



# Hidden Fluids Stewardship: Pharmacist-driven Recommendations for Critically Ill Patients With and Without COVID-19

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## BACKGROUND

- Intravenous fluids (IVFs) are the most common administered drugs in the intensive care unit (ICU).<sup>1</sup>
- Improper administration of IVFs can lead to fluid overload, which is associated with organ dysfunction and increased mortality.<sup>1</sup>
- Hidden fluids, defined as fluids requisite to routine care, the volumes of which are not explicitly prescribed (e.g., medication diluents, flushes), account for 30% of IVFs administered in the ICU.<sup>1,2</sup>
- Fluid stewardship efforts targeted at hidden fluids have not been described in the COVID-19 population, in which there is an increased risk for the development of acute respiratory distress syndrome.<sup>3</sup>

## RESEARCH QUESTION

How do pharmacist-driven recommendations related to hidden fluids differ in critically ill adults with and without COVID-19?

## METHODS

- **Design:** IRB-approved, single-center, retrospective cohort study
- **Setting:** 450-bed community teaching hospital
- **Inclusion Criteria:**
  - Adult patients (≥ 18 years old) admitted to the medical ICU (June 2016 – June 2019) and COVID-ICU (May 2020 – September 2020)
- **Exclusion Criteria:**
  - Patients not followed by academic rounding team
  - Patients without documented recommendations in TheraDoc®
- All pharmacy recommendations were assessed for relevance to fluid stewardship and hidden fluids based on pre-specified criteria
- **Statistical Analysis:**
  - Conducted in SPSS with an alpha of 0.05
  - Chi-squared test and t-test were used for group comparisons

## OUTCOMES

### Primary

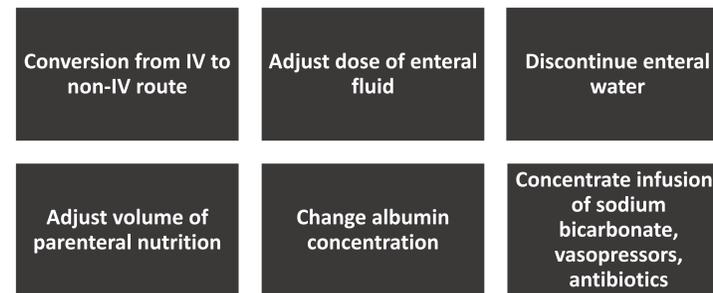
- Percentage of pharmacy recommendations related to hidden fluids

### Secondary

- Classification of hidden fluids recommendations based on definitions established by investigators *a priori*
- Average number of pharmacy recommendations per patient and per patient day
- Average number of fluid stewardship recommendations per patient and per patient day
- Average number of hidden fluids recommendations per patient and per patient day

## OUTCOMES CONTINUED

Figure 1. Hidden Fluids Stewardship Recommendations



## RESULTS

Table 1: Number of Patients and Patient Days – n

	With COVID-19	Without COVID-19
Total Patients	79	350
Total Patient Days	420	895

Table 2: Total Recommendation Types – n

	With COVID-19	Without COVID-19	P-value
<b>Pharmacy</b>	1338	2597	
Per Patient	16.937	7.420	
Per Patient Day	3.189	2.902	0.024
<b>Fluid Stewardship</b>	177	498	
Per Patient	2.241	1.423	
Per Patient Day	0.421	0.556	0.003
<b>Hidden Fluids</b>	85	182	
Per Patient	1.076	0.520	
Per Patient Day	0.202	0.203	0.972

Table 3. Hidden Fluids Recommendations – n (%)

	With COVID-19	Without COVID-19	P-value
Conversion from IV to non-IV route	59 (69.4)	148 (81.3)	0.268
Adjust dose of enteral fluid	16 (18.8)	23 (12.6)	0.217
Discontinue enteral water	6 (7.1)	8 (4.4)	0.378
Adjust volume of parenteral nutrition	2 (2.3)	1 (0.5)	0.197
Change albumin concentration	1 (1.2)	0 (0.0)	0.144
Concentrate infusions of sodium bicarbonate, vasopressors, antibiotics	1 (1.2)	2 (1.1)	0.959

## DISCUSSION

- There were significantly more pharmacy recommendations per patient day, but fewer fluid stewardship recommendations per patient day in those with COVID-19 compared to those without COVID-19.
- Many COVID-19 patients were on very high settings of non-invasive positive pressure ventilation and were unable to tolerate removal of the mask for administration of oral medications and enteral fluid.
- Some COVID-19 therapies were only available through IV administration, with no oral alternative.

### Limitations

- Single-center, retrospective design
- Possible inaccurate classification of recommendations by reviewers

### Future Direction

- Examine the relationship between hidden fluids-related recommendations and patient outcomes
- Assess acceptance rate of pharmacy-specific recommendations

## CONCLUSIONS

- Pharmacist-driven recommendations related to hidden fluids were similar in critically ill adults with and without COVID-19 and accounted for nearly 40-50% of fluid stewardship recommendations.
- Clinical pharmacists in the community teaching hospital setting play a role in minimizing the volumes of these oftentimes unrecognized hidden fluids.

## REFERENCES

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## DISCLOSURES

The authors declare no potential conflicts of interest.