Percutaneous Nephrostomy (PCN) Tube Related Infections

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CLINICAL PRESENTATION

Patient presentation suspicious for PCN infection:
- **Lower UTI:** dysuria, frequency, urgency and/or suprapubic pain
- **Upper UTI:** fever/chills, leukocytosis and/or CVA tenderness (with or without lower UTI symptoms)
- **PCN exit site infection:** local signs for erythema, warmth, tenderness and/or purulence

CVA = costovertebral angle
SIRS = systemic inflammatory response syndrome
UTI = urinary tract infection

EVALUATION

Labs:
- CBC with differential, BUN, creatinine
- Blood cultures
- Urine analysis and urine culture\(^1\) from urethral and PCN sites

Does patient exhibit at least two modified SIRS criteria\(^2\) and hemodynamic instability?\(^3\)

Yes
- Renal ultrasound or CT abdomen and pelvis with contrast
- Consider Infectious Diseases (ID) consult
- See Inpatient Sepsis Management - Adult algorithm

No

Fever, chills, leukocytosis, and/or CVA tenderness?

Yes
- Start empiric IV antibiotics (refer to Page 2)
- Consider CT abdomen and pelvis with contrast to rule out hydronephrosis, pyelonephritis and renal abscess

No
- Start empiric IV antibiotics (refer to Page 2)
- Consider renal ultrasound to rule out hydronephrosis and renal abscess

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1 For proper collection and labeling of urine specimen, refer to ELSEVIER (Mosby’s) Nursing Skills and Procedures (see Appendix A)
2 Modified SIRS criteria:
   - Temperature < 36 or ≥ 38.5°C
   - Respiratory rate > 24 bpm
   - Heart rate ≥ 110 bpm
   - WBC count < 3 or ≥ 15 K/microliter
3 The patient is considered hemodynamically unstable if systolic blood pressure < 90 mmHg
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INITIAL MANAGEMENT

Start empiric IV antibiotics\(^1\) while awaiting laboratory, microbiology and imaging results

- No penicillin allergy: start cefepime
- Non IgE-mediated allergy to penicillin
  - Consider alternative beta-lactam agents in conjunction with ID consult
- IgE-mediated allergy to beta-lactam agents
  - Consider aztreonam plus ciprofloxacin and ID consult
- Start vancomycin or daptomycin, if PCN exit site infection\(^2\) or hemodynamically unstable
- Consider urgent PCN exchange, if patient is hemodynamically unstable or catheter is obstructed
- Consider ID consult, if patient has a history of multi-drug resistant organisms (MDRO) and other pathogens\(^3\) or has a complex clinical scenario\(^4\)

Was the patient on antibiotics for at least 24 hours prior to specimen collection?\(^6\)

- Yes
  - Consider discontinuing antibiotics, if no evidence of renal abscess, bacteremia, or other obvious source of infection
- No
  - Consider switching to a preferred oral antibiotic\(^1\), such as ciprofloxacin or sulfamethoxazole-trimethoprim, if not contraindicated and based on previous urine culture susceptibility panels
  - Oral beta-lactams may be considered as an alternative in patients who have already received IV antibiotics
  - Oral nitrofurantoin, even if noted to be susceptible, should not be utilized for the treatment of PCN related infections due to low concentrations at the infection site

Initial urine culture\(^5\) positive?

- Yes
  - Request Interventional Radiology to perform PCN exchange within 1-4 days once the urinary pathogen has been identified
    - Prior to PCN exchange, the patient should have received at least one dose of concordant antibiotics\(^6\)
    - If the patient has a urinary stent, consider having the implant removed while on concordant antibiotics
- No

\(^1\) For antibiotic therapy consider: medication allergies, history of past infections including multi-drug resistant pathogens, recent antibiotic exposure, creatinine clearance, and significant drug-drug interactions

\(^2\) Observe for local signs for erythema, warmth, tenderness, and/or purulence

\(^3\) MDROs and other pathogens include:
- Enterococcus resistant to vancomycin
- Staphylococcus aureus
- Stenotrophomonas maltophilia
- Any extended spectrum beta-lactamase (ESBL)-producing gram negative bacilli
- Any carbapenem resistant gram negative bacilli
- All other gram negative bacilli that are resistant to usual recommended first-line agents

\(^4\) Significant renal impairment, antimicrobial allergies, and/or drug-drug interactions

\(^5\) Urine culture collected at initial evaluation, see Page 1

\(^6\) Concordant antibiotics are defined as microbiologically active based on current or previous susceptibilities
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FURTHER MANAGEMENT

1 Persistent signs of infection, multiple allergies to antibiotics and/or significant drug-drug interactions
2 MDROs and other pathogens include:
   - Enterococcus resistant to vancomycin
   - Staphylococcus aureus
   - Stenotrophomonas maltophilia
   - Any extended spectrum beta-lactamase (ESBL)-producing gram negative bacilli
   - Any carbapenem resistant gram negative bacilli
   - All other gram negative bacilli that are resistant to usual recommended first-line agents

Complex case\(^1\) and/or antimicrobial resistant pathogens\(^2\) identified?

Yes

Consider ID consult for treatment recommendations

No

Has the patient been diagnosed with pyelonephritis, bacteremia, and/or renal abscess?

Yes

Does the patient have renal abscess?

Yes

- Consider IR drainage (send fluid for microbiological analysis)
- Continue antibiotic therapy for 2-6 weeks (of which 3 days should be post PCN exchange)
- Establish ID outpatient follow-up for long term care

No

Antibiotic therapy for 10-14 days (of which 3 days should be post PCN exchange)

No

Antibiotic therapy for 7 days (of which 3 days should be post PCN exchange)
APPENDIX A: Specimen Collection from a Nephrostomy Tube

**Note:** Collection of a urine specimen from contamination/colonized sites such as the old or used collection bag(s) may lead to inaccurate diagnosis and for this reason the following collection methods should be used.

**Supplies:**
- Specimen labels
- Non-sterile gloves
- CTU-30 Tubing(s) (optional)
- Drainage Collection (bedside) bag(s)
- Biohazard Bags for Specimens
- Sterile specimen container/cup
- 70% isopropyl alcohol wipes
- Leg bag(s)
- Plastic-back protective pad (e.g., “chux”)

**Methods for collection (perform one of the following methods to collect a urine specimen):**

**A. Free flow of urine into a sterile specimen container:**
- Confirm patient identity and explain procedure to the patient
- Position patient sitting with the patient's back exposed
- Perform hand hygiene
- Position the plastic-backed protective pad (e.g., “chux”) to protect the patient's skin and/or linens
- Don gloves
- Disconnect the connector from proximal (nearest to patient) tube
- Scrub the proximal connector with 70% isopropyl alcohol wipes and let dry (preferably for 15-30 seconds)
- Allow urine to flow freely out of the tube into the sterile cup while ensuring sterility. Note: It may take several minutes for the kidney to produce urine.
- Collect at least 10 mL of urine in the sterile cup; secure top of sterile cup
- Label the specimen cup identifying the source (urine), location (right nephrostomy tube or left nephrostomy tube) and any other labeling requirements per institutional policy
- Repeat urine specimen collection on the contralateral side if indicated
- Discard supplies. Doff gloves and perform hand hygiene.
- Ensure timely transport of specimens to lab using Pneumatic Tube System or specimen pick up by lab as appropriate

**B. Free flow of urine into a new drainage collection bag (leg bag or bedside):**
- Confirm patient identity and explain procedure to the patient
- Position patient sitting in the upright position or a position of comfort
- Perform hand hygiene
- Position the plastic-backed protective pad to cover the patient's skin and/or linens
- Don gloves
- Disconnect the distal (away from patient) tube from the proximal connector
- Scrub the hub with 70% isopropyl alcohol wipes and let dry (preferably for 15-30 seconds)
- Carefully insert a new collection bag with a new CTU-30 tubing if needed: position collection bag below the kidney level
- Allow urine to flow freely into the collection bag for 15-30 minutes. Urine allowed to collect or sit in a collection bag for more than 1 hour is considered contaminated and is not to be used as a sterile specimen. Collect at least 10 mL of urine in the sterile cup; secure top to sterile cup.
- When at least 10 mL of urine has been collected in the collection bag, open the bag valve over the sterile cup. Ensure the specimen remains sterile. Do not allow the valve or tip of the nephrostomy tube to touch the rim or inside wall of the cup.
- Label the specimen cup identifying the source (urine), location (right nephrostomy tube or left nephrostomy tube) and any other labeling requirements per institutional policy
- Repeat urine specimen collection on the contralateral side if indicated
- Discard supplies. Doff gloves and perform hand hygiene.
- Ensure timely transport of specimens to lab using Pneumatic Tube System or specimen pick up by lab as appropriate
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SUGGESTED READINGS


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DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the PCN management workgroup at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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