Urinary System
Assessment & Diagnostic Studies

History
- Subjective data (chief complaint)
- Urinary system questions: urine, micturition pattern, renal pain, fluid changes, exposure to nephrotoxic agents, occupation, h/o renal disease, diet…
  - Changes in amount, frequency, voiding at night, incontinence, ?'s about stream & force, odor? Spasms? Swelling?
- Diseases related to renal problems: HTN, DM, gout, lupus, URI
- Allergies
- Past hospitalizations
- Past urinary procedures: catheterizations or procedures with urinary system
- Medications: nephrotoxic, OTC
- Family history: likelihood of similar problems
- Social & personal history: chemical exposure, smoking, activities, DIET
- Review of systems: may have multiple s/sx involving multiple body systems

Physical
- Objective data

- Inspection: skin- bruises, crystals; mouth; face-edema; ABD and extremities- edema; weight gain/loss; general state of health

- Auscultation: possible bruit & thrill; low pitch murmur = renal artery stenosis

- Palpation: normal size kidney is rarely palpable; bladder not normally palpable unless distended

- Percussion

– CVA (costovertebral angle) region (where the 12^{th} rib and vertebral column intersect); place palm over this area and hit the top of this hand with the ulnar surface of the other hand that has been curled into a fist (thud, no pain)

Nursing Observations
- Accurate I&O: most critical indicator or renal functioning
- Examples of Intake –
- Examples of Output –
- Minimum Urinary Output = 30 ml/hr (note ration of intake to output- should be about the same, report any marked change or gradual decrease) ~ 1500 ml/day
- Observations – passage of stones? Retention? Electrolytes? Weight?
- Preparing for exams: teach; chaperone; confidentiality; may need rectal exam at same time

Diagnostic Studies
- Nursing Responsibilities

- Coordination of tests – consider health, age, lifestyle, capability to participate, and requirements
- Patient teaching – inpatient, outpatient, expectations
- Patient preparation – prepare for each test
- Comfort measures
- Follow-up

Diagnostic Studies - Urine

• Urine specimens

– Random (Urinalysis) no special prep

• Specific gravity, pH, color, odor, glucose, ketones, protein, RBCs, WBCs, bacteria, casts, osmolality)

– 24 hour urine (creatinine clearance, lytes, etc) collect in one large container for 24 hrs, if one voiding is discarded must start over; kept on ice; Will look at the excretion rate of Na+, K+, Ca+, Cl-, Phos, uric acid, and proteins. Normal excretion = 1000-2000 ml/hr

– Clean catch or catheter (Urine C & S [Culture & Sensitivity]) aseptic technique; C&S- organisms in urine, kidneys/ureters/bladder normally sterile

– Urine for cytology- malignant cells?

- All urine specimens are refrigerated
  - Specific gravity: measurement of tubules to concentrate or dilute urine; hydration or dehydration
  - pH: reflects ability to maintain normal hydrogen ion concentration (acidity or alkalinity)
  - Color: information about substances
  - Odor: information about substances
  - Glucose: blood glucose level exceeds the reabsorption capacity
  - Ketones: fat metabolism for energy
  - Protein: abnormal glomerular permeability
  - RBC: pathology, not uncommon to never discover the etiology
  - WBC: infection, not uncommon to have 3-4 WBC's
  - Bacteria: infection
  - Casts: + tubular or glomerular disease
  - Osmolality: urine concentration, wnl= 500-800 mosm/l
  - Bence Jones: multiple myeloma, hyperparathyroidism, osteomalacia
  - Creatinine clearance: estimate of GFR, need 24 hr sample and blood sample [creatinine clearance= (urine volume (ml/min) x urine creatinine concentration)/plasma creatinine concentration]
  - Phenosulfonphtalein Test: PSP is a red dye and a substance that kidneys normally excrete completely- used to determine renal function, tubular function
  - Concentration Studies: r/o tubular dysfunction; 'Fishberg Concentration'

Bladder Scanner: Ultrasound, noninvasive, different settings (male vs female); place probe midline over abd ~ 1.5" above pubic bone aim towards coccyx

Diagnostic Studies - Blood

- BUN (blood urea nitrogen): reflects rise in protein metabolism, or a drop in glomerular filtration rate (GFR)
- Creatinine: balance between creatinine production & filtration-
- Electrolytes & Minerals

Diagnostic Studies – X-ray

- KUB (kidneys, ureters, & bladder): estimates kidney position, size, and calcifications

- IVP (intravenous pyelogram): (urography) contrast medium injected, cleared by GF; entire urinary tract with blood supply; bowel prep first; d/c metformin before procedure and hold x48 hrs after (r/f lactic acidosis)

- Retrograde pyelogram: X-rays (anatomical view of ureter, ureteropelvic junction, renal pelvis & calyces) Cystoscopy; Catheter placed- inject dye; best for: iodine allergies and nonfunctioning kidneys; observe for: flank pain dysuria fever chills 24-48 hr post (extravasation of contrast)

- Antegrade pyelogram: contract injected via percutaneous into renal pelvis or via nephrostomy tubes for upper UT evaluation; same prep as IVP; assess for s/sx hematuria, infection, hematoma

- Renal arteriogram: dye into renal artery via catheter placed into femoral artery; arteriogram = blood vessels; post-procedure bed rest 12-24 hrs, assess puncture site, assess pulses

- CT scan: often used in combo with IVP; prep needed if contrast used

- MRI: Coronal, Sagittal, & Transaxial planes; r/o masses/tumors; MRI contraindications: pacers, metal clips or metallic implants; enclosed – sedation

- Ultrasound: fluid vs. solid masses; noninvasive, used for location, hydronephrosis; no prep

- Renal scan: mercury isotope injected via IV, probe passed back and forth over back to detect radiation and record on paper a picture of the kidney; same as Renogram: vascularity, helps discover AKI < 48 hours duration

Diagnostic Studies – Endoscopy

- Cystoscopy: tubular lighted scope used to inspect the bladder; local or general anesthesia

  -Post procedure: pink-tinged- urine and spasms are common, may have dysuria or frequency, should not have bloody urine or severe pain = perforation

-NI's: sitz bath, analgesics, antispasmodics, drinking large quantities of fluid, watch for retention

• Cystogram: dye instilled into bladder via cystoscope or catheter; visualize bladder and vesicoureteral valves (reflux)

• Cystometrogram: insert catheter, instill water or saline into bladder; used to evaluate bladder tone; pressure exerted against bladder wall is recorded

• Biopsy

– Renal: needle or open; examine tissue; if needle – use ultrasound and/or fluoroscopy to find kidney

- Pre: coag. Times; type & cross; BUN/Cr
  - Contraindications: single functioning kidney, infection, tumors, hydronephrosis, coag disorders
- Post: bed rest x 24 hr; vital signs; teaching – s/sx hemorrhage, + hematuria 24 hrs post, avoid strenuous activity

– Brush biopsy of renal pelvis & calyces: catheter with a steel guided wire placed through cystoscope, steel or nylon brush inserted to the level of lesion to obtain sample; pelvis irrigated after specimen obtained with NS

- Post: similar to post cystoscopy; flank pain is common and should disappear in 48 hrs, report severe pain or temp ≥ 101° F

Geriatric Assessment

• Kidney – decrease in amount of tissue, number of nephrons, function of loop of Henle and tubules

– Less palpable

– Decreased creatinine clearance, increased BUN & creatinine

• Ureter, Bladder, Urethra – decrease in elasticity, tone, and capacity

– Palpable bladder due to urinary retention

– Stress & urge incontinence (hesitancy, frequency, urgency, nocturia)

– Changes due to prostatic enlargement