Avoiding Kidney Injury: Obstetric Patients



Objectives

- Discuss incidence and impact of acute kidney injury & chronic kidney disease in obstetric patients
- Review the pathophysiology related to pregnancy and risk for developing AKI
- Summarize neuraxial and general anesthesia recommendations supported by the literature for obstetric patients with AKI or CKD





For more information....

- For a more in-depth overview of kidney disease, including staging and definitions, reference: <u>MPOG Avoiding Kidney Injury Overview, Pathophysiology, Definitions</u>
- For other specialty specific recommendations, reference the following sections of the toolkit:
 - Avoiding Kidney Injury Pediatrics
 - Avoiding Kidney Injury Cardiac
 - Avoiding Kidney Injury Recommendations for Adult Surgical Patients



Kidney Disease in Obstetric Patients

- Kidney disease is an independent risk factor for maternal and fetal morbidity and mortality¹
- Multiple renal physiologic changes in pregnancy
- AKI in pregnancy is rare, hard to define, and difficult to measure















CKD in Pregnancy

CKD in Obstetric Patients



CKD in Pregnancy

- Obstetric complications increase proportionally with the extent of the mother's preexisting renal disease and hypertension¹⁰
- Women with CKD at increased risk for preeclampsia and preterm delivery¹¹
- There is a 4.7x greater risk of progression to ESRD for patients with CKD that develop preeclampsia¹²

| | MULTICENTER PERIOPERATIVE OUTCOMES GROUP |
|---|---|
| Severe renal insufficiency (Cr >2.5mg/dL) | 70% experience preterm delivery, 40% experience loss of renal function during pregnancy or postpartum leading to dialysis |
| Moderate renal insufficiency (1.4-2.5mg/dL) | 20-30% increased risk of preeclampsia and preterm delivery |
| Mild elevated creatinine (1.2-1.4mg/dL) | Small risk for decline in renal function |
| Maternal Renal Function | Associated Risks ^{11, 13, 14, 15, 16, 17} |

Perioperative Management of Obstetric patients with CKD

Periop Eval

• Include assessment of changes to renal function and related systems¹⁸

Consults

• Consult nephrology team to assist early in pregnancy¹⁹

Anesthetic Management

- Dependent on severity of CKD ¹⁸
- Typically euvolemic patients with stable mild to moderate renal insufficiency and well controlled HTN do well with minimal special interventions ¹¹
- Dialysis dependent patients present greater anesthetic challenge ¹¹

Nephrotoxic Drugs

• Avoid nephrotoxic drugs in patients with residual kidney function¹¹



Neuraxial Anesthesia Considerations for Obstetric patients with CKD

- Determine fluid status before anesthesia¹¹
 - If euvolemic, treat hypotension with a vasopressor instead of fluids to reduce risk of fluid overload
- Assess coagulation status
 - At risk for abnormal bleeding¹¹
 - May have residual heparin from HD catheter that precludes regional anesthesia ¹¹
- Documentation of pre-existing neuropathy prior to neuraxial anesthesia ¹⁸
- Insufficient evidence to recommend spinal vs epidural¹⁸



Intraop Management of Obstetric patients with CKD

- Non invasive BP monitoring appropriate for early CKD with well controlled HTN ¹¹
- Pad and protect HD fistula, no blood pressures on that arm¹⁸
- Check serum K before OR, succinylcholine will cause a 0.5-0.7 mEq/L increase ¹⁸
- Magnesium sulfate prolongs NMB¹¹
- Morphine and meperidine can cause accumulation of toxic metabolites in renal failure 11,20
- Fentanyl, sufentanil, remifentanil are considered safe to use in renal failure ^{18,21}
- Neuraxial opioids are a good choice for postop pain relief if not contraindicated ^{18,22}
- NSAIDs may worsen renal function ^{11,23}



AKI in Pregnancy



AKI In Pregnancy

- Causes of AKI
 - In developing countries, septic abortions are the most prevalent cause of pregnancy related AKI^{24,25}
 - In developed countries, the most common causes are severe preeclampsia-eclampsia, acute pyelonephritis of pregnancy, and bilateral renal cortical necrosis^{26,27}
- The majority of women who experience AKI in pregnancy have comorbid conditions or pregnancies complicated by kidney disease, hypertension, diabetes, preeclampsia, HELLP syndrome, hemorrhage or infections²⁸





Pregnancy Specific Causes of AKI ^{29,2}

Early Causes (<20 weeks)

Late Causes (>20 weeks)

| Pre-Renal | Hemorrhage (abortion, ectopic pregnancy) Sepsis/Septic Shock (abortion, retained products of conception, pyelonephritis, etc) Hypovolemia (d/t hyperemesis gravidarum) | Hemorrhage (antepartum: placenta previa, placental abruption, placenta accreta) (postpartum: atony, trauma, uterine rupture) Sepsis (pyelonephritis, chorioamnionitis, puerperal sepsis) |
|------------|---|---|
| Intrinsic | Acute tubular necrosis (d/t septic abortion) | Preeclampsia HELLP Syndrome (most common cause of AKI in pregnancy) Acute fatty liver disease of pregnancy Thrombotic thrombocytopenic purpura (TTP) Atypical hemolytic uremic syndrome (aHUS) |
| Post-Renal | n/a | Uteropelvic obstruction (gravid uterus, masses, renal stone, normally seen with a pelvic pathology) Surgical (ureter damage, post surgical obstruction) Neoplasm |



AKI in Pregnancy

- Non-pregnant AKI definitions (ie KDIGO) not appropriate during pregnancy
- No consensus definition of AKI in pregnancy, making it difficult to establish incidence rate²
- Acute renal failure was found in 4.52 per 10,000 US births from 2008-2009³⁰

| | Non- pregnant adult | First Trimester | Second Trimester | Third Trimester | 31 |
|--|------------------------|--------------------|---------------------|--------------------|----|
| Normal Ref Range Creatinine (mg/dL) | .0509 | 0.4-0.7 | 0.4-0.8 | 0.4-0.9 | |





AKI in Pregnancy

Increased renal function may mask early AKI symptoms²

Lab values considered normal in non-pregnant women may indicate worsening renal function in pregnant patients²⁹

Increasing proteinuria in pregnant patients with CKD may be normal in the progression of pregnancy and not indicative of worsening function

Difficult to establish baseline GFR in pregnancy without 24h collection²

Oliguria in preeclampsia is part of disease pathology in response to intravascular depletion and may not indicate worsening renal fn²⁹



Management of AKI in Pregnancy

- Management of AKI in pregnancy should focus on management of the cause of AKI and consider multiple causes²
- Should also consider non-pregnancy related causes of AKI²⁹
- Renal biopsy rarely indicated, usually delayed until after delivery²⁹
- Should use multidisciplinary approach
- Renal therapy²:
 - Low dose dopamine Not recommended
 - Furosemide Not recommended
 - Fenoldopam Needs further research
 - N-acytylcysteine Needs further research
 - Albumin Needs further research



Clinical Assessment of Pregnant Women with Raised Creatinine²⁹





AKI in Pregnancy Management

- Consider transfer to specialty center if not responding to initial conservative measures²⁹
- Review medications and discontinue nephrotoxic drugs if possible²⁹
 - Renally cleared medications may need adjustment
 - A single loading dose of magnesium sulfate for preeclampsia considered safe even in renal failure
- Should optimize status before delivery¹⁸
 - If BUN >80 mg/dL or K >5.5mEq/L, dialysis should be performed before elective vaginal or c-section delivery
- Neuraxial anesthesia is preferred to general anesthesia¹⁸
- Considerations for general anesthesia in the setting of AKI similar to that for CKD



Obstetric Kidney Disease Summary

- Kidney disease in pregnancy increases risk of adverse outcomes to both the mother and the fetus
- Perioperative management of obstetric patients with CKD should consider CKD staging and related physiologic changes
- Intraop management of CKD should consider individual need for CVP monitoring dependent on fluid status, adjustments of anesthetic medications as appropriate, and protection of HD fistula if present
- Multiple renal physiologic changes in pregnancy make AKI in pregnancy hard to define and difficult to measure. Lab values considered normal in non-pregnant women may be indicative of AKI in pregnancy
- Obstetric AKI management should be individualized to consider the cause of the AKI
- Considerations should be made to discontinue nephrotoxic drugs as appropriate and monitor bleeding risk related to neuraxial anesthesia



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