Urinary incontinence

USMLE prep #2

10.3.2016

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What is the definition?

- involuntary leakage of urine

What are the risk factors?

- age: diminished size of bladder, postmenopausal genitourinary atrophy
- recurrent urinary tract infections
- DM, CHF
- multiparity, history of prolonged labor
- pelvic floor dysfunction in women, BPH, and prostate cancer in in men

What is the innervation of bladder?

Sympathetic effect

- Relaxation – β_2
- Sphincter contraction – α_1

Parasympathetic effect

Contraction – M_3

Sphincter relaxation – M_3

Types of urinary incontinence

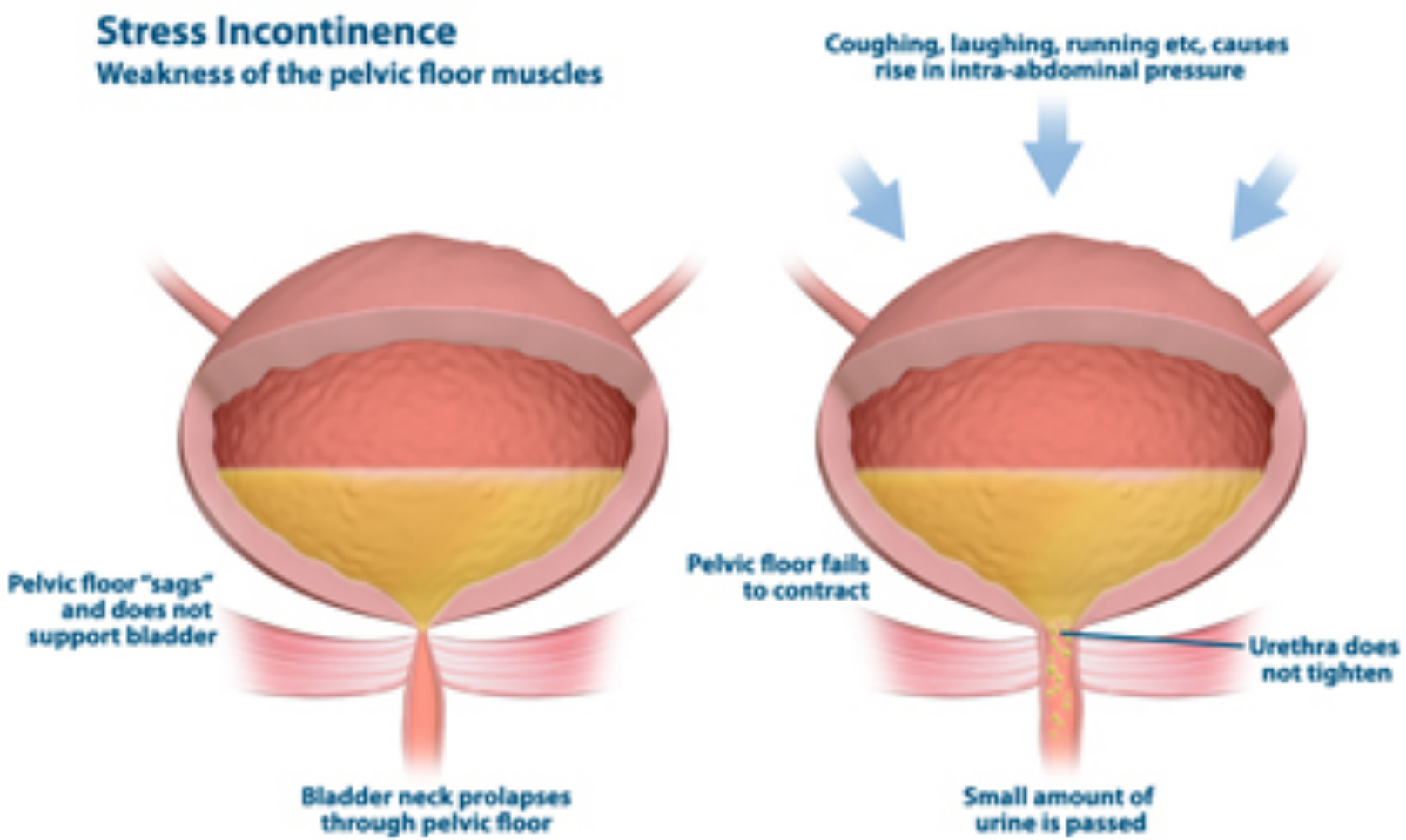
1. Urge incontinence
2. Stress incontinence
3. Overflow incontinence

1. Urge incontinence

- most common in elderly patients
- *causes:* idiopathic, CNS lesions (dementia, strokes)
- *mechanism:* involuntary and uninhibited detrusor contractions -> loss of urine
- *clinical features:* sudden urge to urinate, loss of large volumes of urine with small postvoid residual, and nocturnal wetting
- *diagnosis:* urodynamic study
- *management:* initially bladder-training exercises, if unsuccessful anticholinergics (oxybutinin), and TCAs (imipramine)

2. Stress incontinence

- mostly in women (after multiple deliveries of children)
- *mechanism:* weakness of the pelvic floor allows bladder neck and urethra to descend with increased intra-abdominal pressure
- *clinical features:* involuntary urine loss during increased intra-abdominal pressure (cough, laugh, sneeze, exercise); small postvoid volume
- *management:* Kegel exercises (to strengthen pelvic floor musculature); estrogen replacement therapy; surgery



http://www.pcdsupport.org.uk/index.php/what_is_pcd/raising_a_family_30_years/what_is_stress_incontinence/

3. Overflow incontinence I

- common in diabetic patients and patients with neurologic disorders
- *mechanism:* inadequate bladder contraction (due to impaired detrusor contractility) or a bladder outlet obstruction -> urinary retention and subsequent overdistention of the bladder. Bladder pressure increases until it exceeds urethral resistance-> urine leakage
- *causes:* neurogenic bladder (diabetic patients, lower motor neuron lesions), medications (anticholinergics, α-agonists), **obstruction to urine flow** (BPH, prostate cancer, urethral strictures)

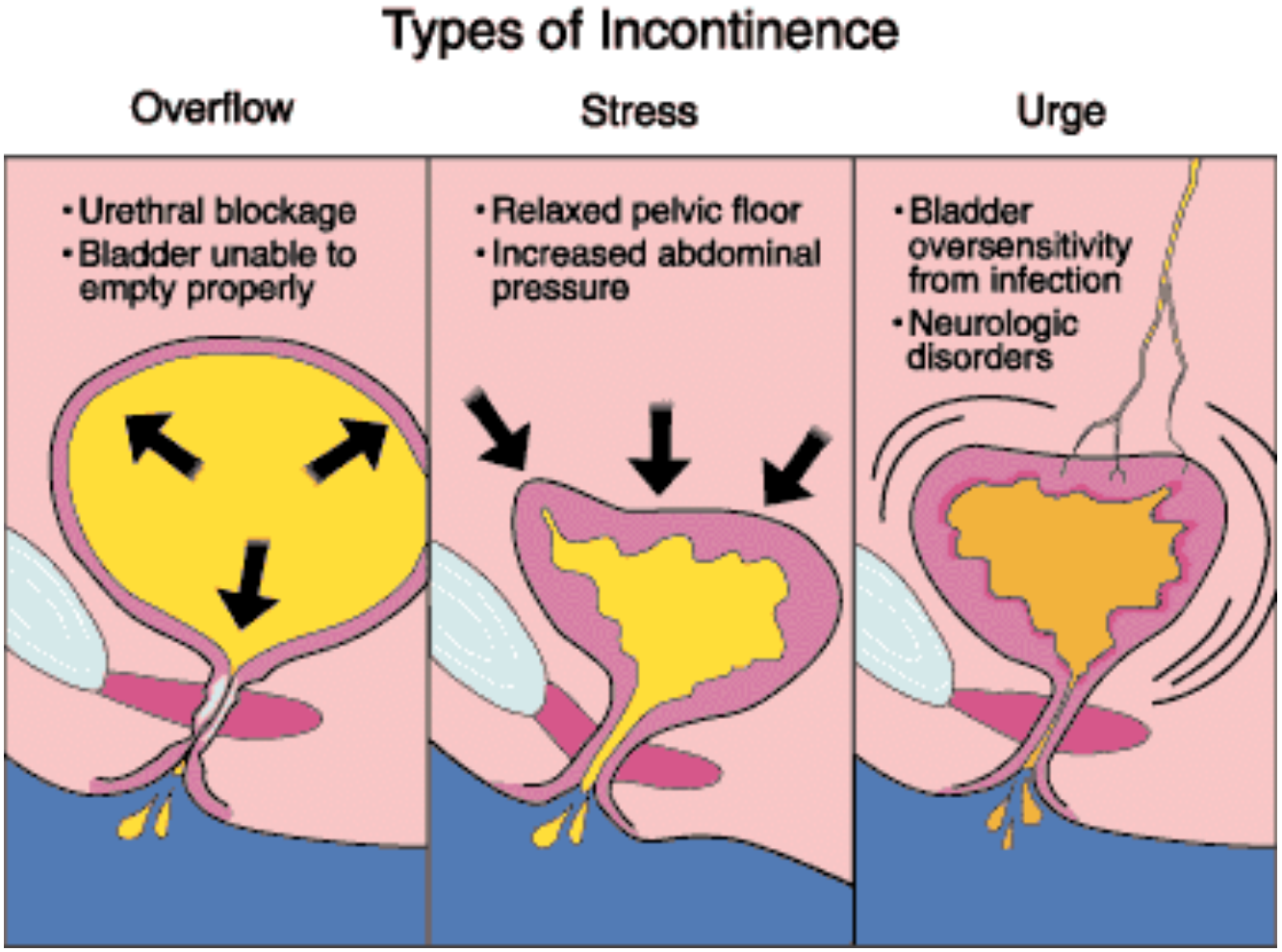
3. Overflow incontinence II

- *clinical features:* nocturnal wetting, frequent loss of small amount of urine; large postvoid residual
- *management:* intermittent self-catheterization is the best management; cholinergic agents (bethanechol); α-blockers (terazosin, doxazosin)

Putting it all together I

Differential diagnosis of urinary incontinence		
Type	**Etiology**	**Symptoms**
Stress	Loss of urethral support & intraabdominal pressure exceeds urethral sphincter pressure	Leaking with coughing, sneezing, laughing, lifting
Urge	Detrusor overactivity	Sudden, overwhelming, or frequent need to empty bladder
Overflow	Impaired detrusor contractility, bladder outlet obstruction	Constant involuntary dribbling of urine & incomplete emptying

Putting it all together II



http://dilipraja.com/urinary-incon.htm

Literature:

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2. VOJVODIC, Miliana and YOUNG, Ann. *Essential Med Notes 2014.* Thirtieth edition. ISBN: 978-1-92736307-2

2. Questions

Q1: A 70-year-old woman is evaluated for urinary incontinence. She reports frequent urge to urinate. She also says, that „when she needs to go she has to go immediately“, because she can´t control urinary flow and has problems with urinary leakage. She started using pads during day and at night, because her symptoms worsened since her last visit. Physical examination is insignificant, pelvic examination reveals vaginal atrophy and urinanalysis is normal. Which of the following is the most appropriate next step?

(A) Begin oral estrogen replacement therapy
(B) Begin oxybutinin
(C) Begin bethanechol
(D) Perform cystoscopy
(E) Surgical management

The correct answer is (B): The patient presents with typical symptoms of urge incontinence. This type of incontinence is typical in **older, postmenopausal woman**. The underlying detrusor instability or hyperreflexia leads to involuntary detrusor contraction and **involuntary urine leakage accompanied by urgency of micturition**. The next step in this case is begin anticholinergic treatment (oxybutinin, tolterodin).

The major patient complain is incontinence, replacement of estrogen (A) would not help and put the patient to the greater risk of developement of neoplasia.

(B) Bethanechol, cholinergic agent, is used in treatment of urinary overflow incontinence. Bethanechol would not improve urge incontinence.

There is no need to perform cystoscopy (D), which is, in this case, unnecessary invasive procedure.

Surgerical management (E) is not indicated in urge urinary incontinence and would not help patient relieve symptoms.

Q2: A 78-year-old man comes to the physician for evaluation after falling fi ve times in 2 months. An x-ray skeletal survey reveals no fractures, but the patient admits to worsening urinary incontinence over the previous 4 months. His wife states that his memory and concentration have deteriorated recently. The patient's vital signs are normal, and his physical examination is notable for a wide-based gait with short steps. A Mini-Mental State Examination results in a score of 26/30. His funduscopic examination is normal, and his neurologic examination is notable for slight bradykinesia without tremor. Laboratory tests, including serum vitamin B12, folate, and TSH, are normal. What is the most likely etiology of this patient's recent decline?

(A) Alzheimer's disease
(B) Hypothyroidism
(C) Multi-infarct dementia
(D) Normal pressure hydrocephalus
(E) Parkinson's disease

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

The correct answer is D. This patient has a potentially reversible case of dementia: normal pressure hydrocephalus (NPH), with the classic triad **of incontinence, gait difficulty, and mental decline ("wet, wobbly, and wacky").** The score of 26/30 on the MiniMental State Examination indicates only that some mild abnormality is present. The pathophysiology of NPH is not well understood, but it is thought that neurons are stretched secondary to ventricular dilation caused by excessive cerebrospinal fluid production, decreased absorption, or both.

Answer A is incorrect. Alzheimer's disease can present with some of the symptoms in this case. However, significant physical impairment tends to occur later in the Alzheimer's disease process and would thus correlate with a much lower score on the Mini-Mental State Examination. The time course and the relatively rapid progression in symptoms are not consistent with this diagnosis.

Answer B is incorrect. Hypothyroidism, another potential **cause of reversible dementia** in the elderly, should be ruled out early in the work-up. This patient's TSH level is normal, indicating euthyroidism.

Answer C is incorrect. Multi-infarct dementia is the **most common cause of cognitive decline** with a stepwise drop in function in the setting of prior cerebrovascular disease and stroke. In this case, the decline has been steadily progressive in a patient with no history of vascular disease.

Answer E is incorrect. Parkinson's disease classically presents with **bradykinesia, masklike facies, shuffling gait, tremor, and rigidity**. This patient has mild bradykinesia and no rigidity or tremor, so this diagnosis is a less likely possibility.

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

Q3: A newborn infant is found to have a congenital urethral abnormality in which the urethral meatus opens on the ventral side of the penis, resulting in difficulty directing the urine stream and ventral curvature of the penis. Which of the following is the cause of this malformation?

(A) Failure of urethral fold fusion
(B) Failure of urethrorectal septum formation
(C) Maldevelopment of the urinary sphincters
(D) Short urethra
(E) Urethral stricture

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

The correct answer is A. The malformation described is hypospadias, resulting from **incomplete union of the urethral folds**. In the male, the urethral folds form the ventral aspect of the penis. In the female, the urethral folds develop into the labia minora.

Answer B is incorrect. Congenital failure of urethrorectal septum formation results in an abnormal communication between the urethra and the rectum. Clinical signs **include feces in the urine**. This is not a cause of hypospadias.

Answer C is incorrect. In males, the proximal portion of the urethra forms from the urogenital sinus. The distal urethra is formed by ectoderm that is canalized to form the navicular fossa. If the sphincters do not form properly, **urethral incompetence and incontinence result.**

Answer D is incorrect. A short urethra causes chordee, or poorly developed penis with ventral curvature, without hypospadias.

Answer E is incorrect. Urethral stricture causes **urethral obstruction and is the second most common cause of incontinence in older men**. It is not a cause of hypospadias.

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

Q4: A 74-year-old man comes to the physician complaining of increased urinary frequency along with difficulty starting and stopping urination. Assuming a benign underlying cause, which of the following is the mechanism of action of a common medication used to treat this condition?

(A) Formation of superoxide radicals that attack DNA bonds

(B) Gonadotropin-releasing hormone analog

(C) Inhibition of cyclic guanosine monophosphate–specific phosphodiesterase type 5

(D) Inhibition of cytochrome P450 enzymes

(E) Inhibition of 5α-reductase

(F) Inhibition of testosterone's negative feedback on gonadotropin secretion

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The correct answer is E. This man has the symptoms **of benign prostatic hypertrophy**, which include difficulty starting and maintaining a urine stream, feeling as though the bladder is never emptied, having the urge to urinate again soon after voiding, and pain on urination or dysuria. **Finasteride** is most commonly used to treat this condition. Finasteride acts by inhibiting the conversion of testosterone to dihydrotestosterone by **inhibiting 5α-reductase**. This leads to a reduction in the size of the prostate, providing symptomatic relief.

Answer A is incorrect. Bleomycin acts by chelating mechanisms to attack the phosphodiester bonds of DNA. It is used to treat **testicular tumors and lymphomas** (especially Hodgkin's), not benign prostatic hypertrophy.

Answer B is incorrect. Leuprolide is a gonadotropin-releasing hormone analog that binds the luteinizing hormone-releasing hormone receptor in the pituitary. This leads to reduced release of luteinizing hormone. Leuprolide is used to treat **metastatic carcinoma of the prostate**, not benign prostatic hypertrophy.

Answer C is incorrect. Sildenafil inhibits cGMP-specific phosphodiesterase type 5, resulting in increased concentrations of cGMP, which increases vasodilation leading to increased blood fl ow to the corpus cavernosum. Sildenafi l is used primarily to treat **erectile dysfunction**.

Answer D is incorrect. Ketoconazole is an that acts by inhibiting cytochrome P450 enzymes. It is not used in the treatment of beniantifungal with antiandrogenic properties gn prostatic hypertrophy.

Answer F is incorrect. Flutamide is a potent androgen receptor antagonist. This drug is used primarily in conjunction with a gonadotropin-releasing hormone analog in the treatment of **metastatic prostate cancer**.

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Q5: A 73-year-old patient has been hospitalized for 6 days due to complications from surgery. The patient had a urinary catheter in place, which was removed on the fourth hospital day. Now she is complaining of painful and frequent urination and has a fever of 38.9° C (102° F). Urinalysis results are positive for nitrites and leukocyte esterase. A urine culture grows a gram-negative rod that produces a red pigment. Which of the following organisms is the most likely cause of this patient's symptoms?

(A) Candida albicans
(B) Escherichia coli
(C) Klebsiella pneumoniae
(D) Proteus mirabilis
(E) Pseudomonas aeruginosa
(F) Serratia marcescens
(G) Staphylococcus saprophyticus

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

The correct answer is F. This patient presents with symptoms of a UTI, most likely caused by prolonged urethral catheterization. **Nosocomial UTI** is most often associated with **Escherichia coli, Proteus mirabilis, Pseudomonas aeruginosa, Klebsiella pneumoniae, Serratia marcescens, staphylococci, enterococci, and Candida albicans**. Although the patient's symptoms are not specific for any of these organisms, the urine culture tells us that (1) the organism is a gram-negative rod, and (2) the organism produces a red pigment. S. marcescens is a gram-negative rod that produces a red pigment called prodigiosin.

Answer A is incorrect. The presence of Candida albicans in an otherwise normal female usually represents colonization rather than infection. UTI with Candida usually can be attributed to structural abnormalities, metabolic or hormonal abnormalities.

Answer B is incorrect. Escherichia coli is the **most common cause of UTI**. Although it is a gram-negative rod, it **does not produce any pigments.**

Answer C is incorrect. Klebsiella pneumoniae is a gram-negative rod and is responsible for approximately 8% of nosocomial infections. It is a significant cause of UTI and pneumonia in hospitalized and ambulatory patients. K. pneumoniae **does not produce any pigments**.

Answer D is incorrect. Proteus mirabilis is a gram-negative bacillus and is a frequent cause of nosocomial UTI. It produces the enzyme urease, which serves to create a more alkaline environment for itself (urea → ammonia + carbon dioxide) but **does not produce any pigments**.

Answer E is incorrect. Pseudomonas aeruginosa has been known to cause catheter-associated UTI. Although it is a gram-negative rod, it produces a **blue-green pigment called pyocyanin**.

Answer G is incorrect. Staphylococcus saprophyticus is the second most common cause of UTI in young women. It is a gram-positive coccus and **does not produce any pigments**.

LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4

Q6: A 20-year-old woman presents with a 2-day history of dysuria and increased urinary frequency. She states that she was recently married and was not sexually active prior to the marriage. Physical examination reveals a temperature of 38.2°C with normal vital signs. Gynecologic examination reveals no evidence of discharge, vaginitis, or cervicitis. Urinalysis reveals 14 white blood cells per high-powered field with many gram-negative rods. Which of the following is the most appropriate pharmacotherapy?

(A) Ceftriaxone

(B) Fluconazole

(C) Gentamicin

(D) Metronidazole

(E) Trimethoprim-sulfamethoxazole

USMLE step 1 Qbook. Seventh edition. New York : Kaplan Publishing, 2015. ISBN: 978-1625232632

The correct answer is E. The patient's presentation is consistent with a simple urinary tract infection; there is a short history of dysuria, increased urinary frequency, and the appearance of white blood cells and gram-negative rods in the urine. Urinary tract infections are common in women after they become sexually active. The infection is likely caused by urethral trauma during intercourse, which leads to bacterial contamination of the bladder. Since most of these infections are caused by *Escherichia coli* (a gram-negative rod), the most appropriate therapy would be trimethoprim-sulfamethoxazole (TMP-SMX) for around 3 days.

Ceftriaxone (**choice A**) is the treatment of choice for uncomplicated infections with *Neisseria gonorrhoeae*, now that most strains are resistant to penicillin.

Fluconazole (**choice B**) is indicated for the treatment of vaginal candidiasis. Since there is no vaginal discharge and the patient has gram negative rods in the urine, a diagnosis of vaginal candidiasis can be excluded.

Gentamicin (**choice C**) would be an inappropriate choice. Most urinary infections caused by gram-negative rods are sensitive to TMP-SMX, and the potential for toxicity secondary to gentamicin is great.

Metronidazole (**choice E**) is an antibiotic typically used in the treatment of vaginal *Trichomonas* and *Gardnerelli* infections, as well as serious infections believed to be caused by anaerobic bacteria. Since there is no vaginal discharge and the patient has gram-negative rods in the urine, this is not the best choice for the treatment.

Most common urinary tract infections bugs

- *Escherichia coli*
  - leading cause of UTI. Collonies show green metalic sheen on EMB agar.
- *Staphylococcus saprophyticus*
  - 2nd leading cause of UTI in sexually active women
- *Klebsiella pneumoniae*
  - 3rd leading cause of UTI. Large mucoid capsule and viscous colonies

Tao Le, Vikas Bhushan: *First Aid for the USMLE Step 1 2014, McGraw Hill Professional, 2014, ISBN 0071831436.*

Q7: A 76-year-old man presents to his physician complaining of an inability to empty his bladder for the past 3 days and a continual leakage of urine for the past 2 days. A cystometrogram reveals that his bladder has an abnormally large capacity, and a MRI reveals a lesion limited to the sacral spinal cord. Which of the following is the most likely diagnosis?

(A) Automatic neurogenic bladder

(B) Autonomous neurogenic bladder

(C) Motor neurogenic bladder

(D) Sensory neurogenic bladder

(E) Uninhibited neurogenic bladder

USMLE step 1 Qbook. Seventh edition. New York : Kaplan Publishing, 2015. ISBN: 978-1625232632

The correct answer is B. This patient has an autonomous neurogenic bladder, which is a type of "lower motor neuron" bladder. There are three types of lower motor neuron bladders: an autonomous neurogenic bladder (lesion to the sacral spinal cord centers involved in bladder function), a motor neurogenic bladder (**choice C**; lesion of motor and visceral efferents to the bladder), and a sensory neurogenic bladder (**choice D;** lesion of sensory afferents from the bladder). All these conditions are associated with a flaccid bladder that fills to capacity. Whereas a normal bladder typically empties at 300 mL, these bladder fill to about 1000 mL. These patients have overflow incontinence, which means the bladder expands completely. Because they cannot void, these patients dribble urine. These are the most dangerous neurogenic bladders, because urinary stasis predisposes patients to lower urinary tract infections, which may ascend to the kidneys, producing pyelonephritis.

An automatic neurogenic bladder (**choice A**) is a type of "upper motor neuron" bladder. This condition is caused by a lesion that disconnects the pontine micturition center (the center that is responsible for producing coordinated voiding) from the sacral spinal cord centers. The bladder is still able to void to some degree, but functions "on its own" without input from the brainstem center. As a result, the urethral sphincter does not relax when the detrusor muscle contracts, leading to urinary retention.

An uninhibited neurogenic bladder (**choice E**) is another type of "upper motor neuron" bladder. Normal adults have cortical control over their pontine micturition center, but when the corticopontine pathways are not functioning properly, the patient develops an uninhibited neurogenic bladder. In these patients, the act of voiding is well coordinated, but not under conscious control. This is seen in patients with frontal lobe lesions and in normal children prior to toilet training.

Q8: A 70-year-old woman presents to her physician prior to beginning chemotherapy for newly diagnosed small cell lung carcinoma. her examination is notable for obesity, blood pressure of 180/110 mmHg, facial hair, abdominal striae, and an acneiform rash on her chest and back. Laboratory values are normal except for a serum glucose of 250 mg/dL (normal range: 70 – 110 mg/dL). Her chest x-ray film shows a right perihilar mass and severe diffuse osteoporosis. Which of the following most likely accounts for her physical examination, laboratory, and x-ray findings?

(A) Adrenal gland destruction by metastases

(B) Anterior pituitary gland disruption by metastases

(C) Ectopic production of corticotropin (ACTH)

(D) Ectopic production of gastrin

(E) Ectopic production of parathyroid hormone (PTH)

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The correct answer is C. This woman has all the classic findings of Cushing syndrome: obesity, hypertension, hirsutism, acne, striae, glucose intolerance, and osteoporosis. Cushing syndrome may be caused by excess production of cortisol due to bilateral adrenal hyperplasia or an adrenal neoplasm; by excess production of corticotropin (ACTH) by a pituitary adenoma; or by ectopic production of ACTH by a tumor, most commonly a small cell lung carcinoma (major clue in the question stem!

Destruction of the adrenal glands bilaterally (**choice A**) or of the anterior pituitary by metastases (**choice B**) would cause a deficiency of cortisol and ACTH, respectively, and would lead to a syndrome of cortisol deficiency with ortostatic hypotension, malaise, nausea, and weight loss.

Ectopic production of gastrin (**choice D**), as seen in Zollinger-Ellison syndrome, causes severe refractory peptic ulcer disease.

Ectopic production of parathyroid hormone (PTH; **choice E**), which can be seen in squamous cell lung carcinoma, would result in hypercalcemia.

TABLE 9-8 Paraneoplastic Syndrome Endocrinopathies

DISORDER	ASSOCIATED CANCER	ECTOPIC HORMONE
Cushing syndrome	Small cell carcinoma of lung, medullary carcinoma of thyroid, pancreatic cancer	ACTH
Gynecomastia	Choriocarcinoma (testis), seminoma	hCG
Hypercalcemia	Renal cell carcinoma, primary squamous cell carcinoma of lung, breast carcinoma, adult T-cell leukemia/lymphoma Malignant lymphomas (contain 1α-hydroxylase)	PTH-related protein Calcitriol (vitamin D
Hypocalcemia	Medullary carcinoma of thyroid	Calcitonin
Hypoglycemia	Hepatocellular carcinoma, ovarian carcinoma, fibrosarcoma	Insulin-like factor
Hyponatremia	Small cell carcinoma of lung	Antidiuretic hormor
Secondary polycythemia	Renal cell carcinoma, hepatocellular carcinoma, cerebellar hemangioma	Erythropoietin

ACTH, Adrenocorticotropic hormone; *hCG,* human chorionic gonadotropin; *PTH,* parathyroid hormone.

GOLJAN, Edward F. *Rapid review pathology. Fourth edition. Philadelphia, PA: Elsevier/Saunders, 2014. ISBN 03-230-8787-6.*

Q9: A 35-year-old, sexually active woman visits her gynecologist complaining of mild, right-sided, lower abdominal pain but no other symptoms. There are no peritoneal signs. Her surgical history is significant for an appendectomy at age 10. Her last period occurred 14 days ago. Which of the following endometrial changes corresponds to this stage of the patient's menstrual cycle?

(A) Apical movement of secretions in the glandular cells

(B) Degeneration of the glandular structures

(C) Glandular glycogen accumulation in the functionalis

(D) Growth of the spiral arteries

(E) Tissue expansion by cellular hypertrophy

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The correct answer is D. This patient appears to be experiencing *mittelschmerz*, abdominal pain occuring at the time of ovulation that can mimic acute appendicitis (which is rule out because of the patient's surgical history). If this information didn't clue you into the stage of the menstrual cycle, you are told explicitly that the patient's last menstrual period was 14 days ago. Therefore, she is at the conclusion of the proliferative (estrogenic) phase. This stage begins during the latter period of menstrual flow and continues through the thirteenth to fourteenth day of typical 28-day-cycle; it is characterized by regrowth of the endometrium. The epithelial cells of the glandular structures remaining after menstruation migrate and proliferate to cover the new mucosal surface. Also, the spiral arteries grow into the regenerating endometrium (this process continues through the secretory stage as well). Significant edema develops by the end of the proliferative stage and continues to develop during the secretory phase.

Apical movement of secretons in the glandular cells (**choice A**) occurs during the secretory phase.

Degeneration of the glandular structures (**choice B**) occurs during the premenstrual stage of the cycle.

Glandular glycogen accumulation in the functionalis (**choice C**) occurs during the secretory phase (luteal phase).

Tissue expansion by cellular hypertrophy (**choice E**) occurs during the secretory phase since mitosis of the endometrial tissue has ceased at this point.

Q10: A 29-year-old woman with a history of pelvic inflammatory disease presents to the emergency department with severe left quadrant crampy pain and spotting, and amenorrhea for the past two cycles. Physical examination reveals a left adnexal mass with tenderness to palpation. The beta-human chorionic gonadotropin (hcG) level is elevated. Further studies would most likely reveal an implantation at which of the following locations in the fallopian tube?

(A) Ampulla

(B) Fimbriae

(C) Infundibulum

(D) Isthmus

(E) Uterine segment

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The correct answer is A. This patient has an ectopic (tubal) pregnancy. Patients with a history of pelvic inflammatory disease are more susceptible to this disorder. The ampulla is the most common site of fertilization within the fallopian tube, as well as the most common site for tubal pregnancy. It is the longest region of the tube and has thin walls.

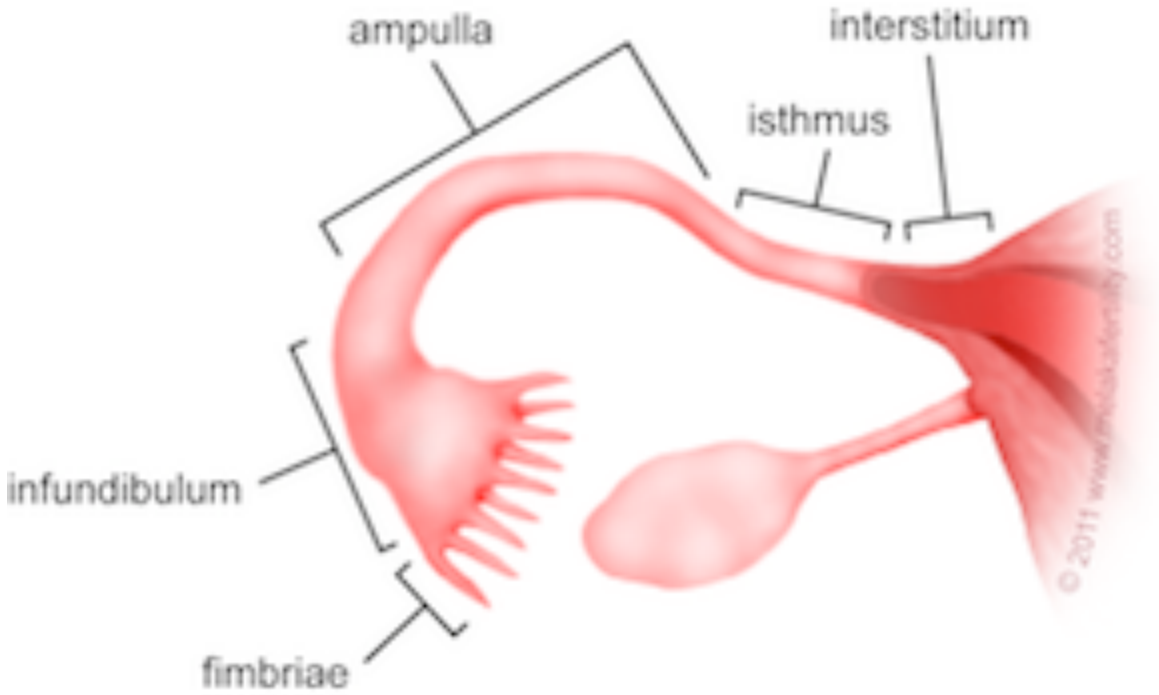
The fimbriae (**choice B**) of the fallopian tubes are highly unlikely locations for tubal pregnancy. They are mucosal ridges located at the funnel-shaped end of the oviduct that are covered with ciliated cells. They beat toward the mouth of the tube, "brushing" the ovum released from the ovary into the fallopian tube.

The infundibulum (**choice C**) is the technical term for the "funnel-shaped end of the fallopian tube." it opens to the peritoneal cavity.

The isthmus (**choice D**) is the narrow, thick-walled segment of the fallopian tube nearest to the uterine wall.

The uterine (interstitial) segment (**choice E**) is the portion of the tube that traverses the uterine wall. Ectopic pregnancies occurring here at particularly high risk for catastrophic rupture.

Anatomy of fallopian tube



http://www.nccrm.com/wp-content/uploads/2012/12/fallopian.png

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1. LE, Tao, Karen A ADLER a Seth K BECHIS (eds.). *First aid Q&A for the USMLE Step 1*. 2nd ed. New York: McGraw-Hill Medical, c2009. ISBN 978-0-07-159794-4
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If you have any questions don’t hesitate to contact us.

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