Original Article

The association between following transportation standards of the burned patients referred to Imam Mosakazem Hospital and the caused early complications in 2011

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Abstract

Background and Goal: Burn is an irreparable event, which results in numerous physical, psychological, social, and economic complications. The burned patients should be merely treated in a professional burn center due to vast clinical range of these patients.

Since, a percentage of mortality in burned patients is for the patients' transportation from other centers; this study has aimed to investigate the manner of their transportation to Imam Mosa Kazem Hospital.

Materials and Methods: This is a descriptive cross-sectional study on 98 subjects selected through sequential sampling from thermally burned patients being referred to Isfahan burn emergency center by ambulance from August 2011 to November 2011. The data including demographic information and event details, burned surface, burning grade and the province of origin were collected by a questionnaire, as well as a checklist related to caring team standards, transportation team, transportation equipment, and outcomes. The data were analyzed by descriptive statistical tests.

Results: Based on the findings, the longest transportation time was 6.35 (4.30) hours. There was no significant association between patients' O_2 intake and hypoxemia. There was no association between patients' hypothermia and cooling the burn in the patients at the event location. There was a significant association between intake of fluid within transportation and urine output and hypovolemia ($P = 0.00$). Most of the defects of treatment were related to the equipments and infection control devices.

Discussion: The findings showed that burned patients' transportation is so far from standards in Iran, and the authorities' should pay specific attention to that in form of vast national investigations.

Key words: Transportation, standards-burned, patients-early complications

Introduction

Burn occurs when skin, the protective barrier of the body, is impaired. It is among the most mortality and disability causes in Iran and developed western countries.

Burn is the third mortality cause after car accidents and drowning in the United States while this is the sixth in Iran. About 2.5 million people are yearly burned in the United States.[1]

About 725 000 burn events occur yearly in Iran. At least, eight people daily die of burning in Iran with mean age of 35.7 years.[2]

Burn can be as a result of direct contact of materials or things with skin and lungs which are categorized a thermal, chemical, electrical, radiation and inhalation burns.[3] Thermal burns are the results of direct contact with flame, hot liquids, steam and materials like fuel or tar as well as hot things. The burned patients are predisposed to hypothermia, hypovolemia and hypoxia due to impaired skin and burning severity.[4]

Burning complications increase the risk of infection, healing disorder and high mortality.[5]

On time and appropriate on-site intervention of the surrounding individuals toward the burned persons can reduce the injury to minimum while inappropriate and non-scientific interventions can result in irreversible injuries and even mortality.

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Appropriate transportation of the burned patient to professional burn centers prevents complications and further injuries to skin, resulting in the least injury severity. Transportation of the burned mostly has two phases: The first phase transportation from the burn location to the primary center, and the second from the primary center to the secondary professional burn center.[3]

Many of the burned, receive early treatment in local emergency wards before being transported to burn centers.[6] Appropriate transportation of the burned lowers mortality. Transportation is suggested to be carried out within the first four hours postburning to prevent complications, and not to be longer that four hours.[3] In case of transportation in specific patients such as the burned patients who should be transferred to professional centers, or when only a few hospitals have been assigned as a professional center, the transportation time to the professional center may be a little longer than to emergency ward. Safe transportation of the patients requires appropriate programming in hiring the trained staffs, use of appropriate equipments, and through an efficient communication among the referrer, transporter and receiver. The patient should be transferred at appropriate time, through efficient staff, and to appropriate location.[7] Various studies have argued that the burned patients who had received better nursing care from location of event to hospital show lower mortality.[8] The physician and the nurse accompanying the burned patient should have adequate knowledge and skills concerning burn care to be able to prevent complications in the patients.

Hypothermia in burning is the result of impaired skin and being exposed to the environment as well as getting necked and disturbed body heat process. In this case, the patient should be kept warm.[9]

The most emergency priority, after management of respiratory problems, is prevention of irreversible hypovolemic shock, which can be treated by fluid and electrolytes therapy. For the patients with more than 20% burned surface, IV therapy is suggested.[10] Urine output of the patient should be measured and recorded in the first 24 hours postburning.[11] As the risk of infection is very high among the burned patients due to various reasons, dressing of the patients' wounds during transportation to prevent wounds infection is crucial so that the patient should never be transported with open wounds, or without a sterile cover.[12] Burned patients should be ideally cared in professional burn centers,[13] there are eight professional burn centers in Iran which admit burned patients from other provinces. This low number causes the long transportation time of the burned patients in some areas. This problem shows the importance of patients' transportation and prevention of early outcomes due to inappropriate transportation including hypothermia, hypoxia, and hypovolemia. Since Isfahan Imam Mosa Kazem Hospital, as a professional burn center, daily admits a high number of the patients from various cities in the province and other provinces, the researcher decided to investigate the present condition in order that the results would bring about strategies to modify these patients' care and their appropriate transportation based on international standards.

Materials and Methods

This is a descriptive cross-sectional study. The researcher started sampling after getting permission from Isfahan Nursing and Midwifery school and declaring the research goals to the head of hospital, manager and matron. The subjects were selected through sequential sampling from thermally burned patients, transferred to Isfahan burn hospital by ambulance in a two-month interval from August to November 2011. The other patients with electrical, chemical, or those taken to hospital by personal cars were omitted from the study. Sampling started by ambulance stop at the entrance of burn hospital emergency ward. Then, the patients were transferred to dressing room by the stretcher, next, the researcher described the research goals to the patients' transferring team and selected the subject and started data collection. First of all, subauxiliary temperature was measured for the patient by a Hg thermometer, and then 2 cc of atria blood sample was taken for ABG and sent to laboratory. Next, patient's blood pressure was measured by a monitoring device and recorded and finally, urine output of the patient was measured and recorded. The temperature in dressing room was steady to 28°C during sampling. The data were collected by a questionnaire containing demographic characteristics and some information on the event, burn surface percentage, the degree and the province of origin. The other data were collected by a checklist including four domains: Caring standards, transportation team, equipments and ambulance medications, and transportations outcomes. The standards in the checklist were assigned in the spectrum of "adequate" and "not adequate.'' The checklist was either ticked by the researcher or the project cooperator, and laboratory results were recorded in that too.

The employed checklist in the present study was confirmed by content validity through consideration and evaluation of some academic members in medical and nursing school, Isfahan emergency center and some personnel in Imam Mosa Kazem Hospital.

The data were analyzed by descriptive statistical tests such as central indices, dispersion, frequency distribution, and Fisher's exact test and Chi-square test through SPSS.

Results

There were 98 subjects of whom 68.4% were male. From 14 various provinces except Isfahan transported to the center, Khouzestan province had the highest number of transportation to this center (29 patients). The most frequent type of ambulance was for intercity 115 emergency center ambulances. Mean time of departure to destination was 6.35 (4.30) hours for private ambulances, and 2.10 (1.13) hours for inter centers transportation. Meanwhile, it was 25 (17) minutes for 115 emergency center ambulances. The most frequent cause of thermal burn was for gas explosion in 26 subjects (36.7%), and burn of petrol and Cresson in 34 subjects (34.7%), respectively.

The most frequent burn percentage was 30-60% in 38 subjects. In 20 subjects, there was $PaO_2 \leq 85\%$.

Only 12 subjects had received O_2 during transportation of which 8 subjects (72.8%) had received that through mask, 2 subjects (18.2%) through nasal canola and one subject by intubation. Only two subjects (2%) underwent respiration monitoring during transportation. Fisher's exact test showed no significant association between patients' O_2 intake and hypoxia in the present study [Table 1]. Body temperature was ≤ 36.5°C in 17 subjects (17.3%) while only three subjects had body temperature lower than 35°C. From all subjects, in 89 (93.7%) the burn had been cooled by running water of whom 48 (63.9%) had received that for 5 minutes. In eighty-five subjects (90.4%), the burn had been cooled by family members or the surrounding people. No significant association was seen between patients' hypothermia and cooling their burn at the event location in the present study.

Seventy subjects had been kept warm during transportation of whom 39 (54.2%) were kept warm by a blanket and 33 (45.8%) by a sheet. Fisher's exact test showed that there was a significant association between being kept warm during transportation and patients' hypothermia ($P = 0.003$) [Table 2]. Only 54 patients (56.3%) had received adequate fluid during transpiration, and only in one subject urine output had been recorded in transportation form. For 44 subjects, the amount of received fluids had been recorded in transportation form. Sixty-nine subjects (73.4%) had received lactated Ringer's serum, 12 normal saline, and 13 subjects (13.8%) had received Ringer's serum. Chi-square test showed a significant association between the amount of received fluid during transportation and patients' urine output in the present study ($P = 0.000$, Table 3) Analgesic medication had been administrated for 84 patients (86.6%) during transportation of whom 18 subjects (21.7%) had received morphine, 22 (26.5%) methadone and 43 subjects (51.8%) had received pethidine. Forty-two subjects (42.9%) had appropriate dressing at the time of transportation.

Table 1: The association between the received O_2 during transportation and hypoxia

Patients took O_2 during transportation	PaO_2<85		PaO_2>86		Statistical test
	%	No	%	No	
Yes	15	3	10.3	7	*P*=0.406
No	85	17	89.9	61	

Table 2: The association between patients' hypothermia and keeping them warm during transportation

Patients were kept warm during transportation	T<36.5		T>36.6		Statistical test
	%	No	%	No	
Yes	41.2	7	78.9	60	*P*=0.003
No	58.8	10	21.1	16	

Table 3: The association between received fluid and urine output

The patients had received adequate fluid during transportation	Oliguria		Normal		Statistical test
	%	No	%	No	
Yes	0	0	84.4	54	*P*=0.000
No	100	32	15.6	10	χ^2=12.795 D=1

Appropriate transportation team members had been selected for 93 subjects (94.9%), and the defects were for equipments, infection control accessories such as a sterile gown, a cap, a disposable mask, gloves, and antiseptic liquids.

Discussion

Based on the obtained data in the present study, most of the thermally burned patients, hospitalized in Imam Mosa Kazem center, had been transported by ambulances. Naghavi *et al*. reported that 5.5% of the patients had been transported to the first medical center by ambulance while 94.5% by personal cars.[14] This issue can be due to the patients receiving their primary care in their local centers, and then, being transported. The present study showed that 2/3 of the transportation had been made by ordinary ambulances.

Since the present study showed that the share of emergency center to give services to the city citizens is high, a basic strategy should be considered to enhance the process of burned patients' transportation and equip the ambulances.

In the present study, most of the patients had been transported from another center to Imam Mosa Kazem Hospital. In Kousha's study, 51% of the hospitalized

patients were from other centers[15] of which most of them had been transported between provinces by private ambulances. Authorities should pay close attention to the services of private organizations and the quality of their services. Contrary to the other studies,[16] most of the burns were for scalds in the present study. About 36.7% of the patients had been transported to Isfahan Burn Center due to gas explosion. This increase in number of burns with gas explosion can own to the fact that since this sort of burn is of extant surface and occurs outdoors, Isfahan emergency center was employed to transport the patients. On the one hand, CNG cars and devices are utilized more in the recent years, which reveals the necessity of public education concerning use of CNG cars and devices, and periodical CNG car technical tests. Percentage of burn surface of the patients hospitalized in Isfahan Burn Center is consistent with Barillo's.[17] The findings of the present research showed that O_2 therapy was very low among transported patients while Andrew's reported only 0.5% of cases had O_2 sat < 80%.[18]

In other studies, about 94.2% of the patients had received O_2 at the time of transportation.[19] In the present study, patients' received O_2 while transportation was not significantly associated with hypoxia. It can be possibly due to insufficient O_2 therapy and lack of patients' respiratory monitoring. Hypothermia in burned patients can disturb wound healing. In Singer's[3] study, 1.6% of the patients were hypothermic, and the lowest temperature was reported as 36.6°C.[20]

High percentage of hypothermia among the patients in the present study can be, like other studies, due to long distance of transportation and not paying attention to keeping the patients warm during the transportation. In the present study, like that of Lonnecker's *et al*., there was no significant association between patients' burn cooling and hypothermia.[21] There was an association between keeping the patients warm during transportation and hypothermia ($P = 0.003$). In lechleuthner' study, only 1.5% of the patients did not have adequate fluid therapy while in the present study, many patients had not received adequate fluid during transportation.[22] This finding shows that the patients in the present study were at a higher risk of hypovolemia and hypotension. The findings in the present study showed that there was a significant association between the fluid received during transportation, and hypovolemia and patients' urine output ($P = 0.00$). Many patients had received analgesic medication in the present study while in lechleuthner's study, 22% of the patients had received analgesic medication. The difference in these percentages can possibly be due to long distance of transportation in the present study compared to other studies.

Most of the patients had been transported by appropriate transportation team members in the present study, which almost concords with other studies.[23] The fewest defects were for equipments related to infection control indicating that infection control is ignored at the time of transportation. In Malmir's study, the highest defect has also been for medications and medical facilities in ambulance.[24]

Based on the obtained findings, it is concluded that burned patients' transportation in Iran is so far from standards. Since the consequences of inappropriate transportation affect wound healing process and result in longer hospitalization and higher treatment costs, it is suggested to diminish treatment costs of the burned patients through assigning a trained and professional transportation team for these patients.

One of the main limitations of the present study was the season the research was conducted in. It is recommended to conduct further studies in other seasons of the year. The prognosis of the transported patients' to burn centers is also suggested to be analyzed.

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