

Appendix 1 Nursing instructions for intervention group patients undergoing the nonopioid protocol

Nursing instructions for postoperative care following percutaneous nephrolithotomy

This patient is currently enrolled in a NIH supported study to evaluate the feasibility of using non-opioid medications for pain control after percutaneous nephrolithotomy. It is been shown that for stent symptoms following ureteroscopy, non-opioid medications are sufficient for treating pain. Given the significant drawbacks of opioid medications, we would like to evaluate a standardized enhanced recovery protocol for our enrolled percutaneous nephrolithotomy patients.

Percutaneous nephrolithotomy is a minimally invasive urologic surgery for large kidney stones. It involves placing the patient prone, inserting a needle into the kidney from the back to gain access to the stone, and treatment of the stone itself with ultrasonic, ballistic or laser energy. Most commonly, patients undergoing percutaneous nephrolithotomy, from the recovery room with a Foley catheter in the bladder and an all-internal ureteral stent. They will have an ABD pad dressing with Medipore tape over the flank incision, which typically measures approximately 1 cm.

Patient is often tolerated the procedure well from a pain perspective, however, they can have significant irritative symptoms from the ureteral stent. The stent can cause discomfort in the kidney, bladder or abdomen. The Foley catheter can also cause significant bladder spasms and discomfort.

A standardized postoperative set of orders has been placed for this patient:

- ❖ The Foley catheter is to remain in place draining to gravity overnight and will be removed following evaluation on rounds by urology housestaff. Should the Foley catheter become poorly draining or clotted from gross hematuria, please notify the on-call urology housestaff.
- ❖ The flank dressing typically should not need to be changed overnight. Should there be significant saturation of the entire ABD pad, please notify the on-call urology housestaff.
- ❖ Patients are expected to ambulate on postoperative day 0 following recovery in PACU.
- ❖ Incentive spirometry is extremely important given the patient's prone positioning during surgery. Patient should be instructed and coached to maximize incentive spirometry use.
- ❖ A low-dose CT scan is ordered for postoperative day 1. This will assess for residual stone burden and other postoperative findings.
- ❖ Pain should be evaluated using the numerical pain rating score (NPRS) every 4 hours and documented in Lifechart.

Standardized medications have been ordered for the study:

- ❖ *Ketorolac 15 mg IV* should be given on an as necessary basis every 6 hours for flank and incisional pain. This is a potent nonsteroidal anti-inflammatory (NSAID) that has both anti-inflammatory and analgesic properties.
- ❖ *Tamsulosin 0.4 mg* should be given every 24 hours as scheduled. This acts on the ureter to relax the smooth muscle and decrease ureteral stent discomfort.
- ❖ *Ditropan 5 mg* is to be given on an as necessary basis every 8 hours for significant bladder spasm. This oftentimes manifest as feeling as though the patient has to urinate or seeing urine pass around the catheter.
- ❖ *Pyridium 200 mg* is to be given on an as necessary basis every 8 hours for ureteral stent symptoms and bladder spasms. Patients should be educated that this turns a urine orange and that this is not concerning.
- ❖ Cold packs may be applied to the flank on an as necessary basis.
- ❖ Opioid pain control (*Dilaudid 2 mg*) should be used only as a last resort for severe (8-10) pain.
- ❖ Antibiotics should be given as scheduled per MAR.

If you have any questions about the orderset, the study or patient management, you may reach out to the PI (*****) or the safety compliance officer (*****) during business hours or the on-call urology housestaff after hours.

Appendix 2 Postoperative discharge instructions for intervention group patients undergoing the nonopioid protocol

Knowing the risks of opioid prescription pain medications

Opioid prescription pain medications are a type of medicine used to relieve pain. Some of the common names include oxycodone and acetaminophen (Percocet®); oxycodone, (OxyContin®); and hydrocodone and acetaminophen (Vicodin®).

These medications:

- ❖ Cause your brain to block the feeling of pain; they do not treat the underlying cause of pain;
- ❖ Are very addictive, especially if they are not used correctly;
- ❖ Increase your chances of accidental overdose, coma, and death if taken with prescription medications, including anti-anxiety and sedating medications, and alcohol.

Effective non-opioid options are available for relieving short-term pain, including ibuprofen (Advil[®], Motrin[®]), acetaminophen (Tylenol[®]), physical therapy, chiropractic, acupuncture, and cognitive behavioral therapy. Talk with your healthcare provider to learn more.

How to care and manage your health at home after percutaneous nephrolithotomy

What can I expect from having a ureteral stent?

Most individuals find that having a ureteral stent after surgery for kidney stones can be irritating but is nothing like the pain of having a kidney stone. Most are able to go back to work without restrictions. Patients usually described being able to “feel” the stent in place when bending, lifting or twisting. This is common.

You may experience flank and groin pain from the stent. After the procedure, you will be prescribed a number of medications that may help with this pain. It is important to take the medications as instructed. Some medications work better for stent pain in certain people than others, so it is important to find a regimen that works for you. It is important to keep taking over-the-counter Tylenol (acetaminophen) and the nonsteroidal anti-inflammatory drug (NSAID) as instructed unless your doctor has recommended against taking these medications.

Because of how the stent sits in your bladder, it may cause feelings of having to urinate more than you usually do. There may be some mild burning with urination. It can also cause blood in the urine (hematuria). Blood in the urine is like food coloring: It only takes a few drops to make it look bright red. You may notice anywhere from light pink clear urine to something resembling Kool-Aid. This is common and can be expected from the stent. Blood in the urine can go away and then come back spontaneously while the stent is in place. Increase the amount of water you are drinking and make sure you stay hydrated. Please call us if you start passing clots in your urine greater than a dime to quarter in size.

You may also notice pain in your flank when you urinate. This is because the stent allows urine to travel back up to the kidney and can cause kidney irritation. This will resolve when the stent is removed. Irritation from the stent can persist even after the stent has been removed. Removal of the stent can cause temporary swelling of the tube (ureter) connecting the kidneys to the bladder. This usually resolves within 24 hours after the stent has been removed. If it continues, please give us a call. Once the stent has been removed, you may stop taking the tamsulosin (Flomax) prescription unless you already take it on a regular basis.

How long will the stent remain in my body?

The stent will remain in place for approximately 7 days. It will be removed in the office. The procedure to remove it does not require any anesthesia and takes about 1 minute. A flexible camera scope is placed into the bladder allowing the surgeon to see the stent and remove it. This is generally extremely well tolerated.

What are things to look out for?

Please call us if you experience any of the following:

- ❖ Urinary retention (no urination for >6 hours).
- ❖ Fever greater than 101.5 F or shaking chills.
- ❖ Passing clots larger than a dime, or dark purple urine that resembles grape juice.
- ❖ Pain that is not controlled by the medications provided.
- ❖ Significant pain not controlled by medications lasting more than 24 hours after stent removal.

General information

Wound care:

- ❖ You have gauze with a tape dressing covering your wound. This can be removed after 48 hours. You can change this as often as needed when wet or soiled.
- ❖ You will have clear/red tinged drainage from your incision, this is normal. You may experience frequent drainage for the first 5–7 days. This will improve over time. You can help to decrease the drainage by peeing every 2 hours, even if you don't feel you have to go.
- ❖ Do not apply any ointments/creams to the incision unless told otherwise by your surgeon.
- ❖ You may shower 2 days after surgery. Let soapy water run over your incision. Do not scrub at your incision.
- ❖ If you notice increasing redness, pain, foul smelling drain coming from you incision, please call the office

Hydration:

- ❖ Hydration following surgery is very important.
- ❖ You should drink at least 2 liters of fluid a day. Avoid alcohol and soda.

Urination:

- ❖ Your urine may be pink colored. This is normal.
- ❖ Call your doctor's office if you have bright red urine or if you are unable to urinate.

Medications:

- ❖ Please continue to take your home medications unless otherwise instructed by your primary care physician and/or your in-hospital providers.
- ❖ Additionally, you will be discharged with a prescription for:
 - ♦ **Voltaren (diclofenac) 50 mg.** Take 1 tablet twice daily as necessary for pain. This is a potent NSAID and will reduce pain and inflammation. After the prescription is complete, you may switch to Ibuprofen as needed.
 - ♦ **Flomax (tamsulosin) 0.4 mg.** Take 1 tablet at bedtime. This will help relieve irritation from the stent.
 - ♦ **Pyridium (phenazopyridine) 200 mg.** Take as needed for stent discomfort, up to 3 times per day. Note, this will turn your urine orange, this is normal!
 - ♦ **Ditropan (oxybutynin) 5 mg.** Take as needed for bladder spasm. Side effects of this medication include dry mouth, dry eyes, constipation, inability to urinate, dizziness, delirium, confusion.
- ❖ Please read all medication inserts prior to taking your prescribed medications.

Pain:

- ❖ You may experience some discomfort in the back over the first 48 hours.
- ❖ Cold packs against the incision may help with the discomfort. Wrap a plastic bag of ice cubes in a towel and apply directly to the flank as you see fit.
- ❖ You may take Tylenol and Voltaren/Ibuprofen as needed for pain.

Activity:

- ❖ You may resume normal everyday activities.
- ❖ No heavy lifting >15 lbs (no more than a gallon of milk) until the stent is out and you are cleared by your surgeon.
- ❖ Do not drink alcohol, drive, make big decisions or operate heavy machinery while taking opioid medications.