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# Weight-based vs. BSA-based Fluid Resuscitation Predictions in Pediatric Burn Patients

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## Introduction

- Fluid resuscitation in acute burn injuries rely on formulas that estimate fluid needs using weight and/or body surface area along with total burn surface area.
- Adult studies have shown that the weight based Parkland formula tends to cause fluid overload and associated complication in obese patients. No similar studies exist in pediatric populations.
- This study assesses whether a weight-based resuscitation formula (Parkland formula) increases the risk of complications in obese children following burn injuries and compares fluid estimates to those that incorporate body surface area (Galveston and Cincinnati formulas).

## Methods

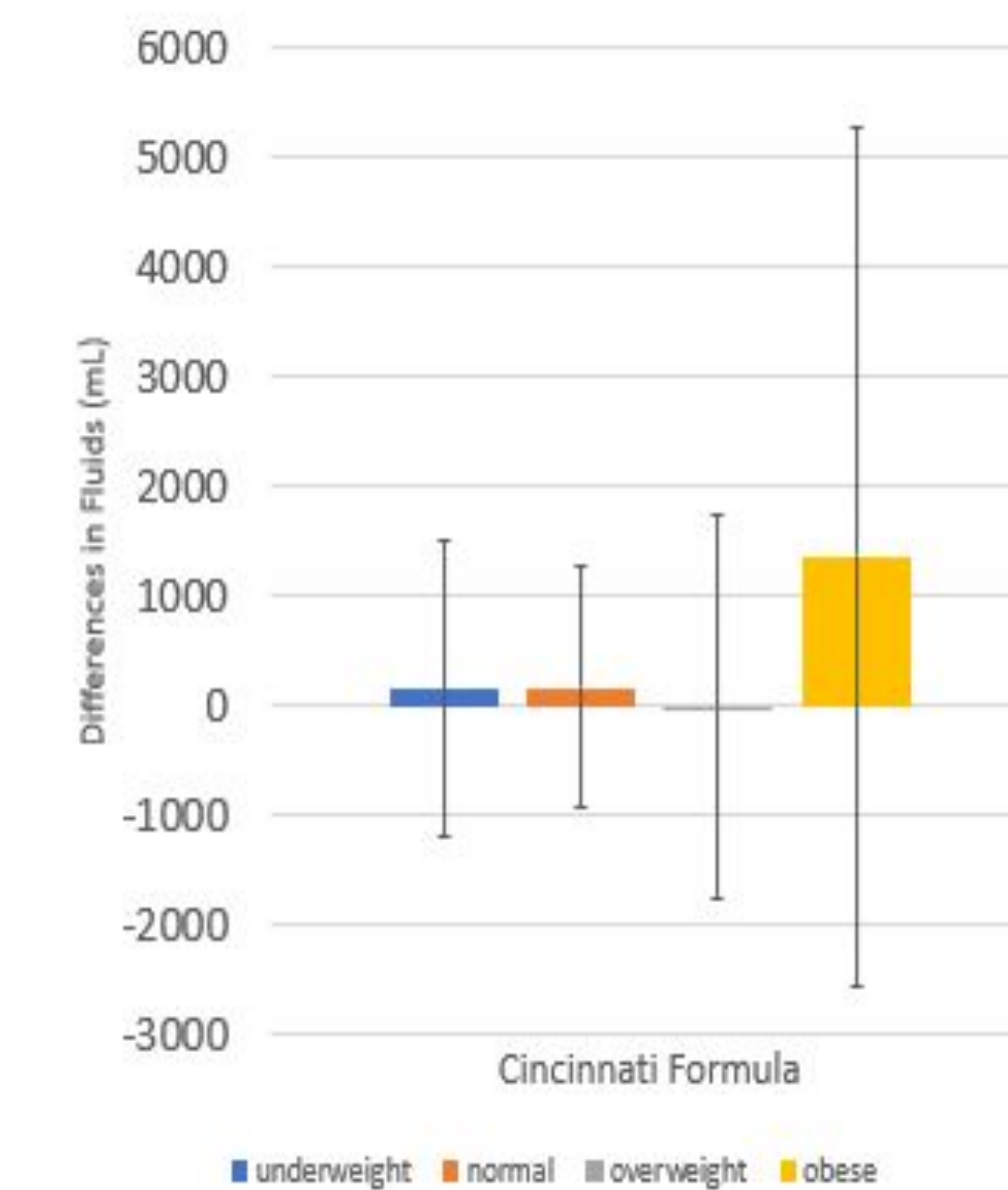
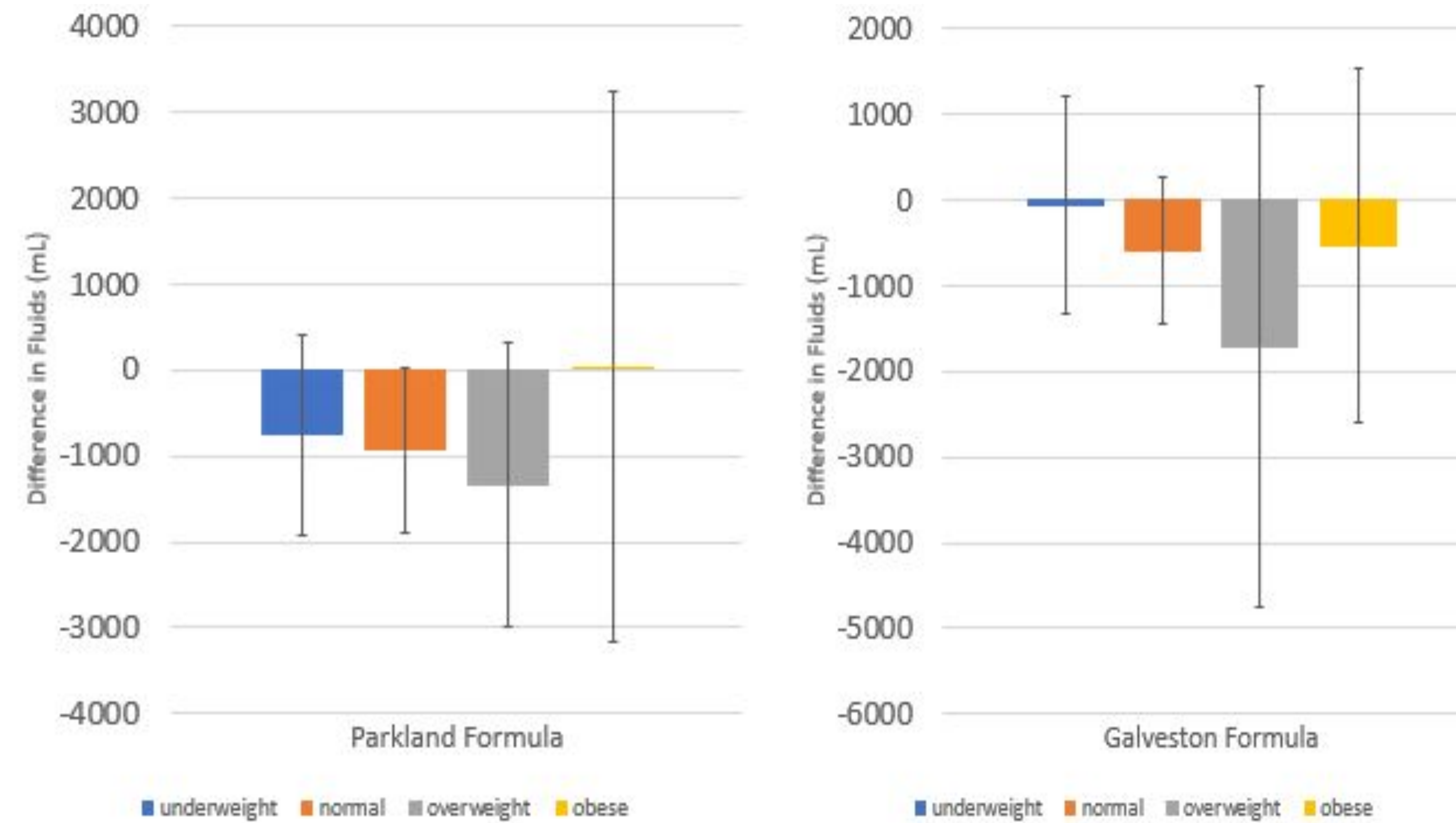
- A retrospective study was conducted on 110 children (≤18 years old) admitted to our institution from October 2008 to May 2020.
- Data including demographics, type of burn, total burn surface area (TBSA), predicted weight-based fluid resuscitation volumes based on Parkland formula, total fluid volume given, urine output, and complications were collected at 8h and 24h post injury.
- Patients were classified into CDC-defined weight groups. Data was analyzed and compared to BSA-based Cincinnati and Galveston formulas.

## Conclusion

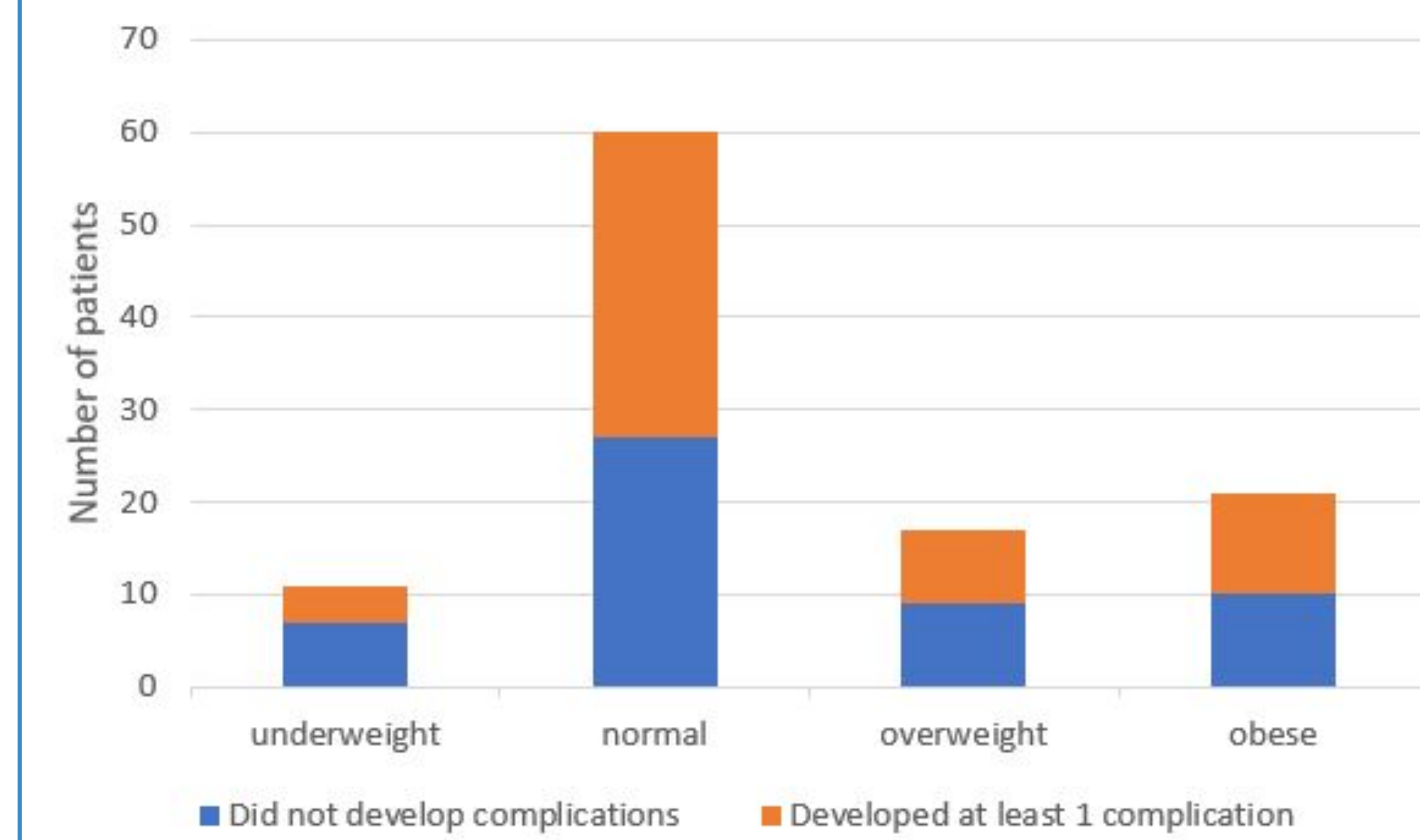
Parkland formula tended to underpredict fluid needs in the underweight, normal, and overweight children, and it overpredicted fluid needs for the obese. Further investigation is needed to determine whether weight-based formulas are superior to those that incorporate body surface area.

## Citations

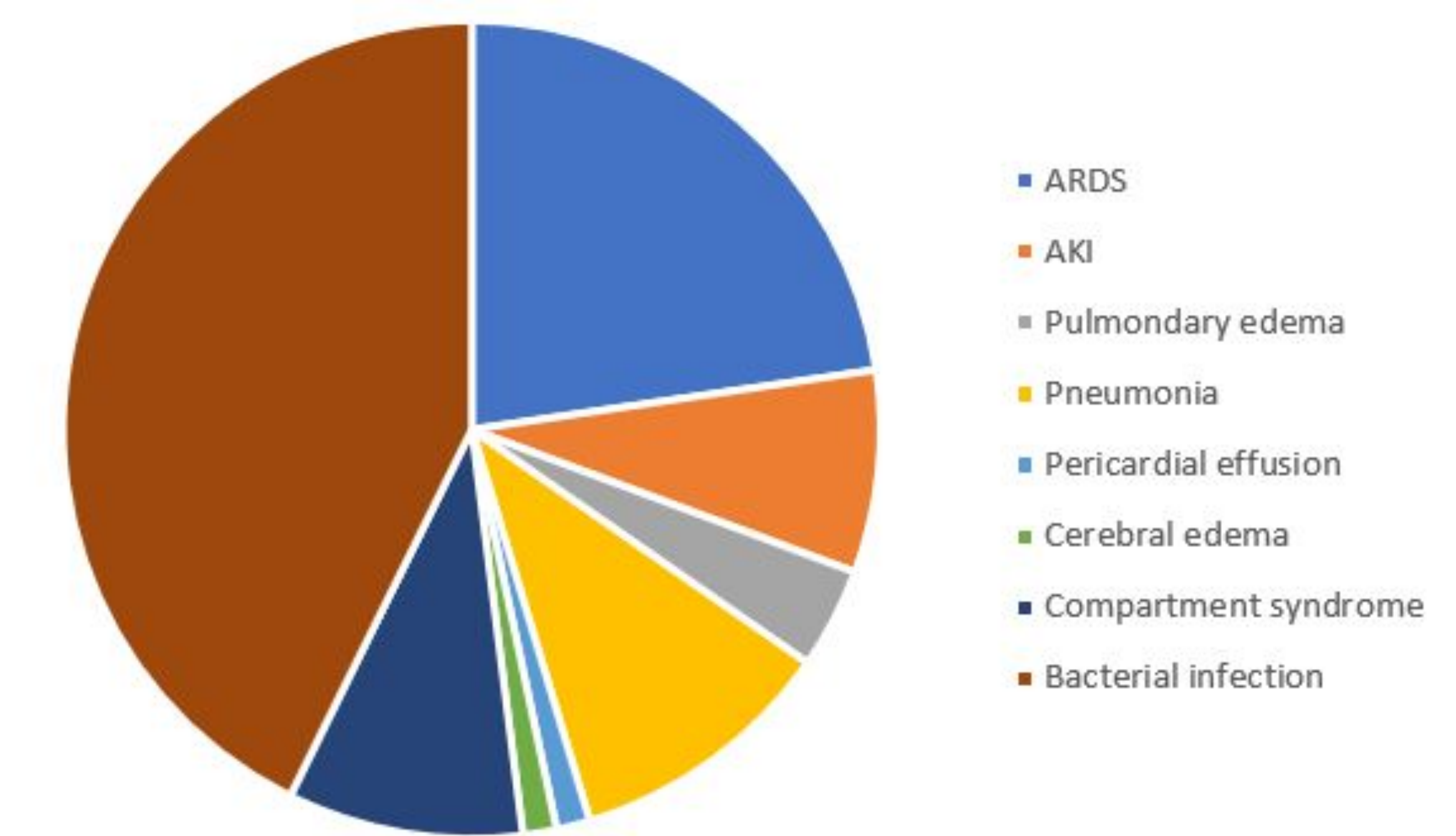
Rosenthal J, Clark A, Campbell S, McMahon M, Arnoldo B, Wolf SE, Phelan H. Effects of obesity on burn resuscitation. *Burns*. 2018 Dec;44(8):1947-1953. doi: 10.1016/j.burns.2018.06.002. Epub 2018 Oct 31. PMID: 30391062.



**Figure 1. Comparison of Parkland, Galveston, and Cincinnati formula-predicted fluid resuscitation volume and fluid volume administered 24hrs post-burn injury.** Parkland formula tended to underpredict fluid needs with increasing weight, yet slightly overpredicts in obese patients. Galveston formula tended to underpredict fluid needs across all groups with the greatest underprediction occurring in the overweight group. Cincinnati formula tended to overpredict fluid needs across all groups with the greatest overestimation occurring in the obese group. The Parkland formula best estimated therapeutic volumes in obese patients, the Cincinnati formula best predicted volume needs in the other three groups. Error bars represent standard deviation.



**Figure 2. Incidence of complications following Parkland formula resuscitation.** In most groups, patients were about equally likely to not develop complications post-fluid resuscitation as they were to develop resuscitation-related complications. However, the underweight group was the only weight group where more patients developed complications compared to those who did not.



**Figure 3. Distribution of post-fluid resuscitation complications.** In the 56 patients who developed complications post-fluid resuscitation, bacterial infection was most common, followed by ARDS, pneumonia, AKI, and compartment syndrome. Pericardial effusion and cerebral edema were uncommon but were noted in some cases.