

Adherence of Burn Outpatient Clinic Referrals to ABA Criteria in a Tertiary Center: Creating Unnecessary Referrals?

Spencer B. Chambers, MD, MSc,* Katie Garland, MD, MSc,* Cecilia Dai, MD,[†] and Tanya DeLyzzer, MD, FRCSC*[Ⓞ]

Initial assessment and triage of burns are guided by the American Burn Association criteria for referral to a burn center. These criteria are sensitive but not specific and can potentially lead to over-triage and “unnecessary” clinic visits. We are a Level 1 trauma center with burn subspecialty care, and due to the COVID-19 pandemic, referrals to our multidisciplinary outpatient burn clinic required triaging for virtual care appointments. In order to improve the triage process, we retrospectively reviewed our outpatient burn clinic referrals over a 2-year period, 2018 to 2019, for adherence to American Burn Association criteria. We collected data pertaining to patient and burn characteristics, as well as treatment outcome, to characterize referrals not requiring an in-person appointment. Of the 244 patients referred, 73% met the referral criteria, with 45% of these patients being healed at the first visit and 14.6% requiring surgical management. Mean time from injury to first visit was 9.7 days (mode 6), and the average number of visits was 2. Overall, mean burn size was 2%, with the majority of injuries being partial thickness (71%), located in the hand or extremity (77%). There was a fairly equal distribution of contact (36%), flame (21%), and scald (26%) burns. This study highlights the nonspecific nature of the American Burn Association referral criteria. We found that pediatric and hand burns in particular were over-triaged and lead to “unnecessary” appointments. This information is useful to help adjust referral criteria and to guide triaging of appointments with the evolution of telehealth and virtual care.

Burns can result in significant morbidity and mortality, and over the past two decades, there have been significant strides in minimizing mortality, as well as reducing the incidence of these injuries through public awareness campaigns and stringent safety guidelines.¹ With the risk reduction strategies it is estimated that over 90% of burns can be treated in the outpatient setting.² The care of patients with burns is decided on the initial assessment and estimation of burn size and depth. This represents a widely known challenge of burn management,^{3,4} as a large proportion of these injuries are initially managed in peripheral hospitals with no dedicated burn specialist and this can be a challenge for primary care providers.³ This potentially results in either over-triaging or under-treating patients, each with its own drawbacks.⁴⁻⁶

To improve on the initial assessment, there has been a large focus on developing guidelines for initial burn management assessment in the periphery and referrals to tertiary burn centers when appropriate. The American Burn Association (ABA) has been a leader in developing guidelines for burn management

at all stages. They have published guidelines for the referral of patients to burn centers that are used around the world (Figure 1). These guidelines include 10 criteria describing the location of burn, type of burn, total body surface area (TBSA) of burn, and other specific circumstances that necessitate referral to a burn center.^{7,8} Despite the ABA guidelines for referral to burn centers, there are variable referral patterns of burns to dedicated burn centers in the United States.^{9,10} The ABA criteria are very sensitive, but specificity is unknown. For burn injuries not requiring transfer and inpatient care, an outpatient clinic referral can be made. For outpatient appointments, the ABA criteria become overly sensitive and can result in patients being over-triaged and over-referred for their injuries.¹⁰⁻¹³ This over-referral results in inefficient healthcare utilization and increased patient direct and indirect costs.

Across Canada, there is a total of three major designated burn centers to service a population of 37.8 million people.¹⁴ Our institution is a Level 1 trauma center with burn subspecialty capabilities, but not an ABA-verified burn center. We are capable of managing burns up to approximately 30% TBSA and receive referrals from a catchment area of approximately 1.5 million.¹⁵ Our center sees a large volume of patients who are referred from our own institution’s emergency rooms, as well as peripheral hospitals, who are instructed to follow the ABA criteria for referral to our burn clinic. As a result of the COVID-19 pandemic, we have been restricted in the number of patients that can be seen in our outpatient clinics. This has forced us to triage our referrals for those who require an in-person assessment and those who can be managed virtually.

The objective of this study was to evaluate and characterize all outpatient burn referrals to our institution’s burn clinic over

From the *Division of Plastic and Reconstructive Surgery, Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada; [†]Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada.

Conflict of interest statement. We have no disclosures or conflicts of interest. Address correspondence to Tanya DeLyzzer, MD, FRCSC, Victoria Hospital, London Health Sciences Centre, Room E2-648, 800 Commissioners Rd East, London, ON N6A 5W9, Canada. Email: tanya.delyzer@lhsc.on.ca

© The Author(s) 2021. Published by Oxford University Press on behalf of the American Burn Association. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com.

doi:10.1093/jbcr/irab117

A burn center may treat adults, children, or both.
 Burn injuries that should be referred to a burn center include:
 Partial thickness burns greater than 10% total body surface area (TBSA).
 Burns that involve the face, hands, feet, genitalia, perineum, or major joints.
 Third degree burns in any age group.
 Electrical burns, including lightning injury.
 Chemical burns.
 Inhalation injury.
 Burn injury in patients with pre-existing medical disorders that could complicate management, prolong recovery, or affect mortality.
 Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient may be initially stabilized in a trauma center before being transferred to a burn unit. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.
 Burned children in hospitals without qualified personnel or equipment for the care of children.
 Burn injury in patients who will require special social, emotional, or rehabilitative intervention.

Figure 1. ABA burn center referral criteria.

a 2-year period prior to the pandemic, 2018 to 2019, and to determine the percentage of patients referred meeting ABA criteria, and whether they require further intervention. Ultimately our goal was to identify patients who have “unnecessary” clinic visits in order to help improve our multidisciplinary burn outpatient clinic triage process and overall efficiency.

MATERIALS AND METHODS

After obtaining institutional research ethics board approval (REB# 2019-114072), the electronic medical records (EMRs) of all patients presenting with acute burn injuries to our specialized outpatient burn clinic were reviewed over a 2-year period, 2018 to 2019 inclusive. Patients who were referred secondarily with remote burn injuries for burn reconstruction, as well as those with incomplete data available, were excluded.

Demographics including age, sex, and time from referral to first visit were acquired directly from the EMR. Clinic notes were reviewed to determine burn source, burn size (%TBSA), and burn depth. When burn size was not explicitly stated, descriptors of the injury were used in conjunction with a Lund–Browder¹⁶ estimation diagram to assign a value for %TBSA. In cases where the total size was unclear, the largest estimation was used for analysis. Similarly, if burn depth was not explicitly stated, descriptors were interpreted to assign burn depth (Table 1). If after evaluating the note for these descriptors the depth of the burn was ambiguous between two depths, a deeper burn injury was assigned. If there was a concern, the EMR was flagged for assessment by a second reviewer. The findings were analyzed and compared between reviewers and if a result was not attainable the data were considered incomplete and the patient’s chart was removed from the overall database.

Source of burn was categorized as electrical, chemical, grease, scald, flame, contact, or other. Location of burn was categorized as face, trunk, hand, perineum, or extremity. In cases where multiple locations were burned, both locations were recorded.

ABA Referral Criteria

To determine the appropriateness of referral, the data collected was compared against current ABA burn center referral criteria.⁷ These included partial-thickness burns greater than 10% TBSA, burns involving the face/hands/feet/genitals/perineum, or major joints, full-thickness burns, electrical and chemical burns, inhalation injury, burns with concomitant traumas, burns in patients with complex medical comorbidities, children requiring specialized supports, and specific situations where patients would require social, emotional, or rehabilitation interventions. The nature of these referral criteria requires judgment and in situations where it was unclear if a patient met these criteria, a second reviewer analyzed the chart and disagreements were settled with discussion. If agreement could not be met, the patient was classified as meeting criteria.

Statistical Methods

Descriptive statistics of demographics, %TBSA, and time to follow-up were calculated using Excel (Microsoft, Redmond, WA). Proportions for burn depth, location, source, and final treatment (surgical intervention, follow-up, healed at first visit) were also reported.

Table 1. Burn depth descriptors

Descriptor	Burn Depth Injury
Erythematous, non-blistered	Superficial
Blistered, moist, painful, normal capillary refill	Superficial partial
Decreased/minimal cap refill, decreased sensation, blistered	Deep partial
Insensate/non-painful, white, leathery, no capillary refill	Full thickness

Where not explicitly stated within the chart review, the depth of the burn injury was estimated using the above descriptors to ascribe a depth to each injury.

RESULTS

Description of Cohort

In total, 244 patients were included in this study (92 females, 152 males). The average age was 28.4 years (range: 0.5–87), and the average time from injury to first clinic visit was 9.7 days (mode 6 days, min 0, max 37), with an average number of total clinic visits of 2 (range: 1–10).

Overall Burn Characteristics

The average burn size was 1.77% (range: 0–30% TBSA). The location of these burns was as follows: hand (50%), extremity (43%), face (16%), trunk (11%), and groin (3%). The etiology of these burns was as follows: contact (31%), flame (27.5%), scald (27.5%), grease (8.1%), chemical (3.5%), electrical (2%), and other (2%). In regard to burn depth, 5.2% of burns were superficial, 71.1% were superficial partial thickness, 2.7% were deep partial thickness, and 2.7% were full thickness. Burn characteristics are demonstrated in Figure 2.

Burn Injuries Meeting ABA Criteria

Patient Characteristics. One hundred seventy-eight (73%) of patients met ABA criteria for referral to a burn center. Seventy patients (40%) were younger than 18 years, 18 patients were older than the age of 65, and the remaining 90 patients (50.6%) fell between this range.

Outcome Characteristics. Of the 178 patients who met the ABA criteria for burn center referral, 80 (45%) were healed at the first clinical visit, 3 patients were admitted from the clinic, and 26 (14.6%) needed surgical intervention (12 operative

excision with skin grafting and 14 local debridement under local anesthetic).

Burn Characteristics. Average burn size was 2% TBSA (range <1–30%). None of the burns were superficial, 72.5% were superficial partial thickness, 14.4% were deep partial thickness, and 13.1% were full thickness. The location of these burns was as follows: hand (54%), extremity (23%), face (14.4%), trunk (5%), and groin (3%). The etiology of these burns was as follows: contact (36%), flame (21%), scald (26%), grease (8.9%), chemical (3.9%), electrical (1.7%), and other (2.8%).

Burn Injuries Not Meeting ABA Criteria

Patient Characteristics. Sixty-six (27%) of patients did not meet ABA criteria for referral to a burn center. Twenty-three patients (34.8%) were younger than 18 years, 5 patients were older than the age of 65, and the remaining 38 patients (57.6%) fell between this range.

Outcome Characteristics. Thirty-six patients (54.5%) were healed at the first clinical visit, and no patients required admission or surgical intervention. Seventy-seven percent of patients only required one clinic visit, and 15 patients (23%) required more than one clinic visit.

Burn Characteristics. The average burn size was 1% TBSA (range 0–9%). Twenty percent of burns were superficial, 70% were superficial partial thickness, 10% were deep partial thickness, and none were full thickness. The location of these burns was as follows: hand (26%), extremity (52%), face (6%), trunk (4%), and groin (2%). The etiology of these burns was as

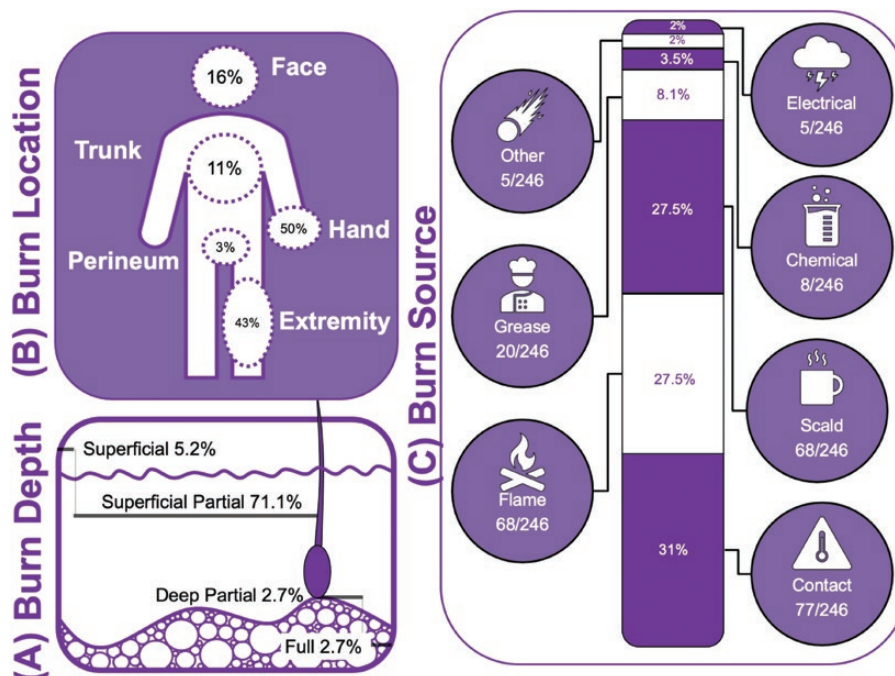


Figure 2. Burn cohort demographics. All quantities reported as the proportion of the total cohort (244 patients): (A) patients divided based on the depth of burn, (B) patients divided based on the location of burn, and (C) patients divided based on the type of burn.

follows: contact (15%), flame (44%), scald (32%), grease (2%), chemical (0.5%), and electrical (0.5%).

DISCUSSION

The prevalence of burn injuries has decreased greatly with the improvement of safety measures and the advent of alternative residential heating methods.¹⁷ With these injuries being less common, practitioners in peripheral centers have less experience in the assessment and triage of burns. This can lead to undertreatment with significant morbidity and mortality or to over-triage resulting in increased costs and inefficiency of the healthcare system. There is limited availability of triaging tools available, with the ABA criteria remaining the cornerstone of decision making for physicians working in centers without specialists. The American College of Surgeons emphasizes the importance of minimizing under-triage for Level 1 Trauma Center Activation to less than 5% in order to reduce preventable mortality or morbidity.¹⁸ However, they also recognize the importance of over-triage leading to higher healthcare costs both for patients and Level 1 trauma centers. The acceptable rate of over-triage is in the range of 25% to 35%.¹⁸ This study was not looking at burns requiring trauma activation and acute transfer of patients, but patients who were deemed appropriate for outpatient care. We found that 73% of outpatient clinic referrals met the ABA criteria for referral to a burn center, while 56% of the total referrals were healed by the time of their first visit (over-triaged) and only 26 patients (10.6% of total referrals) required surgical intervention. This indicates that while peripheral centers are following ABA guidelines for outpatient burn referrals, these guidelines may be too broad leading to over-triage and “unnecessary” in-person clinic visits.

This result was brought to the forefront as a consequence of the COVID-19 pandemic. Many factors have resulted in efforts to minimize patient contact and limit the total number of individuals physically entering the hospital for clinic appointments. At our institution since March 2020, we have been asked to reduce clinic volumes to 60% of pre-pandemic volumes. This has allowed us to triage referrals for the identification of patients who were appropriate for telehealth or virtual visits. These visits have either been conducted over the phone with photographs emailed to an encrypted hospital email address or through video using Ontario Telehealth Network. The vast majority of identified patients for telehealth visits were healed or had very minor injuries not requiring formal interventions (surgery or physiotherapy). This appears to have decreased the volume of patients attending our burn clinics and highlighted that prior to this pandemic, patients may have been making “unnecessary” visits to the hospital for follow-up.

The ABA guidelines created the foundation of modern burn care and triaging.¹⁰ However, these rules were created prior to the ability to carry out an electronic follow-up, as well as to transfer digital images of a burn wound to a specialist for assessment. It has been demonstrated that telemedicine can assist in the triaging of burn patients to avoid over-triage, or prompt expedient care, where initial assessments at receiving facilities do not correlate with the burn expert opinion.¹⁹ Similarly, telemedicine has also been shown as a viable option for follow-up in appropriately selected patients.²⁰

This study implies that the ABA criteria for referral to a burn center may be sensitive, but not specific enough. In particular, this study highlighted that the guidelines appear to be too sensitive for outpatient referral criteria involving hands and pediatric patients. This may be secondary to the fact that the referral criteria for these essentially encompass any burn of the hand or in the pediatric population. The ABA criteria state that any burn involving the hand meets the criteria for referral, but in our population, 56% of patients with a hand burn were healed by their first visit. This data suggests that the ABA criteria for referral of hand burns may be too broad and could be re-classified to reduce unnecessary burn referrals to tertiary centers. For pediatric patients, ABA criteria state that pediatric patients meet referral criteria if the referring center does not have the capacity to manage pediatric patients. Of the pediatric patients referred for burns, 52% were healed by the time of the first visit. The criteria for referral of pediatric burns are vague and site-dependent, which may lead to unnecessary referrals for minor burns in pediatric patients. Overall, the results of this study have highlighted some areas of potential improvement in the ABA burn center referral criteria that could be adjusted to make referral criteria more specific and help minimize unnecessary referrals to outpatient clinics.

The principal weakness of this study is that it is a retrospective review. A retrospective study of this nature is valuable for observing referral patterns and patient outcomes but is limited by not being able to implement changes to referral guidelines and directly observe results. A second weakness associated with this retrospective study was the ambiguity of the documentation. Not all patient documents had burn size and depth recorded; in these cases, these factors had to be estimated using the definitions of burn depth and the Lund and Browder diagram. This ambiguity was most frequently encountered with small (<1%) superficial burns. These burns were only included if the depth and size were described in a manner that allowed the use of validated resources to provide an educated estimate.

Strengths of this study include the large catchment area with a significant rural population and the overall completeness of the dataset. Planned future endeavors recognize the importance of feedback to our catchment area emergency departments. We plan to implement virtual education modules with the purpose of increasing knowledge, as well as providing guidelines for those patients who can be followed by community wound care nurses and primary care physicians. With this, a future prospective study is planned to follow our referral patterns with the implementation of education and updated referral guidelines, as well as the development of our own triage criteria for patients needing an in-person appointment versus those who can have a virtual appointment.

This would be valuable for understanding whether more specific referral guidelines can decrease “unnecessary” in-person patient visits without affecting overall patient outcomes.

CONCLUSION

This study was a retrospective review of outpatient burn referrals to a tertiary hospital. Overall, this study highlighted

that the majority of patients seen in outpatient burn clinics meet ABA criteria but are healed by the time of their appointment. Furthermore, patients with hand burns and pediatric patients appear to be a large cohort of patients presenting to the clinic with healed burns. Moving forward, adjusting guidelines and outpatient referral criteria to make them more specific may help limit unnecessary clinic visits for patients. With the transition toward limiting in-person clinic visits and moving to telehealth appointments, this information is beneficial in aiding the triaging patients for the appointment type that is most appropriate.

REFERENCES

1. Grant EJ. Burn injuries: prevention, advocacy, and legislation. *Clin Plast Surg* 2017;44:451–66.
2. Warner PM, Coffee TL, Yowler CJ. Outpatient burn management. *Surg Clin North Am* 2014;94:879–92.
3. Goverman J, Bittner EA, Friedstat JS et al. Discrepancy in initial pediatric burn estimates and its impact on fluid resuscitation. *J Burn Care Res* 2015;36:574–9.
4. McCulloh C, Nordin A, Talbot LJ, Shi J, Fabia R, Thakkar RK. Accuracy of prehospital care providers in determining total body surface area burned in severe pediatric thermal injury. *J Burn Care Res* 2018;39:491–6.
5. Harish V, Raymond AP, Issler AC et al. Accuracy of burn size estimation in patients transferred to adult burn units in Sydney, Australia: an audit of 698 patients. *Burns* 2014;41:91–9.
6. Hahn B, Roh SA, Price C et al. Estimates of total burned surface area by emergency department clinicians and burn specialists. *Cureus* 2020;12:e9362.
7. American Burn Association. Burn Center Referral Criteria. Guidelines for the operation of burn centers, resources for optimal care of the injured patient 2006, Committee on Trauma, American College of Surgeons. p. 79–86.
8. Holmes JH 4th, Carter JE, Neff LP et al. The effectiveness of regionalized burn care: an analysis of 6,873 burn admissions in North Carolina from 2000 to 2007. *J Am Coll Surg* 2011;212:487–93.
9. Doud AN, Swanson JM, Ladd MR, Neff LP, Carter JE, Holmes JH. Referral patterns in pediatric burn patients. *Am Surg* 2014;80:836–40.
10. Carter JE, Neff LP, Holmes JH 4th. Adherence to burn center referral criteria: are patients appropriately being referred? *J Burn Care Res* 2010;31:26–30.
11. Carter NH, Leonard C, Rae L. Assessment of outreach by a regional burn center: could referral criteria revision help with utilization of resources? *J Burn Care Res* 2018;39:245–51.
12. Latifi NA, Karimi H. Why burn patients are referred? *Burns* 2017;43:619–23.
13. Reiband HK, Lundin K, Alsbjorn B, Sorensen AM, Rasmussen LS. Optimization of burn referrals. *Burns* 2014;40:397–401.
14. Statistics Canada. Table 17-10-0009-01 population estimates, quarterly. doi:10.25318/1710000901-eng.
15. Centre LHS. Facts & Stats 2020. <https://www.lhsc.on.ca/media/1698/download>
16. Lund CC, Browder NC. The estimation of areas of burns. *Surg Gynecol Obstet* 1944;79:352–8.
17. American Burn Association. National Burn Repository® 2016. Version 12.0. Chicago, IL: American Burn Association.
18. Resources for optimal care of the injured patient. American College of Surgeons, Committee on Trauma (ACS-COT). 2014. <https://www.facs.org/-/media/files/quality-programs/trauma/vrc-resources/resources-for-optimal-care.ashx>
19. Garber RN, Garcia E, Goodwin CW, Deeter LA. Pictures do influence the decision to transfer: outcomes of a telemedicine program serving an eight-state rural population. *J Burn Care Res* 2020;41:690–4.
20. Saffle JR, Edelman L, Theurer L et al. Telemedicine evaluation of acute burns is accurate and cost-effective. *J Trauma* 2009;67:358–65.