

Medicinal Treatment versus Dialysis in End Stage Renal Disease Patients with Perioperative Hyperkalemia: A Scoping Review

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Purpose

Investigate whether the application of dialysis or medicinal management reduces the incidence of hyperkalemia adverse effects.

- Hyperkalemia may cause lethal cardiac dysrhythmias within a 24-hour perioperative window.

Assess the benefits of protocol for patients with End-Stage Renal Disease (ESRD) undergoing surgery to prevent hyperkalemia.

- Patients should be optimized before surgery, some even before the pre-operative period.
- Certain anesthetic drugs may increase serum potassium and need to be avoided
- Patients with ESRD are at a greater risk for perioperative complications related to electrolyte imbalances.
- Personalized plan with certain drug choices, dosages, and equipment to mitigate adverse outcomes.

Background

Kidney injury can lead to irreversible failure known as ESRD.

- Supporting copy can be placed right here.

Cardiac dysfunction is a predominate cause of death in ESRD (An, et al., 2022).

- When the kidneys do not excrete electrolyte load, abnormalities in plasma concentrations may lead to hyperkalemia.
- Hyperkalemia causes cardiac dysfunction that may lead to an increase in mortality.

Medicinal treatment of hyperkalemia.

- Use of intravenous calcium to raise myocyte action potential to prevent dysrhythmias.

Dialysis treatment of hyperkalemia.

- Use of dialysis to filter and remove potassium from the bloodstream to prevent dysrhythmias.

The goal is to investigate the use of medicinal treatments versus dialysis to prevent hyperkalemia and the adverse effects that occur with hyperkalemia in a patient with ESRD.

- Protocols must be researched and implemented to ensure patient safety for surgery with collaborative efforts within medical specialties to optimize patient outcomes by reducing the incidence of hyperkalemia pre- intra-, and post-operatively.

Methods

Eligibility Criteria & Information Sources

- Considered peer-reviewed scientific articles written in English from medical or nursing journals from 2009 to 2023.
- Included articles focus on human participants diagnosed with ESRD experiencing hyperkalemia either preoperatively or intraoperatively, with an evaluated treatment modality.
- Utilized MeSH terms to search EBSCO, CINAHL, PubMed, and Cochrane databases from September 2022 to October 2023.

Search & Selection of Sources

- Search phrases: ESRD, hyperkalemia, dialysis, medicinal treatment for hyperkalemia, dysrhythmias or arrhythmias, and perioperatively.
- MeSH terms: “end-stage renal disease,” “hyperkalemia,” and “perioperative”
- Focused on capturing relevant literature regarding the specific medical conditions and treatment modalities.
- Initial investigation yielded 25 articles that were analyzed using Rapid Critical Appraisal (RCA) tools to determine the study level of evidence.
- Final selection of ten articles included systematic reviews, meta-analyses, controlled trials without randomization, case-control or cohort studies, literature reviews, and expert opinions

Data Charting Process

- The ten included articles were organized based on the level of evidence and placed into a synthesis table.
- Outcomes were evaluated and categorized within the Outcome synthesis section of the table.
- Outcomes evaluated included hospital length of stay, presence of preoperative intervention, incidence of postoperative complications, and mortality rate.
- While not all outcomes listed were addressed in each article reviewed, each resource could compare treatment modalities for hyperkalemia involving dialysis and medicinal correction.

Results

	Article 1: Smith et al., 2015	Article 2: Yang et al., 2019	Article 3: Kanda et al., 2017	Article 4: Song et al., 2022	Article 5: An, X. et al. 2022	Article 6: Singh, T. et al. 2021	Article 7: Brienza, N. et al., 2009.	Article 8: Bianchi & Regolisti, 2019	Article 9: Arulkumaran, N. et. al., 2012.	Article 10: May et al., 2019
Outcome #1: MR	↑	NE	NE	↑	↓	↑	↓	—	↑	↑
Outcome #2: PIP	NE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Outcome #3: HLOS	↑	NE	NE	NE	↓	↑	NE	NE	↑	↑
Outcome #4: IPC	↑	↑	✓	↑	↓	NE	↓	NE	NE	↑

Symbol Key:

↑ = Increased, ↓ = Decreased, — = No Change, NE = Not Examined, NR = Not Reported, ✓ = Applicable or Present; MR= Mortality Rate. PIP= Preoperative Interventions Present. HLOS= Hospital Length of Stay.–IPC = Incidence of Postoperative Complication.

Outcomes Evaluated

- The most frequently evaluated outcomes were mortality rate (MR), preoperative intervention present (PIP), hospital length of stay (HLOS), and incidence of postoperative complications (IPC).

Implications for Practice

Research Gap

- Due to a lack of research on the comparison of dialysis verses the efficacy of pharmacological means of treating hyperkalemia in the prevention of cardiac dysrhythmias, a change in bedside practice cannot be recommended at this time.

Gold Standard Practice

- Preoperative dialysis remains the primary means of optimizing the end stage renal disease patient population for surgery and treating hyperkalemia to prevent lethal cardiac dysrhythmias.

Points to Consider/Discussion

- Dialysis machines are costly, and time is of the essence for emergent cases. Dialysis is not always a feasible option. Therefore, further research needs to be conducted to support alternative methods in the treatment of hyperkalemia prior to patients undergoing anesthesia.

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