3rd NATIONAL CONFERENCE ON INTENSIVE CARE

Intensive Care in Trauma

9 – 11 September 2005

Sunway Pyramid Convention Centre
Sunway Pyramid, Petaling Jaya
Malaysia

website: ncic.org.my

Souvenir Programme
Abstract Book

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Organised by

Intensive Care Section
Malaysian Society of Anaesthesiologists

In conjunction with

Ministry of Health Malaysia
(Anaesthetic and Intensive Care Services)

Contents

Message from the Minister of Health Malaysia

I extend my warmest greetings to the participants of the 3rd National Conference on Intensive Care.

I would like to commend the Intensive Care Section of Malaysian Society of Anaesthesiologists and the Anaesthetic and Intensive Care Services of Ministry of Health for organizing this conference which has become an annual event for the intensive care fraternity in Malaysia.

The theme of this year's conference – "Intensive Care in Trauma" is most appropriate. Deaths following motor vehicle accidents now represent one of the three major causes of death in Malaysia. Improved outcome to the critically injured patients can only be ensured by the continued intensive care provided to these patients following the initial emergency care.

The presence of foreign and local experts in this conference will provide participants with the most recent developments in the management of the critically injured. Participants will also have the opportunity to exchange ideas and information and develop their professional networks.

It is my hope that this conference will provide a valuable contribution to continued professional development among healthcare providers caring for the critically injured. The Ministry is fully aware of the fact that the quality of service is closely determined by the level of knowledge and the constant upgrading of skills of all its personnel, and is therefore always committed in supporting such activities.

I wish you all a very successful and fruitful conference.

DATO' DR CHUA SOI LEK

Message from the President, Malaysian Society of Anaesthesiologists & Organising Chairperson, 3rd NCIC

On behalf of the Organising Committee and the Malaysian Society of Anaesthesiologists, I welcome you to the 3rd NCIC.

I am pleased to note that this annual scientific meeting continues to attract a big number of delegates and enjoy strong support from the health industry. But what is most encouraging this year is the big number of high quality free papers submitted for presentation and I believe this is the spin-off effect of holding such scientific meetings on a regular basis. The increase in research activities in intensive care augurs well for the future of this specialty.

Trauma intensive care is chosen as the theme for this year's discussion because after sepsis, trauma is the second most important diagnosis leading to ICU admissions in our hospitals. The management of trauma patient is particularly challenging as it not only demands the highest level of clinical skill but also the ability to coordinate care among various disciplines such as emergency medicine, surgery, radiology, anaesthesia and the operating theatre. I am confident that the trauma symposia in this conference will provide the most up to date knowledge and approach to help you manage these high risk patients.

The Intensive Care Section (ICS) of MSA (previously known as CCMS) has grown from strength to strength in the last three years. Besides the annual conferences, it has held a series of nutrition workshops, training courses for junior doctors and the highly successful 'surviving sepsis road show'. Although small in membership, ICS has proved to be a vibrant professional group worthy of recognition.

This will not be possible without the effort of a few dedicated intensivists and anaesthetists who are committed to the advancement of intensive care in Malaysia. I take this opportunity to pay special tribute to these colleagues of mine who selflessly sacrifice time to contribute to the Section for the love of the specialty.

I would like to express our utmost gratitude and appreciation to the Minister of Health for gracing our function. I thank the speakers especially our foreign guests for participating in the conference.

Finally, I thank you for joining us. I hope you have an enjoyable and a fruitful meeting.

DR NG SIEW HIAN

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YUNUS GUL

Conferment of Honorary Membership on Dato' Dr K Inbasegaran

Citation by **Dr Sylvian Das**

It gives me great pleasure and honour to stand before this distinguished gathering to read a citation for a person who, I think, has contributed a lot to the development of anaesthesiology in this country. On a personal note, I also consider it a privilege as he is a close friend of mine.

Dato' Dr Inbasegaran Kanapathipillai was born in Klang, Selangor and had his school education at the Sultan Abdul Hamid College, Alor Setar, Kedah where he was the top student in 1964, 1965 and 1966. He did his medicine at the University of Malaya from 1967.

Looking at Dato' Dr Inbasegaran, one would not think of him as a sportsman but you will be surprised to know that he represented his school in hockey and long distance running. The endurance and energy that he acquired in his younger days has stood by him during his distinguished career for he carried out his duties with the same endurance and energy.

Dato' Dr Inbasegaran is married to Datin Packiawathy and they have one beautiful daughter.

He obtained his MBBS from the University of Malaya in 1972 and did his postgraduate training in Anaesthesiology. He obtained his FFARACS in June 1979 and his FANZCA in 1992. As a true Government servant, he served in various State Capitals as the Consultant and Head of Department finally culminating in his appointment as the Senior Consultant and Head of Anaesthesiology and Intensive Care in Hospital Kuala Lumpur from 1992 to 2003 when he retired. He is currently employed on a contract basis as a Senior Consultant at Hospital Kuala Lumpur.

During his tenure of office at Hospital Kuala Lumpur, Dato' Dr Inbasegaram has trained a lot of doctors in anaesthesiology, some of whom have now became qualified anaesthesiologists. He has a zest for teaching and the willingness to impart his knowledge to others, a quality that was very much appreciated by those who worked under him. Speaking to those who have been trained by him and have served under him have given me an impression that although he is a strict boss and a stickler for discipline, he is also a kind hearted man who was always willing to help others with their problems.

In addition to teaching Anaesthesiology, Dato' Dr Inbasegaran was very much involved in the improvement of safety standards during the administration of Anaesthesia for patients. In fact he has set and chaired various committees in the Ministry of Health pertaining to the development of Anaesthesiology. It is a well known fact that from 1993 onwards the Ministry of Health saw perhaps the largest procurement exercise to modernize and upgrade all anaesthesia and intensive care equipment in the public hospitals in the country.

Dato' Dr Inbasegaran has also been responsible through the Ministry of Health to start various programmes to upgrade the intensive care units in the hospitals and with that the establishment of CPR programmes on a regular basis.

In spite of his busy official schedule, he has also been involved in the activities of the Malaysian Society of Anaesthesiologists. A member of the Malaysian Society of Anaesthesiologists since 1976 he has contributed immensely to the Society which words cannot express. He has held so many posts in the Society that time does not permit me to state all except to say that he has the distinction of being the President of the Malaysian Society of Anaesthesiologists twice from 1995 to 1997 and from 2001 to 2003. He has also served the Society by being involved in the organization of various conferences both locally and international ones including the 11th Asian Australasian Congress of Anaesthesiologists held in Kuala Lumpur in 2002.

He has done Malaysia proud in the field of Anaesthesiology by being nominated to subcommittees of the World Federation of Societies of Anaesthesiologists namely the Subcommittee on Statutes and Byelaws and the Subcommittee on International Patient Safety Foundation.

In recognition of his contributions, he has received awards from various State Governments including the Datoship from the State of Perlis in 1998.

If there is one singular achievement among his many that one has to highlight during his distinguished career, I would put it to the efforts that Dato' Dr Inbasegaran has done to improve the safety of Anaesthesiology in this country. He is one person who has been very particular about minimum monitoring standards for Anaesthesiology in the operating theatre and it is through the efforts of people like him that it is safer now for patients to undergo anaesthesia in hospitals in Malaysia.

I consider it an honour to present to you Dato' Dr K Inbasegaran for conferment of Honorary Membership of the Malaysian Society of Anaesthesiologists.

Programme Summary

TIME \ DATE	8 SEPTEMBER 2005 THURSDAY	9 SEPTEMBER 2005 FRIDAY	10 SEPTEMBER 2005 SATURDAY	11 SEPTEMBER 2005 SUNDAY
0800 – 0830		REGISTRATION (0800 – 1730)	Pyramid 2 PLENARY 2	Pyramid 2 PLENARY 4
0830 – 0900		Pyramid 2 PLENARY 1		
0900 – 0930			Pyramid 2 PLENARY 3	Pyramid 2 PLENARY 5
0930 – 1000		Pyramid 2 Opening Ceremony		
1000 – 1030		Trade Exhibition / Tea	Tea	Tea
1030 – 1100		Pyramid 2 SYMPOSIUM 1 (Trauma) / Pyramid 1 SYMPOSIUM 2 (Sepsis)	Pyramid 2 SYMPOSIUM 5 (Trauma) / Pyramid 1 SYMPOSIUM 6 (Paediatrics)	Pyramid 2 SYMPOSIUM 9 (Organisation)
1100 – 1130				
1130 – 1200				
1200 – 1230	REGISTRATION (1100 – 1730)			
1230 – 1330		Pyramid 3 Lunch	Pyramid 3 Lunch	Pyramid 3 Lunch
1330 – 1430				
1430 – 1500	ISIS, Anukis & Giza	Pyramid 2 SYMPOSIUM 3 (Trauma Interactive) / Pyramid 3 SYMPOSIUM 4 (Paediatrics)	Pyramid 2 SYMPOSIUM 7 (Respiratory) / Pyramid 1 SYMPOSIUM 8 (Trauma)	
1500 – 1530	PRE-CONFERENCE WORKSHOP ON Hemodynamic Monitoring & Respiratory Care			
1530 – 1600				
1600 – 1630		Tea	Tea	
1630 – 1700				
1700 – 1730		Pyramid 3 FREE PAPERS		
1730 – 1815				

8 September 2005, Thursday

1400 – 1730 **PRE-CONFERENCE WORKSHOP ON HEMODYNAMIC MONITORING AND RESPIRATORY CARE** ISIS / ANUKIS / GIZA

(This Pre-Conference Workshop shall only accommodate a maximum number of 60 participants, to be split into 2 groups of 30 participants for each Module and to switch Module after 105 minutes so that all participants get to attend all stations)

I. Hemodynamic Monitoring

Coordinators: Nor'Azim Mohd Yunos / Ahmad Shaltut Othman

- Introduction on Haemodynamic Monitoring **Nor'Azim Mohd Yunos**

Stations:

1. Flotrac Continuous Cardiac Output Monitoring
2. PiCCO Continuous Cardiac Output Monitoring
3. NiCCO Continuous Cardiac Output Monitoring

II. Respiratory Care

Coordinators: Syed Rozaidi Wafa / Muraly Somasundram / Raha Abdul Rahman

- Introduction to Workshop **Syed Rozaidi Wafa**

Stations:

1. Waveform and Graphics Station **Tyco Specialist**
   - Understanding the Use of Graphics and Waveform in Determining Ventilator Settings and Parameters
2. BiLevel/BiPAP Station
   - How to Use BiLevel/BiPAP from Intubation to Extubation
3. Non-invasive Mechanical Ventilation Station
   - From Start to Finish

Each Workshop consists of a Short Mini Lecture of 10 minutes and a Hands-on Session of 20 minutes and each Station would be rotated every 30 minutes.

9 September 2005, Friday

0800 – 1730	**REGISTRATION**	PYRAMID 2
0830 – 0930	**PLENARY 1** Chairperson: V Sivasakthi Trauma State of the Art: From Epidemiology to Therapy **Jamie Cooper** Pg 13	
0930 – 1000	Opening Ceremony	PYRAMID 2
0920	Guests and Delegates to be seated	
0930	Welcome Address by Dr Ng Siew Hian, President, Malaysian Society of Anaesthesiologists and Chairperson, Intensive Care Section of MSA	
0935	Speech by YB Dato' Dr Chua Soi Lek, Minister of Health Malaysia	
0955	Conferment of Honorary Membership on Dato' Dr K Inbasegaran (Citation by Dr Sylvian Das)	
1000	Opening of the Trade Exhibition	
	Refreshments	
1000 – 1045	Trade Exhibition / TEA	
1045 – 1230	**SYMPOSIUM 1 (TRAUMA)** Chairpersons: Jenny Tong / Lim Wee Leong	PYRAMID 2
1045 – 1110	1. Ischaemia-Reperfusion Injury in the Trauma Patient **Gracie Ong**	
1110 – 1135	2. Trauma – Timing is Everything **Jaafar Md Zain** Pg 14	
1135 – 1200	3. Clearing the Cervical Spine **Jamie Cooper** Pg 15	
1200 – 1225	4. Intra-abdominal Injury: Conservative versus Surgical Management **Yunus Gul** Pg 16	
1045 – 1230	**SYMPOSIUM 2 (SEPSIS)** Chairpersons: Tai Li Ling / Ahmad Shaltut Othman	PYRAMID 1
1045 – 1110	1. The Role of Minimally Invasive Cardiac Output Monitoring **Charles D Gomersall**	
1110 – 1135	2. High Volume Haemofiltration in Septic Shock **Loo Shi** Pg 17	
1135 – 1200	3. Antibiotic Therapy: Early Empiric Therapy, De-escalation, Cycling **Jenny Tong** Pg 18	
1200 – 1225	4. Confronting the Challenge of MRSA **Julian F Bion**	
1230 – 1430	LUNCH	PYRAMID 3
1430 –1615	**SYMPOSIUM 3 (TRAUMA INTERACTIVE)** Faculty: Shanti Rudra Deva / Tai Li Ling / Noor Airini Ibrahim	PYRAMID 2
1430 –1615	**SYMPOSIUM 4 (PAEDIATRICS)** Chairperson: Teh Keng Hwang	PYRAMID 3
1430 – 1505	1. Submersion and Asphyxial Injuries **Tang Swee Fong** Pg 19	
1505 – 1540	2. Neonatal Brain Injury **Cheah Fook Choe** Pg 20	
1540 – 1615	3. Management of Paediatric Burns **David N Schell** Pg 21	
1615 – 1645	TEA	
1645 – 1815	**FREE PAPERS** Chairperson: Nik Abdullah Mohamad	PYRAMID 3

10 September 2005, Saturday

0800 – 0900	**PLENARY 2** Chairperson: Tang Swee Fong Ethical Issues in Intensive Care **Charles D Gomersall**	PYRAMID 2
0900 – 1000	**PLENARY 3** Chairperson: Tang Swee Fong Child Abuse and Intensive Care **David N Schell** Pg 22-23	PYRAMID 2
1000 – 1045	TEA	
1045 – 1250	**SYMPOSIUM 5 (TRAUMA)** Chairpersons: Mohd Basri Mat Nor / V Sivasakthi	PYRAMID 2
1045 – 1110	1. Airway Management in the Polytrauma Patient **Lim Boon Leng** Pg 24	
1110 – 1135	2. Brain and Spinal Cord Trauma: Controversies in the TBI Algorithm **Jamie Cooper** Pg 25	
1135 – 1200	3. Monitoring in Head Injured Patients **Kwek Tong Kiat** Pg 26	
1200 – 1225	4. Hypothermia in the Trauma Patient **Nor'Azim Mohd Yunos** Pg 27	
1225 – 1250	5. Patient Safety during Transport **Tan Cheng Cheng** Pg 28-29	
1045 – 1250	**SYMPOSIUM 6 (PAEDIATRICS)** Chairperson: Thavaranjitham	PYRAMID 1
1045 – 1110	1. Neuro-Intensive Care Monitoring **Loh Tsee Foong** Pg 30	
1110 – 1135	2. The Continuum Care for Emergency Surgery in the Unstable Paediatric Patient **Sushila Sivasubramaniam** Pg 31	
1135 – 1200	3. Brain Death – Criteria for Diagnosis in Children **Adrian Goh**	
1250 – 1400	LUNCH	PYRAMID 3
1400 – 1605	**SYMPOSIUM 7 (RESPIRATORY)** Chairpersons: Nor'Azim Mohd Yunos / Subrahmanyam Balan	PYRAMID 2
1400 – 1425	1. Pharmacologic Approaches in the Ventilated Patient **Chen Fun Gee** Pg 32	
1425 – 1450	2. Evidence for Colloid and Diuretic Therapy in ALI **David V Tuxen** Pg 33	
1450 – 1515	3. Ventilatory Strategies in Pneumonia Induced Lung Injury **Syed Rozaidi Wafa**	
1515 – 1540	4. Lung Recruitment: From Theory to Practice **David V Tuxen** Pg 34-35	
1540 – 1605	5. Protocolised Weaning from Mechanical Ventilation **Loo Shi** Pg 36	
1400 – 1605	**SYMPOSIUM 8 (TRAUMA)** Chairpersons: Shanti Rudra Deva / Aisai Abdul Rahman	PYRAMID 1
1400 – 1425	1. Management of Critical Bleeding in the Coagulopathic Patient **Lim Boon Leng** Pg 37	
1425 – 1450	2. Thromboembolism in the Trauma Patient **Nik Abdullah Mohamad** Pg 38	
1450 – 1515	3. Pain Management in Polytrauma Patients **Mary Suma Cardosa** Pg 39	
1515 – 1540	4. Predicting Outcomes following Severe Head Injuries **Kwek Tong Kiat** Pg 40	
1540 – 1605	5. Management of the Organ Donor **Sharifah Suraya Syed Mohd Tahir**	
1605 – 1630	TEA	

11 September 2005, Sunday

PYRAMID 2

0800 – 0900 **PLENARY 4**
Chairperson: Gracie Ong
Safe Care of the Acutely Ill Patient – The Challenge to Health Services **Julian F Bion**

PYRAMID 2

0900 – 1000 **PLENARY 5**
Chairperson: Gracie Ong
The Impact of Potential Mass Disasters on Intensive Care **David V Tuxen** Pg 41-42

1000 – 1045 TEA

PYRAMID 2

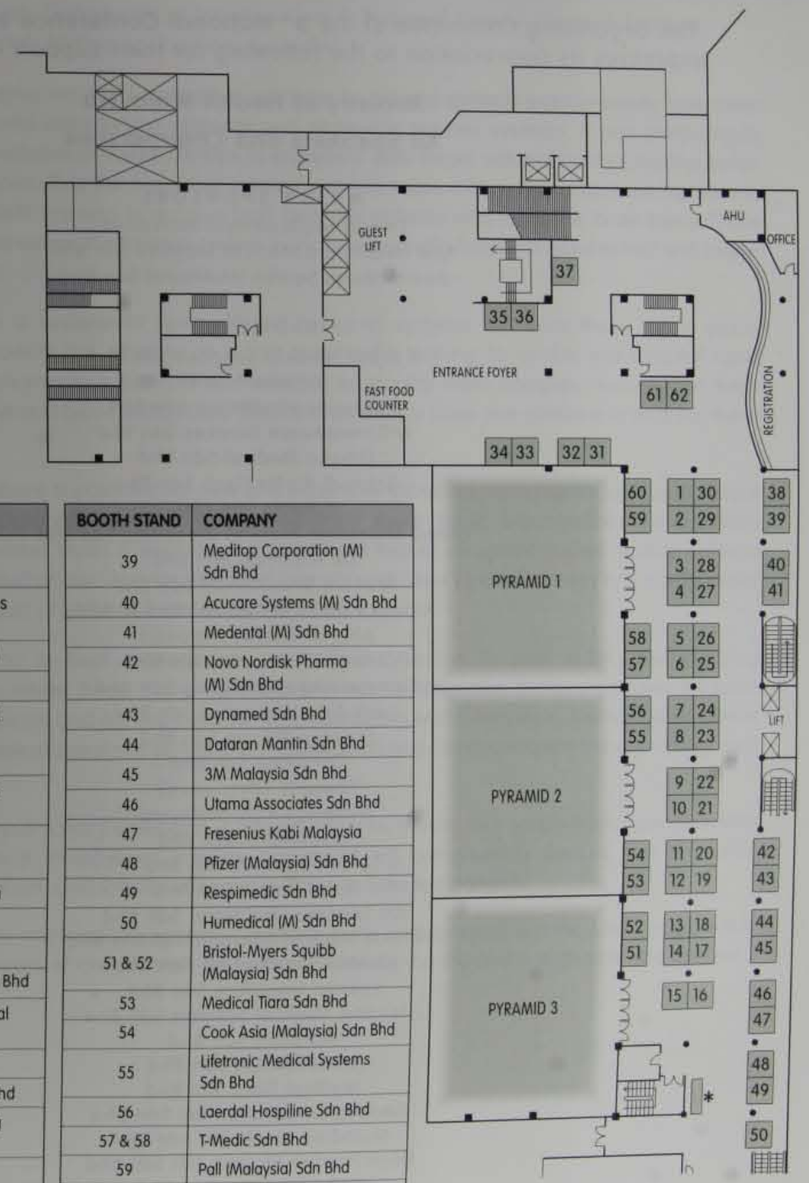
1045 – 1250 **SYMPOSIUM 9 (ORGANISATION)**
Chairpersons: P Anuradha / Jahizah Hassan

1045 – 1110 1. Organisation of Intensive Care Service **Ng Siew Hian** Pg 43
1110 – 1135 2. Triage of Admissions to Intensive Care **Charles D Gomersall**
1135 – 1200 3. Education and Training in Intensive Care **Julian F Bion**
1200 – 1225 4. Research in Intensive Care **Chen Fun Gee** Pg 44
1225 – 1250 5. Point-of-Care Testing in the Intensive Care Setting **Tai Li Ling** Pg 45

PYRAMID 3

1250 – 1400 LUNCH

Function Rooms & Trade Exhibition



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TRAUMA STATE OF THE ART: FROM EPIDEMIOLOGY TO THERAPY

Jamie Cooper
Trauma Intensive Care Unit, Department of Intensive Care & National Trauma Research Institute (NTRI), The Alfred Hospital, Melboune, Victoria, Australia

During the last 25 years, greatest improvements in outcome for trauma patients internationally have been achieved by organising and establishing regional and statewide trauma systems. It has been clearly established that trauma volume at these centres is important with larger volume centres having better outcomes than smaller ones, that the impact of trauma systems takes 7-10 years to become significant, and that the greatest benefit appears to occur in high mortality patients with traumatic brain injury. These factors have all been observed as the trauma system in Victoria Australia has been established and begun to mature.

Pre-hospital trauma care is dependent upon efficient transport systems, but once these are in place, the most contentious aspects are whether to adopt paramedic training to enable pre-hospital rapid sequence intubation in unconscious patients and whether to employ more complex resuscitation fluids including hypertonic saline and blood substitutes. Recent clinical trials have and continue to address these issues.

In the Emergency Room, there is potential for new and expensive therapies including Factor VIIa to reduce bleeding, but there is probably more to be gained from more basic organisational and system improvements. Video assisted audit is enabling a randomised trial of computer guided routine protocol prompts at the Alfred in Melbourne. At a simpler level, use of rapid Level 1 blood infusers has a substantial impact on the small number of patients with very large blood loss.

In the ICU, chest trauma is best managed by meticulous attention to pain relief, and avoiding underestimating severity, whilst head injury optimally involves collaborative protocols based on Brain Trauma Foundation guidelines and agreed between neurosurgeons and intensivists. Collaborative clinical trials have proved an excellent means of optimising collaboration and communication between these craft groups in Australia.

The very high risk for DVT-pulmonary embolism in trauma patients, means that prophylaxis against venous thromboembolism is critical. Prophylaxis involves pneumatic leg compression devices, low molecular weight subcutaneous heparin, and inferior vena caval filters in selected patients.

Cervical spine clearance in unconscious patients continues to be controversial, but the Alfred approach is uniquely based upon 15 years of clinical trials and protocol developments, and is both safe and efficient.

TRAUMA: TIMING IS EVERYTHING

Jaafar Md Zain
Department of Anaesthesia & Intensive Care, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Trauma is the third's leading cause of death after cardiovascular disease and cancer and is now is the leading cause of death for people aged 40 and less. Traffic accidents cause the most serious injuries and a person is injured in a traffic accident every 15 seconds. Donald Trunkey described a trimodal pattern of trauma death with regard to timing of injury. The first peak of death occurs within seconds to minutes of injury, which is unavoidable as it occurs instantaneously upon impact. The second peak of death occurs within an hour or two (Golden Hour) after injury. It is preventable if timely and appropriate resuscitation is rapidly instituted. The third peak of death occurs days or weeks following trauma and is usually attributable to multiple organs failure or sepsis. The Royal College of Surgeons Working Party and the Major Trauma Outcome Study (MTOS) reported serious deficiencies in the way trauma patients were managed in the UK. They concluded that 21% of patients with ISS greater than 15 took longer than 1 hour to reach hospital. Most trauma care systems now focus on the initial management within the golden hour of sustaining major injuries. Adam Crowley, upon reviewing the Maryland emergency medical services system, stated that "the first hour after injury will largely determine a critically injured person's chances for survival. The 'scoop and run' versus the 'load and go', the platinum ten minutes, transport to 'most appropriate' rather to the 'most closest ', triaging, primary and secondary survey, permissive hypotension & low volume resuscitation and staged surgery repair are newer approaches to managing multi-trauma patients. Triaging is a process of sorting out and categorizing patients into classes, which then reflect an appropriate time to initiate response. Class 1 where action is immediate; Class 2 needs urgent attention within 30 minutes of patient admission and so on. Patients in Class 1 will be immediately wheeled to the Trauma Resus Room and immediately attended by a Trauma Team. Members of this team shall include trained doctors, nurses and paramedics who would perform tasks simultaneously, a process known as "horizontal organization. The Trauma Team concept is quite a close resemblance to that of the Formula 1 seen at the Pit Stop! This "horizontal organization" has given tremendous impact on the speed of resuscitation and it has been shown that it reduces time to life saving procedures by 50% when compared to a "vertical organization". The Primary survey should be accomplished within 2 minutes and focus on airway and cervical spine; breathing and ventilation; circulation and hemorrhage control. In conclusion time towards 'stabilization' of the patient's ABC and 'rapid' transportation is the vital link to survival in dealing with multisystem trauma.

CLEARING THE CERVICAL SPINE

Jamie Cooper
Trauma Intensive Care Unit, Department of Intensive Care & National Trauma Research Institute (NTRI), The Alfred Hospital, Melboune, Victoria, Australia

In unconscious trauma patients, rapid cervical spine clearance is important and essential to minimise complications, but missed injury has potentially catastrophic consequences for the patient. Evidence and reality based routine clearance protocols are key to optimising practice, and minimising complications.

Cervical spine X-rays alone are inadequate, and for many years the Alfred in Melbourne utilised dynamic X-rays using flexion-extension fluoroscopy to minimise the risk of missed instability. However detailed investigations determined that dynamic X-rays were time consuming, insensitive, and rarely altered therapy.

More recently, early cervical single slice CT with reconstructions has replaced dynamic fluoroscopy for routine screening. However, in several patients with very high-risk mechanisms of injury, single slice CT failed to detect unstable fractures which were later identified on MRI. We attempted to incorporate MRI into our routine screening, but have found it to be complex and inappropriate. Instead we have adopted multi-slice CT for very high risk patients, and will extend this to all trauma patients as the technology becomes more available to us. MRI now has a more selective role of investigating established injuries or suspicious clinical signs.

In the Alfred cervical clearance protocol for unconscious trauma patients, the final radiologist report of the CT reconstructions on the ICU computer is sufficient for an intensivist to remove the cervical collar, without waiting for time consuming reviews from other specialists.

INTRA-ABDOMINAL INJURY: CONSERVATIVE VERSUS SURGICAL MANAGEMENT

Yunus Gul
Department of Surgery, Faculty of Medicine & Health Sciences,Universiti Putra Malaysia, Kuala Lumpur, Malaysia

In recent years, conservative treatment in patients with blunt liver and splenic trauma has become more widely accepted for haemodynamically stable patients. This has been successfully aided by improvements in hospital care system such as the increasing availability of specialist units and the use of new imaging methods and modern technologies in surgical treatment. It must however be noted that non-operative management requires close clinical vigilance which is of utmost importance in procuring an effective outcome and that this form of management may be untenable in those with multiple injuries. Even though the prognosis of patients with intraabdominal trauma is often influenced by the potential reversibility of haemorrhagic shock and the severity of associated injuries, the role of multidisciplinary care and input in the management process cannot be overemphasised if an effective outcome is to be procured.

HIGH VOLUME HAEMOFILTRATION IN SEPTIC SHOCK

Loo Shi
Department of Anaesthesiology, Tan Tock Seng Hospital, Singapore

The role of extracorporeal blood purification treatment in the management of SIRS/Sepsis remains a matter of controversy. Trials conducted using various modalities have been reported and the evidences were of variable quality.

High volume haemofiltration (HVHF) is among the modalities that have been tried. A proposition was made in Melbourne (ISCCN 2001) to divide "HVHF in Sepsis" into categories according to the volume exchanged. Very Low Volume HF is refers to an exchange rate below 35 ml/kg/h, Low Volume HF is for rates between 35 to 50 ml/kg/h, High Volume HF(HFVF) for rates from 50 to 99 ml/kg/h and Very High Volume HF (VHFVF) for that from 100 to 215 ml/kg/h.

The apparent efficacy of HVHF in experimental models and some small studies has been postulated to be due to its "pleiotropic" effect on SIRS and sepsis: (1) through modulating the early immunological response to sepsis, (2) interfering with cardiovascular compounds in the blood (eg. myocardial depressant factor, endocannabinoids and endothelin), (3) reducing the concentration of PAI-1 factor.

The recent Consensus Statements released by the group Acute Dialysis Quality Initiative (ADQI) has affirmed that while current evidence suggests that HVHF may indeed be promising in the treatment of SIRS/Septic shock, there is still inadequate evidence to recommend it as a standard treatment, especially when there is no concomitant acute renal failure. It was suggested that patients with catecholamine-resistant septic shock and acute renal failure may require HFVF.

ANTIBIOTIC THERAPY: EARLY EMPIRIC THERAPY, DE-ESCALATION, CYCLING

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Septic shock is the most common cause of death in ICUs with a mortality ranging from 40-60%. Antibiotic therapy is a cornerstone in the management of these patients. The choice of antibiotic must address the issue of patient survival with consideration for the prevention of emergence of resistance and cost-effectiveness.

Antibiotic therapy should be started within the first hour of recognition of sepsis, after appropriate cultures have been taken. Many studies have demonstrated that early administration of appropriate antibiotics reduced mortality in patients with sepsis. The choice of initial empirical antibiotic therapy should be guided by the severity of sepsis, most likely pathogens, ability of the antibiotic to penetrate into the presumed source of sepsis and susceptibility patterns of microorganisms in the community and in the hospital.

De-escalation therapy describes an approach of administering empiric broad-spectrum antibiotic to improve outcome and change to a narrow-spectrum antibiotic to prevent the development of resistance and to reduce toxicity and costs. Carbapenems, third-generation and fourth-generation cephalosporins, extended spectrum carboxypenicillins or ureidopenicillins combined with β-lactamase inhibitors are equally effective as empirical antibiotics therapy in patients with severe sepsis and septic shock. The antibiotic regimen should be reassessed after 48-72 hours on the basis of microbiological and clinical data.

Excessive use of broad-spectrum antibiotics has been directly correlated with the emergence of antibiotic-resistant bacteria. Antibiotic cycling is defined as the deliberate scheduled removal and substitution of antibiotics within a class or between different classes for use in empirical and directed therapy. This concept, proposed as a measure to decrease the emergence of antibiotic resistance, will, in theory reduce the selective pressure driving pathogens to become resistant to any single class of antibiotics. Presently, there is insufficient scientific evidence to recommend antibiotic cycling as a strategy to reduce the development of antibiotic resistance.

SUBMERSION AND ASPHYXIAL INJURY

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Drowning and other asphyxial injuries are important causes of childhood morbidity and mortality. Although drowning is unique in some respects, it is a well-studied and common cause of asphyxial injury, and it can serve as a model for understanding many of the prognostic, pathophysiologic and therapeutic aspects of all types of asphyxial injury in the paediatric population. The detrimental results in submersions are the same: intrapulmonary shunting, decreased compliance, and ventilation-perfusion mismatch. Together these lead to hypoxia, which is the central cause of diffuse organ pathology. The extent of hypoxic insult will ultimately determine outcome. A great deal of research has focused on epidemiological, clinical and laboratory predictors of outcome for drowning victims. Factors associated with poor outcome include prolonged submersion time, acidosis, low GCS, and hyperglycaemia. Unfortunately, no single or combination of variables has proven to be reliably predictive of poor outcome. The clinical course of the drowning victim is determined primarily by the duration of hypoxic-ischaemic injury and by the adequacy of initial resuscitation. Children who are admitted to the intensive care unit should be monitored for the presence or development of lung injury or cardiovascular instability. However, the majority of long term morbidity and mortality after drowning is due to hypoxic-ischaemic brain injury. Thus, resuscitating the brain and preventing further neurological injury is imperative in early management. Neuroresuscitative strategies that have been applied to victims of hypoxic-ischaemic brain injury have included ICP monitoring and management, barbiturates, hypothermia, calcium channel blockers, free radical scavengers and others. To date, though, supportive data regarding effective cerebral resuscitation therapies are limited. Therapeutic strategies specifically aimed at limiting brain injury are under investigation and may eventually be possible but are currently not available clinically. It is estimated that 80% of all drownings are preventable; hence, prevention remains the key link in the chain to survival.

NEONATAL BRAIN INJURY

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A distinctive feature of the neonatal brain is that neuronal maturational processes such as organization and myelination continue to develop in the postnatal period. The vulnerability of the newborn brain to various perinatal insults is also characterised by gestational-related susceptibility of certain regions of the brain and types of neurons to injury. For instance, susceptibility to injury of developing oligodendrocytes and subplate neurons, which are critical in the formation of connections between the thalamus and visual cortex, are more pronounced in premature than term infants. The newborn brain is also more vulnerable to oxidative and excitotoxic neuronal damage according to the differences in stages of development.

Other causes of neonatal brain injury aside from birth asphyxia are increasingly revealed with advanced methods of neuroimaging, such as, MRI and diffusion-weighted MRI, and laboratory tests. There is emerging evidence to link intrauterine inflammation with brain injury and associated poor neurologic outcome in preterm infants, whereas in full-term infants - neonatal stroke (1 in 4000 live births), is an increasingly recognized entity presenting commonly as early-onset seizures with the activation of coagulant mechanisms being implicated as an aetiology.

Imaging modalities also help in the early diagnosis of the brain-injured premature infant, often manifesting with subtle signs, and in the prediction of neurodevelopmental outcomes. Electrophysiologic assessment with evoked potentials and early continuous amplitude integrated EEGs are other tools that have allowed better prognostication and evaluation of new therapies.

That neonatal brain injury leads to cerebral metabolic derangement has lent the basis for the development of potential interventions, such as induction of hypothermia. Preliminary results of therapeutic hypothermia suggest that this approach is safe and that neurodevelopmental outcomes were better in moderately encephalopathic infants in the cooling group. Results from further ongoing trials are awaited to confirm the benefits of therapeutic hypothermia before it is introduced into routine clinical practice.

MANAGEMENT OF PAEDIATRIC BURNS

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This abstract will briefly outline current strategies used to manage burns requiring intensive care.

In much of the world, the majority of paediatric burns are caused by scalds and most of these occur within the first 4 years of life. In the early teenage years there is another peak in incidence, predominantly involving males. In our burns unit, approximately 8% of injuries were thought to be a consequence of either abuse or neglect. There has been a progressive decrease in burns mortality over the past few decades; however young children (and elderly adults) are still overrepresented in the figures. In many centres, massive burns (> 80%) are no longer considered a death sentence and significant survival figures are being reported. What are the factors contributing to the improved survival?

1. Centralisation of burns expertise into "Burns Centres" with early referral and transfer.
2. Appropriate resuscitation:
   a. Airway, breathing (including intubation and ventilation prior to the onset of significant airway oedema);
   b. Circulation (goal directed fluid resuscitation and appropriately timed escharotomy) after accurate assessment of burns surface area (e.g. using Lund and Browder chart).
3. Early excision and closure of full thickness wounds is possibly the most important strategy in reducing mortality (depth assessment can be difficult in the first few days after a burn and new strategies including the use of laser Doppler imaging may prove useful).
4. A profound catabolic state occurs in patients with large burns, characterised by increased nitrogen turnover a negative nitrogen balance and loss of lean body mass. These effects do not appear to be reversed by aggressive nutrition; however early feeding may confer other benefits, including a reduction of systemic sepsis. Other catabolic and antianabolic strategies will be discussed.
5. Following initial resuscitation, much of the mortality of burns is sepsis-related. Recognition and diagnosis is often difficult because of persistence of the burns-induced inflammatory response (SIRS) that mimics infection. Surface cultures are difficult to interpret, and excessive use of systemic antibiotics will promote the appearance of resistant organisms. Therefore, antibiotics should be limited to short courses, with narrow spectrum drugs where possible.
6. The use of skin substitutes and other biological dressings has aided in the ability to achieve early excision.

Other issues of importance in the intensive care include appropriate pain management, prevention of contractures, and the psychosocial well being of the child and family.

CHILD ABUSE AND INTENSIVE CARE

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Deliberate or intentional injury of children is not a new concept and there is ample documentation of child maltreatment throughout the history of mankind. The modern medical approach to child abuse has its origins in the work of Ambroise Tardieu, who described 32 children whom he believed died as a consequence of child abuse in 1860. In 1946, Caffey a paediatrician and radiologist described 6 children with subdural hematomas and long bone fractures in the absence of any history of trauma. In 1961 Kempe first used the term "Battered Child Syndrome", and in the early 70's Caffey described "The Whiplash Shaken Infant Syndrome". The true incidence of child abuse is unknown.

The diagnosis of abuse can be challenging. A careful medical history is crucial. Perhaps the most important features are an injury that is unexplained by history or developmentally not possible or an absent, changing, or evolving history. Other commonly described features will be discussed.

The major non accidental injuries seen in Intensive Care are head trauma, blunt visceral trauma and scald burns.

Head Trauma. There is a wide variability in the clinical presentation of patients with inflicted head trauma, and symptoms may be non specific including irritability, poor feeding or vomiting. Those admitted to the ICU present with profound neurological symptoms including seizures and coma, but also respiratory and cardiac arrest. Neuroimaging is routine in these patients and the CT findings are acute subdural hematoma, chronic subdural hematoma, cerebral contusion, focal/multifocal/diffuse cerebral oedema, and atrophy. Acute and/or chronic subdural hematomas and cerebral contusion are common in child abuse; however intracerebral hematomas and extradural hematomas are uncommon. Retinal haemorrhages are found in a significant percentage (possibly as high as 80%) of patients with inflicted head trauma. Caffey, along with others postulated that the head injury was caused by shaking, with the combined effects of rotation, acceleration and deceleration causing shear injury. This pattern of injury is now more commonly called the "shaken baby syndrome". There is some debate as to whether an impact is also necessary, based on biomechanical studies. Clearly, in those cases where a skull fracture is present, an impact has occurred. The differential diagnosis necessarily includes accidental trauma. A common explanation is that the child fell from a low height, often a bed or other household furniture. The controversies surrounding this type of injury include: a) can SDH and retinal haemorrhages occur with a simple fall? b) do rib fractures and retinal haemorrhages occur with cardiopulmonary resuscitation? c) do other medical conditions mimic these features?

Other conditions should be excluded including birth trauma, vitamin K deficiency, coagulopathy including haemophilia and disseminated intravascular coagulation, ITP, CNS infection, and some inborn errors of metabolism. Mortality from abusive head injury is high (12-30%) and neurological morbidity is significant in survivors.

Blunt Visceral Trauma. This is seen less commonly than head trauma in all reported series and should be suspected when there is no adequate history to explain the injury. It is usually the result of a punch or kick to the abdomen or thorax. Clinical presentation is variable, but often involves cardiovascular collapse when the compensatory mechanisms for shock fail. Injuries to the small bowel, particularly the duodenum, mesentery, liver and spleen are described.

Burns. In Sydney, it has been estimated that 8% of burns admitted to hospital are caused by abuse or neglect. In other parts of the world, figures vary from < 1% in Plymouth U.K. to 25% in San Francisco. Certain characteristics are found in non accidental burns. Historic factors are similar to other forms of non accidental injury. Scald burns are seen most commonly, and may have a "stocking" or "glove" appearance. It is said that there is more likely to be a clear demarcation between normal and burned skin with an absence of splash marks. A "doughnut" pattern may be seen with sparing of the buttocks and soles of the feet when a child has been pushed down against the cooler surface of the tub or sink.

An approach to investigation will be discussed, but should include a careful examination for other injuries (fractures, bruises, bites, oral and dental injuries), and investigations to exclude other medical causes for fractures, bleeding and bruising.

In summary, a high index of suspicion is needed to correctly diagnose non accidental injury. Failure to do so may have dire consequences for the child, but similarly may be catastrophic for the carers if accidental injury is labelled intentional. In Australia (and in other parts of the world) suspicion of non accidental injury requires a mandatory notification to child protection authorities. At Children's Hospital Westmead, this involves referral to the hospital's Child Protection Unit and the Department of Community Services. In highly suspicious cases the Joint Investigation and Response Team (a combined investigation involving specialists from the police force and the Department of Community Services) is activated.

AIRWAY MANAGEMENT IN THE POLYTRAUMA PATIENT

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Polytrauma patient may present with airway obstruction due to maxillofacial/ neck/ laryngeal trauma. Airway management is crucial to survival of patient as any delay in securing airway and providing adequate ventilation may prove fatal. Concomitant cervical injury, head injury and aspiration pneumonia may add further difficulties in airway management. Ventilation may be compromised due to severe pain from fracture ribs, flail chest, tension pneumothorax and cardiac tamponade.

Early recognition and intervention of airway is key to survival of polytrauma patient. BCLS should be rendered at the scene with chin lift, jaw thrust, oral/nasal airway.

ACLS should be provided at emergency dept to secure definitive airway.

A difficult airway cart with some of the following devices is useful in emergency difficult airway situations:

1. Gum Elastic Bougie
2. Lighted Stylet (Trachlight)
3. Indirect Rigid Fibreoptic Laryngoscope
4. Laryngeal Mask Airway
5. Oesophageal Tracheal Combitube
6. Fibreoptic Bronchoscope
7. Retrograde Intubation
8. Cricothyroidectomy
9. Percutaneous Tracheostomy

Fibreoptic bronchoscope remains the gold standard for elective predicted extremely difficult airway. However, it is expensive and it takes a longer time to acquire the skill to intubate. It is not useful in emergency situations.

Laryngeal mask has gained recognised role in emergency difficult airway situations. It has been shown to be easily trained even in paramedical staff. The recent introduction of double lumen ProSeal LMA has gained popularity due to its ease of insertion and a separate tract for gastric aspiration to prevent aspiration pneumonia, which is a common complication of polytrauma patient. The tight seal around supraglottic area allows positive pressure ventilation.

The use of ProSeal LMA for difficult airway followed by percutaneous tracheostomy has been reported for patient with difficult airway and impossible to intubate.

Anaesthetist/emergency physician should be familiar with ASA difficult airway algorithm and avoid muscle relaxant for potential difficult airways. Both anaesthetist and ENT surgeon should be called with emergency tracheostomy set on standby before intubation attempts for severe facial/neck trauma.

BRAIN AND SPINAL CORD TRAUMA: CONTROVERSIES IN THE TBI ALGORITHM

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Current outcomes of patients with severe traumatic brain injury (TBI) are unsatisfactory, even at the best centres. Only 50% of these patients are eventually able to live independently.

Focussed well equipped neurotrauma centres are beneficial, but the potential benefit of pre-hospital interventions including rapid sequence intubation, and improved resuscitation fluids is not yet proven. Clinical trials are in progress.

Following the recently published SAFE trial, albumin resuscitation is now in question for patients with TBI, and until further information is available, albumin is best avoided. ICP monitoring is also unproven, but likely important, and is best achieved with an extra-ventricular catheter (EVD). Cerebral perfusion pressure (CPP) is targeted, and guidelines for target CPP have recently been decreased from 70 to 60 mmHg. Some investigators favour individually directed perfusion pressure targets based upon invasive neuro-monitoring of brain oxygen and metabolites.

High dose steroids are now contraindicated in TBI patients, following the CRASH trial, but low replacement dose steroids are often important, as reversible hypothalamic-pituitary suppression is not uncommon in severe TBI.

Prophylactic therapeutic hypothermia is not recommended, after the large US randomised trial found no benefit, but therapeutic hypothermia for refractory intracranial hypertension is more controversial. A future trial will likely address this question.

Decompressive craniectomy surgery for refractory intracranial hypertension holds great promise, is quite controversial, and is the topic of two large international multi-centre randomised trials currently. The ANZICS-CTG DECRA trial will be discussed.

MONITORING IN HEAD INJURED PATIENTS

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The head injured brain is vulnerable to secondary insults that may adversely affect outcome. These insults range from systemic physiologic derangements such as hypotension, hypoxemia, hypo and hypercarbia, hypo and hyperglycemia, anemia and hyperthermia to neurologic events such as raised intracranial pressures (ICP), seizures, brain herniation, edema, vasospasm and hyperemia.

Multi-modality neuromonitoring in head injured patients refers to tracking multiple parameters of brain physiology and function that can be affected by direct medical and surgical interventions. Many of these parameters monitored have been shown to correlate with outcome and are used at the bedside to provide protocol directed therapy.

Monitoring of ICP provides prognostic information (high or refractory high ICP predicts poor outcome), allow assessment and titration of ICP lowering therapies and computation of the cerebral perfusion pressures (MAP-ICP). The gold standard for ICP monitoring is an external ventricular catheter connected to a fluid coupled transducer. This system is accurate, inexpensive and allows drainage of CSF to lower ICP. Newer fibreoptic or micro-strain gauge systems allow placements in the parenchyma or subdurally with fewer complications but are costly.

Continuous fibreoptic monitoring of jugular oxygen saturation (SjO_2) is possible and reflects the difference between cerebral oxygen delivery and CMRO2. It is an indirect reflection of global cerebral blood flows with low SjO_2 values indicative of hypoperfusion. SjO_2 values have been used to predict outcomes and direct therapies such as hyperventilation used as a tier-2 option. It is limited by its poor correlation with areas of focal hypoperfusion.

Brain tissue oxygen tension ($PbrO_2$) monitoring is accomplished by introducing a small, oxygen sensitive catheter into brain tissue. If positioned in a relatively undamaged part of the brain, it reflects global cerebral oxygenation. If positioned in the perumbra zone of an intracranial lesion, it can provide useful information on regional blood flow and oxygenation. Low values have been reported in >50% of patients during the first 24 hrs after injury. The depth and duration of brain tissue hypoxia are related to outcome and are independent predictors of both unfavourable outcomes and death.

HYPOTHERMIA IN THE TRAUMA PATIENT

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Hypothermia is common in trauma patients. Predisposing factors include exposure by removal of clothing and opening of body cavities, administration of cold intravenous fluids or blood products and loss of thermoregulation due to shock, alcohol, drug intoxication or anaesthetic agents. The degree of hypothermia has been shown to correlate with various trauma scorings like the Injury Severity Score (ISS) and Trauma Score. It is also important to note the distinction between accidental exposure hypothermia and intentional therapeutic hypothermia. In the latter, the hypothermia is either purposely maintained by not re-warming or induced by cooling measures to predetermined low body temperatures.

Literature search on the effect of hypothermia on outcome of trauma reveals contradicting results: better outcomes in animal, laboratory studies versus poorer outcomes in actual clinical studies. The former mostly studied intentional therapeutic hypothermia. One likely explanation of the contrasting results is that laboratory studies do not usually develop tissue trauma severe enough to result in the "lethal" triad of hypothermia, coagulopathy and acidosis seen in real life trauma. These confirmed complications are the very reasons that rapid response is crucial in hypothermia.

The prevention of hypothermia begins right from the pre-hospital stage. Removal of wet clothing and placement of hot packs are among basic interventions that should start in the field. It is important to warm the trunk of the patient along with the extremities to prevent the afterdrop phenomenon. This is when the cooler blood from the extremities is dumped to the body core as a result of vasodilatation. The hot packs should thus be placed on the groin, abdomen, axillae and neck.

In the hospital, hypothermia prevention should continue by methods such as increasing ambient temperature in the resuscitation unit, using blankets (either reflective blankets, forced warm-air inflatable blankets or pre-warmed cotton blankets) and administration of warm intravenous fluids (via core re-warming or peripheral re-warming).

The management of hypothermia in short requires rapid response and proper techniques. Meanwhile, more prospective studies are needed to prove that intentional therapeutic hypothermia has beneficial effects on outcome after trauma.

PATIENT SAFETY DURING TRANSPORT

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Interhospital and intrahospital movement of patients is an intrinsic part of healthcare delivery. Patients are moved for various reasons, usually for additional care, whether technical, cognitive, or procedural, that is not available at the existing location. If the patients are critically ill, then transport of these patients places them at risks for adverse events and increased morbidity and mortality.

"Guidelines for the inter-hospital and intra-hospital transport of critically ill patients" have been developed by Dr Warren and colleagues (Crit Care Med 2004; 32:256-262). The guidelines outline the minimum recommendations for transport of the critically ill patient. The authors of the guidelines stress the credence that in transport of the critically ill patients, practical innovations outweigh theoretical dicta. The guidelines are available free at http://www.sccm.org/professional.

In the guidelines for the transport of critically ill patients, at least four concerns need to be addressed through written policies and procedures: communication, personnel, equipment and monitoring.

Transport of the critically ill trauma patients poses additional problems. These patients may be transported to and back from a diagnostic department, operating room, or specialized care unit within a hospital, or to another hospital. The transport of trauma patients from the accident sites to a hospital is beyond the scope of this lecture.

The fact that trauma patients are in an intensive care unit means that these patients suffer severe injuries, may the injuries be single or multiple. They may still be bleeding. Their blood pressure may be labile in spite being on vasoactive drugs. Oxygenation may be difficult to maintain. They may have cervical spine injury. There may be tubes from the chest and abdomen. Bones may be fractured and need immobilization. The list can go on and on.

To ensure patient safety in the transport of a critically ill trauma patient, **planning and attention to details** are of utmost importance.

Good and comprehensive communication with the receiving facility is essential. This necessitates direct communication among involved parties, attending physician to receiving physician and attending auxillary staff to receiving auxillary staff. The receiving location must be well informed and ready to receive the patient before transport. Remember to document your communication, in addition to the indications for transport and patient status.

At least two appropriately trained staff, usually a doctor and a nurse should accompany each patient. The staff should have had some training and experience in airway management and management of critically ill patients. They should be familiar with the history, condition and special requirements of the patient to be transported. There should be a team leader who will delineate responsibility to each member of the transport team.

Have a checklist for equipment and drugs. Decide on the equipment and drugs for the transport. Bag-valve mask ventilation is practical and commonly employed during intra-hospital transports but use of portable mechanical ventilators which reliably administer prescribed minute ventilation and desired oxygen concentrations is desirable. More sophisticated portable mechanical ventilators which can provide positive end-expiratory pressure will be needed to ventilate those chest injured patients with oxygenation failure.

Some general principles to note:

- Choose equipment that you are familiar with
- Check that size of equipment is appropriate
- Check that equipment works
- Never place equipment on top of patient
- Check that batteries are fully charged
- Check that gas cylinders are full and in good function
- Check that resuscitation drugs are in order
- Check that you have enough spare IV fluids
- Check that chest tubes are bubbling and the underwater seal is below the level of the lungs
- Empty drainage bags if appropriate

All critically ill trauma patients undergoing transport receive the same level of basic physiologic monitoring during transport as they had in the intensive care unit. This includes, at a minimum, continuous ECG monitoring, pulse oximetry and periodic measurement of blood pressure, pulse rate, and respiratory rate.

Last but not least, carry out a pre-departure check. The more stable the patient is prior to transport the better but this needs to be balanced against the advantages of the better facilities available in the receiving hospital or the advantages of performing the required investigation or procedure. Always reassess the patient immediately prior to leaving, with all transport equipment attached and functioning – following an A – airway, B – breathing, C – circulation, D – drugs, and E – equipment algorithm

In conclusion patient safety during transport can be achieved through proper planning before transport, proper conduct of the transport itself and proper planning by the receiving end.

NEURO-INTENSIVE CARE MONITORING

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Possibilities in neuro-intensive care monitoring have made many strides in recent decade due to advances in micro-analytical, micro-electronic and laser technologies. The challenge is how to apply work from the bench to the bedside, assess usefulness of each technology and its relevance in current day neuro-intensive care.

These technologies maybe used to further understand about the mechanisms of injury in models of hypoxia, ischaemia or raised intra-cranial pressure.

Most neuro-monitoring techniques assess either:

1. Neurological function e.g. electro-encephalogram, cerebral function monitor and field potential electrodes.
2. Substrate delivery and consumption by the brain as a surrogate measure of cerebral function e.g. pressure transducers, cerebral blood flow monitoring, blood and tissue oxygen sensors and microdialysis probes.

Inherent in its appeal by the bedside is the capability of online continuous monitoring for these devices. But as a proof of concept to guide therapy, these techniques must not just show that its methodology is valid and precise, it must show clinicians that outcome is improved.

THE CONTINUUM CARE FOR EMERGENCY SURGERY IN THE UNSTABLE PAEDIATRIC PATIENT

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Emergency management of an unstable paediatric patient whether an ill newborn, infant or child possesses a challenge. Emergencies provide only a short time for optimisation and preparation and frequently outside daytime hours when medical staff levels are reduced. Emergency conditions generate a higher risk for surgery and anaesthesia and strict management is necessary to ensure optimal conditions.

Comprehensive care of the unstable paediatric patient is multifaceted and requires a through understanding of the surgical disease or pathology encountered, the physiology of the paediatric population, any associated paediatric medical illness, an awareness of unique issues inherent to providing medical care for the child. When a child develops an acute illness requiring emergency surgery, the problems involved in assessment and management differ quite markedly then in those of elective surgery. They include the psychological implications of the emergency situation to the child and parents, the assessment of the paediatric patient, resuscitation and special skills of several disciplines to be coordinated in the best interest of the child. Through collaboration among various paediatric specialties, the paediatric surgical patient will receive a most comprehensive continuum of care.

The key to adequate management is not in the rapid transport to the next available operating room for emergency surgical intervention but in the initiation of critical care management. There must be a timely intervention to avoid acute decompensation of inadequately evaluated respiratory distress or hypovolemia which represent the most determinant factors of early death and long term sequelae. There maybe a need to transfer the critically ill child to a specialized centre.

The principles of management of an unstable paediatric surgical would include an initial assessment, physical examination, resuscitation and diagnosis of the acute illness. Airway must be secured and maintained, breathing must provide adequate ventilation, and oxygenation and circulation must afford adequate perfusion of end organs. Vascular access must be secured.

Most commonly, children who show signs of hypovolemic shock are those with ongoing haemorrhage, peritonitis, intestinal obstruction, vomiting or diarrhoea. A patient in hypovolemic shock should be resuscitated with 20ml/kg bolus of warm lactated Ringer solution administered through peripheral or central venous access. Further resuscitation would address the type of losses and appropriate fluids (crystalloid, colloid and blood) should be administered. Acid-base imbalances and electrolyte disturbances must be corrected before surgery. The endpoint for volume resuscitation includes improvement in skin colour, capillary refill and adequate urine output (1ml/kg/h measured via a urinary catheter).

Appropriate investigations, specialised radiological studies and special examinations must be performed when required. Early antibiotics, analgesia and sedation must be administered.

In conclusion, it is important to understand that the care of an unstable paediatric patient undergoing emergency surgery spans a continuum beginning with diagnosis, continuing with acute care and perioperative management.

PHARMACOLOGIC APPROACHES IN THE VENTILATED PATIENT

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In the ventilated patient, there exists many pharmacotherapy interventions which reduces the need for ventilatory support, improves the efficacy of ventilation or treat the discomfort associated with ventilation or the disease state which necessitate ventilatory support. This presentation reviews some of these interventions to determine if there is any scientific evidence that they reduce ventilatory time, morbidty or mortality.

Theophylline have long being used for the treatment of asthma and COPD for more than 60 years. Its main action as a bronchodilator is well described but much less is known regarding its use in improving diaphragmatic function. A medline search revealed a few small studies showing improvement in respiratory function but none provided sufficient evidence that it could be used routinely to reduce the need for ventilation for patients who do not have asthma or COPD.

Doxapram, a respiratory stimulant have been advocated to treat exacerbations of COPD. In 4 small trials Doxapram was found to marginally improve blood gas exchange for the first few hours of treatment, but there are no randomized controlled trials to compared it with NIPPV. Almitrine bismesylate, a respiratory stimulant specific for peripheral chemoreceptors have shown some promise in improving arterial blood gases but its efficacy in reducing ventilatory requirements have yet to be reported.

Steriods have been advocated to reduce the effects of community aquired pneumonia as well as adult respiratory distress syndrome (ARDS). Marco Confalonieri and colleagues (2004) showed that hydrocortisone infusion reduced ventilatory time as well as mortality of patients with severe community aquired pneumonia. Meduri and colleagues (1998) demonstrated that methylprednisone improved survival in patient with unresolving ARDS in their study involving 24 patients. A subsequent study commissioned by ARDSnet (LaSRS) completed recently however did not confirm the findings and concluded that steroids cannot be recommended for use in patients with ARDS.

Inhaled nitric oxide have been used to improve oxygenation in patients with ARDS. Dellinger (1998) in a randomized controlled trial reported that nitric oxide improved oxygenation for the first 2 days and thereafter, there were no difference between NO and placebo in terms of oxygenation and outcome.

Probably the most significant finding on the effect of pharmacotherapy had on ventilator time was the study by Kress and colleagues (2000). Kress reported that daily interruptions of sedation in critically ill patients significantly reduce duration of ventilation and intensive care stay. This has been adopted as a clinical practice guideline by the Society of Critical Care Medicine (SCCM).

EVIDENCE FOR COLLOID AND DIURETIC THERAPY IN ALI

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The flux of fluid from the intravascular to the interstitial space in any capillary is regulated by the Starling equation: Qf = Kf [(Pc-Pi) – _(Oc-Oi)], which states that Fluid Flux from the capillary (Qf) is due to the pressure gradient between capillary & interstitium (Pc–Pi) pushing fluid out, counteracted by the oncotic pressure gradient (Oc-Oi)] acting to retain fluid. The oncotic pressure gradient is maintained by the low capillary permeability to protein (_) compared with the high permeability to fluid (Kf)

Pulmonary oedema is most commonly caused either by an elevated capillary pressure (hydrostatic oedema / cardiac failure) or an increased permeability to protein due to capillary injury (permeability oedema / ALI). Oedema tendency can also be increased by negative intrathoracic pressure (Pi) or hypo-albuminaemia (Oc) but these rarely cause pulmonary oedema as sole factors.

Once thought to be a static equilibrium, it is now recognized to have a number of dynamic components including fluid efflux at the beginning of the capillary (at higher Pc) and fluid influx at the end of the capillary (at lower Pc) and low net fluid rate of protein and fluid leak that is removed by lymphatic drainage without interstial fluid accumulation. Furthermore, the interstitium in not a passive receiver of the net effect of the above factors but a space bound by a mucopolysaccharide gel that is believed to initially resist oedema formation. However, once oedema has occurred, this gel is believed to break down into osmotically active particles that may act against oedema resolution.

In patients with ALI (permeability oedema) the amount of oedema should be sensitive (possibly more sensitive) to Pc and fluid volume state and hence best managed by fluid restriction and low Pc however there are 2 main problems with this

1. Oedema formation is more complex than simple Starling equilibrium
2. Other organ failures with confliction fluid needs commonly coexist with ALI

Four randomized studies (3 prospective) have addressed the effects of a variety of fluid management protocols on the outcome of ALI. All studies had some form of fluid restriction in the protocol group and all that reported effects on oxygenation (3 studies) showed some form of improvement in the protocol group. Two studies showed a shorter duration of mechanical ventilation or ICU stay and one a trend. One study showed a significant reduction mortality stay and two a trend. Valid meta-analysis was not possible as these had different selection criteria, different protocols, and different ways of assessing fluid state, oxygenation and length of stay. If these differences are ignored there was a significantly lower overall mortality for the protocol groups and a probability of better oxygenation and shorter stay.

These findings cannot be considered in isolation as ALI commonly coexists with other organ failures. Current recommendations for circulatory failure, pre-renal failure and brain injury all include 'adequate' circulatory volume which usually entails fluid loading. These requirements may conflict with a fluid restriction policy for ALI. Theoretically colloid or albumin administration should expand the intravascular compartment without increasing oedema but there is little evidence to support this probably because of the poor intravascular retention due to capillary permeability and short colloid half life. Thus at a practical level, a balance between fluid restriction for ALI and fluid loading for other organ failure must exist. In the absence of circulatory or renal failure, fluid restriction and CVP <10 mmHg can be recommended. In the presence of circulatory or renal failure, fluid administration to a CVP 12-15 mmHg may be appropriate depending on the relative severity of systems failure.

LUNG RECRUITMENT: FROM THEORY TO PRACTICE

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Acute Lung Injury (ALI) and adult respiratory distress symptom (ARDS) are terms used to describe different levels of severity of a response pattern of the lungs to a variety of direct and indirect injury processes. Both are characterised by the acute onset bilateral pulmonary infiltrates, not due to a high left atrial pressure. At a consensus conference in 1994, severity was differentiated by PaO_2 / FIO_2 ratio: ALI <300, ARDS <200.

Although lung injury may appear uniform on plain chest x-ray, CT studies have shown that the wet, injured lung collapses under its own weight and can be considered to have three functionally different zones. The most dependent zone remains completely collapsed throughout the ventilatory cycle. The least dependent zone remains completely inflated throughout the ventilatory cycle and the intermediate zone (between these two) collapses and reexpands with tidal respiration. Each of these zones has a risk of secondary injury by different mechanisms and each has an injury minimising strategy to that forms part of current recommended ventilatory practice.

Early 1980's ARDS studies suggested a community incidence of 30-40 cases per 10^5 population PA, a mortality of 50-80%, the majority of deaths being due to multiple organ failure rather than primary disease or primary respiratory failure and lung function returning to within 90% of pre morbid lung function within 12 months. More recent studies have confirmed this community incidence but with mortality rates being reduced to as little as 30-40%.

For many years it was believed that the multiple organ failure associated with ARDS was due to the primary injury or illness that caused the lung injury or due to an independent process. It is now recognised that the primary lung injury can be aggravated by mechanical ventilation and that the injured lung itself can produce inflammatory mediators (cytokines) that contribute to multiple organ failure. Ventilatory practices that minimise the secondary lung injury are believed to reduce this mediator production and consequently reduce multiple organ failure and death.

Although lung injury may appear uniform on plain chest x-ray, CT studies have shown that the wet, injured lung collapses under its own weight and can be considered to have three functionally different zones. The most dependent zone remains completely collapsed throughout the ventilatory cycle. The least dependent zone remains completely inflated throughout the ventilatory cycle and the intermediate zone (between these two) collapses and reexpands with tidal respiration. Each of these zones has a risk of secondary injury by different mechanisms and each has an injury minimising strategy to that forms part of current recommended ventilatory practice.

The least dependent region is at risk of overexpansion injury. In animal model studies, overexpansion can cause an injury similar to ARDS in normal lungs. This is minimised by maintaining Pplat <30cm H_2O (at worst 35cm H_2O) and the use of sufficiently small tidal volumes to achieve this goal has become an important part of the current ventilatory strategy for ALI. In an injured lung animal model, collapse re-expansion injury has been shown to occur and to be reduced by using sufficient PEEP to prevent collapse from occurring at the end of expiration. Sufficient PEEP to prevent end-expiratory collapse in the intermediate zone (above) has become the second important part of the current ventilatory strategy for ALI.

The most dependent zone that does not inflate at any stage during the ventilatory cycle may occupy over 50% of lung volume and may be one of the larger sources of cytokines. Inflating this collapsed region has been shown to reduce cytokine production. PEEP alone at normal to high levels (5-20 cmH_2O) is not sufficient to inflate these collapsed regions and moderate PEEP levels (13 ± 4 cmH_2O compared with 8±3 cmH_2O, ARDSNet, NEJM 2004) have been shown not to improve patient outcome.

These collapsed regions can be "opened" at least in part by recruitment manoeuvres, sighs, prone ventilation and partial liquid ventilation. The most promising of these is the recruitment manoeuvres, which have been shown in CT studies to open most or all of this collapsed region and that this region can be maintained open by returning to a level of PEEP that is significantly lower than the pressure required for opening.

Recruitment manoeuvres may be static or dynamic. Static recruitment consists of elevating PEEP to 40-60 cm H_2O without any significant ventilation for a period of 40-60 seconds. This can be well tolerated in some patients and poorly tolerated in others with the occurrence of hypotension and desaturation. Dynamic recruitment consists of elevating the PEEP to level 25-35 with preservation of tidal ventilation (pressure or volume regulated breaths) such that plateau airway pressures reach the same end inspiratory goal (40-60 cm H_2O). The latter manoeuvre can achieve the same result, is better tolerated, and is particularly important in patients where hypercapnia or hypotension may be dangerous (eg head injury).

A number of dynamic recruitment strategies have been proposed. These include PEEP plus pressure control (eg PEEP 40 + P Control 15 = Palv 55), regular sighs (eg PEEP 10 + regular Sigh 55 = Palv 55), 'staircase' increases in PEEP up to the target level with P control (eg PEEP up to 40 + P Control 15 = Palv 55), and regularly repeated recruitment manoeuvres ('progressive dynamic recruitment', eg PEEP 40 + P Control 15 = Palv 55 every hour for 6 – 24 hours). Lower level recruitment has also been successfully used via non-invasive ventilation.

Evidence for components of these strategies include randomised controlled studies by Amato (NEJM 1998) where a combination of recruitment manoeuvre, high PEEP, low tidal volumes and hypoventilation improved patient outcome, and the ARDS Network study (NEJM 2000) where the use of only a lower tidal volume achieved a 25% relative reduction in mortality. Prone ventilation has not been shown to improve outcome in large randomised trials, but may have improved outcome in the most severely ill patients and is believed to be an important adjunct to recruiting collapse zones in some patients.

Two key components of "opening" the lung are lung recruitment and higher levels of PEEP. There are no randomised trials clearly supporting the use of these either of these components. The recent randomised controlled ARDS Network study (NEJM 2004) comparing high with low levels showed no significant difference in outcome but has been criticised for insufficient difference in PEEP level between treatment and control groups, insufficient PEEP in the treatment group and inadequate recruitment. The impact of this study on clinical practice is yet to be seen but studies to establish if there is benefit from recruitment followed by sufficient PEEP to maintain recruitment have not been completed.

PROTOCOLISED WEANING FROM MECHANICAL VENTILATION

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Over the past few years, a number of authors have reported the beneficial effects of implementing a process of protocolised weaning from mechanical ventilation. Such protocols were essentially care plans or algorithms which guide weaning decisions in response to objective patient variables. Usually, a team of clinical personnel (including doctors, nurses and respiratory therapists), was involved in the execution of such protocols. Many of the authors reported improved outcomes in terms of shorter duration of ventilation, reduced cost of intensive care and decreased complications.

However, there were other reports which failed to demonstrate the practical superiority of weaning protocols, and it is apparent that these are in particularly true for neurosurgical patients, infants and children, trauma patients and in units where doctors demonstrate a high level of interest in weaning.

It is therefore apparently that as with any other protocolised management, weaning protocols serve the primary function of ensuring that the process of "assessment – treatment modification – reassessment" is carried out in a timely manner for every appropriate patient. However there will be a proportion of patients with specific disease and conditions who may not fit in the scheme provided for by any protocol, and the protocol must allow flexibility for appropriate physician intervention.

Although Weaning Protocols as a work process have improved the weaning outcomes of individual units, there is still no consensus as to best modality (eg. PSV vs T-piece) to wean a patient according to disease states.

MANAGEMENT OF CRITICAL BLEEDING IN THE COAGULOPATHIC PATIENT

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Haemorrhagic shock from uncontrollable bleeding accounts for 39% of death in major polytrauma patients. Initial management of shock follows ATLS guidelines of 1-2 L crystalloids; follow by colloids, blood and blood products. Coagulopathy is a rare problem in first hour of resuscitation, but fluid resuscitation with colloids has been shown to impair coagulation significantly. The causes of coagulopathy in patients with severe trauma are multifactorial, including consumption and dilution of platelets and coagulation factors, as well as dysfunction of platelets and coagulation system. Massive blood transfusion with associated complications of hypothermia, metabolic acidosis and coagulopathy (known as 'lethal triad') often results in exsanguination. Patient with core temperature of <340C has been shown to have hypothermic coagulopathy due to decreased platelet function. Hypothermia must be prevented and reversed if the patient is hypothermic. Warm all infusions by using hot water bath and heated coil (eg Hotline, Fluid & Blood Warmer). In trauma surgery where massive blood loss is expected, eg penetrating trauma and major burns surgery, high flow fluid warmer must be available (eg Level 1, fast flow system blood and fluid warmer).

Baseline PT/PTT and platelet count are valuable baseline tests to obtain within the first hour, especially if patient has history of coagulation disorders or on anticoagulation therapy (eg. Warfarin, aspirin, NSAID/herbs).

Besides rapid haemostasis by surgical repair of vascular injury, current management of critical bleeding is based on blood component replacement therapy. Administration of fresh frozen plasma, platelet concentrations, clotting factors and antifibrinolytic agents is essential in restoring the impaired coagulation system in trauma patients. Recombinant activated factor VII may play a role as an adjuvant haemostatic measure, in addition to surgical haemostatic techniques.

THROMBOEMBOLISM IN THE TRAUMA PATIENT

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The risk of venous thromboembolism (VTE) in trauma patients has been well documented and recognized. In a study by Geerts et al. involving a series of trauma patients who received no VTE prophylaxis, 58% were found to have deep vein thrombosis (DVT). This finding is consistent with other reports in the literature specific to trauma populations. The predisposing factors that increase the risk of VTE include hypercoagulability, venous stasis and endothelial intimal injury, collectively referred to as Virchow's triad.

Patients with DVT may present clinically with swollen lower extremities or calf tenderness. In the most severe of cases, they may present with phlegmasia cerulean dolens or as phlegmasia alba dolens. In a study reviewing trauma admission, it was found that only 1% of patient were recognized clinically prior to diagnostic studies and therefore sole reliance on clinical features will unfortunately lead to underdiagnosis In diagnostic study, Contrast Venography is considered the gold standard, however, Ultrasonography (Doppler or Duplex Scan) is most widely used. Impedance Plethysmography and Nuclear Venography are other methods that may be used.

More than 80% of pulmonary embolism (PE) originate in the lower extremities. Like DVT, the clinical diagnosis of PE can be misleading as symptoms and signs may mimic a wide variety of pulmonary pathologies. Clinically, PE may present as isolated dyspnoea, pleuritic pain, haemoptysis, or circulatory collapse. Pulmonary Angiography is the gold standard for the diagnosis of PE. However, Ventilation-Perfusion (V-Q) scans and Dynamic Chest Computerized Tomography are less invasive and are more commonly used.

Prophylaxis of DVT and PE is importance especially since up to 20% of patients with PE may experience sudden death, and 30% of patients die within 30 days. Both pharmacologic and mechanical methods may be used in the attempt to prevent thromboembolic complications in trauma patients. Pharmacologic methods include unfractionated heparin and low molecular weight heparins (Enoxaparin). Mechanical devices effective for prophylaxis include Thromboembolic Deterrent (TED) Compression Hose, Sequential Compression Devices (SCDs) and Arteriovenous Foot Pumps.

The treatment of DVT and PE is similar regardless of the aetiology or patient population. Anticoagulation is necessary to prevent the progression of the thrombotic process. In patients with intracranial bleeding, major intrabdominal solid organ injuries and other injuries where anticoagulation is contraindicated, Vena Caval Interruption with the placement of a filter device is indicated. A total of 3 – 6 months of anticoagulation therapy is required. Heparin and warfarin are the usual agents used in succession.

In summary, VTE remains an important issue in trauma patients. The risk of thromboembolism is increased particularly in the moderately and severely injured group necessitating prophylactic coverage. Effective methods of prophylaxis are available, however, the value of some currently widely used methods is not very clear. Surveillance for DVT when available should be performed for earlier diagnosis and to detect hidden clinical situations in high-risk patients. Vena cava interruption with intravascular filter placement is an option in cases where conventional methods are contraindicated. Further studies are needed in multiple injured patients to better evaluate the role of different methods of prophylaxis.

PAIN MANAGEMENT IN POLYTRAUMA PATIENTS

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Pain is a common symptom in the polytrauma patient, and pain management should be a key concern in the management of these patients. Unfortunately studies show that patients in Emergency Departments around the world receive sub-optimal pain management. Adequate relief of pain should not only be done for humanitarian reasons but also because unrelieved severe pain can have detrimental physiological effects on the cardiovascular and respiratory systems. Obviously, the multi-trauma patient should be resuscitated first, but once the patient is reasonably stable, relief of pain should be the next priority. One of the reasons for withholding analgesia in the early stages of management of a polytrauma patient is the misconception that analgesics, or their side effects, may mask or exacerbate associated injuries like intra-abdominal or intra-cranial bleeding. A thorough initial surgical and neurological assessment of the patient together with appropriate investigations and imaging should be adequate to achieve an accurate diagnosis in the polytrauma patient. Studies clearly indicate that provision of analgesia does not interfere with diagnostic processes in acute abdominal pain.

Systems should be adopted to ensure adequate pain assessment, timely and appropriate analgesia, frequent monitoring and reassessment of pain and administration of additional analgesia as required. Analgesia should be simple to administer and where possible local-regional techniques like nerve blocks should be used. Where systemic analgesics are necessary, they should be administered intravenously, and drugs used include tramadol, morphine and injectable NSAIDs or COX2 inhibitors. Protocols like the "Morphine pain protocol" can be used for safe and effective analgesia in the emergency department. Physical methods like ice, elevation and splinting, as well as explanation of the cause of the pain and other information necessary to allay anxiety, should also not be forgotten.

PREDICTING OUTCOMES FOLLOWING SEVERE HEAD INJURIES

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Traumatic brain injuries afflict more than 1.4 million Americans per year leaving 50,000 dead and many more disabled physically and economically. With improvements in care provided at the scene of accident, in the emergency department and ICU, the mortality from severe head injuries (SHI) has fallen from 52% (Jennett 1977) to 22% (Patel 2002). The incidence of favourable outcomes has also improved from 35% to 60%.

The ability to predict outcomes early and accurately in victims of SHI will allow withdrawal or withholding of aggressive medical treatment in hopeless cases and allow better utilization of limited healthcare and ICU resources on patients with greater recovery potential. Unfortunately, early prognostications are frequently inaccurate, especially during the first 24 hours. From a survey among senior neurosurgeons, it was found that predictions of outcome were often performed early and influenced decisions on medical management provided.

There is a strong association between a low post-resuscitation GCS score and poor outcome. Both the total GCS and motor score alone have predictive value. There is an increasing probability of poor outcome with increasing age of patients, in a stepwise manner. For patients with SHI aged >60 yrs, the mortality expected is >75%. Patients with fixed, unreactive pupils post resuscitation have a 74% of death or vegetative survival, while only 8.5% of those with reactive pupils will have such an outcome.

Systemic insults may result in additional secondary brain injuries and worsen outcomes. Chestnut et al showed that presence of both hypotension and hypoxia decreased the incidence of favourable outcomes from 51% to 6%.

The CT scan features predictive of poor outcomes are: presence of abnormalities on initial CT, presence of traumatic SAH (↑ mortality 2x) and compression or absent basal cisterns and midline shift (↑ mortality 2-3x). High intracranial pressures (ICP) and failure of high ICP to respond to treatment (eg barbiturate coma) are predictive of poor outcomes.

Outcome predictions are most accurate when performed late or when predicting death vs. survival. When predicting outcomes in SHI, one must beware of making "self fulfilling prophecies" i.e. if we predict a poor outcome, the outcome is more likely to be poor because of the treatment decisions that we make subsequently.

THE IMPACT OF POTENTIAL MASS DISASTERS ON INTENSIVE CARE

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Disasters may be natural (earthquake, cyclone, flood, tsunami, etc) or "man made" (terrorist attack, war). Major natural disasters (>10,000 lives) occur on average every 3 years with an average of 55,000 lives per event. Natural disasters taking >50 lives, occur every year (averaging 34,000 lives per event). The ratio of severe injuries to deaths varies according to the type of disaster – volcanic eruption produces a large number of injuries compared with deaths whereas a tsunami produces relatively few. The types of injury also vary widely according to the type of disaster.

War, atrocities, major internal conflict and genocide have also occurred frequently with over 366 million lives lost over the last century (average 4 million PA) in 184 events ranging from 1000 lives to 55 million (2nd world war). Although conflicts have been of a lesser magnitude during the last decade, there have been over 30 continuing and 7 new conflicts causing approximately 9 million lives (average 0.9 million PA).

Major terrorist attacks (>50 lives) have occurred at a rate of 2 per year in the last 5 years, averaging 430 lives per event. One terrorist group (al-Qaeda) is reported to have made 47 attacks over an 8 year period taking a total 4700 lives. Two countries have reported 90 terrorist attacks each over 5 year periods.

The September 11 attack in 2001 took almost 3000 live at 2 sites (New York & Washington) and injured over 6000. There were approximately 800 emergency department attendances, 180 admissions and 30-40 ICU admissions. Injury types (excluding minor trauma) included ophthalmic, major trauma (ISS>15), smoke inhalation, multiple fractures and crush injury, burns, psychiatric and cardiac injuries. A comprehensive disaster response had been developed following a terrorist attack 8 years earlier and was responsible for a well coordinated rapid response.

In summary data from 4 terrorist attacks (Sept 11, Bali, Madrid and London), there were 3400 deaths, 99% of which were immediate. The number of people injured (not dead) was approximately 8-9000, ranging from the same as number the number killed (Bali) to over 10 times the number killed (London). The number attending a hospital ED was 1930, ranging from a third (Sept 11) to over 6 times the number killed (London) and the number admitted was 520 (26% of ED attendees, range 16-75%). There were 140 ICU admissions – 7% (range 3-28%) of ED attendees and 26% (range 17-39%) of admissions.

Bomb attacks commonly contain a mixture of percussion (blast), burn, shrapnel and displacement injuries which can result in a complex critically ill patient requiring multiple specialty involvement.

Disaster planning, exercise and preparedness prior to a disaster appear crucial to best disaster management. The hospital closest to the disaster usually becomes the event coordinator and primary recipient of the majority of casualties. Key elements are a defined disaster team, a defined response including bed and management facilities, staff availability and equipment, a defined headquarters and communication system and triage system. The hospital response usually includes cancellation of all elective surgery and elective admissions and discharge or transfer of patients to create empty hospital beds.

The magnitude of the disaster and an estimation/target of the ICU requirement should be made. This information is usually not clear. ICU response is primarily beds, staff and equipment. Elective ICU admissions should have been cancelled. All dischargeable patients should be discharged. Low level care patients can be discharged to a temporary high dependency area outside the ICU. Stable critical patients can be transferred to ICUs outside the primary receiving area and or managed with a lower nurse-patient ratio. Additional nursing, medical and ancillary staff should be called in or placed on standby. Additional cubicle spaces and physical beds should be organized and organized with minimum equipment

(ventilators, monitors, etc). This may require using old equipment, transport equipment and organizing urgent supply (or standby) of additional equipment from suppliers.

Intensive care is required in a surprisingly small proportion of patients considering the large number of injuries severe enough to cause death - <2% of injured patients and only 7% of terrorist ED attendees, however this is highly variable and dependent on the type of disaster. Although only a small proportion, disasters may have a sufficient magnitude to overwhelm all levels of medical response. Unlike the primary disaster area response and the ED which require very rapid and rapid responses respectively, the ICU has a little more time to prepare its response. Low mortality in immediate survivors of disasters is critically dependent on an adequate ICU response.

ORGANISATION OF INTENSIVE CARE SERVICE

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Intensive care is a relatively young specialty originating in the 1950's. The polio epidemic, Vietnam War and advances in anaesthesia and cardiopulmonary resuscitation provided major impetus in its development. The status of intensive care as a subspecialty is indisputable, however, the delivery of the service and the model of care vary from country to country. The following concepts will be discussed: closed ICU, integrated intensive care and comprehensive intensive care.

ICUs operate on three models: 'open', 'closed' and 'semi-closed'. An increasing number of scientific studies have demonstrated that these varying models can be associated with differences in quality of care. 'Closed' ICUs directed by full-time intensivist were shown to have shorter length of ICU stay, less complications in ICU, improved hospital mortality and reduced cost of hospitalization. In a 'closed' ICU, the patient's primary physician yields care of the patient to an intensivist while the patient is in the ICU and resume care once the patient is ready for discharge from the ICU. All orders must be cleared with the ICU service and guidelines and protocols are commonplace. Intensivist-led ICU is one of the initiatives advocated by the Leapfrog Group in the US. The use of ICT and teleconsultation with intensivist is a useful option.

Integrated intensive care refers to the delivery of intensive care in a hospital wide setting by a dedicated team of intensive care doctors with multi-disciplinary input and led by intensivists. The service provides care for all critically ill patients requiring intensive care including those in the organ specific ICUs. An extension of the integrated care concept is to continue to provide 'stepped-down' care in the ICU. This is in contrast to the practice of transferring patients to the 'high dependency unit' for stepped down care. Integrated intensive care under a dedicated intensive care team improves patient outcome, resource utilization and prevents fragmentation and duplication of this expensive service.

Intensive care is the extreme aspect of a continuum of acute care. As part of the strategy to improve outcome, attempts at early detection and intervention of patients at risk have been advocated. Initial studies showed that the medical emergency team (MET) in Australia and the Outreach team in UK have reduced the incidence of cardiac arrest in the wards and ICU admissions. However, the extension of intensive care beyond the confines of the unit may further strain a service which is under-staffed.

RESEARCH IN INTENSIVE CARE

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Research in intensive care has grown over the last few years in tandem with that of other medical disciplines. The majority of research papers in intensive care still originate from western Europe and north America but it is expected that as asian countries develop with its huge population the number of research papers from asia will increase.

Research methodology in intensive care is no different from clinical research in other disciplines except for the non homogeneous population in the ICU and the ethical issues associated with getting consent from surrogates or incapacitated subjects typical in ICU subjects.

In the late 1970s David Sackett and his group of epidemiologists at McMaster University started a movement to critically appraisal all medical information which later developed into a philosophy of Evidence Based Medicine (EBM). Since many journals and medical practioners use EBM methodology to determine if the publication has any scientific merit, it would be wise that anyone embarking on research at least understand what EBM is all about.

Using EBM one could formulate the question, determine the significance of the question to our medical practice and whether there has been any answers to the question in the past before embarking on planning of the study protocol.

The study design and protocol should involve statisticians and possibly even ethicists right from the start as the biggest problem in ICU research is often the statistics (due to the non homogeneity of the ICU population) as well as the issue of informed consent.

The issue of ethics in ICU research has received much attention after the European Clinical Trials directive was adopted on 4 April 2001 and compliance mandatory as of May 2004. The main objective of the directory was to harmonise research procedures in the various member European countries but it is the ethical issues which has posed a challenge to ICU research, prompting Truog R to comment in Intensive Care Medicine 2005 "Will ethical requirements bring critical care research to a halt?"

The American Thoracic Society has published guidelines on the conduct of clinical research involving ICU patients in 2004 and it is recommended that anyone embarking on ICU research should be aware of the recommendations.

POINT-OF-CARE TESTING IN THE INTENSIVE CARE SETTING

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Point-of-care testing (POCT) is clinical laboratory testing conducted close to the site of patient care, typically by clinical personnel whose primary training is not in the clinical laboratory sciences. POCT refers to any testing performed outside of the traditional, core or central laboratory.

Decision-making in the intensive care setting is highly time-sensitive. It is essential to have the laboratory values immediately for physicians to make clinical decisions in a rapidly changing patient situation. POCT is able to provide fast results for real time treatment for conditions such as arrhythmias, electrolyte imbalances and ventilator weaning. Using micro-sample technology in POCT requires less blood volume, an important consideration for some patients, such as neonates and patients in the intensive care units. Although POCT has the potential to enhance clinical outcome, outcomes research and evidence are necessary to more clearly define POCT's important role in the intensive care setting.

These strategies should be used to optimise POCT in the intensive care setting:

1. establish a critical care profile
2. select appropriate equipment
3. minimise response time
4. target critical opportunities

The following recommendations by the NACB (National Academy of Clinical Biochemistry) Laboratory Medicine Practice Guidelines address some of the most commonly tests done in the intensive care setting.

Recommendation B (Recommend POCT – fair evidence to support procedure)

- lactate, glucose, magnesium, ionised calcium

Recommendation B/C (Should consider POCT – fair evidence for a small to moderate improvement)

- blood gas

Recommendation C (No recommendation – fair outcomes, but balance of benefit and harm too close to justify)

- electrolytes (Na^+, K^+, Cl^-)

Recommendation I (Insufficient evidence to recommend for or against POCT)

- ACT (except cardiovascular surgery, ECMO – strongly recommended)

Even where POCT does show clinical benefit in one hospital or location, it may not be valid to extrapolate the findings to other institutions or location within the same institution. The reason being that the test requesting procedures, sample delivery systems, electronic data links and laboratory working practices that combine to ensure that the context within which POCT is performed is rarely the same. Recommendations for performing POCT outcome studies should be followed to assess the benefits of POCT in a particular setting. It is suggested that POCT may be most efficient when integrated into the clinical management pathways.

IMPACT OF PIRACETAM (NOOTROPIL) ON NEUROLOGICAL OUTCOME IN TRAUMATIC HEAD INJURY PATIENTS IN IPOH GENERAL HOSPITAL

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PURPOSE

The aim of this study is to review the beneficial effects of piracetam and to justify its usage.

METHODS

This is a retrospective study whereby all neurotrauma patients who were admitted from 1.1.2004 to 31.12.2004 were recruited. Demographic data were reviewed and compared. Primary outcome were mortality rates and improvement of GCS on discharge.

RESULTS

170 patients were included whereby 62 patients received piracetam in addition to the standard management of traumatic head injury. 108 patients who did not receive piracetam acted as control groups. The mortality rate for patients receiving piracetam was 21.4% in severe head injury group but no mortality in mild to moderate head injury groups. Mortality rates for those who did not receive piracetam are 70% in severe head injury group, 30.4% in moderate head injury and 11.4% in mild head injury group. Chi-square test reviewed a statistical significant test with $p<0.05$. The mortality rates were subsequently tested against known confounding factors. Statistical analysis revealed towards a favorable outcome in patients who were treated with piracetam. Limitations of this study are discussed.

CONCLUSION

The use of piracetam in neurotrauma patients has shown in this retrospective study to improve the outcome. However, in the context of the present strength of evidence-based medicine, it can only at best be regarded as a supplemental and adjuvant therapy. Cerebral protection protocol and strategy with intracranial pressure/ cerebral perfusion pressure monitoring remain the gold standard of neurotrauma care.

RECOMMENDATIONS

Ideally a randomized double-blinded control study is required to explore the treatment modalities.

FP 02

ANTIMICROBIAL RESISTANCE PATTERN OF COMMON ORGANISMS IN THE INTENSIVE CARE UNIT, SEBERANG JAYA HOSPITAL

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OBJECTIVE

To determine the patterns of antimicrobial resistance in Intensive Care Unit [ICU], Seberang Jaya Hospital.

MATERIALS AND METHODS

A retrospective study from the period of 1st January 2004 till the 31st December 2004 of urine, blood and tracheal aspirate isolates was conducted during the study period. Monthly aggregate data for ICU patients was collected. Isolates were divided into 3 and they were that of urine, blood and tracheal aspirate.

SETTING

The ICU Seberang Jaya Hospital.

PARTICIPANTS

The total number of samples from ICU during the study period was 1766, out of which 282 isolates were positive. The samples were taken from the ICU patients of Seberang Jaya Hospital with subjection to microbiological quality control by the Department of Microbiology, Seberang Jaya Hospital.

Main outcome measures: Antimicrobial resistance of the 3 commonest organisms from each isolates [urine, blood and tracheal aspirate] was noted.

RESULTS

The most frequent isolate from urine were Candida species [37.5%] followed by Candida albicans [14.6%] and Escherichia coli [12.2%]. The blood isolates showed

that the commonest organism was Staphylococcus aureus coagulase negative [57.8%] followed by Staphylococcus aureus [9.6%] and Pseudomonas species [6.7%]. The tracheal aspirate showed that commonest organism was Pseudomonas aeroginosa [37.7%] followed by Klebsiella pneumonia [27.3%] and Acinetobacter species [9.4%].

Escherichia coli from the urine isolate was most resistant to Cotrimoxazole [60%] and Ampicillin [60%]. The blood isolates show that Staphylococcus aureus coagulase negative was most resistant to Erythromycin [38.5%] and Penicillin [35.9%]. Staphylococcus aureus from the same isolate was most resistant to Penicillin [38.5%] followed by Erythromycin [30.8%], Cloxacillin [30.8%] and Cotrimoxazole [30.8%]. While Pseudomonas species from blood isolates were most resistant to Netilmycin [33.3%] and Amikacin [22.2%]. Pseudomonas aeroginosa isolated from tracheal aspirate was most resistant to Chloromycetin [45%] and Cloxacillin [25%] while Klebsiella pneumoniae from the same isolate was most resistant to Sulbactam/Ampicillin [37.9%] and Cefuroxime [34.5%]. Acinetobacter from the same isolate was most resistant to Ampicillin [80%].

CONCLUSION

This study shows that the patterns of local antimicrobial resistance is a valuable guide to empirical antimicrobial therapy in the ICU. Regular monitoring of antimicrobial resistance patterns in the ICU is a useful tool for the effective control of the development of antimicrobial resistance. The findings are useful for the comparison of the prevalence rate of infection and implementation of guidelines for appropriate antibiotic therapy and strict infection control policy.

FP 03

A COMPARATIVE STUDY OF DEXMEDETOMIDINE AND PROPOFOL FOR SEDATION IN CARDIOTHORACIC INTENSIVE CARE UNIT

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BACKGROUND

The intensive care unit (ICU) is an uncomfortable and often frightening environment for patients. Many new sedative agents are being developed to fulfill the criteria of an 'ideal' sedative agent.

OBJECTIVES

To compare the efficacy of dexmedetomidine and propofol in provision of sedation and analgesia and their haemodynamic and respiratory effects in post open heart surgical patients. To justify the cost-effectiveness of these sedative agents.

METHODOLOGY

Prospective, randomized controlled trials on post open heart surgery patients whom were being mechanically ventilated in the cardiothoracic intensive care unit (CICU) of Hospital Universiti Sains Malaysia (HUSM) between December 2003 and July 2005. Thirty two patients were randomized to receive short-term sedation with either dexmedetomidine (n=16) or propofol (n=16). The infusion rate was titrated to achieve bispectral index of <70. Analgesic requirement, haemodynamic and respiratory parameters and extubation time were measured and compared. Mean rate of infusion to achieve adequate sedation were used to justify the cost-effectiveness of these two agents.

RESULTS

No significant differences in the demographic characteristics, use of intraoperative analgesia and duration of sedation were observed between the two groups. There was significant difference in the morphine requirement between dexmedetomidine and propofol (mean(sd): 17.35(5.63) versus 13.10(2.71) mcg/kg/hour, p=0.01]. Mean heart rate was also significantly different between dexmedetomidine and propofol (mean(SE): 73.89(2.49) versus 82.43(2.60) per minute, F statistic = 5.60, p=0.03] However there were no significant differences in the mean level of bispectral index score, mean systolic and diastolic blood pressure, oxygenation level and extubation time between the two groups. Cost involved in the mean rate of infusion of dexmedetomidine was similar to propofol (RM8.75 versus RM 8.68 per hour)

CONCLUSIONS

Dexmedetomidine confers to several properties of an 'ideal' sedative agent, namely its provision of adequate sedation and analgesia with stable haemodynamic and respiratory parameters. Significant reduction in heart rate is beneficial in these patients by reducing myocardial oxygen demand. Further larger studies may be needed in assessing its long term effect in cardiac morbidity and mortality.

FP 04

THE CURRENT PRACTICE OF SEDATION AND ANALGESIA IN INTENSIVE CARE UNITS IN MALAYSIAN PUBLIC HOSPITALS

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OBJECTIVE

Sedation and analgesia have become indispensable for managing critically ill patients in the intensive care unit (ICU) with considerable practice variations throughout the world. We sought to review the current practice of sedation and analgesia in ICUs in Malaysian public hospitals.

METHODS

A questionnaire survey was designed and sent by mail to all public hospitals with ICU facility in Malaysia. The anaesthesiologists in charge of ICU were asked to complete the questionnaire.

RESULTS

There are 40 public hospitals with ICU facility in Malaysia (36 government hospitals (16 states and 20 districts), 3 university hospitals and one army hospital). Thirty seven questionnaires were returned (92.5% response rate). Merely 35% routinely assess the degree of sedation. The Ramsay scale was used exclusively. A written protocol for sedation was available in only 38%. Although 97% routinely adjust the degree of sedation according to patient's clinical progress, only 27% routinely interrupt sedation on a daily basis. Most agreed that the selection of agents for sedation depends on familiarity (97%), pharmacology (97%), the expected duration for sedation (92%), patient's clinical diagnosis (89%) and cost (73%). Midazolam (89%) and morphine (86%) were the most commonly used agents for sedation and analgesia, respectively. There was no significant difference between the practice in the state/university hospitals and district/army hospitals. Only 14% still frequently use neuromuscular blocking agents, mostly in head injury patients (24%).

CONCLUSION

Our survey showed similarity in sedative and analgesic practices in ICUs in Malaysian public hospitals. Nevertheless, still not many routinely use sedation score assessment or have a written protocol for sedation and analgesia.

FP 05

SURVIVAL RATE FOR NUMBER OF ORGAN FAILURE ON DAY THREE AND FOUR COMPARED TO DAY ONE

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OBJECTIVE

To compare the survival rate of patients with respect to the number of organ failure they have on day three and four verses that of day one of Intensive Care Unit (ICU) admission i.e. after 48 or 72 hours of intensive care.

DESIGN

Prospective observational study

METHODS

The number of organ failure present on day one, three and four was determined for every patient admitted to ICU in year 2003 and 2004, using Knaus' definition of organ failure. These patients were followed up until hospital discharge to determine their outcome. The following patients were excluded from analysis: patients with repeated admission, discharged at own risk, transferred out to other hospital, and pediatric patients.

RESULTS

A total of 2047 patients were admitted to ICU in 2003 and 2004, of which 92 forms were incomplete data, 258 patients were excluded. For the 1697 patients analyzed, the hospital survival rates for 0 organ failure on day 1, 3 and 4 were 94.8, 91.7 and 91.8% respectively, those for 1 organ failure were 69.9, 65 and 65.2%, those for 2 organ failure were 46.2, 38.1 and 35.7%*, those for 3 organ failure were 24.2, 15.6* and 11.3%*, and those for 4 organ failure were 19.6, 4.5 and 11.1% respectively. The drop in survival rates were significant on day 4 for 2 organ failure, and both day 3 and day 4 for 3 organ failure (*$p < 0.05$).

CONCLUSION

For the same number of organ failure, the survival rates were lower on day three and day four when compared to day one. Patients with 2 organ failure or more after 72 hours of ICU care has significantly lower chance of survival than those with similar number of organ failure on admission.

FP 06

TIGHT GLYCAEMIC CONTROL WITH A NEW REGIME OF INSULIN INFUSION: A SECOND LOOK AFTER ONE YEAR

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OBJECTIVE

To compare the glycaemic control (between 4.4 – 7.2 mmol/l) with a new regime of insulin infusion after two weeks of training in 2004, with one year of training and implementation in 2005 at the general Intensive Care Unit (ICU), Hospital Sultanah Aminah, Johor Bahru.

DESIGN

Prospective observational study.

METHODS

All patients who stayed more than 24 hours and above 12 years old were included. Data was collected for 61 days in both years. Random blood sugar was taken on admission and daily thereafter at 0600H. At admission a blood sugar level was determined with the Medisense OptiumTM equipment manufactured by Abbott Laboratories and insulin infusion was started according to the regime.

RESULTS

The two groups were comparable in their demographic data. Mean RBS on admission was 8.45+4.76 mmol/l in 2004 and 9.82 ± 4.70 mmol/l in 2005. Daily mean was 6.4+0.92 in 2004 and 6.8+1.14 in 2005. In 2005 episodes of hypoglycaemia were lesser at 2.06% of total finger pricks as compared to 2004 at 2.47%. In terms of patient-days, 21.1% in 2005 had one or more episodes of hypoglycaemia compared to 21.4% in 2004. The difference in all the results between the two years did not reach any statistical significance.

CONCLUSION

Two weeks of training was as good as one year in introducing a new regime. A tight glycaemic control (between 4.4 – 7.2 mmol/l) can only be achieved in about 60% of the time and patients were at risk of hypoglycaemia.

FP 07

OPINION AND FEELING OF STAFF WORKING IN INTENSIVE CARE UNIT TOWARD WITHDRAWAL OF LIFE SUPPORT

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OBJECTIVE

To study the opinion and feeling of doctors and nurses working in the intensive care unit (ICU) toward withdrawal of life support.

DESIGN

Questionnaire survey

METHODS

A questionnaire was designed and all doctors in the department of anaesthesiology and intensive care and all nurses working in the ICU were asked to fill up the questionnaire in the month of March 2005.

RESULTS

There were a total of 41 doctors and 62 nurses who participated in the survey. Thirty-seven (90.2%) doctors and thirty-seven (59.7%) nurses agreed that withdrawal of life support should be practiced. The difference in opinion between them was statistically significant, p being 0.00051. With regards to the most important reason why withdrawal should be practiced, 24% of staff felt that withdrawal allows other patients to be admitted to ICU; 21% felt that there is no point continuing as patient is unlikely to survive and 17% felt that withdrawal reduces suffering. Only 4 doctors, as opposed to 22 nurses, felt that withdrawal is against their religious belief. Thirty-seven nurses would feel distressed during the process of withdrawal while only 13 doctors would feel distressed (p=0.005). When asked whether they would accept withdrawal for their loved ones or they themselves, about 70.9% and 75.7% answered yes respectively. More nurses (80.6%) than doctors (39.0%) claimed that they would take care of their loved one if in the vegetative state till the last breath, p being 0.000037.

CONCLUSION

Doctors and nurses working in the same department have significantly different opinion with regards to withdrawal therapy. Doctors accept withdrawal more readily and do not feel so distressed during the process of withdrawal.

FP 08

THE ROLE OF CHEST PHYSIOTHERAPY IN VENTILATOR-ASSOCIATED PNEUMONIA

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INTRODUCTION

Chest physiotherapy has been a practiced to help clear secretions and helped lung ventilation in ventilated patients in Intensive Care Units (ICU) regardless of the underlying pathophysiologic conditions. There are no convincing data to support its effectiveness in preventing ventilator-associated pneumonia (VAP) in ICU patients.

METHODS

Forty nine adult patients admitted for ventilation to the Intensive Care Unit, Hospital Universiti Kebangsaan Malaysia (HUKM) from July until August 2004 were randomized to Group A N=20 (chest physiotherapy) or Group B N=29 (no chest physiotherapy). All patients were mechanically ventilated using Puritan Bennet 840 ventilator with a standardized initial setting of: BiLevel mode. The patients also received routine nursing care and supportive therapy accordingly. VAP were diagnosed following CDC critera. The study was considered complete and terminated once the patient developed pneumonia or when extubated, which ever came first.

RESULTS

Twelve patients (60%) who received chest physiotherapy developed VAP compared to only 8 patients (40%) who did not get chest physiotherapy. Twenty-one patients (72.4%) who received no chest physiotherapy did not develop VAP compared to only 8 patients (27.6%) who get chest physiotherapy. However, the onset of VAP in the group receiving chest physiotherapy was after 4.0 ± 3.8 days compared to the 1.3 ± 2.3 days in the group without chest physiotherapy which was statistically significant p=0.001. Among the patients who developed VAP the mean of ventilation duration is 13.0 ± 4.3 days compared to 5.1 ± 2.1 days in patients who did not developed VAP p = 0.007.

CONCLUSIONS

Although chest physiotherapy did not prevent VAP but it delays the onset. VAP does prolong the duration of mechanical ventilation regardless whether they received chest physiotherapy or not.

FP 09

PROSPECTIVE EVALUATION OF A SEDATION AGITATION SCALE FOR ADULT CRITICALLY ILL PATIENTS

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OBJECTIVE

To test the inter-rater reliability of sedation agitation scale for adult critically ill patients.

DESIGN

Non-interventional study where two doctors and two nurses simultaneously and independently assessed patients over a period of 6 months using a revised sedation agitation scale of the Riker Sedation Agitation Scale (SAS)

SETTING

Multidisciplinary 17 bedded Level 3 ICU in a Ministry of Health hospital

PATIENTS

One hundred and forty-two ICU patients (medical and surgical) were assessed. There was 200 assessments (58 patients had repeated assessments on different days) resulting in a total of 800 observations by 4 assessors.

MEASUREMENTS AND MAIN RESULTS

The mean age of the patients was 44.6 + 18.8 years with 65.5% males and 34.5% females. The mean SAPS score was 39.7 + 15.4. 62% of patients assessed were ventilated while 38% were not. 45% of patients did not receive any sedation while the remaining 55% were on some form of sedation.

When patients were classified using this revised sedation agitation scale, 4.9% were anxious, agitated or restless (scale +2 to +3), 58.9% were calm and obeying simple commands (scale +1 to -1) and 36.2% were over sedated (scale -2 to -3). Intraclass correlation coefficient (ICC) was good between all four raters: 0.976 (95% C.I 0.970 – 0.981). There was a good correlation between the two doctors: ICC 0.948 (95% C.I 0.931 - 0.960) as well as the two nurses: ICC 0.954 (95% C.I 0.939 – 0.965). There was also a good inter-rater reliability in the ventilated patients: ICC 0.966 (95% C.I 0.955 – 0.975) and the non-ventilated patients: ICC 0.976 (95% C.I 0.966 – 0.984)

CONCLUSION

This revised sedation agitation scale is highly reliable for the adult critically ill patients.