



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).¹
- Improper administration of IVFs can lead to fluid overload, which is associated with organ dysfunction and increased mortality.¹
- 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.^{1,2}
- 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.³

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

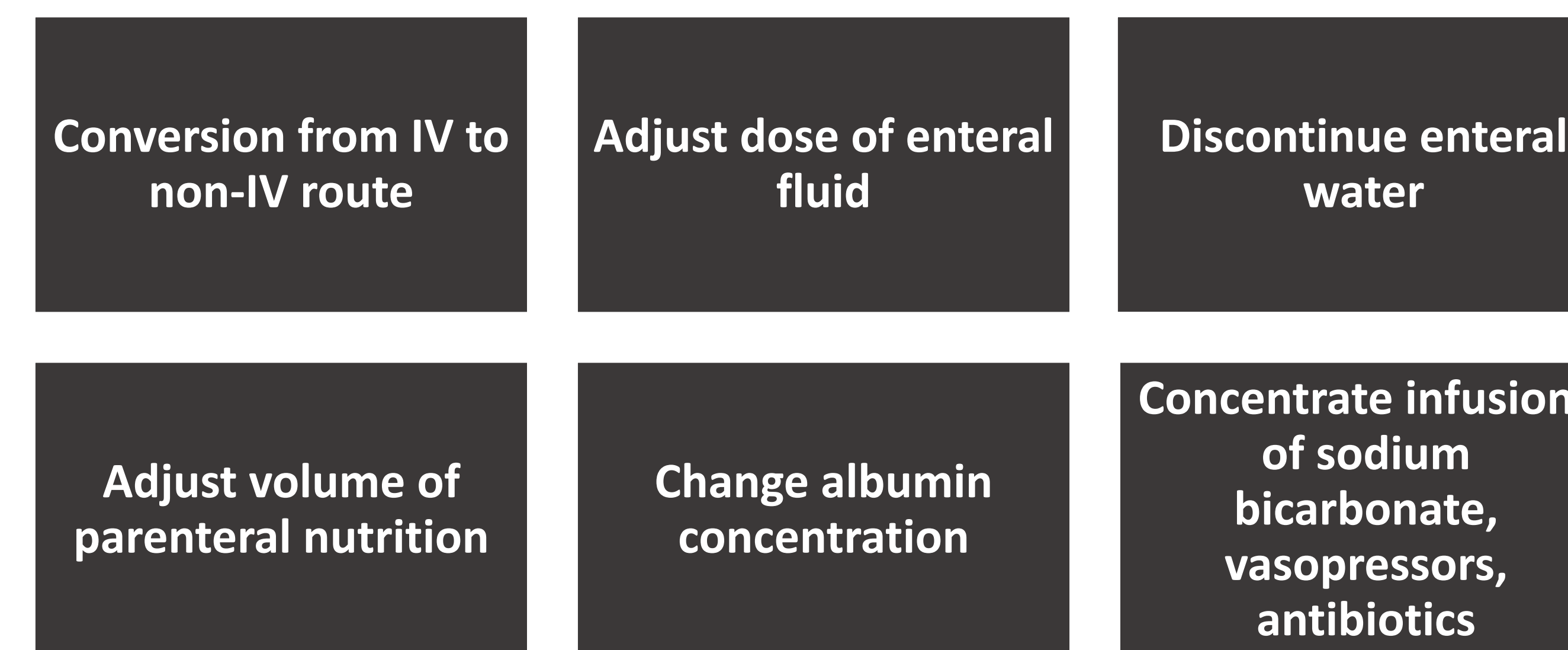
- Percentage of pharmacy recommendations related to hidden fluids

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
Pharmacy	1338	2597	
Per Patient	16.937	7.420	
Per Patient Day	3.189	2.902	0.024
Fluid Stewardship	177	498	
Per Patient	2.241	1.423	
Per Patient Day	0.421	0.556	0.003
Hidden Fluids	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.