

# Too much or too little? Fluid resuscitation in the first 24 hours after severe burns: evaluating the Parkland formula – a retrospective analysis of adult burn patients in Austria, Germany, and Switzerland 2015-2022

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## Introduction

### Fluid resuscitation:

- one of the crucial aspects of acute therapy after an incidence of burn

### Parkland formula:

- quick solution for determining the amount of fluid necessary in a specific situation
- though not strictly followed or used in current practice

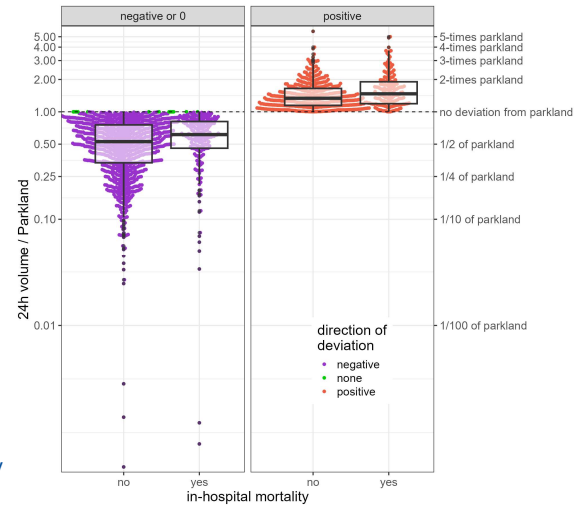
### Aim:

- assess association between a relative deviation from the Parkland formula in either a positive or negative direction and in-hospital mortality
- assess whether this association is further influenced by patient characteristics

## Results

- positive and negative relative deviations from Parkland are associated with higher probability of in-hospital mortality
- adjusting for sex, age, BMI, inhalation trauma, grade 3 burn, and TBSA, only positive deviation from Parkland was still risk factor for in-hospital mortality
- this negative effect of deviating could be further modified by patient characteristics such as inhalation trauma, total body surface area, and BMI, but not patient's age

Figure 1: Relative deviation from Parkland, stratified by outcome in-hospital mortality and direction of deviation



## Methods

### Data:

- 2'235 burn patients
- German Burn Registry
- January 1st 2015 – December 31st 2022

### Methods:

- mixed logistic regression models to assess association between relative deviation from Parkland (positive or negative) with in-hospital mortality
- additional use of interaction effects of the deviation with patient characteristics such as age, inhalation trauma, BMI, and percent of total body surface area affected

Table 1: Patient characteristics stratified by outcome in-hospital mortality

	In-hospital mortality	
	no (n = 1785)	yes (n = 444)
<b>Age</b>	45.0 (31.0, 59.0)	65.0 (51.0, 79.0)
<b>Sex</b>		
F	395 (22.1%)	151 (34.0%)
M	1390 (77.9%)	293 (66.0%)
<b>BMI</b>	25.9 (23.4, 28.6)	26.3 (23.6, 29.9)
Missing	118	45
<b>Sepsis</b>	214 (17.7%)	141 (47.2%)
Missing	575	145
<b>Pneumonia</b>	252 (20.8%)	111 (37.1%)
Missing	576	145
<b>Inhalation trauma</b>	409 (23.0%)	240 (54.2%)
Missing	6	1
<b>Total Body Surface Area [%]</b>	23.0 (18.0, 32.0)	40.0 (25.0, 58.0)

continuous variables: median and interquartile range  
categorical variables: absolute and relative frequency

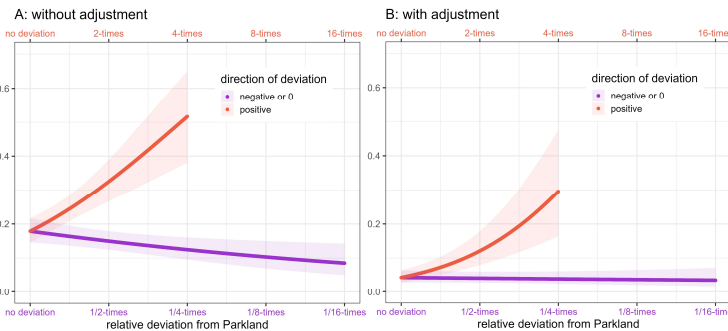


Figure 2: predicted association between relative deviation from Parkland and probability of in-hospital mortality, derived from mixed-effects logistic regression: A) without B) with adjustment

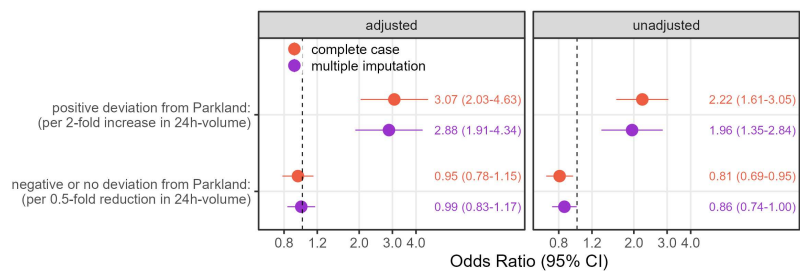


Figure 3: Odds ratios estimates with 95% confidence intervals, based on mixed-effects logistic regression for outcome in-hospital mortality

## Conclusion

- Parkland formula continues to be useful tool for quick liquid calculations in acute phase of severe burns
- deviations from calculated quantity are very common with higher number of over-infusion
- exceeding Parkland formula increases mortality while undershooting does not significantly affect mortality: "Less seems to be better than more."

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