

# The occurrence of fluid overload in critically ill patients: is there a need for fluid stewardship?

Stefanie Samaniego Cameron<sup>1</sup>, Daan Sep<sup>2</sup>, Arnoud Toornvliet<sup>2</sup>, Ingrid van Haelst<sup>1</sup>.

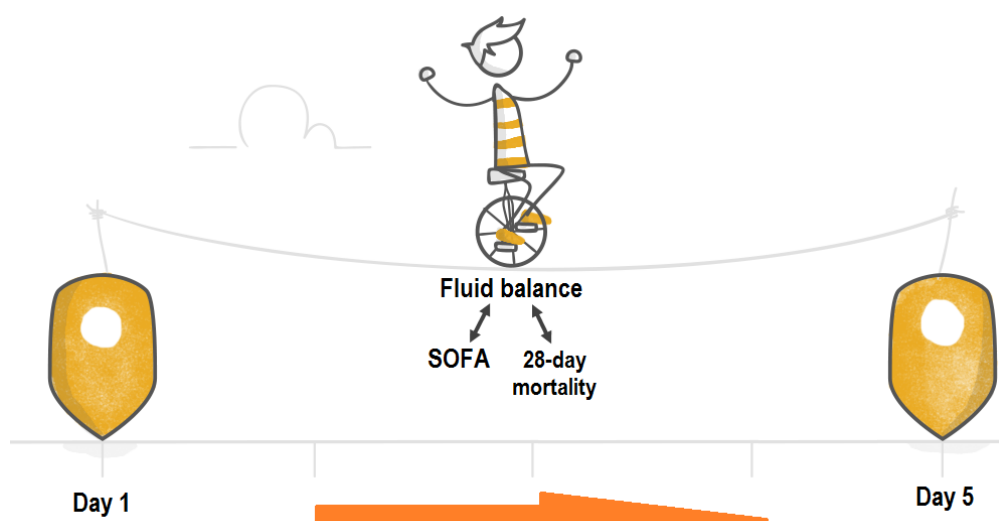
<sup>1</sup>Dept. of Clinical Pharmacy, Noordwest Ziekenhuisgroep, North Holland, NL; <sup>2</sup>Dept. of Intensive Care, Noordwest Ziekenhuisgroep, North Holland, NL.

## Introduction

Fluid infusion represents one of the cornerstones of Intensive care unit (ICU) therapies. However, ICU-acquired **fluid overload (FO)** because of excessive fluid administration is common and seems to be linked to worse long-term effects [1-3]. Therefore, many groups conclude that current fluid strategies should include every effort to reduce the cumulative fluid balance as soon as possible to improve patient outcomes [4, 5, 6]. In practice, however, maintaining a neutral fluid balance in a critically ill patient remains challenging, even when the fluid balance is being monitored daily. Data on fluid prescription and FO occurrence in the ICU population in the Netherlands is lacking. Likewise, the effect of even moderate FO on patient's clinical state has been poorly described.

## Objectives

1. **OCURRENCE** of moderate and severe FO during the first 5 days of ICU admission
2. **EFFECT** of FO on mean SOFA score and 28-day mortality
3. **SOFA score kinetics** FO vs no FO



## Materials and Methods

- Retrospective study
- IC/MC adult patients (≥ 18 years old)
- Between 1 September 2019 and 18 March 2020

FO was calculated as follows [3-4]:

$$\%FO = \left[ \frac{\text{fluid intake (litre)} - \text{fluid output (litre)}}{\text{ICU admission weight (kg)}} \right] \times 100$$

A cutoff value of 5% and 10% defined **moderate** and **severe** FO, respectively [7].

## Statistical Analysis

Descriptive data

Univariate analysis

FO ↔ SOFA/mortality

Multivariate regression model

SOFA kinetics

Linear mixed model analysis

## Contact information

Stefanie Samaniego Cameron

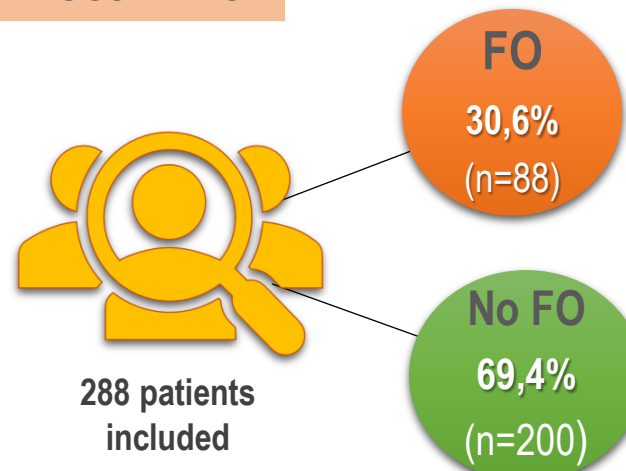
Email: steffi.samaniego@gmail.com

Abstract number: 6ER-020

**NW** Noordwest  
Ziekenhuisgroep

## Results

### 1. OCURRENCE



### Highlights descriptive data:

- The mean admission bodyweight was lower in the FO group (84 kg vs 75,5 kg; p = <0,001)
- Significantly more postoperative patients in FO group
- Moderate FO occurred more frequently in comparison to severe FO (27,1% vs 6,9%)
- Cumulative fluid balance at day 5 was higher in the FO group (8649 ml vs. 1998 ml; p = <0,001)

### 2. EFFECT FO ↔ SOFA/mortality

- FO was associated with a **higher mean SOFA score**.
- FO was not associated with higher 28-day **mortality**.

Table 1. Outcomes after regression analysis (logistic and linear)

Variables	Crude analysis	95% CI	p value	Adjusted analysis	95% CI	p value
Mean SOFA, mean difference	2,06	[1,35-2,77]	<0,001	2,48*	[1,76-3,20]	<0,001
28-day mortality, OR	1,67	[0,92-3,04]	0,094	1,19	[0,59-2,41]	0,625

\*Statistically significant

### 3. SOFA score kinetics FO vs no FO

- The time course (**steepness**) of the SOFA scores between the FO and no FO group **did not differ significantly** (p= 0.314).

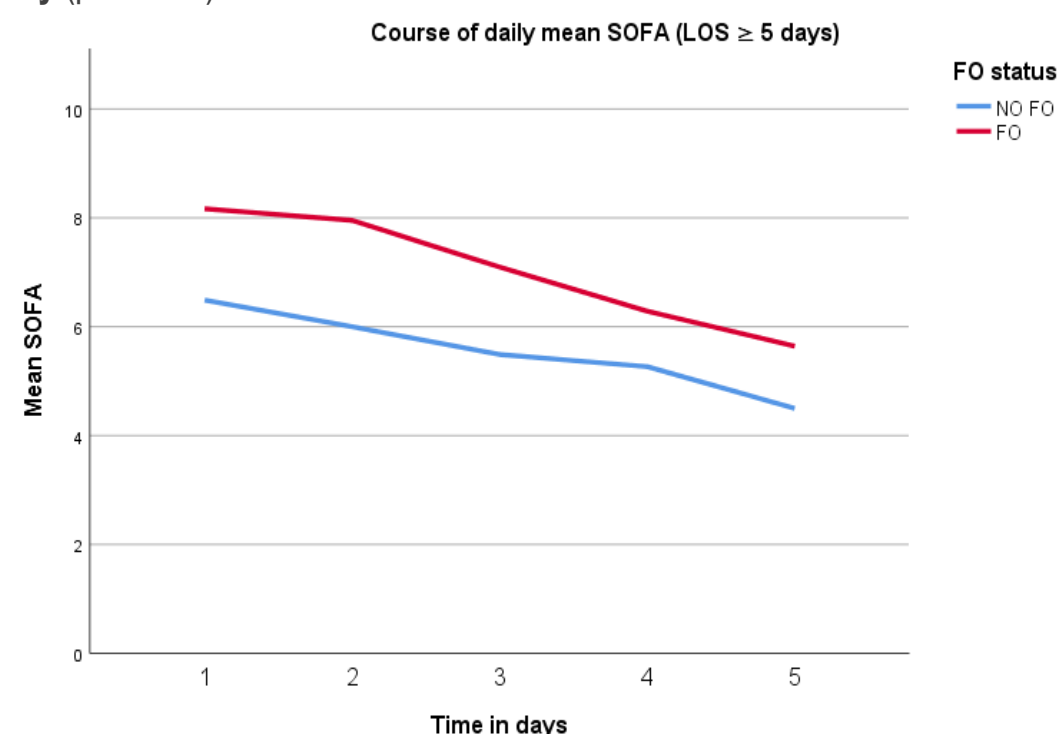


Figure 1. Course of daily mean SOFA in time for patients with Length of stay (LOS) ≥ 5 days.

## Conclusion

- FO occurred in **31%** of patients of which mostly postoperative patients.
- In most patients FO was categorized as **moderate**.
- FO was associated with a **higher mean SOFA score** but not with higher **28-day mortality**.
- The **time course kinetics** of these SOFA scores did not differ significantly.



**Additional findings:** the difference in mean admission weight between FO groups highlighted the importance of **bodyweight-based fluid prescription**.

## References

1. Hawkins, W. A., Smith, S. E., Newsome, A. S., Carr, J. R., Bland, C. M., & Branan, T. N. Fluid Stewardship During Critical Illness: A Call to Action. Journal of Pharmacy Practice. 2019.
2. Malbrain ML, Marik PE, Witters I, Cordemans C, Kirkpatrick AW, Roberts DJ, Van Regenmortel N. Fluid overload, de-resuscitation, and outcomes in critically ill or injured patients: a systematic review with suggestions for clinical practice. Anaesthesiol Intensive Ther. 2014;46(5):361-80.
3. Woodward, C., Lambert, J., Ortiz-Soriano, V., Li, Y., Ruiz-Conejo, M., Bissell, B., Kelly, A., Adams, P., Yessayan, L., Morris, P., Neyra, J. Fluid Overload Associates With Major Adverse Kidney Events in Critically Ill Patients With Acute Kidney Injury Requiring Continuous Renal Replacement Therapy. Critical Care Medicine. 2019.
4. Malbrain, et al. Ann. Principles of fluid management and stewardship in septic shock: it is time to consider the four D's and the four phases of fluid therapy. Intensive Care. 2018;8:66
5. Sakr Y, Rubatto Birri PN, Kottis K, Nanchal R, Shah B, Kluge S, et al. Higher fluid balance increases the risk of death from sepsis: results from a large international audit. Crit Care Med. 2017;45:386-94.
6. Silversides JA, Fitzgerald E, Manickavasagam US, et al; Role of Active Deresuscitation After Resuscitation (RADAR) Investigators: Deresuscitation of Patients With Iatrogenic Fluid Overload Is Associated With Reduced Mortality in Critical Illness. Crit Care Med 2018; 46:1600-1607
7. Berthelsen, RE, Perner, A, Jensen, AK, Jensen, J-U, Bestle, MH. Fluid accumulation during acute kidney injury in the intensive care unit. Acta Anaesthesiologica Scandinavica 2018.