First aid guidelines for Burns: Educational approach & Adaptation

Shivangi Saha[1], Amiteshwar Singh[1] , Maneesh Singhal[1]

[1]Department of Plastic, Reconstructive and Burns Surgery, All India Institute of Medical Sciences, New Delhi, India.

Burn injuries are among the most debilitating of all injuries, and even today are a burning public health concern across the world. The importance of covering this topic in first aid education is underscored by the fact that accurate and timely first aid can result in better burn victim survival rates and improved functional recovery.

The updated First Aid, Resuscitation and Education Guidelines of the International Federation of the Red Cross and Red Crescent (IFRC, 2020) reflect the evidence regarding specific first aid clinical actions and pair the evidence with first aid education. This approach was designed so that users of the Guidelines may easily apply them through adaptation to relevant learner contexts, varying levels of resources and medical care, and localized implementation strategies.

Educators should adapt the content to the learner context because the risk factors for burn vary across age groups, cultures, geographical regions, and work environments, etc. To reduce the incidence of burn injuries, prevention is truly the key. Then comes early recognition and timely response in the form of cooling with running water, to reduce burn morbidity and mortality.

Burn first aid education is one of the most difficult to adapt and propagate because the performance of the first aid provider is not merely determined by lack of knowledge or skills, but rather is defined by a complex interplay of decisions and actions affected by cultural and motivational barriers. There will inevitably be significant gaps in the evidence base, so educators must maintain a principled approach to cover all types of burns. They should be able to recognize life-threatening signs be smart in decision making for first aid and referral.

Key Words: Burns, First aid education, Guidelines

The International Federation of the Red Cross and Red Crescent (IFRC) updated their 2016 Guidelines (IFRC, 2016) in February 2021 to reflect the evidence regarding specific first aid clinical actions and uniquely paired evidence regarding first aid education. This approach was designed so that users of the Guidelines are easily able to apply them through adaptation to relevant learner contexts, contextualization to different levels of resources and medical care, and local implementation strategies.

The development of each new guideline and the review of the 2016 version included a new focus on the domains of the Chain of Survival Behaviors (IFRC 2016) as well as a fresh look through an educational lens across different contexts and the provision of education considerations for each topic. This shift in emphasis occurred in response to calls from developers of curricula and first aid educators from across the movement (including National Societies and the International Committee of the Red Cross – ICRC). The process to include these elements was rigorous and consistent and is

explained in full in the Guidelines (IFRC, 2020). Topics for inclusion were identified in 2018 using surveys and expert opinion of actors within the Movement. Individuals from 43 countries with clinical and/or educational expertise participated in teams to develop search criteria from existing published literature and grey literature for each research question.

Following a clinical review of evidence, each topic was then considered independently by at least two educational reviewers (including one from a lower resource setting and one from a higher resource setting) who both reviewed existing literature to inform the educational approach to a first aid intervention for that topic. They also drew on their own experience and expertise. Together they then synthesized the insight available and contributed educational aspects to the Chain of Survival Behaviors for that topic. They also provided Education considerations to support the application of the topic in an educational setting. Any conflicts were resolved by an independent Guidelines Steering Committee (GSC) member. Worksheets that described the outcomes of each included work and summary relevance were completed. These were presented for peer review to the GSC.

Each first aid topic is introduced with a key action to be emphasized to learners, a brief explanation of the condition, how common it is and the main population likely to be at risk or affected. The Guidelines that follow are rated by the level of scientific evidence that exists for them. Good practice points are provided where evidence was missing but expert opinion was available based on experience and non-systematic review sources of evidence.

The Chain of Survival Behaviors is used by the Guideline authors as a tool to emphasize how first aid education does not start and end with a first aid action. The domains of Prevent and Prepare; Early Recognition; First Aid and/ or Access help; and Early Medical Care/ Self-recovery, are fundamental

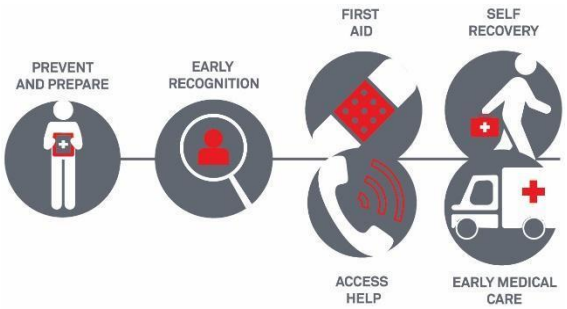

Figure 1 The Chain of Survival Behaviors

considerations for education depending on the context and learner needs. Each clinical topic covered by the Guidelines includes insight based on evidence and expert opinion on how best to frame an educational intervention using these domains and identifying where educators might best position that learning.

This paper reviews how the 2020 Guidelines incorporated available clinical and educational evidence within the domains of the Chain of Survival Behavior for first aid for burns. It then discusses how the educational considerations might be adapted to different learner audiences and their needs.

Burns are among the most devastating of all injuries, and they continue to be a major public health concern around the world, particularly in low- and middle-income nations, which account for nearly all burn deaths (95 percent) (WHO, 2008). In recent times, a lot has been accomplished in terms of lowering the burden of burn injuries ranging from better preventive strategies to advances in burn treatment and care. Yet provision of appropriate first aid is almost negligible. Unfortunately, in some places of the world where burn injuries are still common, victims frequently travel long distances to receive adequate treatment for their burns. (Ranganathan et al, 2020, Gupta S et al, 2014).

An investigation into the use of first aid for burn injuries found that while 53.8 percent of sufferers reported to have received first aid, just 5% of them used the recommended procedure. (Seow et al., 2020). In another study, it was found that 32% of

caregivers to pediatric burn victims treated burns with nonscientific remedies like toothpaste, white flour, tomato paste, yogurt etc. (Alomar et al, 2016). This reflects a substantial gap in knowledge and awareness regarding first aid for burn injuries. In resource poor settings, burn victims often receive inadequate care from first responders. Most victims receive no fluids, pain management or wound dressings while they are being transferred to a health-care facility. Patients with major burns typically encounter delays in presenting to specialized burn centers. (Bodily et al, 2021)

Accurate and timely first aid can result in increased burn victim survival rates and enhanced functional recovery. As a result, first-aid training contributes to the development of a healthier, and safer environment. More importantly, with the use of evidence-based, comprehensible, and practical first-aid guidelines and training of first responders, we can significantly reduce the severity of burn injuries and deaths, as well as help mitigate mass burn casualties and fire disasters.

Educational approach

The scientific foundation for the guidelines on burns discusses some of the most relevant and critical aspects of first aid that must be appropriately applied to enable maximum harm reduction. Some of the key evidence-based educational points discussed in the guidelines include:

- **Cooling:** Data showed that cooling of burnt area may not reduce pain or erythema but definitely helps in reduction in the depth of the burn, thereby indirectly decreasing length of hospital stay. What is certain is that thermal (heat) burns should be cooled for at least 10 minutes, ideally 20 minutes, using running water. There is limited and low-quality evidence on use of ice for cooling. No benefits of using ice could be demonstrated in literature, therefore, it is best avoided.
- **Deroofing of blisters:** There is limited evidence in favor of keeping a blister. It was shown that keeping a blister intact resulted in a statistically significant decrease in the risk of infection. Therefore, they are best left intact until medical advice is sought.
- **Burn dressings:** Although it is impossible to draw definitive conclusions about the effectiveness of specific dressings, in general, a dressing that keeps moisture in the wound, contours well to the wound, and is non-adhesive (e.g., hydrogel) is preferred. Silver sulfadiazine was consistently associated with poorer healing outcomes and is discouraged in these guidelines. At many places, dressings are unavailable, but it is important to cover the wound even if it means using locally available substances such as aloe vera or honey. Clothing and jewelry on or near the burned skin must be removed.
- **Chemical burns:** Chemical burns on the skin or in the eyes should be rinsed with running tap water and (if available) Diphoterine (an emergency rinsing solution for splashes of chemical products) until the pain eases. Both have been shown to decrease the depth of chemical burn thereby improving outcomes.
- **Sunburn:** For sunburns, after sun lotion or cream may reduce erythema and after sun gel (diclofenac 0.1% Emulgel) application may reduce pain.

Good practice points for first responders include:

- When it is possible and safe to do so, an attempt should be made to control the source of danger, for example, by dousing off the source of fire.
- When rinsing a caustic material off the skin, the first responder must ensure that any diluted substance does not injure the victim's healthy tissue or their own. They should put on the appropriate safety gear.
- If the burn is extensive, deep, or involves the head and neck, mouth/throat, or genital area, or if it was caused by chemical agents, electricity, or flames, the first aid provider should seek emergency medical help right away.

In addition, guidelines emphasize that prevention is truly the key for reducing burn related morbidity and mortality. Educators should consider refocusing first-aid training to better help learners. Learners, too, must adjust to their personal and professional environments. Learners who live in warm regions, for example, may benefit most from learning how to prevent sunburns, whereas those who work in kitchens or cook over open fires may benefit the most from knowing how to avoid and treat flame burns (Forjouh, 2006; Outwater et al., 2018).

Adaptations

Cooling the burn is the main action point of this guideline, although if there is no running water available, alternative cool liquids (juice, milk) can be used to cool the burn. Cooling lowers the heat and limits the depth of the burn. Running water is the key, but if water is limited, then a bowl can be placed under the burned part and water poured can be collected and reused. Immersion in a bowl of water is not encouraged since the body part will heat the water, whereas pouring maintains the water at a lower temperature.

Burn dressings are an important element of burn care. If no dressing is available, the burn may be treated with locally available substances such as aloe vera, honey, or banana leaves, because dressing the burn wound reduced pain and reduces the risk of infection. Honey has shown a statistically significant reduction in the time required for wounds to heal and infections to occur when compared to non-antimicrobial dressings. There is evidence from non-randomized trials in favor of using fatty acids and banana leaf dressings as burn dressings but can be applied in the interim period till standard dressing material is made available (IFRC, 2020). When compared to standard burn therapy, topical administration of ethyl linoleate resulted in a statistically significant reduction in the need for narcotic pain relief, time to appearance of the epithelium, appearance of normal pigment and hair, and the number of patients requiring grafts. When compared to using ordinary gauze dressings, banana leaf dressings resulted in a statistically significant reduction in discomfort, dressing removal pain, ease of dressing removal score, and time to complete healing.

The performance of the first aid provider is not merely determined by the level of knowledge or skills, but rather is defined by a complex interplay of decisions and actions such as concern of harming the victim unknowingly, lack of motivation (fear of legal consequences), cultural barriers, gender related barriers, and lack of opportunity (availability of resources and access to respond). For example, a male care provider may be hesitant to disrobe a burning female victim. Therefore, first aid education should be both culture sensitive and context appropriate. Analyzing and addressing these barriers will empower the care providers to tackle burn accidents confidently and efficiently. Some cultural traditions, on the other hand, should not be completely disregarded. For example, honey has been demonstrated to be more effective than alternative dressings in treating superficial and partial thickness burns in research and clinical investigations, making it a feasible option as a helpful topical agent in clinical practice (Zbuchea, 2014).

Based on local customs and treatments, behavior modification interventions should integrate learners' knowledge with additional, positive interventions that will minimize harm and bring comfort to a burn survivor.

Discussion

Through its good practice points, guideline statements, and key action, this Guideline for first aid for burns concisely presents evidence-based practices and aids in decision-making for both educators and learners. The Chain of Survival Behavior's structure to deliver first aid education simplifies the content and makes it more deliverable and as well as easy to grasp for the practitioners.

Burn injuries are largely preventable. It has been consistently reported in literature that the majority of the burden of burn injuries is shared by low- and middle-income countries. Burn injuries can be prevented in most circumstances. According to published research, the bulk of the burden of burn injuries is shared by low- and middle-income countries (WHO, 2008). The presence of pre-existing impairments in children, gaps in child supervision, storage of flammable items inside the premises of a house, low maternal education, and overcrowding are all recognized to be risk factors in these nations. (Forjuoh, 2006). We can draw on a number of examples to illustrate the diverse cultural links to burn injuries. For example, Seizures were common among a number of injured children in a study from Africa, both because seizures can cause children to seize and fall into boiling liquids or open fires, and because epilepsy has been treated in some African cultures by intentionally inducing burns. (Karan, A. et al., 2015). Another aspect of burden of burns is that burns are alarmingly high in girls and women and most accidents occur in kitchens. (Ghosh & Bharat, 2000). Trainers/educators, therefore, need to understand the importance of context-relevant prevention and educate the public as per risk factors involved. Education should focus on modifiable (risks that can be reduced) versus non-modifiable (risks that cannot be reduced) e.g., existing impairment. Careful consideration must be given to educating families about the clinical signs of seizures and important home safety precautions, such as the need for extra-vigilant parental supervision during cooking and open fires, especially for these children. Similarly, scald burns from bathwater can be prevented by adding hot water to cool water rather than adding cool water to boiling water at an incorrect dilution (Karan, A. et al., 2015).

Perhaps, the most universal 'cultural' burn all over the world is related to fireworks. Most devastating hand and ocular burns are observed in users of the fireworks and the injury rate is highest among boys aged 10–14 years. (Al-Qattan, et al., 2009). These can lead to amputation of limbs and permanent blindness. This high-risk behavior could be curbed by initiating education on safe firework practices well in advance to the event and not just one day prior to have a greater impact.

Elderly diabetics are found to be a high-risk group who often sustain burns from room heaters, electric blankets, and electric heating pads during the winter season because of peripheral neuropathy and decreased sensations. (Maghsoudi, et al., 2008) Therefore, it is critical that diabetics are informed about safeguarding themselves against burn injuries by observing preventive behaviors such as keeping the heater away and avoiding direct heat and use of heating pads under the supervision of care takers.

Educational theory drawn on in the Guidelines indicates that it is important to deliver this education in vernacular language to the people while ensuring the meaning and interpretations do not change with translations.

Once a burn incident happens, early recognition and response prevents undue delay in treatment. At this point educators should use day to day examples to deliver the message. For example, it is common knowledge that immersing a boiled potato in cold water for 5 mins just cools the outer layer, but the inner core is cooled only after immersion for a longer time. This is how cooling works for the burned body part as well.

Last in the sequence of chain of survival behaviors is recovery. Educating on signs of infection and nutrition is necessary to prevent complications and aid quicker recovery from burns.

While the Guidelines make a concerted attempt to explicitly lay out particular educational content to assist learners in prevention and managing acute thermal and chemical burns, there is very limited mention of electrical burn injuries which can be far more devastating. Injuries from high voltage electrical wires are life threatening and information on prevention could have been added both for domestic and field settings. In the home, electrical outlets should be capped and all wires should be

insulated and out of reach of the children. High tension electric wires should be placed away from the houses and playgrounds. Workplace safety protocols should be strictly followed. (Zemaitis, 2021).

Another important aspect of early recognition of burns that is missing from the Guidelines is calculation of burn severity. Deciding which method to calculate severity is not vital, but what is important is assessment of the extent of the burn for early referral. Educators and learners can be taught that the patient should be referred to a burn center if the burn size is greater than the size of 10 palms of the patient (10% of total body surface area). (The surface area of a patient's palm, including their fingers, accounts for about 1% of their total body surface area.) (Hettiaratchy, 2004).

Burn injuries to the hand are particularly crippling compared to burn injuries to the trunk. Even though the hands are a small area, burns to the hands can result in significant loss of ability to perform functions necessary to produce a living for oneself and one's family, as well as to carry out daily living activities. Therefore, hand burns should be the focus of early recognition, response, as well as recovery and rehabilitation. The guidelines miss out on mentioning hand burns as a criterion for referral to a definitive care facility.

Conclusion

Burn first aid is critical since it defines the course of the injury in the future, as well as immediate survival and long-term morbidity. Burn first aid education should focus on reducing thermal damage through cooling and preventing further damage from the use of unscientific materials. Simultaneously, all burn care providers should be educated to recognize life threatening signs and be equipped to transport these patients to the nearest health care facility. For deeper penetration of first aid education to the masses, the learners should be educated in the context of their environment.

Acknowledgements

We wish to thank the reviewers, writers and editors that were involved in the development of the 2020 Guidelines.

Conflict of Interests

No conflict of interest exists for any of the authors. The authors were content contributors to the 2020 International first aid, resuscitation, and education guidelines.

Corresponding Author

Prof. Dr. Maneesh Singhal,
drmaneesh@gmail.com

References

Alomar, M., Al Rouqi, F., & Eldali, A. (2016). Knowledge, attitude, and belief regarding burn first aid among caregivers attending pediatric emergency medicine departments. *Burns, 42*(4), 938-943. https://doi.org/10.1016/j.burns.2016.03.019

Al-Qattan, M. M., & Al-Zahrani, K. (2009). A review of burns related to traditions, social habits, religious activities, festivals and traditional medical practices. *Burns, 35*(4), 476-481. https://doi.org/10.1016/j.burns.2008.03.001

Bodily, N. E., Bruenderman, E. H., Bhutiani, N., The, S., Schucht, J. E., & Bozeman, M. C. (2021). The Effect of Transfer on Outcomes in Burns. *Journal of Burn Care & Research, 42*(5), 841-846. https://doi.org/10.1093/jbcr/irab092

Forjuoh, S. N. (2006). Burns in low-and middle-income countries: a review of available literature on descriptive epidemiology, risk factors, treatment, and prevention. *Burns, 32*(5), 529-537. https://doi.org/10.1016/j.burns.2006.04.002

Ghosh A., & Bharat, R. (2000). Domestic burns prevention and first aid awareness in and around Jamshedpur, India: strategies and impact. *Burns, 26*(7):605-608. https://doi.org/10.1016/S0305-4179(00)00021-8

Gupta, S., Wong, E. G., Mahmood, U., Charles, A. G., Nwomeh, B. C., & Kushner, A. L. (2014). Burn management capacity in low and middle-income countries: A systematic review of 458 hospitals across 14 countries. *International journal of surgery, 12*(10), 1070-1073. https://doi.org/10.1016/j.ijsu.2014.08.353

Hettiaratchy S, Papini R. Initial management of a major burn: II--assessment and resuscitation. BMJ. 2004;329(7457):101-103. https://doi.org/10.1136/bmj.329.7457.101

International Federation of Red Cross Red Crescent Societies. (2016). International First Aid and Resuscitation Guidelines 2016.

International Federation of Red Cross Red Crescent Societies. (2020). International First Aid, Resuscitation, and Education Guidelines 2020. https://www.globalfirstaidcentre.org/resource/international-first-aid-resuscitation-and-education-guidelines-2020-2/

Karan, A., Amado, V., Vitorino, P., Kulber, D., Taela, A., & DeUgarte, D. A. (2015). Evaluating the socioeconomic and cultural factors associated with pediatric burn injuries in Maputo, Mozambique. *Pediatric surgery international, 31*(11), 1035-1040. https://doi.org/10.1007/s00383-015-3761-5

Maghsoudi, H., Aghamohammadzadeh, N., & Khalili, N. (2008). Burns in diabetic patients. *International Journal of Diabetes in Developing Countries, 28*(1), 19–25. https://doi.org/10.4103/0973-3930.41982

Ranganathan, K., Mouch, C. A., Chung, M., Mathews, I. B., Cederna, P. S., Raja Sabapathy, S., ... & Singhal, M. (2020). Geospatial mapping as a guide for resource allocation among burn centers in India. *Journal of Burn Care & Research, 41*(4), 853-858. https://doi.org/10.1093/jbcr/irz210

Seow, S. N., Halim, A. S., Wan Sulaiman, W. A., Mat Saad, A. Z., & Mat Johar, S. F. N. (2020). The Practice of First Aid for Burn Injuries Among the Population of East Coast of Peninsular Malaysia for 2012–2016. *Journal of Burn Care & Research, 41*(4), 905-907. https://doi.org/10.1093/jbcr/iraa025

Outwater, A. H., Thobias, A., Shirima, P. M., Nyamle, N., Mtavangu, G., Ismail, M., ... & Justin-Temu, M. (2018). Prehospital treatment of burns in Tanzania: a mini-meta-analysis. *International Journal of Burns and Trauma, 8*(3), 68. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6055078/

Singletary, E. M., Zideman, D. A., Bendall, J. C., Berry, D. C., Borra, V., Carlson, J. N., ... & Woodin, J. A. (2020). 2020 International Consensus on First Aid Science with Treatment Recommendations. *Circulation, 142*(16_suppl_1), S284-S334. https://doi.org/10.1161/CIR.0000000000000897

World Health Organization. (2008). A WHO plan for burn prevention and care. *World Health Organization*. https://apps.who.int/iris/handle/10665/97852

Zbuchea, A. (2014). Up-to-date use of honey for burns treatment. *Annals of Burns and Fire Disasters, 27*(1), 22. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4158441/

Zemaitis MR, Foris LA, Lopez RA, et al. Electrical Injuries. [Updated 2021 Aug 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK448087/