Proceedings of Second International Emergency Medicine and Disaster Management Conference

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Introduction by

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2nd International Emergency Medicine and Disaster Management conference

Emergency Medicine has made the headlines! This young specialty was recently celebrated between 17-19 March 2009, during the Second International Emergency Medicine and Disaster Management conference which was held in the Grand Hyatt Hotel in Muscat. This scientific assembly was a huge success by all means. The conference ran over two and a half days and covered a wide range of topics related to the specialty. The talks were delivered by renowned experts in their corresponding subspecialties of Emergency Medicine, who came from different parts of the globe including North America, Europe, Australia and neighboring Saudi Arabia. This versatile mix of expertise lead to an important and interesting exchange of knowledge and was definitely an enriching factor. The speakers were not only experts in their fields but also had great dynamicity in delivering their presentations which kept the audience engaged at all times.

The first day began with a prestigious opening ceremony attended by many high ranking officials from different government sectors. During the ceremony a talk was delivered by Dr. Scott Delaney, an Emergency Physician from Canada, who reflected on Emergency Medicine as a specialty, how it started, where it is at present and where it is heading. This constituted a great introduction to the conference and emphasized that Emergency Medicine is a well established specialty with its own area of knowledge and complex set of skills. The future of Emergency Medicine in Oman, no different from other parts of the developed world, can only made to flourish by the country investing in its own physicians. The day continued to cover the main focus of the conference namely Disaster Management. This special focus was felt to be essential in view of the recent cyclone Gonu that hit the country in the summer of 2007 subjecting its medical system to great challenges and putting it through the test.

Oman is also unfortunately suffering from an epidemic of road traffic accidents causing devastating disability and death. From this perspective the program included several sessions covering topics related to Trauma and EMS.

Other areas covered included Cardiology, Critical Care, Pediatric Emergency, Aviation Medicine, Research and Medical Education.

The conference also had a local flavor. Several talks were delivered by local speakers who shared their valuable experiences in Disaster, EMS and other fields. A full session was dedicated to cover issues related to the practice of Emergency nursing delivered by local experts in this field.

The conference was attended by about 600 delegates. The audience was a mix of physicians, residents, nurses and paramedics.

Overall, there was excellent positive feedback from speakers and delegates and the experience was enriching to everyone:

"Thanks again for the wonderful hospitality and excellent conference. I really enjoyed seeing your great country for the first time and got good academic value from the other speakers, too..."

Dr. Peter Jones, Auckland, New Zealand

"We have not stopped talking about our trip and the conference. The warm welcome from all, the excellent organisation and the hard work of so many, not only contributed to making the conference a huge success but also made the speakers feel valued and at home in Muscat.."

Dr. Constance LeBlanc, Halifax, Canada

"We owe you a very special "thank-you" for being included in your International Conference. Things were professionally organised, efficiently run and we were made to feel welcome and appreciated. We particularly enjoyed the audience participation in sessions..."

Prof. Anna Jarvis, Toronto, Canada

"I regularly speak at many conferences and have seen great and not-so-great conferences. The conference in Oman last week was definitely one of the great ones..."

Dr. Russell MacDonald, Toronto, Canada

We hope that the third international conference will maintain the high standard achieved.

Below are some of the important abstracts of talks presented by international speakers during the conference.

Speaker: Dr. J. Scott Delaney, McGill University, Montreal, Quebec, Canada

Dr. Delaney practices emergency medicine and sport medicine at McGill University in Montreal, Quebec. He has a fellowship in sport medicine and is the research director for the McGill University Health Centre Adult Emergency Department. He is an assistant professor at McGill University and is the team physician for the local professional and university football and soccer teams as well as Cirque du Soleil. He is a member of the editorial board for the Clinical Journal of Sport Medicine. He has supervised numerous Middle East emergency medicine residents and three Omani sport medicine fellows at McGill University.

Cauda Equina Syndrome

Cauda Equina syndrome (CES) is a serious cause of back pain which, if missed, can cause permanent disability including lower extremity paralysis, sexual dysfunction and loss of bowel/bladder control. CES is an acute stenosis of the lumbar spinal canal leading to compression of neural elements below the first lumbar segment (L1). Compression of the cauda equina can occur rapidly in the case of fractures, acute disc herniations and spinal haemorrhage. It can occur more insidiously in cases of tumour compression or spinal abscesses and often, symptoms of pain, numbness or weakness are present or progress over a period of weeks. It is in these insidious situations where the emergency physician can make an early diagnosis and prevent lifelong morbidity in a patient.

The so called "red flags" on history and physical examination for patients with back pain include many of the clinical features of CES and emergency physicians should be familiar with these. CES will present with bilateral neurologic findings, although physicians should not be fooled as the findings are not usually equal bilaterally. CES will classically present with saddle anaesthesia, urinary retention, fecal incontinence and decreased or absent anal tone. The urinary incontinence of CES is actually over flow incontinence. An early sign of compression of the sacral nerves in CES is a residual bladder volume of more than 150 cc after a patient has voided completely. This can be measured by bladder scan or bladder catheter insertion.

The need to diagnose CES early is vital as the biggest predicator of final neurologic disability is the amount of neurologic disability at the time of treatment. When CES is suspected, the spinal canal must be visualized as quickly as possible. The spinal canal can only be visualized by a MRI, CT myelogram or a plain myelogram. Plain X-rays or a plain CT scan of the lumbar spine will not adequately visualize the spinal canal and can be normal in cases of severe spinal canal compression. When imaging the spinal canal for possible CES, the entire spine should be visualized as up to 10% of patients with tumours will have silent metastasis in another spinal location. When the diagnosis of CES is confirmed or seriously suspected, the emergency physicians should begin treatment with analgesics, antibiotics in possible infectious related compressions and dexamethasone in tumour related compressions. The emergency physician should speak with the consulting spine surgeon regarding the choice of antibiotics and dose of dexamethasone, as doses ranging from 4mg to 100mg of dexamethasone for tumour related compression have been described in the literature. Definitive treatment may involve radiation, especially for tumour related compression that involves several levels of the spine, or surgical decompression for an abscess or single level of tumour related compression.

Updates in Concussions

There have been several changes in the diagnosis and management of concussions in recent years. A concussion is now defined as any alteration in cerebral function caused by a direct or indirect (rotation) force transmitted to the head resulting in one or more of the following acute signs or symptoms: headache, confusion/disorientation, loss of consciousness, light sensitivity/photophobia, nausea/vomiting, abnormal vision, dizziness/vertigo, hearing problems and memory difficulties. The onset of signs or symptoms may not be immediate and can occasionally take hours to develop. Other complaints which are not usually immediately evident may also include: sleep irregularities, fatigue, personality change, lethargy and depression. Physicians and nurses should be aware that it is not necessary to have suffered a loss of consciousness to have a concussion, nor is it always necessary to have suffered a direct blow to the head. Any fall, tackle or car accident which causes the head to accelerate or decelerate quickly can cause a concussion.

It is not compulsory to have advanced imaging for the diagnosis of a concussion. In the vast majority of patients with a concussion, brain CT scans and MRI's are normal. Physicians can feel confident that if a patient has a normal neurological examination with mild and/or improving symptoms, brain imaging is not necessary. Perhaps the most sensitive tool for making the diagnosis of a concussion is the patient's symptoms. Using a patient's symptoms to diagnose and follow recovery from a concussion has been proven to be even more sensitive than special neuropsychological testing. Very often these symptoms will worsen with physical exercise or cognitive stress (ex. doing school work). Treatment of a concussion most importantly involves stopping or avoiding activities or scenarios which exacerbate or cause symptoms to recur. While physical

exercise and cognitive stress have been mentioned, others irritants may include exposure to bright lights, loud noises, working on a computer, etc. It is believed that continuing to exacerbate concussion symptoms only delays healing. While headaches are the most common symptom of a concussion, they can be very difficult to treat with medication. In fact, the use of medication is often used as a diagnostic tool, in that; if medication relieves the headache, then the headaches were probably not concussion related. Patients who are still experiencing symptoms from a concussion are believed to have a lower threshold and be more at risk for another concussion. No patient should be allowed to return to an environment where another blow to the head or acceleration/deceleration of the head can occur (ex. sports) until all of their symptoms have resolved. Full resolution of symptoms requires that a patient is asymptomatic at rest and after a trial of exercise or exertion.

Cervical Spine Immobilization and Log Rolling

Immobilization and movement of a patient with a potential cervical spine injury are important skills for emergency physicians and nurses to possess. Indications for immobilization of a patient's cervical spine are similar to the NEXUS criteria for imaging a cervical spine and include a known or possible history of trauma and one of the following: posterior midline cervical spine bony tenderness, neck stiffenss, altered level of consiousness, focal neurological deficit or a painful distracting injury. Immobilization of the cervical spine should be maintained in the midline position or the position of comfort if a patient is unable to return the cervical spine to a neutral position due to pain or neurologic symptoms caused by movement of the neck. Immobilization does not include traction of the cervical spine and is best accomplished with the patient in a supine position. While different techniques exist, perhaps the most sturdy and secure position involves the person controlling the head and neck (called the immobilizer) standing or kneeling at the head of the patient and grasping both trapezii with their hands while nestling the patient's cervical spine and head in between the immobilizer's two forearms. This procedure can be accomplished both with and without a hard cervical collar in place.

Often a patient with a potential cervical spine injury must be turned or 'log rolled" onto their side to allow for inspection of the back area or placement of a spinal board. The emergency physician or nurse should control the situation and arrange as much help as is needed. Ideally, the physician or nurse may remain free of duties to control airway issues if they arise. If there are enough people to help turn the patient into a supine position, there is one person controlling the head and neck, one person at the shoulders, one person at the hips, one person at the feet and one person to place a rigid spine board if needed. The people controlling the shoulders and hips should cross arms across the patient so they move more as a single unit. The immobilizer will lead the team by explaining the procedure to the patient and other team members. The immobilizer coordinates all movements with commands and other team members do not initiate movement of the patient until the immobilizer directs such movement. If a patient is not supine, the patient will need to be placed in a supine position for better evaluation and potential airway control. In a patient who is prone or on his or her side either in the emergency department or at the scene of injury, the immobilizer should begin with his or her hands in the final position desired (with the thumbs facing upwards) and then turn them back into the patient. Working the hands "backwards" by starting in the ideal final position and turning them back into the patient will avoid awkward twisting of the immobilizer's arms when rolling the patient into a supine position.

In an emergency situation where the physician or nurse is alone with a patient who has a potential cervical spine injury who must be rapidly turned onto his or her side, the procedure can be performed with one person. The immobilizer grasps one side of the trapezius with his or her hand and nestles the patient's head and neck against their forearm. The other arm is used to grasp the shoulder or clothing of the patient and pull them onto their side at ninety degrees. The patient should be turned towards the side that the immobilizer has grasped the trapezius so that as the patient is turned, the head and neck can lean against the immobilizer's forearm and remain in a neutral position. The immobilizer then places a knee behind the patient to prevent the patient from rolling back into the supine position. In this final position, one of the immobilizer's hands and forearms is used to hold the head and cervical spine in a neutral position, the other hand is free to help control the airway (ex. remove vomitus) while one of the immobilizer's knees is against the patient's back preventing them from rolling back into a supine position.

Mass Casualties and Triage

A disaster is defined as any multiple casualty incident which overwhelms the response capabilities of the available resources. Several injured patients may overwhelm a single physician, while it may take dozens or hundreds of patients to overwhelm an event with greater resources. In a disaster situation, the physician's goal is to try and save as many lives as possible. In some extreme instances, care should be withheld from severely injured patients

so that limited resources are available for others. Perhaps the most important decision to be taken in such a situation is for the physician to recognize that they are in a disaster scenario and realize that assessment and treatment principles are now different from the regular practice in the emergency department.

While there are several simple triage systems, the START (Simple Triage and Rapid Treatment) system using the assessment of RPM's (Respirations, Perfusion, Mental status) is a popular system to use. Physicians should become familiar with one system. Most systems will colour code or give a numerical value to each patient. After quick assessment, injured patients should be placed in one of the four colour groups depending on the severity of their injuries.

Color	Priority	Description
Red	1	May survive if given immediate simple life saving measures
Yellow	2	Should survive if given care within a few hours
Green	3	Walking wounded: minor injuries that do not require rapid care
Black	4	Deceased or severely injured patients unlikely to survive

Initially, all patients who can walk are asked to leave the immediate scene. Next, the physician should move quickly to individual patients, assessing respirations, circulation status, and mental status. Under true disaster situations, CPR should not be performed during triage. As the physician moves from patient to patient, the most aggressive measures that should be performed include basic airway opening maneuvers and applying direct pressure over an obvious external source of bleeding. Basic airway maneuvers in a disaster triage situation should be limited to simple procedures such a clearing the airway and performing a chin lift or jaw thrust. Once an initial triage has been completed, the physician may then begin more definitive care for patients. Depending on the resources available, this may involve Basic Life Support maneuvers such as opening and maintaining an airway or compressing an actively bleeding wound. Advanced Trauma Life Support measures, such as performing a needle decompression of a suspected tension pneumothorax, may also be required. The physician should also remember that it is critical that the patients be reassessed and retriaged. Triage is designed to be a dynamic process as patients who seemed well can decompensate and change to a more serious category. By reassessing patients, the physician will be able to detect those patients who may have deteriorated and who now may require immediate care.

Two situations which may affect triage include lightning injuries and blast injuries. In a lightning injury, a large amount of DC current, often more than 1,000,000 volts, is delivered to a patient. This can result in respiratory arrest from a CNS insult and asystole from the DC current delivered to the cardiac tissue. If the patient's respiratory status can be supported, often the CNS will recover and reinitiate respirations. If the circulatory system can be supported with cardiopulmonary resuscitation (CPR), the intrinsic electrical activity of the heart may restart organized cardiac contractions once again. As such, it is often said that triage principles are reversed in lightning injuries, as the patients who appear dead with no respirations and pulse are the ones who are treated aggressively first. In a blast injury from an explosion, many patients near the blast may suffer ruptured tympanic membranes. Patients may be unable to hear because of this injury, may not respond to verbal questioning and may be mistaken for a confused patient. This may lead to inappropriate triage and patient disposition if the physician is not aware of this common injury.

Speaker: Dr. Constance LeBlanc, Dalhousie University, Halifax, Nova Scotia, Canada

Dr. LeBlanc is a medical graduate of Université Laval in Québec, Canada. She is an Associate Professor of Emergency Medicine at Dalhousie University where she served as Emergency Medicine program director for the CCFP(EM) from 1997 until 2005. She holds a Master of Arts in Education degree from Mount Saint Vincent University in Halifax. Connie has served as chair of Continuing Medical Education for the Canadian Association of Emergency Physicians (CAEP) since 2003 and as faculty member for the CAEP roadshow on education "ED STAT!" since 2004. She also serves as a medical control physician for both Life-flight Nova Scotia and for the Nova Scotia Poison Information Center.

Medical Education Track

Effective clinical teaching and the provision of effective feedback are key elements in training insightful physicians and the cornerstone of clinical medical education. We know that learning and the development of insight is facilitated by the provision of high quality feedback yet, we struggle to achieve the honesty to optimize this process for our learners. Why is honesty so difficult?

Bandiera et al. have identified some core behaviors in outstanding teachers; many

of these skills can be learned. Students appreciate enthusiasm, interest in them as people first and clinical teaching including orientation and appropriate feedback among these valued qualities.

There has been a notable increase in literature in the past decade in teaching in ambulatory settings and in Emergency Medicine where there was a paucity previously.

References

1. Irby, D.M., Teaching and Learning in Ambulatory Care Settings: A Thematic Review of the Literature. Acad Med, 1995. 70(10): p. 898-931.
2. *Review of what expert Canadian ED teachers have to say about teaching in the ED. Outlines twelve strategies for success.
3. Heidenreich, C., P. Lye, D. Simpson, and M. Lourich. The Search for Effective and Efficient Ambulatory Teaching Methods Through the Literature. Pediatrics, 2000. 105(1): p. 231-237.
4. Irby Dm. Teaching and learning in ambulatory care settings: A thematic review of the literature. Acad. Med.1995;70(10):898-931
5. *Excellent systematic review (1980-1994) of effective ambulatory teaching methods.
6. Lipsky, M., C. Taylor, and R. Schnuth, Microskills for students: Twelve tips for improving learning in the ambulatory setting. Medical Teacher, 1999. 21(5): p. 469-472.
7. Sherbino, J, Frank, J. Lee, C.and Bandiera, G. Evaluating "ED STAT!": A Novel and Effective Faculty Development Program to Improve Emergency Department Teaching. Acad. Emerg. Med. 2006,13(10): 1062-1069.
8. Thurgur L, Bandiera G(SRA), Lee S, Tiberius R. What emergency medicine learners wish their teachers knew. Academic Emergency Medicine. 2005. 12:856-861.

Orienting the Learner in Medical Education

At the outset of the shift or rotation it is essential to set the foundations for learning and clarify the expectations of both the trainee and the teacher. Although orienting learners seems time-consuming, taking time to orient the learner will this will pay off time and again throughout the rotation or the shift. It is important to take a few moments to acquaint yourself with the learner at the beginning of each rotation. From a student's perspective, this demonstrates your interest in them and their learning. From a preceptor's perspective, this provides you with essential information about the learner that will facilitate discussing patient presentations, differential diagnoses and allow you to make informed choices for feedback. Data collected at orientation will also serve to inform the teacher about the level of supervision that will be required to provide safe care.

Ascertain the level of training, previous fields of training, rotation-specific experience, focused interests (program of training and specific goals) and skill level (experience in this area of medicine) of the learner working with you. This provides important information for the degree of supervision required, the depth of teaching and questioning, focuses the teaching you will provide and general management strategies with regards to time and supervision for the rotation. It is also very important at this time, to state that you will provide feedback to facilitate their learning and that the intention is so doing is to optimize learning rather than to be critical of their performance. The feedback and supervision processes will be facilitated by the information gathered during orientation. The fact that a preceptor has shown interest in the learner and their objectives will also help focus feedback in the most important areas for that learner.

Orienting the learner should take 10 minutes at the outset of the rotation; time saved in doing so will be far greater that 10 minutes the vast majority of the time. A brief orientation at the outset of each shift serves to further convey these messages and ensure open communication.

Teaching is challenging due to competing needs: those of patients and their families, needs of learners, team members, administrative or patient flow requirements in addition to your personal learning needs. Balance in multitasking these is essential to providing learners with meaningful learning experiences, while providing timely and high quality care for patients. In order to teach effectively and efficiently, it is important to identify any specific issues that will affect these aspects of our work.

References

1. Bandiera Glen, Blouin Danielle, Frank Jason R, LeBlanc, C., Lee Shirley, Nuth Janet, & Sherbino Jonathan. E.D. STAT Strategies for Teaching Anytime. 2007. 2005. Ref Type Catalogue
2. Bandiera G, Lee S, Tiberius R. Creating effective learning in today's emergency departments: How accomplished teachers get it done. Ann Emerg. Med. 2005:45:3:253-261.
3. Irby D. What clinical teachers in medicine need to know. Acad. Med. 1994;69(5):333.

*A comprehensive review of how ambulatory medicine changed medical education and how to meet the challenges of teaching different learners in a high-pace environment.

Feedback in Medical Education

During orientation, educators should include a plan for feedback and for the educational experience to learners. This sets the stage for feedback to be received favourably and normalizes it. Feedback is the most common teaching tool discussed (and studied) in the literature. It differs from evaluation in that it is performance based rather than comparative. Feedback can be part of evaluation, but the reverse is not true. Feeding back data on the many facets of clinical performance should be continuous whereas, rating learners comparatively to their peers or to practicing clinicians continuously is futile and could serve to discourage the learner who is struggling

rather than providing a plan or tools to get caught up. The key role of feedback is clearly outlined in the following quote:

"self-assessment, knowing one's limits, and knowing when to seek help depend upon feedback".

Without feedback, students' mistakes will persist and their positive attributes may wane from lack of reinforcement. The provision of high quality feedback is central to student learning. Throughout the literature, the features of good feedback vary little. The same features surface time and again, sometimes with different labels. (See Figure 1 below)

Figure 1: Features of Proper feedback:

1. Elicit self-assessment (determine the degree of insight)
2. Say that it's feedback (label it)
3. Contextual (for today's patients…)
4. Immediate, timely (after the case, after the day…)
5. Based on objective information (examples of occurrence(s), direct observation)
6. Discuss the behaviour- not the person
7. Start with positive and move to negative and end on positive (the knuckle sandwich)
8. Constructive with a plan for corrective measures
9. One on one (privacy)
10. Not evaluation (no judgment, no rating)
11. Solicit feedback on the feedback
12. Solicit feedback on teaching

A more detailed explanation of the above characteristics is provided in the following corresponding bullets.

1. The process of having the learner self-assess serves two purposes: firstly to determine their degree of insight, and secondly to foster reflection on the events of a shift.
2. Often learners don't recognize that they are receiving feedback. Labeling it is important to draw attention to its importance to us and to the student.
3. It is not imperative to provide feedback on everything in one shift. Metered doses of feedback will be better received and allows the preceptor to triage the feedback according to the specific needs of each learner.
4. The best feedback is delivered immediately. Like reprimanding a pet!
5. Feedback on weak data will not be taken as seriously as that on directly observed or clinically rechecked information.
6. Opening with a positive comment is easier for us and closing with one is easier for the learner. This is not true for all situations.
7. Commenting on the length of a student's arms is not helpful, suggestion or recommending the use of a stool for a procedure is.
8. Make every attempt to identify a trend or thread for feedback for the entire shift such as: broader differentials are required, or more detailed histories are necessary.
9. Providing all feedback in relative privacy will reduce the "special attention" for weaker students that all ED staff recognize and remember.
10. Daily evaluations are not helpful or constructive, especially for those learners who are behind their peers. Feedback will provide a better learning experience with an evaluation every 2-3 weeks to document their progress.
11. Ask learners if they are confident they know what to change and if they are comfortable with the information provided.
12. Ask them too, how you could improve the experience for them.

Medical educators must strive to follow the principles of good feedback in all of our student interactions. Fear of tears, anger, accusations, poor teaching evaluations and lack of time are all barriers to the provision of honest feedback. Overall, students rate preceptors who provide honest feedback more highly than their peers.

Ask yourself if a low threshold to tears should allow a trainee to move forward uncorrected. Would you appreciate your son or daughter not receiving the feedback they require to improve in this situation? Do not learners from minority groups deserve the same learning opportunity as others? Why should we remain silent about breaches in professionalism when all available data state that most patient complaints about physicians fall in this sphere of their practice?

This is important and we owe it to all our learners to provide them with this key information to further their development and to assist them in developing insight and reflective practices that will last throughout their careers. Skill in providing honest feedback effectively, like other skills, takes practice and will improve over time.

References

1. Ende J, Feedback in Medical Education. JAMA 1983;250(6): 777-781.
2. Epstein R, Assessment in Medical Education, N Engl J Med 2007 Jan25,356(4):387-96. Review.
3. Eva, K.W. and Regehr, G. (2005). Self-assessment in the health professions: A Reformulation and Research Agenda. Academic Medicine, 80(10 Suppl): S46-S54.
4. Feedback. The Foundation for Medical Practice Education. Education Module. McMaster University; 11(special issue, April 2003).

5. *Booklet published at McMaster University through the foundation for continuing medical education. Nice review.

6. Kruger, J. and Dunning D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. Journal of Personality and Social Psychology. 77:1121-1134.

The Hidden Curriculum

The process of educating physicians is complex and reaching far beyond the curricula set forth by medical schools, despite written objectives and formal curricula, students learn far more than we teach.(1) This gap is the hidden curriculum. (2)

In Posner's description of the types of curricula, he describes the following five: formal, informal, extra, null, and hidden. (3) These are explained in Figure 2 Below.

Figure 2: Posner's Five Types of Curricula.

1. Formal: This includes information an institution would have in written form for dissemination to the public including course prerequisites, requirements, delivery and objectives in addition to the course objectives.
2. Informal: The educational programme as it actually is taught. Some variation from the formal curriculum will occur in every programme.
3. Extra: This consists of all activities not part of the informal curriculum but affiliated with the institution.
4. Null: This describes the elements with potential for inclusion in the formal or the informal curricula, but omitted form both. The content of the null curriculum can send important messages about values and socio-political pressures in the institution and beyond.
5. Hidden: This includes a set of messages transmitted tacitly through working with others and mostly includes social and ethical issues that surround the education provided. These are far more pronounced in apprenticeship models.

The hidden curriculum can include things from the car we drive to how we regard other team members and even patients. The messages in the hidden curriculum are often remembered despite the unintentional nature of their delivery to our students. (4) It will behoove all physician educators to maintain a certain degree of "role-model consciousness".(5,6,7) Derogatory comments about patients, their families, team members or other physicians are inappropriate and we should refrain from entering or engaging in discussions of this type while teaching trainees at any level. These comments and attitudes have been shown to be exceptionally stressful to junior learners. Expressing frustrations about our area of specialty, burnout, finances, are inappropriate unless there is a specific question in this area.

Hopefully, we will behave as if others are watching to benefit from the Hawthorne effect improving the quality of our role modeling and perhaps our patient care. (8,9)

References

1. Hafferty F.W. Into the Valley: death and the socialization of medical students. Yale University Press, 1991.

2. LeBlanc C. Exploring the Hidden Curriculum in Emergency Medicine. Masters' thesis for Master of Arts in Education degree. Mount Saint Vincent University. Canadian thesis site.

3. Posner G. Analyzing the Curriculum. 2nd ed. McGraw-Hill, 1995.

4. Wong JG. Promoting professionalism. Are we living by the values we expect from our students? Postgrad Med 1999; 106(5):11-2, 15.

5. Patenaude J, Niyonsenga T, Fafard D. Changes in students' moral development during medical school: a cohort study. CMAJ 2003; 168(7):840-844.

6. Hicks LK, Lin Y, Robertson DW, Robinson DL, Woodrow SI. Understanding the clinical dilemmas that shape medical students' ethical development: questionnaire survey and focus group study. BMJ 2001; 322(7288):709-710.

7. Kenny NP, Mann KV, MacLeod H. Role modeling in physicians' professional formation: reconsidering an essential but untapped educational strategy. Acad Med 2003; 78(12):1203-1210.

8. Coulehan J, Williams PC. Vanquishing Virtue: The Impact of Medical Education. Acad Med 2001; 76(6):598-605.

9. LeBlanc C, and Heyworth J. Burned out or fired up? CJEM, March 2008.

* Article on the lack of evidence for burnout among Emergency Physicians attending the ICEM 2006.

Informed Use of Cardiac Markers in the Emergency Department

Chest pain is a common Emergency Department (ED) presenting complaint. We know from the medical literature that we miss between 2-5% of Acute Myocardial Infarct (AMI) in the ED. (1) We can ill afford to miss this important diagnosis, however, time, money and space issues do not allow for routine admission of all patients with chest pain.(2) Risk stratification is required.

The 3 key elements of risk stratification for patients with chest pain for whom we are considering an ACS (Acute Coronary Syndrome) these include: clinical assessment electrocardiogram (ECG) and cardiac markers. (3,4,5)

Three main take home points include:

1. If a patient has a positive ECG, the time to decision should be less than 10 minutes. Thrombolytic therapy should be given if the time to access a cardiac cathreterisation laboratory is greater than 90 minutes in the absence of contraindications, otherwise the latter should be the primary intervention.

a. Either troponin-T or troponin-I should be the assay of choice

for a single institution. A single test is only acceptable for patients with chest pain lasting for greater than 20 minutes. (6)

b. To effectively use either troponin assay in the ED, the pain must have been present for at least 20 minutes and the test must be repeated at least 10 hours after the pain started to achieve an excellent sensitivity.

c. Serial ECGs and 15 lead ECGs are very useful in the setting of acute chest pain and are underutilised.

Risk stratification of patients presenting to the ED with chest pain will be more effective with use of serial ECGs and extended ECGs and appropriate use of cardiac markers.

References

1. Pope H et al. Missed Cardiac Ischemia in the Emergency Department. Circulation. 2000; 342(16):1163-1170
2. Christenson J. et al. A Clinical Prediction Rule for Early Discharge of Patients With Chest Pain. Ann Emerg Med 2006; 47(1):1-9.
3. Ohman E et al. Cardiac troponin T levels for risk stratification in acute myocardial ischemia. NEJM 1996; 335(18):1333-1341.
4. Babuin L and Jaffe A. Troponin: the biomarker of choice for the detection of cardiac injury. CMAJ 2005;173(10):1191-1202.
5. Guo X et al. The predictive value of the bedside troponin T test for patients with acute chest pain. Clin Card 2006:11(4):298-301.
6. Mair J et al. Equivalent Early Sensitivities of Myoglobin, Creatinine Kinase MB Mass, Creatinine Kinase Isoform Ratios, and Cardiac Troponins I and T for Acute Myocardial Infarction. Clin Chem;41(9):1266-1272.

Speaker: Dr. Richard Verbeek, University of Toronto, Toronto, Ontario, Canada

Dr. Verbeek is an Assistant Professor in the Department of Medicine at the University of Toronto. He is also a medical director at the Sunnybrook-Osler Centre for Prehospital Care where he provides oversight for the Toronto EMS Paramedic Program, the largest municipally based EMS service in Canada comprised of over 1000 paramedics. Dr. Verbeek is currently the chair of the Prehospital Medical Advisory Committee which is responsible for advising government on standards for paramedic care in Ontario.

Integrating Paramedicine into the Health Care System

Traditionally paramedicine has developed by focusing on the continual expansion of a paramedic scope of practice necessary to provide high level prehospital care. This has led to EMS systems that can be somewhat isolated from the general medical community. Overall little attention has been paid as to how paramedicine can be integrated into the overall health care. Three examples were given of an integrated approach which has resulted in impressive positive contributions to patient outcomes: trauma management, management of acute ST-segment elevated myocardial infarction (STEMI) and acute stroke management. Each of these systems is characterized by the development of hospital-based centers of excellence and the following administrative approach:

- Planned integration of EMS practice and communications into a system wide plan
- Triage protocols developed by EMS and external consultants
- Steering committee oversight that includes EMS in a leadership role.

It is important to understand that these programs have a huge impact on improving patient care without the need to increase the scope of practice for paramedics. The important factor is the system approach and to understand that EMS is less effective when not integrated into the health care community. Medical leadership at this level is characterized by EMS physicians who have a focus on development of EMS systems of care in addition to the emergency care of individual patients.

References

1. Trauma care regionalization: a process-outcome evaluation. Sampalis JS, Denis R, Lavoie A, Fréchette P, Boukas S, Nikolis A, Benoit D, Fleiszer D, Brown R, Churchill-Smith M, Mulder D. J Trauma. 1999 Apr;46(4):565-79; discussion 579-81
2. A citywide protocol for primary PCI in ST-segment elevation myocardial infarction. Le May MR, So DY, Dionne R, Glover CA, Froeschl MP, Wells GA, Davies RF, Sherrard HL, Maloney J, Marquis JF, O'Brien ER, Trickett J, Poirier P, Ryan SC, Ha A, Joseph PG, Labinaz M. N Engl J Med. 2008 Jan 17;358(3):231-40.

Overview of paramedic scope of practice

Scope of practice for all health care professionals including paramedics is a simple list of procedures and medications that can be provided by an individual with specific credentials. Scope of practice is not an educational curriculum or an educational standard. Nor is scope of practice is a profile of clinical competencies or a clinical standard of care. However a well defined scope of practice is needed to guide the development of these aspects of training and performance. There can be various levels of scope of practice for paramedics with varying degrees of training. It is desirable that these levels be limited to no more than four or five since this facilitates job portability, efficiency in training programs over wide geographic areas and "branding" of paramedicine which is essential for public understanding and acceptance. Many systems operate very successfully with only one level of paramedic scope of practice.

There are four essential features that must be met before a

paramedic can be authorized to perform a defined scope of practice. These are:

- Education
  - Acquisition of knowledge, attitudes, psychomotor, and critical decision making competencies
- Certification
  - Formal verification that competencies have been achieved via an exam process
- Licensure
  - Legal authorization to perform a defined scope of practice
- Credentialing
  - Local authorization to perform a defined scope of practice (usually by medical director)

Internationally, many different countries use different terms to describe prehospital care providers with similar scopes of practice. Alternatively, the same term (e.g. "paramedic") can mean a very different scope of practice from country to country. Therefore is it essential when having a discussion with an international colleague to define what scope of practice applies to any particular term used to describe prehospital care providers.

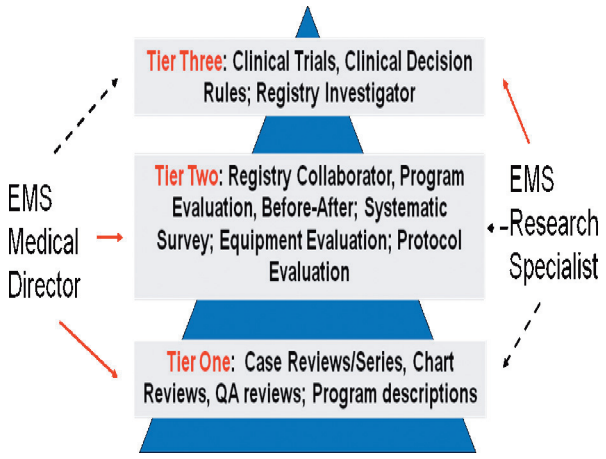
References

1. Canada – Paramedic Association of Canada – www.paramedic.ca - National Occupational Competency Profile
2. USA - National Highway Traffic Safety Administration - www.nhtsa.dot.gov – Scope of Practice Model
3. Ireland - Prehospital Emergency Care Council – www. phecc.ie – Education Training and Standards
4. Australia http://en.wikipedia.org/wiki/Paramedics_in_Australia

Challenges of EMS Research

EMS is a very challenging environment in which to conduct clinical research. Nevertheless clinical research is required since what works in emergency medicine is not guaranteed to work in paramedicine. Controversies that have recently arisen are the benefit of prehospital ACLS, ATLS, pediatric intubation and intubation of patients with severe head injuries. It is important for EMS medical directors to have a research perspective during their daily work since there is much to be learned and clinical research gives academic credibility to the practice of paramedicine.

One approach to developing and maintain a viable and worthwhile EMS research program is to understand the different roles of an EMS Medical Director and an EMS research specialist whose sole focus is clinical research. Three tiers of clinical research projects are proposed as outlined below. These tiers highlight where an



EMS medical director and an EMS research specialist can most productively focus their efforts. The solid lines represent types of research that can be undertaken as the principle investigator while the dashed lines represent areas for collaboration.

This allows a EMS medical director who is often fully occupied with their administrative role to contribute important new knowledge to the scientific literature while ensuring that are not overwhelmed with research responsibilities. Several examples were presented of research that has been published by the University of Toronto in each of these tiers over the past 5 years either by the EMS medical director or the EMS research specialist.

References

1. www.socpc.ca (Website of the Sunnybrook Osler Centre for Prehospital Care of the University of Toronto)
2. www.rescu.net (Website of University of Toronto EMS research program).

Speaker: Dr. Patrick Melanson, McGill University, Montreal, Quebec, Canada

Dr. Patrick Melanson is an emergency physician at the McGill University Health Centre. He also has a fellowship in critical care medicine and he practices both specialties at the Royal Victoria hospital. He is the program director of the critical care fellowship at McGill University.

Diagnosis and Management of Shock in the Emergency Department: A Physiological Approach

Shock can be defined as an impairment of tissue oxygenation and perfusion. The physiological determinants of oxygen delivery are the cardiac output (CO), the blood haemoglobin concentration, and the oxy- haemoglobin saturation. Relying on a systemic Blood Pressure (BP) measurement as the primary indicator of shock is problematic since BP is often maintained at normal values despite

significant decreases in CO due to compensatory vasoconstriction and tachycardia. Hence, some measure of the adequacy of blood flow or systemic oxygen delivery such as serum lactate or central venous oxygen saturation should be considered.

However, knowledge of the physiologic determinants of BP (BP= C.O. x SVR) is useful when attempting to classify shock to and develop a specific differential diagnosis and therapeutic plan. Shock can be classified broadly into a PUMP problem, meaning a low cardiac output, or an arterial TONE problem, meaning a low systemic vascular resistance. Furthermore, PUMP problems can be further sub-classified into HYPOVOLEMIC shock (low preload), CARDIOGENIC shock (decreased contractility), and OBSTRUCTIVE shock (increased afterload).

The clinical exam is useful but not completely reliable when attempting to classify shock. The pulse pressure between systolic and diastolic reflects the cardiac stroke volume and the diastolic pressure reflects the systemic vascular resistance. Patients with PUMP problems typically have an elevated diastolic pressure (high SVR) and a narrow pulse pressure (low stroke volume) with cool extremities due to poor peripheral perfusion and vasoconstriction. Patients with TONE problems generally have a low diastolic pressure (low SVR) and a large pulse pressure (normal or high stroke volumes) with warm well perfused extremities.

Since the clinical exam is not completely reliable and often equivocal, it is frequently necessary to place a central venous catheter to allow measurement of a central venous pressure (CVP) as a surrogate of preload status. Central Venous Oxyhemoglobin Saturation (CVO2) measurement can also be acquired from the central line and a serum lactate can be measured. A low CVO2 or a high serum lactate indicate inadequate peripheral oxygen delivery and thus are consistent with a PUMP problem.

Vasoactive medications should be chosen based on the desired hemodynamic effect and their pharmacological profile. The first line treatment of a PUMP problem is usually fluid resuscitation. It is obvious that hypovolemic shock should be treated with volume, but cardiogenic shock and obstructive shock may respond to volume as well. There is no evidence demonstrating superiority of colloids versus crystalloids. Either are acceptable choices. Removal or treatment of the obstruction is the definitive therapy for obstructive shock. When PUMP problems are not fluid responsive, inotropic agents should be started. Although several different agents could be chosen, Dobutamine, a beta-agonist, is the most common inotropic agent used in the emergency department. Generally dobutamine should be increased in a stepwise fashion until the CVO2 is greater than 70%.

For arterial tone problems, fluid resuscitation is again the usual first line therapy. Those patients who are not fluid responsive should have a vasopressor agent started. The most common vasopressor used in the emergency department is norepineprine (NE). NE is a vascular alpha receptor agonist. Norepinephrine should be increased in a titrated fashion until the Mean Arterial Pressure is maintained at greater than 65 mmHg for the average patient.

Mechanical Ventilation in the Emergency Department: The Basics

Patients requiring mechanical ventilation in the Emergency Department can be classified into four physiological categories; 1) Type 1 (hypoxemic) respiratory failure, 2) Type 2 (hypercapnic) respiratory failure, 3) Patients with normal gas exchange and lung mechanics requiring intubation for non-pulmonary reasons such as coma, and 4) Restrictive lung disease. The goals of mechanical ventilation are to improve oxygenation, to improve ventilation, or to decrease the work of breathing.

Although there are many different modes of mechanical ventilation, Assist-Control (A/C) also known as Continuous Mandatory Ventilation (CMV) is the preferred mode for the majority of patients requiring initiation of mechanical ventilation in the ED. With A/C ventilation the patient is able to trigger a machine breath by initiating a respiratory effort which will be sensed as either a pressure drop or a change in flow by the machine. The ventilator will then deliver a set tidal volume before it cycles off and allows exhalation to occur. In addition, if the patient is unable to initiate a breath due to sedation, neuromuscular blockade, or some other reason, a ventilator timer will ensure that a minimum set number of breaths will be delivered each minute. Thus a minimum minute ventilation is ensured.

When initiating mechanical ventilation on most ED patients, the initial ventilator settings should be Assist Control mode with a FiO2 of 100%, a PEEP of 5 cmH2O, a tidal volume of 8-10 ml/kg, and a respiratory rate adjusted to target a normal PCO2 and pH (usually 10 -14 breaths per minute). The PEEP can be adjusted upward to improve oxygenation if necessary. Otherwise, the FiO2 can be titrated downwards to maintain the Pulse Oximeter oxygen saturation above 90%.

Patients with hypercapnic respiratory failure often have severe obstructive lung disease which limits their rate of exhalation. If the next ventilator breath is initiated before exhalation is completed, mechanical ventilation can lead to gas trapping, dynamic hyperinflation, or Auto-PEEP. Auto-PEEP can cause decreased venous return to the heart and severe hypotension or even a PEA (pulseless electrical activity) cardiac arrest. If hypotension

secondary to Auto-PEEP is suspected, then the patient should be disconnected from the ventilator to allow for complete exhalation of trapped air from the lungs and thus an improvement in the BP. Once reconnected to the ventilator, measures should be taken to decrease the chance that auto-PEEP will recur. These include increasing the flow rate to decrease the Inspiratory/Expiratory ratio, decreasing the tidal volume, decreasing the set ventilator PEEP, or decreasing the respiratory rate. It may be necessary to accept hypercapnia (permissive hypercapnia) in order to avoid auto-PEEP.

Another situation where permissive hypercapnia may be accepted is severe hypoxemic respiratory failure secondary to ARDS. These patients often have severe atelectasis and lung collapse with much smaller lung volumes than normal. Mechanical ventilation with tidal volumes of 10-12 ml/kg may lead to an overstretch injury to the lungs or "volutrauma". Current recommendations are to ventilate with tidal volumes of 6 ml/kg of predicted body weight. The ventilator plateau pressure should be kept below 30 -32 cm H2O as well to minimize the risk of barotraumas.

The ABC`s of Sepsis: A Sepsis "Care Bundle" based on the Surviving Sepsis Campaign 2008

The components of the "Surviving Sepsis Campaign: International Guidelines for the Management of Severe Sepsis and Septic Shock:2008" most relevant to the emergency physician can be summarized with an "ABC pneumonic" as a memory aid or care bundle for the EP faced with a patient with severe sepsis or septic shock. The GRADE system was used to evaluate the quality of evidence and the strength of recommendation. A strong recommendation was graded as 1 and a weak recommendation as 2. The quality of evidence was graded from high (A) to very low (D).

A) AIRWAY

- Consider early use of Non-Invasive Ventilator Support (BiPAP)
- High risk intubation's due to significant incidence of peri-intubation hemodynamic instability/severe hypotension. Use lower doses of your usual induction agents (midazolam, fentanyl, propafol, etc.) or consider using etomidate or ketamine which may cause less hypotension. Have phenylephrine or ephedrine drawn up in a syringe to respond to hypotension immediately.

ANTIBIOTICS

- Begin antibiotic therapy as early as possible and always within one hour of diagnosing severe sepsis (1D) or septic shock (1B).
- Initiate broad spectrum therapy with one or more agents active against the most likely pathogens (1B).
- Panculture before starting antibiotics if time allows (1C)

B) BREATHING

- High incidence of Acute Lung Injury or ARDS. Avoid over distension of lungs; If intubated, use low tidal volume (low stretch approach) as per ARDSnet study
- Initiate Assist Control mode of ventilation with initial tidal volume 8ml/Kg of Ideal Body Weight (reduce to 6 ml/Kg within 4 hours)
- Maintain Plateau Pressure < 30 cm H2O

C) CIRCULATION

- Begin resuscitation immediately in patients with hypotension or lactate > 4mMol/L. Do not wait for ICU admission.
- Measure serum lactate to assess for Global Tissue Hypoxia.
- Start Early Goal Directed Therapy (EGDT) Protocol if any of the following criteria;
- SBP < 90 mmHg after appropriate fluid bolus
- Lactate > 4 mmol/L
- Evidence of one or more organ dysfunction
- Patients with severe sepsis often require large amounts of fluid during the first few hours. They often present with a combination of dehydration, vasodilatation, venodilation, and third space fluid losses due to increased microvascular permeability, which are ongoing. One study demonstrated an average requirement of 5 litres of crystalloid over the first six hours of therapy for patients with severe sepsis.
- Approximately 50% of patients with severe sepsis will respond to fluids alone. It is reasonable to perform initial fluid resuscitation targeting clinical endpoints such as HR, BP, and urine output.
- Often patients with severe sepsis do not receive enough fluids because of concerns about inducing pulmonary edema or volume overload in patients with previous histories of CHF, low ejection fractions, or renal failure. Even in these patient groups, outcome will be improved with aggressive fluid resuscitation using appropriate resuscitation endpoints.
- Initial minimum fluid bolus of 20 ml/Kg crystalloid (or colloid equivalent) if sepsis induced hypotension. Use a fluid challenge technique (1D). Administer fluid boluses (1000cc crystalloid or 500 cc colloid over 30 minutes) until CVP of 8 – 12 cm H2O (1D)
- No clear advantage colloids versus crystalloids.

- Place central line (internal jugular or subclavian vein are the preferred sites) if the patient has severe sepsis, sepsis-induced tissue hypoperfusion or hypotension unresponsive to initial fluid bolus.
- Early Goal Directed Therapy Resuscitation Goals (1C)
- CVP 8-12 cm H2O (1C)
- MAP > 65 mmHg (1C)
- CVO2 > 70 % (1C)
- Decreasing lactate level
- Repeat CVP and CVO2 measures q30 – 60 minutes.
- If a central line cannot be placed and CVP/CVO2 cannot be measured, then fluid therapy should be guided by repetitive clinical assessments including determination of the JVP and auscultation of lungs for rales/crackles. Clinical indicators of adequate peripheral perfusion (i.e., mentation, urine output, capillary refill, extremity warmth, etc.) should be reassessed regularly.
- Initiate vasopressor therapy for persistent hypotension (MAP < 65 mmHg) *despite adequate fluid resuscitation*. Maintain MAP > 65 mmHg (1C).
- Vasopressors should be administered via a central intravenous line. All patients requiring vasopressors should have an arterial line placed as soon as resources allow. BP should be monitored non-invasively at frequent intervals (i.e., q5min) until arterial line monitoring is established (1D).
- Norepinephrine at 2 – 50 mcg/min titrated upwards to keep MAP > 65 OR
- Dopamine 5 to 20 mcg/kg/min. (1C)
- Consider PRBC transfusion if HBG < 10 g/L and patient has lactic acidosis, CVO2 saturation < 70%, acute haemorrhage, or active coronary ischemia.
- Consider inotropic therapy if CVO2 remains below 70 % despite adequate fluid and PRBC resuscitation (Dobutamine beginning at 2.5 mcg/kg/min and titrating upwards q15min at 2.5 mcg/kg/min increments until CVO2 > 70%. (1C)

D) DRUGS

- Activated Protein C (rhAPC, Drotecogin Alfa, Xigris)
- Consider rhAPC administration in collaboration with an Intensivist, in adult patients with sepsis-induced organ dysfunction and a clinical assessment of a high risk of death (two or more organ failure or APACHE II score >24) and no significant bleeding risks/contraindications (2B).

E) ENDOCRINE

- Corticosteroids –
- Consider intravenous hydrocortisone for adult septic shock when hypotension responds poorly to adequate fluid resuscitation and vasopressors.(2C)
- ACTH stimulation test no longer recommended or required (2B)
- Hydrocortisone is the preferred glucocorticoid (2B)
- Hydrocortisone 50 mg iv q6h (if random cortisol done)
- Also consider 'stress dose' steroids in the absence of shock in patients with history of chronic steroid use or adrenal insufficiency
- Glucose control with insulin
- Maintain blood glucose < 8.3 mmol/L with sliding scale subcutaneous insulin or insulin drip protocol.(2C)

F) FIND the source of infection and establish source control.

- Perform focused clinical examination, guided by risk factors.
- Most likely sites are lungs (30%), bloodstream (20%), abdomen (20%), and urinary tract.
- Pan culture
- At least 2 blood cultures prior to antibiotic administration.
- Cultures from other possible sites (sputum, urine, CSF, etc.).
- Directed radiological studies.
- Source control measures (abscess drainage, debridement of devitalized tissues, device or line removal) should be performed as soon as possible.

Speaker: Dr. Anna-Maria Carvalho, McGill University, Montreal, Quebec, Canada

Dr. Carvalho is an Emergency Medicine specialist and a consultant in Aviation Medicine at McGill University in Montreal, Canada. Her fellowship training in aviation medicine encompassed fixed and rotor wing medical evacuations, commercial aircraft health and safety, and occupational health of aircrew. She also obtained her Flight Surgeon and Advanced Diving Medical Officer certificates from the Canadian Armed Forces. Dr. Carvalho works as a medical consultant to Air Canada, and as a flight physician for Skyservice Air Ambulance. She is assistant director for the Aviation Medicine Fellowship program at McGill University and is course director for Onboard Medical Emergencies, an annual educational event for physicians.

Is your Emergency Department patient fit to fly?

Certain chronic conditions, or exacerbations of chronic disease, may make a person unfit to fly. Often, these patients present to the Emergency Department. Knowledge of certain absolute and

relative contraindications to fly can make the travel experience safer for your patient and reduce in-flight emergencies.

The commercial aircraft cabin (pressurized to approximately 8000 feet above sea level) is hypoxic, compared to the ground atmosphere. A normal, healthy adult will desaturate to approximately 93%. Anyone with chronic lung disease, or with abnormal sea-level saturation, will desaturate even further. For this reason, anyone with an abnormal saturation at sea-level or with any oxygen requirements at sea level will require oxygen in flight. This can be arranged through the airline.

A passenger with anemia (hemoglobin less than 90 g/L) cannot fly without supplemental oxygen, even if the ground level saturation is adequate. The decreased oxygen carrying capacity, in combination with the hypoxia of altitude, will lead to decreased oxygen delivery to end-organs and may result in a medical incident in-flight.

Often, emergency physicians encounter travelers who sustain a fracture requiring immobilization. The usual risks of swelling are increased in the traveler with a lower extremity fracture that cannot be elevated in the aircraft. Furthermore, the hypoxic environment causes venodilation, further increasing the risk of swelling and compartment syndrome. For this reason, any cast less than 48 hours old must be bivalved prior to flight. A safe alternative would be to splint the injured extremity.

Most major airlines have physicians on duty to assist in making decisions regarding fitness to fly. Many airlines have a medical form available on the company website to assist in identifying potentially problematic medical conditions. Any uncertainty about prognosis for travel should be cleared with the airline's medical department.

Decompression Sickness

Sport diving continues to increase in popularity, and Oman has developed into a dive destination, with various dive shops and organized diving excursions in the Gulf of Oman. Emergency physicians may encounter injured divers and must always consider the possibility of decompression illness as the cause of the medical condition.

As a diver descends in the water, the atmospheric pressure is increased, causing nitrogen to be dissolved into the tissues (Henry's Law). The longer the time under water and the deeper the dive, the more the tissues will become saturated with nitrogen. When the diver ascends, the nitrogen is off-gassed via the lungs. However, if the diver ascends too quickly, or misses a decompression stop, the nitrogen will come out of solution in the tissues. Depending on where the bubbles are lodged, the diver may experience pain (joint, periarticular tissues), shortness of breath (lungs), chest pain (lungs, heart), neurological problems (spinal cord, brain), or vertigo (inner ear). Most symptoms will occur shortly after the diver surfaces.

If the diver breath-holds while ascending, the volume of air trapped in the lungs will increase in size (Boyle's Law). Eventually, air will be forced across the alveolar-capillary membrane or the compliance of the alveoli will be overcome, causing rupture, resulting in one of the pulmonary overpressurization syndromes, the most serious of which is an arterial gas embolism (AGE). An AGE results when air bubbles travel in the arterial circulation, resulting in obstruction of blood flow.

Both decompression sickness (DCS) and AGE are treated with recompression therapy in a hyperbaric chamber. Hyperbaric therapy decreases the size of the bubbles and forces them back into solution, until they can be off-gassed via the lungs. Transport of the injured diver to a hyperbaric chamber must be done at sea level (to avoid further increase in the size of the bubbles), with the diver on 100% oxygen.

In-flight Medical Emergencies

Increasing numbers of travelers, longer flights, older travelers and travelers with undisclosed medical conditions all lead to an increased number of in-flight medical emergencies across airlines around the globe. The vast majority of in-flight emergencies fall into the categories of neurologic complaints, gastrointestinal problems, respiratory difficulties, and cardiac events. Flight attendants have limited first aid training and are not equipped to deal with a major medical emergency. The health care professional who volunteers to assist with an onboard medical emergency should be aware of the resources available on, and the limitations of, a commercial aircraft.

Most major airlines subscribe to an online ground support service, which provides medical assistance via satellite at any time of day. The health care professional who assists onboard should ask the flight attendant to contact the service, as an aviation medicine specialist can assist in management of the ill passenger, and can advise on options for diversion to a closer airport if necessary. Furthermore, many providers of this type of service provide liability insurance for the health care professional who volunteers to assist onboard the aircraft.

Most large aircraft will have an emergency medical kit onboard. This is often locked, and can only be released to a physician who can provide proof of licensure. The contents of the kit varies from airline to airline, but should contain cardiac resuscitation medications, antihistamines, antiemetics, bronchodilators, glucose, and a minimum of 250cc of intravenous fluid. Medical

equipment in the kit includes a sphygmomanometer, a stethoscope, oral airways, and a setup for delivering intravenous medications.

The aircraft will also carry a bag-valve mask, an emergency oxygen tank and an automated external defibrillator, but these are not included in the emergency medical kit. They are often located in various storage spaces throughout the aircraft and must be requested individually.

Despite best efforts, a death may occur in flight. Should this happen, it is not a reason to divert the aircraft; the flight should continue on to the scheduled destination. While a physician may pronounce the death in-flight, the country of death will be at the next landing.

The emergency medical kits include forms for documenting the medical incident. These should be filled out, as with any medical encounter, and a summary should be given to the passenger to present to the physician who will be taking over care once on the ground.

Speaker:Dr. Peter Jones, Auckland, New Zealand

Dr. Jones has been a specialist in Emergency Medicine since 2000. He has always been interested in good quality research recently completed an MSc in Evidence Based Healthcare at Oxford University. He is senior adjudicator for the Australasian College of Emergency Medicine trainee's Fellowship research papers and a member of both the ACEM Trainee Research Committee and ACEM Clinical Trials Subcommitee. He is organising the NZ arm of the multicentre Australasian Resuscitation in Sepsis Evaluation trial. He has a wide research interest and is especially interested in improving the quality of research done at all levels in Emergency Medicine.

Pitfalls in Focused Assessment with Sonography for Trauma

FAST has become a routine part of the initial assessment of adult patients with blunt abdominal trauma. The evidence base for FAST is discussed and it will be shown that the vast majority of the published literature is of low methodological quality. Studies with better methods have found lower accuracy with FAST for the detection of free fluid. The mean detectable free fluid in FAST is approximately 600mL in the RUQ and 150mL in the pelvis. The pitfalls of performing FAST will be demonstrated using real cases to show how sonographer ability, patient and environmental factors may all contribute to false or inconclusive results with FAST. The results of a recently updated Cochrane Systematic review on the utility of FAST based trauma management compared to non-FAST management found that FAST-based algorithms reduced time to definitive treatment by 98 minutes and reduces the number of CT scans requested by 52%. Although there was no difference in mortality, RR 1 (95% CI 0.5-2.0), the wide confidence interval suggests that more evidence is needed to determine whether FAST based trauma algorithms impact on mortality.

Oral Cyclo-oxygenase 2 Inhibitors for Acute Soft Tissue Injury

Question: Acute Soft Tissue Injuries, (ASTI) are common and carry significant societal costs. Cyclo-oxygenase 2 Inhibitors (COXIB), non-selective Non-Steroidal Anti-Inflammatory Drugs (NSAID) and other analgesics are used to treat ASTI, with ongoing debate about their analgesic efficacy, effects on tissue healing and side effects. The aim of this dissertation is to review the evidence for oral COXIB compared to other oral analgesics for ASTI, using outcomes: Pain, Swelling, Function and Adverse Events.

Methods: Randomised controlled trials were sought through a systematic search in major databases (Medline, Embase, Cochrane CENTRAL, CInAHL, AMED, PEDro and Sport Discus), 'grey' literature (Clinical trials registries and dissertations), correspondence with pharmaceutical companies and hand searches of relevant journals. There was no language restriction. Potentially relevant studies were screened by two reviewers for suitability and risk of bias. Data was extracted using a standard form and extrapolated into suitable format for analysis. Where appropriate, results were pooled in meta-analysis. The evidence was graded for quality.

Findings: COXIB are equal to NSAID (Day 7+, n=1884, 100mmVAS), WMD = 0.18mm (95%CI -1.76 to 2.13)) and Tramadol (Day7+, n=706, 100mmVAS) WMD = -6.6mm (95%CI -9.63 to -3.47) for treating pain after STI (differences not clinically significant). COXIB have less gastrointestinal adverse effects than NSAID, even with short term use, RR = 0.59 (95%CI 0.41 to 0.85), I2 =7% (low quality evidence). COXIB are unlikely to be different to NSAID in helping patients return to full function, however they may improve time to return to function (moderate quality evidence) and may have less side effects than Tramadol (very low quality evidence). The risk of serious adverse reactions with both COXIB and NSAID in this setting is low (but incompletely defined)

Implications: More studies comparing COXIB to NSAID for analgesic efficacy in the setting of acute soft tissue injury are not necessary. More evidence is required for the comparisons between COXIB and other analgesics. The potential for early re-injury with

COXIB and NSAID should be the subject of future randomised controlled trials. Different review methodology is required to answer the question of cardiovascular risk with short term use of COXIB and NSAID.

Investigation of Shortness of Breath in the ED & the Cost of Meeting Targets: The UK 4-hour Rule

The UK government has spent £43 Billion modernising the NHS over the last 5 years. The results of a systematic review of the published and grey literature will be presented to show that despite the vast sums of money spent and strict adherence to the target of moving patients out of the Emergency Department within 4 hours of arrival, there is very little outcome data available to assess the effect of this investment and change in practice. There is low quality evidence suggesting that there has been a slight reduction (20min) in patient ED Length of Stay, with no reduction in the median time to see a doctor. Only 40% of critically unwell patients are seen by a senior doctor within 8 hours of admission, and there has been little or no reduction in admission rate and mortality. Conversely, there has been a 13% increase in number of investigations done per patient. The hidden costs of investigating prior to clinical assessment are discussed using 2 real cases of mis-diagnosis based on inappropriate D-Dimer tests. Appropriate use of D-dimer in a diagnostic algorithm is discussed, introducing the concept of calculating a post-test probability from a pre-test probability and a likelihood ratio (test accuracy estimate) to inform patient management. The lack of specificity of bedside markers to distinguish between different causes of Shortness of Breath will be discussed, emphasising the need for proper clinical assessment prior to requesting investigations for Shortness of Breath in the ED.

How to Search the Medical Literature

Drawing on my experience from a Masters in Evidence Based Healthcare, I will discuss how to search the medical literature in a concise and cohesive manner to maximise the utility of your searches and how to tailor your search strategy to your educational / research objectives. The importance of a Focused Question broken down into Population, Intervention, Comparison, Outcome and Time will be emphasised. How to adapt this format to different settings will be discussed, as will the differences between searching the major medical databases and EBM summaries (ACP Journal Club, Cochrane, Up-to-Date etc). A hierarchy of databases and other information sources will be presented, with the Cochrane Collaboration stressed as the first port of call for reliable summary information. The need to search databases other than Medline (Embase, CINAHL etc) will be stressed. How to reduce bias in your search by including the Grey literature and databases in languages other than English in your search will be revealed. Practical tips for searching using free-text and Boolean operators will be demonstrated. The need to manage your search and results with software such as EndNote® will be discussed. Finally, you will be shown how to integrate your search into your research and/or real time clinical practice.

Speaker: Ms. Maud Huiskamp, Toronto, Ontario, Canada

Maud has worked 10 years as an advanced care paramedic in Toronto before becoming Lead Educator for Sunnybrook-Osler Centre for Prehospital Care (SOCPC) in 2007. Her team is responsible for the development of continuing education for 2000 paramedics in Ontario. SOCPC is an essential part of disaster management in Ontario, working with local ambulance services to provide medical oversight during disaster situations. In addition Maud has worked with Centennial Colleges IDEAS Network to develop and conduct live simulated mass casualty exercises and tabletop exercises for all sectors including government, health, business, education volunteers and media.

Role of prehospital response systems in disasters.

A structured role for an Emergency Medical System (EMS) is an integral part of the overall response to disaster situations. The response must be fully coordinated with allied services and based on effective communication among all responders. The primary roles of EMS are triage of all the casualties, provide appropriate prehospital medical treatment, establish a staging area, coordinate and track the movement of all casualties, update hospitals, communicate appropriate destinations for all patients with receiving facilities and EMS dispatch. All this is done while ensuring the safety of all the EMS responders. Every responder must have training and practice with regard to their roles and responsibilities during a disaster situation, from the first responding paramedic, to the on-site EMS Incident Manager. The operational system is supported through planning, logistics and finance. Special roles may be assigned depending on the size and cause of the disaster. In order for effective medical communication to occur, the EMS system and the receiving facilities should use the same criteria for triage. In Canada the Canadian Triage Acuity Score is utilized. EMS systems have also established special destination algorithms to minimize the time to definitive clinical interventions for specific patients during non-disaster situations. Examples of these algorithms include: Field trauma triage guidelines, On site medical team, Stroke bypass, and STEMI bypass.

Speaker: Ms. Karen Bachynski, Toronto, Ontario, Canada

Karen is with the Ontario CritiCall Program. The CritiCall Program is housed online within the Ontario Resource Registry along with various other programs. Karen held the role of Call Specialist overseeing the call centre and all patient aspects of the program for the first 8 yrs and subsequently managed all disaster or "code orange" situations that occurred provincially relating to the call centre during that time. With the real time, 24 hr, provincial "snapshot" of the emergency health care resources within the province, CritiCall plays a key role in disasters / code orange situations such as the Ice Storm 98, SARS 03 and Air France plane crash 06. In 2004, Karen was appointed Toronto / GTA / Central East Regional Project Manager and is responsible for the 35 hospitals within those areas as well as the Provincial Disaster Liaison for CritiCall. In 2008 the program under went significant restructuring under the Critical Care Secretariat and became CritiCall Ontario. Karen was appointed the Program Manager for LHIN's 7, 8 & 9W as well as Provincial Liaison for Adult Acute Care & Disaster Management.

CritiCall Ontario & Disaster Management

CritiCall Ontario is a one-number-to-call, 24-hour-a-day consultation and referral service for physicians caring for critically ill patients in the province of Ontario, Canada. At roughly four-times the size of Oman, Ontario is 1.5 million square kilometres with a population of 12 million. Since 1996, CritiCall Ontario has been functioning as a 'medical 9-1-1'service for physicians and using technology, including an Internet-based Provincial Bed and Resource Registry, to bridge geographical distance so that patients can be cared for quickly and appropriately.

The Provincial Bed/Resource Registry houses vital information including on-call physician rosters, pager numbers, and resources by specialty (including all beds at the local, regional or provincial level). All of this information is available at the click of a mouse and reportable through extensive provincial databases. During SARS, all patients were transferred via CritiCall to maintain epidemiological links, ensure effective use of limited specialized resources, and provide statistical tracking.

CritiCall manages disaster situations using the very same methodology. During all disaster events, the appropriate and methodical transfer of patients is paramount and statistical tracking invaluable. In a disaster situation, manual and electronic fan-out alerts are sent from CritiCall to local, regional and /or provincial agencies including hospitals, EMS, and the Ministry of Health to confirm and create bed availability, alert all specialists, and control non-disaster related patient flow. In the interim, hospitals can spend their time taking care of patients. CritiCall's ability to function effectively during a disaster scenario is largely due to the fact that the protocols and resources are in place and inform CritiCall's day-to-day activities of helping physicians care for their critically ill patients.

Speaker: Dr. Russell D. MacDonald University of Toronto, Toronto, Ontario, Canada

Dr. Russell MacDonald is a specialist in emergency medicine and is Canada's first sub-specialist in emergency medical services (EMS). He also has a Master Degree in Public Health from Boston University. Dr. MacDonald has worked in academic teaching centers and held academic appointments in emergency medicine in both Canada and the United States. His expertise includes transport medicine, disaster preparedness, and international health. Dr. MacDonald is the Medical Director at Ornge Transport Medicine, North American's largest transport medicine agency. He is also an Assistant Professor in the Faculty of Medicine and holds an appointment at the Institute of Medical Sciences at the University of Toronto. Dr. MacDonald practices emergency medicine at Sunnybrook Health Sciences Center in Toronto, and is the Co-Director of the University's Emergency Medicine Fellowship Program. His academic interests include patient safety and adverse events, impact of airway interventions on patient outcome, and the relationship between public health and emergency services. Dr. MacDonald has a number of peer-reviewed publications and grants for transport medicine research, and is on the editorial board of a peer-reviewed journal.

First Do No Harm: Controversies in Prehospital Airway Management for Trauma Victims

There remains controversy over advance airway management in the transport setting. Traditionally, paramedics with advanced training and scope of practice have included tracheal intubation as part of their routine management of trauma victims. There are recently published prehospital studies that provide new evidence regarding this practice. At first glance, the evidence appears contradictory and the practice of airway management differs greatly across transport systems. What the studies clearly demonstrate is that prehopsital intubation is harmful, particularly in patients with traumatic brain injury. The question, however, remained whether or not it was intubation itself or some other variables that causes this poor outcome.

Prehospital intubation is used to protect the airway, oxygenate, ventilate, and deliver goal-directed therapy to patients. Further examination of the evidence demonstrates that intubation may

cause or exacerbate hypoxia, and when comparing hypoxia and hypotension, hypoxia (and not hypotension) is the predictor of mortality. The evidence also demonstrates that hypocapnia or hypercapnia, due to hyperventilation or hypoventilation (respectively) also contribute to worse outcomes. In other words, monitoring of oxygen saturation end-tidal CO_2 and directing care to maintaining oxygen saturation and CO_2 within predetermined parameters influenced patient outcome. The evidence also demonstrates that provider skill level is a major determinant of patient outcome. Success is related to access to and experience with intubation, suggesting that not all intubators are the same.

In summary, the evidence shows that highly-skilled prehospital providers with appropriate monitoring capabilities actually improve survival for trauma patients. This is particularly true for those patients with traumatic brain injury.

References

1. Stiell IG, Nesbitt LP, Pickett W, Munkley D, Spaite DW, Banek J, et al. The OPALS Major Trauma Study: impact of advanced life-support on survival and morbidity. CMAJ 2008;178(9):1141-52.
2. Liberman M, Mulder D, Sampalis J. Advanced or basic life support for trauma: meta-analysis and mcritical review of the literature. J Trauma 2000;49(4):584-99.
3. Davis DP, Hoyt DB, Ochs M, Fortlage D, Holbrook T, Marshall LK, Rosen P. The effect of paramedic rapid sequence intubation on outcome in patients with severe traumatic brain injury. J Trauma 2003;54(3):444-53.
4. Dunford JV, Davis DP, Ochs M, Doney M, Hoyt DB. Incidence of transient hypoxia and pulse rate reactivity during paramedic rapid sequence intubation. Ann Emerg Med 2003;42(6):721-8.
5. Chi JH, Knudson MM, Vassar MJ, McCarthy MC, Shapiro MB, Mallet S, et al. Prehospital hypoxia affects outcome in patients with traumatic brain injury: a prospective multicenter study. J Trauma 2006;61(5):1134-41.
6. Warner KJ, Cuschieri J, Copass MK, Jurkovich GJ, Bulger EM. The impact of prehospital ventilation on outcome after severe traumatic brain injury. J Trauma 2007;62(6):1330-8.
7. Fakhry SM, Scanlon JM, Robinson L, Askari R, Watenpaugh RL, Fata P, Hauda WE, Trask A. Prehospital rapid sequence intubation for head trauma: conditions for a successful program. J Trauma 2006;60(5):991-1001.
8. Davis DP, Peay J, Serrano JA, Buono C, Vilke GM, Sise MJ, Kennedy F, Eastman AB, Velky T, Hoyt DB. The impact of aeromedical response to patients with moderate to severe traumatic brain injury. Ann Emerg Med. 2005 Aug;46(2):115-22.
9. Poste JC, Davis DP, Ochs M, Vilke GM, Castillo EM, Stern J, Hoyt DB. Air medical transport of severely head-injured patients undergoing paramedic rapid sequence intubation. Air Med J. 2004 Jul-Aug;23(4):36-40.

New tools and techniques to manage the patient's airway

Health care professionals now have a number of devices to help manage a patient's airway, particularly in the setting of a difficult airway. Some are simple and straightforward, while others require training and skill to master their use. As health care professionals, we need to examine these new devices and determine if and how they can be incorporated into our practice. Depending on your scope and role as a health care provider, these four new devices, the King Airway, AirTraq, Glidescope, and Cric, may play a role in your practice.

The King Airway is a disposable supraglottic airway. It is designed for blind insertion in a patient who is either breathing spontaneously or requires positive pressure ventilation. The curved tube has a ventilation aperture positioned between two inflatable cuffs. The distal cuff seals the esophagus and the proximal cuff seals the oropharynx. Its role in airway management is a possible first-line airway for basic providers or first responders, and as a rescue device for advanced providers as part of a difficult or failed airway algorithm. Studies have demonstrated it can be placed faster than a combitube or tracheal tube in simulated difficult airway scenarios.

The AirTraq is an optical laryngoscope, providing a visual guidance system for intubation. It holds the tracheal tube and works in place of a laryngoscope. The intubator looks through the device's eyepiece to view the airway, identify anatomy, and insert the tracheal tube through the cords under direct visualization. It has a role in the patient with anticipated airway problems due to abnormal anatomy, as a rescue device for the failed airway, for patients with cervical spine immobilization, or removal of airway foreign bodies under direct visualization. Studies have demonstrated it allows novice intubators to acquire intubation skill faster, and shortens time to securing the airway in difficult airway scenarios.

The GlideScope is a video laryngoscope that works in place of a laryngoscope to provide a fiberoptic view of the airway on a separate monitor. It has a role is similar to the AirTraq, shortens time to learn for novice learners, and improves success for experienced intubators. The GlideScope is available in a portable version, making it possible to use it in combat or prehospital settings, and a small neonatal version is available for very small airway anatomy.

The Cric is a cricothyrotomy system that can help secure the airway surgically. It is quite new and government approval is pending for this device. The device has a built-in scalpel, skin retraction system, and guide to introduce a cricothyrotomy tube. The goal of the device is to improve safety when performing an open cricothyrotomy. While no studies have been published regarding its use, it may have a role in the difficult or failed airway algorithm where a surgical airway is required.

When considering these four, and any other, airway device the practitioner must reflect several things. They must consider how

they typically secure an airway, what they do in the event of failure, and what tools are available in their practice setting to manage airways. Only then can they consider what role a new device may have in their practice.

References

1. Russi CS. Comparison of King-LT to endotracheal intubation and Combitube in simulated difficult airway. Prehosp Emerg Care 2008; 12(1):35-41.
2. Guyette FX. King airway use by air medical providers. Prehosp Emerg Care 2007; 11(4):473-6.
3. Maharaj CH. Learning and performance of tracheal intubation by novice personnel: a comparison of the Airtraq and Macintosh laryngoscope. Anaesthesia 2006; 61(7):671-7.
4. Nowicki TA. Comparison of use of the the Airtraq with direct laryngoscopy by paramedics in the simulated airway. Prehospital Emergency Care 2009; 13(1):75-80.

Preparation of a Patient for Interfacility Transport

Patients frequently require transfer from hospital to hospital to receive specialized care. However, the transfer itself takes the patient out of a secure care setting and into a potentially unstable environment with limited resources. In order to properly prepare a patient for and safely carry out an interfacility patient transfer without unnecessary risk to the patient, the practitioner must carry out several important steps. These steps typically occur in parallel.

The first step is to quickly recognize an illness or injury that requires a higher level of care. A patient with any illness or injury that requires specialist or subspecialist care, advanced investigations or technology, specialized therapy, or any service not available locally will need to be transferred. The provider should be aware of their own scope of practice, and the resources available to them locally. The sooner the provider recognizes an injury or illness that exceeds their scope or local resources, the sooner they can initiate the transfer. This is particularly important if the illness or injury required treatment that is time-sensitive.

The second step is to resuscitate and stabilize the patient to the best of their abilities. The includes a proper primary survey to identify and address immediate threats to life, carry out secondary survey to ensure no injuries are missed, and provide adequate patient monitoring until the transfer takes place. Investigations should never delay transfer. The common pitfalls in this step include inadequate airway protection, no gastric decompression or spinal immobilization, inadequate vascular access or volume resuscitation, or failure to treat the precipitating illness. If you think the patient may need an intervention or treatment en route, initiate it prior to transfer because doing it en route will be more difficult.

The third step is to arrange the transfer. This requires direct communication between the staff at the sending and receiving facilities. Direct communication facilitates exchange of patient information and helps ensure the patient is well prepared. The sending staff should send copies of all documents, investigations, and other pertinent records with the patient to the receiving facility.

The fourth step is to carry out the transfer. The actual transfer may take place using a land ambulance, a helicopter, or an airplane. The choice of crew is as important as the choice of vehicle because the crew must be able to continue patient care en route. All providers should be aware of what vehicle and crew transfer resources are available in their area, how to access them, and what level of care they can provide. They should also know under what circumstances hospital-based staff or a team may be required to carry out the transfer.

The final step is to review the transfer after it is complete. Each transfer is unique and will have lessons to help improve subsequent transfers. This continuous process will improve the quality and safety of future transfers; ensuring patients receive the best possible care en route.

Speaker: Prof. Francesco Della Corte University A. Avogadro, Novara, Italy

Dr. Della Corte is a full Professor of Emergency and Critical Care Medicine. He graduated in 1979 at the Catholic University, School of Medicine where he became Associate Professor in Disaster Medicine in 1992. He has been a full Professor since 2002. He was appointed as Secretary of the European Society for Emergency Medicine in 1999 to 2006. He is the Course Director of the European Master in Disaster Medicine hosted by the University of Novara and Brussels. He is the Chair of the CCU and Critical ED at Maggiore Hospital, School of Medicine in Novara.

Do simulation exercise for hospital management increase outcome in MCIs and disasters ?

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The Hospital Disaster Preparedness (HDP) Course, a modular course issued within the European Master in Disaster Medicine (EMDM), has as its main goal how to set up Hospital Preparedness for the admission of a large number of casualties in the Hospital. One of the course's motivations is that almost everywhere in the world a well defined law defines the need for a Hospital plan for

the admission of a large number of patients after a mass casualty/ disaster but very often, even if a plan has been set up, it has never been tested with a drill or in real emergencies. The main objective of the course are the following: to identify the possible risk factors in a given area, to manage resources that will be used to implement the plans, to test the plans within a simulated disaster through a simulation game provided on a proper simulation environment.

1. Identifying the possible risk factors in a given area: welcome to Riceland ® virtual Land

The Virtual HDP geopolitical area is called Riceland ®, and every virtual citizen (actually users from the whole world) is given a 'passport' and a virtual identity to get in. Riceland is a land composed of towns, mountains, rivers, lakes, industrial infrastructures. Every player has a key-role, such as Major, Hospital Director, Minister, etc, and she/he is expected to interact both with the other players and with the Game Masters. The land is provided as a digital land embedded in a web-based e-learning environment.

2. *Managing the resources that will be used to implement the plans: spending two months in Riceland*

The citizens are expected to play the game during a time-frame of two months (in the EMDM version of HDP). This differentiates Riceland from any other existing MCGs: simulation of 'real life' in the sense that the effect of a political, economical, logistical and medical decisions has rebounds over time and may contribute to prevent a disaster situation, or to improve the risk. Despite Riceland gives a graphical interactive representation of what happens in the digital land, it has the characteristics of a role playing game, too. At the end of the two months, the players and their teams – led to a completely new situation compared to the initial one (and always different from previous "matches" played on the same platform) – must upload on the e-learning environment their own Hospital Disaster Preparedness plan. The teams have the possibility to ask for structural changes in the buildings (e.g., one more back-up Hospital entrance), and must face the eventuality that big infrastructure failure happen following a disaster simulated in Riceland. The disasters are not driven by Artificial Intelligence agents, but are administered by the team of Masters supervising the game, and implemented and experienced within the game platform.

3. Testing the plans within a simulated disaster through a simulation game provided on a proper simulation environment

Once the Teams are satisfied with their work, the HDP plans belonging to each single Hospital in Riceland (there are 5-6 main towns and hospitals currently) will be tested using a Networked Virtual Environment for real-time disaster simulation. Every Hospital (and all the Teams) will experience massive influx of casualties, the issues related to the communications with the EMS during the virtual drill, the communications (or lack of) with other Hospitals and structures, the occurrence of sudden infrastructure failure such as building failure (even Hospital building), roads failure, etc. Eventually, the very next day after the virtual real-time simulation, the EMDM Students take part to a real-size drill, organized and arranged as it was Riceland (the virtual game) the day of the disaster. During the live-in course of the Fifth Edition of the EMDM, 30 Students from all over the world experienced the drill organized in the town of Casalvolone (Novara, Italy): almost the whole town was the Set of the simulation, with real building failures (fires, etc), real policemen, firemen, Red Cross, and – particularly – more than 50 casualties played by the undergaduate Medical Students of the sixth year, who 'learned' Disaster medicine being 'realistic' victims, and changing their status according to good or bad moves taken by the players.

Conclusions

Training tools alone are not likely to be effective without an instructional framework giving them a sense. Moreover, the tools commonly used for training in emergency medicine seems not necessarily to be the best ones within a Disaster medicine educational setting, since they mostly focus on post-event reduction of the level of "improvisation" within the acute phase occurring in a narrow time-frame and a very specific area, rather than enlarging the scope to a wider area (metropolitan, national, international) and a wider time-frame (including the pre-disaster assessment phases, etc). The HDP – Riceland ® experience was very encouraging both on the teachers and the learners perspective, and fulfilling the possible criteria for effective simulation exercises in Disaster medicine.

References

1. Delooz H, Debacker M, Della Corte F (2003) The European Master Program in Disaster Medicine. International Journal of Disaster Medicine, 1; 35-41
2. Della Corte F, La Mura F, Petrino R (2005), E-learning as educational tool in emergency and disaster medicine teaching, Minerva Anestesiol 71:181-95

Focus on severe head injury management prior to the OR and the ICU

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Traumatic brain injury (TBI) represents a relevant pathology in

the ED and still remains the leading cause of death among people younger than 25 years of age (1) and the main single factor in determining prognosis in the polytraumatised patient. Prognosis in head injury has been strictly correlated with the degree and duration of ischemia and more than 90% of autopsies on patients dead after a head injury showed ischemic lesions of different severity (2). Many causes have been advocated for posttraumatic cerebral ischemia such as intracranial hypertension, arterial hypotension, brain edema and swelling, focal tissue compression from intracranial hematomas and involvement of microcirculation and vasospasm of large cerebral arteries. Many in vivo studies have confirmed that ischemia is the predominant cerebral blood flow pattern in the early postraumatic phase in head trauma patients (3). In addition, early ischemia has been found to correlate with poor outcome and early mortality. The correlation between CBF and mortality is lost after this early period whereas it remains valid for cerebral metabolic rate for oxygen (4). This pattern of early ischemia cannot be attributed only to abnormally low cerebral perfusion pressure, excessive hyperventilation or vasospasm, because it is still present even after normalisation of the haemodynamic and respiratory parameters, suggesting the presence of an increased distal vascular resistance due to different factors (extrinsic microvascular compression by damaged and edematous astrocytic processes, active muscular contraction of the resistance arterioles caused by the trauma induced release of vasoactive substances such as calcium, cathecolamines, prostaglandins, haemoglobin, neuropeptides and intravascular thrombosis)(5).

The cornerstones of treatment in the ED (6) must be aimed at the assessment of the ABC's and the simultaneous resuscitation in the primary survey to obtain a normal oxygenation (arterial haemoglobin oxygen saturation > 95%), the maintenance of CO_2 values at 35 mmHg (avoiding hyperventilation with resulting hypocarbia and subsequent hypoperfusion), the rigorous maintenance of normal systemic arterial pressure values (avoiding even short episodes of arterial hypotension). Prehospital hypotension, defined as a single observation of a systolic blood pressure < 90 mmHg, has been found to be an independent predictor of outcome (7), a normal hematocrit and normovolemia, the avoidance of hyponatriemia and hyperglicemia, the control of epileptic seizures only if they are clinically visible.

Notwithstanding these assumptions, prompt diagnosis and early surgical treatment of intracranial masses still remains the central point for the management of TBI.

Potential strategies for future therapy for the early hypoperfusion phase include induced arterial hypertension; pharmacological agents that might reverse the increase in small vessels' resistance or therapies (drugs and/or hypothermia) that protect neurones from ischemia-induced biochemical events.

As far as the pharmacological approach is concerned, a complex interplay of multiple mechanisms is involved in the determination of posttraumatic cerebral injury. Available evidence suggests that the principal players are: excitatory aminoacid neurotoxicity, intracellular calcium overload, activation of the arachidonic acid cascade, induction of free radical-induced lipid peroxidation, opiate peptides, cathocolamines, cholinergic neurotransmitters, cytokines and adhesion molecules

Experimental studies on animal models brought very promising results for neuroprotection of the injured brain but most of them failed to demonstrate consistent usefulness when applied in human trials. Recent phase III randomised, controlled, placebo vs. drug studies (using competitive NMDA-receptor antagonists, CPP and CGS 19755) failed to demonstrated their efficacy in humans.

Finally, a great interest has been directed to the discovery that primary brain injury stimulates the cells of the CNS to produce a variety of mediators (interleukin 1b, tumour necrosis factor alfa and interleukin 6, leucocyte adhesion molecules (ICAM)-1, E selectin, L-Selectin, P-Selectin and Integrins, which are expressed on the surface of leucocytes and endothelial cells, control the migration of leucocytes into tissues).

References

1. White R.J., Likavek M.J. The diagnosis and initial management of head injury. N. Eng. J. Med; 327:1507-1511,1992
2. Graham D.I., Adams J.H. Ischemic brain damage in fatal head injuries. Lancet 1:265-266, 1971
3. Bouma G.J., Muizelaar J.P., Choi S.C., Newlon P.G., Young H.F. Cerebral circulation and metabolism after severe traumatic brain injury: the elusive role of ischemia J. Neurosurg. 75:685-693, 1991
4. 30-Cerebral blood flow determination with a new DSPET device: prognostic implication in the first 48 hours after severe head injury. Della Corte F., Giordano A., Pennisi M.A., Barelli A., Caricato A., Campione P., Galli G. Acta Neuchirurgica, Vol 139, n. 7, 636-642, 1997
5. Martin NA, Patwardhan RV, Alexander MJ, Afrik CZ, Lee JH, Shalmon E, Hovda DA, Becker DP Characterization of cerebral hemodynamic phases following severe head trauma: hypoperfusion, hyperemia and vasospasm. J. Neurosurg. 87; 9-19, 1997
6. Bullock R., Chesnut RM, Clifton F, Ghajar J, Marion DW, Narayan RK, Newell DW, Pitts LH, Rosner MJ, Wilberger JW Guidelines for the management of severe head injury. New York: Brain Trauma Foundation, 1996
7. Chesnut RM, Marshall LF, Klauber MR et al. The role of secondary brain injury in determining outcome from severe head injury. J Trauma; 34:216-222, 1993

Biomarkers in early diagnosis of septic shock

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Severe sepsis is characterized by acute organ dysfunction secondary to infection while septic shock is defined as severe sepsis plus hypotension not reversed with fluid resuscitation [1;2]. The mortality from severe sepsis still remains unacceptably high. A comprehensive analysis of the epidemiology of severe sepsis in the USA during 1995 reported a mortality rate of 28.6%, amounting to 215 000 deaths nationally, estimated to be 9.3% of all the deaths in the USA that year and equivalent to the number of deaths following acute myocardial infarction [3]. Among the reasons suggested for the high mortality rate from severe sepsis were late recognition of the disease and inappropriate treatment prior to admission to the intensive care unit (ICU). Thus a key role might be played by the emergency physicians. A recent study showed that the incidence of severe sepsis or septic shock in patients admitted to a UK teaching hospital via its emergency department (ED) is approximately 30 cases per 1000 [4]. Severe sepsis and septic shock require comprehensive, aggressive and time-dependent resuscitation in the ED. Recent literature has demonstrated multiple novel options for the management of severe sepsis and septic shock [5-7]. Rivers and colleagues showed that early and aggressive resuscitation of severely septic patients in the ED resulted in a substantial improvement on mortality [7]. On the same line, appropriate and promptly antimicrobial therapy decreases mortality in septic patients [8]. As such, specific therapeutic options should be instituted in the ED to provide a morbidity and mortality benefit. Discrimination between systemic inflammatory response syndrome (SIRS) and sepsis is crucial to promptly establish appropriate treatments in critically ill patients, since therapies and outcomes greatly vary in patients with and without infection. Early detection of sepsis, however, is not easy and no single clinical or biological indicator has so far won unanimous acceptance.

Many potential biomarkers have been investigated, but only C-reactive protein (CRP) and procalcitonin (PCT) are currently used on a routine basis [9;10]. Combining information from several markers improves diagnostic accuracy in detecting bacterial versus nonbacterial causes of inflammation. Multiplex immunoassay approach has been applied in a medical ED and department of infectious diseases of a university hospital in Denmark. They showed that measurements of soluble urokinase-type plasminogen activator (suPAR), soluble triggering receptor expressed on myeloid cells (sTREM)-1 and macrophage migration inhibitory factor (MIF) had limited value as single markers, whereas PCT and CRP exhibited acceptable diagnostic characteristics [11]. Shapiro and colleagues utilized a biomarker panel to predict organ dysfunction, shock, and in-hospital mortality in ED for patients with suspected sepsis. Although original and theoretically useful, further study is warranted to prospectively validate the clinical utility of these biomarkers and the sepsis score utilized in risk-stratifying patients with suspected sepsis [12].

Recently, we characterized a new potential marker involved in sepsis called osteopontin (OPN) [13]. Serum osteopontin levels are strikingly higher in patients with sepsis compared to those with SIRS, and decreased during the resolution of both the disorders [13]. Furthermore we showed that OPN levels directly correlated with those of interleukin 6 and in vitro, recombinant osteopontin increased interleukin 6 secretion by monocytes in both the absence and presence of high doses of lipopolysaccharide [13].

In conclusion early sepsis management in the ED is paramount for optimal patient outcomes. Multiple early markers are studied to improve early diagnosis and management of this complex syndrome.

Reference

1. American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference: definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. Crit Care Med. 1992; 20: 864-74
2. Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM: Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004; 30: 536-55
3. Angus DC, Linde-Zwirble WT, Lidicker J, Clermont G, Carcillo J, Pinsky MR: Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. Crit Care Med 2001; 29: 1303-10
4. Majuran M, Clancy M: Determination of the size of the different sepsis categories presenting to a UK teaching hospital emergency department. Emerg. Med J 2008; 25: 11-4
5. Annane D, Sebille V, Charpentier C, Bollaert PE, Francois B, Korach JM, Capellier G, Cohen Y, Azoulay E, Troche G, Chaumet-Riffaut P, Bellissant E: Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock. JAMA 2002; 288: 862-71
6. Bernard GR, Vincent JL, Laterre PF, LaRosa SP, Dhainaut JF, Lopez-Rodriguez A, Steingrub JS, Garber GE, Helterbrand JD, Ely EW, Fisher CJ, Jr.: Efficacy and safety of recombinant human activated protein C for severe sepsis. N.Engl. J.Med. 2001; 344: 699-709
7. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, Peterson E, Tomlanovich M: Early goal-directed therapy in the treatment of severe sepsis and septic shock. N.Engl.J.Med. 2001; 345: 1368-77
8. Leone M, Bourgoin A, Cambon S, Dubuc M, Albanese J, Martin C: Empirical antimicrobial therapy of septic shock patients: adequacy and impact on the outcome. Crit Care Med 2003; 31: 462-7
9. Carrigan SD, Scott G, Tabrizian M: Toward resolving the challenges of sepsis diagnosis. Clin.Chem. 2004; 50: 1301-14

10. Meisner M: Biomarkers of sepsis: clinically useful? Curr.Opin.Crit Care 2005; 11: 473-80

11. Kofoed K, Andersen O, Kronborg G, Tvede M, Petersen J, Eugen-Olsen J, Larsen K: Use of plasma C-reactive protein, procalcitonin, neutrophils, macrophage migration inhibitory factor, soluble urokinase-type plasminogen activator receptor, and soluble triggering receptor expressed on myeloid cells-1 in combination to diagnose infections: a prospective study. Crit Care 2007; 11: R38

12. Shapiro NI, Trzeciak S, Hollander JE, Birkhahn R, Otero R, Osborn TM, Moretti E, Nguyen HB, Gunnerson KJ, Milzman D, Gaieski DF, Goyal M, Cairns CB, Ngo L, Rivers EP: A prospective, multicenter derivation of a biomarker panel to assess risk of organ dysfunction, shock, and death in emergency department patients with suspected sepsis. Crit Care Med 2009; 37: 96-104

13. Vaschetto R, Nicola S, Olivieri C, Boggio E, Piccolella F, Mesturini R, Damnotti F, Colombo D, Navalesi P, Della Corte F, Dianzani U, Chiocchetti A: Serum levels of osteopontin are increased in SIRS and sepsis. Intensive Care Med 2008;

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