

# Renal Failure, Chronic

## Risk

- Incidence in USA and worldwide: >100 cases of ESRD per million population.
- Between NHANES of 1988–1994 and that of 2003–2006, the prevalence of CKD in people 60 y and older jumped from 18.8% to 24.5%.
- Racial prevalence: African Americans, ~200 cases per million; Hispanics, ~100 per million; Caucasians, ~50 per million.

## Perioperative Risks

- Overall periop mortality of pts with ESRD: 4%.
- Overall periop morbidity of pts with ESRD: 50% (hyperkalemia, infections, hypotension/Htn, bleeding, dysrhythmias, clotted fistulas).
- In recent studies, adjusted HRs for death increased consistently as eGFR fell below 60.0mL/min per 1.73m<sup>2</sup> with a plateau and relative decrease in risk as eGFR fell below around 20mL/min per 1.73m<sup>2</sup>.

## Worry About

- Periop progression from CRI, not requiring dialysis, to dialysis-dependent ESRD.

- Hypovolemia and hypokalemia (especially if recently dialyzed)
- Hypervolemia, metabolic acidosis, and hyperkalemia (especially if not recently dialyzed)
- Autonomic dysfunction (excessive hypotensive responses)
- Exaggerated hypertensive responses to noxious stimuli
- Prolonged responses to renally excreted drugs and metabolites (e.g., vecuronium, pancuronium, narcotics)
- Impaired immune status
- Occult CAD

## Overview

- Decreased excretory and other functions of kidneys related to long-standing disease; with dialysis, disease can persist for many years.
- Associated with multiple complications of failed renal excretory function, including volume overload, accumulation of products of catabolism (e.g., K<sup>+</sup> and hydrogen ions), platelet dysfunction, and side effects of dialytic therapy, including hypovolemia.

- Associated with complications of concurrent diseases (e.g., DM, Htn) with increased mortality for MI in those with versus without CRF
- Volume status and electrolyte balance related to how recent dialysis has been.

## Etiology

- Htn (15% Hispanics; 20% Caucasians; 40% African Americans)
- DM (20% Caucasians; 30% African Americans; 37% Hispanics); represents 43.8% of all secondary cases
- Glomerulonephritis (12% African Americans; 22% Hispanics; 25% Caucasians)
- Other causes: Polycystic disease, collagen-vascular disease, pyelonephritis

## Usual Treatment

- CRI: Fluid restriction, protein restriction, diuretics, antihypertensives
- Peritoneal dialysis or hemodialysis; continuous venovenous hemofiltration or continuous venovenous hemodialysis while hospitalized
- Renal transplantation (can be combined with pancreatic transplantation in diabetics)

## Assessment Points

| System | Effect                                  | Assessment by Hx  | PE   | Test                          |
|--------|---|---|--|-------------------------------|
| CV     | CHF<br>LVH<br>Dysrhythmias              | Exercise intolerance<br>Htn<br>Palpitations                     | Crackles; S <sub>3</sub> , S <sub>4</sub><br>Pulse, auscultation       | CXR<br>ECG                    |
| GI     | N/V, anorexia<br>GI bleeding            | N/V, anorexia<br>Melena, rectal bleeding                        | Malnutrition   | Positive occult blood         |
| HEME   | Plt dysfunction<br>Anemia               | Easy bruising<br>Fatigability                                   | Ecchymoses<br>Pallor   | Bleeding time<br>Hgb          |
| RENAL  | Decreased concentrating ability (CRI)   | Nocturia, frequency   |  | Urinary osmolality<br>BUN, Cr |
| CNS    | Encephalopathy<br>Autonomic dysfunction | Decreased mental acuity, disorientation<br>Postural hypotension | Mental status<br>Tilt-table test: Reduced BP, increased HR when tilted |                               |
| PNS    | Peripheral neuropathy                   | Paresthesias, burning, itching of lower extremities             | Excoriations   |                               |

**Key References:** Kalamas AG, Niemann CU: Patients with chronic kidney disease, *Med Clin North Am* 97(6):1109–1122, 2013; Prowle JR, Kam EP, Ahmad T, et al: Preoperative renal dysfunction and mortality after non-cardiac surgery, *Br J Surg* 103(10):1316–1325, 2016.

## Perioperative Implications

### Preoperative Preparation

- Assess adequacy of dialytic therapy, volume and acid-base status, Hgb conc, CV status, and serum K<sup>+</sup>.
- If pt not dialysis-dependent, assess renal reserve and CV status.
- Consider issues of vascular access.

### Monitoring

- Temp, ECG (rhythm, rate, hyperkalemia).
- Pulse oximeter, capnometer, peripheral nerve stimulator.
- Consider arterial catheter if pt is chronically hypertensive; consider PA catheter for high-risk surgery in pts with cardiac dysfunction.

### Airway

- Gastroparesis precautions if pt is diabetic

### Preinduction/Induction

- Reduce dose of thiopental.
- Higher doses of propofol required to achieve same level of BIS.

- Exaggerated response to benzodiazepines.
- Consider avoiding renally excreted NMBs (vecuronium, pancuronium).
- Use narcotics cautiously.
- If pt is not dialysis-dependent, there are theoretical concerns about sevoflurane, although they do not appear to be clinically relevant.
- Exaggerated BP swings with induction and intubation.
- Reduce dose of local anesthetics if metabolic acidosis is present or if sedatives will cause resp acidosis.

### Maintenance

- Maintenance of an adequate renal perfusion pressure with fluids and inotropic agents may protect against acute kidney injury.
- Propofol infusions associated with faster eye opening.

### Extubation

- Ensure adequate reversal of NMBs.
- Evaluate airway reflexes.

### Adjuncts

- Avoid renally excreted NMBs.

- None of the pharmacologic interventions that have been used to prevent acute kidney injury have convincingly demonstrated a benefit during the periop period.

### Postoperative Period

- Use dialysis if necessary.
- Monitor for frequent causes of postop morbidity (see above).

## Anticipated Problems/Concerns

- Hyperkalemia: Treatment with CaCl<sub>2</sub>, insulin/glucose, or NaHCO<sub>3</sub> may be necessary; intraop dialysis is occasionally required.
- Balancing intraop volume requirements with need for postop fluid removal.
- Exaggerated drug effects.