



## ARC SAC ADVISORY Burn Cooling

Scientific Advisory Council

### **Overall Recommendation:**

There continues to be evidence that cooling of burns with cool running water decreases the severity of the burn and improves outcome. While much of the data is from cohort studies which are conducted at burn centers, randomized evidence also demonstrates what cooling limits the depth of the burn. The preponderance of evidence suggests that 20 minutes of cooling is optimal, however, as adequate first aid has been defined at 20 minutes of cool running water, the data tends to gravitate around 20 minutes. The June 2019 Red Cross review suggested that the minimum duration of cooling associated with improved outcomes was 10 minutes. However, one new study (Griffin 2020) demonstrated that any duration of cooling over 5 minutes decreased the odds of a full thickness burn or needing a skin graft, which appeared to have a dose-response relationship up to adequate first aid of 20 minutes. Although even in this new study, longer durations of cooling had progressively improved outcomes. Studies continue to suggest that cooling within three hours of the injury may be beneficial. While there is the most available evidence for cool running water, other cooling (but not freezing) devices also may have some efficacy. It is mentioned in one study that those of low socioeconomic status may have less access to cool running water.

While cooling of a duration of little as five minutes may be beneficial, this study also suggested that there is a dose response relationship, with increasingly improved outcomes at the duration of cooling progresses up to 20 minutes. As a prior study demonstrated that 10 minutes was the minimum duration for improved outcome, we choose not to change the prior Red Cross recommendation that a minimum of 10 minutes of cooling, with an optimal duration of 20 minutes. Cooling should be done as soon as possible after the injury, but benefit may be seen up to three hours if immediate cooling is not possible. This document is a minor revision as a note was added that transport to a higher level of care should not be delayed to allow time for burn cooling. In addition, the concept that cooling should begin immediately was moved to a standard, whereas the time period of the cooling was left as a guideline. For convenience, the use of a cold pack/compress could be used during transport time.

### **Recommendations:**

Standard:

- Begin immediate cooling of thermal burns, preferably with cool running water (LOE 2b)
- Monitor for hypothermia when cooling large burns or burns in small children. (Level 5)
- Avoid cooling beyond 40 minutes due to risk of hypothermia. (Level 2b)

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Guideline:

- Patients who sustain thermal burns should have overlying clothing and jewelry removed (Level 2b)
- Cooling should be for a minimum of 10 minutes, ideally 20 minutes. (Level 2b)

Option:

- There may be benefit in starting cooling of a burn up to 3 hours after the injury. (Level 5)
- If cool or cold water is not available, a clean cool or cold compress or cold pack can be used as a substitute to cool thermal burns. (Level 5)
- Do not use ice to cool a burn, including an ice pack or bag, due to a risk of worsening the injury. (Level 5)

*Note: Transport to a higher level of care should not be delayed to allow time for burn cooling. For convenience, the use of a cold pack/compress could be used during transport time*

**Questions to be addressed:**

Among adults and children with acute thermal burns, does the use of one cooling modality and duration, compared with another, cause a change in clinical outcomes including pain, depth or size of burn, need for hospitalization, duration of hospital stay, or other?

**Introduction/Overview:**

The Red Cross has not previously reviewed the literature regarding appropriate treatment and active cooling for thermal burns. However, in 2015, ILCOR reviewed the literature regarding this topic and found limited evidence to support cooling of thermal injuries<sup>1</sup>. This review concluded that a minimum of 10 minutes of active cooling should be performed but there was insufficient evidence to suggest a particular method of cooling or appropriate temperature of cooling substrate. The ILCOR review and treatment recommendations were the basis for the 2015 AHA/Red Cross First Aid Guidelines update, which recommended a minimum of 10 minutes cooling for thermal burns. Some burn specialists have been critical of this recommendation, saying that 20 minutes is the minimum amount of time that a thermal burn should be cooled. The June 2019 SAC Scientific Review on this topic aimed to review the literature since the 2015 ILCOR review to see if there are any new scientific evidence to support or refute the recommended minimum of 10 minutes for cooling. The review also aimed to identify any other first aid interventions for thermal burns that might be of benefit.

**Summary of Scientific Foundation:**

Literature search revealed 4 articles for inclusion, three were cohort studies and one was an ILCOR guideline.

In 2020 Griffin et al published a cohort study of 2495 children who presented to a pediatric burn center in Queensland Australia. The purpose of this study was to assess the need for skin grafting following adequate first aid treatment following a burn. In this study adequate first aid treatment consisted of at least 20 minutes of cool running water within 3 hours of the burn. Secondary outcomes and time subsets of cooling were also analyzed. It is noted that disadvantaged populations were also assessed in this study. Scald injuries were the mechanism in 49.1% of cases and 85.3% occurred in the home. Adequate first aid was associated with injury mechanism ( $p < 0.001$ ). Adequate first aid was associated with a decreased risk of skin grafting (OR 0.6; 95% CI 0.4-0.8,  $p < 0.001$ ). In addition, a decreased need for skin grafting was associated with any amount of cooling with running water (OR 0.06; 95% CI 0.4-0.9,  $p = 0.007$ ). The authors noted a dose response relationship between duration of cooling with running water (greater than 5 minutes) and need for skin grafting. Regarding secondary outcomes, cooling with running water was not associated with a decreased time to re-epithelialization. However, the odds of a full thickness burn as well as need for hospitalization decreased with the use of any amount of cool running water over 5 minutes and with adequate first aid.

In 2019 Wright et al published a randomized in vivo trial on women who were receiving reconstructive breast surgery. In this study a perfused tissue flap that was to later be excised had burns created by a device heated to 70C for a time period of 5 – 60 second. Cooling was started 2 minutes following the burn and was conducted with a mechanical cooling device at 16 C for 20 minutes. Histologic examination was conducted of the excised tissue. Twenty-six burns were created on 16 women. There was a mean reduction in burn depth of 25.2 percent when comparing cooled burns to non-cooled burns. Blinding is not reported.

In 2019 Harish et al published a cohort study enrolling 390 participants at two burn centers in New South Wales Australia evaluating the effect of first aid on large ( $\geq 20$  TSBA) burns. In this study, adequate first aid was defined as a minimum of 20 minutes of cool running water (8-25C) within 3 hours of the burn. Mean TBSA was 37.5. Adequate first aid was associated with a 9.8% (95% CI -13.6 to -6.1%,  $p < .0001$ ) reduction in TBSA and 12% (95% CI -19% to -4%,  $p < 0.01$ ) reduction in percentage of full thickness injury. There was no reduction in percentage of skin grafted.

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