

**Project:** Ghana Emergency Medicine Collaborative

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# Acute Renal Failure

Acute Renal Failure or Acute Kidney Injury is a rapid loss of kidney function.

## Classifications/Causes

### Prerenal

ARF secondary to hypoperfusion of the kidneys.

- **Excessive Fluid Loss:** Dehydration, Hemorrhage, Severe Burns, Polyuria, Persistent Vomiting/ Diarrhea/Diaphoresis
- **Decreased Cardiac Output:** Myocardial Infarction, CHF, Shock States (hypovolemic, cardiogenic, obstructive).

### Intrinsic

ARF secondary to damage to renal parenchymal.

- **Acute Tubular Necrosis**
- **Nephritis:** Glomerulonephritis, Interstitial Nephritis, Pyelonephritis, Lupus Nephritis
- **Rhabdomyolysis**
- **Drug Related Nephrotoxicity**

### Postrenal

ARF secondary to an obstruction of the outflow of urine.

- Renal Stones, Blood Clots, Tumors, Prostatic Hypertrophy, Urethral Strictures

# Acute Renal Failure

## Nursing Assessment

Neurological: Confusion, Lethargy (secondary to build up nitrogenous waste products).

Cardiovascular: ARF (with signs of fluid volume depletion) Tachycardia, Hypotension, Orthostatic  
Vital Signs.

ARF (with signs of fluid volume fluid volume overload) Jugular vein distention, S3 Heart Sound,  
Hypertension.

Pulmonary: Crackling/Rales with auscultation also known as "wet" sounding lungs (fluid overload).

Genitourinary: Urine may appear dark, concentrated, odorous (often seen with infectious processes), Oliguria (<300-500cc of UOP daily or <0.5cc/kg/hr), Anuria (<50cc of UOP daily), Polyuria (>2,500cc – 3,000cc of UOP daily, may be secondary to DKA, diuretics, diabetes insipidus)

Integumentary Effects: Decreased skin turgor (if hypovolemia is present), pitting edema (if hypervolemia is present), Skin may have a pale or even a yellow hue secondary to uremic toxins accumulating on the skin surface (duller than jaundice and does not effect the sclera).

# Acute Renal Failure

## Laboratory Tests

Basic Electrolyte Panel: Abnormal concentration of extracellular electrolytes. *Sodium and Chloride* may show an increase (concentrated) or decrease (diluted or flushed from serum). *Blood Urea Nitrogen* (by product of and protein metabolism) and *Creatinine* (by product of muscle breakdown) are increased. BUN increases proportionally quicker than Cr with ARF. Ratios of greater than 20:1 may differentiate an acute incident verse a chronic condition. Renal Failure may cause increases in serum *Potassium* level secondary to impaired excretion. *Bicarbonate* is largely regulated and produced by the kidneys. ARF may cause a decrease in production and conservation. Phosphate may increase in the serum because the kidneys are unable to remove it. Because of *Calcium's* inverse relationship to phosphate a decrease in calcium is often seen.

Complete Blood Count: Changes with *Hemoglobin* and *Hematocrit*. May be concentrated (elevated with dehydration) or could be decreased secondary to a decrease in the kidney's ability to produce erythropoietin.

Urinalysis: If ARF is secondary to dehydration expect concentrated urine with an increase in *Specific Gravity*. If a genitourinary infection part of the ARF expect to see *White Blood Cells, Leukocytes Esterase, Nitrates, and Bacteria*. *Hematuria* is usually present with renal stones and *Myoglobin* is present with rhabdomyolysis.

Arterial and Venous Blood Gases: May show *Metabolic Acidosis* secondary to the kidney's ability to produce *Bicarbonate*.

# Acute Renal Failure

## Nursing Evaluation/Monitoring/Interventions

Assist with discovering the etiology of the acute renal failure. Is it prerenal, intrinsic, or postrenal?

Obtain serum and urine samples for laboratory testing.

Establish large bore intravenous access and prepare for fluid resuscitation (when dehydration is present).

Avoid or administer with caution drugs that are toxic to the kidneys; NSAIDs, ACE Inhibitors, Aminoglycoside Antibiotics, Radiocontrast Dye.

Monitor electrolyte abnormalities and prepare for appropriate corrections (especially hyperkalemia).

Treat hyperkalemia with urgency. Prepare to perform an electrocardiogram (watch for peaked t-waves, widened QRS complexes, and elongated P-R intervals), and prepare to administer any or all of the following medications; calcium gluconate IVPB, regular insulin IVP (along side dextrose to prevent hypoglycemia) sodium polystyrene sulfonate orally, sodium bicarbonate IVP, and nebulized beta two agonists (albuterol).

Closely monitor the patient's intake and output (Foley catheter maybe necessary to maintain accurate records).

# Urinary Tract Infection

Infectious process located in the urinary tract.

## **Causes/Classifications**

### Poor Hygiene

Sexual Activity: Not voiding after sexual activity increases risk of UTI (especially in females).

Urinary Catheterization: Indwelling catheterization poses a greater risk than straight catheterization.

Stagnant Urine: Secondary to renal stones or enlarged prostate.

Incomplete Bladder Emptying: Often seen with patients having spinal cord injuries.

# Urinary Tract Infection

## **Nursing Assessment**

Genitourinary: Dysuria (difficult and painful urination) Frequent Urination, Nocturia (interrupting sleep in order to urinate), Urinary Hesitancy (uneasy or incomplete urination), Dark/Concentrated/Cloudy/Odoriferous Urine Appearance

General: Lower Abdominal Pain, Flank Pain (if related renal stone), Fever/  
Chills, Malaise



# Urinary Tract Infection

## **Nursing Evaluation/Monitoring/Interventions**

Collect and Interpret Urinalysis: If UTI is present a Urinalysis may show the following;

- Bacteria
- White Blood Cells
- Red Blood Cells
- Leukocyte Esterase (an enzyme released by white blood cells)
  - Nitrates (by product of certain bacterial metabolism)

Prepare for antibiotics: Intravenous or Oral

Elderly Consideration: Change in mental status is common when UTI are present in elderly populations.

# Pyelonephritis

Pyelonephritis is an infection of the renal pelvis.

## **Causes/Classifications**

Ascending Urinary Tract Infection: Infection which has began in the urinary tract which has ascended to the renal pelvis.

# Pyelonephritis

## Nursing Assessment

**NOTE:** Pyelonephritis, often can be thought of as an advanced UTI. Signs and symptoms are very similar but tend to be more pronounced once the infection has advanced to the renal parenchymal.

Genitourinary: Dysuria (difficult and painful urination) Frequent Urination, Nocturia (interrupting sleep in order to urinate), Urinary Hesitancy (uneasy or incomplete urination), Dark/Concentrated/Cloudy/Odororous Urine Appearance

Gastrointestinal: Nausea, Vomiting

Costovertebral Angle Tenderness: Tenderness to the area on either side of the vertebral column between the last rib and the lumbar vertebrae.

General: Pain (lower abdomen and affected side's flank), Fever and Chills.

# Pyelonephritis

## **Nursing Evaluation/Monitoring/Interventions**

Similar to the Nurse's Role in Urinary Tract Infections

Collect and Interpret Urinalysis: If UTI is present a Urinalysis may show the following;

Bacteria, White Blood Cells, Red Blood Cells, Leukocyte Esterase (an enzyme released by white blood cells), Nitrates (by product of certain bacterial metabolism)

Recognize the severity of pyelonephritis in debilitated, chronically ill patients and those receiving immunosuppressive therapy. Monitor for signs of sepsis.

# Urinary Calculi

Urinary Calculi - A mineral deposit located in the urinary tract.

## Causes/Classifications

Supersaturation of the Urine: The urine solution contains more solutes than can be dissolved and excreted. This may lead to the formation of crystalline structures (usually composed of calcium or uric acid).

Deficiency of Chelating Agents: The urine solution contains chemical agents that prevent the formation of crystalline structures. If there is a deficiency of these agents the chance of calculi formation increases.

Contributing Factors: Dietary (excessive intake of refined sugars, animal proteins, sodium, cola drinks), Persistent Dehydration, Calcium and Vitamin C Supplements, Hyperparathyroidism, Crohn's Disease, DM, Excessive Alcohol Consumption

Nephrolithiasis: Calculi formation lodged in the kidney.

Ureterolithiasis: Calculi formation lodged in the ureter.

Cystolithiasis: Calculi formation lodged in the bladder.

# Urinary Calculi

## **Nursing Assessment**

Renal Colic: Intermittent and often excruciating pain that begins on the affected side's flank and radiates to the groin, genital area and/or inner thigh.

Genitourinary: Urinary urgency, hematuria

Gastrointestinal: Nausea and Vomiting

General: Restlessness, Fever/Chills and Malaise (with an accompanied infection)

# Urinary Calculi

## **Nursing Evaluation/Monitoring/Interventions**

Obtain urinalysis and monitor for blood and infection.

Establish IV access if needed for hydration, antibiotics, and pain control.

Prepare for CT and US.

Obtain serum sample to monitor electrolytes and renal function.

# Testicular Torsion

Testicular Torsion: Ischemia of the testicles and surrounding structures within the scrotum secondary to twisting of the spermatic cord.

## **Causes/Risk Factors**

Bell Clapper Deformity: A condition where the testis and epididymis fail to anchor to the tunica vaginalis. The deformity predisposes the testis to swing and rotate within the scrotum, increasing risk of torsion.

### Other Risk Factors or Possible Causes:

Most common ages 12-16

Cold Temperatures

Physical Activities

Trauma to Scrotum



# Testicular Torsion

## Nursing Assessment

- Sudden and severe pain/tenderness in the scrotum. Usually of duration less than six hours.
  - Swelling within the Scrotum
    - There is often an absent or decreased cremasteric reflex (the cremasteric reflex is elicited by lightly stroking the inner part of the thigh just above the the scrotum. If the reflex is intact the cremaster muscle pulls the testis on the side stroked up).
      - Abdominal Pain
      - Nausea and Vomiting

# Testicular Torsion

## **Nursing Evaluation/Monitoring/Interventions**

Recognize the severity of testicular torsion and if there is high suspicion (a correlating clinical exam and/or risk factors) advocate and prepare (obtain IV access and preoperative serum samples) for immediate surgical exploration.

When there is lower suspicion for torsion a Doppler ultrasound scan of the scrotum should be performed and a urine sample for urinalysis should be gathered to rule out a urinary tract infection or epididymitis (other less emergent genitourinary disorders).

# Epididymitis

Epididymitis: Inflammation of the epididymis (a coiled structure, posterior to the testicle where sperm is stored and matures)

## **Causes/Risk Factors**

### Infectious Epididymitis

Sexually Transmitted Infections (particularly gonorrhea and chlamydia).

Urinary Tract Infections (bacteria in the urethra travels through the urinary and reproductive structures to the epididymis).

### Non-Infectious Epididymitis

Sterile urine back-flows from the urethra to the epididymis (may be secondary to heavy lifting, straining, sexual intercourse with a full bladder, prostatitis).

Amiodarone (antiarrhythmic drug) has been associated with inflammation of the epididymitis.

# Epididymitis

## **Nursing Assessment**

Testicular pain/tenderness which has a gradual onset and may be worse while bearing down.

Discharge and/or blood while urinating or ejaculating.

Pain and discomfort in the lower abdomen, pelvis and/or groin.

Pain or burning during urination and/or ejaculation.

Scrotal and/or testicular swelling and redness (may be unilateral).

Cremasteric reflex is unaffected by epididymitis.

Fever, chills, nausea and vomiting.

# Epididymitis

## **Nursing Evaluation/Monitoring/Interventions**

Distinguish from testicular torsion.

Obtain urine sample for urinalysis (observe for hematuria and markers for infection) and possible urine culture.

Swab the urethra for chlamydia and gonorrhea.

Prepare patient for Doppler ultrasound (primary purpose is to differentiate epididymitis from testicular torsion).

Administer oral, IM, or IV antibiotics as ordered (if the cause is secondary to infection) and medications to remedy pain, discomfort and inflammation.

# Prostatitis

Prostatitis: An inflammation of the prostate gland.

## Classifications

Acute Bacterial Prostatitis: Sudden bacterial infection marked by inflammation of the prostate.

Usually associated with severe symptoms requiring emergent attention.

Chronic Bacterial Prostatitis: Develops gradually and continues for an extended time.

Chronic Prostatitis Without Infection: Also referred to as Chronic Pelvic Pain Syndrome.

Inflammation without infection. Etiology unclear.

Asymptomatic Inflammatory Prostatitis: Inflammation without symptoms. Etiology unclear.

## Causes/Risk Factors of Acute Bacterial Prostatitis

Intraprostatic Ductal Reflux (urinary backflow to the prostate)

Pharoses (foreskin cannot be fully retracted)

Spreading Rectal Infection

Urinary Tract Infections

Acute Epididymitis

Indwelling Foley Catheter

Transurethral Surgery

# Prostatitis

## **Nursing Assessment Acute Bacterial Prostatitis**

Fever, chills, malaise.

Urination may be difficult, frequent, urgent, painful and may also burn.

Lower back, rectal and/or genital area pain.

# Prostatitis

## **Nursing Evaluation/Monitoring/Interventions Acute Bacterial Prostatitis**

Prepare for antibiotic administration.

Obtain urine sample for urinalysis and possible urine culture. Monitor markers for infection.

Be prepared to for serum blood work that may indicate infection/inflammation:  
Complete Blood Count (elevated WBC), C-Reactive Protein (elevated levels).

Monitor for sepsis (rare occurrence) in immunocompromised patients that present with S.I.R.S.

Transrectal US or Pelvic CT may be preformed to rule out a prostatic abscess.



# Priapism

Priapism: A persistent, often painful, erection (without sexual stimulation) that occurs for more than four hours.

## Causes/Classifications/Risks

Low Flow: Low-flow priapism is usually due to persistent venous occlusion, resulting in venous stasis and deoxygenated blood pooling within the penis tissue. Pain is usually associated.

### *Risk Factors*

- Sickle-Cell Disease
  - Leukemia
  - Malaria
- Medication Side Effects: Papaverine (antispasmodic), Phentolamine (vasodilator), Prostaglandin E1 (impotence agent)

High Flow: High-flow priapism usually is secondary to a rupture of a local artery and unregulated flow into the penis. Pain less likely to be associated or severe.

### *Risk Factors*

- Injury/Trauma to the Penis or the Perineum
- Spinal Cord Injury (Parasympathetic Response)

# Priapism

## **Nursing Assessment**

An erection lasting greater than 4 hours without sexual stimulus or desire.

Assess for genitourinary trauma.

Compile medical history, medication list and history of present illness.

# Priapism

## Nursing Evaluation/Monitoring/Interventions

Assist with identifying risk factors and the etiology:

- Medication Review
- Medical History
- Recent Trauma/Injuries

Depending on the cause serum (CBC, coagulation profile, sickle cell trait) and urine samples may be collected.

If indicated oral pseudoephedrine (vasoconstrictor) or terbutaline (beta agonist) may be the first line treatment with cases secondary to low-flow.

If indicated assist with needle aspiration or phenylephrine/epinephrine injection if a low-flow case is not solved with oral medications.

Prepare for Color Flow Penile Doppler Imaging (in order to differentiate high-flow from low-flow).

Selective angiography (to identify the problematic vessel) or surgical ligation (of the affected artery) may be necessary in high-flow cases that do not resolve spontaneously.

Address the various psychosocial issues that may arise.

# Foreign Body

A foreign body lodged (intentionally or unintentionally) somewhere in the genitourinary tract.

Often sexual or erotic in nature.

Endoscopic and minimal invasive techniques of removal should be used whenever possible.

Surgical retrieval of a foreign body may be required, particularly when there is a severe associated inflammatory reaction.

# Foreign Body

## **Nursing Evaluation/Monitoring/Interventions**

Establish IV access in preparation for pain control, procedural sedation, and/or surgical intervention.

Do not attempt to remove object unless properly trained and in a controlled environment.

# Urologic Injuries - Renal

## **Classifications**

### Renal Laceration

Renal tissue is cut or torn

### Renal Contusion

Hematoma of renal tissue. Blood leaks from the vasculature in the surrounding tissues.

### Renal Vascular Injury

Veins and arteries involved with the kidneys are injured.

## **Causes**

### Penetrating Trauma

Gunshot wounds, Stab wounds

### Blunt Trauma

Rapid deceleration (motor vehicle crash, fall from heights), Direct blow to the flank (pedestrian struck by vehicle, sports injury)

# Urologic Injuries - Renal

## Renal Injury Scale

Grade	Injury Description
I	<u>Contusion</u> : Microscopic or gross hematuria, urological studies normal <u>Hematoma</u> : Sub capsular, nonexpanding without parenchymal laceration
II	<u>Hematoma</u> : Nonexpanding perirenal hematoma confined to renal retroperitoneum <u>Laceration</u> : <1cm parenchymal depth of renal cortex without urinary extravasation
III	<u>Laceration</u> : >1cm depth of renal cortex, without collecting system rupture or urinary extravasation
IV	<u>Laceration</u> : Parenchymal laceration extending through the renal cortex, medulla and collecting system <u>Vascular</u> : Main renal artery or vein injury with contained hemorrhage
V	<u>Laceration</u> : Completely shattered kidney <u>Vascular</u> : Avulsion of renal hilum which devascularizes kidney

Advance one grade for multiple injuries to same organ.

# Urologic Injuries - Renal

## Nursing Assessment

Hematuria: Blood may be present (microscopic, moderate or gross amounts).

Note: The absence of blood does not rule out renal trauma.

Abdomen and flanks may be tender to palpation.

Grey Turner's Sign: Ecchymosis may be seen over injured flank. This represents blood that has escaped from vasculature. It may take 6-12 hours to develop.



# Urologic Injuries - Renal

## **Nursing Evaluation/Monitoring/Interventions**

Compile a history of the trauma. Including time of injury, mechanism, and associated injuries.

Obtain IV access and urine and serum samples for laboratory testing.

Monitor patient for hemodynamic stability.

Prepare patient for ultrasound (F.A.S.T. - Focused Assessment with Sonography for Trauma) and CT.

Prepare patient for surgical interventions when indicated.

# Urologic Injuries - Bladder

## Classifications

### Bladder Wall Contusion

Bruising to the bladder, or partial-thickness tear of the bladder mucosa.

### Extraperitoneal Bladder Rupture

Injury below the pelvic peritoneum.

### Intraperitoneal Bladder Rupture

Pelvic peritoneum is involved in the injury.

## Causes

### Blunt Injury

Assault to the lower abdomen with blunt object, deceleration (fall from great height), MVC with impact against the steering wheel or seatbelt.

### Penetrating Injuries

Gunshots, Stab Wounds

### Procedure/Surgical Related Injury

Cesarean delivery, Hysterectomy, Internal fixation of pelvic fractures

# Urologic Injuries - Bladder

## **Nursing Assessment**

Abdomen assessment may include:

- Pain in the suprapubic region.
  - Rebound tenderness.
- Abdominal wall muscle rigidity, spasm and guarding.

Hematuria: Microscopic, moderate or gross may be present.

Blood may be visible at the urethral meatus or in the scrotum.

Patient may be unable to urinate despite feeling an urge.

# Urologic Injuries - Bladder

## **Nursing Evaluation/Monitoring/Interventions**

Compile a history of the trauma. Including time of injury, mechanism, and associated injuries.

Obtain IV access and urine and serum samples for laboratory testing.

Monitor patient for hemodynamic stability.

Be aware that most ruptured bladders occur in association with pelvic fractures.

Do not insert a Foley catheter when there is a suspected urethral injury or blood at the urethral meatus. This may cause further trauma to the urethra.

Prepare patient for possible F.A.S.T. exam, CT of abdomen and pelvic, Cystography (bladder X-Ray with radiocontrast inserted through a Foley catheter).

If intraperitoneal bladder rupture is present anticipate surgical exploration and prepare patient according.

# Urologic Injuries - Urethra

**Discuss**