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JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

The *Journal of Clinical Chiropractic Pediatrics* welcomes original and scholarly manuscripts for peer-review and consideration for publication. Topics must pertain to the field of pediatrics which includes pregnancy and adolescence. Manuscripts should not have been published before or submitted to another publication.

The following will be considered:

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Literature Reviews — studies of existing papers and books presented with the intention of supporting and encouraging new and continuing study.

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Controlled, Large Scale Studies — usually, but not necessarily, performed at a college or research facility. May be double-blinded.

Commentaries — presentations of opinion on trends within the profession or current events, pertaining to pediatric and adolescent chiropractic care.

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2. The first name, middle initial and last name of each author, with highest academic degree(s)
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The paper must include an **abstract** or **summary.** This abstract/summary should state the purpose of the paper (objective), procedures, methods, main findings (results) and principal conclusions. Also, any key words or phrases that will assist indexers should be provided.

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From journals —
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From books —
Gatterman MI. Chiropractic management of spine related disorders. Baltimore: Williams & Wilkins, 1990: 236.

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Summary of manuscript submission

1. Manuscript (digital or CD, MS Word unformatted)
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8. Digital files to be sent to *pediatricscouncil@chiropractic.org*.

Editorial

This issue of JCCP departs from the journal's usual format to bring readers a wealth of practical information on one of the most important topics to practitioners of all types, as well as to parents: child safety.

We have attempted to approach the general topic of child safety from several different perspectives. These include suggestions on how to incorporate prevention of both intentional and unintentional injuries into practice, as well as a discussion of imaging issues related to common pediatric injuries. Also included are a qualitative summary of the current evidence for the safety of chiropractic care for children, and a detailed description of how to ensure the safety of neonates. We also provide readers with a discussion of issues related to reimbursement for chiropractic care, since these issues may prevent children from getting the care they need.

Another departure from JCCP's usual format is a Grand Rounds feature. The Grand Rounds cases, in keeping with the journal's emphasis on "the evidence informed practice," approach the two cases from a perspective which "allows and promotes both 'art' and 'science' in this process."[1] The two cases represent the diversity of chiropractic pediatric care, with one a teen with back pain complicated by obesity, and the other a baby with infantile colic. For each case, experts from different disciplines comment on the case from their perspective, which we feel will enrich readers' knowledge and understanding of similar cases they might see in their practices while promoting the benefits of collaboration.

The evidence base for chiropractic care of children is still emerging. Practitioners can facilitate its growth not only by contributing to it directly through case reports and participation in research, but, equally important, by using it appropriately in their practices. Scientific evidence has no value if it is not put into practice — the purpose of research is to improve practice, not to prove it.[2] We hope this issue of JCCP will provide relevant information to our readers in a user-friendly and interesting way.

I am greatly honored and pleased to serve as Guest Editor for this special issue of JCCP. As a chiropractor for 33 years, I remain convinced that our profession brings something unique, life-enhancing, and in many cases, life-changing to our patients. Nowhere is this more evident than among children. I am humbled to witness the dedication and expertise of the chiropractors who have trained in pediatrics in order to help "our greatest natural resource" achieve optimal health and wellness. I hope that this issue of JCCP will make a contribution to the continued growth and success of its readers and their young patients.

Cheryl Hawk, DC, PhD, CHES

1. Vallone SA. What is evidence? *JCCP* 2009;10(1):591.
2. Hawk C. Chiropractic clinical research: where are we looking for the key? *J Neuromusculoskeletal System* 2000;7(4):150-155.

First Do No Harm – Chiropractic Care and the Newborn

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AND LORA TANIS, D.C., D.I.C.C.P.

Introduction

Pediatric chiropractic encompasses the care of the child from conception through adolescence. The goal of this paper is to discuss the chiropractic approach to the care of the neonate with an emphasis on safety and ethics.

The neonatal period is the transitional time from intrauterine to extra-uterine life. Defined by most sources as approximately the first four weeks after delivery, the neonatal period is possibly the most tenuous in a human's lifetime. The first month of life is the period of highest mortality in the life of an infant and so careful monitoring and assessment during the period is vitally important.[1] Subtle changes may occur and go unnoticed while potentially life-threatening conditions may masquerade behind minor symptoms such as irritability, lethargy, poor-feeding and restlessness. Accurate clinical evaluation and assessment during this time is of critical importance.

Mastery of the skills to competently evaluate and, when necessary, formulate a diagnosis and proficiently treat a neonate often requires additional academic hours and clinical experience. Chiropractors may choose to expand their clinical practice to encompass the pediatric population or may refer pediatric patients to colleagues with appropriate credentials. A chiropractor's responsibility extends beyond simply providing care to the neonate. It also lies in recognizing when it is appropriate to make a timely referral for collaborative treatment.

Communication — The first doctor patient interaction

Communication is critical in the neonatal therapeutic relationship.[2] First and foremost, clear and honest communication promotes the development of confidence and trust between the family and the provider. The relationship between the parents and child is new and beautiful, but often intimidating and wrought with fears and challenges. New parents are often hyper-vigilant and protective of their new charge and while seeking assistance from the chiropractor with the health of their child will also want assurance of the doctor's qualifications, credentials and experience in pediatric care. Above all, the parents are primarily concerned with the safety of any procedures and techniques that will be performed on their newborn infant.

The chiropractor's role in the care of the neonate may be preventive (as in performing a routine well-child exam) or therapeutic. To provide optimal health care, a chiropractor requires that the parents communicate for the neonate, providing a comprehensive history as well as a clear delineation of any of the child's current or chief complaint. When the neonate's presenting complaint is acute, it may require daily communication to monitor the neonate's response to care and any potential need for collaborative referral to another health care provider.

Prenatal, natal and post natal history elicited in detail provides a significant database from which the chiropractor begins to establish a differential diagnosis. If the family decides to work with the chiropractor, it is also crucial that they understand that ongoing communication about the observed exacerbation or remission of the infant's symptoms and developmental progress is vital to the success of the therapeutic relationship.

The chiropractor, likewise, should be comfortable explaining his or her education, credentials and experience working with neonates. He or she should also be able to clearly communicate the nature and purpose of evaluating the neonate, any proposed diagnostic procedures or treatment that may be performed, the risks and benefits of the proposed procedures together with any alternatives that might be considered as well as their risks and benefits and the risk or benefit of not undergoing any treatment at all.[3,4] The responsibility to verbally communicate this information is an integral part of obtaining a fully informed parental consent required for the chiropractor to care for the child. Parental consent should be documented, signed, witnessed and included as part of the patient's record chart

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for as many years as the child is under care. In many jurisdictions this may be up to 18 years of age.

Special consideration should be given to the anxious parent whose fears are not alleviated by the explanation or demonstration of the procedure. Such procedure or treatment should be postponed until full informed consent has been obtained. It is also important to be aware of obtaining the consent of both parents if the parents do not agree on the suggested course of care or if, in the case of parents who are separated or divorced, that you have obtained the permission of the parent or parents who have the legal right to make medical decisions for the infant.[5]

It is often also important to obtain and review copies of medical records including diagnostic studies previously performed on the neonate. Communication with other healthcare providers creates a forum within which to work as a team, communicating findings, coordinating care and preventing duplication of services. Communication between healthcare providers of different disciplines encourages an integration of their approaches in the best interest of the patient. The chiropractor should obtain written permission to share information (written and oral) about the neonate. Such written permissions from the parents should be included in the patient's record chart.

It is critical that communication between the parents and child begins in the womb, encouraging bonding and neurologic maturation. As the parents communicated with their child before and immediately after birth[6,7] the chiropractor will also develop communication between him or herself and the neonate. Although these communications may be nonverbal, they communicate clearly their comfort level in their environment and habitus. Experience and attention to their "body language" (grimacing or relaxation of the facial muscles; overall muscle tone, arching, writhing, floppy) and tone, intensity and frequency of crying or babbling, baby's use of arms and hands to indicate areas of discomfort will allow the chiropractor to work within the neonate and family's comfort zone.

The chiropractor builds relationship between him or herself and the parents and neonate by encouraging an anxious parent (or infant) contact during the physical examination (whether parent holds the child or simply touches their hand or foot while the examination is conducted so that the infant knows the parent is nearby). Parent/infant contact during treatment will be dictated by the chiropractor's preference. Some chiropractors utilize techniques that place the infant on the parent's lap or chest during the adjustment. Others, especially those performing soft tissue techniques that may require an "unwinding" or movement of their trunk and extremities, may feel that the parent's touch may inadvertently inhibit the infant's movements required to release the restricted tissues. When a neonate shows distress during treatment, the parent's anxiety may be alleviated if the chiropractor can offer reassurance that this is often an expression of discomfort or the expression of a memory associated with the origin of their problem vs. an expression of pain. If the infant's distress escalates, the chiropractor can allow the parents to intervene with cuddles and comfort, or even a brief feeding. It is not unusual to hear a chiropractor or parent coo or babble to comfort or entertain a child. It should be no more unusual for the chiropractor to address the neonate with a verbal expression of their desire to only help, never harm, setting the stage for a mutually respectful relationship

The impact of the chiropractor's communication goes well beyond his or her words, body language and appearance. It is expanded and impacted by the office staff and environment (including comfort and safety measures that are put in place). This is often challenging in a busy office with a mixed population of patients and can be tempered by appropriate staff training and design choices. Establishing safety protocols and procedures for both administrative and therapeutic office staff, careful scheduling and cultivation of a patient "go with the flow" attitude extending from doctor to staff to all patients (adult and child) who enter the office may prove helpful. The benefits of such stress management techniques are well documented.[8]

Creativity and imagination will solve many presenting challenges. For example, if there are insufficient facilities available to accommodate a mother breastfeeding for an additional 20-30 minutes after the appointment, then perhaps providing a rocking chair behind a privacy screen in the waiting room would accommodate her needs. This would help solve such a problem while still maintaining patient flow in the office. It would also offer the chiropractor an opportunity to observe and assist with mother's breastfeeding ergonomics.[9]

Diagnostic and developmental issues

Whether an infant is presented for a "well-baby" visit or with a specific complaint, the chiropractor should maintain the same level of attention to detail whether in the role of providing primary contact or as a consultant. The patient record should be complete including documentation of regular weight, height and head circumference, so that

any alteration in normal development will be detected on subsequent visits.

As thorough as the gathering of information through the written and oral history should be, the attending chiropractor should continue by carefully examining the patient and correlating the historical information together with physical findings. A careful exam, however brief, at each follow-up visit is vital because health conditions can change rapidly with neonates and it should never be assumed that the status quo is maintained between visits, particularly if symptoms are exacerbating or not abating.

A chiropractor's diagnostic skills, initially discussed within the context of clinical case studies in the academic environment, will develop rapidly with experience. The complete evaluation of an infant requires the use of all of the doctor's senses in establishing a differential diagnosis. Sight is important in assessing characteristics such as size, shape, symmetry, alignment, pallor, tone, compensatory recruitment of muscles, motion or lack of motion, presence or absence of infantile reflexes. The sense of touch is important for assessing tissue turgor, temperature, coarseness or softness of the skin, range of motion and tissue resistance, dislocation and fractures, craniosacral rhythm and dural tension. Touch is also required to take a pulse, to percuss and ballot. Touch that is firm and confident also calms, connects and begins to build trust between the doctor and patient.

The sense of hearing to listen to neonatal respiration, both character, frequency, depth; to listen to a cry, its pitch and its vigor; to listen to sounds (clicking, snapping, gulping, gurgling), and most important of all to listen to "the story" told by both the child and the parents or caregivers. The sense of smell can detect ammonia, yeast and other bacteria while the sense of taste may be required to identify the salty skin of the child with cystic fibrosis.

How many of the five senses does the chiropractor use to detect a subluxation? Touch reveals joint restriction, muscle spasm, skin temperature, the eyes see a change in tissue integrity over the subluxation and the ears hear the sound of the patient's complaint when palpating their subluxation.[10]

What is the significance of an overly pink cheek, tugging of the ear, a sneeze, a cough, rash, a fever, edema, diarrhea, constipation, tachypnea, tachycardia? Do each of these potentially indicate the subluxation?[11] Yes, possibly. But they may also be indicative of more serious pathologies that may result in rapid system failure if not correctly diagnosed and referred for co-treatment. Most assuredly each of these states will be associated with a subluxation but do we need to realistically consider the current state of tissue integrity and be responsible to co-treat our neonatal patient with the appropriate supportive personnel. Does our adjustment contribute to the re-establishment of the homeostatic state where the patient's innate ability to heal is optimized?

Fuloria and Kreiter, in the *American Family Physician,* outline the myriad of indicators of underlying problems detected during examination of a newborn:"…the routine newborn assessment should include an examination for size, macrocephaly or microcephaly, changes in skin color, signs of birth trauma, malformations, evidence of respiratory distress, level of arousal, posture, tone, presence of spontaneous movements, and symmetry of movements."[12] They suggest that the presence of any anatomic malformations, jaundice, indications of craniosynostosis, hydrocephaly, masses, cysts or vascular malformations, palsies, cyanosis or murmurs or respiratory difficulties should be referred for evaluation by the appropriate specialist. Once again, as recommended, responsible chiropractors should also be observant and quick to refer for supportive care as the situation requires in conjunction with chiropractic care.

Another important aspect of the neonatal inspection includes the presence or absence of neonatal reflexes. The continued presence of primitive reflexes above the age of six months and the absence or under-development of postural reflexes beyond three and a half years of age are reliable indicators of neurological dysfunction, which can affect both motor and perceptual development and merit a referral for co-evaluation and treatment.[13]

Developmental milestones should not be viewed rigidly for each child follows an individual time line. Be aware, though, that the failure to reach multiple milestones in a "timely" fashion might be an indicator of underlying pathology, or possibly the result of an articular dysfunction or neurologic compromise that is preventing or "distracting" the neonate from progressing.[14,15] Co-treatment with other practitioners who specialize in neonatal development (neonatal developmental pediatrician, occupational therapists, physical therapists, etc.) could perhaps not only expedite diagnosis but also lend supportive rehabilitation post adjustment.

At birth, a fully competent neonate will, if laid prone across its mother's abdomen, bob his or her head up and

down and commando crawl to the breast using his senses of smell, touch and taste to find and latch onto the breast to feed. If unable to feed on his or her own, the infant will be deprived of the immunologic and nutritional benefits of mother's milk as well as the sustenance required for survival, growth and development.

The ramifications of dysfunctional biomechanics on suckling dysfunction are profound. This failure to suckle, therefore to breastfeed successfully, may be a result of either neurologic compromise, articular or muscular dysfunction or imbalance. Neurologic dysfunction might be genetic, congenital, related to constraint, anoxia, trauma, medication or other birth issues. Articular dysfunction may arise as a result of prolonged compression (in utero constraint of the fetus), trauma (birth injury) or congenital anomaly (like micrognathia). Muscular malfunction or imbalance may occur for the same reasons or be secondary to aberrant neurology (cranial or peripheral nerve injury or compromise) or congenital anomaly (like ankyloglossia).

The function of the neurologically competent neonate can be challenged by alterations in form. As a result, the neurologically competent neonate will develop compensations to achieve, if not the same end result, then an adequate substitute. If the neonate cannot successfully latch or efficiently suckle (sometimes bottle as well as breast), he may experiment with clamping, chewing, licking or sucking, differentiating sucking (as from a plastic nipple or a straw) from suckling which utilizes peristaltic tongue action and reverse pressure to empty the ducts of milk.

Although congenital anomalies that interfere with breastfeeding do occur in the neonatal population, many of these neonates are neurologically intact. They likewise will often demonstrate the ability to develop compensations to achieve their goal gaining nutrition at the breast or the bottle. Sometimes these anomalies can be addressed surgically (ankyloglossia, cleft lip) and require support and retraining.[16]

Between birth and their first month's birth date, a neonate will orient visually when his or her head is supported. If pulled up to sit, the facial expression will change indicating an awareness that something is wrong with the head position. Head control upright against gravity (neonate lying or seated father's chest) should permit the neonate to turn his or her head right and left and lift his or her face off the parent's chest if neutral without losing control and hyperextending. Although fatigueable, this head control should be present very early in the neurologically intact neonate. Neonates should move both of their arms in wide arcs originating from the shoulder. At rest, their arms and legs will be flexed at the elbows, hips, knees and ankles and if passively extended, they will recoil back into flexion. When actively kicking, the neonate's movements should be rhythmical, symmetrical and in a reciprocal pattern. If held vertically in gravity, neonates will feel the table under their feet and extend their legs to bear weight. When leaned forward, they will then respond with well organized reciprocal walking movements.

When observing and examining a neonate, again, the absence of any of these milestones individually would most frequently point the chiropractor in the direction of local dysfunction whereas the absence of a significant number of the normal developmental milestones might indicate a more serious upper motor neuron lesion. For example, a neonate with one arm extended and internally rotated with the wrist in flexion would most likely be suffering from a brachial plexus or nerve root lesion versus the neonate with extension of the right arm, hip, knee and ankle as well as asymmetry in the facial muscles and dysphagia.

Treatment planning

Once all information is gathered and reviewed and a diagnosis reached, treatment planning should be done with the family, explaining the suggested procedures, along with any potential material risks, other possible treatments and potential outcome if the parents choose not to treat. Then, an outline of the frequency of treatments and length of time before an evaluation will be performed to assess improvement or changes, suggest additional studies, referrals or discharge from care should be presented.

In the case of the "well child", treatment planning should be based on the projected time of achievement of major developmental milestones with recommended intervention based on occurrence of illness or trauma. For the infant presenting with a chief complaint, frequency and length of care is predicated on the presenting clinical picture, but it is important to remember that children respond quickly to therapeutic intervention and overtreatment should be avoided. Overlays of compromise including in utero constraint, severe birth trauma, infection, nutritional deficits (including feeding difficulties), presence of congenital defects or genetic alteration or toxicity all play a role in the projected therapeutic scheme and might include consultation with a chiropractor who has additional education and clinical experience in pediatric healthcare.

Structural characteristics of the newborn spine

Evaluation and adjustment of the neonatal spine re-

quires that the doctor has a good knowledge of neonatal spinal anatomy. The newborn spine is composed principally of cartilage with progressive ossification occurring over the first 25 years of life.

It is important to understand the variation in neonatal vs adult anatomy to know what modifications should be made to safely and effectively adjust the neonatal and developing pediatric patient. Skeletally, the typical cervical vertebra consists of hyaline cartilage with three separate primary ossification centers, which appear in the ninth to tenth week after birth. One is located in each half of the vertebral arch and the other one in the body. Centers in the arch appear at the roots of the transverse processes and from these the ossification spreads backwards, forwards, upwards, downwards and laterally into the adjacent parts of the vertebra. The major part of the body, the centrum, ossifies from a primary center located dorsally to the notochord.

The atlas is normally ossified from three centers. Each lateral mass has one ossification center at the seventh week. Both centers extend gradually into the posterior arch and fuse together between the third and fourth year. The third center appears in the anterior arch at the end of the first year and fuses with the lateral masses between the sixth and eighth year.

Ossification of the axis is more complex (Ogden 1984). It has five primary and two secondary centers. Each vertebral arch and the body is ossified from one center as in a typical vertebra. The two centers in the vertebral arch appear about the seventh or eighth week, and the one in the body about the fourth or fifth month. The dens is ossified from two primary and two secondary bilateral centers. The primary centers of the dens appear about the sixth month and are separated from the center in the vertebral body by cartilaginous region. The primary centers of the dens and the body most often fuse between the fifth and eighth year. Before fusion of these three centers, the synchondrosis between them is situated below the level of the atlanto axial joints. It must be distinguished from fracture, which usually spreads along this structure in infants and children. Two secondary ossification centers, so-called ossiculum terminale, appear in the apex of the dens at 8-10 years. Fusion of the ossiculum terminale with the rest of the dens occurs between the 10th and 13th year.[17]

Incomplete uncinate processes and wedge-shaped vertebra, lax ligaments and developing muscles result in greater instability within the cervical spine. The spinal cord is eight times more vulnerable to stretch/traction forces as compared to the postural soft tissue structures allowing for subluxation and or spinal cord injuries.

In his text, *Manual Therapy in Children,* Biederman discusses the progression of scientific observations concerning neonatal cervical biomechanics. He relates that in 1993, von Kortzfleisch published his observations that the infant cervical spine appears much more extended in the sagittal plane. Catell and Filtzer 1965, Hill et al 1984, Nitecki and Moir 1994 went on to describe the main pivot for movement in the sagittal plane was not in the C5/6 segment as in adults, but in the C2/3/4 segments. In 1999, Biedermann himself observed that in lateroflexion (frontal plane) the atlas does not move into the concavity as it does in adults, but it moves in the convexity.[18]

The range of motion of the facet joints is affected both by the shape of the unossified, cartilaginous articular surfaces and the degree of elasticity of supporting capsular ligament structures. The newborn infant's spine and peripheral articulations can also be inherently unstable due to the effect of maternal hormones that may still be in the infant's system.

Ligaments in the body are affected by genetic inheritance.[19] Ligaments are composed of two types of collagen, type 1 and type 3. Typically these occur approximately in the ratio of 9 to 1. Type 3 collagen, which has less cross-linkages, has greater elasticity and any individual with an increased ratio of type 3 collagen will demonstrate greater range of motion within the joints throughout the body.[20] Whether a newborn has such an inheritance of increased type 3 collagen is difficult to determine by physical examination. A positive family history of ligament laxity may be the best indicator of its presence in the newborn. However, another indicator sometimes present is that newborn infants with familial ligamentous laxity may demonstrate cavitation of the thoracic and lumbar spinal joints simply by being lifted under the arms. Clinical encounters with such infants demonstrate that it is apparent that such ligamentous laxity changes the way that the joints open, causing more frequent cavitation with lighter forces.

Proposed modifications to allow for ligamentous laxity

Because of the influence of maternal hormones, intrauterine or birth related mechanical effects[21,22] and the potential of yet undetected genetic influences, the ligament stretch factor in these babies may be increased and therefore joints will demonstrate greater range of motion

before reaching the pre-stress position. The following modifications are proposed for infants demonstrating familial ligamentous laxity.

The potential for such conditions to exist require that when applying adjustments to the newborn spine that the line of drive and amount of force applied must be altered to avoid excessive ligament stretch and "overriding" the surfaces of such joints. This type of patient is often more difficult to adjust due to this inherited factor.

The type of adjustment technique used for such patients needs to be carefully selected so as to minimize ligament stretch in pre-positioning the patient prior to adjustment.

The problem that arises when adjusting these patients is that the spinal joints have such an increased range of motion that it is difficult to reach joint tension in the adjusting pre-stress position. This leads to the possibility of ligament sprain occurring if the thrust is too forceful or if the amplitude of the adjustment is too great.

These hyper-flexible patients need to be adjusted with a technique that employs a minimum amplitude thrust and minimizes pre-stress, e.g. finger-tip or instrument-type adjusting.

Evaluation and correction of newborn spinal and cranial problems

Typically, a neonate can present with spinal or cranial problems associated with in-utero constraint, difficult labor or post-natal spinal or soft tissue trauma.

In-utero constraint can cause soft tissue trauma, such as SCM strain, vertebral alignment and joint fixation problems, with associated capsular ligament sprain or cranial bone alignment and positional problems.

A difficult labor can include the scope of difficult passage through the birth canal due to maternal pelvic structural alignment with associated pelvic joint anomalies and/or fixation, pelvic disproportion, fetal positional malalignment, failure to progress triggering the administration of uterine muscle stimulants such as pitocin, or fetal distress requiring mechanical extraction procedures or removal by cesarean section.

Post-natal spinal or soft tissue trauma can include direct trauma from a fall or a blow to the body. Sudden movements of the baby's body can cause spinal and soft tissue trauma. Examples might include inappropriate handling of the baby such as lifting the baby without appropriate support of the head and neck or positioning the baby's unsupported head in an upright position causing it to drop suddenly from the upright position. The principal consideration here is the relative weakness of a baby's neck muscles compared to the weight of the newborn's head.

Appropriate evaluation of the neonate requires a complete history of the pregnancy, labor and delivery and post-natal events that may have caused spinal and soft tissue trauma. Physical examination requires a careful and precise evaluation of the baby's spinal and paraspinal structures. Initially, evaluation of the paraspinal soft tissues may be the most revealing part of the spinal examination. Muscle strain due to trauma and muscle spasm associated with capsular ligament sprain both can be palpated as a tight and tense, and often tender, muscle mass.

Beneath this muscle mass one might palpate a somewhat harder asymmetric tissue mass that represents the misaligned vertebral structure. Whether such a vertebral structure is associated with facet joint fixation or simply misaligned due to asymmetric muscle pull is difficult to ascertain with static palpation alone. Assessment of the region while, for example, moving the baby's head to either side will provide some further information regarding the ability of the involved vertebra to move freely.

Resolution of the muscle tension is the primary goal for treatment of this area. Since not all muscle tension will be associated with fixation of the facet joints, the assumption that an adjustment is the appropriate mode of treatment in all cases may result in inappropriate care and further irritation of the area.

Correction of fixated facet joints may be achieved with light pressure over the misaligned vertebra.

Over-adjusting a baby's spine, i.e. by over-use of amplitude or thrust or by adjusting too often, can lead to complications of increased soft tissue irritation and exacerbation of symptoms.

Alternative adjusting modalities can include instrument adjusting where treatment of the involved area may be performed by utilizing an impulse-type instrument adjusting procedure using a setting at the lightest possible level of thrust.

At this juncture it is important to introduce and to emphasize the importance of the interaction of the cranium and cervical spine.

While misalignment of the cranium can affect many conditions in the neonate through cranial nerve pressure, cranial misalignments can also result in neck muscle contraction through spinal nerve irritation or through direct irritation of cranial nerves which innervate muscles of the neck, e.g. the spinal accessory nerve (Cr. XI). Therefore, cranial evaluation and adjustments must be an integral part of the correction of any condition involving the neck.

Cranial evaluation requires both observation and palpation. Observation will help to identify obvious cranial bone positional anomalies and patterns of restriction as well as suggest the possible need for imaging studies to evaluate underlying structural and developmental problems.

Palpation of the cranial bones and sutures will help to provide a pattern of misalignment since misalignment of a single cranial bone may affect many others in the skull, e.g. the sphenoid articulates with 12 other bones.

When evaluating the newborn cranium it is important to remember that cranial palpation must be performed with light pressure and should not compress any of the cranial bones or sutures. When adjusting the newborn skull it is important to remember that cranial adjustments should always be applied away from the mid-point of the skull with light gliding or lifting movements.

Contraindications to adjusting the neonate

Davies (in his text *Chiropractic Pediatrics: A Clinical Handbook*. 2000 Churchill Livingstone) expounded on the following contraindications for adjusting:

When suspicious of "Shaken Baby Syndrome", the neonate should be evaluated for neurologic symptoms that may have resulted from cerebral hemorrhage.

Head trauma in neonates (sometimes including head trauma associated with birth injury) often requires radiological evaluation prior to adjusting. Fracture and atlas- axis instability should be ruled out. Atlantodental interspace should not exceed 5mm.

In many congenital syndromes one should be suspicious of and rule out basilar invagination, platybasia, articular deformities, agenesis of the posterior arch of atlas or the odontoid process, neurocutaneous syndromes, first and second brachial cleft deformities and agenesis or laxity of ligaments in chromosomal abnormalities (Down's syndrome) or collagen diseases. One must also be cautious in conditions of myelomeningocele due to high frequency of Arnold-Chiari malformation.

In cases of hydrocephalus no upper cervical procedure should be attempted. Numerous cases have been reported in literature of perinatal necropsy resulting from fatal kinking of the medulla-spinal cord junction. This results from the interaction of a freely moveable brainstem and an upper cervical cord that is fixed because of the strong attachments of the dentate ligament. The presence of raised intracranial pressure that occurs with hydrocephalus has the effect of accentuating the cord-medulla angle, enhancing the prospect of a fatal neurovascular event. [23]

Williams, in his text *Pregnancy and Paediatrics, A Chiropractic Approach* discusses potential complications from the popular baby inversion technique developed and taught by DeJarnette (1979).[24] These include intracranial hemorrhage or bleeding conditions in the newborn, especially in pre-term newborns, also hydrocephalus, hip instability, neurological symptoms and seizures.[25]

First do no harm

In an age when the media provides endless sources of information for informed parents, chiropractic has been scrutinized as a safe and effective alternative for a myriad of common childhood complaints. Parents seek out chiropractic as another option for the healthcare of their family.

The responsibility of ethical and safe practice lies with our profession and begins with an acknowledgement that it requires the cultivation and mastery of both an academic foundation and clinical expertise that distinguishes chiropractic from other disciplines.

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Safety of Chiropractic Manual Therapy for Children: How Are We Doing?

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ABSTRACT

Objectives: To assess the risk of adverse effects of chiropractic spinal manipulation in the pediatric population and to promote a culture of safety along with full reporting of adverse events in the chiropractic profession

Methods: Narrative review of all published reports of adverse effects of chiropractic pediatric spinal manipulation

Results: Adverse effects from chiropractic spinal manipulation are rare with 2 moderate and 4 severe events reported during a 59 year period with up to 30 million treatments estimated per year. Current reports show a very low rate (<1% in 8,290 treatments) of mild transient side effects lasting less than 24 hours.

Conclusion: Based on the published literature, chiropractic spinal manipulation, when performed by skilled chiropractors, provides very low risk of adverse effect to the pediatric patient. Vigilance to detect occult pathology as well as other steps to maintain safe practice are of utmost importance.

Introduction

When a child is presented for health care, safety is presumed by the parent, the family, the health care profession and society. Safety is the bedrock upon which all health care is based. After all, the first rule is, "Do no harm." I once overheard a chiropractor say, "We cannot help everyone, but we don't harm anyone." Was that naïve, short-sighted or accurate? Chiropractors who once were secure that their practice was safe, may be currently feeling exposed. Safety for all patients is under scrutiny and the pediatric population is particularly vulnerable because they cannot speak for themselves. Further, parents are equally vulnerable as they are emotionally involved and may not be able to regulate their own stress let alone that of their child and may have difficulty making decisions for their child.

The clinician must take responsibility for the safety of the child under treatment. Safety is a chief concern in all of pediatric health care.[1] For example, the safety of medications given to children is increasingly considered an important public health issue.[2] In fact, such common remedies as cough and cold medications for children are no longer routinely recommended because of negative side effects.[3] The National Patient Safety Agency in the UK has tracked safety incidents in pediatric patients and reported many concerns.[4] Reviewing 33,446 reports on pediatric care in 2006, 19% experienced medication problems as well as other breaches of safety including 14% procedure problems, 9% errors in documentation and 7% errors in clinical assessment among other incidents. Of particular concern was the rate of medication error in children (19%) versus that in adults (9%).[4] The use of medication in children is common with a recent report that the majority of US children <12 years of age use one or more medications weekly.[2]

There is a trend showing that parents often seek complementary and alternative medicine (CAM) for their children.[5] Chiropractic is the most common alternative care sought by parents for their child.[5,6] Choosing a drug-free profession may reinforce the conjecture that parental choice of alternative care for their child may be partly due to "fear of pharma" or phobia related to the use of pharmacology, particularly glucocorticoids.[7] Safety is likely the main reason that parents turn to CAM therapies.[6] However, parents may seek a wide variety of practitioners and chiropractors may be just one of several clinicians treating a child. Data collection of 2,033 pediatric cases that presented to the Anglo-European College of Chiropractic (AECC) teaching clinic between 2000 and 2006 showed that over 90% had seen other clinicians and most had seen multiple types of practitioners for the same condition. (Figure 1)

Awareness of the care that other practitioners provide may be a factor in risk reduction. Certainly, this has been noted in the medical profession. McCann and Newell in 2006 registered concern that children treated by herbs and other ingested remedies could have a reaction because of the (unknown) combination with pharmaceuticals medically prescribed.[8] They further suggested that the comple-

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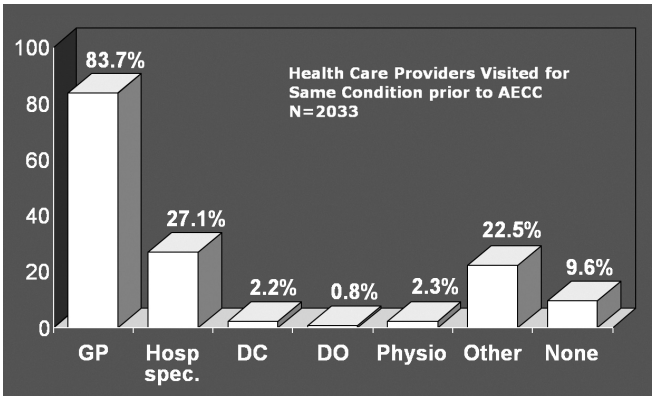
Figure 1. Health providers seen for same condition prior to chiropractic presentation



mentary therapies (physical in nature such as massage and chiropractic) were less likely to interfere with biomedical treatment than complementary medicine which was ingested. Likewise, chiropractors must be aware of pharmaceuticals or other treatments undertaken by our patients which might cause side effects or otherwise complicate our therapy.

Review of safety in practice for the pediatric patient is common across health care.[9,10] The goal of this article is to review the literature that investigated adverse events or side effects of chiropractic care for the pediatric patient and reflect upon risk reducing behaviours in our offices to improve safety for children under our care. The type of care most commonly provided by chiropractors is spinal manipulative therapy (SMT). Many chiropractors prefer the term "chiropractic adjustment". For purposes of this article, we will use the term "SMT" with the understanding that it includes adjustment, manipulation and mobilization of the joints by a chiropractor. In the case of the children, we use the term pediatric spinal manipulative therapy (PSMT), to refer to procedures modified in terms of amplitude, force, speed and depth to the age-specific anatomy of the child relative to routine adult SMT. The safety of this type of care when delivered by chiropractors is the subject of this article.

Methods

A search was undertaken to locate relevant literature. Databases searched were PubMed, Scopus, Index to Chiropractic Literature, and Cochrane Library. Search restrictions were English language, human subjects. Publications were searched prior to September 2009. Hand searches followed through references and bibliographies of articles found. Search terms used were "chiropractic" AND "pediatric;" "manipulation" AND "safety;" OR "side effects" OR "injury." The pediatric age group was defined as between 0 and 16 years.

Results

Twelve published reports addressed safety of manual therapy for the pediatric patient. Six reports were duplicates. Table 1 is a review of the literature that addresses safety of chiropractic treatment for the pediatric patient. One was a systematic review, one was described as a quasi-meta-analysis, one a retrospective records review, one a survey and two were case series. Side effects can be divided into three categories: mild (transient and requiring no health care), moderate (requiring additional health care) or severe (requiring hospital care. All three types of side effects were reported in the literature.

Mild side effects secondary to chiropractic manipulation

Two fairly recent (since 2007) reports,[12,13] one a survey of parental report and one a retrospective record review, of a total of 1,076 pediatric patients having 8,290 treatments resulted in less than 1% experiencing irritability, soreness or stiffness, all transient and requiring no additional care.

Mild side effects secondary to manipulation delivered by medical doctors

The rate of mild side effects was higher when manipulation was given by non-chiropractors. In Table 1, two citations report side effects from 600 children and 695 children, respectively, who were treated with "chiropractic therapy," but manipulation was performed by medical doctors.[14,15] These are included because they specifically describe treatment as chiropractic therapy, although it was not delivered by chiropractors. In the first instance, there were no negative side effects and in the second, there were effects of bradycardia, flush and apnea, all of which subsided in 6-13 seconds. Two points need to be made; (1) the "chiropractic" adjustments given to these infants were described as ranging between 30 and 70 Newtons (N) with an average of 50 N. (2) these side effects occurred preferentially (significance 0.0017) in the youngest age group (<3 months). These side effects would be considered as mild (transient) and occurred at a rate of 6% (84 out of 1,295 children) when combining both reports. It should be noted that this report regarded these as routine by-products of treatment rather than negative side effects.

Moderate side effects secondary to chiropractic manipulation

Two moderate cases were reported which involved se-

Table 1. Summary of reports on safety of chiropractic treatment for pediatric patients.

Author	Design	Time frame	Number patients or treatments	Result
Vohra, et al 2005[11]	Systematic review of pediatric patients treated by manual therapy from any profession	59 years (1940-1999)	1,140,000,000,000 chiropractic treatments estimated (30 million visits in 1997 of children to chiropractors)[11,19]	12 adverse events to pediatric patients, 8 by chiropractors. 19 cases of missed diagnosis and delayed referral to medical practice
Miller and Benfield 2008[12]	Retrospective file review of children under 3 years of age in an intern clinic	3 years	687 children receiving 5,242 treatments	No adverse events; 1% had increased irritability for up to 24 hours
Alcantara J, et. al. 2007[13]	Parent survey	Not reported	Poll of 389 parents of children with 3,048 office visits	2 cases of soreness and stiffness after treatment
Koch, et al. 2002[14]	Case series of infants aged 1-12 months	Not reported	695 infants	12.1% had bradycardia, flush and apnea as immediate result, which recovered within 6-13 seconds
Biedermann H 1992[15]	Case series	Not reported	600 cases of children with kinematic imbalance due to suboccipital strain	No adverse events reported.
Pistolese RA 1998[16]	Quasi-meta-analysis of literature for incidents of neurovascular compromise	1977-1998	502,184,156 visits estimated	Numbers needed to harm were calculated as 250 million patient visits for neurological or vertebrobasilar harm to occur to 1 child

vere headache and stiff neck and acute lumbar pain. These were treatments given by chiropractic students as part of a clinical trial.[11]

Severe side effects secondary to chiropractic manipulation

There were 4 citations in the systematic review which resulted in severe side effects from chiropractic care of pediatric patients.[11]

- In a 1978 case, a 7 year old child had had repeated trauma from mid-air somersaults landing on his cervical spine and occiput. The "chiropractor diagnosed cervical misalignment and initiated a course of rapid manual rotations of the head from side to side with flexion and hyperextention."[17] The child became ill with vomiting, severe headache and facial weakness. A visit to a neurologist found no abnormalities and chiropractic treatment was resumed, first with low back treatment and after two weeks, cervical adjusting. The child experienced two weeks of vomiting, headache and diplopia before hospital admission. Traumatic thrombosis of the left vertebral artery was suspected to be the source of "recurrent microemboli producing left facial paralysis, vomiting and diplopia."[17] After two weeks the child was released from hospital and experienced persistent right-sided dysmetria with reduced quadrantanopia (blindness in visual field) as long term effects.
- In 1992 a chiropractic manipulation to a 4-month baby with torticollis had a serious long-term effect resulting in quadriplegia regressing to paraplegia 18 months after treatment.[11] This occurred because infil-

tration of an astrocytoma was unknown at the time of initial treatment. The authors called for x-ray of every child with torticollis prior to manipulation.[18]

- Another severe event occurred in 1983 with manipulation of a 12-year-old with osteogenesis imperfecta (a condition in which manipulation is contra-indicated) resulting in paraplegia.[11]
- Chiropractic treatment in 1959 of a 12-year-old girl for neck pain persisting from congenital torticollis resulted in unsteady gait, decreased coordination, drowsiness and neck pain and hospitalization followed treatment.[11] Congenital occipitalization was diagnosed in hospital.

Indirect adverse effects of treatment such as missed diagnosis and/or delayed medical treatment were also reported in the Vohra review[11,19] Nineteen cases were reported over a 57 year time span (1940-1997).[11] Sixteen cases involved delayed treatment and no serious adverse results occurred. These 16 cases were reported between 1992 and 1997. Three cases which developed serious adverse events occurred between 1940 and 1969.

Discussion

Overall, the published evidence does not suggest that chiropractic care for the pediatric patient is high risk. The most thorough systematic review[11] uncovered only 8 incidents of hurt or harm to children due to chiropractic manipulation in a 59-year time span (1940-1999) when billions of such treatments were given. The number needed to harm (NNH) has been calculated at one major neurovascular harm for every 250 million treatments.[16]

Any adverse event is regrettable and provides lessons to be learned. There appears to be a pattern wherein early cases (as long as 70 years ago) had worse outcomes than more recent cases. This may indicate that some enlightenment has occurred in our profession over the years. No longer are patients treated in a vacuum but are referred when it is clear that our care is not efficacious. Chiropractors are conscious that therapy must be effective prior to the natural decline of the disorder. Children usually respond quickly and generally do not require a course of treatment to extend beyond 2-3 weeks unless complicating factors are present. It is important that the treatment shows evidence of improved outcomes in that time span. If progress is not seen after 3 weeks of care, the clinician must reflect on the clinical usefulness of the approach and either modify the treatment plan or refer the patient for consultation with an appropriate specialist, The modern chiropractor is trained in recognition of red flags and differential diagnosis and this is reflected in fewer adverse events since 1992.

There are clearly gaps in the data set with few studies of patient safety or adverse effects of chiropractic care. This may be a result of under-reporting. Adverse effects should be reported as a part of normal routine.[20] Further, randomised trials are not a fruitful source of such data. There are few randomised trials addressing chiropractic treatment of the pediatric patient and only rarely do they address safety issues. The lack of safety reporting from RCTs is typical across medical research.[21] The lack of safety research in its own right is typical in much of health care. Over half of pharmaceutical interventions for pediatric patients are off-label or unlicensed.[22] It is possible that there is a different standard in allopathic reporting of side effects than there is in chiropractic reporting. For example, in the Koch study, 12.1% of the infants experienced bradycardia, flush and apnea after a medical manipulation.[14] In the report, these were not regarded as negative side effects, but merely an adaptation of the autonomic nervous system to manual therapy. These would arguably be interpreted as adverse side effects if occurring after treatment by a chiropractor. It should be noted that manipulation given to these infants was much higher force (30-70 N) than is recommended by the chiropractic profession.

What is implicit in safe practice is the ability to identify risk and to modify treatment taking that risk into account. There are too few incidents reported to ascertain where safety incidents cluster. That said, virtually all of the severe sequelae from mis-diagnosis or treatment stemmed from the lack of recognition of occult pathology. Non-recognition of pathology in a child increases the risk of a breach in safety under our care, as the child will be less resilient, as well as the fact that our care is inappropriate. It goes without saying that vigilance is required to detect occult pathology in every patient, although red flags may be more easily detected in adults who can speak for themselves and describe symptoms than in children.

The busy chiropractor may have questions: "How should I interpret this evidence for my practice? Should I be concerned about the few incidents which have occurred? How can I lower the risk of adverse events in this patient group in my own practice?"

Chiropractors can look at practice through risk-reducing lenses and keep in mind some key points.

- Know your limits. This is one of the keys of the Hippocratic Oath. Do not practice beyond your

capabilities.

- Continue to update skills in examination, treatment, note taking, communication, equipment, resuscitation and pediatric life support.
- Do a thorough history and examination. Collect sufficient data to enable you to make a cogent decision on risk reduction.
- Identify red flags and refer whenever indicated.[23]
- Patients with co-morbidities or medical needs should be co-managed with the appropriate health professional.
- Always take vital signs before any treatment commences.
- Always use risk/benefit ratio and risk/effectiveness ratios to determine appropriateness of care (Table 2).[23-26] If the condition being treated does not have a clear efficacious therapy, do a therapeutic trial with a short course of treatment to determine whether benefits accrue more quickly than the natural history of the disorder.[26]
- Use the correct technique for the age and condition of the patient as outlined in best practice recommendations.[23]
- Promote and support research.
- Report side effects and safety incidents so that data can be collected prospectively.[27]

Prospective reporting of all patient safety incidents is recommended and available. In the UK, the Chiropractic Patient Incident Reporting and Learning Systems (CPIRLS)[27,28] is an on-line anonymous web-based system which accepts all types of patient safety events including errors, accidents, mishaps, near-misses or any deviation from the norm. The anonymity and security of the system encourages reporting from all chiropractors. This will result in accurate reporting of incidents for patients and learning and feedback for the profession.

Table 2: Safe/Effectiveness decision making framework for treatment, after Cohen, 2005.

		Is Treatment effective?	
Is treatment safe?	**Yes**	**Yes** If treatment is both safe and effective for pediatric patients, it should be recommended	**No** If treatment is neither safe or effective, do not recommend.
	No	If treatment is effective, but not safe, do not recommend.	If treatment is not effective but is safe, a trial of therapy is appropriate

Conclusions

Based on the published literature, it appears that manipulation, when given by a skilled chiropractor with years of training carried out with low forces recommended for pediatric care, has few side effects in the healthy infant and child and their recorded incidence is exceedingly low.

Nothing is of greater importance in our pediatric practice than taking a pro-active stance to incorporate safe practice strategies into daily practice and to report any incidents with the goal of safety and protection for all patients.

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The Role of Chiropractors in Identifying and Reporting Intentional Injuries in Children

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ABSTRACT

Child abuse and neglect occurs in all cultures and nations throughout the world and is a major threat to the health and well-being of children. Prevention of child abuse has both immediate and long-range effects. A key component of prevention is identification and reporting by health care providers. Detection of child abuse requires a high index of clinical suspicion, as caregivers often attempt to conceal or explain away concerns. Careful investigation and accurate documentation of physical signs and examination findings are imperative. The two most common presentations of physical abuse are skin lesions and fractures, respectively. Chiropractors are mandated reporters of suspected child abuse and neglect and are obligated in all jurisdictions to comply with the law. As a health care profession in which direct personal contact, visual observation, and radiographic evaluation often occur during the examination and/or treatment of the musculoskeletal system, chiropractors are well situated to recognize the signs of intentional injuries in children.

Key words: chiropractic, intentional injuries, child abuse

Introduction

Child abuse and neglect occurs in all cultures and nations throughout the world and is a major threat to the health and well-being of children. Maltreatment may result in physical injury and potential impairment of growth and development. The annual U.S. incidence of non-accidental injuries, or, as they are often termed in the field of injury prevention, intentional injuries, due to maltreatment in children is currently estimated to be in the range of 15 to 42 cases per 1,000 children. Of these, 1,200 children will die each year as an immediate consequence of abuse.[1] Childhood maltreatment has far reaching consequences. As these children grow up they place a disproportionate burden on the health care system and represent a significant factor in years of potential life lost to a community. People who have suffered intentional injuries as children face a significantly higher risk of suicide[2] higher rates of depression,[3] physical symptoms,[3,4] poorer self-assessed health status, [3,4] disability,[4] adult obesity,[5] type 2 diabetes,[5] cardiovascular disease,[6] cancer,[7] and mental health issues.[8,9] In addition to any direct relationship, poor health in survivors may be indirectly mediated by the increased prevalence of health of this population and breaking the cycle of abuse for future generations.[19-21] A key component of prevention is identification and reporting by health care providers. Warner and Hansen[22] state, "Identification and reporting of possible cases of child physical abuse are critical precursors to intervention with maltreating families." However, identification of intentional injuries in children is often missed by a variety of health care providers,[22-31] which is of considerable concern as perpetrators of the abuse are unlikely to self-refer for intervention and treatment.

There are many putative explanations for the failure of health care professionals to report maltreatment of a child including the belief that the abuse was a one-time occurrence, a reasonable explanation was given, the physician wanted to wait until the evidence was more conclusive, confidence in family dynamics, the physician's desire to manage the situation by his/herself, inability to affect change through child protective services, detrimental effects of reporting on the family unit, and the health care provider's lack of training.[24,26,28] In an attempt to reconcile these apparent deficiencies, various tools and training initiatives have been studied to determine their effect on abuse reporting. One of the key components of this training includes the recognition of intentional physical injuries.[32]

Recognizing intentional injuries in children

Detection of child abuse requires a high index of clinical suspicion, as caregivers often attempt to conceal or explain away concerns (see Table 1). Careful investigation and accurate documentation of physical signs and examination findings are imperative. In general, possible signs of

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Table 1. Warning signs of child abuse	
Physical signs	Unexplained bruises, welts, burns or cuts; unusual fractures; age inappropriate injuries; injuries that appear to have a pattern such as marks from a hand or belt; pattern of severe injuries
Behavioral signs	Child is shy or fearful; child appears afraid to go home; child fearful of being touched; child's clothing may be inappropriate such as long sleeved pants and shirts during hot weather
Caregiver signs	Physically abusive caregivers may display anger management issues and excessive need for control; the explanation of injury may not seem plausible and may be inconsistent with other family members description

abuse in a child include unusual behavior, learning delays, excessive watchfulness, and sometimes the desire to stay away from home and caregivers. Caregivers may show a lack of concern for the child, deny obvious problems, provide unusual explanations for injuries, view the child as worthless or show little physical affection for the child.

The two most common presentations of physical abuse are skin lesions and fractures, respectively.[1,33] Frequent bruising in unusual areas such as the back, chest, face, or around the mouth and any bruising in pre-ambulatory children should raise the suspicion of intentional injury. Other skin lesions highly suggestive of intentional injury are burns affecting the extremities, buttocks and/or perineum caused by immersion in hot water.[34] These burns appear to be symmetrical and have a clear upper margin and are often associated with other indicators of abuse such as old fractures or inappropriate bruising.[34]

Fractures in children, particularly in the absence of a plausible mechanism of injury, are also potential indicators of intentional injury.[35] Multiple fractures in various stages of healing and fractures in children under two years of age are also strongly suggestive of abuse.[1,36] Rib and metaphyseal fractures are the most often associated with intentional injuries and should involve a higher degree of suspicion of abuse.[1,35,37,38] However, any fracture is possible, such as vertebral compression fractures, skull fractures, and clavicular fractures, but appear to be less specific to abuse cases.[37]

Reporting of child abuse

The decision of the chiropractor to report an injury as abuse may be affected by his or her perception of the perpetrator's intention to harm the child. However, whether or not the patient or caregiver meant the event to lead to such an injury is of secondary importance when an injured child presents to the health care professional for care. The chiropractor uses clinical skills and judgement to decide if a child's injuries are due to abuse and /or neglect. Chiropractors are mandated reporters of suspected child abuse and neglect and are obligated in all jurisdictions to comply with the law. The Child Abuse Prevention and Treatment Act (CAPTA), managed by the Department of Health and Human Services, provides minimum criteria for child abuse and neglect, as well as funding for research, investigation, and treatment to state agencies. The law requires physicians, counsellors, teachers, nurses, and other professionals to report suspected cases of child abuse to local law-enforcement officials, social services, or child protective services. Informers are kept confidential to promote reporting of suspected abuses. Each state is responsible for implementing federal minimum criteria and any additional state-specific guidelines within its own civil and criminal codes (See Table 2). Not all states have specific emotional-abuse laws. A state-specific online searchable database is available through the Child Welfare Information Gateway *(http://www.childwelfare.gov/)* and additional resources are available from the Centers for Disease Control *(http://www.cdc.gov/ViolencePrevention/childrenmaltreatment/index.html)*

Health care professionals often are concerned about professional and personal liability if investigators determine the report to be unsubstantiated, or if law enforcement officials do not arrest a perpetrator. Should an angry parent file a lawsuit against the reporter, most state statutes provide immunity from civil and criminal liability to all mandated reporters who report suspected abuse in "good faith." This is true even in cases in which the report is investigated and determined to be unsubstantiated or not indicated. This does point out the need for careful, accurate documentation of the case including statements made by the child, family members and other caregivers. Documentation should include the names of all persons making statements or exhibiting behavior and his or her relationship to the child, date and time of the statement, exact words (using quotation marks when appropriate), demeanor of the person making the statement and names of those present when statements are made or behavior is observed.

An abused child may present with any type of physical injury and as such it is imperative that the chiropractor view the case in context, with a holistic view of all aspects

Table 2. Where to call to get help or report abuse*
• To get help in the U.S., call: **1-800-4-A-CHILD (1-800-422-4453)**
• To get help for childhood sexual abuse, call: **1-888-PREVENT (1-888-773-8368)**
• To get help for rape, abuse or incest, call: **1-800-656-HOPE (1-800-656-4073)**

* If you suspect a child is in immediate danger contact law enforcement as soon as possible.

of the case including sociodemographics, psychological profile, parent-child interactions, in addition to a complete physical examination. Kemp and colleagues[36] also strongly advocate the use of diagnostic imaging in children less than two years of age when abuse is suspected.

As a health care profession in which direct personal contact, visual observation, and radiographic evaluation often occur during the examination and/or treatment of the musculoskeletal system, chiropractors are well situated to recognize the signs of intentional injuries in children.

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Injuries in the Pediatric Patient: Review of Key Acquired and Developmental Issues

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ABSTRACT

A plethora of conditions target specifically children and adolescents which are not prevalent in the adult population. Understanding the age-related differences in this population can help clinicians improve diagnosis and therefore management of these conditions. Though it is beyond the scope of this paper to extensively address diseases targeting the pediatric population, common key injuries will be discussed with emphasis on the role imaging plays in establishing accurate diagnosis.

Key words: pediatric trauma, growth plate fractures, slipped capital femoral epiphysis, incomplete fractures, torus fracture, spondylolysis, pars interarcularis defects, single photon emission computed tomography, Scheuermann's disease, ring apophyseal fracture

Introduction

A plethora of conditions specifically target children and adolescents which are not prevalent in the adult population. Understanding the age-related differences in this population can help clinicians improve diagnosis and therefore management of these conditions. Though it is beyond the scope of this paper to extensively address diseases targeting the pediatric population, common key injuries will be discussed with emphasis on the role imaging plays in establishing accurate diagnosis.

Obesity and the musculoskeletal system

An alarming statistic in the United States is the prevalence of obesity, defined as mean Body Mass Index (BMI) greater than 95th percentile, being reported as approximately 17% in children and adolescents.[1,2,3] The reason for this is most likely multifactorial. Lack of physical activity, increase in caloric intake and environmental factors are all potential contributors.[2] Addressing the underlying cause of obesity in a child or an adolescent is paramount. Additionally, an important role of chiropractic clinicians is to anticipate how obesity may affect the musculoskeletal system. Several key comorbid conditions are commonly reported: slipped capital femoral epiphysis, Blount's disease and genu varum, genu valgum, increased musculoskeletal pain, increase risk of fracture, impact on gait and function, and arthritis are most commonly reported.[2] (Table 1)

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Slipped capital femoral epiphysis

As the most common orthopedic hip condition affecting adolescents it is imperative that chiropractic physicians are aware of the clinical manifestations, establish early diagnosis, facilitate best treatment and participate in postoperative care of patients with slipped capital femoral epiphysis (SCFE). (Table 2) Chiropractors play a vital role in each step of the management of adolescents with this condition. The incidence rate has been reported as 10.80/100,000 with boys being 13.5 and girls 8.0.[4] When compared to whites, SCFE was found to be four times as prevalent in blacks and over two and one half times as prevalent in Hispanics.[4] The best prognosis correlates with early diagnosis. A thorough knowledge of etiology, clinical manifestations and classification, imaging protocol and radiologic findings is essential. As mentioned previously, this disease appears to be more common in obese adolescents and is thought to increase a shear stress across the physis. Other etiologic factors such as local trauma, inflammatory and endocrinological factors, and previous radiation are reported.[5,6] (Table 3)

Critical to proper management is an understanding of the classification of slipped capital femoral epiphysis (SCFE). A common classification system is currently used to identify a stable versus unstable SCFE.5 (Table 4) An adolescent that is unable to bear weight on the affected leg, limps in external rotation and experiences pain with any hip motion most likely has an unstable SCFE.[5] Caution should be taken when imaging these patients with an AP pelvis view usually sufficient to demonstrate the slippage. With unstable slips, the patient is at increased risk for development of avascular necrosis necessitating

Table 1. Musculoskeletal effects of obesity in children and adolescents

Effects of obesity on musculoskeleton (Key comrbid conditions)
■ Slipped capital femoral epiphysis
■ Blount's disease and genu varum
■ Genu valgum
■ Increased musculoskeletal pain
■ Increased fracture risk
■ Impact on gait and function
■ Arthritis

emergent orthopedic referral with hospitalization.[5] In our ambulatory care clinics, patients with stable SCFE are more commonly encountered than patients with unstable SCFE. Establishing diagnosis in these patients can be challenging and special attention needs to be given to the proper imaging protocol. Knowledge of the subtle radiographic is of critical importance.

Radiographic evaluation in a patient with a suspected stable SCFE should include bilateral AP and bilateral frog-leg lateral views since up to 60% of patients have bilateral slips at the time of diagnosis.[5] Key radiographic findings include an abnormal Klein's line, haziness of the physis and relative loss of height of the epiphysis. On the AP view only, the lack of superimposition of the acetabulum with the medial corner of the metaphysis that is adjacent to the physis strongly suggests SCFE. (Figure 1) If this finding is present on the AP view, the clinician should carefully evaluate the frog-leg lateral view for other radiographic evidence. The frog-leg lateral view is the most sensitive for detecting subtle slippage. (Figure 2)

Figure 1. *AP pelvis of an adolescent female with insidious onset of right hip pain. Lack of superimposition of the acetabulum and the medial corner of the metaphysis adjacent to the growth plate raises the index of suspicioun of slipped capital femoral epiphysis. Additionally findings are abnormal Klein's line and haziness of the physis.*

Figure 2. *Frog-leg lateral view demonstrates an abnormal Klein's line, a line drawn parallel to the superior edge of the femoral neck does not intersect the epiphysis.*

A general rule for clinicians to remember is that the earlier the SCFE is identified, the better the prognosis. If not treated in its early stages there is a high morbidity including loss of hip motion, pain, arthritis, avascular necrosis and chondrolysis. (Table 4) If the clinician has a strong index of suspicion of SCFE in a patient with negative plain films, magnetic resonance imaging should be ordered. In the presence of a unilateral slippage, the patient should be monitored for at least one year since there is a 25% to 40% incidence of developing a contralateral SCFE.[6]

The treatment goal for SCFE is to prevent progression

Table 2. Key roles of chiropractic physicians in managing pediatric patients with SCFE

Key roles of chiropractic physicians
■ Establish early diagnosis — early diagnosis provides best chance to achieve treatment goals
■ Address causes such as obesity
■ Ensure proper referral for treatment — orthopedic surgeon referral or emergency room
■ Postoperative care
■ Monitor for complications

Table 3. Most likely etiologies of SCFE

Most likely multifactorial etiology
■ Local trauma
■ Obesity causes shear stress across physis
■ Inflammatory factors
■ Endocrinological factors
■ Previous radiation therapy
■ Idiopathic (majority)

and slippage with in-situ fixation of the epiphysis with pins or a screw. (Figure 3) This procedure allows for immediate weight-bearing by the patient, has low further slippage rate, and helps prevents complications. Surgical follow-up in these patients occurs at 6 weeks, 3 months, 6 months, and 1 year. Clinicians should encourage patients to adhere to a closely monitored treatment plan during this time.

Kids don't sprain, they break

A helpful maxim to remember when dealing with child or adolescent trauma is "Kids don't sprain, they break". This reminds the clinician to carefully scrutinize radiographs for fractures unique to this population such as incomplete and growth plate. Typically in our offices we evaluate pediatric patients who have sustained a low-velocity injury such as a fall. Many of these fractures are easily managed through close reduction and casting for a short period of time and normal function is restored. As a general rule, fractures in children heal twice as fast as fractures in the mature skeleton. The periosteum in the child is thick with excellent osteogenic capabilities allowing creation of a stable union with less potential for displacement as compared to the adult.[7] Non-unions are rare in the pediatric population.

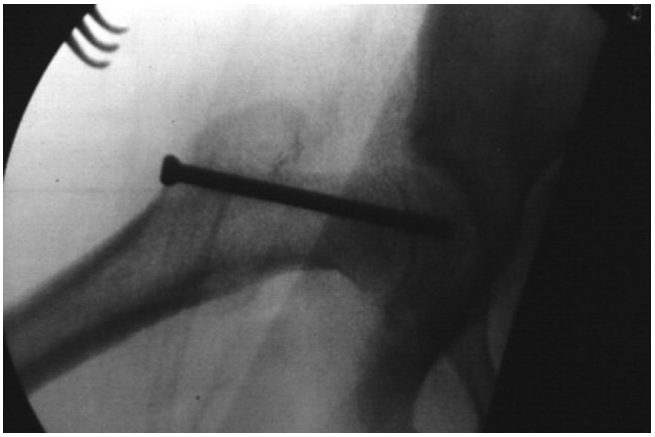

Figure 3. *The treatment goal is to prevent progression of slippage that is usually accomplished with in-situ fixation of the epiphysis with stable SCFE.*

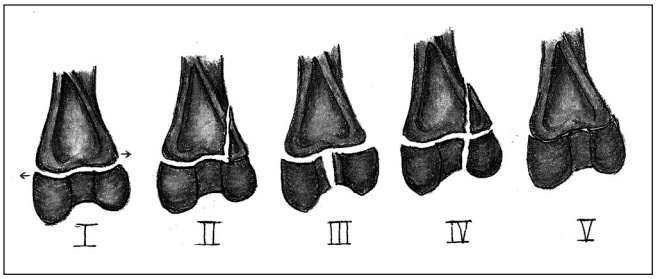

Figure 4. *The Salter-Harris Classification*

Skeletal trauma as a sign of abuse. Being cognizant of the signs that suggest a more serious situation, however, is vital. Skeletal trauma is the second most common manifestation of abuse. A telltale sign of nonaccidental trauma in a young child is the classic metaphyseal lesion (CML) which most frequently involves the distal femur, proximal and distal tibia, and proximal humerus.[8,9] The CML represent microfractures that cross the metaphysis with the fracture line parallel to the physis and perpendicular to the long axis of the involved bone. Generally the thicker peripheral rim is more visible and when viewed in profile appears as a triangular fracture known as a corner fracture. The mechanism of injury is due to horizontal shear force across the metaphysis as a result of violent holding and shaking of an infant by the feet or hands.[8] It is unusual to see this injury in a child over 18 months. Additionally, any fracture in a nonambulatory child should raise suspicion of child abuse. In a study by King et al, the majority of abusive fractures were in the long bones.[8,9] Key fractures that should raise suspicion of abused children are the classic metaphyseal lesion as discussed earlier, scapulae fractures, spinous process fractures, sternal fractures and first rib fractures.[9] The first rib fracture is considered diagnostic of nonaccidental trauma.[9]

Growth plate fractures

Clinicians should be aware that fractures through the growth plate can be difficult to interpret in the absence

Table 4. Classification and presentation of patients with SCFE

Stable SCFE	Unstable SCFE
■ Able to bear weight on affected leg with limp	■ Unable to bear weight on affected leg
■ Knee, hip, groin, thigh pain, or all	■ Knee, hip, groin, thigh pain, or all
■ Limited internal rotation	■ Limp in external rotation
	■ Any hip motion is painful

Figure 5. *The normal appearance of the fifth metatarsal apophysis runs parallel with the long axis of the fifth metatarsal and should not be misinterpreted as fracture.*

of displacement. Anticipating growth plate fractures will increase level of suspicion of subtle findings on plain film radiographs and hopefully improve diagnosis. If these fractures are not recognized growth plate disturbances such as progressive angular deformity, limb-length discrepancy, or joint incongruity may result. Growth plate fractures represent 15% of all pediatric fractures and almost all lead to growth arrest with the exception of the distal radius.[10] Distal femur and proximal tibia, although infrequent sites, carry a high incidence of post-traumatic premature fusion and should be carefully monitored for these complications.[10] The Salter-Harris Classification is typically used to report these fractures. (Figure 4) In addition to physeal fractures at the ends of the long bones, apophyseal regions are also vulnerable to injury in pediatric population. A mimicker to be aware of when assessing the pediatric foot is the apophysis of the fifth metatarsal. The normal appearance of the fifth metatarsal apophysis runs parallel with the long axis of the fifth metatarsal and should not be misinterpreted as fracture. (Figure 5) The pelvis region is particularly vulnerable in young athletes. Clinicians should be aware of potential for injury at the ischial tuberosity, anterior inferior iliac spine, anterior superior iliac spine and iliac crest. (Figure 6) Analogous to the growth plate of the long bone is the ring apophysis of the vertebral body. A weak region exists between the ring apophysis and the vertebral body where displacement may occur. The imaging modality that best demonstrates the presence of the displaced ring apophysis is computed tomography. (Figure 7) Fractures at these sites are often accompanied by disc herniation. An adolescent patient with a disc herniation associated with ring apophysis fracture generally has more severe pain and radiculopathy.[11]

Imaging of traumatic causes of back pain in adolescent athletes

Common conditions to cause back pain in adolescent athletes include spondylolysis with or without spondylolisthesis, intervertebral disc herniation and the aforementioned vertebral apophyseal fracture. Selection of the proper imaging modality will improve diagnosis of these conditions. The first imaging modality typically selected in the adolescent athlete with back pain is plain film; however, understanding the limitations of this modality is critical. Pars interarticularis fractures without associated spondylolisthesis, stress reactions of the pars interarticularis regions, intervertebral disc lesions and vertebral body endplate fractures can be overlooked with plain film imaging. If the clinician's index of suspicion is high for acute pars interarticularis fracture single photon emission computed tomography (SPECT) is recommended. The thin-cut CT slices with SPECT imaging improve the visualization of a stress reaction or stress fracture of the pars interarticularis

Figure 6. *Avulsion fracture of the ischial tuberosity.*

Figure 7. *Computed tomographys best demonstrates the presence of the displaced ring apophysis.*

region and directs the clinician in determining if immobilization with a goal of healing the injury is needed.[12,13] Clinicians should also be aware that a normal plain film and SPECT does not rule out the possibility of serious underlying pathology. Magnetic resonance imaging has been shown to be of value in the depiction of serious occult disease processes.[14,15] Another limitation of plain film radiography is its difficulty in providing direct visualization of significant intervertebral disc lesions including intraosseous disc herniations (Schmorl's node). These lesions are best depicted with magnetic resonance imaging. As mentioned previously, associated vertebral apophyseal fractures are best imaged with computed tomography.

Diseases related to growth disturbances

A potential source of confusion for clinicians when evaluating back pain in a pediatric patient is a lumbar variant of Scheuermann's disease. Back pain has been reported to be present in 20% to 30% of adolescents with this condition.[13] The classic radiographic presentation of Scheuermann's disease includes >5 degrees of anterior wedging in at least three adjacent vertebrae along with one associated sign.[13] These associated findings include Schmorl's nodes, irregularity and flattening of vertebral endplates, narrowing of intervertebral discs, and anteroposterior elongation of apical vertebral bodies.[16] Unlike the classic Scheuermann's disease, the lumbar variant may affect a single level with the vertebral wedging usually less severe. These patients are more likely to be symptomatic and are more likely to have progression into adulthood.[2]

Conclusion

As mentioned throughout this article, it is imperative that clinicians have thorough knowledge of musculoskeletal injuries that target the pediatric population. Carrying a high index of suspicion, improving interpretation skills and ordering the most appropriate imaging modality will further improve recognition of these conditions resulting in proper management and a decrease in complications and comorbidities known to be associated with these injuries.

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Counseling on Unintentional Injury Prevention: How Chiropractors Can Help Keep Children Safe

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ABSTRACT

Unintentional injury is the leading cause of death in all children over the age of one year. All providers of health care for children should provide their patients and their parents with guidance on injury prevention. This article summarizes the leading types of injuries for each age group and outlines the basic evidence-based recommendations on guidance by health care providers for child safety. It also provides appropriate resources that chiropractors can use and/or disseminate to their patients on child safety.

Key words: chiropractic, injury prevention

Epidemiology of Childhood Injury

In the United States and other industrialized countries, unintentional injuries are the leading cause of death in all children over one year of age.[1] Worldwide, nearly 1 million children under age 18 die, annually, due to unintentional and intentional injuries, with unintentional injuries responsible for 90% of those deaths.[2]

Fatal injuries. Over 12,000 children are killed each year by unintentional injuries. Boys have a higher death rate than girls. With respect to race, American Indian/Alaskan Natives have the highest death rate, while Asian/Pacific Islanders have the lowest. Whites and African Americans have approximately equal injury death rates.[3] For children over one year of age, unintentional injuries are the leading cause of death; for infants (< 1 year of age), they are the fifth leading cause of death (Table 1). It is particularly disturbing that intentional injuries — homicide and suicide — are also among the leading causes of death, being 3rd or 4th for children older than one year. Table 2 details the leading causes of unintentional injury deaths, which are dominated by motor vehicle and transportation-related injuries, with children as either passengers or pedestrians.

Nonfatal injuries. Over 9 million U.S. children annually have an emergency room visit to treat an unintentional injury.[3] As with fatal injuries, boys have a higher rate than girls. Table 3 addresses the leading causes of nonfatal injuries, with falls being the leading cause of nonfatal injuries up to age 15.

Is Counseling Patients on Injury Prevention Effective?

Injury prevention and control is an area where a very large body of evidence has been developed, examining risk factors for injuries and evaluating methods to prevent them. The National Center for Injury Prevention and Control (NCIPC), part of the Centers for Disease Control and Prevention (CDC), was established with the mission of preventing injuries and violence, and reducing their consequences. The NCIPC addresses both intentional injuries (violence, including homicide and suicide) and unintentional injuries, the preferred term for "accident." Accident implies that the incident was unavoidable, and most "accidents" actually have precipitating factors which can be modified.[4] There are many proven methods to reduce risk factors for injury and to limit the consequences of injuries, many of which are community based (soft surfaces in playgrounds, for example) or legally mandated (such as use of infant car seats and seat belts). There are also many safety practices which parents can take voluntarily to safeguard their children.[5]

Evidence is building that health professionals, in clinical settings, can have a positive impact on safety practices designed to correct some of the factors contributing to childhood unintentional injuries.[1,5] The evidence of the utility of health care providers counseling parents and children on injury prevention is such that in 1983, the American Academy of Pediatrics established The Injury Prevention Program (TIPP).[5] TIPP, which can be accessed at *http://www.aap.org/family/tippmain.htm,* includes comprehensive instructions for providers to ensure that they supply patients with the best injury prevention information.

Counseling is most effective when it is tailored to the child's developmental stage and to the family and social environment.[5] That is, different age groups are at risk for different types of injuries. With infants or very young children, the parent and caregivers need to be the primary target for counseling, while older children should be included along with their parents in the conversation about

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Table 1. Leading causes of death in U.S. children ages 0-19, by age group.*

Rank	< 1 year	1-4 years	5-9 years	10-14 years	15-19 years
1	congenital anomalies	**unintentional injury**	**unintentional injury**	**unintentional injury**	**unintentional injury**
2	prematurity	congenital anomalies	cancer	cancer	homicide
3	SIDS	cancer	congenital anomalies	**homicide**	**suicide**
4	complications of pregnancy	**homicide**	**homicide**	**suicide**	cancer
5	**unintentional injury**	heart disease	heart disease	heart disease	heart disease

* Intentional and unintentional injury causes are shown in bold. Source: National Center for Health Statistics, 2006 data.

safety. With adolescents, the primary target should be the teen, including the parents as support.

There are innumerable resources available, but many parents may not be aware of them or know how to select the most appropriate ones for their family. Table 4 details resources from which chiropractors can either obtain handouts for their patients, or to which they can direct the patients to access the information themselves. Specific topics that should be discussed with parents and children, by age group, are discussed below.

Recommended Counseling by Age Group

All Children

Parents should have training in cardiopulmonary resuscitation (CPR) for the applicable age groups of their children. They should also post near the phone or program into their phone the numbers for the local emergency medical services, poison control, and other emergency numbers.[5] Table 4 provides sources of handouts and other resources to help parents "child-proof" their homes and vehicles. A general rule of injury prevention is that passive prevention, which refers to methods which do not require that people have to think about it and take action, is far more effective than active prevention, where people must decide to voluntarily take a specific, appropriate action.[4] Airbags and childproof caps on medicine are examples of passive protection, while supervising small children in the bath is an example of active prevention.

Infants

As shown in Tables 2 and 3, the chief safety concerns for infants are suffocation, motor vehicle (MV) injuries, drowning, falls, being struck by or against objects, bites/stings and fire or burns. Most of these injuries occur in the home or indoors, with the exception of MV injuries. The following topics should be priorities for families with infants:[5]

- **Choking prevention:** Parents should make sure children do not have access to objects large enough to lodge in their airway, or items like plastic bags and balloons, which can also obstruct the airway if swallowed. See Table 4 for handouts and resources (such as a small-item tester). At a minimum, parents should:
  - Check toys for loose parts.
  - Check curtain and window blind cords to be sure they are out of reach.
  - Check all rooms and yard to remove small objects that could choke a child.
- **MV safety:** Use infant car seats correctly — rear-facing in back seat, not in the front seat with a passenger-side airbag. Small children should never be left alone in the car.[6,7] Parents need to wear their seat belts too! Parents serve both as mentors to establish good safety habits and a seatbelted parent may reduce the risk of MV accident/death for the child.
- **Water/bath safety:** Infants most often drown in the bath or other containers such as buckets. Therefore, the best drowning prevention is to never leave a baby — even if they are in a bath seat — unattended near any body of water, no matter how small the body of water is.
- **Fall prevention:** Passive prevention devices such as window guards/locks and stairway gates are more effective than active prevention (such as picking the baby up when he/she gets near a hazard). For fall hazards such as changing tables, beds and sofas for which passive prevention is impossible, infants should never be left alone even for a moment.
- **Burn prevention:** Parents should set hot water heaters to no higher than 120^0 F. All electrical outlets should be covered by means of child-proof outlet

Table 2. Leading causes of unintentional injury death in U.S. children ages 0-19, by age group.*

Rank	< 1 year	1-4 years	5-9 years	10-14 years	15-19 years
1	suffocation	drowning	MVT[1] (occupant)	MVT[1] (occupant)	MVT[1] (occupant)
2	MVT[1] (occupant)	pedestrian	MVT[1]	MVT[1]	MVT[1]
3	drowning	fires/burns	pedestrian	pedestrian	poisoning
4	MVT[1]	MVT[1] (occupant)	fires/burns	drowning	MVT[1]
5	other injuries	MVT[1]	drowning	MVT[1]	pedestrian

* Data from the Modified Matrix are shown; source: Centers for Disease Control and Prevention, 2001-2005 data.
[1] MVT, Motor vehicle/transportation-related causes; if "occupant" is not indicated, the location of the injured person was not specified.

plugs. Smoke alarms should be installed and checked regularly; one easy way to ensure this is to tell parents to check the batteries when the time changes in the spring and fall. Liquids should never be heated in the microwave because the heat is distributed unevenly and may burn the infant's mouth.

- **Sleep environment safety:** Soft materials or soft surfaces (feather beds, soft couch cushions, pillows, etc) should be avoided because of the hazard of suffocation. Always keep crib sides up and locked into place. Infants should sleep in a supine, rather than prone, position.

Preschoolers

As shown in Tables 2 and 3, the chief safety concerns for preschoolers (ages 1-4) are drowning, MV-related injuries, falls, being struck by or against objects, bites/stings and cuts. Preschoolers should be introduced to basic safety rules so that these rules become habits and the children become actively involved in learning about the importance of safety. However, this age group should not be relied on to implement all behaviors on their own. The following topics should be priorities for families with preschoolers:[5]

- **Water safety:** Preschoolers are less likely to drown in the bath but more likely to drown in pools or spas. Such items should be safety fenced on all sides and have secure self-closing gates. Preschoolers should never be allowed to play in the water unsupervised.
- **MV safety:** Children over 1 year and 20 pounds may sit in a forward-facing safety seat, although it is preferable to keep them rear-facing until they reach the highest allowable weight for the seat. They should always be placed in the back seat.[6,7] Preschoolers must be closely supervised around cars, including streets, driveways and garages. This age group needs to start using helmets for tricycles and bicycles, even with training wheels.
- **Fall prevention:** The same recommendations as for infants should be followed.
- **Burn prevention:** This is also the same as for infants, with the addition of keeping toddlers, who are highly mobile, away from oven doors, irons and iron cords, radiators, heaters and grills. Parents should make sure hot liquids are out of children's reach.
- **Poison prevention:** In addition to keeping the local poison control number posted or programmed into parents' phones, all medicine, vitamins and other supplements, household cleaning and automotive products should be kept out of children's sight, preferably locked with childproof latches if possible. Ipecac, which had been considered a staple of poison prevention for many years, is no longer recommended. In fact, it is recommended that parents safety dispose of Ipecac they may have in the home.[8,9]
- **Firearm safety:** Firearms, especially handguns, should never be kept loaded; ammunition and unloaded guns should be kept in separate, locked cabinets.
- **Prevention of other types of injuries:** Sharp objects like knives and scissors should always be kept in a secure place; fans should always have childproof guards or be kept well out of reach.

School-aged children

As shown in Tables 2 and 3, the chief safety concerns for school-aged children (ages 5-12) are MV injuries, fires/burns, drowning, falls and being struck by or against objects. School-age children should continue to be actively involved in learning about safety, and understand how important their behavior is. Parents also need to remember that they should model safety behavior with their children, such as always using their own seat belts in the car. Establishing good safety habits is extremely important.

Table 3. Leading causes of nonfatal unintentional injuries in U.S. children ages 0-19, by age group.*

Rank	< 1 year	1-4 years	5-9 years	10-14 years	15-19 years
1	falls	falls	falls	falls	struck/object[1]
2	struck/object[1]	struck/object[1]	struck/object[1]	struck/object[1]	falls
3	bites/stings	bites/stings	bites/stings	overexertion	MV— occupant
4	fire/burns	foreign body	cut/pierce	cut/pierce	overexertion
5	foreign body	cut/pierce	pedal cyclist	pedal cyclist	cut/pierce

* Source: CDC Childhood Injury Report: Patterns of Unintentional Injuries among 0-19 Year Olds in the United States, 2000-2006.
[1] Struck by or against object

The following topics should be priorities for families with children in this age group:[5]

- **MV safety:** Children should graduate to a booster seat when they attain the highest allowable weight and height for their car safety seat. They should stay in the booster seat until they are tall enough to fit into the car's shoulder belt, which is usually about 4'9".[6,7] Children should always wear helmets on bicycles, never ride in the back of a pickup truck, and should not use an all-terrain vehicle until they are 16 years old.
- **Water safety:** Children should learn to swim when they are 5 years old, but should never swim alone. When boating, it is essential that they use approved flotation devices.
- **Firearm safety:** The same recommendations apply to children in this age group as to the younger ones. In addition, parents should ask their children if there are guns in any of the homes of friends with whom they play. Parents should instruct their children that if they ever encounter a gun anywhere, they should not touch it and should go find and tell an adult about it immediately.
- **Sports safety:** Each sport's safety rules, equipment, and conditioning should be observed and the adults supervising should make sure children adhere to them. Protective equipment for cycling, skating and skateboarding should be used.

Adolescents

As shown in Tables 2 and 3, MV injuries, poisoning, falls and being struck by or against an object are the chief safety concerns for adolescents. Teens must be considered the primary target in discussions of safety, and it should be part of a discussion of healthy lifestyle in general. Parents should be considered their support system, but it is essential that teens' desire for independence be respected. Since peer pressure is very important in this group, schools and community groups need to be included as well, in order to diminish the opportunities for the risk-taking behavior so characteristic of adolescence. The following topics should be priorities for families with teens:[5]

- **MV safety:** Teens need to be engaged in discussions of the role of alcohol, drugs, speeding and non-use of seat belts in MV crashes. Discussing how to decrease distractions while driving is important. Parents should provide guidance and rules limiting night driving and excessive numbers of passengers. Teens should use helmets when using a bicycle, motorcycle or ATV (although teens younger than 16 should not drive ATVs).
- **Water safety:** Teens should be aware of the risks of swimming alone or in sites where swimming is not permitted, as well as of the risks of swimming or boating under the influence of alcohol or drugs. They need to be cautioned not to dive into any body of water unless they are sure of the depth and/or possible obstacles such as rocks. They should also use flotation devices while boating.
- **Sports safety:** The recommendations for school-aged children also apply to teens.
- **Firearm safety:** The recommendations for school-aged children also apply to teens, and parents should recognize that firearms are even more dangerous to this age group because of their tendency toward impulsive action and risk-taking behavior, as well as the possibility of the presence of alcohol or drugs.

Conclusion

Chiropractors can contribute to national efforts to decrease unintentional injuries in children by providing resources on safety and evidence-based counseling to their patients.

Table 4. Online resources for injury prevention for children

Description of Resource	Agency/Organization	Website Link
"Do-It-Yourself Child Proof Your Home" Party Kit	American Red Cross	*http://childproofadvice.com/safetykit.aspx*
Checklists of a variety of safety topics, in PDF format	Word Press, providing checklists from Safe Kids, USA	*http://tharseo.wordpress.com/2007/04/10/do-you-know-these-child-safety-tips/*
Fact sheets on various topics	National Center for Injury Prevention and Control	*http://www.cdc.gov/injury/index.html*
Handout on choking prevention	WA State Department of Social and Health Services	*http://www.dshs.wa.gov/pdf/ca/choking.pdf*
National Child Safety Week information — press releases, fact sheets and other downloadable materials; includes calendar of annual safety-related events	U.S. Department of Transportation	*http://www.nhtsa.gov/childps/planner2009/*
Printable color, 6-page safety checklist	American Heart Association	*http://www.snivalleyfire.org/documents/CPR/HS%20AED/Child%20Infant%20Safety.pdf*
Printable color, 6-page safety checklist	Nick Jr.	*http://www.nickjr.com/printables/safety-printable-checklists.jhtml*
Safety checklists on various topics for parents and caregivers	Consumer Product Safety Commission	*http://www.cpsc.gov/cpscpub/pubs/chld_sfy.html*
Safety tips for parents on choking, motor vehicle and bicycle safety, falls, fire and burns, poison and drowning	Safe Kids Worldwide	*http://www.safekids.org/tips/tips.html*
Safety fact sheets and checklists on various topics	Safe Kids USA	*http://www.usa.safekids.org/index.cfm*
TIPP (The Injury Prevention Program) guide	American Academy of Pediatrics	*http://www.aap.org/family/TIPPGuide.pdf*
Traffic safety campaign planners, fact sheets, articles and other resources	U.S. National Highway Traffic Safety Administration	*http://ww w.nhtsa.gov/portal/site/nhtsa/menuitem.5928da45f995923816010310461 08a0c/*

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Chiropractic Treatment of Children: Reimbursement Issues

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ABSTRACT

In the United States, some incidents have occurred in which insurance carriers have used discriminatory policies to deny chiropractic care for children. This article explores the issue of discriminatory insurance reimbursement related to chiropractic care of children and provides strategies to address these issues when they occur.

Keywords: chiropractic: pediatric spinal manipulation, chiropractic cost effectiveness, chiropractic research.

Issues in insurance coverage of chiropractic care for children

Imagine successfully treating a 10 year old child for low back pain, torticollis, asthma, or otitis media, only to be denied reimbursement by the insurance company citing "treatment unproven and investigational." In 2007 one major national carrier released a policy which would have denied treatment to children and adolescents citing treatment as "unproven."[1] That policy was suspended but other discriminatory benefit policies still exist in scattered payor systems around the United States. When faced with improper denials, what should you do? How would you respond? This article explores the issue of discriminatory insurance reimbursement related to chiropractic care of children and provides strategies to address these issues when they occur.

Most large payors avoid obvious discriminatory policies by stating that reimbursement does not depend upon the age of the patient, but upon the ICD9 and CPT codes submitted. Therefore while many carriers do provide reimbursement for common childhood conditions managed by chiropractic physicians, others may take a more back-door approach for denials. Some carriers may implement internal edits which match certain diagnostic codes to employer identification numbers which identify the provider type, and when a chiropractic physician is identified, payment is denied. Chiropractors should report all improper denials to their national association. When a policy is identified that affects the treatment of children, our profession needs to act, as it did in 2007 to obtain the suspension of the policy mentioned above.

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For some outside of the chiropractic profession, treatment of children seems illogical, even dangerous. Why? Similar to the general population, most medical physicians and insurance administrators are unfamiliar with the literature related to the chiropractic management of childhood disorders. Additionally, most have never witnessed a spinal manipulation and/or do not consider the reality that chiropractic is a profession, not a procedure. All too often medically oriented providers and administrators reduce the chiropractic profession, for reimbursement purposes, to the single procedure of a chiropractic adjustment, coded as spinal manipulation(s) (ex., 98940-CMT 1-2 areas, or 98941, CMT 3-4 areas). Based upon licensure alone many insurers inappropriately deny reimbursement to chiropractic physicians for other medically necessary services such as E/M codes, nutritional analysis, advice on fitness, wellness, and prevention, which are all services normally reimbursed if provided by medical physicians.

The evidence base for chiropractic care for children with mon-musculoskeletal conditions

Noted attorney and author David Chapman-Smith points out that many critics suggest that chiropractic care for children is not appropriate since it is not yet supported by randomized controlled trials (RCTs). However, this is not really an adequate reason for denial of care, since most medical and other healthcare interventions, including physical therapy, are also not supported by RCTs.[2]

Chiropractic physicians could avoid reimbursement issues related to the treatment of children by first becoming familiar with the supportive literature. One comprehensive review regarding non-musculoskeletal conditions was published in 2007 and suggested that several conditions have good evidence supporting chiropractic management (not limited to spinal manipulation, but the entire clinical

encounter). Dr. Hawk and her team found that evidence was adequate to support the benefit of chiropractic care for the treatment of: asthma, cervicogenic vertigo, and infantile colic. Evidence was promising for potential benefit of manual procedures for children with otitis media. The authors also found that adverse effects of spinal manipulation for all ages and conditions were rare, transient, and not severe.[3]

The evidence base for chiropractic care for children with musculoskeletal conditions

Chiropractic physicians are trained to address the broad spectrum of musculoskeletal conditions/injuries. We often treat shoulder, elbow, wrist, hip, knee and ankle pain, in addition to other musculoskeletal conditions. In particular though, spine pain in children has become a huge problem and tremendous financial burden on society. A review of the literature reveals a higher prevalence for thoracic spine pain (TSP) in child and adolescent populations, and particularly for females. TSP was significantly associated with: concurrent musculoskeletal pain; growth and physical; lifestyle and social; backpack; postural; psychological; and environmental factors.[4]

Studies conducted in the United States and throughout the world consistently demonstrate the high incidence of low back pain in children. One study stated that LBP in childhood and adolescence is also as common a problem as that for adults. Another found that about every fifth child in the school-age population reports low back pain.[5-7] Given the prevalence of spine pain in children, and the limited training of medical providers regarding musculoskeletal disorders, it only seems logical that well-trained chiropractic physicians who specialize in the diagnosis and treatment of spine disorders function as primary care providers for this patient population.

Physician education related to musculoskeletal care

A significant amount of education and training in chiropractic college is focused on diagnosis and treatment of musculoskeletal disorders. In contrast, the musculoskeletal training in medical education has recently has been described as "woefully inadequate" in preparing medical doctors for the diagnosis and treatment of musculoskeletal conditions, and these deficits stem from the lack of educational and clinical training provided to medical students in musculoskeletal diagnosis and treatment.[8,9] In 1979 the Royal Commission of Inquiry on Chiropractic in New Zealand addressed the issue of medical incompetence for back pain. "The Commission has found it established beyond any reasonable degree of doubt that chiropractors have a more thorough training in spinal mechanics and spinal manual therapy than any other health professional. It would therefore be astonishing to contemplate that a chiropractor, in those areas of expertise, should be subject to the directions of a medical practitioner who is largely ignorant of those matters simply because he has had no training in them."[10]

How safe is Chiropractic?

A 2008 study of 781 case files of children younger than 3 years receiving chiropractic care found no serious adverse events.[11] A 2007 systematic review by Vohra et al found that although rare serious adverse events had been reported among children receiving chiropractic care, causation could not be inferred and that further study is needed.[12] The authors of a 2009 study reported in Spine conducted an electronic search in two databases: Pubmed and the Cochrane Library for the years 1966 to 2007. Their findings: "There is no robust data concerning the incidence or prevalence of adverse reactions after chiropractic."[13]

In 2007, the Council on Chiropractic Guidelines and Practice Parameters (CCGPP) reviewed the issue regarding attempts by insurance companies to deny payment for treatment of children. In their opinion policies which limit access to chiropractic physicians may result in the potential harm to children by denying medically necessary and evidence-based chiropractic care. The following issues, which were addressed in a joint letter to a major insurance carrier by the Council on Chiropractic Guidelines and Practice Parameters (CCGPP), the Congress of Chiropractic State Associations (COCSA), the American Chiropractic Association (ACA), the International Chiropractors Association (ICA), the Foundation for Chiropractic Education and Research (FCER), and the Association of Chiropractic Colleges (ACC) should be considered when issues related to reimbursement of chiropractic care for children arise.

Issue #1: Scope of practice

Many insurers who develop policies regarding "chiropractic services" presumably and mistakenly equate the licensure of the chiropractic profession with the single modality/procedure of spinal manipulation (ex., 98940-CMT 1-2 areas, 98941-CMT 3-4 areas). As is well-established, chiropractors are primary care/portal of entry physicians recognized by statute at both federal and state levels, e.g. Medicare, Medicaid, Department of Defense and Veterans Administration programs. The treatment of special

patient populations, children and adolescents, and specific conditions like headaches have been established for many years to be well within the scope of a chiropractic practice. Treatment includes not only spinal manipulation, but also active and passive therapeutic modalities, evaluation and management services, instruction on lifestyle modifications, diet and exercise, posture and nutritional advice and other facets of chiropractic practice. Chiropractic is not limited to just spinal manipulation and it is often unclear whether other aspects of a chiropractic clinical encounter are reimbursable.

Issue #2: Discriminatory policy/standards

Many insurers do not apply standards concerning research in equal fashion across the spectrum of healthcare professions. In fact, if every licensed profession were held to the same unrealistic standard being imposed by some payers on the chiropractic profession, many fewer treatments and drugs would be reimbursable by carriers.

Issue #3: Research

Research related to the adult population is plentiful. Literature related specifically to children is less voluminous; however, is it truly necessary? What evidence exists indicating that the spines of children and adolescents respond any differently to spinal manipulation and numerous other passive and active interventions used not only by chiropractic physicians, but medical and osteopathic physicians and physical therapists? What evidence exists that would suggest that children and adolescents are somehow immune to spine dysfunction, injury or pain? To deny coverage for a special population of patients based upon the lack of research is analogous to denying payment for spinal manipulation for patients living in West Virginia since no randomized trials exist for that population of patient. In our opinion, restrictions implemented based upon lack of research represents flawed logic in its application of research in a clinical setting. Does any literature exist suggesting that the spines of children and adolescents respond any differently to passive and active modalities and treatment compared to adult populations for which spinal manipulation has proven value?

For example, the literature clearly shows that children suffer significant back pain.[14] In fact, in a study of 1,126 children, the prevalence of nonspecific back pain increased dramatically during adolescence from less than 10% in the pre-teenage years up to 50% in 15- to 16-year-olds. Of 1,122 backpack users, 74.4% were classified as having back pain, accompanied by significantly poorer general health, more limited physical functioning, and more bodily pain. There is widespread concern that heavy backpacks carried by adolescents contribute to the development of back pain.[15]

Other contributing factors to the near epidemic of back pain in adolescents are: sedentary lifestyle, obesity, de-conditioning, excessive sitting, poor diet, etc. These issues not only can all be addressed, but are being routinely addressed with successful therapeutic outcomes, in the normal visit to a chiropractic physician.

Numerous recognized and respected guidelines support the use of spinal manipulation, along with other therapies, in the treatment of back pain. Recently, the widely-respected journal, *Annals of Internal Medicine* stated: "Recommendation 7: For patients who do not improve with self-care options, clinicians should consider the addition of nonpharmacologic therapy with proven benefits — for acute low back pain, **spinal manipulation** [emphasis added]; for chronic or subacute low back pain, intensive interdisciplinary rehabilitation, exercise therapy, acupuncture, massage therapy, **spinal manipulation** [emphasis added], yoga, cognitive-behavioral therapy, or progressive relaxation.[16, 17]

Issue # 4: Clinical skills, financial impact, and patient safety

Given the reality of back pain in children and adolescents, why would an insurer restrict access and benefits to the profession best suited to evaluate and treat such childhood conditions? Chiropractic physicians clearly possess more education and clinical skills in the area of musculoskeletal diagnosis and treatment compared to general allopaths and physical therapists. If restrictive policies are permitted, young patients will have nowhere to turn except to general medicine. Will that shift result in dollars saved? The answer is no. A limited or complete loss of chiropractic benefits will result in a shift and increased payment for traditional care with its inherent higher costs for treatment, diagnostics and risks associated with prescriptions and invasive procedures. Given the fact that our society, especially the young, is already overmedicated, does that policy make good fiscal or epidemiological sense? We, as a profession, are justifiably concerned that policies that restrict access to chiropractic physicians will force unnecessary drugs on children who suffer back pain and other conditions commonly treated by chiropractic physicians. The side effects of those drugs can easily be avoided by the use of more conservative chiropractic care.

Issue #5: Proper use of guidelines and best practice strategy in clinical practice

Restrictive policies often fail to consider that evidence/research is only one facet of a best practice strategy in clinical practice. Other equally important elements include clinical decision-making/experience, patient values, documentation, process of care, response to care, and risk stratification. Over reliance on literature is impractical in a clinical setting where all patients are unique. In the absence of a definitive body of literature, individual clinicians must rely on their clinical judgment to formulate reasonable parameters of care.[18] Recently, a formal consensus process on such parameters was conducted by a multidisciplinary group of experienced clinicians and researchers, funded by the Foundation for Chiropractic Education and Research.[19]

Issue #6: Civil rights of children

A major concern is the possible violation of civil rights against this special population, children. Discrimination based upon age is not acceptable in any venue. Given the lack of reason, science, logic, clinical applicability, and the apparent double standards imposed on chiropractic versus medical licensees, restrictive policies should be immediately withdrawn by the insurance industry. Forcing children into more invasive medical procedures, including medications, by denying coverage for more conservative treatment should not be acceptable to anyone.

In summary, if a chiropractor encounters discriminatory restrictive policies that prevent necessary treatment of children, he or she should alert the national association. In order to avoid, or at least diminish the potential for, denials follow these simple rules:

1) Become familiar with the literature regarding the most common conditions appropriately treated by chiropractic physicians.
2) Use the most appropriate diagnosis, including the musculoskeletal diagnosis, if spinal manipulation is the primary treatment utilized. It should be remembered that the chiropractor is often not treating a condition, such as colic, directly, but rather the spinal dysfunction causing the symptoms.
3) Avoid billing for diagnoses outside of those conditions supported by the literature.
4) Be sure to provide the treatment and modalities consistent with the injury/condition.

Successfully treating suffering babies and young children can be one of the most rewarding experiences for a chiropractic physician. At the same time, inappropriate denials often cause undue stress, dampening the enthusiasm generated by healthier children and their grateful parents. Our collective efforts in this ongoing fight for a level playing field must include education in every venue possible, including decision and policy-makers in the insurance industry. Doctors of chiropractic are truly gifted at spreading the good news of favorable research…among ourselves. The time has come to inform the rest of society of the cost effectiveness, safety, and efficacy of chiropractic healthcare. The educational process begins with each individual DC.

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Grand Rounds Case #1: Infantile Colic

PRESENTER

Sharon A. Vallone, D.C., F.I.C.C.P.

Sharon Vallone is in private practice in Connecticut and on the Postgraduate Pediatric Faculty (D.I.C.C.P.) of Palmer College of Chiropractic. She is also Chair of the Board, Kentuckiana Children's Center in Louisville, Kentucky.

Presenting case history and chief complaint

The parents of a 6-week-old male infant presents to the office with the chief complaint that for two concurrent weeks, their infant has had nightly episodes of inconsolable crying lasting from approximately 1 a.m. until 5 a.m. when he finally falls asleep exhausted and hiccupping. This is their second child and they have no memory of experiencing this type of problem with their daughter who is now three years old.

During these episodes, the infant draws his legs up to his chest alternately arching his head and back so violently that he turns onto his side. He clenches his fists and flails his arms and his face has a painful grimace when he is not screaming with pain. Bouncing him on their shoulder might quiet him for a moment or two, but he then erupts with louder wails. He refuses the breast, and will not be soothed with the usual means of swaddling, cuddling, rocking or driving around in the car that would always bring their first born out of any occasional distress that kept her from sleeping at night.

The mother related that she was in good health before her planned pregnancy and her pregnancy was unremarkable except for a moderate amount of "morning sickness" during the first trimester. She carried to 41 weeks gestation and went into labor without induction. No medications were administered. She labored for 12 hours and delivered her son with three pushes once they gave her permission to push. The umbilical cord was wrapped twice around the neonate's neck and had to be manually removed but his APGAR's were 8 and 9 at 1 and 5 minutes after birth.

The infant was put to breast 10 minutes after he was born and before his umbilical cord was cut and after some initial searching for the nipple latched on and nursed for 15 minutes. The mother's desire was to nurse exclusively but shortly after the birth she experienced excessive bleeding and a sudden drop in blood pressure and a retained placenta was suspected. She immediately underwent a D/C and received intravenous anesthesia, a blood transfusion and antibiotics. Formula was substituted for the next 72 hours of feedings till she was able to resume breastfeeding. By the time she was able to handle the neonate, he had developed an eczematous type skin eruption and was very gassy, but this resolved by 50% within 3-5 days after being exclusively breastfed. However, the baby continued to be gassy. He had frequent wet diapers and stooled at each feeding. Although his stool was of a pasty consistency and seedy nature of a breastfed baby, it was mucousy and greenish in color. Around the third week he developed a red, pustular perianal diaper rash which responded to an antifungal cream prescribed by the pediatrician. On one occasion the parents thought they saw a spot or two of blood in the stool. They called a hospital hotline, where the nurse assured them that it did not sound serious but to see their pediatrician if it occurred again. It did not occur again to their knowledge. All infant visits to the pediatrician for regular weight checks and immunizations were on schedule.

To date, except for the brief period in the hospital when he received a substitute formula, the infant was exclusively breastfed. Breastfeeding was not uncomfortable, although the mother felt as if she were not producing as much milk as she did with her daughter. At one or more feedings a day (usually later in the day), the infant would fall asleep at the breast within 5 minutes of latching. If she tried to remove him from the breast once he fell asleep, he would immediately become alert but appear disoriented, unable to latch, shaking his head back and forth or clamping on the nipple instead of suckling. If she detached him and relatched him carefully, he would nurse for another 15 minutes or longer. She attributed these difficulties to fatigue and the stress of caring for her older child and preparing the family meal.

The schedule of feeding and sleeping was very regular, feeding every 2 - $2^1/_2$ hours during the day and possibly going as long as $3^1/_2$ hours or 4 hours at least once, sometimes twice, during the night before he began waking between midnight and 1 am and crying inconsolably for the rest of the night into the early morning as initially described.

Visit to the Chiropractor

System survey was unremarkable. Physical exam revealed a quiet, afebrile infant with a ruddy pallor; weight was in the 50th percentile and head diameter and length

were in the 75th percentile on the growth charts. All infantile reflexes were intact and appropriate.

Since the parents observation was that the infant seemed to fall asleep quickly at breast, it was necessary to assess the efficiency of the suckle, mother's milk production, milk ejection reflex, and nipple integrity. Suck assessment demonstrated a disorganized suckle with the tongue unable to draw the finger into the mouth. Mother's nipples were also blistered and flattened after nursing.

Examination of the oral cavity revealed decreased mandibular excursion and a type 3 posterior tongue tie. A type 3 tongue tie is the attachment to the mid-tongue and the middle of the floor of the mouth and is usually tighter and less elastic.[1]

The submandibular muscles and the muscles of mastication were hypertonic. His abdomen was distended and firm, percussion revealing gas. Palpating the distended abdomen elicited a grimace and discomfort from the infant and he became agitated lying supine on the exam table. The distended abdomen appeared to interfere with flexion at the waist with the infant preferring an extended posture while in arms or on the exam table. There was evidence of a diaper rash with excoriation of the skin and pustular formation around the anus. There were several small areas of dry skin on the trunk and on the face. Chiropractic evaluation revealed extension of the occiput on C1, a posterior sacral apex, decreased rib excursion and flaring of the lower ribs with fixation of T9/T10 in extension. There was a palpable tension in the respiratory diaphragm and increased dural tension. No radiologic or laboratory evaluations were performed.

Differential diagnosis of an inconsolably crying infant was as follows:

1. infection — viral, bacterial, fungal
2. inflammatory — allergens, post immunization
3. trauma — including concussion, subluxation, strain/sprain, dislocation, fracture, trauma to nerve roots or peripheral nerves (including entrapment and avulsion)
4. metabolic — inborn error of metabolism, electrolyte abnormality, acid/base derangement, hypoglycemia
5. gastrointestinal — intussusception, dehydration, constipation, GERD, blockage by a foreign object, food allergy (rule out celiac disease), colic
6. neurologic
7. cardiovascular
8. failure to thrive due to impediment to breastfeeding (tongue tie, lack of suckle or rooting reflex, biomechanical dysfunction, soft tissue dysfunction)

Diagnosis: Infantile colic was the diagnosis by exclusion when a careful history and physical exam ruled out the above differential diagnoses. Infantile colic is a behavioral state characterized by unexplained bouts of inconsolable crying occurring more than 3 days out of the week and lasting longer than 3 hours. The onset is usually after 3 weeks of age peaking at 2 months and ending around the 4th month of life. The episodes usually occur in the evening or at night and the cry of a colicky baby is loud and painful, sometimes high pitched, and often described as piercing.

The parents were reassured that infantile colic is not a disease, rather a description of behavior associated with different and often multiple exacerbating factors like musculoskeletal derangement, food allergies, autonomic imbalance, etc. The cause is often multifactorial and requires a multimodal approach to care.

It was explained to the parents that when the baby falls asleep quickly while still at the breast, this suggests that he is expending too many calories for the number of calories he is ingesting. Therefore it was also necessary to assess the efficiency of the suckle and mother's milk production, milk ejection reflex, nipple integrity and any impediment to any of these.

Chiropractic care consisted of observation and correction of positioning and attachment, myofascial release of the cervical spine, occipitoatlantal junction, submandibular muscles, hyoid, dural tube and respiratory diaphragm followed by spinal adjustments in areas of segmental dysfunction. The mother again put the baby to breast while observing whether there was any improvement after treatment.[2]

The family was referred to a lactation consultant for further counseling including recommendations on pumping and supplementing with breast milk for continued weight gain of the infant and to promote maintenance of mother's milk production as well as a second opinion from the lactation consultant and or surgeon skilled in evaluating posterior tongue ties.

In addition to chiropractic care, the infant was put on a vegetarian probiotic formula daily to restore normal gut flora that might have been disrupted as a result of mother's

round of antibiotics.[3]

Although a recommendation was made to a naturopath for allergy testing (IgE/IgG), all known allergens were immediately removed from the mother's diet (elimination diet: milk, soy, eggs, corn and wheat) for several weeks. Foods were slowly reintroduced one at a time for 3-5 days each before adding a second food. Although Bath-Hextall et al[4] did not find good quality evidence to support the use of exclusion diets in atopic eczema, his mother found that milk, soy and corn would cause changes in eczema outbreaks, stooling habits and intestinal complaints.

With these changes in lifestyle and after several adjustments, the periods of inconsolable crying became shorter and less frequent and then resolved.[5]

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DISCUSSANT 1

Cliff O'Callahan, M.D., Ph.D., F.A.A.P.

Cliff O'Callahan is a member of the pediatric faculty of the Family Practice Group and Director of Nurseries at Middlesex Hospital in Middletown, CT. He is also Chair of the Section on International Child Health of the American Academy of Pediatrics.

This is a difficult situation for both infant and parents, and the other sibling! Parents get tired, frustrated, and mothers can be at increased risk for post-partum depression.

My first impression was that this child might have some cow milk protein intolerance with colitis. I agree with the move to ask the mother to remove milk from her diet — although I would have advised to eliminate all dairy and I would not have eliminated the other foods.

Even though this case presentation is not strong for GERD, based on the fact that this can be so stressful on the family and that the risk/benefit profile of ranitidine is so benign, I might suggest a trial of ranitidine at 8 mg/kg/day divided q12 hours. One would know if there is a benefit within 2-3 days. (Ranitidine (Zantac) *http://www.nlm.nih.gov/medlineplus/druginfo/meds/a601106.html).*

The finding of a type 3 sublingual frenular insertion is interesting mainly because someone noticed it. There seems to be remarkable variation in individual frenular insertion points. I become concerned when there is an associated breastfeeding history of difficult feeding with nipple pain and lip-sticking, poor production, smacking, and poor efficiency of feeding. Her feeding history, while not as clear-cut as her daughter's seemed to have been, is not terrible. I am not sure whether I would consider a frenotomy based on this history.

DISCUSSANT 2

Jennifer Tow, I.B.C.L.C.

Jennifer Tow is an International Board Certified Lactation Consultant (I.B.C.L.C.) with The Intuitive Parenting Network, LLC, in West Hartford, Connecticut.

The time frame for onset of symptoms in this infant suggests that the most likely culprit is a sensitivity to foods ingested through the mother's milk. Such a sensitivity tends to present after the first several weeks of life, with symptoms becoming more severe over time. Behavior such as inconsolable crying, arching the head and back and drawing the legs up to the chest are typical of infants with food sensitivities. Exposure to artificial infant milk in the post-partum period increases the risk of sensitivity and the fact that the infant experienced subsequent skin rash and gassiness is consistent with such a reaction. Pasty, green and mucousy stools are also consistent with food sensitivity, as is blood in the stool and diaper rash.

While diaper rash, gassiness, discomfort and poor feeding at breast may also indicate thrush, I would consider thrush to be likely secondary to primary gut damage, if present at all, given the infant's exposure to artificial feeds and the absence of nipple pain in the mother.

It must also be taken into consideration that one commonly sees such behaviors in children who are neurologically compromised due to birth trauma or who are struggling

to feed due to non-physiologic management practices. Such management is common when maternal milk supply is dis-regulated, however since it has been suggested that milk supply is actually compromised, a conclusion cannot be drawn without further assessment. Assessing feeding at breast is a key factor in determining whether management is a contributing factor, whether supply or flow is playing a role in the infant's discomfort and whether the infant is displaying competent state and feeding behaviors.

While the birth, as relayed, suggests normal physiology and progress, a visual assessment of the baby both at rest and at breast is used to provide insight into the possibility of structural misalignment. A suck assessment will assist in determining if an anomalous oral structure or an inefficient or disorganized suckle might be a factor. The possibility of tongue-tie must always be evaluated when feeding efficiency is compromised. All babies with persistent gut issues need to be evaluated for structural misalignment and treated appropriately.

Information on weight gain is not provided and could be informative. The feeding pattern as presented indicates an unusually long window between feedings and raises questions as to the mother's supply, the infant's competency at breast and the possibility that the infant may be avoiding feedings due to discomfort. Avoidance of feeding at breast is also consistent with food sensitivities.

It is not within the scope of practice of the IBCLC to make a medical diagnosis, however it is also the opinion of this practitioner that "infantile colic" is not a condition, disease or disorder, but is simply a term applied to a set of symptoms and behaviors that has underlying, resolvable causation.

Protocol for such evaluation and treatment includes assessment of feeding at breast, referral for muscle-testing of food sensitivities, referral to a pediatric chiropractor, referral for release of tongue-tie if necessary, supplementation of the infant with probiotics and healing of the mother's gut, if necessary.

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DISCUSSANT 3

Miela Gruber Cooley, N.D.

Miela Gruber Cooley practices at Forest Family Medicine in West Hartford, Connecticut.

This type of case is not uncommon, making this a great case for discussion. The baby's signs and symptoms--gas, green mucousy stool, screaming, arching, abdominal tenderness on palpation, abdominal distension and lack of flexion, are all obvious clues that this baby has severe gastrointestinal inflammation, leading to poor digestion, and ultimately pain. Colic has often been dismissed as just a part of infancy. However, this baby's clear cut symptomatology shows that it is actually a painful and abnormal state which healthcare providers should attempt to resolve by eliminating the causes. It has been my experience that in so doing, the so-called colic will improve. Colic should never be considered simply a normal developmental stage, and a baby screaming inconsolably always deserves our careful attention to discover what he is trying to communicate to us so vigorously! In so doing, we might be able to avoid having the baby develop more serious conditions down the road.

The child's tongue tie is likely to have contributed right from the beginning to the structural problems, as well as problems with feeding, establishing milk supply, proper gut function and motility. Following that, the baby was exposed to both formula and antibiotics at the same time due to the mother's hospitalization. Antibiotics, in eliminating the beneficial bacteria newly colonized in the baby's gut, will have made him more susceptible to both pathogenic organisms such as candida, which the baby did present with, and also disregulate the baby's normal immune function, leading to a tendency to atopy. We clearly see that the baby began to have atopic symptoms shortly after, and also a candidal diaper rash (although this baby's rash did respond to the antifungal cream, indicating candidal diaper rash, perianal itching and redness are also

common symptoms of food sensitivity or allergy). Just as the baby's GI mucosal barrier was being compromised by this dysbiosis, he was also exposed for the first time to formula. Formula, unfortunately, is made up of proteins with a tendency to be allergenic: cow's milk, corn syrup solids, and often soy as well. The parents say that they thought that there might have been blood in the stool. One intervention at this point that might have been helpful was to test the baby's stool not only for blood, but also secretory immunoglobulin A (SigA) antibodies to corn, milk, soy, wheat, and eggs. Because his mother's gut function would have also been compromised by antibiotics, she could have been tested as well. Infants' gut mucosa is naturally more permeable than that of older children and adults. This enables them to absorb the rather large immunoglobulin proteins from their mother, acquiring passive immunity. However, if the mother is also secreting antibodies to food, he will also absorb those. This is why the removal of allergens from the mother's diet was so instrumental in helping him recover.

There are a few supplements that are safe to use with breastfeeding mothers and infants that may have provided additional support. Beneficial probiotics have been well researched to help stimulate gut associated lymphoid tissue (GALT) immune function, diminish mucosal inflammation, reduce candidal overgrowth, and reduce atopic symptoms. Astragalus, althea and slippery elm are also safe to soothe and repair GI mucosal lining, even in babies. Biotin and olive leaf extract can be taken directly by both mother and baby to help control candida. The candida must be controlled to prevent thrush, breast infection, and the perpetuation of GI inflammation and the tendency to atopy. Candida can be tenacious and should be followed for at least three months. The discomfort caused by yeast die-off at the onset of treatment can be helped by giving small amounts ($^1/_4$ tsp) of activated charcoal or bentonite clay for a short time. It is interesting to see how the structural and biochemical problems are intertwined in this case, and how treating either one of them alone would have left unresolved issues that would have perpetuated the situation.

Lastly, homeopathy is often a powerful treatment modality when working with young infants and breastfeeding mothers. Again, both baby and mother should be treated. This baby was a classic case of chamomilla, with green stool, back arching, and inconsolable crying. However, there are many remedies for babies with stomach upset, such as aethusia, borax, lycopodium, nux vomica, arsenicum, sulphur, etc. Ideally, the baby could be treated for acute symptoms, and then treat both baby and mother constitutionally.

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DISCUSSANT 4

Joyce Miller, BS, DC, FACO, FCC

Joyce Miller is Senior Clinic Tutor at Anglo-European College of Chiropractic and Lead Tutor in the MSc Advanced Professional Practice in Paediatrics at Bournemouth University, UK.

This very compelling case of 6 week old crying baby with "colic" presents an atypical case rather than a typical case of infant colic. Colic typically presents earlier, by two weeks of age and secondly, tends to be unrelated to feeding issues. Any role for nutrition is likely to be found in only the small proportion of infants who are afflicted with a sensitivity to their food; that seems to be true in this case.

The disruption of breastfeeding in favor of 72 hours of formula feed within a few days after birth (time period not precisely given) may be a key to one of the primary problems of this child. Formula feeds were immediately associated with atopic symptoms which resolved by 50% after 3-5 days of resuming breastfeeding. Eczematous rash, blood and mucous in stool and nappy rash with excoriation are associated with the large protein damage to and inflammation of the intestinal lining of cow's milk protein intolerance. Oral tolerance (the mechanism which ensures that we are not allergic to all ingested foods) improves with age but is poor in this early phase of life. Another etiology or contributing factor could be the mother's use of antibiotics culminating in the elimination of normal

flora throughout her system and thus the inability to fluorinate the infant's colon.

Another issue is the infant's feeding practice. Due to the lack of data on height and weight or weight faltering, any failure to thrive issues are impossible to address. However, a diagnosis of colic is generally given only in cases where growth and development is considered normal, so I am basing this care plan on the idea that failure to thrive has been excluded as a concern.

I recommend the following management plan:

1) Maternal dietary restriction of all cow's milk products and soya products.[1] Substitute enriched rice milk, oat milk or pea milk if milk products are required. Avoid any cow's milk, goat's milk or soya based formula at all with the infant, the latter due to the possibility of cross-reactivity.[2-3]
2) Supplement the mother's diet with prebiotics and probiotics to reestablish proper flora in the colon following the antibiotic infusion.[4,5]
3) Do not supplement the infant diet with probiotics due to remote chance of reaction or over-recolonisation.[6]
4) Obtain a surgical consult for the tongue-tie.
5) Provide support for the mother-infant dyad with a lactation consultant.
6) Provide any manual therapy indicated for the musculoskeletal discomfort of the infant.
7) Surveillance of growth velocity and comparison of height, weight and head circumference data against the National Centre for Health Statistics is indicated to assure that there is no growth faltering.

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Grand Rounds Case #2: Teen with Back Pain Complicated by Obesity

PRESENTER

Robert A. Leach, D.C., M.S., F.I.C.C., C.H.E.S.

Robert Leach has been active in private practice for 30 years and is the author of The Chiropractic Theories: A Textbook of Scientific Research. *His primary research interests include studying potential subluxation mediator variables, as well as chiropractic as a wellness approach.*

History

This 17-year-old high school senior presented with a 5/10 (i.e., verbal scale, where 0 = no pain and 10 = unbearable pain) level of low back pain (LBP) that started 2 weeks ago. The onset was gradual and she believes it is related to poor posture while studying. However, she was also roller-skating around the time the LBP started, and she could not recall but admitted occasionally falling while practicing this recreational activity. Bending forward and standing worsen the pain. Pulling her knees to her chest relieves it to some extent.

She was not currently under any other provider's care, took no prescription or non-prescription drugs, and hasn't used any type of treatment for the LBP.

She reported having had a car accident in December 2007 that did not require medical treatment, and had no other relevant medical or surgical history.

She reported no regular exercise, only occasional roller-skating.

She has no prior history of LBP and has never received chiropractic care.

Physical findings

She had no other relevant systemic symptoms. Her vital signs were within normal limits but her BMI was 34 (height 5'3.5", 195 pounds).

Patient points to L5 as place of pain. Pressure pain threshhold (PPT) was assessed at various points bilaterally to the spine by use of a force gauge (algometry). The Fischer method was used at a rate of 1 kg/cm2/sec. Abnormal PPTs were documented bilaterally at L3 (i.e., 2.8 kg R; 3.5 kg L) and L5/S1 (i.e., 2.8 kg R; 2.7 kg L). Dorsal-lumbar ROM examination revealed flexion at 95 degrees was positive for reproducing the patient's primary complaint of L5 pain (i.e., pain is 5/10 at this level). No significant rib hump was noted during trunk flexion.

Oswestry Questionnaire reveals activities of daily living disability in the lumbar spine is 8%.

Radiological findings

The practitioner ordered a routine lumbopelvic x-ray study because the patient was unsure whether she hurt her back while roller skating and spinal trauma could not be ruled out.

Fair AP lumbopelvic alignment with mild R curvature apex T11, L apex L4 approximately 10 degrees. SIJ spacing is WNL. There is approximately 15 mm L anatomical short leg measured across acetabulae.

Lat LS film reveals hyperlordosis with mild loss L2/L3 and L5/S1 disc spaces, but good canal diameter and facet spacing.

Diagnosis

1. Lumbar myofascitis
2. Acquired curvature
3. Lumbar hyperlordosis
4. R/O Mild loss L5/S1 disc space

Plan

The patient was advised that up to 12 passive treatments during the next month (i.e., three times per week treatments until the patient is pain free, or has seen no further improvement in pain during the past week) may be needed to manage the current pain episode. She and her parents were advised through an oral and written report that lifestyle modification, including weight management strategies, were necessary to possibly prevent or at least reduce the likelihood of recurrence or worsening of back problems as she aged.

Treatment

Passive treatment included side posture lumbar adjustments and supportive therapies including moist heat, in addition to in home use of shower exercises twice daily for stretching as well as other lifestyle modifications. The

patient attended a spinal care class (i.e., 30 minutes of instruction using a power point presentation). After her back pain improved several weeks into her care, she was given floor exercises for core trunk strengthening, which consisted of two sets of abdominal flatteners and erector exercises for 3-5 seconds 10x each, twice daily.

During the spinal care class she was taught that many of the same underlying risk factors that cause chronic diseases and predispose to heart and brain attacks may also cause spinal degeneration and trigger "back attacks," such as her current pain episode. Specific examples were provided including smoking, weight gain, a sedentary lifestyle, and any disorder or risk factor that impairs circulation to the spine such as alcohol, diabetes, stress, or illicit drug use. It was explained that controlling these variables generally included primarily a three-pronged approach: a) improving activity levels (i.e., safely at first, generally by walking, using a treadmill, or swimming), b) monitoring diet (i.e., during the class patients are educated verbally, by power point, and by handouts, about further resources such as the www.mypyramid.gov website whereby they can learn how to increase their fruit and vegetable and fiber consumption while decreasing fats and red meats, exchanging water and diet drinks for other beverages high in caffeine and sugar, etc), and c) managing stress (i.e., including advice and web references regarding the importance of learning good coping skills to help with smoking cessation and weight loss, as examples).

Also during the course of care handouts were given that reinforced home care instructions and lifestyle recommendations including weight loss and activity changes.

Progress

After one month of chiropractic care (13 treatment sessions), the patient's self reported pain scores steadily fell to the level of 0-1/10 during the final three sessions, which triggered a dismiss evaluation. During the evaluation she basically denies any more pain except for mild 1/10 discomfort in her lower back and left hip when she is sleeping on her left side or crossing her legs when sitting. As a side note she admited that normally over the past few years she has LBP with her menstrual cycle that ranges up to 8/10, but that while receiving chiropractic adjustments her pain this month was no more than 5/10. She believes that the lifestyle changes, adjustments, and back exercises have helped her back. She walks regularly now and avoids using a heavy pack between classes.

Her weight is unchanged at 223 lb, leaving her BMI unchanged as well. However, all other physical findings are now within normal limits, including all PPTs. LS ROM no longer provokes LBP.

DISCUSSANT 1

Will Evans, D.C., Ph.D., C.H.E.S.

Will Evans is Director of Wellness Inititiaves at Parker Research Institute in Dallas, Texas. He has a PhD in health promotion from the University of Alabama, and is a Certified Health Education Specialist (C.H.E.S.).

Back pain in the adolescent population is increasing.[1] Furthermore, sedentary lifestyle among adolescents is also increasing along with the rate of overweight and obesity. According to a 2009 report, the percentage of obese and overweight children raging from 10-17 years is at or above 30% in 30 states.[2] Numerous studies indicate obesity to be highly co-morbid with chronic spine problems and they are the second most common cause of adult disability in the United States (US).[3]

For a teen with lower back pain and co-morbid obesity the prudent practitioner must be willing to discuss needed changes in lifestyle in the report of findings and making an attempt to determine the readiness of the patient to make a change. Some will be willing to make changes in physical activity (PA) levels and diet and others will not. Currently, fewer than $^1/_3$ of adolescents ages 6-17 engage in vigorous PA for at least 20 minutes that challenge cardio respiratory levels of fitness.[2] New guidelines from the US Centers for Disease Control state that this age group should get 60 minutes of PA daily and that it should include aerobic levels of exercise, muscle-strengthening, and bone-strengthening activities at lease some of that time.[4] For this age group exercise may be the gateway behavior that will lead to other positive lifestyle changes and must be encouraged. PA should be encouraged for all patients, even those who do not appear to be overweight or to have lifestyle-related health issues as one can't always assess health by observation alone. And the adolescent age-range should be among our most active!

Other key issues surrounding advising any patient include gain-framing the message. Patients who need to take a look at diet or PA levels already know this. But they have rarely been told by their doctor what they should do. Specific recommendations on diet such as replace a snack item high in refined carbohydrates with a fruit are easy, achievable goals. The doctor should emphasize the health

benefits to be gained, rather than only warning the patient that if she continues on a path of overweight that she will suffer. Accentuating the positive has been well documented to be more effective. Setting small, achievable goals is important to increase patient self-efficacy. Emphasizing PA that the patient already enjoys that is safe for their level of health is a good place to start. Roller skating in this case should be encouraged when it is safe to return to it and tips on how to accumulate 60 minutes of activity each day can be shared. For those who get little or no PA, anything is a good start. They can begin with something as simple as parking further away from stores or school, and participating in activities that may accumulate to an hour of PA a day, even if in 10 minute increments.

The practitioner can use the ABC's of health promotion in practice.[5] Assess your patient and their willingness to make positive changes; extol the Benefits of positive changes rather than the negatives of continued behavior; use Chiropractic visits as teachable moments when possible; and provide Stay-the-course messages to encourage them to keep at it. In summary the key is to provide short, specific, messages that inform the patient of not only what should be done but how they can be successful in getting it done. Providing them with tip sheets or resources on how to be successful is critical to encouraging successful behavior change.

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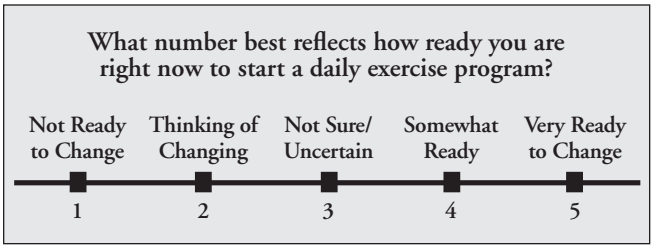
DISCUSSANT 2

Ronald D. Williams, Jr., Ph.D., C.H.E.S.

Ronald Williams is the Graduate Coordinator and an Assistant Professor of Health Promotion at Southeast Missouri State University. His research interests include health advocacy, substance abuse prevention, and overall college health.

While back pain has been often studied and treated among adults, it is increasingly more common to see adolescents experiencing some form of pain of the spine. Causes of such pain can vary from carrying heavy loads (backpacks, book bags, etc.) to lack of physical activity to being overweight.[1] Unfortunately for those youth suffering with back pain, the pain itself precludes many from seeking treatment through physical activity. In such a case, it is the responsibility of the healthcare practitioner to motivate and encourage the patient through the process of positive behavior change.

Figure 1: Sample Readiness to Change Ruler for Physical Activity



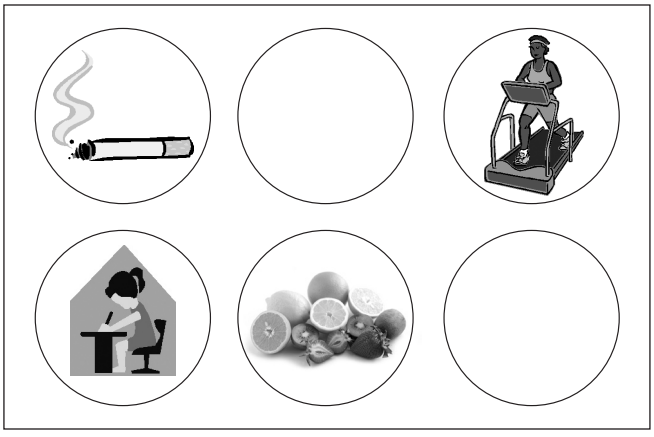
Healthy behavior changes are essential for adolescents to improve back pain. Perhaps the most beneficial changes can be sought through modification of nutritional habits and physical activity. When communicating with patients, practitioners should utilize health promotion techniques designed to move patients from unhealthy behaviors to healthy ones. The Transtheoretical Model, also known as Stages of Change, provides a systematic framework through which practitioners can measure the possibility of successful behavior change.[2,3] The stages include precomtemplation, contemplation, preparation, action, and maintenance. These stages represent the potential or possibility of behavior change within a person, or behavioral intention. In the precomtemplation stage, a person has no intention of making a behavior change, while a person in contemplation stage is aware that a change in behavior is needed to overcome an existing problem. The stages identify those who are making conscious efforts to plan for a change (preparation), those who are attempting a change (action), and those who have successfully made changes (maintenance). Applying this model to individual patients can transform "doctor's advice" into useable, appropriate health messaging.

Healthcare practitioners frequently advise patients on lifestyle changes, but how frequently is the current stage of change taken into account? If a patient suffering from back pain has no real intention to increase physical activity, what good does it do to advise this patient on specific exercises

to strength core muscles? Quite often, the health messages delivered to patients do not match the stage in which they exist regarding the behavior. Behavior change messages must be framed to assist patients in moving through stages. There are a few tools designed to help practitioners determine the stage of change of a patient. The Readiness to Change Ruler is an assessment instrument by which patients can determine whether or not they are prepared to change.[3] This allows the practitioner to determine a stage-appropriate message for health communication with the patient. Figure 1 shows a sample readiness ruler pertaining to physical activity.

In combination with stage-appropriate health education, the practitioner should also encourage the patient to make appropriate health choices to modify behavior. Allowing patients to become actively involved in behavioral decision-making provides some level of empowerment and self-efficacy. A simple tool to assist in this process is the agenda-setting chart.[4] This instrument should be used to guide discussion about behavior change by allowing the patient to speak openly about various behaviors that may need modification. The practitioner can assist the discussion by acknowledging the behaviors of concern; however the patient should be actively involved in the decision-making process. Agenda-setting allows for open discussion of various behaviors affecting the patient's condition, but also encourages active participation from the patient in deciding which behavior changes will be attempted. Although patients and practitioners may not agree on the most important behavior on which to focus, allowing a patient to make healthy changes in one area may lead to stage progression in another. For instance, if a patient is willing to make dietary changes, but resists increases in physical activity, practitioners should utilize positive health communication techniques to encourage such dietary changes. As the patient progresses with healthy nutritional changes and self-efficacy improves, the practitioner may then begin to focus on other behaviors on the agenda. A sample agenda-setting chart and discussion script are included in Figure 2.

Figure 2: Sample Agenda-Setting Chart and Practitioner Script for Patient Discussion



Practitioner's Script for a 17 year old with back pain:

I am showing you this chart because it contains things that I usually talk about to people who experience back pain. As the chart shows, several things are linked to back pain including lack of physical activity, poor nutrition, bad posture, and cigarette smoking. There are also some blank spaces that we can use to include other things that you think may be causing your back pain. Let's spend a few minutes talking about these things and what kind of changes you can make to improve your back pain.

Healthcare professionals frequently speak to patients about making healthy behavior changes; however such modifications are not always attempted. Using the stages of change as a guide for communication, as well as utilizing appropriate tools to assist in behavior change can help to increase patient success.

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DISCUSSANT 3

Dawn Privett, R.D.L.D.

Dawn Privett, currently practices dietetics in Raytown, Missouri. She specializes in supplemental nutrition, healthy lifestyle promotion, and wellness.

To continue with our previous discussant's thread of treatment, readiness for dietary change becomes very important in the treatment process. In working with an adolescent patient like this one, it must also be considered that although she makes a majority of decisions about her

own dietary intake, her family is most likely still important in the purchasing and cooking process.

Because of the age of the patient, simple and concrete changes that the patient feels are easy for her will most likely be adhered to better than a diet planned by an outside health care provider. It becomes very important at this stage to get a real picture of what her and her families diet and beverage intake actually consists of before making suggestions.

If the patient were willing, a diet consult to assess actual patterns would be of most help. This may or may not include the patient's family depending on how the dynamics of the family work. This age group frequently will want the autonomy of being an adult, but may welcome the families' involvement when both parties are willing.

Some simple changes in behavior can support multiple goals. Adding calcium to a diet that most likely is lacking is an important step for many reasons. Calcium is known to be the precursor for many metabolic reactions, one of which is how fast metabolism occurs. Adequate calcium in the diet can help to burn more calories naturally which will help in the weight loss process. Calcium is also a natural form of relaxant to the muscle and nerve tissues and can help in the pain and healing process. Many studies continue to report the inadequacy of calcium in the diet of many adolescent and early adult women. Inadequate calcium intake can lead to osteoporosis and spinal changes early in life and needs to be immediately addressed.

Along with calcium intake, vitamin D levels would most likely need to be monitored. Vitamin D is needed for calcium to be adequately absorbed and utilized. Many population groups are at risk of this due to poor intake habits or lack of outdoor activity.

Adequate calcium and Vitamin D intake can be augmented by addition of low fat dairy sources to the diet. They may also be added as guided supplementation if the patient does not prefer calcium and Vitamin D rich foods or is unwilling to add them to her regimen.

Another area of intake needing to be addressed is overall fluid volume. Inadequate hydration can also cause slowed metabolism. Helping the patient learn to increase her overall water intake to 1 oz per 2 # of body weight is not an easy task. Simple awareness techniques and personal challenges could be added to help her realize her goal. Something as simple as buying a mug or container that held 64 oz of fluid could be a fantastic start to increasing fluid intake. Although she would actually need about 117 oz per day, this would be a great start. If she currently uses many sugared or artificially sweetened beverages, discussing the need to teach her body to get out of the cycle of always preferring a sweet taste may be important in her being able in add water to her routine. It may also help in allowing her to recognize poor diet food patterns as well.

Timing of meals and snacks, regardless of content, may also need to be addressed. Many people in today's society skip meals throughout the day. This leads to overeating in the evening when metabolism starts to slow down. Balancing the day's intake and discussing the importance of eating some kind of AM meal may be an easy first step in helping with weight loss and better diet habits.

Assessing overall diet quality is the ultimate goal. When the patient has adopted the previous suggestions, teaching the importance of increasing fruit and vegetable content to 9-11 servings per day can be one of the best habits to acquire in any person's life. It increases fiber in the diet to recommended levels, as well as increasing vitamin, mineral, and antioxidant content. It helps in lowering blood pressure (DASH diet), normalizing blood lipid content, and accentuating weight loss.

This is not an easy goal, nor should it be a first goal. This is a long term plan that is achieved one step at a time. If her diet currently includes a limited number of fruit and vegetables a day, increasing it by one per day and then sticking with the new level for a month is a great first start. Introducing her to new fruits and vegetables, or helping with cooking and preparation ideas will allow her to enhance her diet along the journey of adulthood.

Goal setting and continued diet support may be needed for an extended period of time. Finding a support group or dietitian practitioner that the client feels comfortable with can be of vital importance in making progress to overall weight goals. Many studies have confirmed that accountability to an outside person can allow for permanent personal changes better than having a patient receive a one time instruction without the follow up of support personnel.

Abstracts

J Manipulative Physiol Ther 2009 Jul-Aug;32(6):493-9.

A model framework for patient safety training in chiropractic: a literature synthesis.

Authors: Zaugg B, Wangler M

OBJECTIVE: The objective of this review is to develop an evidence-focused and work-based model framework for patient safety training, that is, reporting and learning from adverse events in chiropractic care. This article will not debate specific issues of adverse events from spinal manipulation. The main focus is on education for patient safety.

METHODS: We conducted a systematic search and synthesized 196 articles on patient safety to provide guidance. The review was carried out by the 2 authors independently in 3 ways: research type, relevancy with respect to patient safety, safety culture or climate, and distinct description of one or more of the adapted Bland's characteristics.

RESULTS: Fifty-five articles were included. Their review provided knowledge acquisition and practice behavior regarding patient safety issues and excellent baseline data on reporting and learning of adverse events for training purpose.

CONCLUSIONS: Leadership, commitment, and communication together with trust and openness to build a culture of patient safety are prerequisites for successful reporting and learning.

J Pediatr 2009 Aug 14.

Risk of Childhood Asthma in Relation to the Timing of Early Child Care Exposures.

Authors: Gurka MJ, Blackman JA, Heymann PW

• Department of Public Health Sciences (M.G.) and the Department of Pediatrics (M.G., J.B., P.H.), University of Virginia School of Medicine, Charlottesville, VA.

OBJECTIVE: To examine whether early child care exposure influences the risk for development of asthma.

STUDY DESIGN: Longitudinal data from 939 children and their families from the National Institute of Child Health and Development Study of Early Child Care and Youth Development were analyzed. Exposure to other children in the primary child care setting as an infant (before 15 months) and as a toddler (16-36 months) were assessed as risk factors for persistent or late-onset asthma by age 15 via logistic regression.

RESULTS: The number of children in the child-care environment when the child was a toddler was significantly associated with odds of asthma, even after adjusting for respiratory illnesses and other risk factors ($P < .05$). The fewer the children exposed to as toddlers, the higher the probability of persistent or late-onset asthma by age 15.

CONCLUSIONS: This study supports the theory of a protective effect of exposure to other children at an early age, especially as a toddler, on the risk of asthma. This effect appears to be independent of the number of reported respiratory tract illnesses, suggesting that other protective mechanisms related to the number of children in the child care environment may be involved.

BMJ 2009;338:b2525

Recurrence up to 3.5 years after antibiotic treatment of acute otitis media in very young Dutch children: survey of trial participants.

Authors: Bezáková N, Damoiseaux RA, Hoes AW, Schilder AGM, Maroeska M Rovers MM.

OBJECTIVE: To determine the long term effects of antibiotic treatment for acute otitis media in young children.

DESIGN: Prospective three year follow-up study within the framework of a primary care based, double blind, randomised, placebo controlled trial.

SETTING: 53 general practices in the Netherlands.

PARTICIPANTS: 168 children aged 6 months to 2 years with acute otitis media.

INTERVENTIONS: Amoxicillin 40 mg/kg/day in three doses compared with placebo.

MAIN OUTCOME MEASURES: Recurrence of acute otitis media; referral to secondary care; ear, nose, and throat surgery.

RESULTS: Acute otitis media recurred in 63% (47/75) of children in the amoxicillin group and in 43% (37/86) of the placebo group (risk difference 20%, 95% confidence interval 5% to 35%); 30% (24/78 amoxicillin; 27/89 pla-

cebo) of children in both groups were referred to secondary care, and 21% (16/78) of the amoxicillin group compared with 30% (27/90) of the placebo group had ear, nose, and throat surgery (risk difference -9%, -23% to 4%).

CONCLUSION: Recurrent acute otitis media occurred more often in the children originally treated with amoxicillin. This is another argument for judicious use of antibiotics in children with acute otitis media.

J Altern Complement Med 2009 Jul;15(7):787-92.

The use and the user of herbal remedies during pregnancy.

Authors: Holst L, Wright D, Haavik S, Nordeng H.

BACKGROUND: The physiologic changes that occur during pregnancy can lead to a variety of conditions that can usually be self-treated. There are no licensed medicines for conditions such as morning sickness or insomnia in pregnancy, and evidence from Western countries suggests that patients often resort to using herbal medicines. Research on the health behaviors of pregnant women in the United Kingdom with respect to herbal remedies has not been undertaken.

OBJECTIVE: The objective of this study is to describe the use and the user of herbal remedies during pregnancy and to study the sources of information about herbs used.

DESIGN: The study design was a survey among expectant mothers more than 20 weeks pregnant presenting at an antenatal clinic.

SETTING: The setting was an antenatal clinic and antenatal ultrasound department at Norfolk and Norwich University Hospital. One thousand and thirty-seven (1,037) questionnaires were handed out between November 2007 and February 2008.

RESULTS: Five hundred and seventy-eight (578) questionnaires were returned (55.7%). Three hundred and thirty-four (334) of the 578 respondents (57.8%) reported using herbal remedies during pregnancy with a mean of 1.2 remedies per woman (median: 1, range: 0-10). The most commonly used remedies were ginger, cranberry, and raspberry leaf. The most probable user had been pregnant before and had a university degree. "Family and friends" were the most frequently cited source of information about herbal remedies during pregnancy, and more than 75% of the users reportedly did not tell their doctor or midwife about the use.

CONCLUSIONS: A large percentage of the women in the study used herbal remedies during pregnancy — many of them without informing their doctor or midwife. Doctors or midwives should ask pregnant women if they use herbal remedies during pregnancy. Health care personnel should be open to discuss the use of herbal remedies during pregnancy and be able to give balanced information as the use is so widespread.

Pediatrics 2009;124(2) August:e172-e179

Probiotic Effects on Cold and Influenza-Like Symptom Incidence and Duration in Children.

Authors: Gregory J. Leyer, PhDa, Shuguang Li, MSb, Mohamed E. Mubasher, PhDc, Cheryl Reifer, PhDd and Arthur C. Ouwehand, PhD

OBJECTIVE: Probiotic consumption effects on cold and influenza-like symptom incidence and duration were evaluated in healthy children during the winter season.

METHODS: In this double-blind, placebo-controlled study, 326 eligible children (3-5 years of age) were assigned randomly to receive placebo (N = 104), Lactobacillus acidophilus NCFM (N = 110), or L acidophilus NCFM in combination with Bifidobacterium animalis subsp lactis Bi-07 (N = 112). Children were treated twice daily for 6 months.

RESULTS: Relative to the placebo group, single and combination probiotics reduced fever incidence by 53.0% (P = .0085) and 72.7% (P = .0009), coughing incidence by 41.4% (P = .027) and 62.1% (P = .005), and rhinorrhea incidence by 28.2% (P = .68) and 58.8% (P = .03), respectively. Fever, coughing, and rhinorrhea duration was decreased significantly, relative to placebo, by 32% (single strain; P = .0023) and 48% (strain combination; P < .001). Antibiotic use incidence was reduced, relative to placebo, by 68.4% (single strain; P = .0002) and 84.2% (strain combination; P < .0001). Subjects receiving probiotic products had significant reductions in days absent from group child care, by 31.8% (single strain; P = .002) and 27.7% (strain combination; P < .001), compared with subjects receiving placebo treatment.

CONCLUSION: Daily dietary probiotic supplementation for 6 months was a safe effective way to reduce fever, rhinorrhea, and cough incidence and duration and antibiotic prescription incidence, as well as the number of missed school days attributable to illness, for children 3 to 5 years of age.

Med Hypotheses 2009 Aug 17. [Epub ahead of print]

Vitamin D deficiency during pregnancy may impair maternal and fetal outcomes.

Author: Lapillonne A

Over the past decade, new evidence has shown that vitamin D deficiency may contribute to the risk of developing a wide range of common chronic diseases that are different from the classic action on calcium and bone homeostasis. Acting through the vitamin D receptor, vitamin D can produce a wide array of favorable biological effects via genomic, non-genomic or intracrine mechanisms and, therefore, contributes to the improvement of human health in humans. We hypothesize that some of these effects may be even more critical during pregnancy. The focus of this paper is to review the data on the classic and non-classic actions of vitamin D with regards to pregnancy. It appears that vitamin D insufficiency during pregnancy is potentially associated with increased risk of preeclampsia, insulin resistance and gestational diabetes mellitus. Furthermore, experimental data also anticipate that vitamin D sufficiency is critical for fetal development, and especially for fetal brain development and immunological functions. Vitamin D deficiency during pregnancy may, therefore, not only impair maternal skeletal preservation and fetal skeletal formation but also be vital to the fetal "imprinting" that may affect chronic disease susceptibility soon after birth as well as later in life.

Rheumatology (Oxford) 2009 May;48(5):587-90. Epub 2009 Mar 31.

Current teaching of paediatric musculoskeletal medicine within UK medical schools — a need for change.

Authors: Jandial S, Rapley T, Foster H.

OBJECTIVES: Doctors involved in the assessment of children have low confidence in their clinical skills within paediatric musculoskeletal (pMSK) medicine and demonstrate poor performance in clinical practice. Core paediatric clinical skills are taught within undergraduate child health teaching but the extent and content of pMSK clinical skills teaching within medical schools is currently unknown. The aim of this study was to describe current pMSK teaching content within child health teaching at UK medical schools.

METHODS: Structured questionnaires were sent to child health leads at all medical schools within the UK delivering clinical teaching (n = 30).

RESULTS: Child health teaching was delivered in all responding medical schools (n = 23/30) predominantly by paediatricians (consultants and senior trainees) and within secondary care. pMSK clinical skills teaching was included in 9/23, delivered predominantly within lectures and featured uncommonly in assessment (6/23, 26%). pMSK clinical skills were reported as being less well taught than other bodily systems, although the majority ranked pMSK to be of equal importance, with the exception of development.

CONCLUSIONS: pMSK clinical skills medicine is not part of core teaching within child health in the majority of UK medical schools. There is a need to understand the barriers to effective pMSK clinical skills teaching, to achieve consensus on what should be taught and develop resources to facilitate teaching at undergraduate level.

Pediatr Radiol 2009 May;39(5):471-84. Epub 2009 Mar 11.

Sport injuries in the paediatric and adolescent patient: a growing problem.

Authors: Kerssemakers SP, Fotiadou AN, de Jonge MC, Karantanas AH, Maas M.

With an increasing number of paediatric and adolescent athletes presenting with injuries due to overuse, a greater demand is put on clinicians and radiologists to assess the specific type of injury. Repetitive forces applied to the immature skeleton cause a different type of injury than those seen in adults due to the differences in vulnerability of the musculoskeletal system, especially at the site of the growth cartilage. Intrinsic and extrinsic risk factors all play a role in the development of overuse injuries. MRI plays a key role in imaging overuse injuries due to its high potential for depicting cartilaginous and soft-tissue structures. Sport-specific biomechanics are described, since this knowledge is essential for adequate MRI assessment. An overview of several sport-related injuries is presented, based on anatomical location.

Spine; 34(16):1650-1657, July 15, 2009.

Pediatric and Adult Three-Dimensional Cervical Spine Kinematics: Effect of Age and Sex Through Overall Motion.

Authors: Greaves, Laura L.; Van Toen, Carolyn; Melnyk, Angela; Koenig, Lynn; Zhu, Qingan; Tredwell, Stephen; Mulpuri, Kishore; Cripton, Peter A.

OBJECTIVE. To determine the effect of age and sex on the

three-dimensional kinematics of the cervical spine.

SUMMARY OF BACKGROUND DATA. Spine kinematics information has important implications for biomechanical model development, anthropomorphic test device development, injury prevention, surgical treatment, and safety equipment design. There is a paucity of data of this type available for children, and it is unknown whether cervical spine kinematics of the pediatric population is different than that of adults. The helical axis of motion (HAM) of the spine provides unique information about the quantity and quality (coupling etc.) of the measured motion.

METHODS. Ninety subjects were recruited and divided into 6 groups based on sex and age (young children aged 4-10 years, older children aged 11-17 years, adults aged 25+ years). Subjects actively moved their head in axial rotation, lateral bending, and flexion/extension. An optoelectronic motion analysis system recorded the position of infrared markers placed on the first thoracic vertebrae (T1) and on tight-fitting headgear worn by the subjects. HAM parameters were calculated for the head motion with respect to T1.

RESULTS. HAM location in axial rotation and flexion/extension was more anterior in young females compared to adult females. Young females had a more anterior HAM location in flexion/extension compared to young males, indicating an effect of sex. For females, the HAM locations of adults were superior to those of children in flexion/extension and lateral bending whereas in males the HAM locations of adults were inferior to those of children. Age-related differences in HAM orientation were also observed in axial rotation and lateral bending.

CONCLUSION. Cervical spine kinematics vary with age and sex. The variation in spine mechanics based on age and sex found in the present study may indicate general trends that would grow stronger in even younger children (age <4 years).

Spine 1; August 2009; 34(17):1751-1755

The natural history of congenital scoliosis and kyphosis.

Authors: Marks, David S. FRCS, FRCS (Orth); Qaimkhani, Saeed A. FRCS (Orth).

OBJECTIVE. To discuss natural history of congenital scoliosis and kyphosis.

SUMMARY OF BACKGROUND DATA. Review of previously published literature on natural history of congenital spine deformities.

METHODS. Medline and google search for congenital scoliosis, kyphosis, and kyphoscoliosis, congenital spine anomalies, deformities, and pathologies, and congenital vertebral anomalies, deformities, and pathologies was performed.

RESULTS. Congenital vertebral anomalies have potential to progress and careful assessment and monitoring is essential and early intervention may be desirable.

CONCLUSION. Congenital vertebral anomalies invariably result from disturbed asymmetric growth and can have serious consequences.

J Pediatr Hematol Oncol 2009 Mar;31(3):177-82.

Pediatric oncologists' views toward the use of complementary and alternative medicine in children with cancer.

Authors: Roth M, Lin J, Kim M, Moody K.

BACKGROUND: Pediatric oncology patients commonly use complementary and alternative medicine (CAM), yet approximately only 50% of these patients discuss CAM with their oncol ogist.

OBJECTIVE: The aim of this study is to assess barriers to CAM communication in pediatric oncology.

DESIGN/METHODS: A 33-question survey was sent via electronic mail to 358 pediatric oncologists in the United States.

RESULTS: Ninety pediatric oncologists completed the survey. Ninety-nine percent of pediatric oncologists think it is important to know what CAM therapies their patients use. However, less than half of pediatric oncologists routinely ask their patients about CAM. This is primarily because of a lack of time and knowledge. Many physicians think some forms of CAM may improve quality of life, such as massage (74%) and yoga (57%). Over half of physicians thought that dietary supplements, herbal medicine, special diets, vitamins, and chiropractic might be harmful to patients.

CONCLUSIONS: Pediatric oncologists believe it is important to know which CAM therapies their patients use; however, they are not asking about them owing to lack of time and knowledge. To improve communication about CAM, increased physician education is needed. In addition, physicians should identify patients using potentially harmful CAM therapies. Furthermore, CAM research in pediatric oncology should focus on those modalities physicians believe may improve patient quality of life.

Prim Care Diabetes 2009 Jul 15. [Epub ahead of print]

Correlates of complementary and alternative medicine (CAM) use in Chicago area children with diabetes (DM).

Authors: Miller JL, Cao D, Miller JG, Lipton RB.

AIMS: To correlate complementary and alternative medicine (CAM) use in children with diabetes mellitus (DM) with DM control and other family or disease characteristics.

METHODS: Parents/guardians of children with DM were interviewed about demographics, clinical characteristics, CAM use, health care beliefs, psychosocial variables, and religious beliefs. The child's hemoglobin A1c (HgbA1c) value from the visit was collected. Statistical analyses included chi(2), Fisher's exact test, and 2-sample t-tests.

RESULTS: 106 families with type 1 DM were interviewed. 33% of children tried CAM in the last year; 75% of parents had ever tried CAM. Children most commonly tried faith healing or prayer; parents most commonly tried faith healing or prayer, chiropractic, massage, and herbal teas. Children were more likely to have used CAM if their parents or siblings used CAM or their family was more religious. They were more likely to have discussed CAM with their providers if they used CAM. Parents of child CAM users reported more problems with DM treatment adherence.

CONCLUSIONS: Children with DM used CAM. There were no differences in DM control, demographics, healthcare beliefs, stress, or quality of life between CAM users and non-users. Practitioners should inquire about CAM use to improve DM care for children.

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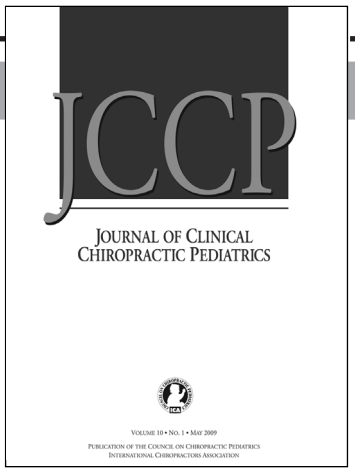

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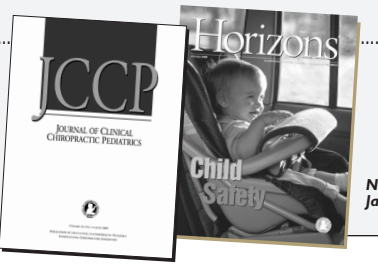

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