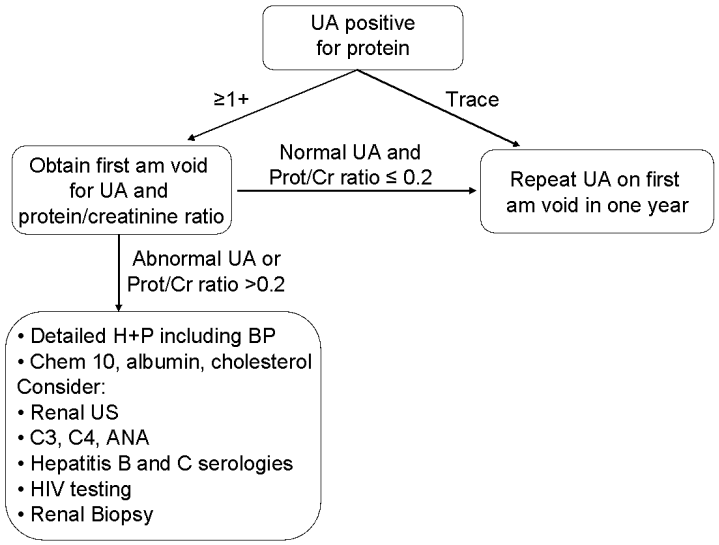
Hyperkalemia	
Workup	Chem 10 (ensure not hemolyzed -- free-flowing sample, order STAT), blood gas to assess acid/base status, EKG, TTKG (see above) -- low TTKG (<7) in setting of hyperkalemia may indicate aldo deficiency or resistance, plasma renin and aldosterone.
Management	If real and w/ EKG changes STOP K+ supplementation, K+-containing IVF, and K+-sparing medications **Stabilize cardiac membrane: calcium gluconate** 10% @ 0.5 mL/kg (=100 mg/kg) IV over 5 **calcium chloride** 20 mg/kg IV over 5-10 min if impending cardiac arrest **Drive K+ into cells** **insulin** 0.1 U/kg, max 10U IV with glucose: <5 yo: D10 (100 mg/mL) @ 5 mL/kg // ≥5 yo: D25 (250 mg/mL) @ 2-4 mL/kg IV (max 25g), infuse over 30 min **albuterol nebs**: neonates 0.4 mg in 2 mL NS // < 25 kg, 2.5 mg in 2 mL NS // 25-50 kg: 5 mg in 2 mL NS // >50 kg: 10 mg in 2-4 mL NS or 4-8 MDI puffs **bicarb**: 1 mEq/kg IV (max 50 mEq) over 10-15 min (< 6 mo: 2 mL/kg of 4.2% NaHCO3 // ≥ 6 mo: 1 mL/kg of 8.4% NaHCO3) **intubate + hyperventilate** (induce alkalosis) **Excrete total body K+** **Kayexalate** (1 g/kg, max 50g PO/PR q4h PRN) **Furosemide** 1-2 mg/kg IV (max 40 mg or 80 mg if renal insufficiency) q6h PRN **Dialysis** if emergent or if ongoing source of K+ release (tumor lysis, rhabdo)

Hematuria	
Definition	Red blood cells in the urine
Etiology	• **Extra-glomerular**: UTI, ureteral trauma, nephrolithiasis, cystitis (any UTI, adenovirus, cyclophosphamide), sickle cell disease or trait, malignancy (bladder CA, Wilms tumor) • **Intra-glomerular**: glomerulonephritis (see GN section), benign familial hematuria / thin basement membrane disease
Workup	• UA (+blood on dip AND +RBCs on micro?) • If only +blood, think myoglobin vs hemoglobin • If red but neg blood/neg RBC, think beets, rifampin, nitrofurantoin, doxorubicin, chloroquine • If cola- or tea-colored urine, RBC casts, marked proteinuria, or dysmorphic RBCs, think GN • If blood clots, uniform RBCs, urethral bleeding, think extra-gl.) • If h/o trauma, do CTAP • If s/sx UTI, do Ucx • If s/sx nephrolithiasis, do renal US +/- CTAP • If c/f GN, send chem 10, CBC/d/retic, C3/C4, albumin, ASLO, anti-DNase B, ANA, urine protein:Cr ratio; consider renal bx if concomitant proteinuria/HTN and/or rising serum creatinine

Proteinuria	
Definition	• Excessive excretion of urinary protein • **Dipstick**: estimates as follows: trace = 15-30 mg/dL / 1+ = 30-100 mg/dL / 2+ = 100-300 mg/dL / 3+ = 300-1000 mg/dL / 4+ = >1000 mg/dL • Primarily detects albumin • **Quantitative** (perform if dip pos): spot urine prot/Cr (nl <0.2 mg if age 2+, <0.5 if <2 yo; 3-3.5 mg/mg = nephrotic) / 24h: >100 mg/m2 per day is abnormal, >1000 mg/m2 per day is nephrotic

Proteinuria

Definition



Etiology

- **Glomerular** (inc filtration of macromolecules, esp albumin -- may be **transient** [fever, exercise, stress, seizures, resolves on rpt testing after stressor gone] vs **orthostatic** [present when standing and not when supine - first morning void] vs **persistent** [elevated on both supine/upright voids])
- **Tubular** (inc excretion of **low molecular weight proteins**, esp beta-2-microglobulin, that are normally filtered in the glomerulus and reabsorbed in the proximal tubule -- may be d/t congenital disorders of proximal tubule [Fanconi syndrome, cystinosis, galactosemia, Lowe syndrome] or with acute tubular injury [ATN, AIN, pyelo])
- **Overflow** (inc excretion of low molecular weight proteins d/t protein overproduction [multiple myeloma, myoglobin in rhabdomyolysis] .

Presentation

- If significant quantity, protein will be frothy; otherwise varies with cause
- If nephrotic, may have edema/HTN, may have stigmata of primary dx (oral ulcers, rash, and joint swelling in SLE; abdominal pain and palpable purpura in HSP; h/o recurrent UTIs with VUR, hepatitis and movement d/o in Wilson dz)

Nephritic Syndrome

Definition

Any of several conditions leading to glomerular hematuria, proteinuria, and potential AKI with azotemia/oliguria, edema, and hypertension.

Etiology

- Post infectious:
  - **Group A beta hemolytic strep**, either after pharyngitis or impetigo
  - Other infections: staph aureus/epi, pneumococcus, mycoplasma, viral
- IgA Nephropathy (most common glomerulopathy worldwide)
- SLE Nephritis
- **Membranoproliferative GN**: can be idiopathic or secondary to HBV/HCV or rheumatologic disease
- **Alport Syndrome**: XLR collagen IV mutations, a/w hearing loss, vision changes
- **Goodpasture Syndrome**: autoAb to Type IV collagen in glomerular and alveolar basement membranes → hemoptysis,
- **Vasculitis**: HSP, granulomatosis with polyangiitis (lung/sinus/kidney), eosinophilic granulomatosis with polyangiitis (asthma/neuropathy/lung/kidney/skin), microscopic polyangiitis (lung/kidney)

Nephritic Syndrome continued on next page →