

# LIFE STAR LINES

A Hartford Hospital publication addressing articles of interest to emergency and critical care personnel

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 HARTFORD HOSPITAL

## CASE STUDY: TRAUMATIC BRAIN INJURY

By Wendy Lord, RN, CCRN, EMT-P

No one could foresee the unusual turn January 11th, 2003, would take for me and a family in crisis for a second time.

Looking forward to an afternoon of outdoor winter fun with her church group, eleven year old Kelly Doyle and her best friend raced to be the first pair to tube down the icy hill. Unable to control their speed on the slippery slope, the girls perilously slid head-on into a tree.



☒ Kate Doyle, Nurse Wendy Lord, Kelly Doyle

As both girls lay unconscious in the snow, bystanders immediately called 911 to activate the Colchester Hayward Volunteer Fire Department. Colchester EMS Captain Kevin McManus quickly assessed the critically injured girls then requested two helicopters to transport the friends to a pediatric trauma center.

Within 15 minutes, LIFE STAR and UMASS Life Flight landed on scene. My partner Diana Dlugolenski and I were directed to Kelly's side as the UMASS team made their way over to

help the other patient. I noticed Kelly's parents, Fred and Sandy, standing near the back of the ambulance looking on in disbelief. And strangely enough, I recognized them. Three years prior as a nurse in the pediatric ICU at Connecticut Children's Medical Center, I remembered caring for Kelly's older sister Kate, a young red-haired girl battling acute lymphocytic leukemia. Moreover, I remembered her family—the Doyles. Much to my surprise, Fred also recognized me.

On scene, Kelly had a Glasgow Coma Score of 5, decorticate posturing, and unequal pupils. She had agonal respirations supported by bag-valve-mask ventilation. Her pupils were unequal and her right eye was swollen and ecchymotic. Neurologically depressed and unable to protect her airway, Kelly required intubation. Rapid sequence induction medications were given by the LIFE STAR team and an orotracheal tube was placed. Additional paralytics and sedatives were administered as Kelly was prepared for transport. Her mom accompanied us in flight. After a full trauma evaluation at Hartford Hospital, Kelly was diagnosed with a large diffuse subarachnoid hemorrhage, a right pneumothorax, a right temporal fracture, and a right orbit fracture.

Over the next few weeks, I frequently checked on Kelly's progress. Despite a devastating neurological

event, she improved steadily. After a long hospitalization and rehabilitation, Kelly was discharged home and has almost fully recovered from her injuries. Sadly, Kelly's friend succumbed to her injuries.

I believe each patient you care for impacts you in some way. This patient, indeed this family, will stay with me for as long as I am a nurse.

### Discussion:

Traumatic brain injury is a prevalent, devastating problem in the United States. Annually, this injury claims more than 56,000 lives and leaves another 99,000 people with permanent sequelae. Generating more than 370,000 hospitalizations each year, the impact of traumatic brain injury on society and our health care system cannot be ignored. Subarachnoid hemorrhage, such as Kelly sustained, is present in 23-39% of severe head injury patients and is the most common traumatic brain injury found on autopsy.

Subarachnoid hemorrhage (SAH) is described as a collection of blood within the meningeal layers of the brain. It occurs when cerebral vessels are disrupted (either from trauma or aneurysm rupture) causing blood to fill the subarachnoid space, a space generally filled with cerebrospinal fluid. A CT scan of the head is typically used to diagnose SAH.

Little can be done to repair the brain once a traumatic injury has occurred. Therefore, acute care of

Continued from page 1

patients with severe head injury is aimed at preventing further brain insult. Preventing hypoxia and maintaining an adequate airway are key. Any patient who demonstrates an inability to protect their airway or has a Glasgow Coma Score less than 8 should be intubated. To blunt the sympathetic response that occurs with this procedure, the LIFE STAR team can administer Lidocaine 1.5mg/kg IV and/or a defasciculating dose of a non-depolarizing neuromuscular blocking agent, along with typical rapid sequence induction doses of Etomidate and Anectine.

Optimizing cerebral perfusion pressure (CPP) and controlling intracranial pressure (ICP) are effective strategies in preventing secondary brain injury. The skull and its contents function in a finite space. The brain occupies approximately 80% of that space, with the cerebrospinal fluid and blood evenly distributed in the remaining space. The balance of these three components creates a baseline intracranial pressure (ICP) of about 10mmHg. Limited, protective compensatory mechanisms exist to accommodate small changes in the balance of the three components, meaning, as one component expands one or both of the remaining components decrease. However, when this balance is dramatically disrupted, such as in the case of subarachnoid hemorrhage, intracranial pressure (ICP) rises and cerebral perfusion can be compromised. Cerebral perfusion pressure (CPP) is the difference between the mean arterial pressure (MAP) and the intracranial pressure (ICP).  $CPP = MAP - ICP$ . A cerebral perfusion pressure (CPP) of 50-60mmHg must be maintained to ensure adequate blood flow to the brain. Should the CPP fall below

40mmHg, cerebral ischemia develops and Cushing's triad (increase RR, widening pulse pressure, decrease HR) may be seen.

Cerebral perfusion pressure (CPP) can be maintained by manipulating mean arterial pressure (MAP) and ICP. Assuring an adequate to slightly elevated BP can help preserve CPP when an increased intracranial pressure exists. Numerous strategies exist to reduce ICP. Mannitol, sedation, ventriculostomy placement to drain excess fluid in the subarachnoid space, elevating the head of the bed 30 to 45 degrees and keeping the head in a neutral midline position can all help reduce ICP. Since increased blood carbon dioxide levels cause cerebral vessels to dilate, maintaining normal to slightly lower PCO<sub>2</sub> levels can reduce ICP by reducing excess brain blood flow, resulting in improved CPP. Seizure prevention, assuring euglycemia and normothermia, close hemodynamic monitoring and frequent neurological checks are also important.

Overall prognosis for those who have suffered a traumatic subarachnoid hemorrhage is poor. Clinical research has found that 46-78% of these patients have severe disabilities, live in a vegetative state, or succumb to their injury. The most effective treatment of a severe head injury is prevention such as the use of seat belts, helmets and other protective gear when indicated. Early recognition of a head injury and rapid transport to neurosurgical specialty care may help maximize patient outcomes. With this in mind, the keen assessment and quick actions of the Colchester Hayward Volunteer Fire Department undoubtedly played a key role in Kelly's positive outcome.

## NEW CREW: Review



Michael Vaclavik, Pilot: Mike joined the LIFE STAR team in March, 2003. He has been flying helicopters for the last 21 years including 17 years of flight duty with the United States Army and several years experience transporting crew and equipment to off-shore drilling platforms in the Gulf of Mexico.



Jerry Mosimann, Pilot: Jerry has been a pilot for 19 years. He has just recently returned home to Connecticut after spending 13 years in Alaska as a senior line pilot and company flight instructor with TEMSCO. He joined the LIFE STAR team in March 2003.



Flight Nurse James Marcelynas, RN, CCRN, EMT-P: Jim has been with the LIFE STAR team since November 2002. Prior to joining LIFE STAR, he was a flight nurse with Care Force based in Columbia, South Carolina. Jim has solid cardiothoracic and pediatric ICU experience. He is a graduate of Western Connecticut State University and has been actively involved in EMS since 1993.



Flight Nurse Samantha VanVoorhis, RN, EMT-P: Joining LIFE STAR in April 2003, Samantha brings 10 years of experience to the team. She graduated from Quinnipiac College in 1993 with an Associate's Degree in Nursing. Samantha has extensive ICU and Emergency Department experience, and served as a volunteer EMT with the Stafford Ambulance Corps. for many years.



Flight Nurse Steven Neher, RN, EMT-P: Steve moved from sunny Arizona in May 2003 to join our team. He has been a nurse for seven years, including three years of experience as a flight nurse with Guardian Air in Flagstaff, Arizona. He worked as a paramedic for a 911 service in Colorado for many years and has a strong background in both ICU and emergency nursing. He has a Bachelor of Science Degree in Nursing from the University of Southern California.



Flight Respiratory Therapist Patrick Dowd, RRT, EMT: Patrick has worked as a respiratory therapist since graduating Quinsigamond College in 1996. Prior to joining LIFE STAR in February 2003, Patrick gained experience in the NICU, pediatric and adult settings at UMASS Memorial Hospital and Massachusetts General Hospital.



Flight Respiratory Therapist William Muskett, RRT, EMT: Bill has been a member of the LIFE STAR team since December 2002. A New Jersey native, he graduated from the University of Medicine and Dentistry and has four years experience as a respiratory therapist in a variety of adult, pediatric and neonatal settings.



Nicole Wilson, Communication Specialist: Nicole brings seven years of experience as a dispatcher for the Manchester Fire Department to her new position as a LIFE STAR communications specialist. She has been an EMT for many years and joined our program in September 2002.

## NEW LANDING ZONE: Revised Dimensions



When establishing a LIFE STAR landing zone, please note that the LZ size requirement has been changed to 85ft x 75ft, slightly larger than the previous 60ft x 60ft dimensions.

☑ LIFE STAR en route,  
photo by Scott Palmer

## RACE FOR THE CURE: 10th Annual Susan G. Komen 5K

A team of 30 athletes from LIFE STAR, Hartford Hospital's emergency and critical care units, Connecticut Children's Medical Center and the Hartford School District were among the 14,766 participants in the 10th annual Susan G. Komen 'Race for the

Cure'. Held in May in New Britain, the 5K race raised more than \$800,000 for breast cancer research. Respiratory Therapist Scott Ely was the top LIFE STAR finisher with a time of 21:23. John Lohan turned in the team's best time of 18:20 and finished 21st overall.





Dear Reader,

We would like to thank you for your continued support of and interest in our program. We wish you and your families a safe, healthy and prosperous holiday season and look forward to working with you in the new year.

Sincerely,

The staff here at LIFE STAR

**NEWS BRIEFS: FYI**

Our new email address is up and running, [LIFESTAR@harthosp.org](mailto:LIFESTAR@harthosp.org). Feel free to use the site to ask general questions about the program or to provide feedback on our operation. We look forward to hearing from you!

For questions about merchandise or catalog, please contact the LIFE STAR Communications Center (860) 545-4369 or call Barker Specialty directly 1-800-BARKERS (227-5377)

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**FACTOID: LIFE STAR FACTS**

Between September 1<sup>st</sup> and November 30<sup>th</sup>, LIFE STAR transported 289 patients including 163 from emergency departments, 93 from scenes and 33 from intensive care units. Also, included in that number are 24 completed standby missions and 6 ground transports.

Total distance flown during those same three months: 20,843 miles. As a comparison, approximate circumference of the earth: 24,900 miles

Busiest day of the week: Sunday  
Busiest Time of Day: 1500-1600

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