



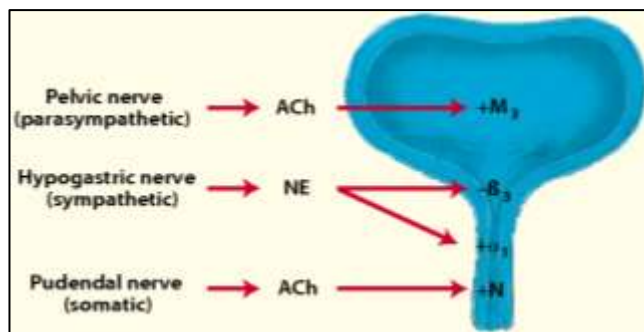
# Clinical Pharmacology & Toxicology Pearl of the Week

## Drug-Induced Urinary Retention

- ✓ Drug-induced urinary retention is very common and can be caused by many classes of medication.
- ✓ It may occur more often in men due to concurrent prostate hypertrophy, but should be considered in women as well.
- ✓ Micturition and bladder control are coordinated at multiple levels of the nervous systems, including:
  - the central pontine micturition center
  - the autonomic nervous system (remember: “Parasympathetic makes you Pee”)
  - the somatic nervous system

### Micturition occurs via:

1. Detrusor muscle **contraction** due to acetylcholine (ACh), which binds the type-3 muscarinic receptor (M3).
2. Internal urethral sphincter **relaxation** due to decreased sympathetic input to both  $\alpha_1$  and  $\beta_3$  receptors.
3. External urethral sphincter **relaxation** via decreased ACh-mediated activity of Nicotinic (N) receptors
4. Localized prostaglandin signalling



- ✓ Any medication that acts centrally or peripherally to modulate serotonin, norepinephrine or acetylcholine neurotransmission (including receptor agonism/antagonism) can lead to alterations in normal micturition.

**Table 1: Drug Classes Causing Urinary Retention**

<u>Drugs causing urinary retention</u>	<u>Example medications</u>	<u>Mechanism</u>
Anticholinergic drugs	<ul style="list-style-type: none"> <li>- TCAs (amitriptyline, nortriptyline)</li> <li>- tiotropium (Spiriva)</li> <li>- diphenhydramine (benadryl)</li> <li>- dimenhydrinate (gravol)</li> </ul>	Impaired detrusor contraction, leading to poor bladder emptying.
Opioids	All opioids	<ul style="list-style-type: none"> <li>- Impaired detrusor relaxation</li> <li>- Decreased neurotransmission of bladder fullness</li> <li>- Increased external sphincter tone</li> </ul>
alpha & beta rc. agonists	<ul style="list-style-type: none"> <li>- Phenylephrine, oxymetazoline (<math>\alpha_1</math>)</li> <li>- Salbutamol, sympathomimetics (<math>\beta &gt; \alpha</math>)</li> </ul>	impaired detrusor contraction + impaired sphincter relaxation.
GABA-ergic drugs	Benzos, baclofen, barbiturates, propofol	Largely due to muscle relaxation & inhibitory effects
NSAIDs	All NSAIDs	alteration of prostaglandins that mediate muscle contraction and relaxation.
Calcium channel blockers	Amlodipine, nifedipine, gabapentin	Relaxation of smooth muscle leading to impaired contraction (can cause incontinence too)
SSRI/SNRI drugs	All SSRI/SNRI have this potential	Serotonin is the main neurotransmitter modulating micturition both centrally and peripherally.

### References:

1. Verhamme, K.M.C., Sturkenboom, M.C.J.M., Stricker, B.H.C. et al. Drug-Induced Urinary Retention. *Drug-Safety* (2008) 31: 373.



The Calgary Clinical Pharmacology physician consultation service is available Mon-Fri, 9am-5pm. The on-call physician is listed in ROCA. Click [HERE](#) for clinical issues the CP service can assist with.



The Poison and Drug Information Service ([PADIS](#)) is available 24/7 for questions related to poisonings. Please call 1-800-332-1414, and select option 1.