Association of fluid balance with the medication regimen complexity score in intensive care units

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BACKGROUND

Mortality

Disposition

Fluid overload is associated with negative patient outcomes

Duration of mechanical ventilation

Increased length of stay

The medication regimen complexity score for the intensive care unit (MRC-ICU) is shown to correlate with:

- Pharmacist interventions
- Drug-drug interactions
- Hospital length of stay
- Mortality

PURPOSE

The purpose of this study was to evaluate the relationship between the MRC-ICU and fluid balance. A positive correlation is expected.

STUDY DESIGN

- IRB-approved, retrospective analysis of electronic medical records for patients admitted to medical and surgical ICUs at a 350-bed community teaching hospital
- Inclusion criteria: admission to ICU between December 2016 and March 2018 for at least 24 hours, 18 years of age and older
- Exclusion criteria: ICU stay less than 24 hours
- Evaluation of relationship using Pearson's correlation and linear regression analysis
- MRC-ICU scoring:

Analyze medications → Review use of medical devices → Assign point values and total score

RESULTS

Table 1: Patient Characteristics

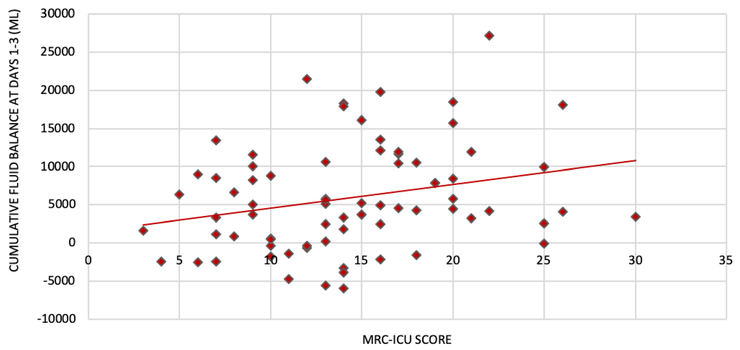
Variable	ICU (N = 75)
ICU Type	
Medical	65 (87%)
Surgical	10 (13%)
Age (years)	64 (54 – 72)
Male Gender	41 (55%)
Caucasian	41 (63%)
MRC-ICU Score at 24 hours	14 (10 – 18)
Height (cm)	169 (162 – 178)
Weight (kg)	77 (63 – 92)
BMI	27 (22 – 33)
SOFA Score	6 (4 – 8)
Fluid Balance, Day 1 (mL)	+1513 (+329 - +3134)
Cumulative Fluid Balance, Day 1-3 (mL)	+4188 (+1902 - +7090)
Fluid Overload	25 (33%)
Ventilator-Free Days	21 (5 – 24)
Mortality	11 (15%)
ICU Length of Stay	6 (5 – 11)
Hospital Length of Stay	13 (8 – 18)

Data reported as median (interquartile range [IQR]) or number (percent).

Table 2: Factors Associated with Cumulative Fluid Balance at Days 1-3

Variable	Beta Coefficient	95% Confidence Interval	p-value
MRC-ICU Score	167	8.83 – 325	0.039
Female Gender	338	-1489 – 2164	0.713
Age	5.95	-56.1 – 68.1	0.849
SOFA Score	262	14.9 – 509	0.038
Weight	-13.1	-46.4 – 20.1	0.434

FIGURE 1: FLUID BALANCE AND MRC-ICU CORRELATION



MRC-ICU Scoring Tool

Parameter	Point Value
High Priority Medications	
Aminoglycosides (amikacin, gentamicin, tobramycin)	3x
Amphotericin B and liposomal amphotericin B	1
Antiarrhythmics (amiodarone, dofetilide, sotalol)	1x
Anticoagulants (NOACs/DOACs, fondaparinux)	1x
Anticonvulsants (carbamazepine, phenobarbital, phenytoin, valproic acid)	3x
Argatroban	2
Azole antifungals (posaconazole, voriconazole)	2x
Blood products (factor products, antithrombin III)	2x
Chemotherapy (active inpatient)	3x
Clozapine	3
Digoxin	3
Ganciclovir/valganciclovir	1x
Hyperosmolar fluids (hypertonic saline [1.5%, 3%, 23.4%], mannitol)	1x
Immunosuppressants (cyclosporine, sirolimus, tacrolimus)	3x
Lidocaine (continuous infusion)	2
Lithium	3
Prostacyclins (epoprostenol, iloprost, treprostinil)	2x
Theophylline	3
Therapeutic heparins (enoxaparin, heparin infusion)	2x
Vancomycin (IV)	3
Warfarin	3
ICU Medications	
Neuromuscular Blockade	2
Continuous infusions (exclude those listed elsewhere)	1x
Total Parenteral Nutrition	
Managed by non-pharmacist service	1
Managed by clinical specialist pharmacist	3
ICU Prophylaxis and FAST HUGS BID	
Thromboembolic prophylaxis (exclude heparin infusion, therapeutic enoxaparin)	1
Stress ulcer prophylaxis (exclude pantoprazole infusion)	1
Glycemic control (subcutaneous insulin; exclude IV insulin)	1
Bowel regimen	1
Chlorhexidine	1
Analgesia and Sedation	
Opioids and sedatives (scheduled and PRN)	1x
Continuous infusion opioids and sedatives (propofol, fentanyl, dexmedetomidine, ketamine, benzodiazepines)	2x
Antimicrobial Agents	
Antimicrobials (include HIV medications, exclude those listed elsewhere)	1x
Restricted antimicrobials	2x
Devices	
Dialysis	2
Extracorporeal membrane oxygenation (ECMO)	2
Intra-aortic balloon pump (IABP)	1
Left ventricular assist device (LVAD)	1
Mechanical ventilation	2

Each medication or class is associated with a numeric score. If a multiplier is listed, every medication that meets the criteria will be multiplied by that multiplier. The MRC-ICU is the sum of all the points.

CONCLUSIONS

There was a positive, yet weak correlation observed between the MRC-ICU score and cumulative fluid balance over the first three days.

- Combining data from multiple study sites is needed to evaluate the strength of this correlation and the potential use of the MRC-ICU for identifying patients at risk of fluid overload
- Future directions:
  - ❖ A strong correlation will promote early fluid de-resuscitation thus improving patient outcomes
  - ❖ MRC-ICU score will aid in appropriate use of pharmacy resources, including pharmacist-to-patient ratios

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DISCLOSURES

The authors of this presentation have nothing to disclose.