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

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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]:

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

A cut-off 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

Results

1. OCURRENCE

<table>
<thead>
<tr>
<th>FO</th>
<th>No FO</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.6% (n=88)</td>
<td>69.4% (n=200)</td>
</tr>
</tbody>
</table>

288 patients included

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)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Crude analysis</th>
<th>Adjusted analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean SOFA,</td>
<td>2.06</td>
<td>2.48*</td>
</tr>
<tr>
<td>mean difference</td>
<td>[1.35-2.77]</td>
<td>[1.76-3.20]</td>
</tr>
<tr>
<td>p value</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>28-day mortality, OR</td>
<td>1.67</td>
<td>1.19</td>
</tr>
<tr>
<td>[0.92-3.04]</td>
<td>[0.59-2.41]</td>
<td></td>
</tr>
<tr>
<td>p value</td>
<td>0.094</td>
<td>0.625</td>
</tr>
</tbody>
</table>

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).

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