

Trauma *rounds*

For emergency medicine and trauma professionals

Winter 2009/2010

University-Affiliated Trauma Centers

Benedum Pediatric Trauma Program

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In This Issue

Page 4

Protective Equipment in the C-spine-injured Athlete

Page 6

Dr. Yealy Named Chair of Department of Emergency Medicine

Page 6

UPMC Northwest Designated Level III Trauma Center

Page 7

Calendar of Events



Geriatric Trauma

by Gary Marshall, MD

By the year 2040, 20 percent of the U.S. population will be over age 65. Americans are now enjoying a longer life expectancy and are leading a more active life style into old age; however, because of age-related declines in motor and cognitive function, an ever-expanding group of patients are experiencing trauma. In addition, serious injuries can result from far less mechanism in the elderly patient.

Triage

Mortality in the elderly is higher than in younger patients with matched injury severity scores; this trend appears in both early and late mortality. Advanced age should therefore prompt early, aggressive care. "Under-triage" occurs twice as frequently in the elderly than in younger patients; because as many as 85 percent of elderly trauma patients can return to independent living, this should be avoided at all costs.

One important point to remember is that the mechanism of injury and stable vital signs can be misleading. Thirty percent of persons over 65 years of age fall each year; of these falls, 6 percent result in fractures, 10 to 30 percent result in significant trauma, and 7 percent lead to mortality. Falls from a standing position account for half of all rib fractures in the elderly population. The current American College of Surgeons recommendations are that all trauma patients over age 55 should be transported to a designated

(continued on Page 2)

Geriatric Trauma *(continued from cover)*

trauma center regardless of apparent injury severity. They also suggest that automatic trauma team activation be considered for all patients older than 75 years.

Assessment and Resuscitation

Many factors contribute to the difficulties in initial assessment and resuscitation of the elderly patient, including pre-existing medical conditions, prosthetics, altered mental status, and the effects of medications and normal age-related changes in physiology. All systems experience decline with advancing age, and this impacts the patient's "physiologic reserve" in the face of trauma. Again, these changes should prompt early and aggressive care. A normal blood pressure for a younger patient may represent frank hypotension in an elderly person.



Supplemental oxygen should be administered to all elderly trauma patients. Intubation should be considered early in elderly patients with signs of shock, significant chest trauma, and altered mental status. Pulmonary capacity can be seriously impaired by trauma. The elderly are susceptible to rib and sternal fractures, and their diminished vital capacity can limit compensation.

Splinting secondary to pain leads to hypoventilation and pneumonia. Blunted responses to hypercarbia, hypoxia, and acidosis may delay the signs of impending respiratory collapse, making arterial blood gas measurements important.

The elderly are unable to increase heart rate to the extent needed for adequate shock compensation. Therefore, administration of fluid and blood should not be delayed, and the source of bleeding must be rapidly identified and controlled. Indications for FAST (Focused Assessment with Sonography in Trauma) and diagnostic peritoneal lavage remain the same. Hypotension should prompt rapid laparotomy in patients with abdominal trauma. In addition, initially negative FAST exams should be repeated if the patient develops signs of hemodynamic instability. The presence of shock and occult hypoperfusion reliably predict mortality. Systolic blood pressure < 90 mmHg is associated with mortality of 82 to 100 percent. Occult hypoperfusion is predicted by a base deficit of ≤ -6 or lactate ≥ 2.4 mM. Early blood transfusion

should be considered in any unstable patient. During resuscitation the elderly are sensitive to hypothermia, so core temperature should be obtained, and warmed fluids and other adjuncts should be employed.

Imaging

Chest x-ray is useful in the unstable geriatric patient to rule out life-threatening pathology; however, it fails to identify up to 50 percent of rib fractures, and is less sensitive for aortic dissection than in younger patients. When feasible, CT is the modality of choice. The pelvic x-ray is useful in the unstable patient, and should be obtained between the primary and secondary survey.

Noncontrast CT scans can detect pulmonary contusion, rib fractures, and significant pericardial effusion, and are 82-percent sensitive for detecting bowel and mesenteric injuries requiring surgical repair. The addition of contrast allows for full delineation of the aorta, better identification of bowel injury, and grading of solid organ injury. This comes at the cost of an increased incidence of contrast induced nephropathy (CIN) in the elderly. Risk factors for renal toxicity include age greater than 75, diabetes mellitus, dehydration, congestive heart failure, and chronic renal insufficiency. Techniques available to reduce the incidence of CIN include volume expansion, bicarbonate, N-acetylcysteine, nonionic contrast media, minimizing contrast dose, avoiding short intervals between tests, and avoiding other nephrotoxic agents.

The elderly suffer frequent spine fractures, even without an obvious mechanism of injury. Signs of injury that should prompt full imaging include pain, tenderness, palpable deformity, and neurologic deficit. The physical exam is notoriously inaccurate in these cases. Spiral CT offers a reported sensitivity of 97 to 100 percent.

Cranial CT should also be employed liberally. A normal Glasgow Coma Score and physical exam cannot reliably exclude significant pathology even with minor head trauma. Many clinical rules have been developed to predict the need for CT evaluation, but none of these have proved reliable in the geriatric population. As many as 82 percent of elderly head-injured patients return to independent living; thus, early diagnosis and treatment are imperative.

Management

Mortality is increased across all phases of the death curve in the elderly: prehospital, early, and late. Early mortality can be reduced by aggressive resuscitation, liberal radiographic evaluation, early monitoring, and surgery. Late mortality is

reduced by meticulous attention to changes in patient status. Complication rates of 33 percent are reported in the elderly, compared with 19 percent in younger patients. Cardiovascular events (23 percent) and pneumonia (22 percent) are the most common and significant complications.

Head Injury

Traumatic brain injury (TBI) and intracranial hemorrhage (ICH) are common, accounting for more than 80,000 ED visits annually. Increasing age is associated with higher mortality and disability than in younger patients. Cerebral atrophy contributes to the increased frequency of subdural hematoma, and the added space may mask bleeding. Assessment is complicated by cognitive decline. Frequent comorbidities can increase hypotension, hypoxia, and coagulopathy, all of which aggravate brain injury. The use of medications such as aspirin, Plavix, and Coumadin is widespread in this age group. More than 9 percent of elderly trauma patients with TBI are on Coumadin. In anticoagulated patients with blunt head trauma and minimal or no symptoms, the rate of significant ICH is 7 to 14 percent. Any ICH, clinical demise, or supratherapeutic INR should prompt pharmacologic reversal. Temporary reversal in the setting of ICH does not increase thrombosis or ischemic events. Aggressive reversal with FFP has been shown to reduce progression of injury and mortality; however, 2 to 4 L of fluid may be required. The effects of Plavix and aspirin may be reduced with platelets, desmopressin, or rFVIIa. Elderly patients with TBI on anticoagulation must be admitted, as clinical deterioration is frequent and subsequent mortality high.

Spine Trauma

Of seven predictive variables for C-spine fracture, only tenderness is statistically significant. Unfortunately, tenderness is present in fewer than half of patients with significant fracture. Type 2 odontoid fractures are the most common in elderly patients. Fine-cut CT is the best diagnostic modality to identify these fractures. Without treatment there is a high incidence of nonunion, chronic pain, and spinal cord injury.

Solid Organ Injury

Nonoperative management has become routine for splenic trauma, and in properly selected patients has a success rate of 62 to 85 percent. However, age greater than 55 years is a risk factor for failure, and clinical outcomes may be worse. Most failures occur in the first 48 to 72 hours. Unstable hematocrit, increasing pain, persistent unexplained tachycardia, and hemodynamic decompensation or instability may indicate the need for operation. Angiographic embolization is a reasonable option when a contrast blush or extravasation is seen on imaging, but other sources of decompensation must

be ruled out before transport to angiography.

Pelvic fractures are frequent in the elderly, and are more commonly caused by ground-level falls than by motor vehicle collisions. Polytrauma and thoracic trauma are common. The overall mortality is 9 to 30 percent, and approaches 81 percent in open pelvic fractures. Lateral compression fractures are five times more common than anteroposterior. The former are associated with higher rates of hemorrhage, transfusion, embolization, and ICU admission. Patients should be typed and crossed for 4 to 6 units of packed red blood cells upon diagnosis. Unfortunately, external fixation is not useful for a lateral compression fracture. Retroperitoneal hemorrhage is common, and responds better to angiographic treatment than to surgical intervention. Indications for angiography include pelvic fracture, any hemodynamic compromise, pelvic hematoma on CT, and transfusion of over 4 units of blood. Despite admission, hemodynamic status mortality is decreased with the employment of angiographic embolization.

Thoracic Trauma

Rib fractures are common in this population, and are a significant source of morbidity. Falls from a standing position represent 50 percent of rib fractures; low- and medium-speed motor vehicle collisions can also cause thoracic trauma, due to seat belts. Concomitant sternal fracture is more likely. Each rib fracture increases mortality by 19 percent and risk of pneumonia by 27 percent. Aggressive pain control is needed; epidural analgesia is effective, and reduces sedative-related complications. NSAIDs are also useful, but caution is required in their use in the elderly.

Summary

The elderly population is ever increasing, and a more-active lifestyle is prompting more emergency visits for trauma. Injury is more frequent in these patients, and their ability to compensate is limited. The elderly patient may not show the typical signs of impending demise; consequently, a careful and thorough work-up is warranted. Early, aggressive treatment leads to better outcomes, and age should not limit therapy.

Gary Marshall, MD, is an assistant professor, departments of Surgery and Critical Care Medicine, University of Pittsburgh School of Medicine.

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Protective Equipment in the C-spine-injured Athlete

by Joseph M. Gatti, MS, ATC, EMT-B

The emergency treatment of athletes with suspected C-spine injuries (CSI) in the field has been greatly improved by an ongoing dialogue and collaboration between sports medicine specialists and EMS providers. However, continual efforts by manufacturers to improve their equipment have made it necessary for EMS responders to maintain a working familiarity with the new equipment and how it should be managed in assessing and treating patients.

One important limitation is that most research has focused on football. Unfortunately, the concepts learned in the equipped football player may not always hold in other sports. Therefore, EMS providers must use good clinical judgment when applying this body of knowledge.

Football Helmets

Generally, rescuers should leave protective equipment in place on a football player when CSI is suspected. To minimize movement of the C-spine and to gain access to the airway, only the facemask should be removed prior to immobilization. A “combined-tool” approach should be utilized: The rescuer employs a

screwdriver as the primary tool to remove the screws and T-nuts of the four loop straps. Should this fail, an appropriately matched cutting tool should be used as a secondary tool. Once the facemask is removed, effective airway management techniques can be utilized.

In recent years, football helmet manufacturers have developed new technologies make their products safer. Two of the more popular helmet manufacturers have recently developed new helmets intended, in addition, to make access to the airway quicker. But EMS personnel must be familiar with their designs and the processes by which their facemasks should be removed.

Riddell has introduced its trademarked Quick Release Face Guard System (QR; see Figure 1). With the QR system, the side loop straps are replaced by a push-button release system. Rather than removing a screw and T-nut, the rescuer simply depresses a pin to remove the entire clip. Riddell states that, in new helmets, the clips can be removed without resorting to tools or cutting 100 percent of the time. Other research suggests 98 percent success rates after a season of use.



Another new facemask system, the Schutt Ion 4D, has no side loop straps (Figure 2). In the Ion 4D's Energy Wedge System, the facemask has two "prongs" on each side that slide into the shell of the helmet. A single top-loop strap has replaced the traditional surfaced-mounted loop straps. This strap needs to be cut, as opposed to unscrewed, prior to facemask removal.

Although, normally, only the facemask should be removed, some circumstances warrant further equipment removal. These may include, but are not limited to, improper helmet fit (when immobilizing the helmet does not immobilize the head), equipment preventing proper neutral alignment of the C-spine, equipment preventing airway access, and any facemask that cannot be removed in a reasonable amount of time. In general, it is an "all or none" approach: both the helmet and shoulder pads need to be removed to maintain proper cervical spine alignment.

Other Sports

Extreme variation in design exists in lacrosse and ice hockey helmets. For instance, in lacrosse helmets, the chinguard is usually attached to the facemask. Therefore, the chinguard and facemask have to be removed to gain access to the airway. The visor may need to be removed as well (Figure 3). The resulting procedure may require the removal of anywhere from three to five or more screws.

With ice hockey helmets, airway access depends on accessories, helmet type, and position. A player may or may not wear a "cage" that is attached by loop straps or a shield that is attached in a similar manner (Figure 4). A goalie helmet is very similar to a lacrosse helmet, in that a solid lower chinguard must be removed to gain full access to the airway (Figure 5).

When considering other sports in which the participant wears a helmet and shoulder pads, considerable variation in equipment poses a clinical challenge; in addition, a lack of research exists regarding cervical spine alignment and head immobilization. As a general rule, the goal should be to immobilize the head while maintaining a neutral C-spine position.

Summary: Maintaining Cervical Alignment Is Key

Research has shown that, in most circumstances, the equipment can be left in place to achieve neutral cervical spine alignment in the CSI football player. Airway management techniques can be employed by removing only the facemask, and the athlete can be properly secured to a rigid backboard while wearing the equipment. Unfortunately, this research cannot always be extrapolated to other sports.

Football research nevertheless provides a foundation when caring for other CSI athletes who are wearing protective equipment. Medical personnel should use their best clinical judgment and follow their local protocols for in-line stabilization. Due to the lack of research and anecdotal evidence of ill-fitting equipment in sports other than football, rescuers should use caution and their best judgment in these cases. It becomes necessary to remove equipment if the equipment does not maintain neutral C-spine alignment, the head cannot be properly immobilized to the rigid backboard, or the facemask, faceshield, and/or chinguard cannot be removed in a timely fashion to gain access to the airway.

Joseph M. Gatti, MS, ATC, NASM-PES, EMT-B, is a certified athletic trainer, UPMC Sports Medicine and Duquesne University Football.

For additional information:

Swartz EE et al. (2009) "National Athletic Trainers' Association Position Statement: Acute Management of the Cervical Spine-Injured Athlete," *Journal of Athletic Training* 44(3):306-331.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

Donald M. Yealy, MD, Named Chair of Department of Emergency Medicine



Donald M. Yealy, MD
Chair of Department of
Emergency Medicine

Donald M. Yealy, MD, has been appointed chair of the University of Pittsburgh School of Medicine's Department of Emergency Medicine.

Vice chair of the department since 1995, Dr. Yealy is a principal investigator on two current federally funded research trials totaling \$9.6 million. His broad research interests cover traditional emergency medicine concerns; prehospital care challenges, including optimal airway management; and predictive risk modeling. His recent work includes studying differences in the severity of illness between black and white patients hospitalized with congestive heart failure and researching the optimal care of inflammatory cytokine response in pneumonia, sepsis, and pulmonary embolism.

Dr. Yealy succeeds Paul M. Paris, MD, who will return to his academic and clinical pursuits at the School of Medicine.

After receiving a BS in Biology from Villanova University, Dr. Yealy earned his medical degree from the Medical College of Pennsylvania. After completing a residency in emergency medicine and a clinical research fellowship at the University

of Pittsburgh, he became a senior staff physician at the Scott and White Memorial Hospital in Texas and director of research of its Department of Emergency Medicine. He returned to Pittsburgh in 1993 as associate chief of what was then the Division of Emergency Medicine, as well as chief of the then-Presbyterian University Hospital Emergency Services. He has been a professor of emergency medicine since 1999.

Dr. Yealy is a fellow of the American College of Emergency Physicians and a member of the Society for Academic Emergency Medicine. He has been widely recognized for his academic achievements, including an award for Outstanding Contributions to Research from the American College of Emergency Physicians (2009), the Hal Jayne Academic Excellence Award from the Society for Academic Emergency Medicine (2006), and an award for Outstanding Contributions to Education from the American College of Emergency Physicians (2001). He also has won three awards for faculty excellence in teaching from the University of Pittsburgh's affiliated Residency Program in Emergency Medicine.

UPMC Northwest Designated Level III Trauma Center

On Nov. 1, 2009, UPMC Northwest officially became a Level III Trauma Center, accredited by The Pennsylvania Trauma Systems Foundation.

The designation gives UPMC Northwest, a 189-bed community hospital in northwest Pennsylvania's Venango County, enhanced resources for providing trauma patients with the level of care needed and for rapidly determining whether patients can be treated locally or require care at a Level I facility, according to Daniel Palermo, MD, medical director of the center.

"We have transfer protocols in place with UPMC Presbyterian, Children's Hospital of Pittsburgh of UPMC, and UPMC Mercy," Dr. Palermo says. "As part of the statewide trauma network, we're able to provide rapid triage and care for our patients."

While rapid transport to definitive care at centers such as UPMC's three Level I Trauma Centers is obviously important for patients who require it, the new designation offers more to the area's residents, he adds.

"Just as importantly, we're able to identify patients whose care can be safely managed close to home," Dr. Palermo says, "which is important to a rural community."



Level III Trauma Centers have the ability to stabilize life-threatening injuries, and rapidly distinguish between those whose care can be safely managed locally and those in need of more comprehensive care at either a Level I or Level II Trauma Center. This accreditation represents three years of hard work and dedication by not only the Emergency Department, but the entire hospital staff and trauma specialists at UPMC's tertiary care hospitals as well, Dr. Palermo says.

UPMC Northwest's Trauma Program is undertaking an outreach and education program with local EMS providers, both to help the latter understand how best to utilize the new trauma center and to help program staff better understand how to support EMS. For more information, contact Heidi Boitnott, RN, trauma coordinator for the program and STAT MedEvac flight nurse, at 814-676-7867 or boitnotth12@upmc.edu.

Calendar of Events

Continuing Education Classes

Name	Date	Time	Location
Human Anatomy Lab <i>Presented by Raquel Forsythe, MD</i>	Feb. 17	6 to 9 p.m.	Butler County Community College 107 College Drive Butler, PA 16002
Third Thursday EMS Lecture	Feb. 18	6 to 9 p.m.	UPMC Mercy Sr. Ferdinand Clark Auditorium 1400 Locust St. Pittsburgh, PA 15219
Advanced Medical Life Support <i>Presented by the UPMC Prehospital Care Staff</i>	Feb. 20-21	8 a.m. to 6 p.m.	Medevac Ambulance of Pittsburgh 332 Wampum Ave. Ellwood City, PA 16117
ALS for BLS Part I <i>Presented by Deborah J. McCoy-Freeman</i>	March 4	6:30 to 10:30 p.m.	Parkview EMS 200 Margery Drive Pittsburgh, PA 15238
Third Thursday EMS Lecture	March 18	6 to 9 p.m.	UPMC Mercy Sr. Ferdinand Clark Auditorium 1400 Locust St. Pittsburgh, PA 15219
Well-Being of the EMS Provider	March 18	6 to 9 p.m.	Medevac Ambulance of Pittsburgh 332 Wampum Ave. Ellwood City, PA 16117

Preregistration is required for all classes listed above. You can preregister or cancel a registration by calling 412-647-9077, ext. 1, or by completing the prehospital online registration form at <http://prehospitalcare.upmc.com/classes.htm>.

Advanced Trauma Life Support 2010

April 22-23	July 22-23
April 23 (Re-verification)	July 23 (Re-verification)
Oct. 14-15	Nov. 18-19
Oct. 15 (Re-verification)	Nov. 19 (Re-verification)

For more information about ATLS courses, e-mail upmcats@upmc.edu, call 412-647-3520, or fax 412-647-1045.

For a list of nationally available ATLS courses, see <http://web2.facs.org/atls/ATLSSearch.cfm?Search=USA>.

Consider the opportunity to earn continuing education credits by reading *Trauma Rounds* and completing the corresponding continuing education test. After reading, log on to <http://prehospitalcare.upmc.com/traumarounds.htm>. On the *Trauma Rounds* website, you can print the test and mail the completed version back to UPMC, or you can take the test online through the Pennsylvania Department of Health's online testing program.



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