

Standardization of Burn Patients Transfer: Implementation of a Transfer Request Form to Israel's National Burn Center

Uri Aviv MD^{1,4*}, Ariel Berl MD^{1,4*}, Josef Haik MD MPH^{1,2,4}, Ariel Tessone MD^{1,4}, and Moti Harats MD^{1,3,4}

¹Department of Plastic and Reconstructive Surgery, Sheba Medical Center, Tel Hashomer, Israel

²College of Health and Medicine, University of Tasmania, Sydney, NSW, Australia

³Institute for Health Research, University of Notre Dame, Fremantle, Australia

⁴Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

ABSTRACT

Background: Burn injuries are an extreme form of traumatic injury and are a global health issue. The Israeli National Burn Unit at the Sheba Medical Center, a tertiary level 1 trauma center and hence the national referral center, treats burn patients admitted both directly and referred from other medical centers. The transfer and handover of patients is a critical step in patient care. In Israel, to date, there is no standardized and accepted transfer request form for burn patients from one medical facility to another.

Objectives: To construct a transfer request form to be used in all future burn patient referrals.

Methods: After reviewing publicly available international transfer forms and comparing them to the admission checklist used at our unit, a structured transfer request form was constructed.

Results: After a pilot study period, testing the form in various scenarios and adapting it, the first standardized transfer form for burn patients in Israel in both English and Hebrew was implemented beginning May 2020.

Conclusions: Implementation of a standardized transfer process will improve communication between healthcare professionals to help maintain a continuum of care. We believe that implementation of a burn transfer form in all future referrals can standardize and assure better care for burn patients, thus improving overall patient care.

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*These authors contributed equally to this study

Burn injuries are an extreme form of traumatic injury and are a global health issue, accounting for almost 3% of all emergency department (ED) trauma related admissions. There were over 5000 burn injuries treated in Israel between 2013 and 2017 [1-3].

Between 2015 and 2019, the Israeli National Burn Unit at the Sheba Medical Center treated over 120 admissions of adult burn patients annually with various degrees of burns, with over 15% of patients referred from other institutions. These referrals included patients from peripheral hospitals in Israel, Palestinian Authority, Gaza Strip, and other countries (e.g., Cyprus, Romania) as Sheba Medical Center is considered a tertiary facility and primary trauma center.

The majority of burn patients are initially assessed at the medical center, which is in the closest vicinity, before being transferred to a dedicated burn center [4,5].

Optimal primary assessment and stabilization of burn patients by qualified personnel have been shown to be advantageous to patient recovery and outcomes [6,7]. Maintaining patient hemodynamic status and skin perfusion is critical for preventing further damage to the zone of stasis [8]. The advantage of a specialized burn unit accepting referrals from other primary, secondary, and even tertiary centers in accordance with adjusted American Burn Association (ABA) guidelines is practiced worldwide and is justified when considering the specialized care required and high costs of burn victims' treatments [9-13].

It is the authors' impression from past experience that transfer requests from other medical facilities, presented via phone conversation or electronic medical records summary, whether from the ED, intensive care unit (ICU) or department, do not encompass concise details for an efficient patient transfer. This shortcoming can have a major influence on patients' admissions and bed allocation decisions and can delay treatment.

The transfer and handover of patients in various medical fields is a critical step in patient care and if unstructured and non-standardized, may lead to less efficient care and reduce the optimal care given in a dedicated facility [14]. Several studies have demonstrated that effective transfer relies on communication between caregivers with structured checklists, forms and documentation [15-17]. In Israel, to date, there is no standardized and accepted transfer form for burn patients from one medical facility to another. This lack of standardization may hamper appropriate management. The necessity of a proper transfer form stems from the following purposes: Incongruent transfers in the past, transfers not according to ABA guidelines, incomplete or misleading handover of information, need for appropriate preparation in the accepting ward including specialized equipment and room settings. All the aforementioned can have direct impact on patient care and treatment. Implementation of a structured form may serve several purposes:

- Checklist provides essential information from the referring institution to the burn center physician, assuring proper

preparations and decision making (e.g., Intubated and severe burn versus minor burn).

- Checklist for adequate initial management of the burn patient to be provided by the first medical care facility that refers the patients. The checklist may assure appropriate first care such as fluid resuscitation, vaccinations, avoid unjustified antibiotics, estimate more precisely burn size and depth, asses associated injuries, avoid exposure to hazards as well as prevention measures for isolation and hypothermia.
- Checklist may provide information that can be analyzed and improved for future transfers by both receiving and referring institutions.

PATIENTS AND METHODS

The authors reviewed publicly available burn transfer forms from developed countries (USA, UK, Australia) [18-21]. These forms were compared to parameters in the admission’s checklist of the National Burn Unit at the Sheba Medical Center. The use of a checklist is the result of experience gained through years of burn patient management in the ED and the burn unit. Our checklist was adjusted and applied for intubated and non-intubated patients and includes targeted history taking, placement for various catheters (central lines, urinary catheters, nasogastric tubes), immediate burn treatment related procedures, laboratory tests, relevant imaging studies, consultations for trauma management (trauma surgeons, anesthesiologists, orthopedic surgeons, otorhinolaryngologists, ophthalmologists), and further assessments.

Our aim was to construct a structured transfer request form according to a standard of care and following principles:

- Simplified, comprehensible, and easy to complete
- Based on advanced trauma life support algorithms (e.g., airway, breathing, circulation)
- Made available in both Hebrew and English to permit local and foreign referrals (and potential to be translated in the future to other languages as according to the referring center)

The authors agreed to omit information regarding the general state, which is dynamic, subject to change and under the responsibility of the care provider and emergency medical services (EMS). This exclusion includes analgesics, sedatives, ventilator settings, arterial blood gas analysis, and nutritional therapy.

RESULTS

We present the first standardized transfer form for burn patients in Israel in both English and Hebrew (supplements 1 and 2, respectively). The form includes demographic data and clinically essential information including total burn surface area (TBSA), airway management, circulatory parameters, fluid resuscitation, radiology and laboratory results.

Figure 1. Burn transfer form to the Israeli National Burn Center, English version.

Burn patient transfer request form
 Sheba medical center hospital, Tel Hashomer 52621
 The burn unit, Tel. 035302405, Fax: 035302246

Patient Name: _____ **I.D.** _____ **Age** _____ **M / F / other** _____ **Medical History:** _____ **Chronic Medications:** _____

Allergies: _____ **Tetanus:** Administered / Unnecessary _____ **Smoking:** Yes / No / NA _____ **Drug abuse:** Yes / No / NA _____ **Alcoholism:** Yes / No / NA _____

BURNS

Date of injury: ____/____/____ Time: ____:____ Date of arrival: ____/____/____ Time: ____:____

TBSA% _____ Conscious Yes / No _____ Mechanism of Injury: _____ Circumferential Yes / No _____
 Body temperature _____ Flame/Water/Electric/Chemical/Scalding/Other _____ Escharotomies Yes / No _____
 If yes, Location _____

Inhalational Injury Yes / No _____ Additional Injuries: _____
 If Yes, COHb _____ % (Examination by Surgeon/Neurologist/Orthopedist/Ophthalmologist/ENT)
 Attach any additional findings separately.

Burn dressing with _____ Initial irrigation and debridement Yes / No _____ Antibiotics Yes / No, Indication _____
 In case of electrical burns – urine alkalization Yes / No _____ Prolonged irrigation Yes / No _____
 In case of chemical burns – type of chemical agent _____

AIRWAY Please mark burn area on figure: _____ Rule of 9's

Intubated Yes / No _____ Notes regarding intubation _____
 Endotracheal tube size _____
 Respiratory stable Yes / No _____ Bronchoscopy/BAL Yes / No _____

BREATHING

O2 support Yes / No _____ O2 Sat. _____ %
 (including assessment of affected limbs)

CIRCULATION

Fluid resuscitation (24h) Yes / No _____ Amount of fluid administered _____ Type of fluids _____
 Parkland: Weight (Kg) _____ X TBSA% _____ X 4 ml = Total _____ ml/kg/24h

Central / Peripheral lines _____ Arterial location _____ NGT Yes / No _____ Urine catheter Yes / No, Urine output _____ ml/hr
 Venous location _____
 Vasoactive agents support Yes / No, if Yes _____ Blood products given Yes / No _____

IMAGING & LABS

ECG Yes / No _____ X-ray Yes / No _____ CT scan Yes / No _____ BHCG/Pregnancy Yes / No _____
 Hb _____ WBC _____ CRP _____ Cr _____ UREA _____ AST _____ ALT _____ Bilirubin _____ ALK-PHOS _____ BHCG/Pregnancy Yes/No _____
 If electric burn: CPK _____ Troponin _____

Notable events during initial hospitalization in referring institution _____
 Preparation for patient transfer (Burn dressings, Fluid resuscitation, Temperature maintenance, Urine output) _____
 Referring hospital _____ Referring Dr. _____ Signature _____
 Mobile no. _____ Date ____/____/____ Time ____:____

**After approval all transfers will be conducted to the Emergency room in the medical center unless otherwise specified.

We prepared a transfer request form and compared the parameters of the new form with previous admissions for validity. Amendments were reviewed, completed, and approved by all experienced senior burn unit physicians.

After completion, a pilot study was conducted, and forms were filled out by our physicians during admissions of burn patients directly to our institution. Assessments of form completion, feasibility and physician feedback regarding convenience as well as time-consumption were reviewed with satisfactory results.

An approval from the hospital’s management was granted, and beginning on 10 May 2020, the transfer request form was implemented for all requests of referrals to the National Burn Unit in our institution. A notification was sent to all plastic and reconstructive surgery departments in Israel, as well as to the Israeli EMS (Magen David Adom), local trauma units, and EDs.

During the trial period, all transferred patients to our institution were accompanied by our newly adapted transfer form. The majority of referring hospitals completed the form sufficiently. We continued to assess the parameters reported by referring

Figure 2. Burn transfer form to the Israeli National Burn Center, Hebrew version

טופס בקשה להעברת מצוע כוויות

המרכז הרפואי המשילב ע"ש חיים שיבא, הר השומר 52621
 יחידת הכוויות הארצית, טלפון: 03-5302405, פקס: 03-5302246

שם המטופל: ת.ד. גיל ז/נ מוחלט רקע: תרופות קבועות: אלרגיות: _____

סטטוס: ניתן / אין צורך: **אתיליום:** כן / לא / לא ידוע **שימוש במסכים:** כן / לא / לא ידוע **עשיון:** כן / לא / לא ידוע

BURNS

תאריך הפגיעה: שעה: / / תאריך הגעה לבית החולים: שעה: / /

אחוז כוויה משטח (TBSA%)
 הנוף: _____ טמפ' גוף: _____

מנגנון הכוויה: _____
 אשמים/חשמלי/כימי/מגע עם חפץ חם/אחר

פגיעות שאינן כוללות: (האם בדיק ע"י כירורג/ניורולוגי/אורתופדי/עיינים/א"א)
 במידה וכן רמות COHB % _____
 במידה ויש ממצאים נא לציין בגפנד:

במה נחבשו הכוויות: _____
 בועץ קרצוף ראשוני: _____ טיפול אנטיביוטי: כן/לא, אנטיקציה: _____
 כן/לא

בכויות חשמל – הבסטר שותן כן / לא
 בכויות כימית – סוג החומר: _____
 האם בוצעה שטיפה ממושכת כן / לא

AIRWAY

נא לסמן את מיקום הכוויות בתרשים:
 מונחם כן / לא גודל טובוס: _____ אירועים סביב אינטובציה: _____
 יציב נשימתית? כן / לא ברונכוסקופיה / BAL / כולא

BREATHING

O2% Sat. _____ (כולל מדידה בגפיים מעורבות בכויה) תחת תמיכת חמצן? כן/לא

CIRCULATION

החיית נזלים (HR24) - כן/לא | כמות נזלים שניתנה עד כה: _____ סוג הנזלים: _____
 פרקלינד - משקל(ק"ג) X כוויה % כוויה 4X מ"ל סה"כ _____
 צנתרים פריפרלי מרכזי עורקי מיקום _____ זונדה כולא _____ קטטר כן / לא, כמות שתן לשעה _____ מ"ל
 נורדי מיקום _____ מוצרי דם כן/לא (מנות דם/FFP)

IMAGING & LABS (נא לציין מסמכים רלוונטיים)

אק"ג כולא _____ צילום חזה כן/לא _____ CT כולא _____ בדיקת BHCG/הריון כן/לא _____
 ALP _____ BILIRUBIN _____ ALT _____ AST _____ UREA _____ Cr _____ CRP _____ WBC _____ HB _____
 במקרה של כוויות חשמל: CPK _____ טרופונין _____

אירועים חריגים במהלך שהות המטופל במוסד ממנו הועבר/ה
 האם בוצעה הערכות להעברת? (חבישת הכוויות, תכנית נזלים, שמירת חום, מעקב שתן) _____
 בית חולים מפנה _____ שם רופא מפנה _____ תחניה וחומנת רפא _____
 טלפון יו"ר רופא מפנה _____ תאריך ושעה: _____ / /

* העברה תחבצע ליון במרכז הרפואי אלא אם נאמר אחרת ולאחר אישור

hospitals with the aim of adapting the transfer form, learning and improving the transfer process. Following an observation period, we adjusted the form to include all necessary information and parameters for a structured patient transfer.

DISCUSSION

The treatment of burn patients has high costs and constitutes a major burden on a health system [22,23]. In Israel there is one national specialized burn unit, which treats patients admitted directly to our institution by EMS as well as referred patients from other medical facilities. Between 2015 and 2019 a total of 513 adult patients were hospitalized in our unit, of those patients, 80 (15.6%) were referred from other hospitals. Some tertiary centers also accept burn patients from other medical centers in Israel and from foreign facilities, including the Palestinian Authorities and Gaza Strip. The transfer of burn patients to our unit from other primary care facilities in the past years was not standardized, often leading to a suboptimal handover of patients and lack of data affecting proper management.

In addition to offering a structured tool for burn patient transfer, our form can also offer guidance for the initial treatment by the first caregivers. This assistance assures critical and proper assessment of specific burn patients characteristics.

A major conclusion from review of transfer forms, both in our practice and worldwide, is the need for a comprehensive form, not cumbersome and as short and concise as possible without omitting vital information.

Future analysis of transfer forms and patient characteristics can help continuous education and ameliorate the care for both referring facilities as well as for the receiving burn center and can be adjusted with time. Implementation of a standardized transfer process will aid in the improvement of communication between healthcare professionals maintaining continuum of care.

CONCLUSIONS

Further implementation of our burn transfer form is valuable in standardizing and assuring better care for burn patients.

Correspondence

Dr. U. Aviv
 Dept. of Plastic and Reconstructive Surgery, Sheba Medical Center, Tel Hashomer 5265601, Israel
 Fax: (972-3) 530-2246
 email: uri.aviv@sheba.health.gov.il

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Justice is truth in action.

Benjamin Disraeli (1804–1881), British Prime Minister

Capsule

Lung mesenchymal cells elicit lipid storage in neutrophils that fuel breast cancer lung metastasis

Acquisition of a lipid-laden phenotype by immune cells has been defined in infectious diseases and atherosclerosis but remains largely uncharacterized in cancer. In breast cancer models, Li et al. found that neutrophils were induced to accumulate neutral lipids on interaction with resident mesenchymal cells in the premetastatic lung. Lung mesenchymal cells elicit this process through repressing the adipose triglyceride lipase (ATGL) activity in neutrophils in prostaglandin E2-dependent and -independent manners. In vivo, neutrophil-specific deletion of genes encoding ATGL or ATGL inhibitory factors altered neutrophil lipid profiles

and breast tumor lung metastasis in mice. Mechanistically, lipids stored in lung neutrophils are transported to metastatic tumor cells through a macropinocytosis-lysosome pathway, endowing tumor cells with augmented survival and proliferative capacities. Pharmacological inhibition of macropinocytosis significantly reduced metastatic colonization by breast tumor cells in vivo. Collectively, this work reveals that neutrophils serve as an energy reservoir to fuel breast cancer lung metastasis.

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Eitan Israeli

Capsule

SARS-CoV-2 infection of human ACE2-transgenic mice causes severe lung inflammation and impaired function

Although animal models have been evaluated for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection, none have fully recapitulated the lung disease phenotypes seen in humans who have been hospitalized. Winkler and colleagues evaluated transgenic mice expressing the human angiotensin I-converting enzyme 2 (ACE2) receptor driven by the cytokeratin-18 (K18) gene promoter (K18-hACE2) as a model of SARS-CoV-2 infection. Intranasal inoculation of SARS-CoV-2 in K18-hACE2 mice resulted in high levels of viral infection in lungs, with spread to other organs. A decline in pulmonary function occurs 4 days after peak viral titer and correlates

with infiltration of monocytes, neutrophils, and activated T cells. SARS-CoV-2-infected lung tissues show a massively upregulated innate immune response with signatures of nuclear factor-κB-dependent, type I and II interferon signaling, and leukocyte activation pathways. Thus, the K18-hACE2 model of SARS-CoV-2 infection shares many features of severe COVID-19 infection and can be used to define the basis of lung disease and test immune and antiviral-based countermeasures.

Nature Immunol 2020; 21:1327
Eitan Israeli