

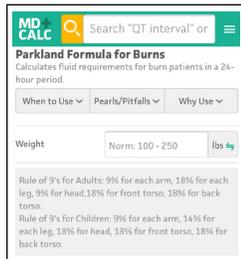


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Parkland Formula for Burns

Introduction: The Parkland formula for burns calculates fluid requirements for burn patients in a 24-hour period.

Points & Pearls

- The Parkland formula is a validated and effective approach to initial fluid resuscitation in the acutely burned patient.
- Overly aggressive fluid resuscitation, termed “fluid creep,” is well documented in critical care literature. Factors that may lead to fluid creep include lack of physician observation of endpoints (ie, urine output), increased opioid use, and the emergency nature of goal-directed resuscitation.
- Patients with inhalational and electrical burns, as well as children and the elderly, may require more or less fluid resuscitation than is predicted by the Parkland formula.

Critical Actions

Critically ill burn patients are best cared for at a dedicated burn center, particularly those who have any of the following:

- Partial-thickness burns to > 10% of total body surface area. In pediatric patients, this can be calculated using the Rule of Nines for children: 9% for each arm, 14% for each leg, 18% for the head, 18% for the front torso, and 18% for the back torso. Alternatively, the Lund and Browder chart can be used to calculate an age-based estimation.
- Any size full-thickness burn
- Burns to hands or genitals

- Inhalation injury
- Serious chemical injury
- Serious electrical injuries, including lightning injury

Advice

It is important to remember that all resuscitation formulas should only be used as guides. Patients should be assessed frequently, with individual adjustments made to maintain adequate organ perfusion.

Evidence Appraisal

Blumetti et al (2008) conducted a retrospective study of patients resuscitated with the Parkland formula at a single institution over 15 years to determine the accuracy of the formula in guiding resuscitation. Using urine output as a guideline for adequate resuscitation, they found that patients commonly received fluid volumes higher than predicted by the Parkland formula, and concluded that the formula should represent a resuscitation “starting point,” but urine output is the most important parameter to control resuscitation volume.

Cartotto et al (2002) performed a retrospective study, and also found that the Parkland formula underestimated the volume requirements in most adults with burns, especially in those with large full-thickness burns. Thus, the Parkland formula is a validated and effective approach to **initial** fluid resuscitation in the acutely burned patient (Baxter 1974, Cartotto 2002, Blumetti 2008).

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CALCULATOR REVIEW AUTHOR

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Why to Use

The Parkland formula has been endorsed by the American Burn Association. It has been shown to appropriately restore intravascular volume and limit the development of hypovolemic shock.

When to Use

Use the Parkland formula for patients with acute burns.

Next Steps

Resuscitation endpoints and monitoring:

- Urine output: 0.5 mL/kg/hr in adults and adolescents weighing ≥ 30 kg, and 0.5-1.0 mL/kg/hr in children weighing < 30 kg.
- Heart rate: Adequate volume is suggested by a normal heart rate, which varies by age. Narrowed pulse pressure provides an earlier indication of shock than systolic blood pressure alone.
- Monitoring blood pressure by arterial catheter is superior to cuff pressures because of the interference of tissue edema. The radial artery is the first choice, followed by the femoral artery.
- Serum lactate is a strong predictor of mortality, and trends can be utilized to determine hemostatic status; however, it should not be used as an independent predictor of adequate fluid resuscitation.

Calculator Creator

Charles Baxter, MD

[Click here to read more about Dr. Baxter.](#)

References

Original/Primary Reference

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Rule of Nines Illustration

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Additional Reading

[Click here to access a *Pediatric Emergency Medicine Practice* issue reviewing emergency management of pediatric burn patients.](#)

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