# Fluid Stewardship: Identifying Hidden Fluids as a Target for Fluid Minimization

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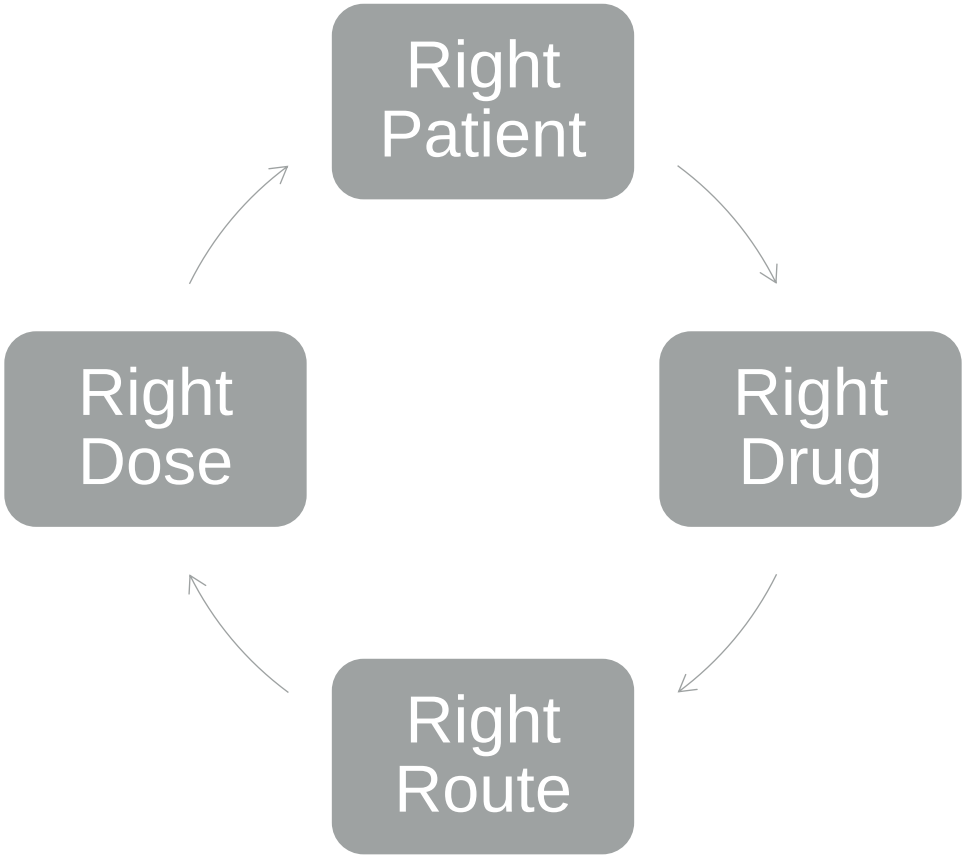
# Fluid Management

- >30% of ICU patients require fluid resuscitation.
- IVF are most commonly administered drugs in critically ill adults
- Inappropriate use of fluids occurs in up to 20% of patients receiving IVF therapy
- Fluid therapy is a mainstay of management during critical illness but robust trials on safety and efficacy are severely lacking



*Finfer S, Liu B, Taylor C, et al. Crit Care 2010;5:R185.*
*Glassford NJ, Bellomo R. The Korean Journal of Critical Care Medicine 2016;4:276-99.*
*Hoste EA, Maitland K, Brudney CS, et al. British journal of anaesthesia 2014;5:740-7.*

# Fluid Stewardship: The Four Rights



The purpose of this multi-center, retrospective study was to characterize the contribution of hidden fluids to the total fluid intake (TFI) with the intent to identify opportunities for fluid stewardship

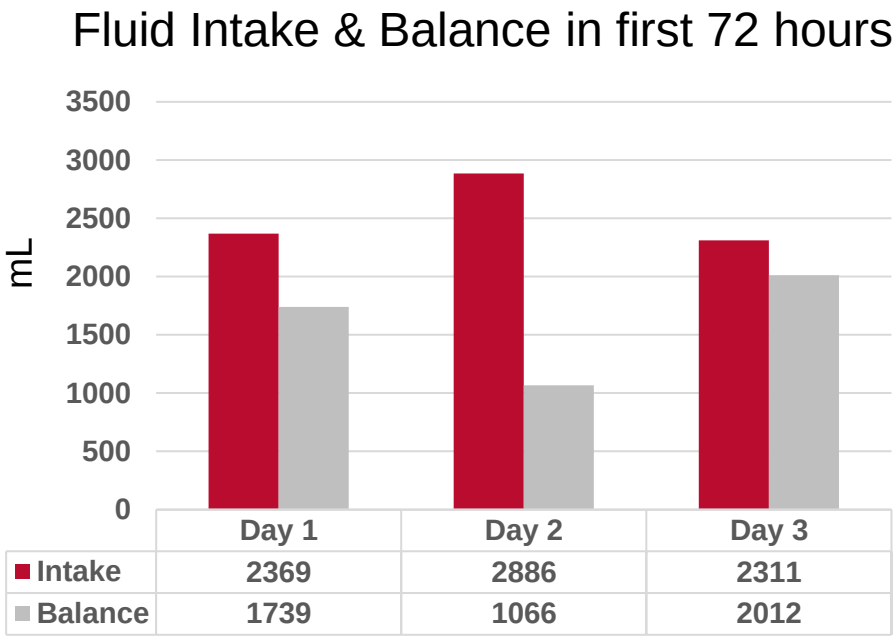
Hidden fluids: continuous and intermittent IV medications, line flushes, blood products, and enteral nutrition

# Study Design

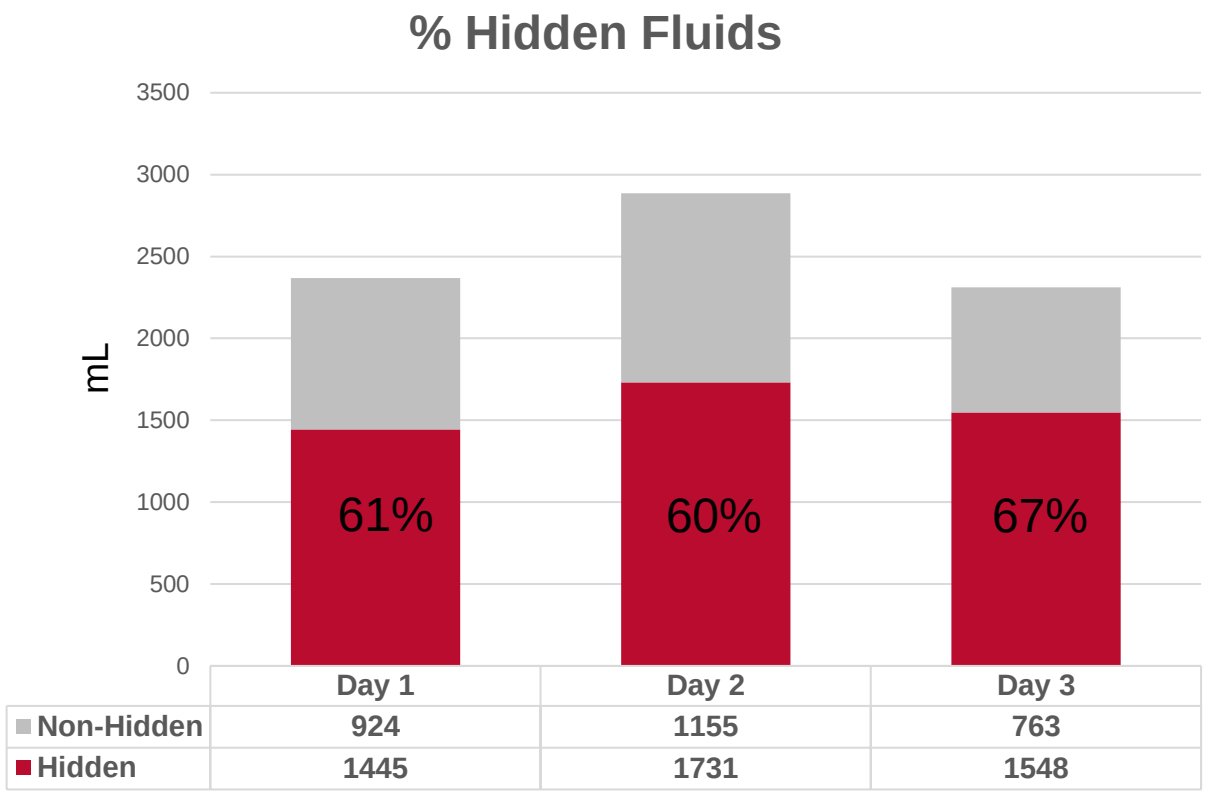
| | |
|---|---|
| Design | • Multi-center, retrospective cohort study<br>• Augusta University Medical Center (75), Piedmont Athens Regional Medical Center (75), Phoebe-Putney Memorial Hospital (69) |
| Patient Population | • Inclusion≥ 18 years old and admitted to MICU or SICU for at least 72 hours between 2013-2018<br>• Exclusion: diabetes insipidus, diabetic ketoacidosis, pregnant, were receiving TPN, or were transferred from an outside hospital |
| Data Collection | • Primary outcome: percentage of TFI comprised of hidden fluids at days 1 and 3 of ICU stay.<br>• Secondary outcomes included the association of hidden fluids with fluid overload, length of stay, and mortality. |

# Demographic Data

| | n=219 |
|---|---|
| Age | 62 ± 14 |
| Male Gender | 111 (51%) |
| Race | |
| Caucasian | 88 (40%) |
| AA | 55 (25%) |
| Other/Unknown | 76 (35%) |
| Weight | 85 ± 29 |
| Past Medical History | |
| Chronic lung disease | 65 (30%) |
| Chronic heart disease | 72 (33%) |
| EF <40% | 16 (7%) |
| Afib | 24 (11%) |
| Chronic liver disease | 13 (6%) |
| Chronic kidney disease | 37 (17%) |
| Cancer | 29 (13%) |
| SOFA | 6 ± 3 |



# Fluid Sources




| | Day 1 | Day 2 | Day 3 |
|---|---|---|---|
| Non-Hidden | 924 | 1155 | 763 |
| Hidden | 1445 | 1731 | 1548 |

# Outcomes

- Hospital length of stay was negatively correlated with %Hidden Fluids on Day 1 ($r_s$ = -0.33, $p < 0.001$)
- Hospital length of stay was negatively correlated with %Hidden Fluids for Cumulative Day 1-3 ($r_s$ = -0.173, $p < 0.010$)

| | No Fluid Overload | Fluid Overload | p-value |
|---|---|---|---|
| Total Fluid Intake | 6,711 ± 7,041 | 12,556 ± 4,501 | $p < 0.001$ |
| % Hidden Fluids (cumulative) | 60 ± 28% | 46 ± 23% | $p < 0.001$ |

# Future Directions

- Evaluation of medications with highest fluid burden
- Evaluation of fluid sources as predictors of patient outcomes
- Impact of fluid minimization protocols on patient outcomes

# Study Team

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