, blood products, medications, and, sometimes, total parenteral nutrition (TPN). Although CVCs have significant benefits in many clinical situations, the increase in their use over the last 20 years has been associated with at least a doubling of resultant nosocomial infections (Fraenkel et al. 2000). The average rate of CVC-associated blood stream infection (BSI) is 5.3 per 1,000 catheter days in the ICU. The attributable mortality for these BSIs is and their attributable costs are high. The documented infection rate for PICCs is 0.75 infections per 1000 catheter days, compared with short-term (non-medicated) central venous catheters at 2.51 infections per 1000 catheter days (Carrico 2005), resulting in substantial savings.

Moreover, unsuccessful insertion of CVCs may occur in up to 20% of cases. The hazards associated with attempted CVC insertion (whether successful or not) include arterial puncture, haematoma, pneumothorax and hemothorax. In general, the rate of major CVC complications (e.g., pneumothorax or vessel laceration requiring repair) and minor complications (e.g., arterial puncture without significant haemorrhage) is between 0.5 and 10%. There are no risks of pneumothorax with the PICC insertion procedure.

PICCs first gained popularity in the 1970s, and their use has grown steadily since then. In a recent report, Centers for Disease Control and Prevention (CDC), in the US, recommends usage of peripherally inserted central catheters (PICCs) when the duration of IV therapy is likely to exceed 6 days. As a result of the CDC recommendation, PICCs have now become well recognised as reliable central venous access devices (VAD), with lower potential for complications than short-term central venous catheters.

PICC is a special long, soft, intravenous line. For a VAD to be termed a PICC it must be inserted into the peripheral vasculature and the distal tip of the catheter must terminate in the superior vena cava, the inferior vena cava, or the proximal right atrium. A vein in the arm is the most common point of insertion. Progress into the chest via the peripheral system follows the basilic or cephalic veins into the axillary, the subclavian, then the innominate veins that join to form the superior vena cava (SVC). Optimal central venous placement is the lower third, distal portion of the SVC, or as close to the right atrium as you can get without entering. A tip termination proximal to the superior vena cava is technically not a PICC but rather a peripheral catheter. After the PICC is inserted, confirmation of correct tip placement by X-ray requires that the PICC line material be visible on radiographs. Therefore, radiopaque substances (e.g., barium sulphate) are blended into the PICC-line material.

Many intravenous medications and solutions cause damage to the peripheral venous endothelium and should be administered centrally to avoid damage. With central tip termination of PICC, the blood flow around the catheter is high (2 L or more per minute) which provides immediate dilution of the infusate and helps protect the vessel walls from chemical irritation by the prescribed therapy. Thus, PICCs may be used for any infusate, regardless of osmolarity, pH, or other chemical properties of the solution or medication (Vesely et al. 2002).

Various articles have proven that central venous pressure can be checked reliably from PICCs (Alansari and Hijazi 2004; Black et al. 2000). More over, it has been shown that attempted bedside PICC placement in the ICU could be successful 97.8% of the time.

Although these facts, in addition to its' other features, make PICC an excellent option for usage with patients in the ICU, more studies need to be done to support its' use.

Pre-Insertion Assessment

An assessment should be done as early as possible during a patient's hospital/ICU admission, in order to determine the type of VAD that is most appropriate for the therapy type and duration, condition of veins, and diagnosis. The most appropriate device should be able to provide access throughout the course of therapy, minimise pain and venous damage, use nursing time efficiently, and be cost effective.

"Dwell time" is the maximum expected duration considered appropriate for a given type of device. However, many devices have no established dwell time. Nontunnelled percutaneous central venous catheters, such as internal jugular, subclavian, and femoral devices, are generally considered appropriate only for short-term use, due to the higher risk of infection compared with PICCs, implanted ports, and tunnelled catheters. It is well known that PICC lines can stay for a long time (more than a year) with good care (Fiore 2005).

Contraindications

Insertion of any central VAD must be performed judiciously, as every insertion increases the risk of vessel damage, thrombosis, and stenosis, and potentially creates difficulty in obtaining future access. PICC insertion often becomes difficult or impossible for patients who have had multiple PICCs previously. If a patient requires frequent intermittent access, an implanted venous port may be a preferred option.

PICCs should not be used for frequent intermittent access or for blood sampling. Because a PICC is very long and thin, it is not advisable to insert it solely for the purpose of obtaining blood for laboratory analysis. Each blood draw increases the risk of occluding the catheter. A risk-benefit analysis should be done to determine the value of using a PICC for drawing blood.

Several factors contraindicate PICC placement: lack of peripheral access, venous thrombosis, and end-stage renal disease. Patients with restricted peripheral access must be sent to the interventional radiology department to have PICC placement performed under fluoroscopy. The presence of upper extremity or subclavian thrombosis is another contraindication for bedside PICC insertion, regardless of whether or not ultrasound is used. These patients also may be referred to interventional radiology to have a PICC inserted under fluoroscopy.

Patients with chronic renal failure and end-stage renal disease are not appropriate candidates for PICC placement. The need to preserve peripheral veins for future dialysis fistulas is a critical issue for these patients. Insertion of any catheter in the upper extremity or the subclavian veins can cause thrombus formation and scarring that could reduce the probability for successful fistula development. The internal jugular vein, particularly the right jugular vein, is the preferred insertion site for these patients. Although this choice is not without risks, it provides shortest and most direct route to the superior vena cava and minimises potential venous damage (Saad and Vesely 2003).

Development of PICC Line Insertion program

Hospitals are responsible for developing training curricula to certify staff in PICC line insertion. In accordance with Intravenous Nurses Society (INS) guidelines, these courses require only an 8-16 hour class including clinical training. Hospitals with well-developed PICC line insertion programs recommend separating the PICC line program from radiology if there is enough patient volume, as it will generate significant cost savings for the hospital. This is a result of lower procedure costs than those resulting from a radiologist who performs the insertion in the radiology department. In addition to the decreased costs, risk of infection is also lessened, as staff at the bedside closely monitor insertion.

"A PICC line insertion should be the VAD of choice."

Conclusion

PICCs are central catheters with all the benefits of centrally inserted catheters, without some of the disadvantages. A PICC line insertion should be the VAD of choice, due to its lower incidence of infection compared with subclavian and internal jugular percutaneous catheters. Advantages focus on the less serious nature of the complications that occur with PICCs as opposed to other central lines. Vein identification is easier with peripheral access than with more risky access into the chest. Peripheral access avoids the risk of pneumothorax, nerve damage to the nerves of the brachial plexus or those in the chest, and infection with lower heat and bacterial growth on the skin of the arms and legs. Disadvantages with PICC lines are frequent occlusions due to the small diameter, risk of breakage and frequency of phlebitis. When considering the risk benefit ratio with central lines including both PICCs and chest lines, PICC lines clearly have the greatest benefit with the least risk. ■

For more information on developing a PICC line program:
Intravenous Nurses Society (INS), Cambridge, Massachusetts
www.ins1.org

Visitors in the ICU:

Pro's and Con's of Unrestricted Visitation

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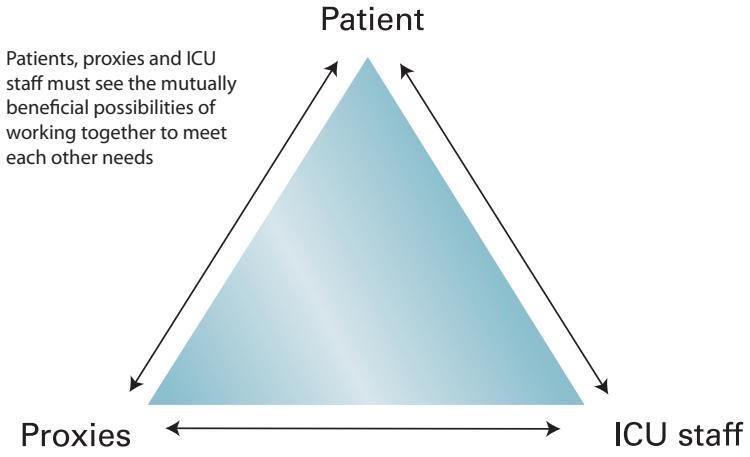
Introduction

"Patient- or family-centred care" is a popular term favoured currently by ICU management teams. However, what is often overlooked is that in a niche environment with few limits, the latter not only implies that high-standard diagnostic and therapeutic care will be provided, but also that extended needs of the patient and his proxies as well will be met as well (Azoulay et al. 2001, Vandijck et al. 2007a). Patients and families place high value on the presence and support of loved ones. For both, this has been associated with a decreased level of stress and increased comfort (Abbott et al. 2001). Notwithstanding this, the vast majority of adult ICUs in Europe and the United States place restrictions on visitation. In a French study by Quinio and collaborators, 97% of ICUs reported restricted visits, allowing the patient proxies at only one (33%), two (62%), or respectively three (2%) prearranged access periods (Quinio et al. 2002). Accordingly, a study of our own group found that all Flemish adult medical, surgical, cardiosurgical and mixed ICUs, including units for severely burned patients had restricted visiting policies (Vandijck et al. 2007b). Nevertheless, cultural contexts should not be underestimated, as demonstrated by an excellent study of Lee and collaborators conducted in New England, reporting open visitation in about one third of ICUs, and a Swedish study in which no less than 70% of participating ICUs reported no restrictions at all (Knutsson et al. 2004, Lee et al. 2007). Contrary to unrestricted visitation, restricted visitation can be characterised by a policy that imposes limits on access, time, and number of visitors, or excluding the presence of proxies in particular cases (Giannini 2007). A multitude of arguments are opposed to this, which will be highlighted below.

Unrestricted Visitation: Pros

To date, there is no scientific evidence to support arguments to keep the doors of the ICUs "closed". For instance, the fact that open ICU visitation policies coincide with increasing infection rates among either patients or proxies is a myth (Burchardi 2002). Rather, it has been shown that it is contact between patient and ICU staff which is the major risk factor, and efforts aimed to achieve "sterile" ICUs are extremely cost-ineffective and totally inefficient (Giannini 2007). Further, the presence of proxies does not necessarily interfere with patient care or treatment as they may be involved

"...the fact that open ICU visitation policies coincide with increasing infection rates among either patients or proxies is a myth."



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in particular caring tasks, may help in facilitating mutual communication between staff and patient, and may give emotional support throughout difficult moments (Young and Plotkin 2000). As such, the presence of patient proxies can have a rather positive impact on patients by decreasing anxiety, stress, and also by creating a serene atmosphere in cases in which the patient is dying (Abbott et al. 2001, Fumagalli et al. 2006, Levy 2001). Lastly, reserving adequate time to make open and respectful dialogue possible between all healthcare workers involved in patient care is of the utmost importance. By providing proxies with honest, direct, and patient-specific information most misunderstandings will be prevented, and will increase proxies' faith in the whole ICU team (Azoulay et al. 2000).

To date, few efforts have been undertaken to incorporate many of these findings into practice, although, mainly in paediatric ICUs, the idea of unrestricted visitation is becoming more accepted. Patients, proxies and ICU staff must see the mutually beneficial possibilities of working together to meet each other needs (Figure 1).

Unrestricted Visitation: Cons

Visiting policies are often developed by nursing staff, and their attitudes and concerns are amongst the strongest barriers to overcome for ICU managers who aim to liberalise visitation in their ICUs. Several studies report ICU nurses convictions and negative beliefs toward unrestricted visitation (Berti et al. 2007, Kirchhoff et al. 1993, Marco et al. 2006).

Reasons include nurses' fear of interference with nursing care planning, treatment, direct patient care, and increase of workload, as well as more time spent in providing information to patient proxies, higher levels of stress for the patient and his relatives, and violation of privacy. Additionally, a higher risk of infection for the patient and also for family members is often noted, the need to protect proxies (especially children) in troublesome treatment situations, as well as difficult experiences and feelings of discomfort in dealing with families overall are other arguments which are raised against opening the doors.

"...the presence of patient proxies can have a rather positive impact on patients by decreasing anxiety, stress, and also by creating a serene atmosphere in cases in which the patient is dying."

Conclusion

Although empirical research indicates that unrestricted visitation is associated with better patients' recovery, fewer physical and psychological complications, reduced emotional stress, and more satisfactory social standards, many ICU managers and staff remain sceptical toward opening their ICUs. However, the main objective should not be provide unrestricted visitation regardless of extenuating circumstances, but to consider all factors in collaboration with both patients and their proxies so that decisions on visits benefit all parties involved. ■

Therapeutic Hypothermia for Spinal Cord Injury

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Introduction

Spinal cord injury is a devastating problem that affects approximately 11,000 individuals each year in the United States. According to NIH's National Institute of Neurological Disorders and Stroke, some 280,000 Americans are living with the debilitating consequences of SCI (Tuszynski et al. 2006). This injury mainly effects young males and leaves them with devastating consequences including loss of motor and sensory function, a range of autonomic problems, and bowel and bladder dysfunction. As with other neurological disorders, recent experimental and clinical work has been directed toward targeting secondary injury mechanisms with new treatments that may limit the progression of neurological symptoms, including paralysis. Although various pharmacological strategies including steroids, gangliosides and excitatory amino acid antagonists have been tested on SCI patients, no clinical trials have resulted in a proven treatment for acute spinal cord injury.

Researchers are increasingly aware of the importance of systemic and nervous tissue temperature after brain and spinal cord injury (Bernard and Buist, 2003). Recent experimental studies have shown that even modest levels of hypothermia (33-34 degrees celsius) can reduce many of the devastating consequences of cerebral ischaemia and trauma and improve structural and functional outcome in clinically relevant animal models. Indeed, recent success in terms of translating findings from the laboratory to the bedside has been reported in cardiac arrest patients (Bernard et al. 2002). Good clinical outcomes have also been recently reported with modest hypothermia after neonatal asphyxia and other indications such as traumatic brain injury (Gluckman et al. 2005; Marion et al. 1997; Polderman et al. 2004).

Spinal Cord Injury

The history of hypothermia for treating SCI is full of studies showing inconclusive findings. Clinical studies were begun in the 1960s following promising experimental reports (Albin et al. 1967; Tator et al. 1973). In those early studies, local profound cooling induced by cold saline irrigation during customary surgical decompression was shown to be feasible for acute SCI. Nevertheless, these early clinical studies were difficult to evaluate because of a limited number of patients, lack of randomised control groups, and concomitant interventions including spinal cord compression and the use of steroids such as methylprednisolone. Also, a major problem with utilising hypothermia in the clinical arena is the need for prolonged anaesthesia to prevent shivering. *The need in some cases to monitor neurological function and the potential risk of adverse effects including pneumonia, bleeding and cardiac problems have complicated the use of prolonged cooling in some patient populations.*

Recently, the emergence of intravascular heat-exchange catheters as well as progress in the development of more efficient surface cooling devices has helped advance the therapeutic hypothermia field. In addition, shivering can now be controlled with a new generation of drugs, which act by lowering shivering threshold. Experimental studies of spinal cord cooling have consistently shown benefits in reducing lesion volume and improving functional outcome. In the mid 60s, studies by Albin and colleagues (1967) showed that profound levels of hypothermia improved outcome. In the 1970s, Green and colleagues (1973) showed that hypothermia was effective in decreasing the degree of hemorrhage after SCI. Most recently, modest levels of hypothermia have been shown to also improve outcome in rodent models of SCI. Yu and colleagues (2000) reported that modest levels of hypothermia (33ºC) administered acutely for a four hour period improved open-motor function and decreased the degree of both grey and white matter damage. Thus, it is clear the modest levels of hypothermia can be used to improve outcome in experimental models without introducing the potentially devastating effects of profound hypothermia on a variety of biological processes.

How Hypothermia Works

A rich body of literature exists that describes how modest levels of hypothermia can be neuroprotective. In addition to lowering the metabolic demand of the injured tissue, modest hypothermia affects various injury processes involved in cell death including excitotoxicity, apoptosis, free radical generation, and inflammation. In a study by Chatzipanteli and colleagues (2000), modest hypothermia after SCI reduced the recruitment of inflammatory mediators including polymorphonuclear leukocytes into the contusion site. Other studies have reported that post-injury cooling alters cell signaling cascades involved with programmed cell death and apoptosis. *Thus, the reason why hypothermia is such a strong neuropro-*

tectant strategy is it affects multiple pathophysiological mechanisms important in cell death mechanisms. This is in contrast to various drug treatments that primarily affect only one injury mechanism.

Discussions regarding the importance of temperature in CNS injury must also consider the detrimental effects of mild elevations in temperature. Periods of fever are common in critically injured brain and spinal cord patients (Kilpatrick et al. 2000), and experimental studies have shown that artificially induced periods of mild hyperthermia significantly worsen outcome. Yu and colleagues (2001) reported that elevated spinal cord temperature to 39ºC for four hours following SCI worsened behavioural outcome and led to an increase in contusion volume. Experimental studies have shown that elevations in temperature aggravate many of the injury mechanisms that are attenuated with hypothermia. Thus, it is critical to establish intensive care unit procedures to effectively inhibit periods of fever, in addition to possibly inducing modest hypothermia.

Cooling Approaches

A recent advance in inducing hypothermia in patient populations is the development of new approaches to produce systemic cooling. External cooling devices such as ice packs or forced air or water circulation blankets may not critically control temperature during the cooling and rewarming phases and may limit the ability to transport and access patients. Endovascular catheters have now been developed and tested where venous blood is cooled as it passes around a cold saline filled balloon. This approach allows for a satisfactory rate of cooling and the critical maintenance of the desired temperature for several days. New energy transfer pads have also been developed that are more conductive and adhesive to the skin surface. In addition to utilising these new devices for producing modest hypothermia, these approaches can also be used to reduce fever burden, an important clinical problem in the intensive care unit.

In addition to systemic hypothermia, local cooling approaches are also being developed especially in the area of brain injury. However, local cooling approaches after SCI have been developed and tested in limited experimental and clinical conditions. A major question regarding the use of local cooling in SCI is the level of hypothermia that is most protective. Although early studies used cold saline irrigation to induce profound cooling, it is not known whether these low temperatures were necessary or possibly produced harm by affecting the local hemodynamic state of the injured tissue. More research is therefore required to clarify these questions before these approaches should be translated to the clinic.

Clinical Protocols

Use of hypothermic circulatory arrest for descending thoracic aortic resection has been shown to afford excellent preservation of spinal cord function in a number of clinical studies. However, a recent high profile case has brought the use of hypothermia in acutely spinal cord injured patients to the forefront in terms of new therapeutic treatments. In that situation, a variety of medical modalities including early cord stabilisation, neuroprotective treatments, imaging and surgical interventions, and intensive care management all likely contributed to the good outcome recently reported in the popular press. It is clear that more experimental and clinical data are required before one can conclude whether or not therapeutic hypothermia is safe and effective in treating acute spinal cord injury. Modest hypothermia is an experimental procedure and certainly has potential risk factors and unwanted side effects associated with its use. Based on clinical data from studies in other types of neurological disorders, periods of hypothermia may need to be extended for days, thereby increasing the potential for adverse consequences. As sufficient randomised clinical trial data on the use of modest hypothermia in acute spinal cord injured patients is lacking, it is clear that controlled studies need to organised and conducted and the potential benefits carefully weighed relative to potential risks.

Recently the AANS/NSS joint sections of disorders of the spine and the AANS/NCNS joint section of trauma published a position statement regarding the use of systemic therapeutic hypothermia for the treatment of acute SCI. In that document, Resnick and colleagues (2007) recommended that clinicians should be aware that systemic hypothermia has been associated with medical complications in the head injured population prior to considering this treatment modality. Also, after reviewing the published literature on hypothermia and SCI this group found insufficient evidence available at this time for either local or systemic therapeutic hypothermia to be recommended as a treatment for acute SCI. Thus, it is clear that continued investigation is required if this potentially exciting therapy is to advance to more acutely injured spinal cord injured patients.

⏩ *continued on p. 36*


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EMEA-DEV-EN-1
Date of preparation: February 2008
EMEA 08/009

Data Management Systems

ECRI Institute
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ECRI Institute is a totally independent nonprofit research agency designated as a Collaborating Center of the World Health Organization (WHO). Such organizations are appointed to contribute to WHO's public health mission by providing specialized knowledge, expertise, and support in the health field to the WHO and its member nations. ECRI Institute is widely recognized as one of the world's leading independent organizations committed to advancing the quality of healthcare with over 240 employees globally.

ECRI Institute is pleased to provide readers of ICU Management with sample information on Data Management Systems, designed for use in critical care from its Healthcare Product Comparison System (HPCS), which contains over 280 reports. The HPCS reports contain extensive information about the technology, its purpose, its principles of operation, stage of development specifications and reported problems. The Data Management Systems for critical care comparison charts include ECRI Institute's 'Recommended Specifications' (generic templates) which can be used for comparison and tendering purposes. The comparative tables overleaf are extracted from ECRI's 2005 database and have additionally been reviewed and updated by the respective manufacturers.

Publication of all submitted data is not possible. For further information please contact editorial@icu-management.org or visit www.icu-management.org.

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Footnotes used in page 26

1. These recommendations are the opinions of ECRI Institute's technology experts. ECRI Institute assumes no liability for decisions made based on this data.

Healthcare Product Comparison System

SUPPLIER	ECRI INSTITUTE'S RECOMMENDED SPECIFICATIONS [1]	iMDsoft
MODEL	**BASIC AIMS**	**MVOR**
WHERE MARKETED		Worldwide
FDA CLEARANCE		Yes
CE MARK (MDD)		Yes
HARDWARE & SOFTWARE OR SOFTWARE ONLY		Software only
SYSTEM SIZE		
Number of OR stations	As required by user facility	Unlimited
Number of remote stations	As required by user facility	Unlimited
Number of other stations	As required by user facility	Unlimited, PC for configuration/query
SYSTEM FEATURES		
Central Display	Yes	Yes
Scheduling		Yes
OR	Yes	Yes
Patient/case	Yes	Yes
Personnel	Optional	Yes
Billing		
Charge capture	Yes	Yes
Cost accounting by procedure	Optional	Yes
Billing software	Optional	Custom interface to billing software
Reports generated		
Anesthesia record	Yes	Yes
Customized	Yes	Yes
QA posting	Yes	Yes
Tracking patient outcomes	Yes	Yes
Drug utilization analysis	Yes	Yes
Narcotics control	Optional	Yes
Equipment utilization analysis	Yes	Yes
Other		Real-time clinical database queries using Query Wizard
OPERATING SYSTEMS	Any	Windows 2000 or XP
NETWORK DATABASE		SQL 2000 or 2005 Server
Server		Not specified
CPU	Any	Windows based, SQL 2000 server
Memory	By user requirements	1 GB minimum
Storage	By user requirements	RAID 5 devices compatible with Windows 2000
Database management	Any	Microsoft SQL 2000 server
LAN PROTOCOLS USED	Any	Ethernet, TCP/IP
OTHER SPECIFICATIONS		Nonproprietary AIMS provides full perioperative (pre-, intra-, and postoperative) patient assessment; myMV (Web-based communication platform for use outside CCU); analog data FD; provides decision support and analysis tools.
LAST UPDATED		March 2008

	GE HEALTHCARE	GE HEALTHCARE	GE HEALTHCARE	PICIS	PHILIPS
	Centricity Anesthesia	**OR Management with Opera**	**Deio Anesthesia**	**CareSuite Anesthesia Manager**	**CompuRecord Perioperative IS**
	Europe, Middle-East, Africa	Africa, Europe, Middle East	Asia-Pacific, Europe	Worldwide	Woldwide
	Not specified	Not specified	Yes	Yes	Yes
	Yes	Not specified	Yes	Yes	Yes
	Software only	Software only	Both	Software only, hardware with Windows 2000/XP/2003	Software only; whole system to software-only solutions
	Unlimited	Unlimited	Up to 48 monitors and edit stations	Unlimited	Unlimited
	Unlimited	Unlimited	Up to 4 central	Unlimited	Unlimited
	Additional workstations can be added to Windows 2000 network	Additional workstations can be added to Windows 2000 network	Additional workstations can be added to Windows 2000 network	Unlimited, PC for configuration/query	Unlimited
	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes, Premier solution partners
	Yes	Yes	Yes	Yes	Yes, Premier solution partners
	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Via interface	Yes
	Yes	Yes	Yes	Yes	Yes
	No (prepares reports used by billing system)	No (prepares reports used by billing system)	No (prepares reports used by the billing system)	No	Yes
	Yes	No	Yes	Standard; user-defined	Yes
	Yes	Yes	Yes	Fully customizible	Yes
	Yes	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes	Yes
	Yes	No	Yes	Yes	Yes
	Yes	No	Yes	No	Yes
	No	No	No	Yes	Yes
	Productivity, queries of all events captured in real time	Material requirements planning, material consumption and traceability, productivity, queries of all events captured in real time	Productivity, queries of all events captured in real time	Data may be queried from real-time database	Over 40 reports available with optional software modules; user-generated reports
	MS Windows 2003/XP	MS Windows 2003/XP	AMX, Windows 2000	Windows 2000/2003	Windows NT/2000/XP
	Not specified	Not specified	Not specified	Not specified	Not specified
	IntelR Pentium Xeon, 2.4 GHz or higher	IntelR Pentium Xeon, 2.4 GHz or higher	Pentium III, 733 MHz	Windows-based multiprocessor or server class file server (CPU); any supported by Windows 2000/XP/2003 for SQL server and/or Oracle	Intel Xeon PM
	4 GB	2 GB	133-512 Mhz SD-RAM	2 GB minimum	1 GB RAM, expandable
	2x 40 GB, RAID 10	3x 36 GB, RAID 10	20 GB, RAID 5	Any supported by Windows 2000/2003, Windows 2002/2003, Windows-based multiprocessor or server class file server (CPU); any supported by Windows 2000/2003 for SQL server and/ or Oracle	Hot-swap drive bays
	Sybase ASE	MS SQL	Sybase ASE	Microsoft SQL server and/or Oracle	Microsoft Sequal server RDBMS
	TCP/IP, IPX/SPX, Ethernet 802.3	TCP/IP, IPX/SPX, Ethernet 802.3	TCP/IP, IPX/SPX, Ethernet 802.3	TCP/IP	IPX/SPX, TCP/IP, NBP, Ethernet, Token Ring
	Provides seamless data continuum through entire anesthesia workflow in 3-tier technology platform.	Surgical suite management solution covering whole perioperative process, including materials management.	Easy-to-use embedded and cost-effective solution for anesthesia record keeping.	CareSuite automates the entire perioperative process, including anesthesia, PACU, OR management, QM, and tracking.	Patient evaluation; patient and staff locator overview; anesthesia record; PACU nursing documentation; management information services; configuration manager; drug cost; supplies cost, remote case view, electronic signature, research, case browser, and QA software.
	March 2008	March 2008	March 2008	December 2006	September 2005

SUPPLIER	ECRI INSTITUTE'S RECOMMENDED SPECIFICATIONS [1]	iMDsoft
MODEL	**BASIC AIMS**	**MVOR**
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LAST UPDATED		March 2008

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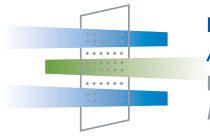

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Quality of Care in Paediatric Emergencies

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Timely and adequate medical care significantly reduces morbidity and mortality in (paediatric) emergencies. However, a wide variability in care (and suboptimal care) has been described by several authors worldwide. We audited emergency care for severely ill children in Flanders (Belgium) and identified multiple areas open for improvement, often in basic areas of paediatric life support. More performance-based teaching may have positive impacts on the care delivered and intensive care "outreach" must become part of our daily practice.

Quality of Care

The field of intensive care and emergency medicine is continuously evolving and our way of working and thinking has changed profoundly in the last 20 years. At times it seems the boundaries of our capabilities are more defined by ethical concerns, than by strict medical considerations. In the meantime, society has changed as well. In terms of healthcare, the focus on health and disease has clearly shifted from a biomedical to a more holistic "patient-centred" model. Beyond mere survival, long-term health has become the standard of value for medical care and given the continuous economic pressure on existing healthcare systems, outcomes are weighted against costs in obtaining them. Society thus demands that we, as a profession, are critical towards our own efficiency.

Traditionally healthcare systems were (and still are to a great extent) solely evaluated in terms of input (i.e. number of staff, equipment, organisational structure…). Outcome is now recognised to be an at least equally important construct. Measuring outcome is however, hampered by suboptimal measurement tools and inherent bias (Curtis et al. 2006). Adverse outcomes are not that frequent and it is often difficult to define a clear relation between certain processes and the eventual outcome.

If we believe that the things we do (or prescribe…) make a difference for a patient, then not doing them or doing them wrong makes a difference as well; even if not for that individual patient, then likely for the next, or the one thereafter ('near-miss principle'). Under the assumption that certain processes of care are associated with certain desired outcomes, the audit of these care processes becomes an important part of evaluating health systems.

Huge variability has been described in virtually any aspect of healthcare. Where a certain degree of variability constitutes medical evolution (within the boundaries of studies and case-specific "informed risk-taking"), most often variability actually means "suboptimal care". While our knowledge about health and disease increases, the evidence that this knowledge is not applied in day-to-day care increases as well. More specifically for intensive care and emergency medicine, the last two decennia have been characterised by several innovative trials about the major impact of certain processes (e.g. early goal directed treatment in sepsis, low tidal volume strategies, timely and correct antibiotics…) (Pronovost et al. 2004). Yet simultaneously more and more reports were published about the lack of compliance with these ("high-evidence") processes and about the overall percentage of suboptimal care, especially in case of emergencies (Rubenfeld et al. 2003; Abella et al. 2005; Seward et al. 2003; Lecky et al. 2002).

Measuring Performance

Measuring our performance and the quality of the care we provide is a responsibility we have towards our patients and society. One of the means of doing this is by peer-review audit. Peer-review audit has been under discussion, as it is felt to be subjective with a high inter-observer variability and a low reproducibility. Further, due to its retrospective nature, it relies heavily on the quality of available data. However, when using strict guidelines for panel review, well-validated data and trained reviewers, the inherent degree of subjectivity associated with the methodology can be kept within limits. Structured panel review then has the power to identify problem areas to improve and needs to be addressed. Indeed, if one wants to pursue change, the first step most often is the perception of the problem. Importantly, audit is a means not an end; eventually it is about performance improvement not about throwing stones.

The Quality of Care in Paediatric Emergencies in Flanders

Paediatric emergencies are uncommon and their management complex. Therefore the probability of providing suboptimal care is likely higher. Yet, it has

been shown that especially for these emergencies timely and adequate medical care significantly reduces morbidity and mortality (Han et al. 2003; McGloin 1997). It is thus very important that all who are involved in the first hour of treatment of a severely ill child are well trained to do so.

We audited emergency care in two different groups of severely ill children in Flanders. In both audits a similar methodology was used. Data were collected prospectively and missing data were completed afterwards. Reviewers received a short anonymous patient description and an extensive chronologic data sheet. Problems with care processes were categorised as defaults if there was convincing evidence in literature and if there was consensus between both reviewers. Only clear violations of well-defined standards were withheld as suboptimal care, and this was irrespective of their potential impact on outcome.

In the first audit, we reviewed medical care in children (0-17y) with severe trauma (Injury Severity Score [ISS] > 13). Data were obtained through the Flemish paediatric trauma registry (PENTA) (Van de Voorde et al. 2008). This registry collected data on paediatric trauma in 18 emergency departments during a one-year period (2005). 92 cases (median ISS 21, 12 deaths) were reviewed by two reviewers independently and then discussed in consensus meetings. There were no defaults seen in only four of the cases reviewed. Inadequate care in "Airway-Breathing" management was seen in 41.3% of all relevant cases. Defaults in "Circulatory" management were observed in 31.5%. More detailed results of this audit will be published in the nearby future.

In the second audit we reviewed care in 50 consecutive "high urgency" secondary transfers to our institution (PICU, tertiary care university hospital). Again only clear violations were withheld as defaults. We found that in 22% of cases the demand for referral was delayed and/or inadequate. Defaults in "Airway-Breathing" management were seen in 36% of all cases. Inadequacies in "Circulation" management occurred in 36%. For "D – neurological" management suboptimal care was observed in 39% of relevant cases.

How to Influence Performance

In both of these audits the degree of inappropriate care recognised is clearly significant, even when taking the inherent subjectivity of the methodology into consideration. Defaults were often seen in really basic areas of (advanced) paediatric life support.

How then can we better prepare health providers for paediatric emergencies? First of all, we should try to better define "the barriers" to optimal care that currently exist. Is it merely about knowledge gaps? False beliefs? Fear? Is it a catecholamine-induced memory failure in view of a child that is critically ill? The fact is, that passive dissemination of information does not necessarily promote behavioural change (Bero et al. 1998; Stockwell and Slonim. 2006). Performance-based teaching seems to be more effective, yet its effect tends to diminish rapidly over time (Grant et al. 2007; Semeraro et al. 2006). Courses like EPLS/APLS could make an important difference as long as they are repeated regularly. Yet in Flanders, (as in many other countries) there lacks a strong (societal) incentive for following any of these courses and thus, certainly not for recertification.

Further, knowing how much of the fight is won or lost in the first hours of treatment, we cannot just stay in our unit and wait for the patient to arrive. Even the healthcare professional who has received repeated and thorough performance-based teaching, whatever his/her background, will have an actual exposure to severely ill children that remains far lower than that of us, paediatric intensive and emergency care physicians. Therefore, it is our task to be available for advice if wanted, feedback if asked, and most importantly, rapid (ward) intervention if needed.

Conclusion

We audited medical care in paediatric emergencies in Flanders and identified several problem areas, often in basic areas of paediatric life support. Defining the barriers to "optimal" care and more performance-based teaching may have positive impact on the care delivered and the eventual patient outcome. Furthermore, if not already, we should make intensive care "outreach" part of our daily practice. ■

PENTA is sponsored by the Flemish Fund for Scientific Research FWO "Levenslijn Kinderfonds"

CARDIOLOGY MANAGEMENT

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Creating a Collaborative Model to Improve Patient Flow

With strategic focus on improving the quality and safety of patient care, it has become increasingly obvious to both physicians and hospital leadership that improving patient flow and communication between care providers is the foundation upon which better patient care is built.

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Former Vice-President of Surgical and Emergency Services
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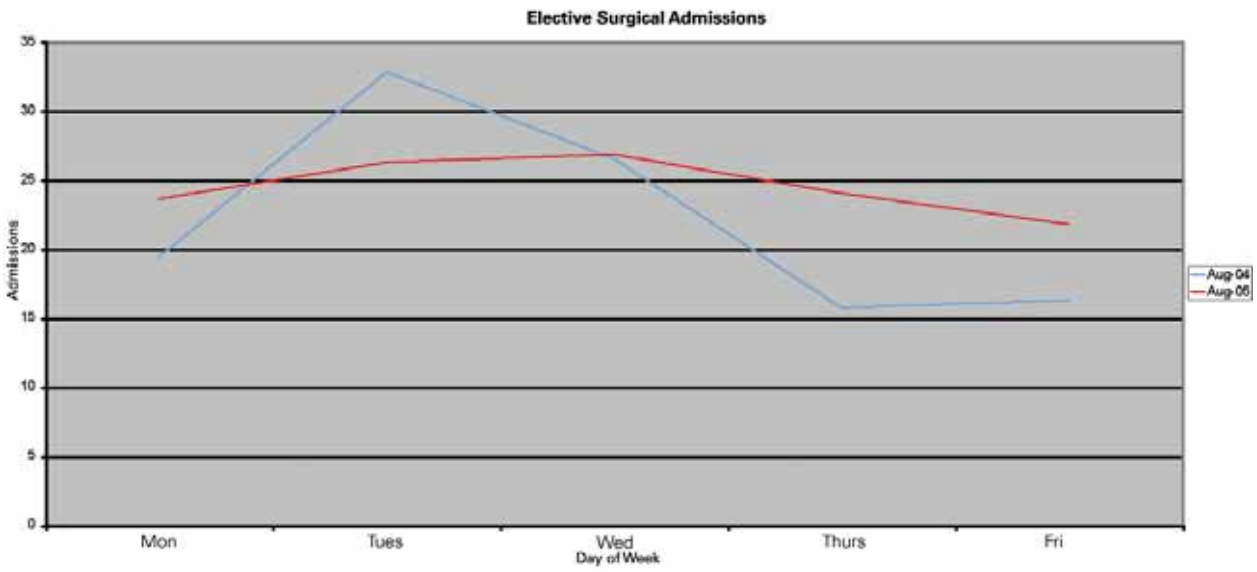
Perioperative Services and the OR specifically, are a key focal point for improvement strategies. Costly technology and high utilisation of both human and supply/equipment resources, coupled with the significant volume of elective admissions to the hospital make this the primary area for improving patient flow. In addition, the downstream effect on the ICU and inpatient units leads to peaks and valleys in inpatient census with resulting deficiencies in nurse to patient ratios with patient quality and safety ramifications. It was with this realisation that St. John's Regional Health Center in Springfield, Missouri embarked upon on a significant and successful performance and quality improvement strategy. St. John's Regional Health Center is an 866 bed community hospital located in southwest Missouri in the US. 26 operating rooms in the main hospital and 8 ambulatory surgery rooms provide for the 31,000 cases annually. As an integrated delivery network, the physicians partner with the hospital in strategic initiatives. However, the dichotomy between physician and hospital needs are the same in an integrated model as in a private practice model and communication and collaboration are as or more important.

The driving force for the collaboration between physicians and hospital leaders is the Perioperative Services Guidance Team. This team consists of 7 surgeons, an anaesthesiologist, materials manager, and the nurse managers from each area of Perioperative Services – OR, PACU, AM Admissions/Preadmission Unit, Ambulatory Surgery. The group is co-chaired by the Department of Surgery Chair (a surgeon) and the Director of Perioperative Services (a nurse). This multidisciplinary team meets twice monthly and is responsible for reviewing all issues associated with the implementation and monitoring of all initiatives related to surgical services. Attendance is not required nor are the physicians paid to attend. However, virtually 100% attendance is enjoyed at every meeting, thanks to the collaboration and transparency as well as the ongoing progress made by this group. As a result, this committee has become very powerful within the organisation. This active physician and hospital collaboration is also seen in the shared governance of the intensive care units with the medical director and nursing directors responsible for the quality, safety, and care provided by the unit.

The physicians and hospital leadership review financial information, scheduling issues, physician conflict, capital and operating budget planning, and make decisions after review of all relevant informa-



tion. The hospital senior leadership supports this group and enables the decision-making authority.

The primary methodology used for performance improvement is the Institute for Healthcare Improvement's small tests of change and rapid cycle improvement. Instead of collecting and analysing data for years before actually implementing any change, small sample sizes and rapid improvement strategies are evaluated on a dynamic basis. If the strategies are successful they are implemented on a wider scale. If they aren't successful, the strategy is "tweaked" and re-evaluated. This dynamic process assures active participation and the very real perception of progress. The group then becomes a team of passionate change agents who identify opportunities for improvement and obstacles to progress.

One of the first and most influential initiatives undertaken using this methodology began in October 2002. Dr. Eugene Litvak, a professor of operations management with Harvard and Boston Universities, presented data and theory to support separation of scheduled and unscheduled cases. By segregating cases into homogeneous populations, artificial variability is reduced and efficiency is improved. St. John's at that time was close to 100% blocked with elective surgical scheduling. There was little "open" time for scheduling and competition for any available OR time was prevalent daily. The block scheduling rules were consistently enforced and the block schedule was revised every four months based upon utilisation. Because the schedule was so heavily blocked, add-on cases were started after the blocks ended, usually around 5pm, resulting in add-ons being done late into the evening and at night. Patients were forced to wait for long periods, elective cases were frequently bumped for more urgent and emergent add-on cases, staff overtime was high, and the surgeons were unhappy. It was not infrequent to have patients in the ICU waiting for surgery to be able to move to the next level of care. However, because the elective surgery schedule had so many peaks and valleys, they were often bumped and their length of stay was extended. In addition, the peaks in the inpatient census required patients to board in the ICU when an inpatient bed on the nursing floor could not be found further extending lengths of stay and nursing frustration. As Dr. Litvak had stated, separating scheduled and unscheduled cases would allow more predictability for the scheduled cases and result in fewer bumping or delays providing more flexibility for the overall surgical schedule.

A group of trauma surgeons agreed to release their block for a 30-day trial period. During this trial, a room was set aside for add-on procedures. The definition of an add-on was critical to the success of this project. Four categories were assigned: emergent requiring the next available room, priority requiring a room within 2 hours, urgent requiring a room within 6 hours, and anything else that needed to be done within the next 24 hours. Surgeons were responsible for prioritisation of the cases based on the patient's clinical presentation. Any misprioritisation was addressed in the Perioperative Service Guidance Team meetings and penalties assessed by the Chair of the Department of Surgery. The trauma surgeons were assured that if the trial was unsuccessful, their block would be returned.

The add-on room was implemented in November 2002. No cases were allowed to be scheduled into this room until 6am the morning of surgery. At that time, the add-on cases were slotted into the room based upon the surgeon's priority. We did not want the room to be more than 60% utilised, so that the flexibility it provided was maintained. The results obtained exceeded our expectations and these results persist today. The volume of surgery during the "business" part of the day 7am-1:30pm grew by 5.1%. The need for operating rooms after 3pm decreased by 45%. The surgery department overtime has declined from almost 6% to 2.3% currently. The trauma surgeons who gave up their block realised a 4.5% increase in their revenue because they were better able to schedule predictably in their other block time. Patient, staff, and physician satisfaction improved. In addition, surgical volumes increased 33% over five years. These improvements have been sustained since the implementation of the add-on room and provided the track record of success necessary to continue patient flow improvements.

The success of the add-on room enhanced the trust and collaboration between the hospital and physicians thereby enabling more complex hospital wide improvements with even more substantial implications for increasing case volumes and revenues. Smoothing the flow of elective admissions through the OR in order to minimize peaks and valleys in inpatient census was the next step. St. John's smoothed the flow of elective admissions primarily by smoothing the hours allocated to each surgical specialty based upon utilisation. 59% more inpatient capacity was created without adding additional physical beds by working with the surgeons to smooth their elective admissions across the week.

Collaboration, communication, and real time data analysis are key to the success and sustainability of any process improvement. By creating a culture of trust and transparency the physicians and hospital were able to create a "win" for everyone involved. ■

An Overview of Healthcare in Brazil

National Health Policies and Plans

The national health policy is based on the Federal Constitution of 1988, which sets out the principles and directives for the delivery of healthcare in the country through the Unified Health System (SUS). Under the constitution, the activities of the federal government are to be based on multi-year plans approved by the national congress for four-year periods. The essential objectives for the health sector were improvement of the overall health situation, with emphasis on reduction of child mortality, and political-institutional reorganisation of the sector, with a view to enhancing the operative capacity of the SUS. The current plan reinforces the previous objectives and prioritizes measures to ensure access to activities and services, improve care, and consolidate the decentralisation of SUS management.

Health Sector Reform

The current legal provisions governing the operation of the health system, instituted in 1996, seek to shift responsibility for administration of the SUS to municipal governments, with technical and financial cooperation from the federal government and states. Another regionalisation initiative is the creation of health consortia, which pools the resources of several neighboring municipalities. "The Project to Strengthen and Reorganise the SUS" is an important instrument of support for regionalisation.

Public Healthcare Services

The main strategy for strengthening primary healthcare is the Family Health Program, introduced by the municipal health secretariats in collaboration with the states and the Ministry of Public Health. The federal government supplies technical support and transfers funding through Piso de Atençao Básica. Disease prevention and control activities follow guidelines established by technical experts in the Ministry of Public Health. The National Epidemiology Center (CENEPI), an agency of the National Health Foundation (FUNASA) coordinates the national epidemiological surveillance system, which provides information about and analysis of the national health situation.

Individual Healthcare Services

In 1999, 66% of the country's 7,806 hospitals, 70% of its 485,000 hospital beds, and 87% of its 723 specialised hospitals belonged to the private sector. In the area of diagnostic support and therapy, 95% of the 7,318 establishments were private, and the public also operated 73% of the 41,000 ambulatory care facilities.

BRAZIL: FACTS AND FIGURES	
Population	186,405,000
Official name	Federative Republic of Brazil
Capital	Brasilia
Official language	Portuguese
Area	8,504,535 square kilometres
Life expectancy at birth	Males: 57 years Females: 62 years (2002)
Probability of dying under five	33 (per 1 000 live births)
Probability of dying between 15 and 60 years	Male: 225 Female: 118 (per 1 000 population)
Gross national income per capita	8,230 (PPP international $)
Total expenditure on health per capita	1,520 (Intl $, 2004)
Total expenditure on health as % of GDP	8.8 (2004)
Number of physicians	198,153 (2000), 1.15 physicians / 1,000 people
Number of nurses	659,111 (2000), 3.84 nurses / 1,000 people
Number of health management and support workers	839,376 (2000), 4.89 workers / 1,000 people

Figures are for 2005 unless indicated. Source: World Health Statistics 2007

Hospital beds in the public sector were distributed as follows: surgery (21%), clinical medicine (30%), pediatrics (17%), obstetrics (14%), psychiatry (11%) and other areas (7%). In the same year, 43% of public hospital beds, and half the hospital admissions were in municipal establishments. Since 1999, the Ministry of Public Health has been carrying out a health surveillance project in Amazonia that includes epidemiological and environmental health surveillance, indigenous health and disease control components. With 600 million dollars (US) from a World Bank loan, efforts are being made to improve the operational infrastructure, training of human resources and research studies. An estimated 25% of the population is covered by at least one form of health insurance, and commercial operators and companies with self-managed plans offer 75% of the insurance plans.

Health Supplies

Brazil is among the largest consumer markets for pharmaceutical drugs, accounting for a 3.5 % share of the world market. To expand public access to drugs, incentives have been offered for marketing generic products, which cost an average of 40% less than brand-name products. In 2000, there were 14 industries authorised to produce generic drugs and about 200 registered generic drugs were being produced in 601 different forms. In 1998, the National Drug Policy was approved, whose purpose is to ensure safety, efficacy, and quality of drugs, as well as the promotion of rational use and access for the population to essential products. The responsibility for national production of immunobiologicals is entrusted to public laboratories; which have a long-standing tradition of producing vaccines and sera for use in official programs. The Ministry of Public Health invested some US$ 120 million in the development of the capacity of these laboratories. In 2000, the supply of products was sufficient to meet the need for heterologous sera, such as those used in the vaccines against tuberculosis, measles, diphtheria, tetanus, whooping cough, yellow fever, and rabies. In 1999, quality control of the transfused blood consisted of 26 coordinating centers and by 44 regional centers.

Human Resources

In 1999, the country had some 237,000 physicians, 145,000 dentists, 77,000 nurses, 26,000 dietitians and 56,000 veterinarians. The national average ratio was of 14 physicians per 10,000 population. In 1999, of the 665,000 professional positions, 65 % were occupied by physicians, followed by nurses (11%), dentists (8%), pharmacists, biochemists (3.2%), physical therapists (2.8%) and by other professionals (10%). An estimated 1.4 million health sector jobs are occupied by technical and auxiliary personnel.

Health Sector Expenditure

In 1998 national health expenditure amounted to 62,000 million dollars (US), which corresponded to nearly 7.9% of GDP. Of that total, public spending accounted for 41.2 % and private expenditure accounted for 58.8%. In per capita terms, public spending is estimated at 158 dollars (US) and private expenditure at 225 dollars (US).

Technical Cooperation

Technical cooperation projects are carried out with different countries, as well as with the World Bank and UNESCO among many others. International foundations also provide direct financing for projects or individuals. Brazil is also engaged in an intense exchange with the MERCOSUR countries, aimed at establishing common health regulations.

This information has been adapted from data obtained from the Pan American Health Organization, a regional office of the World Health Organization (WHO) and the WHO. ■

continued from p. 23

Summary

Although a large amount of experimental and clinical evidence supports the continued study of modest hypothermia as a neuroprotective strategy after SCI, this treatment is experimental and certainly not the "standard of care". This is an important point for the public as well as treating physicians to keep in mind. Ongoing studies are determining various unknown factors associated with the cooling procedure including the therapeutic window for hypothermia treatment, length of cooling, and how to best rewarm the patient. In addition, important questions regarding pharmaceutical agents that may be combined with modest hypothermia to extend the therapeutic window and/or provide more complete protection are being tested. To advance this treatment, well-designed prospective controlled trials to accumulate sound evidence for this experimental therapy are required. Based on ongoing clinical studies, available data indicates that treatment with modest hypothermia in a controlled protocol/environment can be safely applied in a number of clinical conditions, but its effectiveness in terms of clinical outcome after SCI remains to be determined. ■

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Critical Care in Brazil

Statistics

Causes of death in children under-5

Distribution of causes of death among children under 5 years of age, Brazil, 2000-2003

Causes	Deaths[b] (%)	Regional average (%)
Total neonatal deaths	100	100
Neonatal causes[a]	38	44
HIV/AIDS	0	1
Diarrhoeal diseases	12	10
Measles	0	0
Malaria	1	0
Pneumonia	13	12
Injuries	3	5
Others	33	28

a. Includes diarrhoea during neonatal period
b. Sum of individual proportions may not add up to 100% due to rounding.

Annual estimated proportions of death by cause for neonates, Brazil, 2000

Causes	Deaths[c] (%)	Regional average[c] (%)
Total neonatal deaths	100	100
Neonatal tetanus	1	1
Severe infection[a]	19	18
Birth asphyxia	23	19
Diarrhoeal diseases	1	1
Congenital anomalies	11	15
Preterm birth[b]	38	38
Others	7	8

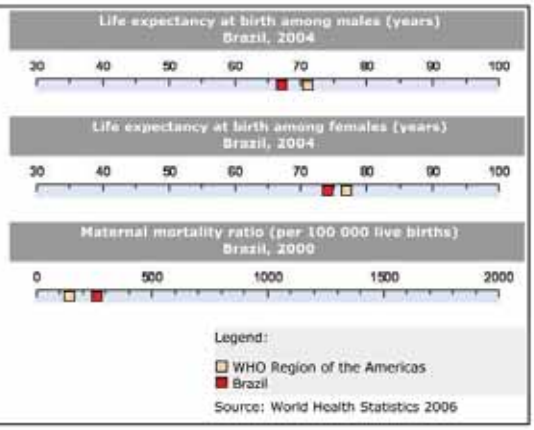
a. Includes deaths from pneumonia, meningitis, sepsis/septicaemia and other infections during the neonatal period.
b. Includes only deaths directly attributed to prematurity and to specific complications of preterm birth such as surfactant deficiency, but not all deaths in preterm infants.
c. Sum of individual proportions may not equal 100% due to rounding.

Causes of Death

Top ten causes of death, all ages, Brazil, 2002

Causes	Deaths (000)	Deaths (%)	Years of Life Lost (%)
All causes	122	100	100
Ischaemic heart disease	139	11	7
Cerebrovascular disease	129	11	6
Perinatal conditions	70	6	14
Violence	57	5	9
Diabetes mellitus	53	4	3
Lower respiratory infections	51	4	4
Chronic obstructive pulmonary disease	46	4	2
Hypertensive heart disease	36	3	2
Road traffic accidents	34	3	5
Inflammatory heart diseases	22	2	1

Source: Death and DALY estimates by cause, 2002
http://www.who.int/entity/healthinfo/statistics/bodgbddeathdalyestimates.xls



News

Safe Hospitals, A Global Strategy

In the framework of the Global Platform for Disaster Risk Reduction meeting, held in Geneva, WHO and PAHO organised a workshop on disaster risk reduction in health facilities and the health sector to call attention to the serious effects that emergencies, disasters and other crises have on health and the impact they have on development.

WHO and PAHO have joined forces with the ISDR to launch the 2008-2009 world campaign for disaster reduction, dedicated to Safe Hospitals. The campaign will focus on all health facilities - big and small - to ensure that these critical installations remain functional during and after disaster situations.

The meeting discussed the impact of disasters in health facilities, and on why mitigation measures should be included during the planning, reconstruction and rehabilitation of health facilities. The Safety Index for Hospitals, which has been tested in several countries of Latin America and the Caribbean, was presented and offered as an instrument to assess the progress. For more information contact Patricia Bittner, bittnerp@paho.org.

EID Updates: Emerging and Reemerging Infectious Diseases, Region of the Americas

Jungle Yellow Fever (JYF) in Brazil, Paraguay, Argentina

In 2007 and the beginning of 2008, Brazil reported an intense and extensive epizootic of Jungle Yellow Fever in an area encompassing 6 states (Goiás, the Federal District, Mato Grosso do Sul, Minas Gerais, Tocantins, and São Paulo). The State Health Departments have confirmed the epizootic based on laboratory and clinical epidemiological criteria. In the past two months, 26 confirmed human cases were reported in 3 federal states (Goiás, Mato Grosso do Sul, and the Federal District); 13 of the patients died. The affected areas have high vaccination coverage. Nevertheless, as part of ongoing control measures, health authorities have intensified vaccination for people living in or traveling to affected areas. ■

This information has been adapted from data obtained from the Pan American Health Organization, a regional office of the World Health Organization (WHO) and WHO.

ICU MANAGEMENT

Author guidelines

Content

Articles may focus on any management or practice issue in intensive care related to economics, quality of care or patient outcome. We only accept scientific papers with a clear connection to management and practice issues. We also invite viewpoints for publication in our Forum section, which can be personal opinions of the author and/or reactions to articles published in prior issues. These are published at the discretion of the Editors.
Submissions may not have been published previously or be currently submitted for publication elsewhere.
Articles must be written by independent authorities and any sponsors for research must be named. If manufacturers are named in an article, the text must present an unbiased view, not in support of any particular company.

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Authors are responsible for all statements made in their work, including changes made by the editor and authorised by the submitting author.
The text should be provided as a word document via e-mail to editorial@icu-management.org.
Please provide a contact e-mail address for correspondence.
Following review, a revised version, which includes the editors' comments and recommendations, is returned to the author (at the contact e-mail address) for authorisation.

Length

- Articles: maximum 700 words (less if figures or tables are included)
- Viewpoints: maximum 700 words
- News/research/product updates: maximum 175 words

Please note that contributions longer than the specified number of words may not be accepted.

Structure

Article texts must contain:

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- Main authors are requested to supply a portrait photo (see specifications below)
- Summary of one or two sentences (no more than 30 words) describing the content
- Contact name for correspondence and an e-mail address which may be published with the article
- Website, if appropriate
- Acknowledgements of any connections with a company or financial sponsor
- Introduction, main text and summary/conclusion, with subheadings as appropriate
- Authors are encouraged to include checklists and/or guidelines, which summarise findings or recommendations
- References or sources, if appropriate, as specified below

Writing Style

Articles must be written in UK/British English (e.g. organisation, not organization), with short sentences, a clear structure (see above) and no bias. Full stops in numbers may only be used to indicate a decimal place; otherwise use commas as separators.

Images

Main authors are invited to supply a portrait photo for publication with their article. This and any other relevant images for publication with an article should be sent by e-mail as separate files (only high resolution images with 300dpi) and their order of placement in the article must be clearly indicated. Only the electronic formats "tif" or "jpg" can be used for images, i.e. not Microsoft Word or PowerPoint. Images must be no smaller than 9cm x 9cm at 100% scale. Only images meeting these specifications can be published.
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Example of within text citation: (Edwards 2004; Edwards and Miller 2002; Miller et al. 2003).
The format for listing references in submitted articles should follow the Harvard reference system.
Example of standard journal reference: Sydow Campbell, K. (1999) "Collecting information; qualitative research methods for solving workplace problems", Technical communication, 46 (4) 532-544.
Readers will be provided with an e-mail contact for references, which will be kept on file and supplied on request.
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Acceptance

It is always at the discretion of our editorial board to accept or refuse submissions. We will respond to submissions within 8 weeks of receipt. We reserve the right to revise the article or request the author to edit the contents, and to publish all texts in any EMC Consulting Group journal, on the Internet and to list them in online literature databases.

Thank you,
The ICU Management Editorial Team
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An interview with
Prof. Antonio Artigas

Professor Antonio Artigas has been managing the Critical Care Centre at Sabadell Hospital in Barcelona, Spain since 1988. He spoke at length with Sherry Scharff at the 13th International Symposium on Infections in the Critically Ill Patient in Athens, Greece, a meeting he heads. In this discussion, he describes the successes he has experienced in his hospital, outlines the challenges the intensive care field has to face in the coming decades and offers an optimistic view on the state of critical care both in Spain and beyond.

Can you describe your ICU?

My critical care centre has three Units (Intensive, Intermediate and Prehospital care), which treat for patients from the onset to discharge. We have a staff of 15 physicians and 58 nurses; with three intensivists on duty at one time, as well as one nurse per every two patients in the main ICU, and in the intermediate ICU, where the patients require less frequent care; we have the equivalent of one nurse per every five patients. Our mortality rate is 8 percent (22% in the ICU and 1% in the Intermediate Unit) with an SMR 0.78 and an occult mortality of 2.3%. I am confident that this will improve even more with the emphasis on early detection, implementation of new intelligent technology systems and continued education and training initiatives.

What changes have you initiated or implemented specifically to improve outcomes and quality of care in your unit?

Currently there is a renewed push within in the intensive care field for early detection and treatment, especially the treatment of severe sepsis. Two years ago we established a system to improve our performance and we have had tremendous success since it's implementation. We created an Outreach-style system in our hospital, which we call a Vital Risk Team (VRT). The goal of the VRT is to initiate treatment before patients reach the ICU. Each shift, one physician is delegated to in-hospital care outside of the ICU, and we use a special phone system to efficiently deal with the onset of critical care from different departments. In our hospital, it has been well accepted that this timely treatment is saving lives and reaching patients within this "golden period" (often within the first 3 hours) is essential. Often times, patients receiving this early treatment recover before they even reach the intensive care unit, alleviating the use of addition resources in our unit. Of course, continuous communication and coordination between all related departments (especially the ER) is crucial to the success of this initiative, which provides more than 2300 services per year. We organise monthly meetings to discuss cases, evaluate progress and plan new strategies.

What would you say are the most important qualities of a successful ICU manager?

Many managers see the administrative duties attached to our positions as interference or a hindrance to their main role and objectives. As managers, we need to utilise these opportunities-meetings, strategic plans and evaluations to increase communication, set goals and adjust our protocols when necessary. At our hospital we have monthly meetings with our "working groups" which span departments and have been successful in encouraging a more cross-departmental communication, which ultimately leads to better quality care for our patients. In the Critical Care Centre, our working group on infections and sepsis has two nurses and an equal number of physicians from the ICU, and a physician from the ER, as well as the Microbiology and Infection Departments. There is also an intensive neurological group, which is very active and involves a number of neurologists- from intensivists to neurosurgeons. Other working groups are: politrauma, acute renal failure, acute respiratory failure, sedation and analgesia and cardiovascular. Their meetings seek to define and update protocols, define research and training and they complete annual evaluations and set future goals. There is also a meeting, which includes each chairman of all the working groups that strives to create a hospital-wide directive outlining initiatives and goals for all departments at work under our umbrella.

Personally, I see the strategic plan I must submit every four years as an unique opportunity to review progress over the past four years, and to outline strategies and goals for the next four-year period.

ICU MANAGEMENT

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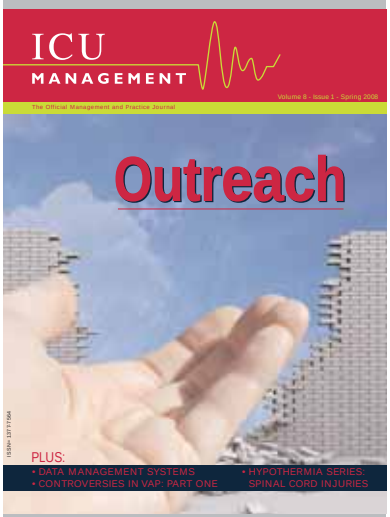

Within this presentation, I must include patient demographics and human resources figures, including the number of nurses and doctors, as well as the number of beds and the budget requirements. Inevitably, these numbers are on the increase, both as a result of the changing demographics (i.e. more elderly patients) and increased rates of cancer and other long term diseases.

Constant re-evaluation, communication and training have been key to our success in eradicating MRSA in our hospital. We developed a teaching and monitoring program and one nurse and one physician are in charge of controlling this everyday. We have regular microbiological meetings and we re-evaluate protocols when necessary.

Of course, strategising and co-ordinating plans is only a part of my managerial role. Part and parcel of budgetary increases is the need to find resources and this usually involves partnering with companies (as we've done with our in-hospital animal laboratory) to increase ingoing resources and subsequently improve the quality of care we provide. Any manager, and especially one in an intensive care setting quickly realises that there is an element of psychological adeptness and skill in human relations necessary in any position that brings such a blend of skilled workers together into a high-stress environment. In this highly charged climate, patience and flexibility are absolutely key strengths. So, to sum up the skills necessary to be successful ICU manager, I would say those of an administrator, leader, fundraiser and at times, therapist.

What do think about new technologies and their role in the ICU?

Without doubt, we must embrace any technology that helps us to treat patients reach patients faster, aids in a more timely diagnosis, helps to monitor patients more effectively and improve overall patient incomes. We are the first ICU in Spain to use mechanical pumps, which are programmed by a central software system and we also use a high-tech alert program to help monitor patients. Currently there is research underway on a telemedicine prototype that allows doctors to treat patients and interact with colleagues within the unit via the use of a specialised remote computer and portable automated device with a screen. In terms of informatics, we have just implemented a new hospital-wide system that should make access to information much easier. Of particular interest, in radiology, is the digitalising of x-rays so that physicians, and in the future, patients themselves can access their data quickly, and from anywhere in the world, so long as they have a computer. This would also solve the problem of where (and with whom-i.e. general practitioner, hospital) to store this information for future diagnoses.

Can you describe briefly the changes you have witnessed over the years in the ICU?

I first started in over 30 years ago in the ICU, and it evolved into a management role 20 years ago. When I began, all the research was centred around the physiology of the lung and now the field of study has broadened to include issues of management of care, biotechnology, and now more and more focus is on risk factors and early detection and treatment to deal with the new reality of our rapidly aging population.

What do you forecast in the future of intensive care?

Well in terms of a focus, I think it is inevitable that more research, time and resources need to be devoted to elderly care. We need to revisit differences in both the anatomy of this segment of the population, and the limitations of current therapies as well as explore the involvement of families with these cases.

In Spain, the field of intensive care is very promising. Of course there are more critical care patients requiring more ICU beds, so we need to consider other possibilities such as home care and innovative ways to expand resources to meet these increasing needs. Regardless of the challenges that lie ahead, I remain optimistic about the future because intensive care is well prepared to change to a more translational system. Already some hospitals are utilising lab-to-bedside communication, whereby intensivists are applying basic science and biology to clinical practice. This practice of "Translational Research" benefits everyone involved, from the lab technician to the patient because it breaks the boundaries between the science and the recipient of the care.

This cooperation and increased communication would also be beneficial on a wider scale, between ICU's throughout the EU. The issue of a lack of common standards from between countries could be solved through accreditation, as well as a network with set protocols, training programs and standards, and the internet could and should be more widely utilised to exchange information between healthcare professionals around the world. ■

ESICM Tackles Tough Issue During Silver Anniversary in Berlin

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More than 4900 intensive care practitioners converged on Berlin between October 6 and 10, 2007, for the 20th Annual Congress of the European Society of Intensive Care Medicine (ESICM). The congress, which also provided an occasion to celebrate the 25th anniversary of the founding of the society, included a varied programme, ranging from oral and poster presentations of new research to interactive educational sessions to technical sessions sponsored by industry. The Society's silver anniversary was highlighted by thematic sessions looking at developments in intensive care and by the publication of a book titled 25 Years of Progress and Innovation in Intensive Care Medicine.
Just in the past 10 years, membership in ESICM has increased from 1876 to 4500, and the scope of the annual meeting has grown in parallel (see Box). At the opening session, ESICM President Marco Ranieri stressed that 25 years after its' founding, the Society is dynamic and alive.

Tackling a Tough Topic

The Society also showed its willingness to tackle controversial issues with a keynote address on the topic "Conflict of Interest", delivered at Sunday's opening session by Jukka Takala from Bern, Switzerland.

In recent years there has been much debate over how research is conducted, or should be conducted, and increasingly over how it should not be conducted. Collaboration between medical research and industry is essential, said Dr. Takala, and has produced major advances. Yet research involving major conflicts of interest -- and promotion of drugs by medical professionals with financial stakes in the drugs' success -- has "badly eroded public trust in medicine and industry" stated Dr. Takala. "Why are conflicts of interest so common, and why are they taken so lightly within the medical community? " he asked. "Why do we accept or even expect that somebody else pays our lunch, travel, hotel, congress, et cetera?"

It is not immoral or unethical to have a conflict of interest, Dr. Takala said. What is unacceptable is to take inappropriate action as a result of the conflict. Direct financial incentives, vested interests, patents, study designs deviating from common practice, and lack of access to source data are all examples of areas in which the potential for a conflict of interests exists, he said.

How should the issue be addressed? Full disclosure of conflicts is popular because it provides no substantive change, said Dr. Takala. Instead, he made several recommendations: 1) practice guidelines should be developed by experts who do not have conflicts; 2) source data from completed clinical trials should be made available to an external academic coordinating centre for systematic analysis, 3) journals should require statistical confirmation of clinical trial results by external academic sources for all industry-sponsored studies, and 4) research institutes should require unrestricted access to the trial database and unlimited rights to publish the results.

At the close of the keynote address, ESICM President Ranieri stressed that "the Society is working on these issues, and the clinical community is working on these issues. What is important is that the clinical community is reacting and industry is reacting. All are making an effort to rebalance the system." Dr. Takala thanked ESICM "for having the guts to bring this difficult issue to the forefront. It's a bold move," he said, "and this needs to be done."

Complete coverage of ESICM's Silver Anniversary congress is available at www.esicm.org (Congresses/Annual congress/Past ESICM congresses). ■

ESICM Annual Congress 10-Year Comparison

Number of attendees	2170	4900
Number of countries represented	55	92
Number of sessions	68	149 + 6 PGs*
Number of speakers and chairpersons	170	245
Number of abstracts submitted	813	1211
Number of abstracts selected	678	1046
Number of posters	309	862
Number of exhibitors	52	84
Amount of exhibit space	945 m^2	1634 m^2
Number of major sponsors	4	11
Number of educational awards	12	4
Total monetary value of awards given	6000	6000

** postgraduate courses*

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Wonderful, Wonderful Copenhagen

Jennifer M. Hunter
Chairman
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In 2008, the European Society of Anaesthesiologists (ESA) will hold its annual scientific meeting, Euroanaesthesia, for the first time in Denmark at the Bella Conference Centre, Copenhagen. We look forward to welcoming you to this beautiful city. Yet again, intensive care medicine will have a high profile at this four day meeting, with two symposia based on sepsis, and five refresher courses covering weaning strategies (Grasso, Italy), renal replacement therapy (Schuerholz, Germany), and monitoring of the microcirculation (Stuber, Germany). ScvO2 and treatment strategies for secondary peritonitis will also be discussed. Pro/con debates will cover the use of insulin in the management of the critically ill (Scheeren vs. Pearse), and the use of hydrocortisone in septic shock (Martin vs. Druml). Coagulation in sepsis will be covered in detail, as will mechanical ventilation.

In other sections of this large meeting, paediatric resuscitation (Habre, Geneva) and trauma resuscitation (Brattebo, Norway) are covered, as are "hot topics" in emergency medicine. These include management of severe head trauma and spinal cord injury, and cardiopulmonary resuscitation. A symposium on thrombolytic treatment in emergencies, chaired by Jerry Nolan (Bath, UK) looks promising, with the management of myocardial infarction, pulmonary embolism and ischaemic stroke being discussed. Non-invasive ventilation in the pre-hospital setting and the use of therapeutic hypothermia for traumatic brain injury will be studied in detail in specially designed workshops.

Ethical issues in the critically ill receive coverage, including "Beyond end of life care". Living wills, do not resuscitate orders, and refusal of care in the intensive care unit will be discussed. Non-heart beating organ donation and ethical developments in transplantation medicine will be considered, as will discrimination against the morbidly obese patient.

Communication in critical care receives detailed consideration both from the patient and the staff perspective – how should we teach communication skills in this context? Maire Shelly has some suggestions. Coping with stress in this clinically demanding area is considered and explanations for its causes are given. A session on new systematic reviews in critical care is chaired by Arash Afshari (Denmark).

A joint symposium on monitoring in anaesthesia and intensive care in 2008 will consider functional haemodynamic monitoring in sepsis and acute lung injury and metabolic monitoring. An update on EEG monitoring in the critically ill by Vakkuri and Yli-Hankala (both from Finland) will be given in detail.

Of the 1300 abstracts submitted for poster presentation, several are covering aspects of intensive care. A Best Abstract Prize Competition will be held at the meeting, with judges choosing the best three out of a short-list of six abstracts. The winners will all receive cash prizes and a ticket for the conference party on the Sunday evening. The next best 12 abstracts will also have the opportunity to present their abstracts verbally.

The social programme is a fun part of the congress. The Euroanaesthesia 2008 Opening Ceremony promises to be an extraordinary show as the Danish Peter Schaufuss ballet – the first independent, internationally touring ballet company in Denmark – is putting together an unparalleled performance. Make sure to book a ticket for the networking evening at the Statens Museum for Kunst, where masterpieces can be enjoyed with delicious refreshments – the perfect opportunity to mingle with your colleagues from around the world. And last but not least, visit the Euroanaesthesia Trade Exhibition where international companies will display the latest within the field of anaesthesia and intensive care medicine. Stop by at the ESA stand where many of our National Societies will be exhibiting, sharing information about their activities. And if you are considering taking the exam for the European Diploma in Anaesthesiology and Intensive Care the ESA stand will feature a simulation test that will help prepare for the exams.

So there is plenty in the scientific and congress programme to tempt intensivists to Copenhagen from May 31st – June 3rd 2008. I am grateful to Professor Gernot Marx, Chairman of the intensive care subcommittee of the Scientific Programme Committee of the ESA and all his team for their efforts in putting together such an exciting aspect to this year's programme. I look forward to seeing you all again. I am confident that we will all receive a very warm reception from the Danish Society of Anaesthesiology and Intensive Care Medicine in Copenhagen. ■

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Agenda

APRIL 2008

17-18 10th International Consensus Conference on Intensive Care
Florence, Italy
www.esicm.org

MAY/JUNE 2008

31-3 Euroanaesthesia 2008
Copenhagen, Denmark
www.euroanesthesia.org

22-25 15th International Symposium on Infections in the Immunocomprosed Host
Thessaloniki, Greece
www.ichs.org

JUNE 2008

3-6 17th International Vicenza Course on Hemodialysis and 1st Congress of the_International Society for Hemodialysis
Vicenza, Italy
www.nefrologiavicenza.it

6-8 7th Summer Conference in Intensive Care
Athens, Greece
www.esicm.org

22-25 15th International Symposium on Infections in the Immunocompromised Host
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SEPTEMBER 2008

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Lisbon, Portugal
www.esicm.org

OCTOBER 2008

1-4 2nd Therapeutic Temperature Management (TTM) Congress
Barcelona, Spain
www.ttmcongress2008.com

4-8 European Respiratory Society Annual Congress
Berlin, Germany
www.ersnet.org

24-28 2nd Congress of the European Academy of Paediatrics (EPA)
Nice, France
www.kenes.com/paediatrics

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COVER STORY
- Sepsis

MATRIX
- Current Controversies in Ventilator-associated Pneumonia
  Part II: Diagnosis and Antimicrobial Management

MANAGEMENT
- Cardiac Management

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CONGRESS PREVIEW
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ICU Management is the Official Management and Practice Journal of the International Symposium on Intensive Care and Emergency Medicine.

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ICU MANAGEMENT IS PUBLISHED BY
EMC Consulting Group
28, rue de la Loi, B-1040 Bruxelles, Belgium
E-mail office@icu-management.org
Website www.icu-management.org

PUBLISHER
Christian Marolt c.m@icu-management.org

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Luk Haesebeyt marketing@icu-management.org

SUBSCRIPTION RATES

One year	Europe	50 Euros
	Overseas	65 Euros
Two years	Europe	85 Euros
	Overseas	100 Euros

Note: Participants of the International Symposium on Intensive Care and Emergency Medicine receive a one year subscription as part of their symposium fee.

ART DIRECTOR
Astrid Mentzik layout@icu-management.org

PRODUCTION AND PRINTING
Print run: 5,258
ISSN = 1377-7564

REFERENCES
References cited in this journal are provided to EMC Consulting Group by the authors and are available on request at editorial@icu-management.org.

Verified Circulation
according to the standards of International Business Press Audits

ICU Management is independently audited by Accountskantoor Closset on behalf of International Symposium on Intensive Care and Emergency Medicine

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