As medical professionals administering care to children suffering from burn injuries, it is important to review the key areas in which pediatric treatment for major burns differs from that of adult burn patients. The following article provides an overview of managing the unique needs of the pediatric burn patient.

Overview

Major burns account for about ten percent of deaths caused by accidental injury in children. When evaluating the pediatric burn patient, there are four significant areas in which pediatric burn assessment and management differ from those of adult burn patients. The following article provides an overview of managing the unique needs of the pediatric burn patient.

Calculating (BSA)

Because infants and small children have proportionally smaller legs and larger heads than adults, the traditional "rule of nines" used on adults to estimate the percentage of body surface area burned is inaccurate for assessing pediatric burn patients. The Lund and Browder Chart should be used to accurately calculate BSA as it allows for the varying rates of growth in the head, thigh and lower leg of different age groups. In absence of the Chart, the size of the child's palm can be used to estimate 1% BSA.

Airway Management

Children are at greater risk of respiratory distress: in fact, the younger the child, the greater its risk of mortality due to respiratory complications. A child's airway is narrower than that of an adult but when exposed to hot air or toxic fumes, will swell to the same degree. Consequently, while an adult's airway size might decrease by 10 to 15 percent from exposure, a child's airway could be reduced by over 50% from that same period of exposure.

When managing the pediatric burn patient, it is extremely important to look for signs that suggest the possibility of an airway burn. Signs of respiratory burn include singed nasal hair, facial burns, blood-stained sputum, carbonaceous sputum, edema in the neck and facial area, respiratory distress, uneven noisy respirations, shallow breathing, tachypnea, stridor, hoarseness, changes in mental state, restlessness, cyanosis and eventually loss of consciousness. Children burned in an enclosed space must be considered to have an inhalation injury until disproved.

Also note, symptoms of hypoxia and respiratory distress can progress rapidly in children: at minimum, oxygen should be given when there is a risk of airway injury. Intubation should be performed if stridor or respiratory stress is progressive. However, general rules for

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According to the American Burn Association (ABA), each year over one million people in the U.S. incur burn injuries severe enough to require medical attention. Of these, about 45,000 are hospitalized. Of the 2,000-plus Burn Center patients treated annually from throughout the Southeast, about one-third of them are children.

As we move into the colder months—a time when the majority of major burn injuries to children occur—this issue reflects on the unique requirements/issues related to treating the burn-injured child. While many of us (especially those specializing in ER, pediatric, and family practice medicine) are well-acquainted with these needs and are often a child’s first point of medical contact, there are other fields of specialty in which pediatric patients may seek care for injuries in which burns are one of many factors in total trauma sustained.

To that end, Dr. Hassan has provided an article outlining the management of major burn injuries in children, and Dr. Santini another on recognizing signs of child abuse or neglect. In addition, we have included information on prevention and treatment programs implemented here at the Burn Center, including our Wee Care Pediatric Program and Youth Firesetter Program. Both of them embody models that may have relevance to your particular specialty or medical environment. We also offer the enclosed Burn Prevention Tips tear-out sheet as a tool to further educate your patients on preventing burn injuries to children.

Finally, we are pleased to have Sally Phillips, a Social Services Supervisor with the Columbia County, Georgia, Department of Family and Children’s Services, as our guest columnist. As medical professionals, it is incumbent upon us to understand how we can work together with agencies such as DFACS to best facilitate positive outcomes for children suffering from abuse and/or neglect.

As always, we invite your comments and are here to answer any questions you may have concerning burn treatment, research and prevention.

A. F. Mullins, M.D.
Medical Director
Joseph M. Still Burn Center

New Program Guides Parents Through Child’s Treatment

Few childhood injuries are more emotionally stressful to families—especially parents—than those sustained from serious burns. And while it’s only natural for parents to want to hold round-the-clock vigil during their child’s treatment and recovery, it’s not necessarily the best medicine according to Tanya Simpson, Assistant Vice President of Burn Services at the Joseph M. Still Burn Center at Doctors Hospital.

In answer, the Burn Center recently implemented its Wee Care Pediatric Program. Designed to address the highly sensitive emotional needs of pediatric burn patients’ parents, Wee Care provides the structure burn-injured children and their families need to ensure optimum clinical care and compassionate recovery.

“There are so many aspects of pediatric burn care that, by virtue of all the dynamics involved, make the process especially difficult for parents and families,” Simpson said. “Setting guidelines for loved ones not only promotes the highest level of care possible, but also ensures that we are able to deliver the best recovery outcome possible.”

Upon their child’s admittance to the Burn Center, parents receive a Wee Care brochure. It outlines visiting hours, encourages Story Time/Educational sessions at a designated time each day, and offers tips on concerns such as dealing with their child’s pain and physician-related questions. Parents are also issued a daily “Hug” card redeemable at the discretion of either parent or child for a special 20-minute visit each day.

“We have always had great respect for the healing power of family interaction and support—regardless of the age of the burn patient. In fact, beyond the clinical expertise we provide, we offer all patient families a variety of services designed to help them navigate the highly stressful burn treatment and recovery process,” Simpson said. “Our Wee Care Pediatric Program is just another extension of our overall philosophy of care.”

To learn more about the Wee Care Pediatric Program at the Joseph M. Still Burn Center at Doctors Hospital, contact Beth Frits at 706.364.6400.
Examination of Pediatric Burn Needs

intubation (apnea, gasping or cyanosis despite oxygen) do not apply for burned children. By the time cyanosis with oxygen has developed, there may be so much swelling that intubation is difficult. When combined with the fact that the angle of a child's glottis is more acute than that of an adult, intubation can be even more challenging, especially for those less experienced.

Thermo Regulation
The burned child is particularly vulnerable to hypothermia. For example, a 1-year-old child has twice as much surface area per pound of body weight as an adult. On a cold day, twice as much heat is lost to the environment per pound of body weight. If hypothermia does result, chances for survival are significantly reduced. Burned children are also at increased risk for hypothermia because burned areas of skin have an impaired ability to retain body heat. Even children suffering first and second degree burns, may lose their ability to vasoconstrict blood vessels in response to cold. Hence, warmed blood continues to richly perfuse the burned area, resulting in considerable transfer of heat to the environment.

Fluid Resuscitation
Resuscitation of burned children differs in two aspects. First, because there is great variability between body surface area and weight in a growing child, the standard Parkland formula commonly underestimates fluid requirements in a burned child and may not provide even usual daily maintenance requirements. More accurate estimation of a child's resuscitation requirements can be based on body surface area, determined from nomograms of height and weight.

Second, infants require glucose due to small glycogen stores and are prone to hypoglycemia in the initial resuscitation period. Serum and urine glucose levels should be monitored and replaced as indicated. Over-aggressive dextrose infusion can produce an osmotic diuresis, paradoxically increasing burn shock.

Resuscitation formulas should serve as guides only. It is more important to monitor the child's response to fluid administration as well as its physiologic tolerance. Additional fluids are commonly needed in inhalation injuries, electrical burns, associated trauma and delayed-resuscitation patients. The correct resuscitation regimen administers the minimal amount of fluid necessary for maintenance of vital organ perfusion measured as adequate urine output. Inadequate resuscitation can cause further compromise to pulmonary, renal and mesenteric vascular beds. Fluid overload can produce pulmonary or cerebral edema. Over-resuscitation will also increase wound edema and thereby, dermal ischemia, producing increased depth and extent of cutaneous damage.

Circumferential Burns
Full thickness circumferential burns can cause a tourniquet effect. Loss of elasticity of full thickness burn/skin, localized edema, and reduced circulatory blood volumes result in circulation compromises of the distal part. When this occurs, an escharotomy should be performed as a preventative measure to reduce the likelihood of further damage to the tissues that lie distally to the circumferential eschar.

Conclusion
Understanding the unique needs of children suffering major burns and then managing their injuries appropriately upon initial examination can greatly impact both a child's overall rate of survival as well as his or her ability to attain the best outcome possible.

For further information on this or other burn-related topics, please contact Beth Frits at 706.364.6400 or visit our website at www.josephmstillburncenter.com.

Dr. Hassan, a plastic & reconstructive surgeon, has been with the Joseph M. Still Burn Center for six years.

Transfer Criteria for Pediatric Burn Patients

Please refer to American Burn Association (ABA) criteria.

- All Burns with a surface area greater than 10%
- All burns to face, ears, eyes, hands, feet, genitalia, perineum or a major joint—even if less than 5%.

In addition:
- Electrical burns (including lightning injury);
- Chemical burns;
- Burns associated with significant fractures or other major injury in which the burn injury poses a significant risk of morbidity or mortality;
- Inhalation burns of any nature (ICU admission);
- Burns in children under the age of 12 months (emergency transfer may not be required but assessment should be made);
- Small area burns in patients with social problems, including children at risk;
- Any other patient deemed appropriate upon consultation with the Burn Center.
By Juan Colon-Santini M.D.

While our profession's overall awareness of child abuse has greatly increased over the past two decades, deliberate burn injuries to children often remain undetected. Because the incidence of further injury and death is so high in burn-related child abuse cases, it is critical for medical professionals to recognize indicators of abuse.

Overview
Deliberate burn injuries constitute about 10% of all child abuse cases. Of this group, almost all are under the age of ten, with the majority falling under the age of two. In comparison to accidentally burned children, abused children have significantly longer hospital stays and higher mortality rates. And while pediatric burns can be caused by a variety of factors—sometimes intentional, sometimes accidental—in general, children who have been purposely burned often present with injuries caused by scalding, immersion in hot liquid, or direct contact with a hot object.

Scald Burns
The most common type, scald burns, may be caused by any hot liquid—hot tap water, boiling water, water-like liquids such as tea or coffee, and thicker liquids such as soup and grease. They can be further categorized into those caused by spill/splash incidents and those resulting from immersion.

- **Spill/Splash Injuries** - Caused when a hot liquid falls from a height onto the burn victim, splash injuries are characterized by irregular margins and non-uniform depth. The depth and degree of burn vary depending on whether the child was wearing clothing at the time of the burn. Note that a splash pattern will appear at the point where the scalding liquid first made contact with the victim and that the area below the splash will taper in an "arrow down" pattern.

- **Immersion Burns** - These may result from the child falling or being placed into a tub or other container of hot liquid. A deliberate immersion burn is uniform in depth and has sharply defined borders or "waterlines" with little tapering of depth at its edges. Only children with deliberate immersion burns sustain deep burns of the buttocks and/or the perineum. When examining, also note signs of sparing—striped configurations of burned and unburned zones caused by the child's instinct to protect the area being burned such as clenching the fist, doubling over, flexing hips or knees, etc.

Contact Burns
Usually of the branding type, contact burns often mirror the object used to cause the injury—curling iron, steam iron, cigarette lighter, heated kitchen tool or other implement. Note that accidental contact burns usually lack a pattern as the child instinctively pulls away from the source. However, even brief accidental contact can cause a second-degree burn in which the pattern of the burning object is revealed.

Lastly, be aware that it is sometimes difficult to distinguish between burns caused by abuse and those resulting from other medical conditions. For instance, certain cutaneous infections such as impetigo, severe diaper rash, and early scalded skin syndrome may resemble scald injuries. Wounds related to an allergic reaction can also cause a severe local skin irritation that may be mistaken for a burn.

Conclusion
Burn injuries in children should always be carefully evaluated and documented. Review the child's medical history and question his or her caretakers as to the cause of the injury. Finally, examine the entire skin surface for other signs of abuse including healed burns, multiple simultaneous burns, evidence of sexual abuse, or other skin traumas such as bruises, slaps, bites or whip marks.

Remember, thorough investigation of child-related burns not only protects children suffering from abuse, it also safeguards against responsible parents/caretakers being unjustly accused.

Dr. Santini, has been a pediatrician with the Joseph M. Still Burn Center for 16 years.
As a social services professional working daily to improve the quality of life and well being of children, it is a privilege to speak directly to physicians and first response medical professionals who treat burn-injured children suffering from potential abuse or neglect.

First, it is a great credit to your profession that today’s healthcare providers are highly skilled in both the assessment and documentation of suspected child abuse and neglect cases. Your dedication and cooperation have had tremendous impact in communities throughout the country. Yet sadly—even one child suffering from maltreatment is one too many. And, as with many issues that cross over into multiple fields of discipline where protocols differ, our greatest challenge as partners lies in the area of inter-communication. Even in the face of complex issues such as patient confidentiality, we must always remember that the open exchange of information is our strongest weapon in achieving our joint goal—serving healthier, happier children.

To that end, I would like to take this opportunity to offer several suggestions that would greatly facilitate social service professionals in our mission to prevent and reduce child abuse and/or neglect:

**Look Carefully**
During initial examination, document as much information as possible. This not only includes clinical descriptions of the injury itself (type, location, causative agent, etc.), but also specifics such as height, weight, (medical history if available), child’s stage of development, overall level of care/hygiene, and any other physical conditions that currently exist or indicate past injuries/illnesses.

**Listen Objectively**
Talk to everyone present at the time of injury, including the child. Document what you've heard in your examination report.

**Document Meticulously**
When photographing injuries, 35mm film is preferred as prints provide maximum clarity and can be easily enlarged for use in court evidence. Instant cameras are acceptable but do not offer the same benefits as those mentioned above.

**Connect the Dots**
Use your professional expertise to compare what you've observed physically with what you've been told during the interview process. If you detect any inconsistencies from one explanation to another, note it in your examination report. Also, after reviewing the child's medical history, should you uncover past medical problems that speak to a pattern of injury, seem uncharacteristic or unusually frequent for someone your patient's age or stage of development, please provide that information in your report also.

**Stay in Touch**
Testimony from treating physicians and medical personnel present during the time of a child's initial physical examination is one of the most effective and powerful tools social service agencies have when investigation results in prosecution. Make yourself available should you be called to share your testimony.

On behalf of all of those who serve in the field of family and children's social services, I thank you for taking time to share our view of the world. Keep up the good work! Together, we can impact children's lives for the better!
Guns or Matches? Youth Program Teaches Fire Safety

Which youthful curiosity results in more deaths to children—an attraction to guns or the allure of fire? According to national statistics, more children are killed annually as a result of inappropriate use of fire than die from handling guns. In fact, for every 100 people injured by fire, about one-fourth are children; worse, for every 100 fatalities due to fires set by a child, more than four-fifths, or about 85, are children.

In an effort to prevent devastating accidents such as these, the Joseph M. Burn Center at Doctors Hospital has teamed with the Augusta-Richmond County Fire Department and Safe Kids Coalition of East Central Georgia to offer a program specifically aimed at young people aged 16 years and under. The Youth Firesetter Program, established and coordinated by Jackie Voss, RN, a staff nurse with the Burn Center, recently completed its second year of service.

“When we first began, many of the kids participating were those referred to us by Juvenile Court systems—young people who had already demonstrated ‘at risk’ behavior for inappropriate use of fire,” Voss said. “Now, many of the children we work with have been enrolled by their parents out of concern for their child’s overly curious attraction to fire.”

The three-session, weekend course is offered free to children of all ages, although Voss said the average age of attendees is between ages 11 and 15. Children under 6-years-old undergo a more age-appropriate, one-on-one program. A parent or guardian is required to attend the course with their child.

During the first session, lawyers introduce the children to legal consequences of fire use; mental health professionals speak to them about anger management. In session two, they learn about the dangerous properties of fire as well as how to handle and respond to fire-related situations. In their final class, the class tours the Burn Center, participates in a Fire Safety House drill in which they’re asked to practice newly-acquired fire safety skills, and lastly, required to sign a “No Fire Use For One Year” contract. In the case of children who have actually been involved with unsafe fire use that resulted in damage or harm to persons or property, participants are also asked to apologize to the person(s) affected.

According to Voss, it has been a highly effective approach. Of the nearly 100 children who have undergone the course in the past two years, Voss reports only one instance of recidivism. In fact, even seemingly ‘unreachable’ children are ultimately moved by the experience.

“We worked with one 8-year-old boy who had set his Grandfather’s car on fire,” Voss said. “Throughout the program he maintained his distance. Even while touring the Burn Center, he seemed unmoved. After apologizing to his Grandfather, the man turned to his grandson and said, ‘I don't care about the car; it can be replaced. I just pray I'll never have to visit you as a Burn Center patient.’ The child broke down; he finally got it.”

Now serving on a statewide committee to set standards for implementing similar programs throughout Georgia, Voss hopes to launch a toll-free number in the next year that will help parents find similar programs in their area.

To learn more about the Youth Firesetter Program at the Joseph M. Still Burn Center at Doctors Hospital, please contact Beth Frits at 706.364.6400 or Jackie Voss at 706.855.6777.
In an effort to encourage fire safety and prevent accidental burn injuries in children, the Joseph M. Still Burn Center provides the following tips to the public. We invite you to share these guidelines with your patients.

**Burn Prevention Tips For Children**

- Never ever hide under the bed or in your closet if your house is on fire, because your parents and the firemen won't be able to find you.

- Remember to always check your bath water with your fingertips.

- Never play with matches or cigarette lighters. They're dangerous and can burn you, your clothes and your whole house.

- Stay away from the stove and microwave. Leave the cooking to your mom and dad!

**Burn/Scald Prevention Tips for Parents**

- While cooking hot foods on the stove, turn handles toward the back of the stove so children cannot pull the pot down on themselves.

- Do not allow cords from appliances, such as coffee pots, to dangle from counter tops. Do not hold infants while handling hot liquids. They may grab for the hot liquid and get burned.

- Avoid placing hot liquids on place mats, or using tablecloths with young children. They use these items to pull on and grab items, which can cause hot liquids to be pulled down on the child causing a burn.

- Set hot liquids away from the edge of tables and counters. Children can easily grab the cups or containers and get burned.

- Establish a safe area in front of the stove. Teach children why the stove/oven is unsafe and identify the kitchen as a place they cannot play, walk or run.

- Be careful when handling items cooked in the microwave oven. They are hotter than you think. Test food for proper temperature before giving it to a child.

- Know how HOT your tap water is. Thousands of adults and children are burned every year because their home’s tap water is too hot. Set your water tank temperature at a safe temperature—in general, it should be set at about 120 degrees Fahrenheit/ 48.9 degrees Centigrade. At 160 degrees Fahrenheit it takes one second to get a serious burn.

- Place cold water in the bathtub first. Then add the hot water to the appropriate temperature. Always check the temperature of the water before placing children in the bathtub. Teach children to check the water temperature before getting into the bathtub.

- Do not leave children unattended in the kitchen or bathroom. Children often get burned when parents leave the room for “just one minute.”

For more information about burn prevention, contact Beth Frits at 706.364.6400 or visit us at [www.josephmstillburncenter.com](http://www.josephmstillburncenter.com).
Winter Burn Symposium
February 1-2, 2007
Augusta, Georgia

The Joseph M. Still Burn Center at Doctors Hospital invites all air transport personnel to attend a symposium designed to update and improve skills* for managing burn patients during accident site and inter-facility air transfer. Conducted by the Burn Center team, conference topics include:

- Airway Management
- Shock/Fluids
- Burn Wound Management
- Transport Issues
- New Frontiers in Burn Therapy: Latest Research

The event will also feature an Opening Reception, a Burn Center Tour and a Closing Panel Discussion on the "Evolution of Burn Therapy". Registration is $75 before January 5, 2007, or $100 after; fee includes CEU credits, education materials, breakfast, lunch, refreshments, reception and tour transportation.

For more detailed information, a list of area accommodations, or to register for the event, visit www.josephmstillburncenter.com or contact Beth Frits at 706.364.6400.

*This program is approved by the American Association of Critical Care Nurses (AACN) for 8.0 Contact Hours, CERP Category A, File number 00013311; and for EMS personnel by the Georgia Department of Human Resources, Division of Public Health for 4.25 credit hours, approval number SPEMS-2006-15-CE.