POSITION STATEMENT PROPOSAL ON THERAPEUTIC MASSAGE FOR BURN SCARS

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BACKGROUND INFORMATION:

Scar formation is a normal reaction of the body to injury. On the skin surface, scars develop as the result of damage such as burns, deep lacerations, or a variety of other injuries that penetrate or damage the skin. The development of superficial scarring is the method by which the body heals the skin wound. However, in those cases where injury is too deep or severe, skin grafts are usually performed.

In grafts, skin is taken from a non-damaged area of the body and reattached over the injured area. Scar formation may then continue for a period of time after wound closure is accomplished. [1, 2,3,13,16,17]

The characteristics of a scar vary with the individual but generally follow a pattern of wound healing. At first the scar is usually red in appearance and is considered an "immature" scar. As time passes and healing continues the scar will fade to normal flesh color and become "mature".[18] Scar characteristics can include one or more of the following depending on degree of injury:[2,3,12]

- Hard and non-pliable: The scar may also develop bands of fibers on or below the surface that may feel like a cord or a rubber band with pressure.[18]
- Painful: The scar may be painful, "itchy" or sensitive as nerve endings heal.[9,21,22,23,25]
- Contractures: A tightness or shortening of the skin where scars are located – especially characteristic across joints and may limit joint range of motion, compromise function, or cause deformity.
- Hypertrophic: Scar that becomes raised above skin surface as the body overproduces collagen, the substance found in scar tissue. The appearance can be thick, irregular, and rough. Usually found in larger and deeper wounds, wounds that require grafting, and wounds that take a long time to heal.[7,8,14,15,20,24]
- Keloid: Hypertrophic scars that are considerably larger than the original wound.[8]
- Matured scars: Even healed scars may become dry and reopen – this is especially true for skin grafts which do not produce oil or sweat.[7,17,28]

Burn survivors undergo extensive treatment for their burns while in the hospital.[17] However, after release from the hospital, post-treatment care typically consists of outpatient wound care, pharmaceutical pain management, and physical therapy. Pediatric burn survivors are especially vulnerable to pain and disfigurement due to physical growth of their bodies and scars as well as the emotional turmoil of burn recovery.[14,15, 20,24,28] In addition, according to the American Burn Association web site, many survivors come from economically depressed populations living at or below the poverty line with little or no access to health insurance to support this lifelong recovery process.[13,28]

Studies have already shown that massage therapy can improve mobility, decrease pruritus, improve skin status and assist in the overall recovery process for burn survivors. Massage assists in recovery by increasing blood flow, softening tissues, releasing scar tissue, and improving lymph drainage in the scarred tissue.[1,2,3,5,6,7,9,10, 20,21,22,23, 27]

Current research on burn-related scar tissue indicates that massage is effective in increasing mobility of previously immobile or restricted tissue. While there has not been a conclusive study on massage and mobility, early studies have been promising.[1,4,5,6,7,20,24,27] Additional research recommends massage as part of an optimal scar modification technique.[1,20,27]

One key to acceptance of the effectiveness of a given treatment in the medical and research community, is using evidence-based work that clearly demonstrates the efficacy of the procedure and/or intervention. (Agency for Healthcare Research & Quality [AHRQ] web site 2010).[19] This is the challenge for alternative and integrative therapies including massage.

RATIONALE:

There is a clear and consistent relationship between the effects and benefits of massage therapy and burn recovery. The importance of touch to recovering burn survivors cannot be overestimated. Over ten years of research has shown the importance and relevance of therapeutic massage for burn scars. Research has indicated not just psychological benefits but reduction in pruritus, improvement in range of motion, and significant reduction in pain.

This position fully supports AMTA's mission and future directions:

- As noted in AMTA's 2011/12 mission statement and future directions "…*quality research is the foundation for evidence-informed massage therapy education and practice*".
- Furthermore, AMTA's strategic plan states as its advocacy and influence goal that "*the health care and wellness industry accepts the value of massage therapy*" and for research that "*AMTA members are aware of the importance of scientific research to the massage therapy industry*."
- In line with AHRQ guidelines on evidence-based research, AMTA has also stated in previous strategic plans that "Massage therapy education and practice is evidence-informed".

Given that one of AMTA's strategic focus areas for fiscal year 2011/2012 is to "*increase understanding of the benefits of massage therapy through education of the health care and wellness industry"* we propose that AMTA adopts the following position statement.

POSITION STATEMENT:

It is the position of the American Massage Therapy Association (AMTA) that massage therapy can assist in the rehabilitation of burn scars.

REFERENCES:

1. Roh YS; Cho H; Oh JO; Yoon CJ. Effects of skin rehabilitation massage therapy on pruritus, skin status, and depression in burn survivors. Taehan Kanho Hakhoe Chi. 2007 Mar;37(2):221-6. PMID: 17435407

PURPOSE: Hypertrophic scarring and depression are the principal problems of burn rehabilitation. This study was done to verily the effects of **skin rehabilitation massage therapy (SRMT)** on pruritus, skin status, and depression for Korean burn survivors. METHODS: A pretest-posttest design using a non-equivalent control group was applied to examine the effects of SRMT for 3 months in a group of 18 bum survivors. The major dependent variables-including pruritus, objective and subjective scar status, and

depression-were measured at the beginning and at the end of the therapy to examine the effects of SRMT.
RESULTS: Burn survivors receiving SRMT showed reduced pruritus, improved skin status, and depression. The remaining scar also showed improvement in skin pigmentation, pliability, vescidarity, and height (compared to the surrounding skin) as measured on the Vancouver Scar Scale (VSS).
CONCLUSIONS: The findings demonstrate that SRMT for bum survivors may improve their scars both objectively and subjectively, and also reduce pruritus and depression.

2. Bláha J; Pondělicek I. Prevention and therapy of post burn scars. Acta Chir Plast. 1997;39(1):17-21. PMID: 9212487

The cosmetic and functional result in post burn scar deformities is influenced by following factors: 1. The type of patient's central nervous system and his response to burn injury. 2. Depth and site of burn areas. 3. Early excision and grafting. 4. Infection complications, their severity and location. 5. Fixation of dressings should be done using elastic materials and applied for so long until stabilisation of scars is completed. Elastic materials should be combined with rigid pressure and **pressure massage**. 6. Congenital predisposition of the patient to hypertrophic scarring.

3. Rochet JM; Zaoui A. Burn scars: rehabilitation and skin care. Rev Prat. 2002 Dec 15;52(20):2258-63. Review. French. PMID: 12621946

Burn rehabilitation main goal is to minimize the consequences of hypertrophic scars and concomitant contractures. The treatment principles rely on the association of joint posture, continuous pressure completed with range of motion to prevent joint fusion (which happens to adults but not to children). Throughout the different treatment phases and wound evolution, reassessment is necessary to review rehabilitation goals and activities. During the acute phase the alternance of positioning is prioritized in order to keep the affected extremities in anti-deformity positron using splint or other devices. At the rehabilitation phase, treatment is focused on active/passive range of motion (skin posture) strengthening exercises and use of dynamic splint is introduced to correct contractures. After their discharge home, patients benefit from outpatient rehab until scar maturation (approximately 18 months). The treatment consists mainly on active/passive range of motion, **scar massage**, strengthening exercise and endurance retraining. Also modalities (such as thermal bath and high pressure water spray) are used to address itching problems and for scar softening. Finally, reconstructive surgery can be performed to correct excessive scarring or joint contracture for better functional or cosmetic outcome.

4. Morien A; Garrison D; Smith NK. Range of motion improves after massage in children with burns: a pilot study. J Bodyw Mov Ther. 2008 Jan;12(1):67-71. Epub 2007 Jun 27. PMID: 19083657

Little is known about the effect of massage on post-bum tissue in children. We conducted a pilot study to examine the effect of **massage** (3-5 days) on mood and range of motion (ROM) in eight post-bum children. Participants showed significant increases in ROM from Time 1 (pre-massage, first day) to Time 2 (post-massage, last day) in massaged tissue but not control (non-massaged) tissue. Mood was elevated throughout the study and thus did not change across time. Although massage improved ROM, we are cautious in our interpretation because of the small sample size.

5. Silverberg R; Johnson J; Moffat M. The effects of soft tissue mobilization on the immature burn scar: results of a pilot study. J Burn Care Rehabil. 1996 May-Jun;17(3):252-9. PMID: 8736373

The purpose of this pilot study was to determine the effects of **soft tissue mobilization** (STM) on range of motion (ROM), scar pliability, and vascularity. Patients received either one treatment session of standard physical therapy or standard physical therapy plus 10 to 15 minutes of STM. Before and after ROM, scar pliability and vascularity measurements were obtained. The student's t test was used to compare measurements and revealed the STM group ($n = 5$) had significant ($p < 0.10$) gains in wrist extension and radial deviation, and the control group ($n = 5$) had significant gains in wrist extension and ulnar deviation. No significant difference was found in ROM, scar pliability, and vascularity when the STM group was compared to the control group. Further study of a larger sample over multiple treatment sessions is necessary to determine the true efficacy of STM.

6. Field T. Massage therapy for skin conditions in young children. Dermatol Clin. 2005 Oct;23(4):717-21. Review. PMID: 16112449

Two studies are reviewed that highlight the positive effects of **massage therapy** on skin conditions in young children. In the first study children being treated on a burn trauma unit received 30-minute massages before debridement or dressing change. The children who received massage therapy were more relaxed during the procedure. In the study on children with eczema, those who were massaged during the application of their skin medication showed less anxiety after the massage sessions. Across the massage period the children also showed an improved clinical condition including less redness, lichenification, scaling, excoriation, and pruritus.

7. Patiño O; Novick C; Merlo A; Benaim F. Massage in hypertrophic scars. J Burn Care Rehabil. 1999 May-Jun;20(3):268-71; discussion 267. PMID: 10342484

Various attempts have been made to intervene with the formation of hypertrophic scarring (HTS) or to ameliorate it once it has developed, but none have yet proved effective. **Massage therapy** is routinely used by therapists for the treatment of various conditions,

and there have been reports of increased scar pliability and decreased scar banding with the use of massage. This study examines the use of friction massage over a 3-month period in a group of 30 pediatric patients with HTS. The patients were randomly assigned to receive either therapeutic massage sessions of 10 minutes per day in combination with treatment with pressure garments or they were treated with pressure garments alone. A modified Vancouver Burn Scar Assessment Scale was used to measure the characteristics of the identified scars (10 cm by 10 cm) before and after the implementation of massage therapy. The study failed to demonstrate any appreciable effects of massage therapy on the vascularity, pliability, and height of the HTS studied, although there were reports of a decrease in pruritus in some patients. Further studies, with prolonged treatment intervals, are necessary to conclusively demonstrate the ineffectiveness of this therapy for HTS.

8. Berman B; Viera MH; Amini S; Huo R; Jones IS. Prevention and management of hypertrophic scars and keloids after burns in children. J Craniofac Surg. 2008 Jul;19(4):989-1006. Review. PMID: 18650721

Hypertrophic scars and keloids are challenging to manage, particularly as sequelae of burns in children in whom the psychological burden and skin characteristics differ substantially from adults. Prevention of hypertrophic scars and keloids after burns is currently the best strategy in their management to avoid permanent functional and aesthetical alterations. Several actions can be taken to prevent their occurrence, including parental and children education regarding handling sources of fire and flammable materials, among others. Combination of therapies is the mainstay of current burn scar management, including surgical reconstruction, **pressure therapy**, silicon gels and sheets, and temporary garments. Other adjuvant therapies such as topical imiquimod, tacrolimus, and retinoids, as well as intralesional corticosteroids, 5-fluorouracil, interferons, and bleomycin, have been used with relative success. Cryosurgery and lasers have also been reported as alternatives. Newer treatments aimed at molecular targets such as cytokines, growth factors, and gene therapy, currently in developing stages, are considered the future of the treatment of post burn hypertrophic scars and keloids in children.

9. Field T; Peck M, Scd; Hernandez-Reif M; Krugman S; Burman I; Ozment-Schenck L. Postburn itching, pain, and psychological symptoms are reduced with massage therapy. J Burn Care Rehabil. 2000 May-Jun;21(3):189-93. PMID: 10850898

Twenty patients with burn injuries were randomly assigned to a **massage therapy** or a standard treatment control group during the remodeling phase of wound healing. The massage therapy group received a 30-minute massage with cocoa butter to a closed, moderate-sized scar tissue area twice a week for 5 weeks. The massage therapy group reported reduced itching, pain, and anxiety and improved mood immediately after the first and last therapy sessions, and their ratings on these measures improved from the first day to the last day of the study.

10. Field T; Peck M; Krugman S;Tuchel T; Schanberg S; Kuhn C; Burman I. Burn injuries benefit from massage therapy. J Burn Care Rehabil. 1998 May-Jun;19(3):241-4. PMID: 9622469

Twenty-eight adult patients with burns were randomly assigned before debridement to either a **massage therapy** group or a standard treatment control group. State anxiety and cortisol levels decreased, and behavior ratings of state, activity, vocalizations, and anxiety improved after the massage therapy sessions on the first and last days of treatment. Longer-term effects were also significantly better for the massage therapy group including decreases in depression and anger, and decreased pain on the McGill Pain Questionnaire, Present Pain Intensity scale, and Visual Analogue Scale. Although the underlying mechanisms are not known, these data suggest that debridement sessions were less painful after the massage therapy sessions due to a reduction in anxiety, and that the clinical course was probably enhanced as the result of a reduction in pain, anger, and depression.

11. Neugebauer CT; Serghiou M; Herndon DN; Suman OE. Effects of a 12-week rehabilitation program with music & exercise groups on range of motion in young children with severe burns. J Burn Care Res. 2008 Nov-Dec;29(6):939-48. PMID: 18849852

Previous studies indicate that rehabilitation programs supplemented with a strength and endurance-based exercise program improve lean body mass, pulmonary function, endurance, strength, and functional outcomes in severely burned children over the age of 7-years when compared with standard of care (SOC). To date, supplemental exercise programming for severely burned children under the age of 7-years has not yet been explored. The purpose of this study was to determine if a 12-week rehabilitation program supplemented with music & exercise, was more effective in improving functional outcomes than the SOC alone. This is a descriptive study that measured elbow and knee range of motion (ROM) in 24 severely burned children between ages 2 and 6 years. Groups were compared for demographics as well as active and passive ROM to bilateral elbows and knees. A total of 15 patients completed the rehabilitation with supplemental music and exercise, and data was compared with 9 patients who received SOC. Patients receiving the 12-week program significantly improved ROM in all joints assessed except for one. Patients receiving SOC showed a significant improvement in only one of the joints assessed. Providing a structured supplemental music and exercise program in conjunction with occupational and physical therapy seems to improve both passive and active ROM to a greater extent than the SOC atone.

12. Gangemi EN; Gregori D; Berchialla P; Zingarelli E; Cairo M; Bollero D; Ganem J, Capocelli R; Cuccuru F; Cassano P; Risso D; Stella M. Epidemiology and risk factors for pathologic scarring after burn wounds. Arch Facial Plast Surg. 2008 Mar-

Apr;10(2):93-102. PMID: 18347236

OBJECTIVE: To describe the clinical characteristics of post burns scars and determine the independent risk factors specific to these patients. While burns may generate widespread and disfiguring scars and have a dramatic influence on patient quality of life, the prevalence of post burn pathologic scarring is not well documented, and the impact of certain risk factors is poorly understood.
METHODS: A retrospective analysis was conducted of the clinical records of 703 patients (2440 anatomic burn sites) treated at the Turin Burn Outpatient Clinic between January 1994 and May 15, 2006. Prevalence and evolution time of post burn pathologic scarring were analyzed with univeriate and multivariate risk factor analysis by sex, age, bum surface and full-thickness area, cause of the bum, wound healing time, type of bum treatment, number of surgical procedures, type of surgery, type of skin graft, and excision and graft timing.
RESULTS: Pathologic scarring was diagnosed in 540 patients (77%): 310 had hypertrophic scars (44%); 34, contractures (5%); and 196, hypertrophic contracted scars (28%). The hypertrophic induction was assessed at a median of 23 days after reepithelialization and lasted 15 months (median). A nomogram, based on the multivariate regression model, showed that female sex, young age, burn sites on the neck and/or upper limbs, multiple surgical procedures, and meshed skin grafts were independent risk factors for post burn pathologic scarring (Dxy 0.30).
CONCLUSION: The identification of the principal risk factors for post burn pathologic scarring not only would be a valuable aid in early risk stratification but also might help in assessing outcomes adjusted for patient risk.

13. American Burn Association 2012. http://www.ameriburn.org/resources_factsheet.php http://www.ameriburn.org/resources

Burn Incidence and Treatment in the United States: 2011 Fact Sheet
The following annual estimates have been derived from statistics provided by the U.S. Vital Statistics, several ongoing national surveys, selected states and the National Burn Repository of the American Burn Association. Repository reports describe admissions to hospitals with specialized services provided by "burn centers."
Burn Injuries Receiving Medical Treatment: 450,000 *(nearest 50,000)*
This general estimate is derived mainly from federal surveys which provide annual estimates of visits to hospital emergency departments. The estimate is rounded upward slightly to include burn patients who may have been treated only at hospital outpatient clinics, free-standing urgent care centers or private physician offices. Their sample sizes are too small to provide separate national estimates for burns.
Sources: National Hospital Ambulatory Medical Care Survey (NHAMCS); National Ambulatory Medical Care Survey (NAMC); National Electronic Injury Surveillance System-All Injury Project (NEISS-AIP)(2008 data).
Fire and Burn Deaths Per Year: 3,500 *(nearest 250)*

This total includes an estimated 3,000 deaths from residential fires and 500 from other sources, including motor vehicle and aircraft crashes, and contact with electricity, chemicals or hot liquids and substances. About 75% of these deaths occur at the scene or during initial transport. Fire and burn deaths are combined because deaths from burns in fires cannot always be distinguished from deaths from smoke poisoning.
Sources: National Fire Protection Association (2008); American Burn Association National Burn Repository (2010 report: 2000-2009 admissions); US Vital Statistics (2007).

Hospitalizations for Burn Injury: 45,000, including 25,000 at hospitals with burn centers *(nearest 5,000)*

About 55% of the estimated 45,000 U.S. acute hospitalizations for burn injury in recent years were admitted to 125 hospitals with specialized facilities for burn care ("burn centers"). The percentage admitted to burn centers has increased steadily in recent decades, with growing recognition of the special needs of burn patients and continuing advances in the technical resources and skills of those who refer, transport and treat them. Burn centers now average 200 annual admissions, while the other 4,700 U.S. acute care hospitals average less than 3.
Sources: National Hospital Discharge Survey (NHDS); Healthcare Cost and Utilization Project-National Inpatient Sample (HCUP-NIS (200)); recent 100% hospitalization data sets from several states..

Selected Statistics on Admissions to Burn Centers, 2000-2009
Survival Rate: 94.8%
Gender: 70% male, 30% female
Ethnicity: 63% Caucasian, 17% African-American, 14% Hispanic, 6% Other
Admission Cause: 42% fire/flame, 31% scald, 9% contact, 4% electrical, 3% chemical, 11% other
Place of Occurrence: 66% home, 10% occupational, 8% street/highway, 16% other
Source: American Burn Association National Burn Repository (2010 report)

14. Bombaro KM; Engrav LH; et al. What is the prevalence of hypertrophic scarring following burns? Burns. 2003 Jun;29(4):299-302. PMID: 12781605

Hypertrophic scarring after burns remains a major problem and is considered to be "common". Pressure garments are commonly used as treatment even though there is little sound data that they reduce the prevalence or magnitude of the scarring. In 1999 we began a study of the efficacy of pressure garments on forearm burns. After studying 30 patients, mainly white adults, we found no hypertrophic scar in either those treated with pressure or without. This prompted us to review the literature on the prevalence of hypertrophic scarring after burns and found only four articles with a relatively small number of patients and only three geographical locations. It became clear that the prevalence of hypertrophic scarring is really unknown. We then did a retrospective study of 110 burn survivors and counted all hypertrophic scars of all sizes and locations in all races and found the prevalence hypertrophic scarring to be 67% which conflicts with the

published reports and our prospective study and suggests that further research is necessary. We concluded that a worldwide, prospective survey is necessary to establish the prevalence of hypertrophic scarring after burns. In this article we are calling for and offering to organize this survey.

15. Staley MJ; Richard RL. Use of pressure to treat hypertrophic burn scars. Adv Wound Care. 1997 May-Jun;10(3):44-6. PMID: 9306778

Pressure has been used since the early 1970s by burn care provides to help minimize the formation of hypertrophic scars. Although the exact mechanism of action is unknown, pressure appears clinically to enhance the scar maturation process. Bandages that can be wrapped and unwrapped or are made of a soft material are used in early scar management. Custom made pressure garments generally are used for definitive scar management. Inserts are placed in concavities to aid in compression. Whatever intervention is used for scar management, patient and family should be educated about the realistic, potential outcome.

16. Edwards J. Scar management. Nurs Stand. 2003 Sep 10-16;17(52):39-42. PMID: 14533225

Scarring has major psychological and physical repercussions—for example, scarring on the face and visible regions of the body can be very distressing for the patient, whether it is simple acne scars or large, raised surgical or traumatic scars. This article discusses the process of scar formation, the differences between scars and proposes a number of ways in which the nurse can manage scars.

17. Ward RS. Pressure therapy for the control of hypertrophic scar formation after burn injury. A history and review. J Burn Care Rehabil. 1991 May-Jun;12(3):257-62. PMID: 1885644

Devastating functional problems can result from the formation of hypertrophic scar tissue after burn injury. Although a patient with burns may have several medical problems to contend with because of the injury, most ongoing rehabilitation difficulties are a consequence of the continual wound contraction that occurs in immature burn scars. Treatment of hypertrophic burn scar consists of several surgical options and of **pressure therapy**, which traditionally involves wearing garments made from elasticized fabric. This article reviews the treatment of hypertrophic scar tissue, with emphasis on its history and on nonsurgical methods of managing the burn scar.

18. van Zuijlen PPM; Angele AP; Kreis RW; et al. Scar assessment tools: implications for current research. Plastic & Reconstructive Surgery. 2002 March;109(3):1108-1122.

Scarring is considered a major medical problem that leads to cosmetic and functional

sequelae. Scar tissue is clinically distinguished from normal skin by an aberrant color, rough surface texture, increased thickness (hypertrophy), occurrence of contraction, and firmness. Marked histologic differences are the change in dermal architecture and the presence of cell: the myofibroblast. Many assessment tools are available for analysis of pathologic conditions of the skin; however, there general agreement as to the most appropriate tools for evaluation of scar tissue. This review critically discusses current available objective measurement tools, subjective assessment tools, and potential devices that may be available in the scar assessment.

19. Agency for Healthcare Research & Quality. Http://www.ahrq.gov/ Evidence-based health care information and reports. 2010 April.

Evidence-based Practice Centers: *Synthesizing scientific evidence to improve quality and effectiveness in health care*
Under the Evidence-based Practice Centers (EPC) Program of the Agency for Healthcare Research and Quality (formerly the Agency for Health Care Policy and Research—AHCPR), 5-year contracts are awarded to institutions in the United States and Canada to serve as EPCs. The EPCs review all relevant scientific literature on clinical, behavioral, and organization and financing topics to produce evidence reports and technology assessments. These reports are used for informing and developing coverage decisions, quality measures, educational materials and tools, guidelines, and research agendas. The EPCs also conduct research on methodology of systematic reviews.
Overview / Centers / .Report Development / Additional Information
Overview: In 1997 the Agency for Health Care Policy and Research (AHCPR), now known as the Agency for Healthcare Research and Quality (AHRQ), launched its initiative to promote evidence-based practice in everyday care through establishment of 12 Evidence-based Practice Centers (EPCs). The EPCs develop evidence reports and technology assessments on topics relevant to clinical, social science/behavioral, economic, and other health care organization and delivery issues—specifically those that are common, expensive, and/or significant for the Medicare and Medicaid populations. With this program, AHRQ became a "science partner" with private and public organizations in their efforts to improve the quality, effectiveness, and appropriateness of health care by synthesizing the evidence and facilitating the translation of evidence-based research findings. Topics are nominated by non-federal partners such as professional societies, health plans, insurers, employers, and patient groups. Go to http://www,ahrq.gpy/clinic/epc/epctopJcn,htm for topic nomination procedures. Federal partners often request evidence reports and should contact the EPC Program Director for more information.

20. Holavanahalli, Radha K. PhD; Helm, Phala A. MD; Parry, Ingrid S. MS, PT; Dolezal, Cynthia A. PT, MLS; Greenhalgh, David G. MD. Select Practices in Management and Rehabilitation of Burns: A Survey Report. Journal of Burn Care & Research, March/April 2011,32(2):210-223.

The purpose of this study is to document the organization and current practices in physical rehabilitation across burn centers. An online survey developed for the specific purposes of this study sought information regarding a) logistics of the burn center; b) inpatient and outpatient treatment of patients with burn injury; and c) specific protocols in the treatment of a few complications secondary to burn injuries. Of the 159 responses received, 115 were received from the United States, 20 from Australia, 16 from Canada, and 7 from New Zealand. The overall sample included responses from 76 physical therapists (PTs) and 78 occupational therapists. Seventy-three of those surveyed considered themselves primarily a burn therapist. Nurses (86%) were reported as primarily responsible for wound care of inpatients, followed by wound care technicians (24%). Ninety-seven percent of the therapists reported following their own treatment plans. The trunk and areas of head and neck were treated by both PTs and occupational therapists, whereas the lower extremities continue to be treated predominantly by PTs. Some common practices regarding treatment of a few complications secondary to burn injuries such as splinting to prevent contractures, treatment of exposed or ruptured extensor tendons, exposed Achilles tendons, heterotopic ossification, postoperative ambulation, conditioning, **scar massage**, and use of compression garments are described. Opportunities exist for 1) developing a common document for practice guidelines in physical rehabilitation of burns; and 2) conducting collaborative studies to evaluate treatment interventions and outcomes.

21. Goutos, Ioannis BSc(Hons), MBBS(Hons), MRCSEd; Dziewulski, Peter FRCS, FRCS(Plast); Richardson, Patricia M. MRCP, FRCA. Pruritus in Burns: Review Article. Journal of Burn Care & Research, March/April 2009,30(2):221-228.

Pruritus represents a common and distressing feature of burn wounds. Over the last decades, significant advances in neuroanatomical and neurophysiological knowledge have resulted in the elucidation of the mediators and pathways involved in the transmission of pruritic impulses. A plethora of therapeutic approaches have been evaluated mostly in small-scale studies involving burns patients targeting both the peripheral and the central components of the neurologic pathway. Antihistamines, doxepin, **massage therapy**, and transcutaneous electrical nerve stimulation are effective strategies to combat pruritus in burns patients. Recent studies have provided preliminary evidence regarding the effectiveness of gabapentin and ondansetron. The area of burns pruritus is under-researched and large-scale studies are required to reinforce the armamentarium of specialists with evidence-based regimens for the treatment of this highly distressing symptom.

22. Li, Adrienne L. K. BASc; Gomez, Manuel MD, MSc; Fish, Joel S. MD, MSc, FRCS(C). Effectiveness of Pain Management Following Electrical Injury. Journal of Burn Care & Research, January/February 2010,31(1):73-82.

The purpose of this study was to evaluate the effectiveness of pain management after electrical injury. A retrospective hospital chart review was conducted among electrically injured patients discharged from the outpatient burn clinic of a rehabilitation hospital (July 1, 1999, to July 31, 2008). Demographic data, numeric pain ratings (NPRs) at initial assessment and discharge, medications, nonpharmacologic modalities, and their effects before admission and after rehabilitation were collected. Pain management effects were compared between high (≥1000 v) and low (<1000 v) voltage, and between electrical contact and electrical flash patients, using Student's *t*-test and χ^2, with a $P < .05$ considered significant. Of 82 electrical patients discharged during the study period, 27 were excluded because of incomplete data, leaving 55 patients who had a mean age ±SD of 40.7 ± 11.3 years, TBSA of 19.2 ± 22.7%, and treatment duration of 16.5 ± 15.7 months. The majority were men (90.9%), most injuries occurred at work (98.2%), mainly caused by low voltage (n = 32, 58.2%), and the rest caused by high voltage (n = 18, 32.7%). Electrical contact was more common (54.5%) than electrical flash (45.5%). Pain was a chief complaint (92.7%), and hands were the most affected (61.8%), followed by head and neck (38.2%), shoulders (38.2%), and back torso (38.2%). Before rehabilitation, the most common medication were opioids (61.8%), relieving pain in 82.4%, followed by acetaminophen (47.3%) alleviating pain in 84.6%. Heat treatment was the most common nonpharmacologic modality (20.0%) relieving pain in 81.8%, followed by **massage therapy** (14.5%) alleviating pain in 75.0%. During the rehabilitation program, antidepressants were the most common medication (74.5%), relieving pain in 22.0%, followed by nonsteroidal antiinflammatory drugs (61.8%), alleviating pain in 70.6%. Massage therapy was the most common nonpharmacologic modality (60.0%), alleviating pain in 75.8%, and then cognitive behavioral therapy (54.5%), alleviating pain in 40.0%. There were pain improvements in all anatomic locations after rehabilitation except for the back torso, where pain increased 0.7 ± 2.9 points. Opioids were more commonly used in high voltage ($P < .05$), and cognitive behavioral therapy in low-voltage injuries ($P < .05$). Opioids were used in both electrical flash and electrical contact injuries. Pain in electrically injured patients remains an important issue and should continue to be addressed in a multimodal way. It is hoped that this study will guide us to design future interventions for pain control after electrical injury.

23. Parlak Gürol, Ayşe MSc; Polat, Sevinç PhD; Nuran Akçay, Müfide MD. Itching, Pain, and Anxiety Levels are Reduced with Massage Therapy in Burned Adolescents. Journal of Burn Care & Research, May/June 2010,31(3):429-432.

Burn can be among the most severe physical and psychological traumas a person may face. Patients with burns commonly have severe itching and pain. Severe itching has also been associated with anxiety, sleep disturbance, and disruption of daily living activities. The addition of complementary treatments to standard care may lead to improved pain management and may offer a safer approach for reducing pain and procedural anxiety for patients with burns. The authors conducted an experimental study to examine whether the effects of **massage therapy** reduced burned adolescents' pain, itching, and anxiety levels.

Sixty-three adolescents were enrolled in this study shortly after admission (mean days = 3 ± 0.48) at a burn unit in a large university hospital from February 2008 to June 2009. The measures including the pain, itching, and state anxiety were collected on the first and last days of the 5-week study period. The participants had an average age of 14.07 ± 1.78 years and came usually from the lower socioeconomic strata. The authors observed that massage therapy reduced all these measures from the first to the last day of this study ($P <$ .001). In most cultures, massage treatments are used to alleviate a wide range of symptoms. Although health professionals agree on the use of nonpharmacologic method for patients with burns, these applications are not yet common.

24. Richard, Reg MS, PT; Baryza, Mary Jo PT, MS, PCS; Carr, Judith A. OTR/L; Dewey, William S. PT, CHT, OCS; Dougherty, Mary E. PT; Forbes-Duchart, Lisa MSc, OTReg (MB); Franzen, Beth J. OTR/L; et.al. Burn Rehabilitation and Research: Proceedings of a Consensus Summit. Journal of Burn Care & Research, July/August 2009, 30(4):543-573.

Burn rehabilitation is an essential component of successful patient care. In May 2008, a group of burn rehabilitation clinicians met to discuss the status and future needs of burn rehabilitation. Fifteen topic areas pertinent to clinical burn rehabilitation were addressed. Consensus positions and suggested future research directions regarding the physical aspects of burn rehabilitation are shared.

25. Bell, P Lynn DO; Gabriel, Vincent MD, FRCPC. Evidence Based Review for the Treatment of Post-burn Pruritus. Journal of Burn Care & Research, January/February 2009, 30(1):55-61

Pruritus is one of the most common and distressing complications of burns. It is often debilitating and interferes with sleep, activities of daily living and may cause additional tissue damage from scratching. This systematic review classified and ranked 10 trials and one case report for the effective treatment of post-burn pruritus. A literature search was performed using Ovid Medline from 1950 to present; limited to English and used the search terms pruritus, itching, and burns. The studies available were evaluated using the Physiotherapy Evidence Database scoring system. Each article was then classified according to the Practice Guidelines for Burn Care 2006, a practice guideline published in the Journal of Burn Care and Research. Ten trials were available and all were accepted for analysis. The evidence was classified class II or class III, meeting criteria for guideline status according to the Practice Guidelines of Burn Care 2006. The best quality study for the pharmacological treatment of post-burn pruritus was selective histamine receptor antagonists. The best quality study for the non-pharmacological treatment of post-burn pruritus was the use of pulse dye laser. A paucity of literature exists for the treatment of post-burn pruritus. Also, in the search for effective treatments of post-burn pruritus, there is not a consistent and detailed instrument of measure available for use. Currently, there is no quality evidence available for the treatment of post-burn pruritus and prospective, randomized controlled trials are needed.

26. Willebrand, M; Sveen, J, MD; Ramlint, M, RN; Bergquist, M, MD; Huss, F, MD Folke Sjöberg. Psychological problems in children with burns—Parents' reports on the Strengths and Difficulties Questionnaire. Journal of Burn Care & Research: Accepted 3 August 2011. Published online 19 September 2011.

Burns may have a devastating effect on psychological health among children, although previous studies report difficulties as well as positive findings. The aims were to describe the rate of psychological problems in children with burns using a standardized instrument and to explore statistical predictors of these problems. Parents (n = 94) of children aged 3–18 years who sustained burns 0.3–9.0 years previously answered the Strengths and Difficulties Questionnaire (SDQ) covering Emotional symptoms, Conduct problems, Hyperactivity/Inattention, Peer relationship problems, Prosocial behaviour, and a Total difficulties score. Questions regarding parental psychological health and family situation were also included. The results for three of the SDQ subscales were close to the norm (10%) regarding the rate of cases where clinical problems were indicated, while the rate of cases indicated for Conduct, Peer problems and Total difficulties was 18–20%. Statistical predictors of the SDQ subscales were mainly parents' psychological symptoms, father's education, and changes in living arrangements. Visible scars were relevant for the Total difficulties score and Hyperactivity/Inattention. In summary, a slightly larger proportion of children with burns had psychological problems than is the case among children in general, and family variables exerted the most influence on parental reports of children's psychological problems.

27. Garrison, DK, BA LMT; Smith, NK, LMT; et al. Therapeutic Massage for Pediatric Burn Survivors, Poster # 5. Presented at: Southern Region Burn Conference, November 12-14, 2010 at Cook Convention Center in Memphis, TN.

OBJECTIVE: These 2 projects were designed to 1) determine if **therapeutic massage** intervention produced clinically meaningful changes in ROM, keloid size/shape, and mood variances in children ages 8-18 (2006 project); and 2) to determine if massage alone or massage with AIS produced greater changes in ROM (2010 project).
DESIGN: Data collected at Camp Amigo 2006 and at Camp Amigo & the Central Virginia Burn Camp in 2010.
PARTICIPANTS: From an initial screening of 30 children, 8 children were eventually selected for full protocol in 2006. From an initial screening of 47 children in 2010, no children met the criteria for full protocol, and 24 children were given general therapeutic massage sessions. All were burn survivors living in the Southeastern US and all had thermal burns > 2 years.
RESULTS: Massage significantly increased ROM in participants with scars when comparing the first day of measurement to the last day. Neither circumference nor mood was significantly altered.
CONCLUSIONS: Although ROM was significantly different when comparing first and last day measurements, we are cautious to contribute this entirely to massage because of

the small number of participants in the study. More research is needed on both massage & ROM and massage with AIS. We would also strongly encourage studies with adult populations.

28. Radha K. Holavanahalli, PhD, Phala A. Helm, MD, Karen J. Kowalske, MD. Long-Term Outcomes in Patients Surviving Large Burns: The Skin. J Burn Care Res 2010;31:631–639

The objective of this study was to evaluate persons who have survived severe burns and to describe the long-term residual problems relating to the skin. This is a cross-sectional descriptive study that included a one-time evaluation of 98 burn survivors (18 years old or older) who survived >30% TBSA burns, were >3 years postinjury, and consented to participate. Study participants were required to undergo a physical examination conducted by the Physical Medicine and Rehabilitation physicians in addition to completing study questionnaires. Participants were predominantly male (63%) and Caucasian (69%). The average time from injury was 17 years (range 3–53 years), and the average TBSA burn was 57% (range 30–97%). Problems with hot and cold temperature, sensory loss, raised scars, and itching continued to pose problems many years after burn injury. Reports of open wounds, skin rash, painful scars, and shooting pain in scars tended to decrease over time, whereas reports of fragile burns, including cuts and tears, tended to increase over time. Findings from the physical examination of the participants include hypertrophic scars in grafted areas (92%) and in nongrafted areas (38%), decreased sensation to pin in grafted areas (71%), hyperpigmentation in grafted areas (53%), fingernail deformities (35%), and skin breakdown (32%). Individuals with large burns deserve more long-term attention. As survivors of large burns continue to face significant burn-related issues, there is a critical need for long-term follow-up both in the clinic and in research.