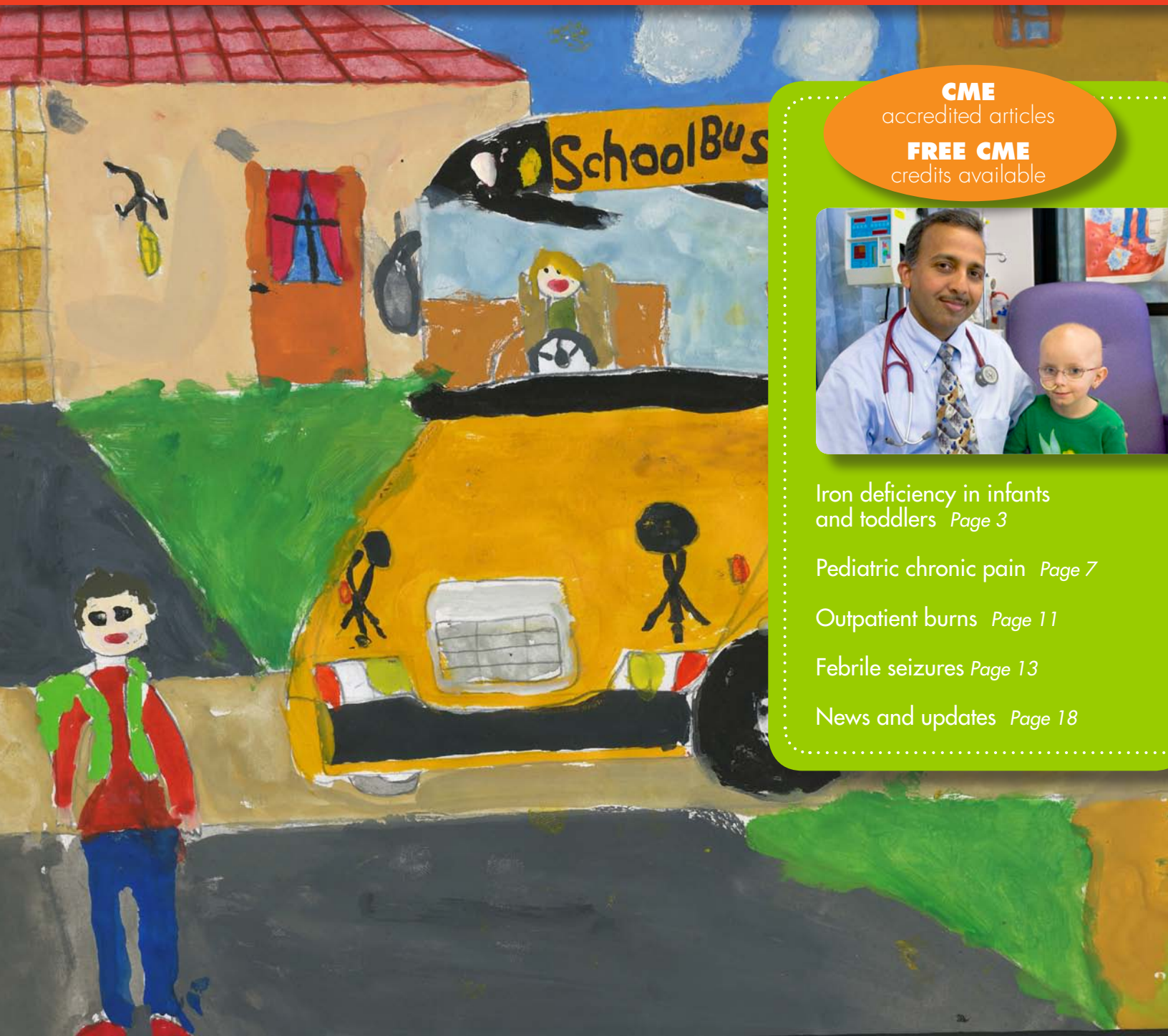


Pediatric Forum



A journal of The Children's Medical Center of Dayton

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Pediatric Forum

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This education activity is designed for pediatricians, family physicians and related child health care providers.

Educational objectives

- ▶ Articles will review commonly encountered clinical conditions and provide updates in pediatric medical and surgical care.
- ▶ Each individual article will have activity-specific learning objectives.

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DIAGNOSIS AND PREVENTION OF IRON DEFICIENCY IN INFANTS AND TODDLERS

3

Objectives

Following the completion of this article, the reader should be able to:

1. Review the role of iron in growth and development of infants and young children.
2. Institute measures to prevent iron deficiency in infants and toddlers
3. Discuss screening methods for iron deficiency in children.

Iron deficiency remains the most important single nutrient deficiency in the world today.¹ Recent research has highlighted the effects of iron on neuro-development and behavior in infants and toddlers, and therefore iron is now considered critical to the health and nutritional well-being of these children.^{2,3}

Iron is an important component of hemoglobin and myoglobin, largely as a result of its flexible redox chemistry. It is also essential for proper functioning of a variety of enzyme systems. Table 1 below shows a few examples of essential systems that are iron-dependent.⁴

Table 1

Iron containing proteins

Hemoglobin
Myoglobin
Cytochrome a, b, c
Catalase
Myeloperoxidase
Tyrosine hydroxylase
Ribonucleotide reductase
Aldehyde Oxidase and others



Mukund Dole, MD

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PHYSIOLOGY OF IRON

The body tries to maintain homeostasis in terms of iron balance. An average adult has about four to five grams of elemental iron in their body. Approximately 0.5-1.0 mg is lost on a daily basis and menstruating females lose an additional 1 mg daily. These losses need to be replaced, and more elemental iron is also needed during childhood and adolescence growth periods.

Dietary iron is mostly absorbed in the proximal duodenum. Generally, iron in heme form is better absorbed as compared to inorganic forms of iron. Various other factors such as pH, vitamin C and the presence of other foods influence iron absorption. The absorption of iron and its assimilation are regulated by complex local mechanisms which are not fully understood. Approximately 10 percent of dietary iron is absorbed in normal individuals, although in deficiency states and severe anemia, higher amounts may be absorbed. Hepcidin is a recently

described peptide hormone that regulates the egress of iron from intestinal cells into the body. Once iron enters the circulation a majority is incorporated into hemoglobin, and smaller amounts become part of other enzyme systems.

DEFINITION OF VARIOUS ENTITIES IN IRON DEFICIENCY

Anemia: Essentially characterized by reduced oxygen carrying capacity of blood and is defined as Hb less than 2 SD below mean Hb concentration for children of same age and sex. (Hb < 11 gm percent for both sexes between 12-36 months)

Iron Deficiency (ID): State in which there is insufficient iron to maintain physiologic function.

IDA: Anemia as a result of ID which is usually hypochromic and microcytic.

Iron overload: State that is characterized by excessive accumulation of iron in tissues.

CONSEQUENCES OF IRON DEFICIENCY⁵

Neuro-cognitive effects are of particular concern in infants and toddlers. ID, in these age groups, has been the subject of many studies. Studies have shown long-lasting cognitive defects, lower developmental scores and a higher incidence of learning disabilities in children, and some of these effects do not appear to be reversible.

Pica: An uncontrolled perversion of appetite with a tendency to eat dirt, paper, clay and ice has been described, and also increases the risk of lead poisoning.

Epithelial changes: Mucous membranes usually effected.

Iron deficient anemia (IDA): Develops as a relatively late event and is usually hypochromic, microcytic in nature.

IRON REQUIREMENTS

Normal iron requirements are expressed in the form of recommended dietary allowance (RDA) which is the average daily intake sufficient to meet requirements of all individuals of a given age or gender. In instances where there is not enough information to establish an RDA, the term adequate intake is used which denotes the average intake of the nutrient by a given group (such as infants between 0-6 months of age).

Most newborns accumulate 80 percent of their iron stored in the last trimester of pregnancy. A number of maternal conditions such as pre-eclampsia and diabetes can affect iron accumulation during this phase. Full-term infants need very little iron during the first six months of life but iron needs increase quickly thereafter.

A. **Infants up to 12 months:** *Preterm infants (< 36 weeks GA)* need about 2-4mg/kg/day of iron because of their poor storage, relatively greater growth velocity and iatrogenic losses which are often associated with hospitalization in intensive care units.

Term infants 0- 6 months: On the basis of iron content in breast milk and milk consumption, it has been estimated that an adequate intake of iron is about 0.27 mg/day for babies in this age group.⁶

Infants 7-12 months of age: Once again, on the basis of a factorial approach based on iron needs and losses, the RDA for this group is approximately 11 mg/day of iron.⁶

B. **Toddlers: (1-3 years):** Based on similar calculations, the RDA of iron is approximately 7 mg /day for children in this age group.⁶

PREVALENCE OF ID AND IDA

ID/IDA are commonly encountered problems, even in the West. The prevalence of ID/IDA in Norwegian infants was approximately 4 percent at six months of age and 12 percent at 12 months of age.⁷ The data from National Health and Nutrition examination survey done in the US (1999-2002) shows that the prevalence of ID and IDA in toddlers (age 1-3 years) has gradually declined, possibly from the use of iron supplemented formulas, fortified infant foods and reduced use of cow's milk. According to this survey, approximately 6.6-15.2

percent of toddlers have ID and about 0.9-4.4 percent of toddlers had associated IDA.⁸ Other studies have shown that increased lead concentrations are associated with ID. Primary prevention of ID could thus hopefully lead to reduction in the cases of lead poisoning. Additionally, iron supplementation seems to improve the benefits of chelator therapy in cases of lead poisoning.

DIAGNOSIS OF ID/IDA

Disorders of iron metabolism are a spectrum with iron overload at one end and IDA at the other. ID/IDA is basically due to an imbalance between the physiologic needs at any stage in life and availability of iron leading to characteristic changes in laboratory parameters. These changes occur gradually and as the Hb concentration falls, the child also has IDA. Unfortunately, there is no single laboratory measurement to characterize iron status in order to make a definite diagnosis of ID or IDA.

Parameters in Iron Deficiency

<i>Parameter</i>	ID	IDA	Iron Overload
Sf	low	low	high
Transferrin Saturation	low	low	high
TfR1	low	high	low
CHr	low	low	normal
Hb	normal	low	normal

Tests that are recommended for diagnosis include⁴:

- ▶ Complete blood count with relevant indices to document anemia, if present.

- ▶ Serum ferritin (SF): An acute phase reactant which also reflects iron storage. A value of <10 mcg/L in children indicates iron deficiency. SF should be ideally combined with CRP estimation to rule out associated inflammation, infection or malignancy which can confound ferritin levels
- ▶ CHr: (reticulocyte Hb): A new test that is becoming more readily available. It reflects iron that is readily available to newly formed red cells and can be measured by flow cytometry. The test has been validated in children and low CHr levels are a strong predictor of IDA.
- ▶ Transferrin receptor 1 (TfR1) levels reflects ID at the cellular level. TfR1 is a protein on the red cell membrane which facilitates transfer of iron into the red cell. ID leads to upregulation in expression of TfR1 levels which spill into blood causing elevated TfR1 levels. The test is still relatively expensive and not widely available.

For most practicing physicians, the best approach to diagnose ID/IDA would be to obtain:

- ▶ CBC to make a diagnosis of IDA if (Hb < 11 gm percent)
- ▶ Serum ferritin (SF) estimation with CRP
- ▶ CHr measurement, if available

If IDA is suspected and the results are equivocal, a therapeutic trial with oral iron at 3-4 mg/kg/Fe for a month can be tried followed by a repeat CBC in one month. An improvement in Hb levels by 1 gm percent or higher is diagnostic of underlying iron deficiency.

PREVENTION OF ID AND IDA

Given the critical role of iron in growth and development, it is important to institute prophylactic supplementation early on to prevent the development of ID and IDA. The current recommendations for primary care providers are summarized below.

Preterm infants (<37 wks GA):

Babies on breast milk should be supplemented with iron at 2 mg/kg/day starting at age 1 month through 12 months (either with formula or Fe supplements). Infants on preterm infant formula (14.6 mg/L of iron) may receive adequate iron supplementation but a small number may still develop ID at 4 to 8 months and will need additional supplements. Preterm infants who have received multiple blood transfusions may not need additional iron.

Term, breast fed:

These babies have adequate iron stored until the age of 4 to 6 months as discussed. The small amount of highly bioavailable iron in breast milk is generally considered sufficient until 4 months of age. Therefore, for exclusively breastfed infants, it is recommended that iron supplements be initiated at 1 mg/kg/day at 4 months of age and continued until appropriate iron containing solids have been introduced. Similar recommendations have been made for the partially breast fed infant largely because of uncertainty of iron intake in formula.

Term, formula:

These infants need iron supplementation but the ideal concentration of iron in infant formula has been controversial. Currently available infant formulas with 12 mg/L of elemental iron are now generally considered safe and well tolerated. Concerns about growth and increased risk of infections have not been substantiated. The current recommendations for formula fed infants are to start iron fortified foods at 4 months of age and avoid whole milk until 12 months of age.

Toddlers:

The iron requirement for toddlers (7 mg/day) should be ideally met with dietary consumption of natural iron-rich foods which include both heme and non-heme sources (such as legumes). Foods rich in Vitamin C should be included as they promote absorption of iron in the duodenum. Most governments in industrialized countries and the developing world have resorted to iron fortification of common foods with fairly good success. If there is any concern for ID/IDA, iron supplements may be used prophylactically.

SCREENING

The AAP recommends that universal screening for anemia be performed in all infants at one year of age. Ideally, a CBC and an assessment of risk factors (such as prematurity, lead toxicity, exclusive breastfeeding beyond 4 months, feeding issues, poor weaning practices) should be carried out with the visit. If a child is identified with anemia, additional tests should be carried out to establish the diagnosis of ID/IDA as not all cases of anemia in the US are due to iron deficiency (60 percent of infants have other causes of anemia). Treatment of IDA requires appropriate dose of elemental iron for at least two to three months. Once treatment has been com-

pleted, these children should be followed up carefully to ensure correction of low Hb levels and iron levels.

There is now a push to incorporate technology-based reminders (especially in EMR) not only to screen for ID/IDA but also for follow-up and therapy.

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CME Questions

1. The appropriate amount of iron in diet that is absorbed is:
 - a. 90 percent
 - b. 50 percent
 - c. 10 percent
2. Breast fed infants do not need any iron supplementation in the first year of life.
 - a. True
 - b. False
3. Iron deficiency causes the transferrin receptor TfR1 concentration in plasma to:
 - a. Increase
 - b. Decrease
 - c. Does not change
4. Serum ferritin levels are best interpreted in combination with:
 - a. CRP
 - b. Transferrin saturation
 - c. Liver function tests
 - d. Tumor marker assays

Objectives

Following the completion of this article, the reader should be able to:

1. Discuss the definitions of acute versus chronic pain.
2. Review the assessment and management strategies related to chronic pain.
3. Identify the services available at Dayton Children's for management of chronic pain in pediatric and adolescent patients.

Chronic pain is a significant problem in the pediatric population; conservative estimates indicate that 15 to 20 percent of children may be affected (Goodman & McGrath, 1991). In a large study of 8- to 16-year-olds, 37.3 percent had chronic pain. Of those initially reporting chronic pain, 58 percent still suffered at their one year follow-up. These children had a worse quality of life, missed more days of school and had significant disruption in peer relationships (Huguel and Miro, 2008). The diagnosis of chronic pain in a child has significant emotional, social, physical and psychological impact on the child and family. Studies show that pediatric chronic pain may indeed develop into adult chronic pain. (Campoctal, 1999; Walker, Garber, Van Slylee and Green, 1995).

The American Pain Society differentiates between the acute and chronic pain experience. Acute pain follows injury to the body and generally disappears when the bodily injury heals. It is often, but not always, associated with objective signs of

autonomic nervous system activity. Chronic pain, in contrast to acute pain, rarely is accompanied by signs of sympathetic nervous system arousal. The lack of objective signs may prompt the inexperienced clinician to say the patient does not "look" like he or she is in pain (American Pain Society, 1999).

The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (Pediatric Chronic Pain Position statement, American Pain Society, 2010). This definition focuses on three levels of pain which include sensory (location, intensity, quality), motivation-affect (anxiety, depression) and cognitive evaluation (thoughts – cause and significance).

The biologic significance of pain incorporates many factors. Pain is adaptive and alerts patients to danger. Pain also motivates escape, avoidance learning and recuperation. Pain is partly subjective and is influenced by the environment, expectations and emotions.

All pain is not the same. Pain can be classified as nociceptive, neuropathic, inflammatory or dysfunctional.

- ▶ **Nociceptive pain** is protective and generated by the presence of tissue damaging stimuli. This type of pain responds to nonsteroidal anti-inflammatory drugs (NSAIDs) and opiates; pain related to an appendectomy is representative of nociception.

- ▶ **Neuropathic pain** is caused by damage or entrapment of peripheral nerves and responds to neuroactive medications (tricyclic antidepressants, anticonvulsants and traditional analgesics).
- ▶ **Inflammatory pain** is caused by tissue injury and will respond to NSAIDs. An example of this type of pain is juvenile rheumatoid arthritis.
- ▶ **Dysfunctional pain** is defined as non-nociceptive (central) pain which occurs without obvious signs of tissue damage. This type of pain is nonresponsive to NSAIDs or opiates and as a result can be very challenging to treat.

Chronic pain can be characterized by all four types of pain but is usually represented by neuropathic and dysfunctional pain (Walco, GA, Dworkin, RH, Krane ET, LeBell AA, Tuede R-D, 2010).

The Gate Control Hypothesis (Wall and Melzack, 1965) is the most complete theory related to the pain response. The pain response travels along spinothalamic pathways in both an ascending and descending fashion. The response travels from peripheral receptors to the spinal cord, through the medulla, pons and thalamus. Several specific neurotransmitters which either facilitate (Substance P) or inhibit (serotonin, norepinephrine) are involved. It is hypothesized that interneurons, activated by A-delta fibers, act as a gate by controlling the transmission of pain stimuli conveyed by C fibers to higher centers. Consider the process of rubbing skin near the site of injury to make the area feel better. This action "closes the gate."



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Central sensitization syndrome (CSS) is being studied as a reasonable explanation for chronic pain and its sequelae. CSS is defined as the hyper-excitability of the central nervous system (CNS) following a peripheral stimulus, a central stimulus or no stimulus. Clinical manifestations of CSS include amplified pain, hyperalgesia, spread of pain, unpleasant sensations after physical stimulus, allodynia and chronicity. Objective findings in CSS include fMRI and PCT abnormalities, elevated substance P in cerebrospinal fluid and reduced presynaptic dopamine activity/abnormal dopamine response to pain. CSS potential etiologies include genetic causes (serotonin, dopamine and catecholamine related genes); stressors (early life trauma, physical trauma, infections), autonomic/neuroendocrine/sleep disorders (higher cortisol levels) and enhanced pain processing (lower mechanical and thermal thresholds, higher ratings to noxious stimuli). Members of the CSS “family” include fibromyalgia syndrome, chronic headache, irritable bowel syndrome, myofascial pain syndromes, neuropathic central pain, restless leg syndrome, temporomandibular disorder, interstitial cystitis and pelvic pain (Aaronetal, 2000). Chronic pain is defined by mechanisms; there is a central disturbance in pain processing. Peripheral (nociceptive which can be visceral or semantic) pain is primarily due to inflammation or damage in the periphery. Central (non-nociceptive) is primarily due to a central disturbance and behavioral factors are more prominent. Mixed pain which includes both peripheral and central responses is classified as neuropathic pain.

Chronic pain in children will be pain that lasts at least one, three to six or greater than

Chronic pain is a significant problem in the pediatric population; conservative estimates indicate that 15 to 20 percent of children may be affected.

six months. It must be viewed within developmental, physiologic and psychosocial domains. Objective signs may be absent in contrast to acute pain where symptoms are usually present (American Pain Society Bulletin, 2001).

The “Pain Vulnerable Child” is predisposed to develop pain more than peers (Malleson PN, Connell, H, Bennett SM, Eccleston, C, 2001) due to both intrinsic and extrinsic factors such as previous pain experiences, social deprivation, parental modeling of chronic pain behaviors and stressors at school. Whether a patient develops “pain associated disability (PAD) is influenced by family behavior, cultural expectation and access to health care. This syndrome is characterized by a “spiral of increasing pain-related deception of function” in children and was described in 1998. In order to attempt to prevent PAD, it is essential to assess functional limitations at home and school, institute a multimodal management program which includes medications and nonmedical therapies, and focus on functional improvement prior to pain reduction (Zeltzer, LK, Tsao JC, Brusch B., Myers CD, 2006).

The treatment of pediatric chronic pain must focus on multimodal management and varies depending on the site and defined etiology (if this can be determined). With any pain presentation, it is essential to rule out any organic causes. A thorough history and physical with appropriate diagnostic tests is a must. If an organic cause is identified, the treatment of the disease will help the pain. If pain is identified as nociceptive, neuropathic or mixed type, medication approaches are varied, as are treatment options. The emphasis of any pain treatment plan must include restoration of functional capacity, minimizing physical pain/discomfort, alleviating anxiety and preventing PADs. (Walco, GA, Dworkim, RH, Krane EJ, Lebel AA, Tredde RD, 2010). The cornerstone of a chronic pain treatment plan includes extensive education, pharmacological support, physical restoration, behavioral/psychological approaches and complementary therapies such as massage, acupuncture/pressure, dietary modifications, distraction, muscle relaxation, biofeedback, yoga, hypnotherapy and art therapy. Family therapy is very helpful and goals include decreasing family stress, im-

proving family communication, implementing a behavioral plan and providing extensive education regarding chronic pain (Cherny, NI, 2007).

At Dayton Children's between 2009 and 2011, 3,943 clinic visits occurred for head, abdomen and musculoskeletal pain. The figures include acute and chronic pain and both new and follow-up visits. Approximately 75 to 100 teenagers with fibromyalgia are followed in the clinic with the youngest patient diagnosed being only 9 years of age. Patients who are referred to the chronic pain service at Dayton Children's include those who are self-referred and also referred from either community or hospital-based practitioners. These patients – children and adolescents - have chronic pain disorders which are primarily noncancer in origin (patients with pain related to hematology/oncology diagnoses are managed by hematology/oncology). All are screened to ensure that a complete medical and surgical, if relevant, evaluation has been performed to exclude remediable causes of pain.

Outpatients are seen in the neurology clinic with Daniel Lacey, MD, PhD as the chronic pain physician provider. Currently, there are two to four clinic days per month devoted to chronic pain visits. Initial screening is done by an advance practice nurse (APN) who utilizes standardized rating tests for pain, anxiety, depression and functional impairment. Complete medical histories of the patient and family are taken. The clinic physician reviews the records and examines each patient. A treatment plan is developed and presented to the patient and family; appropri-

ate referrals are made and may include nutritional guidance, physical therapy, psychological counseling and other complementary treatments such as hydrotherapy, massage therapy and acupuncture/acupressure. Follow-up visits are made with the clinic physician and/or advanced practice nurse (APN).

Inpatients are referred to the inpatient chronic pain service via hospital-based attending physicians and residents. The inpatient service is a consult service only. The chronic pain clinical nurse specialist (CNS) completes the initial screening using standardized rating tests for pain, anxiety, depression and functional impairment. Complete medical histories of the patient and family are taken. The CNS initiates a pain treatment plan for the patient and the family. The plan is reviewed by the attending pain service physician. The pain service physician examines the patient and provides consultative services. The treatment plan is fully reviewed with the patient and family. A variety of management modalities are discussed and includes, but is not limited to, medications, distraction, relaxation, physical therapy, massage therapy, dietary adjustments and psychological support. Teaching is an integral part of the plan and includes various brochures and internet site reviews. The CNS is available to patients after discharge by beeper or cell phone. Chronic pain consults are initiated via an order in the electronic medical record (EMR) and both neurology and the CNS are notified. Discussion occurs between the pain management physician and the CNS regarding initial evaluation and ongoing management.

Resources available to the chronic pain team by consult include the following:

- ▶ **Chronic pain medical director:** An individual physician who evaluates patients for the presence of chronic pain, prescribes medications, and assesses and evaluates nonmedical appropriate therapies.
- ▶ **Pediatric APN:** An advanced practice nurse who serves as the program coordinator, evaluates patients, assists in patient/family development of coping skills, coordinates follow-up and multidisciplinary team conferences, and handles patient/family phone calls.
- ▶ **Psychology:** A psychologist who assists in nonmedical means of managing chronic pain including relaxation, self-hypnosis and biofeedback, and manages commodities including anxiety, fear, depression, social isolation and family dysfunction.
- ▶ **Pharmacy:** A pharmacist who provides consultation related to pain medications and optimal delivery modalities/managing side effects.
- ▶ **Physical Therapy:** A physical therapist who develops and maintains a graduated exercise program when indicated.
- ▶ **Nutrition Services:** A dietitian who provides dietary modifications and education related to dietary management.
- ▶ **Child Life:** A child life specialist who initiates distraction and assistance with activities.

- ▶ Complimentary Alternative Medicine: Various specialists who may provide in-house massage therapy, consultation to community massage therapists, acupuncture/pressure services and hydrotherapy.

In summary, pediatric chronic pain is a real and ever-increasing phenomenon that causes suffering, impairs function and interferes with quality of life and interaction with families and peers. Goals of a successful pain management plan include:

- ▶ Utilization of appropriate medications.
- ▶ Initiation of various multimodal techniques such as psychological support, relaxation, distraction, physical therapy support, dietary modifications and complementary alternative therapies.
- ▶ Education of patients/families to learn to live with pain and that life may not be pain free.
- ▶ Helping patients/families understand that catastrophizing and learned helplessness is counterproductive in being as pain free as possible.

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CME Questions

- Pediatric patients are rarely affected by chronic pain.
 - True
 - False
- Neuropathic pain is characterized by:
 - Responsiveness to opioids /NSAIDS
 - Damage to or entrapment of peripheral nerves
 - Initial activation of the sympathetic nervous system
 - None of the above
- Clinical manifestation of CSS includes:
 - Hypoalgesia
 - An acute nature
 - Allodynia
 - Decreased pain response
- Pain associated disability is always a complication of chronic pain and can't be prevented.
 - True
 - False

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Objectives

Following the completion of this article, the reader should be able to:

1. Describe techniques to care for pediatric burns in the outpatient setting.
2. Recognize medications appropriate for pediatric outpatient burn care.

Burns and burn care have been the topic of journal articles, text book chapters and entire books. Criteria exist to guide referrals to burn centers. That is not the intent of this article; the focus here is the outpatient treatment of minor burns.

Often it is difficult to assess the depth of a new burn. Older terms such as 1st degree, 2nd degree, etc. have been replaced with new descriptors:

- ▶ **Superficial burns:** Do not extend below the basal layer of the epidermis and do not blister. They are red, dry and painful. Sunburn is a superficial burn.
- ▶ **Superficial partial thickness and deep partial thickness burns:** Blisters may or may not be intact, are moist, and blanch. They are very painful. Epithelial cells in the epidermis and dermis and keratinocytes will migrate to moist areas. This will become important as burn care and healing are discussed. These burns heal in two to three weeks by granulation and reepithelization. Delayed healing indicates deeper injury and likely need for a skin graft.
- ▶ **Full thickness burns:** Extend into subdermal fat. These burns are white, dry, do not blanch and are often painless. These will require a skin graft.

Skin is responsible for many vital functions including protection from infection, body temperature regulation and prevention of body fluid losses. Children suffer deeper injuries from shorter heat exposure because of their thinner epidermis.¹

INCIDENCE

In the United States, burns (pediatric and adult) account for 700,000 emergency department visits per year with 45,000 admitted for inpatient care. That leaves the remaining 655,000 patients to be cared for in the outpatient arena.²

Data obtained from Dayton Children's trauma registry reports 214 patients presented to the Soin Pediatric Trauma and Emergency Center with burn injuries in 2010. Of those, 13 were admitted. The remainder were treated and referred for outpatient burn management in the pediatric surgery office. This number represents only those patients actually presenting to the ED. Based on referrals made to pediatric surgeons at Dayton Children's, we know that many pediatric burns are initially seen at other hospitals and by primary care providers. In Dayton the age and sex of the pediatric burn patient and type of burn reflects what is seen nationally. In this same reporting year, 56 percent of the patients evaluated at Dayton Children's were male with an average age of 5.07 years. Scald burns from hot food or drinks were the most common mechanism of injury followed by contact burns from the kitchen stove. Clothing irons, curling irons and flat irons were also frequently implicated.

The possibility of abuse needs to be considered in pediatric burns injuries as with any other trauma. Circumferential burns of the extremities and burns of the buttocks and genitalia warrant a good history taking. Contact burns that take on the

shape of the offending item (cigarette, clothing iron) should also raise concern.

CARE

As is true with many medical diagnoses, burn care is an evolving process based on research and expert experience. Much debate has surrounded the management of bullae. Bullae form early in burn injury as capillary permeability increases allowing for fluid to collect between the epidermis and the dermis. Most blisters occur in superficial partial thickness burns. They may, however, be present in deeper burns. Those who favor opening the blister argue that blister fluid may provide a medium for bacteria growth and obscure the depth of the burn. Those who favor leaving the blister intact argue that opening the blister makes a painless wound painful and exposes the wound to infection.³

Following an extensive review of the literature, Sargent reported her findings on this subject.⁴ Generally, thin-walled blisters greater than 6 mm in size should be debrided to remove nonviable tissue from the wound bed and decrease the likelihood of infection. Large blisters can cause mechanical pressure on underlying tissues with ensuing complications. The strongest level of evidence is found for maintaining a moist wound bed and using dressings that do not require frequent dressing changes, thereby reducing patient pain. Decreased cost is also associated with less frequent dressing changes.⁴

An open technique is the preferred treatment of burns to the face and perineum. These areas can be cleansed with saline or mild soap and water. Shur-Clens® Skin Wound Cleanser (ConvTec), a sterile cleansing solution designed for skin wounds in all areas, including around the eyes is preferred by Herndon.³ Rinsing is not neces-



Linda Hollen, MS, CNP

Ms. Hollen is the nurse practitioner for the division of pediatric surgery at Dayton Children's. She received her bachelor's degree in nursing and her master of science with a family nurse practitioner concentration from Wright State University. She works in collaboration with the five pediatric surgeons at Dayton Children's and has been with the facility since 1990.

sary. A gauze pad moistened with Shur-Clens® is used at Dayton Children's. After cleansing, the burn is coated with a topical antimicrobial three to four times per day to keep the burn moist. Once daily, all accumulated burn debris and antimicrobial ointment is gently washed off and then reapplied. This process is repeated until healing is completed. For burns covered by a diaper, the area should be gently cleansed with each diaper change and antimicrobial ointment applied.

A closed technique is used on other parts of the body. The burn is cleansed with Shur-Clens®. All loose tissue is removed either with a gauze pad or with sharp scissors. Blisters are opened. Adaptic® (Johnson & Johnson) or other non-adhering dressing is generously coated with a topical antimicrobial and then placed over the burn. The area is wrapped with gauze bandages (Kerlix®) and then secured with an elastic wrap (Coban®) or stockinette dressing. If fingers are involved, each digit is individually wrapped and then the hand wrapped boxer-glove style. The burn dressing serves to absorb drainage, protect the wound and decrease pain. Since one purpose is to absorb drainage, the dressing needs to be thick enough to do so. On extremities, it is helpful to extend the gauze bandage and elastic wrap slightly above and below the closest joint. For example, a burn on the calf would have a dressing from just above the knee and extending to the ankle.

Recommendations for the frequency of dressing changes range from twice daily to once a week. For his pediatric outpatients, Herndon uses triple antimicrobial ointment and dressing changes at three-to seven-day intervals in conjunction with clinic visits.³ This alleviates the parent from changing the dressing at home and inflict-

ing pain on their child.³ Twice weekly care in the surgeon's office has become standard at Dayton Children's. The family and patient are instructed to keep the dressing dry and intact between office appointments.

Any burn may be referred to the pediatric surgeons office, but those that will clearly not heal within seven days should be considered for referral. Burns to areas of functional and/or cosmetic importance should be referred earlier.

MEDICATIONS

Silver sulfadiazine has antiseptic properties which contribute to delayed wound healing. It also delays reepithelization and causes trauma to fragile healing cells with frequent dressing changes.^{3,1} For these reasons topical antimicrobials have replaced silver sulfadiazine in this clinical setting.

There is no role for systemic antibiotic prophylaxis in minor burns as it is rare that an outpatient burn will become infected. In fact, unnecessary antibiotic use may increase the chance of colonization with more resistant organisms. Tetanus status, however, should be determined and tetanus booster given if appropriate.³

Burns are painful, especially partial-thickness burns. Pain is increased with burn dressing changes and burn care. IV narcotics and anxiolytics are frequently used in the emergency department. In the outpatient setting, NSAIDs are commonly used for pain relief and recommended for around the clock use the first 72 hours following the injury. Oral narcotics given just prior to burn care are effective. Topical anesthetics are not recommended.³

Pruritus is frequently noted with healed and healing burns as histamine synthesis is increased. The incidence is greater in children and in lower-

CME Questions

9. Silver sulfadiazine is the preferred topical treatment for small, outpatient burns.
 - a. True
 - b. False
10. 120 degrees Fahrenheit is the maximum recommended water heater temperature in homes with children.
 - a. True
 - b. False

extremity burns. Scratching can reinjure a healed area. Antihistamines (Benadryl®), cool compresses and lotions are helpful. Lotions must be without alcohol or fragrance.³

PATIENT EDUCATION

No discussion of pediatric burns can be complete without addressing patient and family education. Home water heaters should not be set any higher than 120 degrees. At 120 degrees, a child can suffer a partial thickness burn injury in 150 seconds.¹ Hot foods and liquids need to be out of reach, as do lighters and matches. Working smoke detectors are a necessity.

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Objectives

Following the completion of this article, the reader should be able to:

1. Differentiate between simple and complex febrile seizures.
2. Review the indications for performance of a lumbar puncture in children presenting with febrile seizures.
3. Discuss the recurrence rate of seizures following an initial febrile seizure in infants and children.

According to estimates, roughly 1.5 to 3 percent of all people in the United States are diagnosed with epilepsy. They account for approximately 2 percent of the visits to emergency departments at children's hospitals. Febrile seizures are the most prevalent cause of convulsions in children. The incidence of single febrile seizures accounts for 4 to 5 percent of all children younger than 5.

INTRODUCTION

The relationship between fevers and convulsions in children has been documented since the fifth century B.C. However, it was not until the 1980s that febrile seizures were recognized as a distinct clinical entity, separate from other types of seizures in early childhood, and an operational definition was suggested.

There are two definitions of febrile seizures. The National Institute of Health (consensus statement of 1980) defines a febrile seizure as an event in infancy or childhood, usually occurring between 3 months and 5 years of age, associated with fever but without evidence of intracranial infection or a defined cause of the seizure. The International League Against Epilepsy (1993) defines a febrile seizure as a seizure occurring in childhood between 1 month and 5 years of age, associated with a febrile illness not caused by an infection of the central nervous system without previous neonatal seizures, or a previous unprovoked seizure and not meeting criteria for other acute symptomatic seizures. These two definitions only differ in the lower age limit (3 versus 1 month respectively).

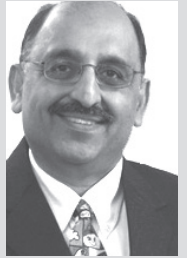
Although one of the essential precursors of a febrile seizure is a fever, the other definition provides a specific temperature criterion for its diagnosis. Over the years, an axillary temperature of greater than 38° C or 37.8° C became the simple cut off. This level has been proposed as a preliminary diagnosis of febrile seizures; however, there is no current consensus.

CLINICAL ELEMENTS OF A SIMPLE FEBRILE SEIZURE

- ▶ Patient being 6 months to 5 years of age.
- ▶ Generalized tonic clonic convulsion.
- ▶ Seizure lasting 15 minutes or less.
- ▶ Return to alert mental status after the seizure.
- ▶ Documentation of fever greater than 38° C.
- ▶ One convulsion within a 24-hour period.
- ▶ Absence of pre-existing neurological abnormalities.
- ▶ Positive family history of febrile seizure in first degree relative.

CLINICAL ELEMENTS OF A COMPLEX FEBRILE SEIZURE

- ▶ Seizure lasting longer than 15 minutes.
- ▶ May present with seizures with limited time interval.
- ▶ Events may recur within next 24 hours.
- ▶ Focus of seizures with several possible features.
- ▶ Tonic and clonic movements.
- ▶ Loss of muscle tone.
- ▶ Beginning on one side of body with or without secondary generalization.
- ▶ Head or eye deviation to one side.
- ▶ Seizure activity followed by transient universal paralysis lasting minutes to hours, occasionally days.



Nadir Khan, MD

Dr. Khan is director of Dayton Children's pediatric epilepsy clinic and clinical associate professor of pediatrics at Wright State University Boonshoft School of Medicine. He graduated from Khyber Medical College. He is fellowship trained in epilepsy and EEG and board certified in pediatric neurology. His special interest are in seizures and epilepsy.

Of the group of febrile seizures, the complex febrile seizures constitute 9 to 35 percent of the febrile seizure group or roughly one-third of this group.

WHAT CAUSES FEBRILE SEIZURES?

This part of the pathophysiology of febrile seizures remains unclear. The general consensus hypothesizes that it is an age-dependent response of the immature brain to a fever. This thought is supported by the fact that 85 percent of all febrile seizures occur between the ages of 6 months and 3 years with a peak incidence at 18 months. Although the mechanism for this increased susceptibility is unclear, animal models suggest an enhanced neural excitability during the normal brain maturation. It is well known that febrile seizures occur in families and thus the genetic susceptibility can be transferred through both parents. A positive family history of febrile seizures correlates with approximately 25 to 40 percent of children who have febrile seizures. Familial clustering studies indicate that the risk for children doubles when both parents have a history of febrile seizures. The studies suggest that the mode of inherent susceptibility of febrile seizures is mostly polygenic and occasionally, somewhat dominant. There have been some studies in Japan where the susceptibility in families have been mapped to Loci FEB 1 (chromosome 8q13-q21) and FEB 2 (chromosome 19p13.3) indicating a somewhat dominant pattern with reduced penetration. There have been other reports indicating deficiencies of rare substances including iron and zinc; however,

the precise clinical significance of these observations remains unclear.

The diagnosis of a febrile seizure is based on clinical grounds, on an accurate description of the seizure and its clinical setting as provided by a reliable parent or caregiver. A detailed clinical history to identify the cause of the fever and its treatment is always needed. Family history of febrile seizures, recent antibiotic therapy, including medications given by the parent, and recent history of immunizations should be specifically ascertained. The risk of contracting meningitis, for a patient with simple febrile seizures, is remarkably low, less than 1.3 percent. However, with a complex febrile seizure it is close to 9 percent but the exact figures are unknown. The common causes of fever in the United States — viral infections, otitis media, upper respiratory tract infections and tonsillitis — account for 60 percent of children with simple febrile seizures. A small number of children can also be seen with urinary tract infections. The focus of the seizures cannot be clearly identified in about one-third of the children. More recently, human herpes virus six and influenza virus A have been implicated as etiological agents as well.

The immunization with diphtheria, whole cell, pertussis, tetanus, vaccine (DPT), and the measles, mumps and rubella vaccine (MMR) have been reported to be associated with transiently increased risk of febrile seizures on the day of vaccination and eight to 14 days after vaccination is completed. However, these risks do

not outweigh the benefits and do not appear to be associated with any long-term adverse consequences. In Asia and Africa, malaria, other mosquito-borne illnesses and gastroenterological illness can also be a suspected cause of a fever. As part of further investigations, the question of spinal tap has come up repeatedly, in addition to other tests for evaluation of simple febrile seizures.

2011 GUIDELINES

A policy statement published in *Pediatrics* by the subcommittee on febrile seizures recommended that a lumbar puncture should be performed in any child who is presented with a seizure and fever, has meningitis signs and symptoms such as neck stiffness, Brudzinski signs or any other child whose history or examination suggests the presence of meningitis or intracranial infection.

A lumbar puncture should also be performed in an infant between 6 and 12 months of age who is presented with a seizure and fever. A lumbar puncture is an option when the child is considered deficient in influenza type B (HIB), streptococcus pneumonia immunizations and who has not received scheduled immunizations as recommended or when immunization status cannot be determined because of the increased risk of bacterial meningitis.

A lumbar puncture is an option for a child who is presented with a seizure and fever while being treated with antibiotics because an antibiotic treatment can mask the signs and symptoms of meningitis.

An EEG should NOT be performed in the evaluation of a neurologically healthy child with simple febrile seizures and hematological tests of calcium, phosphorus, magnesium and blood glucose. A complete blood cell count should **not** be performed routinely for the sole purpose of identifying the cause of a simple febrile seizure. It is also recommended that neuroimaging should **not** be performed in the routine evaluation of a child with simple febrile seizures. As is always the case in medicine, a physician should not hesitate to perform a lumbar puncture if his or her clinical judgment considers the procedure necessary.

In 2010, another policy statement was published in *Pediatrics* stating that even patients with complex febrile seizures yield of acute bacterial meningitis by cerebrospinal fluid (CSF) in the absence of signs and symptoms of meningitis was very small. CSF was obtained from 340 patients; 14 patients had pleocytosis, two had acute bacterial meningitis and 12 had pleocytosis, nine of whom were admitted. There were no positive cultures out of these 12 patients. However, four were presumed to be meningitis. In the end, only three patients clearly met CSF criteria for acute bacterial meningitis with streptococcus pneumonia and two of the patients were presented before the introduction of the conjugated pneumococcal vaccine. For this reason, the current recommendations are to look at signs, symptoms or suspicion, and when the immunizations are unclear, be somewhat more aggressive with CSF evaluation.

REASSURANCE AND COUNSEL OF PATIENTS

Witnessing a febrile seizure is emotionally traumatic for parents and it may lead them to think that their child may be dying or that their child's brain is becoming damaged. After an initial febrile seizure, parents may have persistent fear of recurrence of future epilepsy. All of which negatively affect their family life and their routines. Therefore, reassuring and counseling parents is one of the most important aspects of management of simple febrile seizures. We should be reassuring the parents that there is no risk of death or brain damage, since viral infections are a common cause of fever which triggers a febrile seizure.

RISK OF RECURRENCE

After initial febrile seizure, about one-third of children will experience a reoccurrence. In addition, 50 percent of the recurrences happen within six months of the first febrile seizures, 75 percent within a year of the first febrile seizure, and 90 percent within two years of the first febrile seizure. The recurrence depends on:

1. Young age - less than 12 to 18 months.
2. Family history of febrile seizures in first and second degree relatives.
3. Low temperature of less than 40° C at the initial febrile seizure.
4. Multiple febrile seizures occurring in the first episode.

Others have added sex, ethnic origin, income level of family, family history of epilepsy, level of fever causing seizures, dura-

tion of fever before seizures and type of seizures (simple versus complex).

RISKS OF EPILEPSY

There is great controversy regarding this topic and it is considered overall that after an initial febrile seizure, about 2 to 12 percent of children will subsequently develop epilepsy by adolescence. The risk factors for developing epilepsy include pre-existing neurodevelopment abnormalities, complex febrile seizures and family history of epilepsy in first or second degree relatives.

Children with a history of simple febrile seizures who later develop epilepsy usually develop generalized epilepsy. Again, there is great controversy in regard to the cause of the epilepsy from febrile seizures in infancy; however, the greatest controversy revolves around hippocampal injury and medial temporal sclerosis.

RISKS OF COGNITIVE IMPAIRMENT

Published studies have found that previously normal children who have febrile seizures, simple or complex, perform as well as other children in terms of academic progress, intellect and behavior at 5 and 10 years of age. So it is postulated that febrile seizures are not associated with neural damage.

RISKS OF DEATH

There is no increased risk of incidence of death in children with febrile seizures including febrile status epileptics.

LONG-TERM MANAGEMENT OF FEBRILE SEIZURES

While antipyretics, Tylenol® or ibuprofen prescribed during subsequent febrile seizures provide comfort and symptomatic relief to a child, they do not prevent febrile seizure recurrence. Daily therapy with carbamazepine and phenytoin are not effective in preventing febrile seizure recurrence either. However, there have been reports of therapy with phenobarbital or valproic acid which shows reduced risks of febrile seizure recurrence. One certainly has to consider the potential significant side effects of both of these medications, especially where the side effects may outweigh the minor risks associated with recurrences. Thus, general continuous daily use of medication is no longer routinely recommended to prevent recurrence. In addition to that, no type of medication has absolutely proven that it can prevent future epilepsy.

Parents in general assign tremendous importance to prevention of febrile seizure recurrence. Parents should be aware that the risks of recurrence declines rapidly after six months from the previous seizure. They should be educated about the natural history of seizures to reduce their anxieties. They should also be taught to measure the temperature and use simple methods such as administering Tylenol® and ibuprofen, sponging to reduce fever, and comforting the child. Rectal Diastat can be used at home according to weight in a dose of approximately 0.5 mg/kg of body weight, especially in the event that the seizure is longer than five minutes.

In parting, educational information for the parents has been known to reduce their anxieties and improve their skills in managing the febrile episodes.

Since febrile seizures are a common occurrence in children, the family physician or pediatrician plays an important role in acute seizure management, as well as in the initial assessment and long-term management of these children. They also can play a very important part in counseling the parents and decreasing their anxieties with information in regards to good long-term prognosis.

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CME Questions

11. Which of the following febrile illnesses is least likely to be associated with a febrile seizure?
 - a. Tonsillitis
 - b. Otitis media
 - c. Pneumonia
 - d. Gastroenteritis
 - e. Roseola (*herpes virus 6*)
12. Which of the following statements best describes the role of electroencephalography (EEG) in febrile seizures?
 - a. Predicts the recurrence risk of febrile seizure
 - b. Useful in both simple and complex types
 - c. A useful tool to diagnose febrile convulsion
 - d. Predicts the future risk of epilepsy
 - e. Not recommended in febrile seizures
13. A 5-month-old female presents to the emergency room two hours following a generalized clonic seizure lasting five minutes. Her temperature is 104°F. She remains lethargic. The most important laboratory test to be performed is:
 - a. Blood glucose determination
 - b. Lumbar puncture
 - c. MRI of head
 - d. EEG
 - e. CT

PROGRAM EVALUATION

- The material presented in this publication met the mission to enhance health care delivery in our region through education based on the essentials and policies of the Accreditation Council for Continuing Medical Education?
 Strongly agree Agree Neutral Disagree Strongly disagree
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 Yes No
- Did the material presented in this publication have a commercial bias? Yes No
- Please rate the contents of this issue using the following scale:
 1 = Poor, 2 = Fair, 3 = Good, 4 = Very good, 5 = Excellent
(Circle one response for each.)

	Poor			Excellent	
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- Please describe any changes you plan to make in your clinical practice based on the information presented in this program.

- Are there any other topics you would like to have addressed in this publication or future educational programs for health care providers?
 Yes No If yes, please describe: _____

- Please describe how you will incorporate information obtained from this publication into your practice.

- Letter to the editor (may be published in next issue) _____

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 Volume 23
 Number 2

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NEWS AND UPDATES FROM DAYTON CHILDREN'S

Patient access

Dayton Children's has launched an aggressive plan to strengthen access to new patient appointments in key specialty areas. The goal is to have a sufficient number of physicians on staff to enable a wait time of no more than 10 days, 100 percent of the time. To accomplish this, the plan calls for adding nine specialists in the areas of endocrinology, gastroenterology, neurology and pulmonary medicine.

"Based on current volumes, we need to increase the number of specialists in these areas to reduce the wait times for new patients. Our board recognized the importance of improving access and determined this strategic investment in recruiting additional pediatric specialists would enable us to better meet the pediatric health needs of our region," says Gregory Ramey, PhD, vice president of outpatient services, Dayton Children's.

Please contact Cyndy Emerson, manager, physician recruitment, with information about anyone who would be a good candidate. She may be reached at 937-641-5307 or emersonc@childrensdayton.org.

Dayton Children's welcomes new physicians



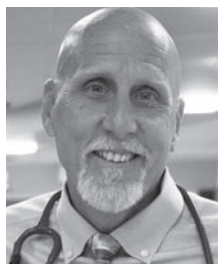
Craig Shank, MD

Tennessee. He is fellowship trained in orthopedics and has special interests in pediatric trauma, foot and ankle deformity and pediatric hip disease.



Lora Harrison, MD

Health Services in Cincinnati and is board certified in pediatrics with a certificate of added qualification in primary care sports medicine.



Stephen Wolf, MD

He is board certified in pediatrics and pediatric pulmonary medicine with special interests in cystic fibrosis, asthma and medical education.

Craig Shank, MD, joined Dayton Children's orthopedic surgery division from Crockett Hospital in Lawrence,

Lora Harrison, MD, joined Dayton Children's as medical director, urgent care. Dr. Harrison comes from University

Stephen Wolf, MD, joined the department of pulmonary medicine from private practice in Flagstaff, Arizona.



James Rick, MD

gastroenterology at Wright-Patterson Medical Center. Dr. Rick is pediatric gastroenterology and nutrition fellowship trained from National Capital Consortium and is board certified in pediatrics and pediatric gastroenterology. He has special interests in liver disorders and inflammatory bowel disease.



Ilona Albrecht, DO



Melissa Kay Benbow, MD

pathic Medicine in Athens, and Dr. Benbow received her medical degree from The Ohio State University.

James Rick, MD, joined the department of pediatric gastroenterology after serving as chief of the department of pediatric

Ilona Albrecht, DO, and **Melissa Kay Benbow, MD**, have joined Children's Health Clinic. Both trained as pediatric residents at Dayton Children's for the last three years. Dr. Albrecht received her degree from Ohio University College of Osteo-

Dermatology clinic added



D. Greg Palmer, MD

Dayton Children's has added an additional dermatology clinic on Thursday afternoons with D. Greg Palmer, MD, who is board certified in dermatology and pediatrics. For more information, contact the dermatology department at 937-641-4000.

Laboratory Update

Laboratory accredited.

The College of American Pathologists has informed us that Dayton Children's laboratory has successfully met the Laboratory Accreditation Program (LAP) Standards for Accreditation. This is a two-year accreditation. Congratulations to the laboratory staff.

Campylobacter now part of routine stool culture

The microbiology lab now includes isolation and identification of *Campylobacter* as part of the Routine Stool Culture. You are no longer required to order a stool for *Campylobacter* as a separate test. Along with *Campylobacter*, the routine stool culture also includes *Salmonella*, *Shigella*, *Enteropathogenic E. coli (EPEC)*, *Plesiomonas*, *Aeromonas* and *Shiga-Toxin* Testing. A stool culture for *Yer-*

sinia will still require a separate additional order (code: ST0Y). Contact Microbiology at 937-641-5100 if you have any questions.

Dayton Children's Virology/ Infectious Disease Molecular Lab offers C. Difficile by PCR

Most labs perform a *C. difficile* screen, which is an EIA technology that detects the toxin itself. Unfortunately, *C. difficile* toxin is very unstable. The toxin degrades at room temperature and may be undetectable within two hours after collection of a stool specimen. False-negative results occur when specimens are not promptly tested or kept refrigerated until testing can be performed. Sensitivity of the test runs between 50 percent and 75 percent. For this reason, more than one specimen is often ordered. In a recent study presented at the International

Conference of Health Care Associated Infections found pediatric patients had a 35 percent false positive EIA result when compared to the gold standard *C. difficile* test.

C. difficile PCR assay avoids these problems of false negatives and false positives. The assay detects the DNA in the bacteria responsible for producing the toxin, which is very stable. The *C. difficile* PCR has a sensitivity comparable to cytotoxin assay but with the speed of an EIA test.

- ▶ Acceptable specimens are: unformed, (liquid or soft) stool specimens in a clean container.
- ▶ Formed stool or stool in preservative will not be accepted for testing.
- ▶ A single specimen is recommended as sufficient for testing. If the PCR test is negative, repeat testing is not recommended for 7-14 days.
- ▶ Infants have been shown to be asymptomatic carriers of toxigenic *C. difficile*. Testing should not be performed on asymptomatic infants under one year of age.
- ▶ To avoid positive tests due to colonization, only test patients with diarrhea.
- ▶ The test should not be used as a test-of-cure.

The test is performed daily. Specimens received before 2:00 pm will be resultd the same day. Any questions please call the virology/molecular infectious disease at 937-641-5100. For courier pick-up of specimens collected in your office, call 937-641-4305.

Imaging Upgrade

Dayton Children's imaging department introduces state-of-the-art technology through recent MR upgrade. The upgrade will allow for shorter imaging times and enhanced patient safety because of noncontrast imaging-capable application. In addition, the upgrade enables enhanced image quality with improved clinical application for cardiac, neurology and body imaging.

"With the current heightened awareness of radiation exposure, especially in children, the trend in diagnostic imaging is toward MR, reserving CT for emergency and specific applications. In order to meet that need, the medical imaging department is focusing on improving MR imaging for cardiac applications and body imaging.

The recent MR upgrade includes a new cardiac workstation and numerous new MR applications for MR angiography and cardiac imaging. "The upgrade also allows improved body imaging with abdominal MR angiography, faster abdominal imaging, MR cholangiography, and protocols to evaluate for iron overload in the heart and liver," says Beth Ey, MD, medical director of medical imaging.

New clinic started

Dayton Children's department of gastroenterology and nutrition announces the addition of a liver clinic in collaboration with Cincinnati Children's Hospital Medical Center and William Balistreri, MD.

The clinic will be staffed by Farhat N. Ashai-Khan, MD, of Dayton Children's and William Balistreri, MD, medical director, pediatric liver care center and associate chair for subspecialty training, department of pediatrics at Cincinnati Children's.

The liver clinic will be held on the second Monday of the month beginning in mid- November 2011. Dayton Children's liver clinic appointments are made by a referral from a physician at 937- 641-4000.

Partnering with physicians for pediatric care that's... Just Right for Kids



Dayton Children's is the only hospital in the region totally dedicated to diagnosing and treating children. What makes us just right for kids?

As the only hospital in the region totally dedicated to diagnosing and treating children, our mission is to provide quality health care for children from infancy through the teenage years. We are known throughout the region as the health care resource for all children, regardless of their socioeconomic status. Want more good reasons to consider Dayton Children's as your first choice in pediatric health care

- ▶ Pediatric specialists specially trained to care for children of all ages and in all stages of growth and development.
- ▶ Medicine, equipment and supplies sized right for each child.
- ▶ Multidisciplinary care delivered with the family at the center — actively participating in all aspects of care and decision making alongside professionals who care only for kids.
- ▶ Expertise in communicating with kids and putting them at ease.
- ▶ Best practices for keeping kids safe inside and outside our hospital.

Our customer satisfaction scores regularly exceed 90 percent throughout the hospital. Outpatient surgery, urgent care and Children's Health Clinic consistently score 95 percent or higher in customer satisfaction.