Research supports multidisciplinary care as an efficacious, and cost-effective approach for treating pain. An interdisciplinary approach to treatment for chronic pain in children and adolescents has been successfully implemented at Children’s Mercy Hospital Kansas City. The hospital has supported the establishment and growth of an Integrative Pain Management Team (IPMT), an Abdominal Pain Program (APP), and recently has added multidisciplinary teams that deal with a variety of difficult, chronic gastrointestinal issues. Biofeedback-assisted relaxation training (BART) has been integrated into the Abdominal Pain and Integrative Pain Management programs and is a valued component of their comprehensive treatment care plans. A description of current biofeedback training protocols, training modalities, therapeutic games, and home practice tools is provided.

Interdisciplinary treatment utilizing a biopsychosocial model has become widely accepted as an efficacious and cost-effective approach to deal with the complexities of chronic pain in children and adolescents. A biopsychosocial model takes into account the physical, emotional, and social aspects that contribute to an individual’s perception of discomfort and typically includes medical management, cognitive behavioral techniques, and physical therapy. “Of all the approaches to the treatment of chronic pain, none has a stronger evidence-base for efficacy, cost-effectiveness, and lack of iatrogenic complications than interdisciplinary care” (Schatman, 2012). The importance of a multidisciplinary model is emphasized by Kozlowska et al. (2008) who attribute the success of interdisciplinary pain programs to the comprehensive nature of the treatment approach. The use of the biopsychosocial model begins at the initial evaluation and emphasizes the significant contributions of all aspects of a patient’s environment to his or her emotional, physical, and social well-being, thus avoiding the negative impression that the patient’s pain is not real or simply psychosomatic.

**Multidisciplinary Programs at Children’s Mercy Kansas City**

Children’s Mercy Kansas City (CMKC), a large Midwestern regional pediatric center located in Kansas City, Missouri, has supported the development and growth of several multidisciplinary programs in response to the need for a more comprehensive approach to address chronic pain in children and adolescents who did not respond to standard medical treatment.

The Integrative Pain Management Team (IPMT) was established in 2003 to provide services that promote and support optimal comfort, health, and functioning, recognizing the patient and family’s physical, emotional, social, spiritual, and financial needs. The interdisciplinary team is made up of physicians, advanced practice nurses/physician’s assistants, psychologists, registered nurses, biofeedback practitioners, and massage therapists. Other disciplines involved in the promotion of wellness for IPMT patients may include physical therapy, nutrition, evaluation and treatment of allergies, and when indicated, patients may be referred to community providers for cranial sacral therapy or acupuncture. Treatment is a collaborative effort among clinical services, with extensive patient/family education and research, targeted to improve outcomes.

The Gastroenterology (GI) Division provides evaluation and treatment for children and adolescents with a variety of GI conditions, and has established a number of multidisciplinary teams to deal with complex patients. The Abdominal Pain Program (APP) was initiated in 2002, the Interdisciplinary Constipation and Incontinence (ICI) Clinic in 2010, the Inflammatory Bowel (IBD) Team in 2011, and the newest subclinic, the Intestinal Rehabilitation Program, to address intestinal failure/short gut syndrome in 2014.
(Deacy, Maddux, Wassom, Johnson, & Schurman, in press). Biofeedback-assisted relaxation training (BART) is a component of treatment for patients referred to the IPMP and APP, with long range plans to expand services to include the ICI Clinic. The present article will focus on the integration of biofeedback-assisted relaxation therapy into the APP.

**Abdominal Pain Program**

The APP was developed because of the need for a more comprehensive approach to address chronic abdominal pain. At this time the APP team includes two pediatric gastroenterologists, two psychologists, an advanced practice nurse, a physician’s assistant, a social worker and nursing staff dedicated to the APP, and three biofeedback practitioners.

Appropriate referrals to the APP are between 8 to 18 years of age, are able to fill out age appropriate questionnaires, and have experienced chronic abdominal pain for at least two months with no previous diagnosis of IBD or Crohn’s disease. At the initial visit a pediatric gastroenterologist and psychologist meet together with the patient and family to design a plan of care. This plan is inclusive of medications, biofeedback, and/or cognitive-behavioral training, nutritional support, physical therapy, or other discipline deemed important to the individual’s recovery. Monthly treatment team meetings are scheduled to discuss especially difficult cases and modify the treatment plan if needed.

The primary goal of the APP is for improved general functioning, facilitating the patient’s return to school, sports, and other important activities as soon as possible. Time is spent discussing sleep hygiene and the importance of maintaining a schedule that includes regular sleep-wake times, chores, mild to moderate exercise, homework, and time for leisure activities. Parents are encouraged to be supportive of children by acknowledging their discomfort, but expecting them to follow their treatment plan (Drews et al., 2011). It is recommended that parents provide appropriate rewards for the children/adolescents when they use positive coping skills, particularly relaxation strategies taught during biofeedback sessions.

In a survey of 298 families and patients who were seen in the Gastroenterology Clinic (GIC) at CMKC, Schurman and Friesen (2010) found that the APP’s multidisciplinary approach, particularly the team’s explanation of therapies to address the mind/body connection, was a significant contributor to patient and family satisfaction when comparing 145 APP patients with 153 standard-of-care general GI patients. Parents reported more confidence that the APP evaluation was comprehensive and that “nothing had been missed.”

**The Biofeedback Clinic at CMKC**

BART was added to the APP in 2004 in response to increasing evidence that stress management and self-regulation play a significant role in decreasing chronic abdominal pain in children (Humphreys & Gevirtz, 2001). Due to positive outcomes and patient/family satisfaction (Schurman, Wu, Grayson, & Friesen, 2010), most APP patients are encouraged to pursue biofeedback training as part of their treatment plan.

As the BART program has grown, along with recognition of its benefits, referrals have increased significantly and presenting diagnoses have become more diverse. Diagnoses that are accepted for treatment are: recurrent abdominal pain, headaches, fibromyalgia/chronic fatigue, chronic pain related to sickle cell disease, rheumatoid disease, Raynaud’s phenomenon, musculoskeletal pain, anxiety, and amplified pain syndrome. The goal of our Biofeedback Training program is to teach children how to balance their autonomic nervous system in order to reduce physical stress, improve coping when they feel anxious or stressed, enhance pain management skills, improve sleep, and reduce symptoms.

When the biofeedback evaluation is scheduled, a general explanation of the training process is provided and the parent is asked to schedule three additional sessions approximately one week apart for the next 3 weeks. During the fourth visit, the trainer and patient evaluate protocol compliance and progress, and determine if additional appointments are needed. If patients’ self-regulation skills have improved, they are practicing at home as recommended, and their symptoms are beginning to improve, subsequent appointments may be scheduled every 2–3 weeks. Patients who follow recommendations typically begin feeling a reduction in their stress/anxiety and fall asleep more quickly by the fourth session; many participants experience improvement in their discomfort by the third or fourth session, but some require 6 to 10 sessions for symptom relief.

The objectives of the first biofeedback session are to establish rapport with the patient and parent(s), to complete an intake history, introduce the patient to the principles of biofeedback therapy, perform a stress profile, explain the results of the stress profile, and provide a personalized home practice plan for achieving the therapeutic goals.

During the intake history, patients are asked to provide as much information as possible that is specific to their symptoms and lifestyle. Following the intake, the clinician introduces the individual to the rationale for biofeedback
training for his or her particular diagnoses. Very soon, patients will be able to view a PowerPoint presentation: Introduction to the Principles of Biofeedback on an iPad while they are waiting to be seen by an APP provider. It is anticipated this will reduce the time spent for doing an initial evaluation from 90 minutes to 60 minutes. This will also be a beneficial use of waiting time in the clinic. Another important benefit is that the PowerPoint presentation provides visuals of the anatomy and physiology of the digestive system, the body’s response to stress, and how the patient is “hooked up” to the biofeedback equipment. Patients who are referred to the biofeedback clinic from other departments in the hospital will not have access to the iPad presentation. For those individuals, the PowerPoint will be used by the biofeedback practitioners during the introductory biofeedback session as it provides an enhanced visual and audio learning experience.

Once questions are answered about the introductory material and the stress profile is performed, the results serve as a guide for effective and efficient biofeedback training and as the basis for home practice recommendations. By obtaining the electromyographic, electrodermal, and peripheral temperature readings, the trainer is able to identify the physiological changes that occur when a stress response or a relaxation response is induced.

The patient and parent are informed that there is no guarantee that biofeedback will “cure” or eliminate symptoms, but are assured that with regular practice it is likely that the following goals can be achieved:

1. the ability to recognize and utilize the powerful connection between the mind and body,
2. the learning of new and effective strategies for coping with symptoms, and
3. the development of biofeedback skills that may reduce or alleviate insomnia, anxiety, and/or discomfort.

Follow-up sessions are scheduled based on the needs of the individual, the presenting problems, the stress profile results, and his or her relaxation abilities. While in training, prescribed medications are monitored for changes in dosage, additionally prescribed drugs, medications discontinued, and reported side effects. This is because medications may cause physiological changes that will influence the degree to which biofeedback will be successful. The baseline readings are recorded for each follow-up session and charted to show improvements in those readings. All patients are trained in a combination of peripheral temperature, electrodermal, electromyographic, and heart rate variability biofeedback, based on the results of the stress profile. Patients are taught to control their physiology by using slow, diaphragmatic breathing and various muscle relaxation strategies. Scripts are read or instructions given by the trainer to induce a relaxation response. In general, when children are given visual feedback via the computer display screen, they quickly become engaged and eager to learn self-regulation skills. When a proficient skill level has been achieved, patients are offered the opportunity to play one of the following games: Journey to the Wild Divine, Wisdom Quest, Healing Rhythms, or Dual Drive (the Wild Divine Project). The emWave games, Garden, Rainbow, and Balloon, that are part of the emWave stress relief system (Heart Math®), are also used. To achieve the goals of the games, children must be able to produce heart rate coherence and a low-level skin conductance response.

It is emphasized that the success of biofeedback therapy is dependent on home practice. The patient is provided with tools to use at home. These include: (a) a variety of CDs developed by the Biofeedback Clinic providers that are appropriate for age level, with tracks for learning and practicing slow, deep, abdominal breathing, several quick relax muscle stretching exercises, autogenic hand warming, age appropriate progressive muscle relaxation exercises, visualization, and pain relief strategies (there are two CDs, one for 8–12 year-olds, and one for 13–18 year-olds); (b) a glass thermometer to monitor peripheral finger temperature, if age appropriate, and/or a Stress Control Card, (d) practice log sheets, and (e) instructions for downloading computer applications such as the Breathe2Relax and EZ Air Plus breath-pacing programs. At the last session, it is recommended that “brush-up” or “refresher” sessions be arranged 3, 6, and 12 months after initial training is completed to maintain and enhance skills.

Follow-up visits with APP providers usually occur while patients are learning biofeedback. The patients are seen by the advance practice nurses/physician assistant and the pediatric psychologist to promote follow-through of the treatment plan and to assist in any difficulties experienced by the family or patient. Families are encouraged to continue with outside supportive services if recommended by those providers.

BART began as a tentative, sparingly used option, with one part-time practitioner. CMKC currently supports three practitioners certified by the Biofeedback Certification International Alliance, one full-time and two part-time registered nurses. The long-term goal is to have five full-time providers when funding is available and/or insurance reimbursement is forthcoming from most area companies. Two primary insurance providers in the state of Missouri—Blue Cross Blue Shield Kansas City and state Medicaid
plans—deny reimbursement for biofeedback services despite substantial research supporting the efficacy of the modality for gastrointestinal issues, headache, Raynaud’s, and many other chronic pain disorders (Frank, Khorshid, Kiffer, Maravec, & McKee, 2010).

The Biofeedback Clinic had been housed in an office within the GIC, but recently moved into a new space dedicated in May 2014. Funding was provided by a local company who sponsored a golf charity event. The clinic has a small waiting room, a workroom/conference area with a kitchenette, and three separate, fully equipped treatment rooms designed to facilitate relaxation and provide an effective work environment for the trainers.

**Conclusion**

The multidisciplinary treatment model has proven to be the best approach for dealing with chronic abdominal pain in children and adolescents (Schurman et al., 2010). Emphasizing that BART has become an important aspect of the APP’s comprehensive pain management treatment plan, Dr. Jennifer Schurman, co-director of the APP, stated recently “…biofeedback is integral to our programmatic success.”

**References**


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