Urinary Incontinence

A. TRANSIENT (RECENT ONSET) INCONTINENCE

B. ESTABLISHED INCONTINENCE

DIAGNOSIS

YOUNG PATIENTS

OUTLET OBSTRUCTION WITH DRETEUSOR OVERACTIVITY

OUTLET INCOMPETENCE (STRESS INCONTINENCE)

OUTLET OBSTRUCTION WITH DRETEUSOR OVRERACTIVITY

PERMANENT (SURGICAL) URINARY DIVERSION

SYMPTOMS

URINARY INCONTINENCE - involuntary urine leakage of sufficient severity to be health or social problem.

- always abnormal (regardless of age), mobility, mental status).
- highly treatable and often curable, but still largely neglected problem.

- males = 5:1
- 10-25% of all 25-64 yo women
- 40% of all > 65 yo women

- frequent NOCTURNAL ENURESIS see p. S46 >>

YOUNG PATIENTS - frequent NOCTURNAL ENURESIS. see p. S46 >>

- 5% young and middle-aged women experience urinary incontinence in association with childbirth.

ELDERLY PATIENTS

- often institutionalized (significant burden to caregivers).
- predisposing physiologic factors in aging (alone do not cause incontinence):
  1) more prevalent uninhibited bladder contractions: a impaired bladder contractility (detrusor hyperactivity with impaired contractility)
  2) bladder capacity
  3) among women, urethral resistance declines (estrogen effects and weakened periurethral and pelvic muscles), urethral length
  4) among men, urethral resistance increases (prostatic enrollment).
  5) ability to postpone voiding
  6) postvoiding residual volume (but ≤ 50-100 mL).
  7) daily ingested fluid is excreted later in night.

COMPLICATIONS

1. Uncontrollable
2. Skin problems
3. Falls (in older patients rushing to bathroom)
4. Social stigma: embarrassment, isolation, depression.

Urinary incontinence is commonly important precipitating factor in decision to enter long-term care facility.

Sympathetic nerves promote STORAGE (α-adrenoceptors contract sphincter, β-adrenoceptors relax bladder).

Parasympathetic nerves promote MICTURITION (relax sphincter and contract detrusor).

A. TRANSIENT (RECENT ONSET) INCONTINENCE

- requires treatment of underlying cause only.
- untreated may become persistent!
- uncommon in younger persons but common in elderly (should always be considered!).
1. **Symptomatic UTI (vs. asymptomatic UTI - does not cause incontinence!) especially in young women - DYSURIA and URGENCY are so severe that person cannot reach toilet before voiding.**

- sexually active women with persistent dysuria - does not cause incontinence!
- sexually active women with persistent dysuria - test for Chlamydia trachomatis.

2. **Atrophic urethritis** in postmenopausal women - leads to epithelial and submucosal thinning → loss of mucosal seal, local irritation → URGENCY.

- **treatment** - estrogen.

3. **Alcohol and drugs (psychoactive drugs, diuretics, anticholinergics)** esp. in older persons.

4. **Psychiatric disorders** (delirium, depression, psychosis).

5. **Polyuria**.

6. **Restricted mobility** prevents patient from reaching toilet (H: urinal or bedside commode).

7. **Impacted stool** (esp. in elderly patients) - URGE or OVERFLOW INCONTINENCE.

- **mechanism** - stimulation of opioid receptors or mechanical bladder-urethra disturbance.

- typically have associated fecal incontinence.

8. **Postprostatectomy, postpartum.**

**B. ESTABLISHED INCONTINENCE**

1. Detrusor overactivity

2. Detrusor underactivity

3. Urethral obstruction

4. Urethral incompetence

### ETIOPATHOPHYSIOLOGY

**- lower urinary tract malfunction:** see p. 2435 >>

**Functional problems** in older persons (e.g. environment, mentation, mobility, manual dexterity, medical factors) are often superimposed - may contribute to incontinence but rarely cause it (if so, it is called **FUNCTIONAL INCONTINENCE**)

### 1. DETRUSOR OVERACTIVITY → involuntary bladder contractions.

**leading cause of incontinence in older persons** (prevalence - 31% women ≥ 75 years and 42% men ≥ 75 years).

- **UMN damage** (multiple sclerosis, stroke, Parkinson, Alzheimer) see p. 2590a >>

- **GU causes** (cystitis, bladder stone, bladder tumor)

- **clinically** - **URGE INCONTINENCE**: abrupt onset of intense urge to urinate → inability to delay voiding → precipitant voiding (leakage volume is moderate ÷ large; vs. stress incontinence – small volume);

- **- FREQUENCY** (> 8 voids per 24 hours);

- **- NOCTURIA** is common.

- **anal sphincter voluntary control is intact.**

- **may coexist with impaired contractility (detrusor hyperactivity with impaired contractility)** - urgency, frequency with weak flow rate, significant residual urine, bladder trabeculation.

### 2. DETRUSOR UNDERACTIVITY - least common cause of incontinence;

- **involuntary bladder contractions.**

### 3. OUTLET INCOMPETENCE - most common cause in younger women (second most common cause in older women);

- **neurogenic causes** (radical prostatectomy*, LMN disease, Shy-Drager syndrome).

### TABLE B-4 - Common functional tests that may affect outcome

<table>
<thead>
<tr>
<th>Type of Motivation</th>
<th>Examples</th>
<th>Perineal Effort on Endurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity/hypersensitivity</td>
<td>Long-lasting urgency, discomfort (e.g., decreased, fluorinated)</td>
<td>Sedation, delirium, immobility</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Polyuria, frequency, urgency, solution, delirium, immobility</td>
<td>Urinary incontinence, overflow incontinence, delirium, impaction</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Dystonia, dysuria, sedation</td>
<td>Anticholinergic actions, solution, sedation, libidity, immobility</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>Thioridazine, haloperidol</td>
<td>Anticholinergic actions, solution</td>
</tr>
</tbody>
</table>

*Examples include penicillin, cephalosporin, tetracycline, antibiotics, monosodium.

**Adapted from BM Round, in Current Medical Diagnosis and Treatment, L.T Timms et al., Norwalk, Appleton & Lange, 1993.

### 3. OUTLET INCOMPETENCE - most common cause in younger women (second most common cause in older women);

- **neurogenic causes** (radical prostatectomy*, LMN disease, Shy-Drager syndrome).

- **GU causes** (causes stress incontinence).

1. **urethral hypermobility** - loss of posterior urethrovaginal angle (type 1 stress incontinence) - due to pelvic muscle or ligament laxity (e.g. after childbirth) – most common form!!!
2) **sphincter incompetence** due to damage (radical prostatectomy, childbirth) – type 3 stress incontinence - rare.
3) **congenital anomalies** (bladder exstrophy, epispadias, vesicovaginal fistula, ectopic ureteral orifices).
   - clinically – **STRESS INCONTINENCE** - instantaneous small leakage (without bladder contraction) on stress maneuvers that increase intrabdominal pressure (coughing, laughing, bending, lifting).

### 4. OUTLET OBSTRUCTION
- **second most common cause in men** (N.B.: most men with obstruction are not incontinent!):
  1. **unobstructed urethral closure** – **sphincter-detrusor dysysnergia** – rather than lacking when bladder contracts, outlet contracts (→ severe outlet obstruction with severe trabeculation, diverticula, and "Christmas tree" bladder deformation → hydroabdomen → renal failure).
  2. **GU causes** - benign prostatic hyperplasia, prostate cancer, urethral stricture, large cystourethroid prolapses and kinks urethra on straining.
   - can present as **DIABETIC INCONTINENCE** after voiding.
   - if secondary detrusor overactivity develops → **URGE INCONTINENCE**;
   - if detrusor decompensation supervenes → **OVERFLOW INCONTINENCE**.
   - residual volume > 50-100 mL (may be nil in early obstruction!)

### SIGNS & SYMPTOMS
- **voiding diary** is very useful (kept by patient or caregiver).
- also see p. 2431 >>

#### Five CLINICAL TYPES of incontinence:
1. **Urge incontinence**
2. **Stress incontinence**
3. **Overflow incontinence**
4. **Functional incontinence**
5. **Mixed (urge + stress)**

**URGENCY** is not sensitive / specific for detrusor overactivity, but **PERSISTENCY** (abrupt sensation that urination is imminent) is.

- **involuntary urination** (in absence of stress maneuvers) without warning (reflex or unconscious incontinence) - invariably due to detrusor overactivity.

**URINARY FREQUENCY** (> 7 voids/day) - due to voiding habits, overflow incontinence, sensory urgency, stable but poorly compliant bladder, depression, anxiety, excessive urine production.

N.B. incontinent persons may severely restrict fluid intake and thus do not void frequently!

**NOCTURIA** - nonspecific symptom (e.g. two episodes may be normal for person who sleeps 10 h but not for one who sleeps 4 h):
1) **excessive fluid intake** in late evening (younger persons excrete most of their daily ingested fluid before bedtime, whereas many healthy elderly excrete at night)
2) **polyuria**.
3) **bladder dysfunction - outlet obstruction**, small capacity, detrusor overactivity, sensory urgency.
4) **peripheral edema**.
   - if volume of most nightly voids is much smaller than functional bladder capacity (largest single voided volume on voiding diary) - either sleep-related problem (patient voids because he is awake anyway) or bladder dysfunction.

**OBSTRUCTIVE AND IRITATIVE SYMPTOMS**
- a) benign prostatic hyperplasia or bladder outlet obstruction
- b) overactive detrusor (may be exacerbated by surgery if prostatic hyperplasia was incorrectly held liable).

### DIAGNOSIS

1. **Neurologic exam**
2. **Digital exam**:
   - **URETHRAL sphincter is evaluated through ANAL sphincter examination** (same innervation – **SAA**) - successful sphincter contraction is evidence against cord lesion.
3. **Pudic examination** on all women.
4. **Cystometry** (assessment of detrusor tone and dynamics) – bladder is being filled through catheter; if contractions start = detrusor overactivity.
5. **Stress testing** (> 90% sensitivity and specificity for outflow incompetence): with full bladder (at end of cystometry), patient assumes upright position, spread legs, relaxes perineal area, and provides single, vigorous cough - immediate leakage that starts and stops with cough (delayed or persistent leakage suggests detrusor overactivity triggered by coughing).
6. **Observation of voiding** a multichannel urodynamic testing (uroflow).
7. **Postvoiding residual volume** (by catheterization or portable ultrasound) – essential in almost all patients because symptoms of overflow incontinence are nonspecific; if > 50-100 mL suggests bladder weakness or outlet obstruction, but smaller amounts do not exclude either diagnosis.

- **Cystoscopy**.
- **Q-tip test** (indirect measure of urethral angle = axis of inclination) – patient in lithotomy position; Q-tip is inserted into urethra; if Q-tip moves > 30° from horizontal = abnormal urethral mobility.

### TREATMENT

**BALANCED BLADDER** (balance between storage and evacuation) - no outlet obstruction, sterile urine, low residual volume (< 100 mL), low voiding pressures.

- **Pads and special undergarments**
  - **condom catheters** (for men) may lead to skin breakdown and decreased motivation to become dry.
  - **external collection devices** may be effective in women.

- **Other essential care**
  - continual renal function monitoring.
  - **UTI control** - high fluid intake (diabetes > 3 L/d), urine acidification (e.g. **ASCORBIC ACID**).
  - for bedridden patients:
    1) early ambulation, frequent position change
    2) dietary Ca restriction (to inhibit calculus formation).

**DETRUSOR OVERACTIVITY (SPASTIC BLADDER – URGE INCONTINENCE)**
• indwelling urethral catheters are not recommended - they usually exacerbate contractions (if catheter is necessary, small balloon should be used to minimize irritability and consequent leakage around catheter).

1. Behavioral therapy - cornerstone of treatment:
   a) Bladder retraining regimens
      for example: in patient who is incontinent every 3 h, regimen involves voiding every 2 h during daytime and suppressing urgency in between, once patient has maintained daytime urinary control for 3 consecutive days, voiding interval can be extended by 1/2 h and process repeated until minimal satisfactory result or continence is achieved.
   b) prompted voiding technique
      patient is asked at 2-h intervals about need to void; patient who responds “yes” is escorted to toilet and given positive reinforcement after voiding (negative reinforcement is avoided).

2. Pharmacotherapy - BLADDER RELAXANT DRUGS - can augment behavioral therapy but not replace it (drugs generally do not abolish unobstructed contractions!)
   A. Anticholinergics [detrusor inervation is parasympathetic!]:
      N.B. anticholinergics may cause cognitive decline in elderly!
      1) PROPRANOLOL (15-30 mg bid)
      2) PHENOTIPIURINE: extended release tablet - 4 mg (max 8 mg) administered x1/d.
      3) TOLTERODINE
      4) DARFENIUM*
      5) SOLIFENACIN*
      *selective M2 muscarinic antagonists
   B. α-adrenergics [work in detrusor] - MIABUSEXOM (Myrbetriq®)
   C. Smooth muscle relaxants - FLAXICOTYLINE
   D. Combination (smooth muscle relaxant + anticholinergic):
      1) OXYBUTYNIN (shortest acting but highest incidence of side effects); FDA approved for women > 18 yrs as OTC (for men – only by Rx)
      2) DIETETYLINE
      3) TRUSCOTYLINE (as effective as oxybutynin but with better tolerability).
   E. Ca-channel blockers – NIFEDIPINE, DILTIAZEM.
   F. Antidepressants - IMIPRAMINE (250-200 mg/d, DOXEPIN).
   G. ADH analogs (for nocturia) – DESMOPRESSIN.
   H. BOTOX (ONABOTULINUMTOXIN) – FDA approved for adults who cannot use / do not adequately respond to anticholinergic.
      in males, detrusor overactivity often coexists with urethral obstruction - urodynamical testing should be done before bladder relaxant drugs!
      • drugs with rapid onset of action (e.g. OXYBUTYNIN) can be used prophyllactically if incontinence occurs at predictable times.
      • some drugs can be used intravesically.
      • all drugs may cause urinary retention (intentionally inducing urinary retention and using intermittent catheterization may be reasonable for some patients).

3. Augmentation cystoplasty increases bladder capacity by incorporating section of stomach or intestine – reserved for severe cases (e.g. in MS patients).

DETRUSOR UNDERACTIVITY (ATOMIC BLADDER – OVERFLOW INCONTINENCE)
Establish immediate drainage to prevent overdistention → detrusor muscle damage - bladder decompression (for 2-7/14 days)
   a) intermittent catheterization (done by patient) – preferable! (less complications, better bladder training)
   b) continuous catheter drainage (presupposes men to urethritis, periurethritis, prostatic abscess, and urethral fistulae).

Bladder after decompression:
A. Bladder function partially restored:
   1) augmented voiding techniques: double voiding, Creden's maneuver (suprapubic during voiding), Valsalva maneuver
   2) cholinergic agonist (BETHANECHOL)
      • esp. useful if bladder contracts poorly due to anticholinergic drug that cannot be discontinued.
      • most effective in combination with α-adrenergic blocker (e.g. TIRAZAZIN).
B. Acontractile detrusor – any medical intervention is likely to be futile → intermittent self-catheterization (UTI prophylaxis with antibiotics).
   • patients with motor difficulties (unable to perform self-catheterization):
     a) indwelling urethral catheter (UTI prophylaxis with antibiotics is not useful here) with 6-weekly changes; use clamps to achieve volumes ≈ 300 mL.
     b) surgical urinary diversion (e.g. suprapubic diversion), see below >>
   N.B. in lower motor neuron damage medical therapy is generally ineffective! see p. 2590a >>

OUTLET INCOMPETENCE (STRESS INCONTINENCE)
1. Nonpharmacologic measures:
   • pelvic muscle exercises (e.g. Kegel's exercises – strengthen m. pubococcygeus) + biofeedback are often effective! – both women and men!
   • electrical stimulation (to strengthen pelvic muscles) is under investigation.
   • treatment of precipitating conditions (e.g. coughing, atrophic vaginitis with estrogens), avoiding known bladder irritants (caffeine, alcohol)
   • weight loss in obese patient.
   • pessary insertion, contraceptive diaphragms in younger women; tampons in older women.
   • toileting and fluid regimen that maintains bladder volume below leakage threshold.

2. Pharmacotherapy
   to increase bladder outlet resistance - α-agonists (e.g. sustained-release PHENYLPROPIONAMLINE, sustained-release PHENOTIPIURINE 240-120 mg daily), TULOXETINE 40-60 mg daily);
   • for menopausal women – topical estrogen (N.B. data from large clinical trials suggest that oral estrogen may precipitate actualy worsen incontinence).
   • *NDA approved for this indication

URINARY INCONTINENCE 2590 [4]
3. Surgery (urinary retention is rare!)

**for urethral hypermobility**

- **Bledder neck suspension (ELEVATION TECHNIQUES):**
  1. Retroperitoneal urethrotomy (gold standard) – paraurethral-paravesical structures are fixed to pubis:
    - traditional MMK (Marshall-Marchetti-Krantz) procedure – fixation to symphysis (complication - osteitis pubis).
    - Burch colposuspension (best results!)* – fixation to Cooper’s ligament; frequently done as additional component of surgery for uterine prolapse.
  2. Needle procedures - paraurethral structures are fixed to anterior abdominal aponeurosis.

- **Pubovaginal sling** (by use of fascia lata) – complicated procedure, but results very good.

**for sphincter incontinence:** in order of increasing complexity:

For men after radical prostatectomy, wait at least 1 year post-op before electing further surgery (during this time pelvic floor exercises seem to have great benefit)

- injection of urethral bulking agents (glutaraldehyde cross-linked bovine collagen);
- endoscopic injection of in submucosa overlying or just distal to urethral sphincter, at four sites circumferentially, until urethra isocopic; can be repeated after 4 weeks.
- **Pubovaginal sling**, **male perineal sling** (urethral cuff and control pump that have to be operated by patients).
- **artificial urinary sphincter** implantation - gold standard treatment for men after prostatectomy.

4. Palliative measures

- for men - condom catheter, penile clamp, penile sheath, self-adhesive sheath.
- some collection devices for women are available.

**OUTLET OBSTRUCTION**

- in males:
  1. U-adrennergic blockers (**ALPHOSUN**, **YAMULOSIN**, **TERAZOSIN**, **PHENOTYPEN**): relax internal sphincter and improve urinary voiding symptoms (frequency and urgency).
  2. **BICALUTAMIDE**
  3. **5-alpha-reductase inhibitor** (**FINASTERIDE**): for men with prostatic obstruction.
  4. **TURP**, **external sphincterotomy** (in male), bladder neck incision with bilateral urethral bulking agents.
  5. **surgical** urination on demand and reduce tone of striated sphincter.

- **in females**:
  1. **large cystocele** → surgery + outlet suspension procedure (if urethral hypermobility coexists).
  2. **distal urethral stenosis** → dilation + estrogen.

**OUTLET OBSTRUCTION WITH DETRUSOR OVERACTIVITY**

(e.g. detrusor-sphincter dyssynergia in suprasacral spinal cord injury with spastic LMN – see p. 2590)

1. **U-blockers** (*TERAZOSIN* 1-2 mg tid or qid) to relax sphincter.
2. **anticholinergics** (to promote urinary retention).
3. **endo-U**: - intermittent self-catheterization for women, condom catheter for men (or permanent indwelling catheter); discontinues if < 80 mL on 3 consecutive occasions.
4. **endoscopic external sphincterotomy**.
5. **surgical** urinary diversion.


- **equipment**: 1) extradural electrodes - attached to sacral anterior nerve roots 2) subcutaneously implanted receiver-stimulator 3) external battery-powered controller and transmitter (placed on skin over subcutaneously implanted receiver-stimulator - emits electromagnetic fields).
- **prerequisites**: 1) clinically complete suprasacral spinal cord lesion. 2) intact anterior sacral nerve roots (i.e. intact parasympathetic innervation of bladder) 3) skeletal maturity and neurological stability. 4) patient cannot be adequately managed with intermittent or condom catheterization.

- **implantation** is performed in conjunction with **dorsal rhizotomy** via S-5 laminctomy (results in artiflex bladder with low intravesicular pressure and high compliance - limiting incontinence and autonomic hyperreflexia; extradural electrodes are implanted during same procedure.

- **Vocare® device** is **patient-activated** - urethral sphincter and bladder contract and relax.

**PERMANENT (SURGICAL) URINARY DIVERSION**

- if circumstances prevent satisfactory continuous or intermittent bladder drainage.

**Types**:

- **upper tract diversion** (by ileal or colon conduit).
- **suprapubic cystostomy** (predisposes to infection, calculi formation, and, rarely, transitional or squamous cell carcinoma).
- **cutaneous vesicostomy** (Bladder opened to anterior abdominal wall) with external appliance (no indwelling catheter) - convenient in children.