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

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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.

KEY WORDS: burn, burn center, transfer, transfer form, trauma

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, ensuring 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, assess 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.

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 institutions.
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.

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**References:**

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.

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 masssively upregulated innate immune response with signatures of nuclear factor-kB-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.


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

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