# Massage Therapy Utilization in Pediatric Acute Burns: A Retrospective Cohort Study

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*Background:* Patient-centered burn care extends beyond physical treatment to incorporate the management of the psychological impacts including stress, pain, and anxiety. This study explores the novel application of massage therapy (MT) in children with acute burns, assessing utilization and impact on pain and relaxation.

*Methods:* A retrospective review of 198 children with thermal injury admitted to an American Burn Association-verified pediatric burn center between January 2022 and July 2023 was conducted, excluding those requiring intensive care admission. Demographics, injury details, and MT variables were summarized using descriptive statistics. A logistic regression explored the impact of age, length of stay (LOS), and total body surface area on MT provision.

*Results:* All patients received MT consultation, with 13.6% of patients (n = 27) undergoing 43 MT sessions, with a median duration of 25.0 min. Common burn mechanisms in the MT group were scalds (55.6%), flame (22.2%), and contact (14.8%) burns. Of patients reporting pain pre-massage, 75.0% experienced pain relief, and 95.3% were content, relaxed or resting comfortably post-intervention. Barriers to MT included patients being asleep (42.1%), off the unit (33.7%), or attended to by other health-care providers (21.1%). Patients receiving MT had a longer median LOS compared to those who did not ($p < 0.001$).

*Conclusion:* MT is potentially valuable for children admitted with acute burns, reducing pain and promoting relaxation. However, patients admitted on weekends and with short admissions frequently missed MT treatment. Addressing barriers through additional weekend resources, provider education, and increased awareness of patient readiness for sessions may improve access to MT.

KEYWORDS: Massage therapy; pediatrics; burn; pain; non-pharmacological intervention

## INTRODUCTION

Burns in pediatric patients can be physically and psychologically devastating, and initial treatments can involve surgical procedures and aggressive physical therapy.[1,2] Acute burn management focuses on resuscitation, wound care, infection prevention, nutrition, rehabilitation, and pain relief. As pediatric patients progress through their post-burn recovery, they frequently continue to experience stress, anxiety, pruritis, and pain related to their treatment.[2]

Pediatric burn patients may experience intense pruritus and pain, which leads to additional anxiety and sleep disturbances post-burn.[3–5] Management of these symptoms is important in order to prevent post-traumatic stress disorder.[1,6,7] The mainstay of post-burn pain treatment is medical therapy, often including opioids[8,9]; however, these medications are not all encompassing and do not convincingly address neuropathic pain, decrease anxiety, or promote rest.[10–12] The negative side effects of opioids, including sedation, constipation, dependency, and itching, are also well documented, particularly in pediatric patients.[13,14] Therefore, patient-centered burn care for pediatric patients requires a

comprehensive, multimodal approach to manage the symptoms inflicted by thermal injury, such as pain, anxiety, and itching.[5,15]

Pharmacological management is just one piece of a comprehensive treatment plan following burn injuries. Complementary therapies, which continue to gain popularity, provide non-pharmacological interventions to holistically care for patients.[5,9,15–18] Non-pharmacological approaches currently being utilized to reduce pain, anxiety, and pruritis in pediatric patients include virtual reality gaming, guided relaxation, distraction, music therapy, and massage therapy (MT).[5,15,18–22] MT is a low-cost and non-invasive technique with demonstrated early effectiveness in reducing anxiety, pain, and pruritis.[5,15,18–21] Scar massage is a well-studied component in the long-term management of hypertrophic scars, thought to improve both scar appearance and itching.[23–25] MT can also be used to provide relaxation and reduce pain resulting from burns through the use of effleurage and petrissage.[16] However, the use of MT in the acute phase (initial admission) of burn treatment for relaxation in the pediatric patient population is distinct from scar management and remains largely unexplored, despite demonstrating early promise.[26] The purpose of this study is to examine the utilization of and barriers to MT in pediatric patients with acute burn injury.

## MATERIALS AND METHODS

### Study Design and Ethics

A retrospective review of the electronic health records (EHRs) of pediatric patients admitted to the hospital with thermal injury between January 2022 and July 2023 was performed. This study gained ethical approval from the local institutional review board (STUDY00003538).

### Setting

This study was conducted in a single large, free-standing pediatric quaternary American Burn Association (ABA)-verified pediatric burn center that admits approximately 200 burn patients a year, in addition to an outpatient census volume of 500 unique patients. Every child admitted is referred for an occupational therapy and physical therapy evaluation to assist with mobility, prevention of contracture, and restoration of function. In addition to occupational and physical therapies, automatic consultations for MT are placed in the EHR. MT evaluation and treatments are available Monday to Friday on an individualized, scheduled basis. Massages are provided by 1 of 12 licensed massage therapists who cover consultations from all inpatient wards. Interventions provided vary based on the individual needs of the patient, but frequently include effleurage, petrissage, stroking, and passive touch. MT is a billable service.

### Data Collection

EHRs were reviewed for this study if they met the inclusion criteria of pediatric burn patients aged 0–18 years admitted to the inpatient floor at an ABA-verified pediatric burn center. Patients requiring intensive care unit admissions were excluded. MT data were collected through manual chart review. Discrete burn injury and demographic data were extracted from a trauma/burn patient registry maintained by the institution. The following data were extracted for each patient: demographic information (gender, age at time of burn, race, ethnicity, and insurance coverage), injury details (burn type, injury date, total body surface area (TBSA) burn, length of stay (LOS), surgical procedures, and complications), and MT treatment data (MT received, days to initial MT treatment from order, self-reported or provider assessed presence of pain pre-post MT intervention, treatment frequency, duration of massage sessions, moisturizer used, outcomes of sessions, and barriers to evaluation/treatment). Adverse reactions, including graft loss, were extracted from the burn registry. Massage sessions were performed as part of routine clinical care in the patient's room. String data from missed visit MT notes were coded by two researchers (BR, DZ) to assess barriers to MT sessions and for ease of analysis.

### Data Analysis

Statistics were completed using Microsoft Excel (Office 365, Microsoft, Seattle, WA) and SPSS (SPSS for Windows, version 28, IBM, Chicago, IL). Descriptive statistics summarized patient demographics, injury details, and variables related to MT treatment. To investigate the potential

impact of age, LOS, and TBSA on the provision of MT, a binary logistic regression was performed, and a Bonferroni correction was applied to control for multiple comparisons. An alpha of <0.05 was considered to be statistically significant.

## RESULTS

### Demographics

Over the study period of 12 months, a total of 197 patients were admitted for burn care, all of whom received a consultation for MT. The patients had a median age of 2 years (interquartile range (IQR): 1.3–6.0 years). Age did not determine the likelihood of MT intervention ($p = 0.471$). The patients were primarily male (64.0%), of white race (54.3%), and identified as non-Hispanic or Latino ethnicity (91.9%). The majority had Medicaid insurance coverage (68.5%), followed by commercial (22.3%), and self-pay (9.2%). Of all patients who received MT consultations, 27 (13.7%) patients received a combined 43 MT treatment (mean: 1.6; SD=1.6) sessions. Detailed demographic characteristics can be seen in Table 1.

### Injury Details

Burn injury mechanisms in this cohort included scald burns (61.4%), contact burns (17.8%), and flame burns (10.7%). Median TBSA burn for all patients in the admitted cohort was 3.0% (IQR: 1.0–6.0). The median TBSA burn for children receiving MT was greater than that of those who did not receive MT (4.0% vs 3.0%) though this did not meet statistical significance ($p = 0.996$). Median LOS for all patients was 1.0 day (IQR: 1.0–2.0 days), with those receiving MT demonstrating an association with increased median LOS compared to those who did not receive MT (4.0 days, IQR 2.0–7.0 days vs 1.0 day, IQR 1.0–2.0 days; $p < 0.001$). A total of 48 children (24.4%) required surgical procedures in the operating room. Graft loss was a complication in only one case, and this was unrelated to MT intervention and hence not deemed to be an adverse event.

### Massage Therapy Treatment

Of those treated by MT, the majority were prescribed a frequency of two visits per week (28.0%), and the median session duration was 25.0 min (IQR: 23.0–33.5 min). All patients had positive responses to MT intervention, and of the 12 sessions during which patients reported pre-massage pain, 75.0% of them self-reported no pain following MT intervention. MT treatment information is detailed in Table 2.

### Barriers to Massage Therapy

A total of 138 MT sessions were attempted, 43 (31.2%) of which resulted in successful delivery of an MT. In 20.5% of unsuccessful consultations, massage therapists made at least one attempt to treat patients who had not undergone MT. Barriers to implementation of MT included patients sleeping (42.1%), patients being off the inpatient ward (33.7%), and the patient being attended to by other providers (21.1%) (Figure 1). Of patients not attempted by MT, 36.5% of consults (n = 62) occurred over the weekend, a period when massage therapists are not present to provide services, and 85.5% of those patients (n = 53) had an LOS of 2 days or fewer.

## DISCUSSION

This center is one of the few pediatric burn centers to offer routine MT to patients on admission. Results from this cohort represent the first study examining the implementation and utilization of MT for children hospitalized with acute burns. MT was implemented without adverse effects and resulted in increased restfulness and reduced pain in the majority of patients receiving interventions. Despite these benefits and automatic consultation, a small portion of patients (13.7%) actually received MT interventions. Improving the success rate of massage therapists in the provision of care is critical to ensure that children with burns are able to obtain the non-pharmacological benefits of MT.

Removing barriers to MT delivery is critical to increasing the number of successful sessions, but it remains important to understand the appropriateness of respecting some barriers to MT that may not be applicable to all therapies. A common barrier in this cohort was “patient sleeping”; however, removing this limitation to therapy delivery by waking a resting child for MT, a service aiming to promote restfulness and relaxation, would be questionable and counterintuitive.

TABLE 1. Demographics Characteristics

| | *Massage (%)* | *No Massage (%)* | *Total (%)* |
|---|---|---|---|
| Patients | 27 (13.7) | 170 (86.3) | 197 (100) |
| Sex | | | |
| Female | 8 (29.6) | 63 (37.1) | 71 (36.0) |
| Male | 19 (70.4) | 107 (62.9) | 126 (64.0) |
| Age, median years (IQR) | 3.0 (1.8–8.0) | 2.0 (1.3–5.8) | 2.0 (1.3–6.0) |
| Race | | | |
| Asian | 1 (3.7) | 11 (6.5) | 12 (6.1) |
| Black | 6 (22.2) | 50 (29.4) | 56 (28.4) |
| Hispanic | 1 (3.7) | 5 (2.9) | 6 (3.0) |
| Multiple races | 2 (7.4) | 13 (7.6) | 15 (7.6) |
| White | 17 (63.0) | 90 (52.9) | 107 (54.3) |
| Ethnicity | | | |
| Hispanic or Latino | 3 (11.1) | 7 (4.1) | 10 (5.1) |
| Non-Hispanic or Latino | 24 (88.9) | 157 (92.4) | 181 (91.9) |
| Unknown | 0 (0.0) | 6 (3.5) | 6 (3.0) |
| Insurance | | | |
| Commercial | 5 (18.5) | 39 (22.9) | 44 (22.3) |
| Medicaid | 17 (63.0) | 118 (69.4) | 135 (68.5) |
| Self-pay | 5 (18.5) | 13 (7.6) | 18 (9.2) |
| Burn type | | | |
| Chemical | 0 (0.0) | 6 (3.5) | 6 (3.0) |
| Electrical | 0 (0.0) | 1 (0.6) | 1 (0.5) |
| Flame | 6 (22.2) | 15 (8.8) | 21 (10.7) |
| Contact | 4 (14.8) | 31 (18.2) | 35 (17.8) |
| Other burn | 1 (3.7) | 8 (4.7) | 9 (4.6) |
| Scald | 15 (55.6) | 106 (62.4) | 121 (61.4) |
| Unknown | 1 (3.7) | 3 (1.8) | 4 (2.0) |
| TBSA Burn, Median (IQR) | 4.0 (3.0–8.0) | 3.0 (1.0–6.0) | 3.0 (1.0–6.0) |
| LOS, Median Days (IQR) | 4.0 (2.0–7.0)* | 1.0 (1.0–2.0)* | 1.0 (1.0–2.0) |
| OR | | | |
| Yes | 11 (40.7) | 37 (21.8) | 48 (24.4) |
| No | 16 (59.3) | 133 (78.2) | 149 (75.6) |
| Complications | | | |
| Graft loss | 1 (3.7) | 0 (0) | 1 (0.5) |
| None | 26 (96.3) | 170 (100) | 196 (99.5) |

IQR = interquartile range; LOS = length of stay; OR = operating room; TBSA = total body surface area.
*$p < 0.001$.

TABLE 2. Massage Therapy Treatment Information

| | *n (%)* |
|---|---|
| Recommended MT frequency | |
| 1×/week | 1 (3.7) |
| 2×/week | 12 (44.5) |
| 3×/week | 9 (33.3) |
| 4×/week | 4 (14.8) |
| Discharge | 1 (3.7) |
| Pre-pain | |
| Yes | 12 (28.0) |
| No | 31 (72.0) |
| Post-pain | |
| Yes | 3 (7.0) |
| No | 40 (93.0) |
| Duration, median minutes (IQR) | 25.0 (23.0–33.5) |
| Moisturizer used | |
| Yes | 16 (37.2) |
| No | 27 (62.8) |
| Provider-observed outcomes | |
| Content/relaxed | 11 (25.6) |
| Resting quietly | 30 (69.8) |
| Sleeping | 1 (2.3) |
| Not documented | 1 (2.3) |

IQR = interquartile range; MT = massage therapy.

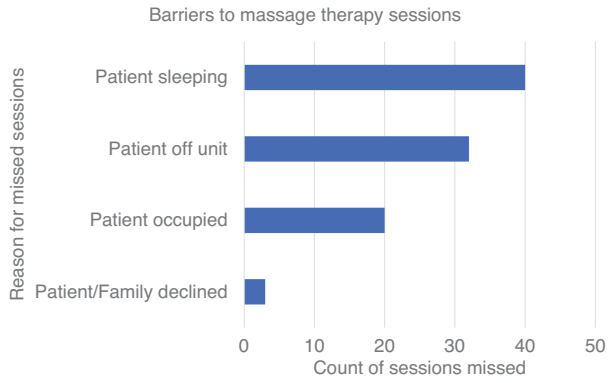


*FIGURE 1. Barriers to massage therapy sessions.*

Instead, it should be an aim to improve the ability of massage therapists to check-in throughout the day on a single patient, thus increasing the chance of identifying a non-sleeping time that might be appropriate for therapy without disturbing the child's rest. Additionally, involving child life services to craft a schedule that bundles therapies for the patient during typical waking hours, especially for long-term patients, would increase predictability of being able to complete MT sessions.

To further address the issue of access, the exploration of other modifiable barriers to MT is key. A challenge at this institution is the lack of dedicated massage therapists for the burn unit. Therapists cover multiple wards across the hospital which impacts their availability to follow-up with patients who may be unavailable on the first attempt. A potential solution could involve a dedicated therapist who is routinely present to increase the success rate of MT interventions. Consideration could be made to group several disease-specific patient populations who might benefit from MT to a particular unit in the hospital, in order to justify the dedication of a therapist to this location. Moreover, collaboration with other specialties to provide co-treatments, which has shown benefit in other contexts, could enhance the patient experience and address barriers such as children being attended to by other providers.[27] Expanding MT services to weekends could also increase accessibility for children needing treatment.

However, addressing access issues requires acknowledging broader systemic challenges within the inpatient setting. Czarnecki and colleagues identified various barriers to pain management in children, including insufficient orders, low priority by staff, competing demands for time, and patient/parent reluctance.[28] While consultations to MT are not a barrier in this study, it is possible that the reasons for missed sessions reported by massage therapists may be underpinned by similar barriers reported by Czarnecki et al., such as low priority by staff.[28]

If MT is perceived as a low-priority service by medical staff and nurses, there may be a lack of advocacy for MT intervention and promotion of participation could be limited. A Canadian study of health-care professional views of MT found a lack of knowledge about MT to be a barrier to clinical collaboration,[29] while a Swiss study revealed that nurses question the validity of massage and regard it as pleasure care rather than a true intervention.[30]

While the findings of these studies may not mirror the sentiments of clinicians in the United States, education of staff on the growing evidence of MT's effectiveness in controlling pain, while also reducing anxiety and pruritis,[5,20] may increase advocacy for MT and facilitate the removal of barriers (i.e., timing of sessions around other appointments and protecting time for MT services).

Longer LOS in the cohort receiving MT demonstrates the importance of length of admission in the access of MT. The relatively small number of children receiving MT may likely be due to the brief period of hospitalization for the majority of patients included in this review. In our admitted pediatric burn population, most patients have relatively small burns, and require a short stay for wound care and family teaching. The exclusion of children requiring intensive care admission likely removed children with higher TBSA burns that required greater level of medical management and lengthier hospitalizations, which would equate to greater opportunities for MT to play a role in the children's care.

Though the purpose of this study was not to examine the specific effectiveness of MT in treating pain in patients with acute burns, it is clear that the outcomes of MT are challenging to capture in a quantitative measure. The limited number of clinically feasible MT outcome assessments/tools for pediatric patients will need to be further addressed to allow for more robust exploration of MT effectiveness in clinical environments. Ideally, the effectiveness of MT would be studied prospectively by collecting both patient- and provider-reported outcomes and objective data, such as vital signs. Our center is hoping to move toward the use of a standardized outcome measure for pain in clinical encounters, but the lack of quantifiable pain assessment in this study limits the strength of our finding that pain was reduced following massage for the majority of patients.

## CONCLUSION

MT was delivered in an acute clinical setting to children with burns without adverse effects, though only a small proportion of children received MT due to barriers to access. Barriers included patients sleeping, being occupied by other providers, and being off the unit. In order to improve access to MT, there is a need to consider strategies such as improving therapist availability, collaborating with other providers to provide co-treatments, and educating staff and families about the benefits of MT. Future studies should assess the impact of MT using validated measures to evaluate the effectiveness of MT in reducing pain, anxiety, and pruritus.

## CONFLICT OF INTEREST NOTIFICATION

The authors have nothing to disclose.

## COPYRIGHT



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