

## Troubleshooting Nephrostomy Tubes

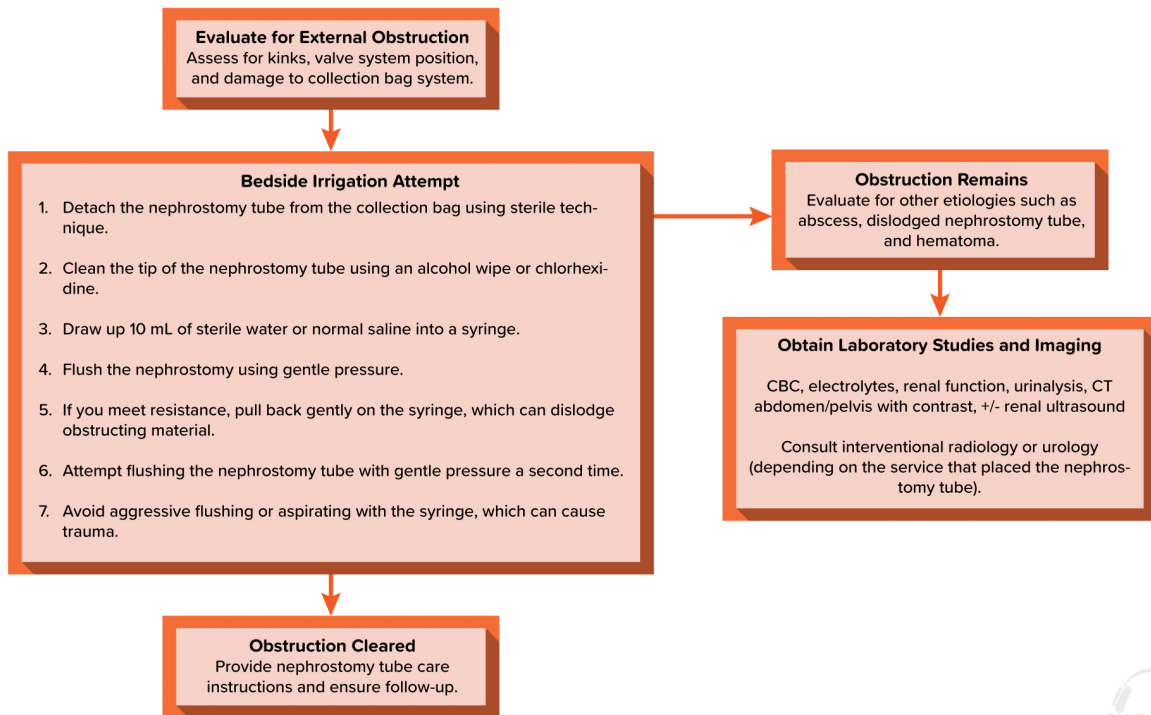
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- Nephrostomy basics
  - A nephrostomy tube connects the renal pelvis or calyx to a small draining catheter that exits the skin.
  - Nephrostomy tubes are placed for urinary obstruction (most common), urinary diversion, preparation for other endourologic procedures, diagnostic testing, and instillation of chemotherapy and adjuvant therapy for upper urothelial carcinomas.
  - Success rate is 99%, with acute complications ranging between 0.3% and 4.7%.
- Complications
  - Minor
    - Local redness/pain
      - This may be due to localized irritation from adhesive dressing, sensitivity to concentrated urine, or localized infection.
      - Ensure dressing changes are frequent; apply topical antibiotics (cream or ointment) and skin protectants; look for evidence of systemic infection.
    - Leakage of urine
      - This may be caused by a collection bag failure or decreased adhesion of the flange.
      - Check the integrity of the urine bag, replace it with a new collection bag, or remove hair around the skin anchoring site.
    - Decreasing urine output
      - This may be caused by mechanical complications (including catheter kinking, inappropriate capping, and obstruction) or by decreased fluid intake.
      - Check the entire tubing for kinks and precipitants; assess patient posture and hydration status.
    - Scabbing around the site
      - Scabbing likely represents physiologic healing and granulation tissue.

Assess for infection but typically nothing is needed except reassurance.
  - Major
    - Obstruction
      - Obstructions may occur due to hypercalciuria and hyperuricosuria, or any physiologic change in drainage.
      - Most cases are resolved with gentle irrigation with saline or sterile water.
      - If this is unsuccessful, speak with the placing consultant.

- If the patient is immunocompromised, anuric, or with acute kidney injury, urgent consultation is needed.
- Evaluate for other causes like hematoma, infection/abscess, catheter dislodgement.
- Obtain laboratory studies (complete blood count, renal function, electrolytes) and imaging (ultrasound to evaluate for abscess/hematoma; CT is another option).

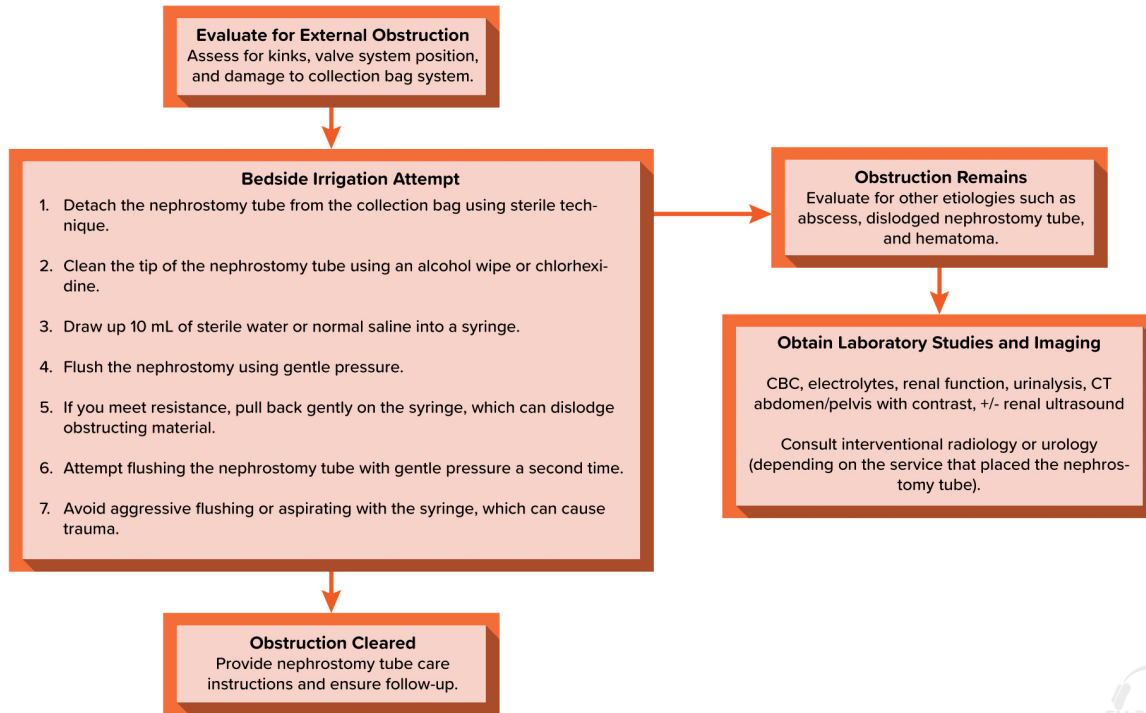
### Troubleshooting an Obstructed Nephrostomy Tube



- Catheter dislodgement and kinking
  - Incidence of dislodgement is around 5%; the risk is higher with a body mass index >35 (greater skin laxity, more subcutaneous tissue that can allow for movement of the tube from the anchor point).
  - Patients may present with flank or back pain, decreased urinary output, systemic symptoms, and leakage or bleeding around the nephrostomy tube site.
  - Differentiating dislodgement or kinking of nephrostomy tubes from an obstruction is challenging.

- If unable to obtain urine or resistance is met with flushing, dislodgement, kinking, and obstruction must be considered.
- Obtain CT abdomen/pelvis with IV contrast to evaluate catheter position and dislodgement.
- If the tube is dislodged or kinking is present, consult the placing specialist for catheter exchange.
- Infection
  - Post-tube infection rates can reach 14%, but asymptomatic bacteriuria can occur in 7.5% of patients.
  - Infection usually occurs in the first 6-7 weeks after placement.
  - Patients with post-nephrostomy tube infections may present with systemic symptoms, flank or back pain, leukocytosis, abnormal vital signs, and fever.
  - Changes in urine quality, including worsening odor, new or worsening hematuria, or decreasing output, may indicate post-nephrostomy tube infection, but these are very nonspecific.
  - Preoperative pyonephrosis (presence of purulent material in the upper urinary tract) is the strongest evidence-based risk factor for developing post-nephrostomy tube infection.
    - Up to 60% of patients with pyonephrosis develop post-procedural septicemia and progress to septic shock.
  - Up to half of infections are polymicrobial (*Pseudomonas*, *Escherichia coli*, *Enterococcus*, *Klebsiella*, *Proteus*).
  - Investigations include CBC, renal function, electrolytes, urinalysis, and urine cultures. If the patient is toxic/sick, obtain blood cultures. Obtain CT with IV contrast if there is concern for abscess or if a concomitant obstruction is likely.
  - Collecting urine: Don't collect from the present bag. Under sterile technique, detach the current bag and place a sterile specimen cup at the tip of the nephrostomy tube. Allow gravity to provide fresh urine. Then attach the tube to a new collecting bag. Make sure to anchor the tube to prevent dislodgement.
  - There are no clear guidelines or consensus on antibiotic regimen and timeline for catheter exchange.
  - Antibiotics should cover typical bugs for sick pyelonephritis patients.
  - Speak with a specialist for tube exchange.

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- Bleeding/Hematuria
  - Gross hematuria is expected postoperatively, which resolves over 48 hours. Serious bleeding may occur in 1%-4.3% of patients.
  - Preoperative renal failure is the only statistically significant predictive factor for the development of clinically significant postoperative bleeding.
  - Bleeding complications can occur weeks to months after nephrostomy tube placement, leading to delayed hematuria and hematoma presentations. This is likely due to missed intraoperative vascular injury with development of an arteriovenous fistula, hematoma, or pseudoaneurysm.
  - Presentation includes continued bleeding beyond 2-3 days after the procedure, or recurrence of gross hematuria and passage of clots after a period of clear urine.
  - Patients may also present with signs/symptoms from anemia: dyspnea, elevated heart rate or respiration rate, decreased exercise tolerance, skin pallor, presyncope, and syncope.
  - Obtain CBC, renal function, electrolytes, urinalysis, coagulation panel, and blood type and screen.
  - Hematoma formation could cause obstruction, acute kidney injury, and anemia.

- Bedside ultrasound can be used to assess for hematoma and obstruction, but CTA is the ideal imaging test.
- Management depends on hemodynamic status. Consult a specialist once a diagnosis is made. If the patient is severely anemic or unstable, urgent transfusion is recommended. For other patients, transfuse based on the patient's comorbid conditions and the presence and severity of symptoms from anemia.
- Nonoperative management with transfusions and supportive care may be successful in some; post-nephrostomy patients with new onset or worsening hematuria, acute anemia, or hematoma formation need urgent consultation with interventional radiology for evaluation for angiography and embolization.
- Other considerations
  - Pleural injury
    - Pleural injury is rare (0.3%) but can occur during placement with pneumothorax, hydrothorax, and pleural effusions.
    - Risk is based on the approach for renal access (intercostal approach between the 11th and 12th ribs carries a higher risk than subcostal approach).
    - Patients may present with decreased breath sounds, hypoxia, pleuritic chest pain, and hypotension.
    - There is no difference in evaluation and management compared with other causes of these conditions.
  - Pediatric considerations
    - Placement in pediatric patients occurs for similar indications as in adults (relief of obstruction, urinary diversion, and bridging to other endourologic procedures), with a high success rate.
    - Pediatric patients have similar complications to adults: mechanical complications (17%), leakage (6.7%), and infection (5.4%-17%) occur most frequently, whereas bleeding complications requiring transfusion (0.8%-3%), sepsis (0.8%-3%), and pleural injury (0.2%) occur less commonly.
    - Evaluation and management are similar to those in adult patients.