

ORIGINAL ARTICLE

# Examining the effectiveness of burn care practice in emergency units in Saudi Arabia: a pilot study

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## ABSTRACT

**Background:** Burns are one of the leading causes of trauma globally, and they require immediate management by the primary caregivers. The first hours are the most critical as the patient is susceptible to complications, if first line healthcare is insufficient. Therefore, this study evaluated the effectiveness of practice provided by emergency physicians regarding burn cases.

**Methods:** A cross-sectional study was conducted in February 2020. Data were collected via an assembled online questionnaire that was distributed among emergency physicians attending the fifth Saudi Society of Emergency Medicine conference.

**Results:** This study included 89 physicians, of which 59 (66.3%) claimed to be comfortable in dealing with different classifications of burns. The participants were asked if they could manage the patients according to the World Health Organization burn guidelines and 69 (77.5%) answered yes. Disconcertingly, the study showed that only 28.1% of the participants adhered to the initial management of the burn patients. Investigations showed that physicians who claim to have insufficient knowledge referred their patients rather than treating them ( $p = 0.002$ ). A significant correlation between physicians who claimed to have sufficient knowledge and area of practice ( $p = 0.042$ ) and the presence of a burn unit and the perception of sufficient knowledge to manage burns were also found ( $p = 0.016$ ).

**Conclusion:** The effectiveness of burn first aid in the emergency department is an important aspect to tackle as the majority of the physicians reported that they do not think their knowledge is sufficient regarding burn care.

**Keywords:** Burns, ER physicians, burn management, effectiveness, Saudi Arabia.

## Introduction

A burn, which is an acute traumatic accident, is caused by destructive damage to the skin and tissues [1]. It is one of the leading causes of trauma worldwide [2,3]. It can be a result of factors like heat, electricity, and chemicals [4,5]. Alkali drain cleaners, car battery acid, and sulfuric acid are examples of chemicals capable of burning the skin and are more prevalent causes in Saudi Arabia as compared to other countries [6]. In 2004, around 11 million people required medical care due to burn injuries [7]. An estimated number of 180,000 people die yearly from a burn injury [7]. According to a study done in Al-Madina assessing burn prevalence among the population of Saudi Arabia, 69.4% of their participants underwent burn injuries, which concluded that the prevalence of burn patients is considerably high [3]. Due to the prevalence and associated mortality and morbidity of burn cases, it

is crucial to evaluate the quality of medical and clinical management that burn patients receive.

There are four categories of burns, epidermal, superficial dermal, deep dermal, and full thickness. They are

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grouped according to the layer of skin the injury penetrated [8]. Each type of burn, however, has its own management protocol, which must be followed by the primary caregivers [1]. This is critical in burn patients in particular since burn wounds demand reassessment within the first 48-72 hours. These critical hours play a huge role in determining whether the patient's state of wellbeing will improve or further worsen. Within this timeframe, the patient's wound is highly susceptible to complications and a worse prognosis due to inadequate first line healthcare management or infections [1,3,9,10].

The management of burns varies according to the range in severity of the trauma from minor to major [8]. Minor burn wounds are inclusive of epidermal and superficial dermal burns [8]. These could typically be effectively resolved in the primary care setting using soap and water, diluted disinfectant, or loose dressing [1]. According to previously conducted studies, the vast majority of burn patients in Saudi Arabia were admitted to the hospital through the emergency department (ED). This makes up about 80% of burn cases [11]. Therefore, the first aid care received by burn patients is in the emergency room. This department deals with a wide spectrum of cases ranging from minor to fatal. As a result, it is crucial for ED practitioners to be competent and comply with clinical practice guidelines in order to provide sufficient care [12]. The main goal in the ED is to stabilize the patient, avoid complications, and ensure overall safety of the patient. However, research has showed that emergency services in low to middle income countries are inadequate [9,13].

Patient safety is the most prioritized aspect in all medical treatment. This is of great importance, especially when looking at critical burn cases because of their vitality. Unfortunately, despite burns being one of the most common traumas in the ED, there are not enough adequate studies portraying the efficiency of practice in regards of following the guidelines that all physicians are required to act accordingly. The emergency care protocols are set to ensure that the patients are receiving the proper management in the ED since that management would have a direct impact on the patients' prognosis. For further clarification, these standards will set a path for the healing process and decrease the severity of complications that the patients are susceptible to. Thus, this study was conducted to assess the adequacy of emergency care management given to burn patients by emergency physicians and practitioners, in addition, to evaluate the level of compliance to standard protocol in the ED.

## Subjects and Methods

A cross-sectional and observational survey was carried out at the fifth Saudi Society of Emergency Medicine conference (SASEM) which was held in Dammam, Kingdom of Saudi Arabia, in February 2020. The conference's main attendees were emergency consultants, emergency residents and specialists, general practitioners, medical interns, and medical students. The exclusion criteria included interns and students because they did not have much exposure on the subject. Whereas,

inclusion criteria included emergency medicine physicians including the residents. The data were collected via online questionnaire. The online questionnaire was assembled by a senior author, which was reviewed by the research committee. It was also revised and approved by two experienced consultants in the same field. The questionnaire was distributed by two volunteers at the conference and was sent to Emergency room (ER) physicians who did not attended the conference.

The sample size was calculated by using the Raosoft® software by the website [www.raosoft.com/samplesize.html](http://www.raosoft.com/samplesize.html). The total number of participants in the SASEM will be roughly about 1,000. The required sample size was estimated at the 95% confidence level with an estimated 50% prevalence. The margin of error of  $\pm 5\%$ . The required minimum sample size was determined to be 278. As the sample size is small, all the participants were included in the study during the above said time period.

For analysis, data were entered and analyzed using SPSS version 1.0.0.1508 software. Categorical data was presented using frequencies and percentages. An appropriate inferential statistical test using Chi-square and Fisher's Exact Test was applied.  $p$ -values  $< 0.05$  were considered to be significant.

## Results

A total of 89 physicians participated in the study including 33 (37.1%) residents, 29 (32.6%) consultants, 22 (24.7%) general practitioners, and 5 (5.6%) specialists as illustrated in Figure 2. Around 82 (92.1%) of them did not have a fellowship in trauma, 76 (85.4%) physicians worked in governmental institutions, while 6 (6.7%) worked in private institutions. The remaining 7 (7.9%) worked in both governmental and private institutions as displayed in Figure 3. About 51 (57.3%) of them worked in tertiary healthcare centers, 29 (32.6%) worked in secondary centers, and only 9 (10.1%) worked in primary healthcare centers as demonstrated in Figure 4. When asked about their shifts, none of the participants worked an all evening or all-night shift. Almost 75 (84.3%) worked mixed shifts and 14 (15.7%) had all day shifts only. Accordingly, 16 (18%) participants noted that there was no consultant present during their shift. On the other hand, 58 (65.2%) reported the presence of 1-2 consultants per shift. Ten (11.2%) participants reported that three or more consultants were present per shift, while five (5.6%) did not know (Table 1).

Upon asking whether burn patients had the same priority as all other trauma patients, 68 (76.4%) answered yes. A number of physicians (78.7%) claimed to manage the patients according to burn guidelines as illustrated in Figure 5. Moreover, 68 (76.4%) affirmed the presence of a plastic surgeon at their center (Table 2).

Regarding the initial management of a burn patient, 42 (47.2%) would wash the burned area with cold water. Out of the 89 participants, 88 (98.9%) confirmed their use of analgesics to burn patients and 78 (87.6%) stated that they were able to assess the percentage of burns according to the rule of nines. Around 78 (87.6%) stated that they were aware of the methods of fluid resuscitation.

**Table 1.** The demographic characteristics of the patients.

	<i>n</i>	%
What is your level of training?		
General practitioner	22	24.7
Resident	33	37.1
Specialist	5	5.6
Consultant	29	32.6
Have you done a fellowship in trauma?		
Yes	7	7.9
No	82	92.1
What type of institution do you work in?		
Governmental	76	85.4
Private	6	6.7
Both	7	7.9
What type of health care center do you work for?		
Primary	9	10.1
Secondary	29	32.6
Tertiary	51	57.3
What best describes your primary clinical practice?		
Rural	16	18.0
Urban	54	60.7
Suburban	5	5.6
Other	14	15.7
Types of shifts		
All day shifts	14	15.7
Mixed shifts	75	84.3
How many consultants are there per shift?	16	18.0
1-2	58	65.2
3 +	10	11.2
I do not know	5	5.6
Total	89	100.0

Emergency physicians' knowledge and awareness is shown in Table 3.

Furthermore, 65 (73%) declared they were aware of the criteria for burn admission. Upon asking them when hospitalization of the patient is required, 9 (10.1%) said when the burn is greater than 15% in adults, 11 (12.4%) said hospitalization is required when the burn is greater than 10% in children, 18 (20.2%) said any full thickness burn, and 36 (40.4%) would hospitalize when it is an inhalation injury. Around 13 (14.6%) picked all of the above, and the remaining 4 specified the involvement of the face or perineum or deterioration in the patient's stability.

## Discussion

Burns are very common injuries that vary in etiology and severity [1,2,8]. The possible complications that could arise from burns depend primarily on how well they are handled and treated; therefore, it is very crucial to assess and manage burn patients correctly [1,3,9,10]. Therefore, an initiative was taken to conduct a cross-sectional study to fill this gap. This study aimed to evaluate the level of primary burn care provided by emergency physicians

in Saudi Arabia based on the international guidelines devised by the World Health Organization (WHO).

The study included consultants, specialists, residents, and general practitioners, most of whom did not have a fellowship in trauma as illustrated in Figure 1. Approximately half of the participants reported that their facilities did not have burn units, however; most of them accepted burn cases regardless. Alarming, less than half of the participants felt that their knowledge is sufficient to manage all degrees of burns. The participants were asked if they managed the patients according to the WHO guidelines, and the majority answered yes. This protocol majorly focuses on assessing Airway, breathing, circulation, disability, and exposure (ABCDEs), adequate IV fluid resuscitation, and assessing the BSA per the rule of 9s. However, the results of the questionnaire revealed that only one quarter of the physicians abided by the guidelines with a *p*-value of 0.529 on the Fisher's Exact Test. Moreover, half of these participants who managed patients according to the guidelines reported that they do not feel that their knowledge is sufficient to manage all degrees of burn with a *p*-value of 0.108, as illustrated in Figure 6. Most burn patient was referred by these

**Table 2.** Preparedness of the workplace and physicians in managing burn patients.

	<i>n</i>	%
Presence of a burn unit in your facility		
Yes	37	41.6
No	46	51.7
I do not know	6	6.7
If not, do you accept burn cases, regardless? (Valid %)		
Yes	52	73.2
No	19	26.8
Do you believe that burned patients have the same priorities as all other trauma patients?		
Yes	68	76.4
No	21	23.6
On a typical shift, how many burn patients do you see per hour?		
0-2	79	88.8
3-6	7	7.9
7-10	2	2.2
More than 10	1	1.1
Are you comfortable in dealing with the different classifications of burn?		
Yes	59	66.3
No	30	33.7
Do you feel that your knowledge is sufficient to manage all degrees of burn?		
Yes	38	42.7
No	51	57.3
Are you treating the burn patient or referring them to other departments?		
I am treating them	39	43.8
I refer them	50	56.2
Do you have a plastic surgeon in your center?		
Yes	68	76.4
No	21	23.6
Total	89	100.0

physicians who claimed to have insufficient knowledge with a  $p$ -value of 0.002 on the Chi-square test. In contrast, investigations revealed significant correlation between physicians feeling that their knowledge is sufficient and area of practice, which included rural, urban, suburban, and others with a  $p$ -value of 0.042. Moreover, the presence of a burn unit at the institution correlates with the perception of sufficient knowledge to manage with a  $p$ -value of 0.016 on the Fisher's Exact Test.

When comparing the current findings to those of other studies, a number of differences and similarities were noted. Around 50% of the study participants treated patients by washing the burned area with cool water, whereas Sener et al. [14], reported that majority of the patients were treated only with dressing changes. In the same study, it was found that approximately around 25% of the patients were discharged early against medical advice due to various issues. Some of which were poor adherence to remedies, cultural issues and unawareness of the disease [14]. Nonetheless, only one participant in the current study answered that patient education impacts the healing process. Pereira et al. [15] claimed that the most significant factors correlating with mortality rates in burn patients were age older than 65, and BSA greater than 75%. However, only a few physicians in the current

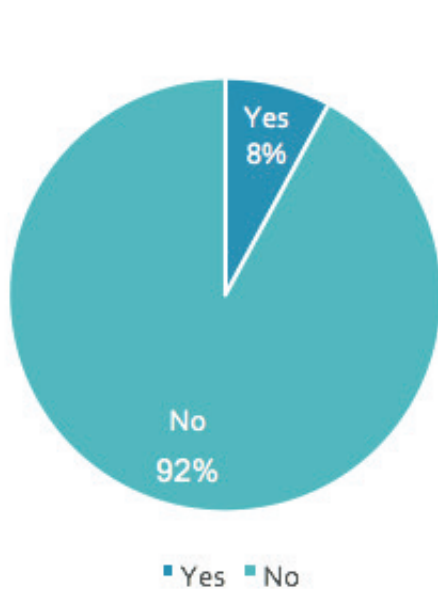
study reported a large total BSA as an element of a poor healing process. Additionally, even less physicians recorded age as another factor. In the current study, almost all physicians administered analgesia as a part of their burn regime. Pereira et al. [15] highlighted the importance of this practice by reporting increasing evidence that geriatric patients were undertreated for pain, due to the misconception surrounding less pain with age. Furthermore, they claimed that more aggressive fluid resuscitation is required to avoid hypovolemia in this population. Although, only a couple of respondents in the current study focused on the independent importance of fluid resuscitation [15]. Kut et al. [16] reported most of primary care-based physicians treated burn patients without referring them. However, in the current study, most of the primary health caregivers referred them to general hospitals or burn units. According to the same study, the majority of the participants used the rule of nines; similarly, it was revealed by the current study [16]. Conversely, Lam et al. [17] found that only a minority of physicians were able to assess the burns utilizing the rule of nines. Most of their doctors were washing the burnt area with cold water while less than half of the current population would follow this practice [17]. Finally, the same study reported that half of their participants were

**Table 3.** Emergency physicians' awareness and knowledge towards burn management.

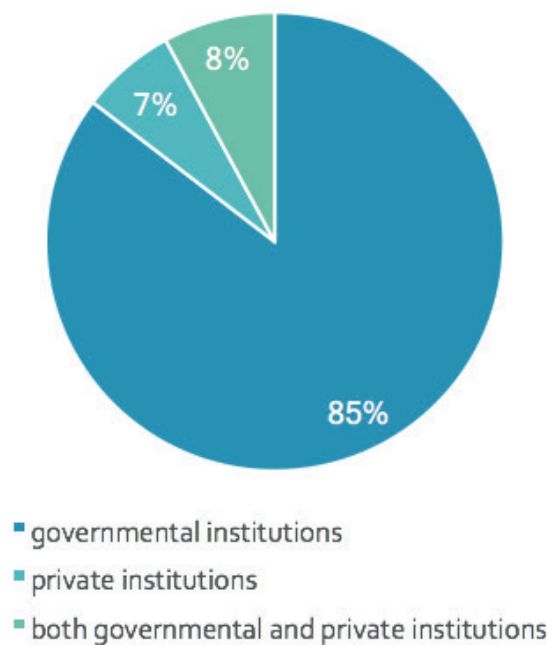
	<i>n</i>	%
Do you follow burn guidelines management in your center?		
Yes	70	78.7
No	19	21.3
If encountered with a burn patient, what is your initial management?		
Administer tetanus prophylaxis	9	10.1
Wrapping the burned area with a dressing	20	22.5
Washing the burned area with cool water	42	47.2
Other	18	20.2
If you chose other, please specify.		
ABC	8	9.0
Assessment of burn degree	2	2.2
Analgesia	3	3.4
Flamazine or mepo cream	2	2.2
IV fluid	1	1.1
IV fluid and antibiotics	1	1.1
Do you use analgesics?		
Yes	88	98.9
No	1	1.1
Are you able to assess the percentage of the burn according to the rule of nines?		
Yes	78	87.6
No	11	12.4
What determines the severity of the burn?		
Burn surface area (BSA)	27	30.3
Depth of the burn	35	39.3
Location of the burn	9	10.1
The cause of the burn	2	2.2
Others	16	18.0
If you chose others, please specify.		
All of the above	10	11.2
Site, size, and depth	6	6.7
What factors influence the duration of the healing phase?		
Age	10	11.2
Baseline health status	23	25.8
Severity of burn	36	40.4
Burn location	8	9.0
Initial management	9	10.1
Fluid resuscitation	7	7.9
Antibiotics	2	2.2
Wound care	15	16.9
Skin response to healing	1	1.1
Involvement of plastic surgeon	1	1.1
Unsure	15	16.9
Wound infection	11	12.4
Patient education	1	1.1
Prolonged exposure to burning agent	2	2.2
Nutrition	5	5.6
Multifactorial	3	3.4
Are you aware of the methods of fluid resuscitation?		
Yes	78	87.6
No	11	12.4
Are you aware of the criteria for the burn admission?		
Yes	65	73.0
No	24	27.0

Continued

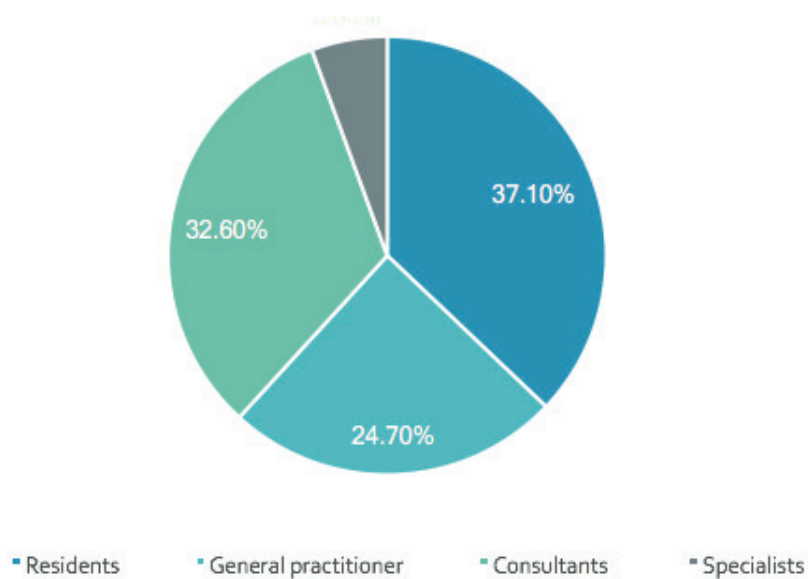
	<i>n</i>	%
When do patients require hospitalization?		
Greater than 15% burns in an adult	9	10.1
Greater than 10% in children	11	12.4
Any full thickness burn	18	20.2
Inhalation injury	36	40.4
Others	15	16.9
All of the above	13	14.6
Site	1	1.1
Large surface area and any chemical burn affecting patient stability	1	1.1
Total	89	100.0



**Figure 1.** Population with a fellowship in trauma.

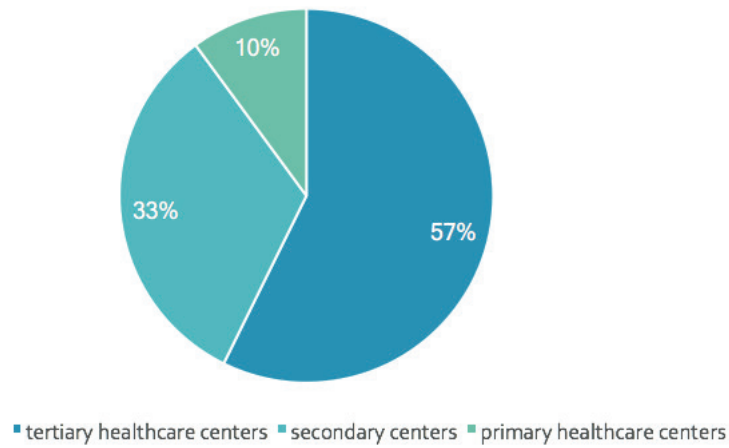


**Figure 3.** Institution administration for the population.

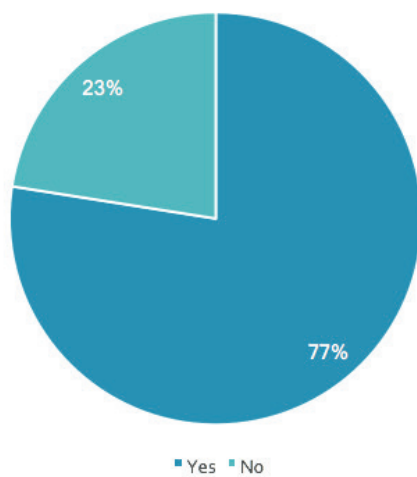


**Figure 2.** Level of training.





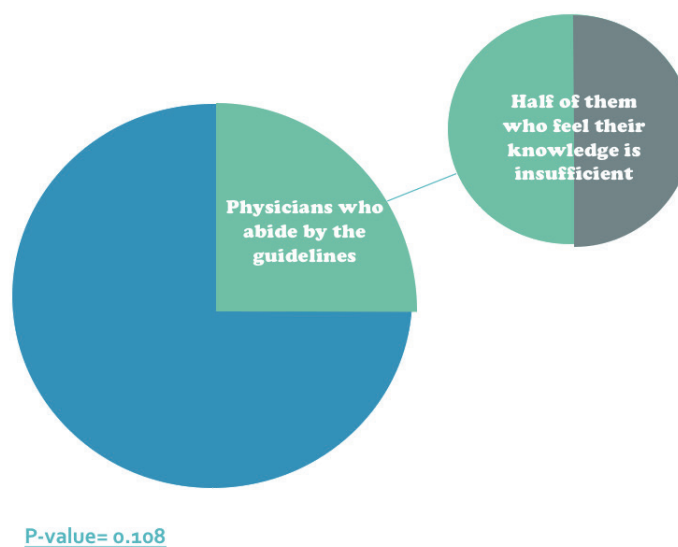
**Figure 4.** Institution type for the population.



**Figure 5.** Do you manage the patients according to WHO burn guidelines?

based in tertiary care centers which matches the findings in the current study [17].

A possible explanation as to why there is discrepancy between the current study and Sener's et al. [14] might be due to the implementation of different guidelines. Also, their study focused solely on the pediatric population unlike the current paper where a particular population was not specified. Sener's et al. [14] study also highlighted the importance of patient education in regards to the healing process, since a considerable number of patients were discharged against medical advice due to lack of insight among other reasons. Lack of emphasis on the importance of patient education and awareness of burns explains the neglect seen in the current results. Pereira et al. [15] noted that age and BSA are independent factors associated with high mortality. Even though



**Figure 6.** Compliance with burn guidelines.

only a few of the current participants reported that age affects the healing process, the vast majority mentioned baseline health status which is inclusive of comorbidities associated with advanced age. Moreover, aggressive fluid resuscitation was stressed on in Pereira et al. [15] which focused on geriatric population. This population is especially prone to complications of fluid loss. The high referral rate from primary health care centers seen in the current study could be explained by various factors such as underdeveloped institutions that could not be accommodated by the patients. Physician's education, lack of training, and poor compliance to proper referral protocol are other possible reasons.

One of the current study's strengths lies within the fact that it is the first Saudi-based study that assesses the level of adherence of ER physicians to the WHO guidelines of burn management. In addition, the survey used was conducted with simple, timely, and convenient questions including open-ended questions to avoid limiting the answers. Despite current sample size being small, the results were significant. Some weaknesses in the current study were the dependence on the participants' willingness to cooperate. Similarly, the authenticity of the participants' answers was considered authentic since the survey was not carried out in a controlled environment. As a result, the reliability of the data varied accordingly.

## Conclusion

In conclusion, burns are one of the most common trauma injuries worldwide, and it is crucial to treat them properly because the morbidity and mortality of the patient is heavily dependent on the initial management, especially in the first 48 to 72 hours. Consequently, physicians need to be better educated on burn care and practice treating patients according to the international guidelines stated by WHO. This study was conducted due to the prevalence of burn traumas and the weight they bear on the patients' wellbeing. Another motive was the lack of data available in the kingdom. The current study showed that a significant number of physicians do not follow the international guidelines stated by WHO. Additionally, most physicians do not feel comfortable dealing with all degrees of burn, so they referred them. Unfortunately, this is not ideal as all physicians should know the international guidelines very well and feel comfortable enough to deal with burn patients and not refer them. Initiating intensive burn management courses for doctors that cover the principles of burn trauma management following the international protocol as it is the ideal treatment plan for burn patients is recommended. To ensure compliance, these courses must be mandatory to all ER physicians. It was also recommended to make burn management guidelines a yearly examination topic along with the emphasis on the importance of patient education.

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## List of Abbreviations

BSA      Burn surface area  
WHO      World Health Organization

## Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

## Funding

None.

## Consent to participate

Written informed consent was obtained from all participants.

## Ethical approval

Ethical approval was granted by King Abdullah International Medical Research Center, Institutional Review Board (IRB). Reference number: JED-19-427780-74665. Study number: SP19/127/J. Approval date: June 24, 2019.

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