Baxter

Equilibria

FLUID OPTIMIZATION

Increased use of chloride-restrictive intravenous (IV) fluids can help provide clinical and economic benefits for your healthcare system

What is acute kidney injury (AKI)?

Classified in three stages, AKI is an abrupt (within 48 hours) reduction in kidney function based on an elevation in serum creatinine level, a reduction in urine output, the need for dialysis, or a combination of these factors.[1] Its causes can be pre-renal (e.g. a decrease in renal perfusion due to excessive vomiting), intrinsic (e.g. acute tubular necrosis due to ischaemia) or post-renal (e.g. obstruction of urinary flow due to prostatic hypertrophy).[1]

Clinical and economic burden of AKI

Estimated to occur in up to 15% of hospital inpatients, the incidence of AKI has continually increased over the last 20 years.[2,3] In a meta-analysis incorporating 13 cohort studies, AKI was concluded to be an independent risk factor for developing chronic kidney disease (CKD), progressive CKD and end-stage renal disease.[4] Observational studies have shown, in the intensive care unit setting, the mortality rate due to severe AKI requiring renal replacement therapy (RRT) can exceed 60%.[2] A study found that AKI was associated with a per-patient increase in hospitalisation costs of $7,933 (USD) and an increase in length of stay of 3.2 days compared with patients without AKI.[5]

Chloride-liberal vs chloride-restrictive IV fluids – a closer look

Chloride-restrictive fluids have been shown to positively impact clinical outcomes. Fluid restoration is required as part of AKI treatment, and the choice of IV fluid can have a significant impact on clinical outcomes.[6] A meta-analysis revealed potential benefits of chloride-restrictive fluids vs chloride-liberal fluids, including a significantly reduced risk of AKI and metabolic acidosis, volume of blood transfusion and time on mechanical ventilation.[7]

Reduced risk of AKI

Reduced risk of metabolic acidosis

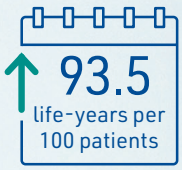
Reduced volume of blood transfusion

Reduced time on mechanical ventilation

Cost analysis of IV fluids

Compared with those on chloride-liberal fluids, i.e. 0.9% sodium chloride (saline), patients treated with chloride-restrictive fluids gained 93.5 life-years and 81.4 quality-adjusted life-years per 100 patients, and fewer patients received chronic dialysis, which costs $22,161.60 per 90 days of treatment.[6] One study of a simulated patient cohort receiving chloride-restrictive IV fluids used a predictive model and showed a 39% reduction in the development of AKI in the first 90 days compared with patients receiving chloride-liberal IV fluids.[6] Although chloride-restrictive fluids have higher acquisition costs (a 72-hour infusion of chloride-restrictive fluid costs an average of $59.28 compared with $38.23 for chloride-liberal fluids), results from the US Renal Data System indicate that improved renal outcomes translate into reduced short- and long-term costs.[6]

Fewer patients receiving chronic dialysis, which costs $22,161.60 per 90 days of treatment



Predicted life-years gained

Quality-adjusted life-years gained

$4,664
90-day direct cost savings[6]

$296,017
Long-term direct cost savings[6]

$298,576
Total savings over the cohort lifespan[6]

Higher acquisition costs of chloride-restrictive IV fluids are offset by over double the savings from avoiding adverse renal outcomes in the initial 90-day period[6]

AKI, acute kidney injury; CKD, chronic kidney disease; IV, intravenous; USD, United States Dollar.

References

1. Rahman M *et al. Am Fam Physician.* 2012;86(7):631–9. **2.** Makris K, Spanou L. *Clin Biochem Rev.* 2016;37(2):85–98. **3.** Siew ED, Davenport A. *Kidney Int.* 2015;87(1):46–61. **4.** Coca SG *et al. Kidney Int.* 2012;81(5):442–8. **5.** Silver SA *et al. J Hosp Med.* 2017;12(2):70–6. **6.** Perrault L *et al. JHEOR.* 2016;4(1):90–102. **7.** Krajewski ML *et al. Br J Surg.* 2015;102:24–36.

UKI/GNAK/20-0003a September 2020