SASKATCHEWAN REGISTERED NURSES' ASSOCIATION

RNs WITH ADDITIONAL AUTHORIZED PRACTICE
CLINICAL DECISION TOOL
DECEMBER 1, 2016

PYELONEPHRITIS ADULT

DEFINITION

Description

Pyelonephritis is an infection of the upper urinary tract. It often follows a lower urinary tract infection (UTI) such as cystitis:

- Cystitis is an acute infection of the urinary bladder (lower urinary tract) and can occur alone or in conjunction with pyelonephritis.
- **Uncomplicated UTI:** Occurs in clients who have a normal, unobstructed genitourinary tract, who have no history of recent instrumentation, and whose symptoms are confined to the lower urinary tract. Uncomplicated UTIs are most common in young, non-pregnant, sexually active women.
- **Complicated UTI:** Is an infection of the lower or upper urinary tract in the presence of an anatomic abnormality, a functional abnormality, or a urinary catheter.
  - Pregnant females and males can present with complicated UTIs.

Pyelonephritis is characterized by an infection of the renal parenchyma and renal pelvis, often producing localized flank or back pain combined with systemic symptoms such as fever, chills, and nausea. It has a wide spectrum of presentation, from mild illness to septic shock.

Chronic pyelonephritis is the result of progressive inflammation of the renal interstitium and tubules, presumed to be caused by recurrent infection, vesicoureteral reflux, or both.

IMMEDIATE CONSULTATION REQUIRED IN THE FOLLOWING SITUATIONS

- Sepsis: Signs of sepsis (e.g., fever, tachycardia, hypotension, tachypnea, altered mental status)
- Renal Failure
- Pregnant client

CAUSES

Pyelonephritis is more common in women because it is frequently caused by fecal floras that colonize the vaginal introitus and subsequently ascend along the urinary tract to the kidney.

PYELONEPHRITIS ADULT

70-95% of cases are caused by gram-negative organisms:

- *Escherichia coli* in over 80% of cases
- *Proteus mirabilis*
- Klebsiella
- *Pseudomonas aeruginosa*

5-10% of cases are caused by gram-positive organisms:

- *Staphylococcus aureus*
- Enterococcus
- *Staphylococcus saprophyticus*

PREDISPOSING RISK FACTORS

- Recent untreated UTI
- Incontinence
- Instrumentation
- Catheterization

Complicated:

- Male
- Urinary tract obstruction
- Anatomic abnormalities
- Neurogenic bladder (strokes, multiple sclerosis, and spinal cord injuries)
- Antimicrobial resistant pathogen
- Diabetes
- Multiple sclerosis

Females:

- Increased sexual activity (> 3 times per week in past 30 days)
- New sexual partner in past year
- Recent spermicide use
- Pregnancy, in particular nulliparous women
- UTI (upper or lower tract) in the past year
- Stress incontinence in the past 30 days

Males:

- Males engaging in anal sexual intercourse
- Lack of circumcision
- Anatomic abnormality
- Obstruction of normal flow resulting from prostatic hypertrophy and urethral strictures

HISTORY

- Usually sudden onset
- Fever (> 38°C oral), rigours, chills
- Headache
- Malaise
- Nausea and vomiting
- Dysuria, frequency, urgency may or may not be present
- Abdominal, back or flank pain may be present (e.g., costovertebral angle tenderness)
- Fatigue, diarrhea
- Cloudy foul smelling urine

Chronic pyelonephritis

- Client may present with fatigue, nausea, decreased appetite with weight loss, nocturia, and/or polyuria.
- May have weeks to months of malaise, fatigue, nausea, abdominal pain, hematuria.

Elderly
May have an atypical presentation including the following:

- Change in mental status
- Generalized deterioration
- Absence of fever is common

PHYSICAL FINDINGS

- Temperature elevated (> 38°C oral)
- Heart rate may be elevated
- Blood pressure may be elevated or decreased as in shock

- Client appears moderately to acutely ill
- Mild, generalized abdominal discomfort
- Mild to severe pain with deep abdominal palpation of kidney
- Marked to severe costovertebral angle tenderness with percussion and palpation over kidney

DIFFERENTIAL DIAGNOSIS

- Acute cholecystitis with fever
- Lower lobe pneumonia
- Perforated abdominal organ
- Appendicitis
- Acute pancreatitis
- Pelvic inflammatory disease
- Renal colic (kidney stone)
- Renal cancer
- Bladder obstruction
- Musculoskeletal pain
- Shingles
- Ectopic pregnancy
- Diverticulitis

COMPLICATIONS

- Acute renal failure
- Chronic renal failure
- Renal abscess
- Sepsis
- Focal renal scarring
- Renal papillary necrosis
- Emphysematous pyelonephritis and/or cystitis
- Respiratory dysfunction

Pregnancy

- Preterm labour
- Low birth weight infant

INVESTIGATIONS AND DIAGNOSTIC TESTS

Obtain midstream urine for urine dipstick testing.

- Leukocyte esterase positive in most clients with acute pyelonephritis
  - False positive esterase occurs with kidney stones, tumours, urethritis, and poor collection techniques
- Nitrites are positive with gram negative infections
  - False negatives occur with diuretic use, inadequate dietary nitrates, or if infected by bacteria that doesn't produce nitrates (*S. saprophyticus*, Enterococcus, Pseudomonas*)*
- Dipstick hematuria may or may not be present (44% sensitive, 88% specific)
- Obtain midstream urine for culture and sensitivity for all suspected cases of pyelonephritis
- Pregnancy test for child-bearing age female

MAKING THE DIAGNOSIS

Clinical diagnosis of acute pyelonephritis is based on a combination of history and:

- urine dipstick result positive for leukocytes and nitrites.
- clinical presentation (fever, chills, flank pain, nausea, vomiting, costovertebral angle tenderness).
- often occurs concurrently or after cystitis.

MANAGEMENT AND INTERVENTIONS

Early or mild infections that are uncomplicated may be treated on an outpatient basis in those clients who:

- are hemodynamically stable.
- are young and otherwise healthy.
- have uncomplicated acute pyelonephritis.
- are able to tolerate oral medications and fluids.
- for whom adequate follow-up has been arranged.

Moderate or severe uncomplicated and all complicated infections usually require hospitalization and consultation with a physician/RN(NP).

Gradient of severity

Local symptoms (mild):

- Dysuria
- Pain
- Bladder tenderness

The above symptoms are synonymous with cystitis. The clinician should consult the SRNA CDT Cystitis Adult.

General symptoms (mild):

- Fever
- Flank pain
- Nausea

Systemic symptoms (moderate to severe):

- Fever
- Rigours
- Dehydration
- Vomiting

Systemic symptoms (severe):

- Circulatory failure
- Organ dysfunction
- Organ failure
- Altered level of consciousness

Goals of Treatment

- Relieve symptoms of acute infection
- Eradicate bacterial infection
- Prevent complications or reinfection

Appropriate Consultation

- All complicated infections
- Nausea and/or vomiting with an inability to rehydrate or take medications orally
- Pregnancy
- Potential medication compliance concerns

- All males
- All complicated infections

Non-Pharmacological Interventions

- None

Pharmacological Interventions

Analgesic and antipyretic:

Acetaminophen 325 mg 2-3 tablets orally q4-6h (maximum 12 regular strength tablets, 4 g/day).

- Alternative dosing: Acetaminophen 500-1000 mg orally q4-6h (maximum 4 g/day).

Ibuprofen 200-400 mg orally q6-8h prn

Uncomplicated, non-obstruction, mild infection

- Low grade fever without nausea or vomiting
- First Line (*E. coli*, *K. pneumoniae*, *P. mirabilis*)
  - Sulfamethoxazole/Trimethoprim (SMX/TMP) 400/80 mg orally 2 tabs q12h or 800/160 mg (DS) orally 1 tab q12h for 14 days.
    - Alternatives to SMX/TMP should be considered when local resistance is anticipated to be > 20% and if there is a history of recurrent UTI and previous treatment with SMX/TMP
    - Ciprofloxin 500 mg orally q12h for 7 days
    - Levofloxin 500 mg orally once daily for 10 days or 750 mg orally once daily for 5 days
- Second line
  - Amoxicillin/Clavulanate 500 mg orally q8h or 875 mg orally q12h for 7-10 days

Treatment for moderate, severe, and complicated clients or those allergic to front line medication is to be determined in consultation with a physician/RN(NP).

Client and Caregiver Education

- Counsel client/caregiver about appropriate use of medications (dose, frequency, completion of entire course of antibiotics, etc.).
- Instruct client/caregiver about proper hygiene to prevent recurrence of infection.
- Ask client/caregiver to report recurrence of symptoms immediately.
- Teach double void (void, wait 3 minutes, void again) in clients with post void residual.
- Increasing fluid intake of water and juices will increase urine flow to achieve light coloured urine.
- Create a voiding routine every 2-3 hours.
- Avoid bubble baths.

Monitoring and Follow-Up

- Follow-up in 24-48 hours to determine clinical response to therapy; if poor response after 72 hours of therapy (e.g., no improvement or worsening symptoms), consult a physician as radiographic evaluation may be warranted.
- Arrange follow-up after the completion of therapy to assess for continuing symptoms. If the client is asymptomatic (except for pregnant clients), there is no need to repeat the urinalysis and culture.

Referral

- Treatment failure
- Reoccurrence
- All males
- Moderate to severe infections
- Males with pyelonephritis
- Recurrent pyelonephritis (within one year) after a course of appropriate therapy
- Immunocompromised client (e.g., diabetic, multiple sclerosis)
- History of renal stones or another urologic concern
- Prior urologic surgery
- Pregnancy
- Urologic dysfunction
- Urinary tract obstruction
- Neurogenic bladder

DOCUMENTATION

- As per employer policy

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