Massage Therapy as a Supportive Care Intervention for Children With Cancer

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Purpose/Objectives: To review relevant literature about massage therapy to assess the feasibility of integrating the body-based complementary and alternative medicine (CAM) practice as a supportive care intervention for children with cancer.

Data Sources: PubMed®, online references, published government reports, and the bibliographies of retrieved articles, reviews, and books on massage and massage and cancer. More than 70 citations were reviewed.

Data Synthesis: Massage therapy may help mitigate pain, anxiety, depression, constipation, and high blood pressure and may be beneficial during periods of profound immune suppression. Massage techniques light to medium in pressure are appropriate in the pediatric oncology setting.

Conclusions: Massage is an applicable, noninvasive, therapeutic modality that can be integrated safely as an adjunct intervention for managing side effects and psychological conditions associated with anticancer treatment in children. Massage may support immune function during periods of immunosuppression.

Implications for Nursing: Pediatric oncology nurses are vital in helping patients safely integrate CAM into conventional treatment. Pediatric oncology nurses can help maximize patient outcomes by assessing, advocating, and coordinating massage therapy services as a supportive care intervention.

Key Points . . .

- Children with cancer require high-quality psychosocial care and symptom management.
- Children with cancer frequently use complementary and alternative medicine to manage side effects of cancer treatment.
- Research demonstrates the potential applications of massage therapy for children with cancer.
- Pediatric oncology nurses are vital in facilitating the safe integration of massage therapy for children undergoing treatment for cancer.

Massage therapy is among the most prevalent complementary and alternative medicine (CAM) practices used by the American public to promote health, prevent disease, and manage acute and chronic conditions. An ancient healing art characterized as a systematic manipulation of the soft tissues of the body, massage therapy consists of hands-on stroking, kneading, friction, and percussive or vibratory movements (Arkko, Pakarinen, & Kari-Koskinen, 1983; Ernst, 2003). Generally employed for pain reduction, massage therapy has been used with the intention to alleviate stress and muscle cramping, induce relaxation, improve circulation and lymph flow, promote muscle tone, increase range of motion, and encourage recovery from injuries and medical procedures. Preliminary research further suggests that massage therapy may be a beneficial body-based modality for a variety of immunologic illnesses, such as asthma and HIV (Hall, 2001).

Although recent reports in the United States have acknowledged the widespread use of massage therapy among adults and children with cancer as a noninvasive, therapeutic intervention, minimal investigation of massage by the healthcare community has been conducted to determine risks, benefits, and feasibility of incorporating the practice among cancer populations. In a survey of 85 physicians at a municipal hospital, 18% reported that they had inadequate information about massage therapy, 32% wanted massage therapy to be provided at the hospital as an intervention for their patients, and 32% reported having recommended massage therapy to patients (Boutin, Buchwald, Robinson, & Collier, 2000). Despite the growing popularity of the practice, massage therapy rarely is incorporated into patient care plans for children with cancer. Although research investigating the efficacy of massage has been conducted, only preliminary studies have been initiated in children with cancer.

Because children diagnosed with cancer must cope with a variety of stressors and symptoms related to illness and treatment (Docherty, 2003), healthcare professionals are increasingly recognizing the need for safe, effective, noninvasive supportive care interventions to improve the overall quality of life of patients. Stress, anxiety, and depression

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are highly prevalent among children with cancer (Kusch, Labouvie, Ladisch, Fleischhack, & Bode, 2000), and requirements for high-quality psychosocial care for children with cancer continue to emphasize coping not only for psychological but also behavioral means to manage internal and external stresses of cancer. Because chronic stress may lead to further immune suppression (Hernandez-Reif et al., 2004), any immune-supportive regimen may be valuable within the population. This review summarizes the literature on massage therapy to inform healthcare providers about the potential uses of massage for children with cancer. Observational and clinical studies included in this review were identified through repeated literature searches. The PubMed® database and online resources were searched for the terms *massage*, *massage and cancer*, and *massage and children*. Twenty-five clinical and 12 observational studies were retrieved.

History of Massage

Dating back to descriptions in early Chinese and Indian writings from approximately the eighth century BC, massage therapy has been recommended throughout history for a variety of medical and surgical conditions (Cole & Stovell, 1991; Field, 2002). Most of the great ancient cultures of the world have recorded the use of massage or rubbing techniques; Egyptians, Persians, and Japanese historical writings and artifacts often refer to the practice. References to Chinese pediatric massage date back to the Sui/Tang dynasty (581–907 AD). By the late 14th century, the practice was organized into an academic discipline in medical institutions (Cline, 2000).

Hippocrates (460–377 BC) wrote about benefits of massage in medical practice to relieve sprains and dislocations (Cole & Stovell, 1991); in 400 BC, he described the procedure as "medicine being the art of rubbing" (Field, 2002). In ancient times, massage was administered with bare hands, a cloth, or various instruments; oil often was used for its medicinal value or as a lubricant (Basmajian, 1985). Although massage use declined during the Middle Ages in the Western world, the practice resurfaced in the middle of the18th century with support from the Swedish government. As medical technology advanced during the first half of the 20th century, interest in massage declined (Gecsedi, 2002), but by the 1950s, massage regained popularity and was recommended as a body-based treatment to reduce swelling for women with breast carcinoma (Tidy, 1952). Currently, population-based surveys in the United States indicate widespread interest in massage therapy as a therapeutic modality (National Center for Complementary and Alternative Medicine, National Institutes of Health, 2006). The practice of massage for infants and children began in India. Since the 1970s, massage therapy for infants has been practiced, researched, and taught in massage therapy schools in the United States (Field, 1995) and has been implemented in hospital-based programs for new parents.

Types of Massage

Many forms of massage therapy (therapeutic massage) are practiced in the United States; at least 150 methods from various regions around the world may be employed. Common types of massage therapy include Swedish massage, a system of strokes and kneading on the superficial layers of muscles with the use of oils and lotions; reflexology, a system that uses finger and thumb pressure to stimulate reflex points of the body on the feet and hands (Hodgson, 2000); and Shiatsu, a system of stretching and applying gentle to hard palmar compression and finger pressure on the meridians, the purported electromagnetic channels, of the body. Swedish massage techniques include effleurage, a technique of long strokes over large areas using the palm of the hand; petrissage, a kneading movement using palms or fingers and thumb; friction; and tapotement, a tapping technique. Most of the research discussed in this review examines the use of gentle massage techniques.

Table 1 lists massage techniques in wider use and includes energy healing modalities that use finger pressure, range of motion, compression, or other practices considered methods of massaging soft tissue and mobilizing joints. Through the application of pressure to and manipulation of the soft tissues of the body, massage therapy stimulates circulation of blood flow and oxygenation in muscle and loosens fibrous tissue and stiff joints. The local effects could influence neural activity and modulate the activities of the subcortical nuclei that influence mood and pain perception, yet the mechanisms by which massage elicits therapeutic effects are unknown (Sagar, Dryden, & Wong, 2007). A massage session generally takes 15–90 minutes, and follow-up visits may be scheduled.

Use of Massage in Children

Surveys suggest that massage therapy is a common practice used by parents for their children. In a recent survey of parents of 191 healthy children from three primary-care settings in a metropolitan area of the midwestern United States, massage therapy was noted as one of the most commonly used CAM modalities (Loman, 2003). Of the parents surveyed, 29% used massage for their infants, 14% used massage for their children, and 11% reported having used massage for themselves in the past. Massage for infants was used to relieve colic, gas, and pain and for its general calming, relaxing, and sleep-promotion qualities. Massage therapy for children was used in response to musculoskeletal complaints, stress reduction and relaxation, and headaches; reflexology was used for treatment of asthma and diarrhea (Loman). Studies of massage therapy in children and adolescents with various conditions, including psychiatric disorders, asthma, and HIV, have shown significant improvements in cooperative behavior with nurses and reductions in depression and anxiety levels after massage intervention (Diego et al., 2001; Field et al., 1992, 1998).

Massage therapy is one of the most commonly reported CAM therapies among children with cancer. In a review of studies on the prevalence of CAM use in children with cancer, the prevalence of massage therapy ranged from 7%–66% over the previous decade (McLean & Kemper, 2006). Parents have reported the use of massage therapy to help reduce or prevent toxicities from chemotherapy and radiation therapy, including fatigue, pain, and nausea. It is used most often to cope with psychological issues associated with anticancer therapy and to improve children's overall quality of life while they undergo treatment.

Table 1. Massage Techniques

Technique	Origin	Description
Swedish or therapeutic massage	Pehr Henrik Ling (1776–1839), gymnastics and fencing master at the University of Lund, Sweden, developed a style of massage and exercise known as Swedish remedial massage and exercise, influenced by his time spent in China studying massage and martial arts. Part of Ling's system of massage is practiced widely as Swedish massage in Europe and the United States (Maxwell-Hudson, 1988).	Application of effleurage (long strokes) and petrissage (short stokes or kneading), with light to medium pressure to superficial muscles, usually in the direction of venous return. Striping (friction in the direction of muscle fibers) and cross-friction (friction against or across muscle fibers) are used to break adhesions in deeper muscle tissue. Tapotement and vibration (percussion-like tapping) and active and passive range of motion are used to manipulate the nervous system response to break spasm-pain cycles. Massage oil, lotion, cream, or gel is applied. This is the most popular form of massage therapy.
Deep tissue massage	Same as Swedish massage	Very similar strokes and methods as Swedish massage, except pressure is slower, with medium to deep contact to affect muscles under the superficial layers. The work can be tailored to focus on a specific area of the body. Breaks up fibrous and scar tissue in deeper muscles and restores joint range of motion, circulation, and function to specific muscles or muscle groups. Cocoa butter, massage oil, lotion, cream, or gel is applied on the skin during the session.
Pediatric massage	Same as Swedish massage	Uses a lighter touch
Medical or orthopedic massage	Hippocrates (460–377 BC) wrote about the use of massage in medical practice. Two of his works were titled "On the Joints" and "On Setting the Joints by Leverage." He described a rubbing procedure as to bind joints that are too loose and loosen joints that are too hard. Hippocrates also described manual manipulation of the spine to treat what is now known as kyphosis (Rattray, 1995).	Addresses primary injury and secondary compensations where injury or trauma has occurred. Therapists generally use several bodywork modalities to relieve spasm-pain cycles to restore normal function and structural posture. Techniques include muscle testing, heat or cryotherapy, deep tissue work, myofascial trigger point release, range of motion, stretching and strengthening exercises, and other associated alignment and movement methods.
Sports massage	Galen (131–201 CE), a Roman physician, promoted massage. He introduced the use of massage to the gladiators to prepare them for combat by rubbing them all over, increasing their circulation until their skin was red (Fritz, 2003).	Two types exist: pre-event (warm up and invigorate) and postevent (cool down and recover). Targets muscles or muscle groups that are primarily used in a particular sport to prevent cramping, strain, and injury. Includes rigorous to calming compression to muscle bellies, jostling, range of motion, and stretching techniques of muscles groups that are most stressed for a specific sport. It is used primarily for athletes.
Aromatherapy massage	Egypt (4300 BC): Records indicate the use of balsamic substances with aromatic properties historically used for religious ritual and medical applications. Scented barks, resins, spices, vinegars, wines, and beers were used (Whitton, 1995).	Aromatherapy is a practice using medicinal-grade essential oils derived from plants, flowers, stems, bark, or roots that contain chemical compounds and nutrients that can assimilate into the human body to restore physical, emotional, and spiritual function. Certain oils have very specific properties for particular symptoms. Aromatherapy massage is an application of these essential oils on the skin mixed with a carrier oil or sometimes undiluted as a "drip method" on certain parts of the body. Aromatherapy may be added to most massage methods.
Shiatsu	Translated as "finger pressure." Japan (1912): Tokujiro Namikoshi Sensei, founder, discovered the healing properties when he pressed on his mother's body to relieve her of pain from rheumatism. Through study and practice, he subsequently developed an anatomical and physiologic theory to explain the treatment. In 1940, Tokujiro established a school and began training practitioners. Shiatsu was introduced in the United States in 1953 and was added as an adjunct therapy to chiropractic care. In 1955, the Japanese Ministry of Health and Welfare officially recognized the practice (Jwing-Ming, 1994).	Shiatsu is performed by pressing with thumbs, fingers, and palms on Shiatsu points or "tsubos" throughout the body. Fingers and palms are used to apply pressure to particular sections on the body's surface for the purpose of correcting imbalances and maintaining and promoting health. With contact, a practitioner detects irregularities in the skin, muscles, or body temperature. When irregularities are found, imbalances are treated with hand, knuckle, elbow, knee, and foot pressure. Stretching, rocking, and range of motion also are used to open constrictions in joints, muscles, and energetic pathways.
Ayurvedic massage	India (2500 BC): a component of Ayurvedic medicine, originating from ancient Hindu medical compendiums that cover a vast array of topics, including pathology, diagnosis, treatment, surgery, lifestyle, and philosophy	Based on the use of pressure points on the body. Points are located at the junctions of ligaments, vessels, muscles, bones, and joints. Application of gentle circular movements with either the forefinger or the middle finger on those points brings about homeostasis. The body is seen as a microcosmic universe in which the five great primordial elements (ether, air, fire, water, and earth) combine to form three humors known as wind, choler, and phlegm. The balance among the humors determines an individual's constitution and predisposition to disease. The physical body is seen as a network of channels that circulate fluids and essences around the body.

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Table 1. Massage Techniques *(Continued)*

Technique	Origin	Description
Acupressure	China, more than 5,000 years ago: Chinese discovered by pressing certain points on the body that other parts of the body benefited and pain was relieved.	Acupressure points are points on the skin sensitive to bioelectrical impulses in the body. The points are stimulated with pressure of the thumb and fingers. The pressure releases endorphins, thus inhibiting pain. Acupressure also helps rebalance the body by relaxing the muscles and increasing blood flow and oxygen to the affected area. Acupressure is based on the Chinese Meridian System and therefore can be used to fortify the yin, yang, and qi of the body.
Reflexology	Egypt (2330 BC): Hieroglyphs depicting certain healing techniques were found in a physician's tomb. Reflexology, or hand and foot zone therapy, was believed to be one of them. From there, it is traced to India, China, and Japan. The Christian missionaries brought the technique to Europe, where physicians studied and practiced it (Byers, 1983).	A system that uses finger and thumb pressure to manipulate zones and reflex points in the feet and hands that correspond to every organ, gland, muscle, and bone in the body. A therapist detects blockages or congestion in the zones or reflex points and applies pressure and circular movements to the areas, breaking the blockages, which restores balance to the body.
Rolfing	Ida Rolf; fully developed into a practice by 1960 (Rolf, 1977)	Formally known as Rolfing® Structural Integration, the system can be an extremely intense deep tissue therapy involving soft tissue and myofascial manipulation with movement education that organizes the body in gravity to achieve changes in posture and structure of the body. Sessions are progressive; 7–10 sessions usually are required to organize sections of the body to bring structural imbalances back to proper alignment.
Myofascial trigger point release therapy	Froriep, a 19th-century author, identified *muskel schwiele* as extremely tender, palpable hardenings in the muscles that, when treated, provided pain relief. By the early 1950s, Travell, a physician, reported pain patterns of trigger points in 32 skeletal muscles and identified taut bands in the muscles that had a referral pain pattern. She found that self-sustaining characteristics of trigger points depend on feedback mechanisms between trigger points and the central nervous system. By 1997, Simons, a physician, identified a likely pathogenesis, implicating dysfunctional endplate regions as the prime set of trigger point pathophysiology (Simons et al., 1999).	Used to treat muscular pain and dysfunction. A trigger point is a hyperirritable spot in the skeletal muscle and fascia associated with a hypersensitive palpable nodule in a taut band. The spot is painful on compression and can give rise to characteristic referred pain, tenderness, motor dysfunction, and autonomic phenomena such as pain, sweating, "goosebumps," and belching. A practice that compresses the "ropey" tissue with a thumb or finger, along with the patient's breath, it relaxes the taut band, thereby bringing circulation and stress reduction to the area and the referred painful area.
Tui na massage	Shang Dynasty (1700 BC): Originally, it was used to treat childhood diseases and adult digestive complaints. Recorded in the Tang Dynasty (618–907 AD) were many massage doctors in the Imperial hospital. It was suppressed in the Qing Dynasty, along with many other cultural arts, only to emerge following the Communist revolution. The techniques eventually were brought to Japan, giving rise to Shiatsu (Xiangcai, 2002).	Literal translation means "pushing and pulling." Tui na includes the use of hand techniques to massage the myofascial and tendonous tissue of the body. The manipulation realigns the musculoskeletal and ligamentous relationships. It uses the traditional Chinese medicine theory of the flow of qi (energy) through the meridians or energetic pathways. Specific treatment protocols are used.
Manual lymph drainage	Vodder (1930s)	Manual lymph drainage is an advanced form of massage aiming to stimulate the lymphatic system to remove congestion and stagnation from the body. It is a gentle rhythmic technique using a pumping style with the hands along the limbs to stimulate the lymph fluid. It moves congestion and stagnation from the body by helping to move the lymph system, thereby draining toxins from collecting in the muscles and helping to build the immune system.
Trager therapy	Trager, a physician, developed the therapy over 65 years. Born with spinal deformity, he learned that movement of the body through boxing warm-up exercises alleviated his pain and produced lasting results. He then began his exploration of movement techniques to achieve results in other musculoskeletal problems, such as sciatica and polio.	Trager is based on movement. The goal is to free up holding patterns in the muscles and joints. It uses gentle, nonintrusive natural movements such as soft strokes, stretches, and rocking. A session usually lasts 60–90 minutes. No oils or lotions are used.

Tables 2 and 3 summarize the results of clinical and observational trials on massage therapy in adults and children undergoing anticancer treatment.

Decreased heart rate, blood pressure, and respiratory rate are frequently reported physiologic effects of massage (Hadfield, 2001; Post-White et al., 2003; Wilkie et al., 2000). The effects of massage therapy on improving symptom management, minimizing psychological distress, and supporting the body through periods of immune suppression also have been documented.

Massage for Symptom Management

In a nonrandomized clinical trial of 41 adults undergoing chemotherapy or radiation and receiving either therapeutic massage, consisting of Swedish massage techniques of effleurage and petrissage, or routine care with nurse interaction (Smith, Kemp, Hemphill, & Vojir, 2002), a trend was noted in the massage group: improvement in mean scores for symptom distress or perception of discomfort in relation to 10 symptoms (nausea, mood, appetite, insomnia, pain, mobility, fatigue, and bowel movement patterns, concentration, and appearance). Reduction in constipation also has been noted among patients receiving massage in the palliative stage of cancer (Hodgson, 2000).

Preliminary research suggests that massage therapy may help patients cope with side effects associated with anticancer therapy, including pain, nausea, and fatigue (Ahles et al., 1999; Fellowes, Barnes, & Wilkinson, 2004). Massage is noted as one of the most frequently used strategies for pain management among children during the first year after a cancer diagnosis (Van Cleve et al., 2004). Swedish massage, reflexology, and aromatherapy massage are techniques reported to significantly decrease pain and pain intensity among patients with cancer (Corner, Cawley, & Hildebrand, 1995; Stephenson, Weinrich, & Tavakoli, 2000; Weinrich & Weinrich, 1990; Wilkie et al., 2000). Significant decreases in nausea, vomiting, and nausea intensity have been observed in patients with breast cancer and gastric cancer and those undergoing autologous bone marrow transplantation receiving therapeutic massage, Swedish massage, or acupressure (Ahles et al.; Billhult, Bergbom, & Stener-Victorin, 2007; Dibble, Chapman, Mack, & Shih, 2000; Shin, Kim, Shin, & Juon, 2004). Patients undergoing autologous bone marrow transplantation also have reported significant reductions in fatigue following massage seven days prior to transplantation ($p = 0.02$) and predischarge ($p = 0.03$) (Ahles et al.).

Psychological Effects of Massage Therapy

Studies in adults and children indicate the potential of massage or massage-related therapies to alleviate psychosocial symptoms arising during cancer therapy. In a randomized study of adult patients receiving palliative care, overall quality-of-life measures improved significantly for a reflexology group compared to a placebo control group (Hodgson, 2000). A recent Cochrane Database Systematic Review, which investigated randomized, controlled trials of the effects of massage and aromatherapy massage on psychological morbidity in adults and children with cancer, found decreased symptoms of distress and improvements in quality of life (Fellowes et al., 2004). Of eight studies evaluating 367 patients meeting certain inclusion criteria, four trials reported a reduction in anxiety following massage intervention and one trial detected a significant difference in depression.

In two studies of massage therapy in children with cancer, reductions in anxiety and depressed mood were noted after massage. Using the State Anxiety Inventory for Children and the Profile of Mood States, Field et al. (2001) noted significant decreases in anxiety and depressed mood following parent massage. Phipps, Dunavant, Rai, Deng, and Lensing (2004) noted child and parent reports of decreased anxiety for the child after the first professional massage using a visual analog scale and the Behavioral, Affective, and Somatic Experiences Scales, yet no significant reductions in anxiety were found in the parent massage group. Parents also reported significant improvement in levels of discomfort for their children after professional massage.

Immunologic Effects of Massage Therapy

Most of the studies investigating the effects of massage therapy on the immune system have centered on natural killer (NK) cell activity. Healthy adults under acute stress have shown enhanced NK cell activity and increased white blood cell counts following massage (Zeitlin, Keller, Shiflett, Schleifer, & Bartlett, 2000). Additionally, adult men and adolescents infected with HIV have shown significantly increased NK cell number, NK cell cytotoxicity, and CD56+CD3– lymphocytes following massage (Diego et al., 2001; Ironson et al., 1996). In two studies examining massage therapy in women with breast cancer (Hernandez-Reif et al., 2004, 2005), long-term massage effects included significant increases in NK and lymphocyte cell numbers and dopamine and serotonin levels.

Two studies of massage in children with cancer have reported changes in immune function as measured by white blood cell counts and neutrophil counts. In a randomized study, 20 children with acute lymphocytic leukemia received massage therapy administered by their parents concomitantly with standard medical care for 30 days and were compared with a wait-list control group, a group that began the study in a no-treatment phase but were offered the intervention at the end of the study period (Field et al., 2001). After 30 days of massage, the massage group had significant increases in mean white blood cell counts and mean neutrophil counts; the control group had significant decreases in mean white blood cell counts and neutrophil counts.

In another trial of massage in children with cancer, 50 children undergoing bone marrow transplantation were randomized to three arms: a parent-administered massage arm, a professional massage arm, and a standard psychosocial care control arm (Phipps et al., 2004). Although the professional massage and control groups experienced no significant differences in days to engraftment, decreases in time to engraftment were observed with parent massage as compared to controls. When the two massage arms were combined into a single group, the massage group was associated with a significant reduction in the number of days to engraftment, defined as the day a patient reached an absolute neutrophil count of 500 on two consecutive days compared to the control group, and a trend was noted toward reduction in the number of days hospitalized from transplant to first discharge compared to the control group.

The two studies did not control for timing of radiation or chemotherapy treatments, nor did they assess the effects of massage therapy on NK cell number and NK activity specifically. Long-term effects of massage therapy on white blood cell counts and neutrophil counts were not measured. Measurement of NK activity and NK cell number following massage may provide further insight on its effects on the general immune function of children with cancer.

Table 2. Massage and Cancer Clinical Trials

Study	Sample	Design	Massage Technique	Results
Billhult et al., 2007	Subjects with breast cancer Subjects: n = 19; mean age = 50.5 years Controls: n = 20; mean age = 53.1 years Dropout = 0	Randomized, controlled trial	TM versus visit by hospital staff	Significant decrease in nausea ($p = 0.025$); no significant decrease in anxiety or depression
Mehling et al., 2007	Subjects with cancer diagnoses Subjects: n = 93; mean age = 55.9 years Controls: n = 45; mean age = 59.2 years Dropout = 12	Randomized, controlled trial	TM, acupuncture, and acupressure versus usual care	Significant decrease in pain ($p = 0.038$) and depressive mood ($p = 0.003$); no significant decrease in nausea, vomiting, or mood
Stephenson et al., 2007	Subjects with cancer diagnoses Subjects: n = 45; mean age = 60.5 years Controls: n = 45; mean age = 56.1 years Dropout = 3 subjects and 1 control	Randomized, controlled trial	Reflexology versus usual care and attention	Significant decrease in pain intensity ($p = 0.001$) and anxiety ($p = 0.001$)
Wilkinson et al., 2007	Subjects with cancer diagnoses Subjects: n = 144; mean age = 51.5 years Controls: n = 144; mean age = 52.8 years Dropout = 38 subjects and 29 controls	Randomized, controlled trial	AM versus usual care	Significant decrease in clinical anxiety and/or depression at six weeks postrandomization ($p = 0.01$); no significant decrease in clinical anxiety and/or depression at 10 weeks; significant decrease in self-reported anxiety at 6 and 10 weeks ($p = 0.04$)
Hernandez-Reif et al., 2005	Subjects with breast cancer Massage subjects: n = 22; mean age = 53 years Relaxation subjects: n = 20; mean age = 54 years Controls: n = 16; mean age = 53 years Dropout not reported	Nonrandomized, controlled trial	Massage using Swedish, Trager, and acupressure versus standard treatment	Significant decrease in depressed mood and symptoms ($p < 0.05$), anger ($p < 0.05$), anxiety ($p < 0.001$), and pain ($p < 0.001$) in massage group; significant increase in dopamine ($p < 0.05$), serotonin ($p < 0.05$), natural killer cell number ($p < 0.05$), and lymphocytes ($p < 0.05$) in massage group
Hernandez-Reif et al., 2004	Subjects with breast cancer Subjects: n = 20; mean age = 52.7 years Controls: n = 20; mean age = 53.3 years Dropout = 2 subjects and 4 controls	Randomized, controlled trial	Massage using Swedish, Trager, and acupressure versus standard treatment	Significant decrease in anxiety, depression, and anger ($p < 0.05$); long-term significant decrease in depression ($p < 0.01$) and hostility ($p < 0.05$); significant increase in natural killer cell number, lymphocytes, dopamine, and serotonin ($p < 0.05$)
Phipps et al., 2004	Pediatric subjects with cancer diagnoses and undergoing bone marrow transplantation Professional massage subjects: n = 20 Parent massage subjects: n = 20 Controls: n = 10 Age range = 1–19 years Dropout not reported	Randomized, controlled trial	Professional massage versus parent massage versus standard care	Significant difference in days to engraftment in combined massage group ($p = 0.02$); significant decrease in anxiety ($p < 0.0001$) and discomfort ($p = 0.004$) in professional massage group
Shin et al., 2004	Subjects with gastric cancer Subjects: n = 20; mean age = 52.75 years Controls: n = 20; mean age = 47.25 years Dropout = 0	Randomized, controlled trial	Acupressure plus standard care versus standard care alone	Significant decrease in nausea and vomiting ($p < 0.01$) and duration of daily nausea and vomiting ($p < 0.01$)
Soden et al., 2004	Subjects with cancer diagnoses AM subjects: n = 16 Massage subjects: n = 13 Controls: n = 13 Median age = 73 years Dropout = 6 subjects and controls	Randomized, blinded, controlled trial	AM versus massage with carrier oil versus control group	Significant decrease in depression scores for massage ($p < 0.01$); significant increase in sleep in combined massage compared to controls ($p = 0.04$)
Wilcock et al., 2004	Subjects with cancer diagnoses Subjects: n = 23; mean age = 74 years Controls: n = 23; mean age = 71 years Dropout = 12 subjects and 5 controls	Randomized, controlled trial	AM plus conventional day care versus conventional day care	Significant increase in vigor (p value not reported)

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AM—aromatherapy massage; HT—healing touch; MLD—manual lymph drainage; TM—therapeutic massage

Table 2. Massage and Cancer Clinical Trials *(Continued)*

Study	Sample	Design	Massage Technique	Results
Post-White et al., 2003	Subjects with cancer diagnoses TM subjects: n = 78; mean age = 54.9 years HT subjects: n = 77; mean age = 53.9 years Controls: n = 75; mean age = 55.5 years Dropout = 15 TM, 21 HT, and 30 controls	Randomized crossover trial	TM versus HT versus a replicated environment	TM decreased respiratory rate, heart rate, systolic blood pressure, diastolic blood pressure, and pain levels ($p < 0.001$); TM decreased total mood disturbance ($p = 0.004$) and anxiety ($p = 0.023$); TM subjects used significantly fewer nonsteroidal anti-inflammatory drugs ($p = 0.018$).
Stephenson et al., 2003	Subjects with cancer diagnoses Subjects: n = 19 Controls: n = 17 Mean age = 65 years Dropout not reported	Randomized, controlled trial	Foot reflexology	Significant decrease in pain postintervention ($p < 0.01$)
Ross et al., 2002	Subjects with cancer diagnoses Subject: n = 14 Controls: n = 12 Mean age = 74 years Dropout = 7 subjects and 2 controls	Randomized, blinded, controlled trial	Foot reflexology versus basic foot massage	No superior effect of reflexology over foot massage
Smith et al., 2002	Subjects with cancer diagnoses Subjects: n = 20; mean age = 64 years Controls: n = 21; mean age = 60 years Dropout = 8 subjects and 10 controls	Nonrandomized, controlled trial	TM versus nurse interaction	Significant decrease in pain and symptom distress ($p < 0.1$)
Williams et al., 2002	Subjects with breast cancer Subjects: n = 31; mean age = 59 years Dropout = 2	Randomized crossover trial	MLD versus simple lymphatic drainage	MLD decreased excess limb volume ($p = 0.013$), dermal thickness in upper arm ($p = 0.03$), and sleep disturbance ($p = 0.03$); MLD increased emotional function ($p = 0.006$), dyspnea ($p = 0.04$), pain ($p = 0.01$), and discomfort ($p = 0.002$).
Field et al., 2001	Pediatric patients with cancer diagnoses Participants: n = 20; mean age = 6.9 years Dropout not reported	Randomized, controlled trial	Parent massage with oil versus wait-list control	Significant increase in mean white blood cell count and neutrophil count ($p = 0.01$); significant decrease in anxiety ($p = 0.05$) and depression ($p = 0.01$) in parent and child
Dibble et al., 2000	Subjects with breast cancer Subjects: n = 8; mean age = 50.8 years Controls: n = 9; mean age = 48 years Dropout not reported	Randomized, controlled trial	Acupressure plus standard care versus standard care	Significant decrease in nausea ($p < 0.01$) and nausea intensity ($p < 0.04$)
Grealish et al., 2000	Subjects with cancer diagnoses Subjects: n = 103; mean age = 58.2 years Dropout = 16	Randomized crossover trial	Foot massage versus quiet bed activity	Significant decrease in pain ($p = 0.0001$), nausea ($p = 0.0012$), and mean heart rate ($p = 0.0001$); significant increase in relaxation ($p = 0.0001$) after massage treatment
Hodgson, 2000	Subjects with cancer diagnoses Subjects: n = 6 Controls: n = 6 Age range = 58–80 years Dropout = 0	Randomized, blinded, controlled trial	Reflexology versus placebo reflexology	Significant increase in quality of life for reflexology group ($p = 0.004$); nearly significant decrease in constipation ($p = 0.056$)
Stephenson et al., 2000	Subjects with breast or lung cancer Subjects: n = 24; mean age = 67.8 years Dropout = 1	Randomized crossover trial	Foot reflexology versus no intervention	Significant decrease in anxiety after reflexology and versus control group in breast and lung cancer groups ($p = 0.000$; $p = 0.000$); significant decrease in pain after reflexology and versus controls in breast cancer group ($p = 0.004$; $p < 0.05$)

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Table 2. Massage and Cancer Clinical Trials *(Continued)*

Study	Sample	Design	Massage Technique	Results
Wilkie et al., 2000	Subjects with cancer diagnoses Subjects: n = 26 Controls: n = 30 Mean age = 63 years Dropout = 11 subjects and 16 controls	Randomized, controlled trial	Swedish massage versus hospice care	Significant decrease in pulse rate, respiratory rate, and pain intensity ($p < 0.05$)
Ahles et al., 1999	Subjects with cancer diagnoses and undergoing autologous bone marrow transplantation Subjects: n = 16; mean age = 41 years Controls: n = 19; mean age = 42 years Dropout = 1 control	Randomized, controlled trial	Swedish massage plus acupressure versus standard medical care	Significant decrease in diastolic blood pressure ($p = 0.01$), nausea ($p = 0.01$), distress ($p = 0.02$), and anxiety ($p = 0.0001$); significant decrease in fatigue predischarge ($p = 0.03$)
Corner et al., 1995	Subjects with cancer diagnoses AM subjects: n = 17 Massage subjects: n = 17 Controls: n = 18 Age range: 17–79 years Dropout = 0	Randomized treatment groups and nonrandomized, matched, controlled trial	AM versus massage with oil versus standard treatment	Significant decrease in anxiety for AM ($p < 0.05$) and combined massage group ($p < 0.01$) over course of study; significant decrease in symptom distress, including pain ($p < 0.02$), mobility ($p < 0.03$), ability to learn ($p < 0.03$), and communicating with family ($p < 0.04$) in AM group
Weinrich & Weinrich, 1990	Subjects with cancer diagnoses Subjects: n = 14 Controls: n = 14 Mean age = 61.5 years Dropout = 0	Randomized, controlled trial	Swedish massage versus visit	Significant immediate decrease in pain for men ($p = 0.01$)
Sims, 1986	Subjects with breast cancer Subjects: n = 6; mean age not reported Dropout = 0	Randomized crossover trial	Gentle massage versus rest period	Significant increase in symptom distress in those who received massage first ($p = 0.05$)

AM—aromatherapy massage; HT—healing touch; MLD—manual lymph drainage; TM—therapeutic massage

The psychoneuroimmune framework proposes that perceived stress may influence neurohormone responses, resulting in immunosuppression and illness. Stress has been found to be associated with a significant decline of absolute numbers of Leu7+ NK cells and NK cell lysis (Glaser, Rice, Speicher, Stout, & Kiecolt-Glaser, 1986), and increased glucocorticoid levels also have been associated with tumor growth (Turner-Cobbs, Sephton, & Spiegel, 2001). By suppressing immune function, chronic stress may increase susceptibility to infectious agents and increase the incidence of and stimulate the growth rate of experimentally induced tumors (Jemmott & Locke, 1984).

Massage therapy may affect the overall relationship among feeling s of stress, stress hormones, and immune function. Through the reduction of psychological distress associated with disease, massage therapy may suppress the activity of the hypothalamic-pituitary-adrenal axis, causing decreases in cortisol and neuropeptide levels (Diego et al., 2001) and glucocorticoid levels (Turner-Cobbs et al., 2001). Decreased cortisol and neuropeptide levels may assist in improving immune function by increasing NK cell number and NK cell activity. With reduction of stress, glucocorticoid levels also may decrease.

A few studies have noted decreased cortisol and neuropeptide levels after a period of massage therapy in humans. Significantly decreased cortisol levels have been correlated with increased CD56 lymphocyte number and NK cytotoxicity as well as decreased levels of stress and anxiety in HIV-positive men (Ironson et al., 1996). Decreases have been observed in two-hour postmassage cortisol levels in nine healthy male volunteers (Arkko et al., 1983). In a study of massage in 34 patients with breast cancer, a significant increase in NK cell number and a reduction in anxiety were reported for the massage group compared to controls, and no significant decreases in cortisol, norepinephrine, or epinephrine levels were observed (Hernandez-Reif et al., 2004). The findings may, in part, be because of a short period of massage. With mixed preliminary results on the effects of massage on stress, immunity, and neuroendocrine measures, further research with larger sample sizes is needed.

Massage also may increase NK cell number and cytotoxicity through the physical manipulation of muscle tissue. Potential mechanisms of massage include mechanical fluid displacement in the vascular and lymphatic channels, metabolic changes, and reflex sensations (Nordschow & Bierman, 1962). A diminished state of excitability of the sympathetic division of the hypothalamus and cerebral cortex has been observed following massage, which may account for the observations of physical and mental relaxation in people receiving massage (Nordschow & Bierman).

Table 3. Massage and Cancer Observational Studies

Study	Sample	Design	Massage Technique	Results
Billhult et al., 2007	Subjects with breast cancer Subjects: n = 10; mean age = 50 years Dropout = 0	Case series	Therapeutic massage	Qualitative descriptions of patients experiencing distraction from the frightening experience, a turn from negative to positive, sense of relaxation, confirmation of caring, and feeling good
Cassileth & Vickers, 2004	Subjects with cancer diagnoses Subjects: n = 1,290; age not reported Dropout = 0	Case series	Therapeutic massage, light touch, and foot massage	Decrease in symptom scores by a mean of 54% (95% confidence interval = 52%, 56%); significant decrease in symptom score for outpatients versus inpatients ($p = 0.0002$)
Billhult & Dahlberg, 2001	Subjects with cancer diagnoses Subjects: n = 8; age range = 54–80 years Dropout = 0	Case series	Gentle massage with oil	Qualitative descriptions among women in oncology ward of relief from suffering and positive relationship with staff
Hadfield, 2001	Subjects with brain tumors Subjects: n = 10; mean age = 55 years Dropout = 2	Case series	Aromatherapy massage	Significant decrease in systolic blood pressure ($p = 0.003$), diastolic blood pressure ($p = 0.02$), heart rate ($p = 0.002$), and respiratory rate ($p = 0.000$)
Bredin, 1999	Subjects with breast cancer Subjects: n = 3; age range = 25–65 years Dropout = 0	Case series	Therapeutic massage	Qualitative descriptions of less discomfort and more relaxation, sleep, and ability to cope with changed self-image postmastectomy
Wilkinson et al., 1999	Subjects with cancer diagnoses Subjects: n = 46 Controls: n = 57 Mean age = 53.5 years Dropout = 3 subjects and 13 controls	Randomized case series	Aromatherapy massage versus massage	Significant decrease in anxiety ($p < 0.001$), psychological symptoms ($p < 0.001$), quality of life ($p < 0.01$), severe physical symptoms ($p < 0.05$), and severe psychological symptoms ($p < 0.001$) in total sample
Kite et al., 1998	Subjects with cancer diagnoses Subjects: n = 58; mean age of women = 52 years; mean age of men = 58 years Dropout = 31	Case series	Aromatherapy massage	Significant decrease in anxiety and depression ($p < 0.001$)
Kirshbaum, 1996	Subjects with breast cancer Subjects: n = 8; age not reported Dropout = 0	Case series	Aromatherapy lymphedema massage	Qualitative descriptions of less pain and swelling and more relaxation and comfort
Wilkinson, 1996	Subjects with cancer diagnoses Subjects: n = 71; mean age = 53.5 years Dropout = 23	Case series	Aromatherapy massage versus massage	Qualitative descriptions of 48 subjects liking some aspect of massage and 45 claiming benefit; all noted an increase in relaxation.
Evans, 1995	Subjects with cancer diagnoses Subjects: n = 69; age not reported Dropout = 0	Case series	Aromatherapy massage	Qualitative descriptions of feeling better after massage
Wilkinson, 1995	Subjects with cancer diagnoses Subjects: n = 26 Controls: n = 25 Mean age = 53 years Dropout = 0	Randomized case series	Aromatherapy massage versus massage	Preliminary analysis: significant decrease in physical symptoms ($p = 0.003$) and overall fewer or less severe symptoms ($p < 0.05$) and significant increase in quality of life after aromatherapy massage; significant decrease in physical symptoms for aromatherapy massage versus massage
Ferrell-Torry & Glick, 1993	Subjects with cancer diagnoses Subjects: n = 9; mean age = 56.6 years Dropout = 2	Case series	Therapeutic massage	Significant decrease in pain perception and anxiety ($p = 0.02$) and in respiratory rate, heart rate, and blood pressure after massage ($p < 0.05$); significant increase in feelings of relaxation ($p \leq 0.05$)

Safety of Massage Therapy

Massage generally is considered safe. Historically, massage has been contraindicated in people with tumors or purulent inflammations because of the possibility of "transferring" a virus to other tissues (Ostrom, 1907). Others have suggested that massage may stimulate lymph flow and theoretically may cause cancer cells to spread from one part of the body to another. Hypothetically, the highest risk correlation between massage and metastasis risk is with firm, direct contact on or near a tumor, resulting from the possibility of cell shedding (Curties, 2000), yet no data support the theory.

In a systematic review evaluating the safety and efficacy of massage therapy (Ernst, 2003), 16 case reports and four case series of rare adverse events were found, including cerebrovascular accidents, hematoma, and leg ulcers. No adverse events were noted in patients with cancer. Most adverse events were associated with massage not delivered by a licensed massage therapist or with the use of rigorous massage techniques. Adverse events were based on case reports and were not observed consistently. Based on the popularity of massage therapy, Ernst concluded that the number of adverse events reported was minimal.

Gecsedi (2002) suggested that patients receiving radiation should not be massaged in the field of treatment so as not to further irritate irradiated skin. Special precautions include avoiding areas of skin breakdown, adjusting the amount of pressure for those at risk for thrombocytopenia-induced bruising and peripheral neuropathy, and minimizing massage movements that create a rocking motion in patients with nausea or vomiting.

Specific concerns associated with massage among younger children and adolescents may include fear of massage being administered by a stranger and apprehensions regarding touch and body image. To gain children's trust, massage practitioners may demonstrate what massage is on parents, allowing children to visualize the technique. Parents then can encourage children that massage is safe. Initiating massage at the feet may allow children to recognize the potential calming and soothing benefits of massage on a noninvasive area of the body almost immediately. Massage practitioners should be aware of young adolescents who have modesty or body-image issues and work on the limbs before proceeding to the back or other areas of the body. By voicing where their pain is located, children may feel more in control and be more willing to proceed with massage sessions. Massage practitioners can educate parents about massage and reflexology techniques so that they can provide massage to their children at home. Massage therapy may be particularly useful when parents want to do something positive for their children and bond with them at the end of life.

Selecting a Provider

The American Massage Therapy Association (AMTA) is the professional association representing the massage field and provides accreditation, education, and research. AMTA has developed safe practices for working with patients with cancer and encourages massage practitioners to educate themselves about the effects of massage and corresponding contraindications so that they can work effectively with medical staff (Walton, 2000). The National Certification Board for Therapeutic Massage and Bodywork administers the national certification examination and certifies massage therapists. The practice of massage therapy is regulated in the United States in 35 states and the District of Columbia; however, the laws and requirements vary by state such that each state has set licensing, registration, or certification laws that require varying amounts of education and training hours. AMTA (n.d.) maintains a list of states with laws governing massage practice on its Web site. State laws establish professional standing to protect the public from practitioners who do not meet recognized standards of care; in the absence of such laws, entities that provide services are at increased risk of liability if adverse events occur (White House Commission on Complementary and Alternative Medicine Policy, 2002). Clinicians should be aware of professional licensure regulations, the scope of practice, and malpractice concerns of their states to understand the legal parameters of referring children with cancer to CAM providers (Cohen, 2006).

Potential Application in the Pediatric Oncology Population

Massage is a supportive therapy that can be readily applied by credentialed massage therapists or by parents who have learned massage techniques from licensed therapists. Parents of children with cancer and adults with cancer consistently have reported t hat massage therapy provides benefit during anticancer therapy. By learning about the benefits and applications of massage, parents may feel empowered to take an active role in their children's treatment plans.

Nurses are among the leaders in facilitating the safe integration of CAM therapies into conventional pediatric oncology treatment plans. They have the ability to identify conditions, symptoms, and acute treatment side effects as well as coordinate services to maximize positive patient outcomes. Massage might help mitigate pain, anxiety, depression, constipation, and high blood pressure, among many other symptoms experienced by pediatric oncology patients, and also may be beneficial during periods of profound immune suppression. Pediatric massage and reflexology are some of the most appropriate massage techniques to use in the population. Massage therapy in children with cancer need not be aggressive in nature to achieve its maximum potential; many of the studies reviewed in this article reported on the benefits of massage techniques that were light to medium in pressure.

Specific massage guidelines, including type and duration, for the incorporation of massage for children with cancer have yet to be developed. Further research is needed to elucidate the mechanisms by which massage affects the body during cancer treatment. Additional studies should examine the potential of massage to reduce stress levels; enhance the immune system, including short- and long-term effects on NK cell number, activity, and cytotoxicity; and minimize side effects of cancer therapy. In the interim, massage therapy can be incorporated safely into the care of children with cancer.

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