

# CORE CURRICULUM IN NEPHROLOGY

## Geriatrics

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### DEMOGRAPHICS

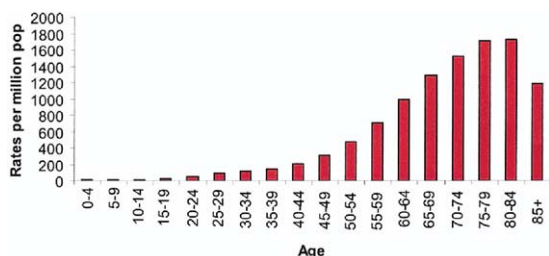
- End-stage renal disease (ESRD) primarily affects the older population:
  - Peak incident counts of treated ESRD occur in 70- to 74-year age group at >12,000
  - Peak incidence rate of treated ESRD occurs in 80- to 84-year age group at 1,729 per million population
  - Mean age at start of ESRD therapy is 62 years
- See Fig 1

### ADDITIONAL READING

1. US Renal Data System: USRDS 2003 Annual Data Report. The National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2003

### RECOGNIZING IMPAIRED RENAL FUNCTION IN OLDER PATIENTS

- Muscle mass declines with age, especially in frail elderly persons
- Patients with normal-appearing serum creatinine values can have profoundly impaired renal function
- Formulae for estimating glomerular filtration rate (GFR) are far more accurate than measures of serum creatinine at predicting GFR; however, these formulae tend to break down in oldest and frailest patients



**Fig 1. Incidence rates of treated ESRD by age. Data from US Renal Data System, USRDS 2003 Annual Data Report, The National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2003.**

- Many laboratories now provide GFR estimates based on the Modification of Diet in Renal Disease (MDRD) formula, which can be requested with routine laboratory tests; laboratories being set up to provide this information when a basic or comprehensive metabolic panel is requested can greatly increase provider's awareness of impaired renal function
- See Fig 2

### ADDITIONAL READING

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3. Rimón E, Kagansky N, Cojocaru L, Gindin J, Schattner A, Levy S: Can creatinine clearance be accurately predicted by formulae in octogenarian in-patients? *QJM* 97:281-287, 2004
4. Manjunath G, Sarnak MJ, Levey AS: Estimating the glomerular filtration rate. Dos and don'ts for assessing kidney function. *Postgrad Med* 110:55-62, 2001

### PREVENTING PROGRESSION TO ESRD

- Most older patients with established ESRD are treated with hemodialysis
- Hemodialysis does not provide normal life expectancy, but can provide meaningful life extension (Table 1)
- Emphasis should be on preserving residual renal function by using same approaches as

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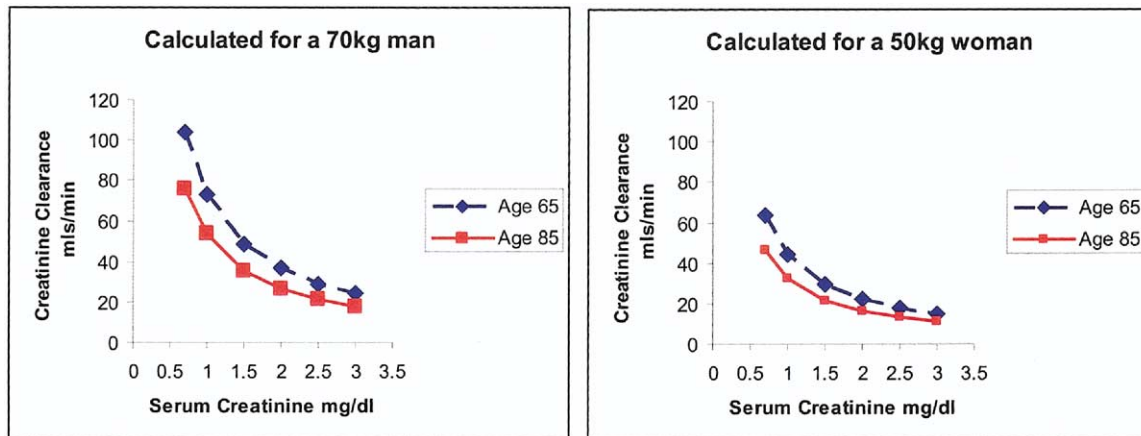
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**Fig 2. Creatinine clearances calculated using the Cockcroft-Gault equation versus creatinine levels: values for (left) a 70-kg man and (right) a 50-kg woman. To convert creatinine clearance in mL/min to mL/s, multiply by 0.01667; creatinine in mg/dL to  $\mu\text{mol/L}$ , multiply by 88.4.**

for younger people; detailed clinical guidelines available on the National Kidney Foundation's Web site ([www.kidney.org](http://www.kidney.org)):

- Treatment of reversible causes
- Aggressive blood pressure control
- Use of angiotensin-converting enzyme inhibitors/angiotensin receptor blockers and aldosterone antagonists
- Good glycemic control
- Lipid control
- Minimizing proteinuria
- Aggressive phosphorous management
- Moderate dietary protein restriction

#### ADDITIONAL READING

1. US Renal Data System: USRDS 1995 Annual Data Report. The National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 1995

2. Alebiosu CO: An update on 'progression promoters' in renal diseases. *J Natl Med Assoc* 95:30-42, 2003

**Table 1. Life Expectancy on Dialysis Therapy**

Age (y)	Life Expectancy (y)	
	On Dialysis Therapy	In General US Population
40-44	6.7-9.2	30.1-40.8
50-54	5.1-6.9	22.5-31.5
60-64	3.7-5.1	16.0-22.8
70-74	2.7-3.5	10.8-15.2
80-84	2.0-2.4	6.9-8.8

## MEDICATION USE

### Pharmacokinetics

- Challenges of prescribing in chronic kidney disease (CKD) population are confounded by age and accompanying comorbidities and polypharmacy
- Bioavailability may be reduced in elderly patients by:
  - Higher gastric pH
  - Changes in gut motility
  - Reduced blood flow to the bowel
  - Changes in first-pass metabolism in the liver
  - Induction of liver enzymes by coadministered drugs
- Distribution may be changed by:
  - Changes in serum protein levels
  - Changes in body composition
  - Competition for binding by coadministered drugs
- Renal clearance can be changed by:
  - Reductions in renal blood flow
  - Reductions in glomerular filtration
  - Reductions in tubular secretion
  - Reductions in tubular reabsorption
  - Changes in bound versus free drug concentrations
- Hepatic clearance and metabolism can be changed by:
  - Reduced hepatic blood flow
  - Changes in cytochrome activity

**Drugs Inappropriate for Elderly Patients**

- Many individual drugs and classes of drugs are well known to cause problems in elderly persons
- Many such drugs have central nervous system complications, but others cause hypotension, arrhythmias, and falls
- For full list of inappropriate medications for elderly persons, see the Beers criteria (originally published 1997, updated 2003)
- Common culprits include:
  - Analgesics, including nonsteroidal anti-inflammatory drugs (NSAIDs), opiates, tricyclics, propoxyphene, and meperidine
  - Benzodiazepines, especially those with long half-life and active metabolites
  - Barbiturates, except to control seizures acutely
  - Antispasmodics for both bowel and bladder
  - Antihistamines, including diphenhydramine
  - Decongestants containing ephedrine-related compounds
  - Muscle relaxants
  - Antiarrhythmics, amiodarone, short-acting calcium channel blockers, digoxin

**ADDITIONAL READING**

1. Beers MH: Explicit criteria for determining potentially inappropriate medication use by the elderly. *Arch Intern Med* 157:1531-1536, 1997
2. Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH: Updating the Beers criteria for potentially inappropriate medication use in older adults. *Arch Intern Med* 163:2716-2724, 2003

**RENAL CHALLENGES****Acute Renal Failure (ARF)**

- Was detailed in the March 2005 issue
- More than 50% of patients with ARF aged >60 years
- Many predisposing factors are more common in elderly persons:
  - Reduced renal blood flow
  - Reduced GFR
  - Volume contraction
  - Medications:
    - NSAIDs

- Angiotensin-converting enzyme inhibitors
- Angiotensin receptor blockers
- Diuretics
- Surgery
- Arrhythmias
- Sepsis
- Toxins, including drugs
- Thromboembolic disease
- Obstruction

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1. Dursun B, Edelstein CL: Acute renal failure [Core Curriculum in Nephrology]. *Am J Kidney Dis* 45:614-618, 2005
2. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P, The ADQI Workgroup: Acute renal failure-Definition, outcome measures, animal models, fluid therapy and information technology needs: The Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. *Crit Care* 8:R204-R212, 2004 (E-pub May 24, 2004)
3. Macias-Nunez JF, Lopez-Novoa JM, Martinez-Maldonado M: Acute renal failure in the aged. *Semin Nephrol* 16:330-338, 1996

**Renovascular Disease**

- Primarily a disease of the older population
- Was detailed in Core Curriculum on Hypertension in August 2004 issue
- Presentation, diagnosis, and treatment are, in principle, no different in older than in younger population
- Risk factors increase with increasing age:
  - Smoking
  - Atherosclerosis
  - Thromboembolic disease
  - Dissecting aneurysms
  - Vasculitis
  - Neurofibromatosis

**ADDITIONAL READING**

1. Warnock DG, Textor SC: Hypertension [Core Curriculum in Nephrology]. *Am J Kidney Dis* 44:369-375, 2004
2. Textor SC: Ischemic nephropathy: Where are we now? *J Am Soc Nephrol* 15:1974-1982, 2004

**Glomerular Disease**

- Autopsy series show glomerulosclerosis appears during fourth decade of life in otherwise normal kidneys
- In biopsies, it is superimposed on other pathological states, such as those caused by diabetes and hypertension

- Distribution of biopsy diagnoses changes with age
- Primary glomerulonephritides in order of frequency in the older population:
  - Membranous
  - Minimal change
  - Amyloidosis
  - Focal segmental
  - Membranoproliferative
- Secondary causes of glomerulonephritis extensively covered in August 2003 Core Curriculum
- Many conditions, such as diabetes and vasculitis, increase in frequency with age
- Older patients may have atypical presentations of these disorders, such as pulmonary edema or malignant hypertension
- Age not a contraindication to biopsy for diagnosis and treatment; indications and contraindications for biopsy are same as in younger patients—if patient is not suitable candidate for treatment because of frailty or advanced dementia, then workup should not be performed

#### ADDITIONAL READING

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2. Cameron JS: Nephrotic syndrome in the elderly. *Semin Nephrol* 16:319-329, 1996
3. Haas M, Spargo BH, Wit EJ, Meehan SM: Etiologies and outcome of acute renal insufficiency in older adults: A renal biopsy study of 259 cases. *Am J Kidney Dis* 35:433-447, 2000
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5. Nair R, Bell JM, Walker PD: Renal biopsy in patients aged 80 years and older. *Am J Kidney Dis* 44:618-626, 2004

#### Salt and Water Handling

- Older patients lose homeostatic reserve and become increasingly vulnerable to dehydration and/or volume overload
- More than 25% of older patients presenting acutely have abnormal serum sodium levels
- Increasing age is strong independent risk factor for hyponatremia and hypernatremia
- Predisposing risk factors:
  - Decreased total-body water
  - Impaired thirst perception
  - Decreased renal blood flow

- Decreased GFR
- Impaired tubular diluting capacity with inability to excrete water load
- Impaired renal concentrating capacity with inability to excrete salt load
- Impaired sodium conservation
- Impaired renal response to vasopressin
- Higher levels of atrial natriuretic peptide
- Decreased plasma renin concentrations
- Cognitive impairment
- Precipitating causes:
  - Impaired access to fluids and/or sodium, especially for institutionalized seniors
  - High fluid and/or sodium loss through gastrointestinal tract, sweating, etc
  - Volume and pressure changes related to surgery
  - Increased fluid intake, especially injudicious administration of intravenous fluids
  - Drugs, especially diuretics, NSAIDs
  - Syndrome of inappropriate antidiuretic hormone secondary to malignancy, drugs, cerebrovascular accidents
  - Comorbidities, especially cardiac and hepatic dysfunction
- Clinical presentation, workup, and treatment of common abnormalities of salt and water handling will be detailed in upcoming Core Curriculum

#### ADDITIONAL READING

1. Phillips PA, Rolls BJ, Ledingham JG, et al: Reduced thirst after water deprivation in healthy elderly men. *N Engl J Med* 311:753-759, 1984
2. Terzian C, Frye EB, Piotrowski ZH: Admission hyponatremia in the elderly: Factors influencing prognosis. *J Gen Intern Med* 9:89-91, 1994
3. Miller M, Morley JE, Rubenstein LZ: Hyponatremia in a nursing home population. *J Am Geriatr Soc* 43:1410-1413, 1995
4. Polderman KH, Schreuder WO, Strack van Schijndel RJ, Thijs LG: Hypernatremia in the intensive care unit: An indicator of quality of care? *Crit Care Med* 27:1105-1108, 1999

#### Renal Transplantation: Older Donors, Older Recipients

- Older patients increasingly are considered for transplantation
- May receive live donor kidney from older donor
- Special considerations in older recipients:

- They show lower acute rejection rates
- They show lower incidence of chronic rejection
- They show greater risk for infection/sepsis
- Donor and recipient age are independent risk factors for chronic allograft failure
- Donor and recipient age have additive effect on chronic allograft failure
- Greater survival probability than patients remaining on dialysis therapy, even when corrected for level of comorbidity
- Immunosuppression should be adjusted in older recipients

#### ADDITIONAL READING

1. Davis CL: Transplant: Immunology and treatment of rejection [Core Curriculum in Nephrology]. *Am J Kidney Dis* 43:1116-1134, 2004
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### GERIATRIC CHALLENGES

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#### Geriatric Assessment

- Evaluation of older patients should include the following domains:
  - Medical, including sensory domains
  - Full drug review, plus assessment of ability to manage regimen
  - Cognitive
  - Affective
  - Nutritional assessment
  - Functional, activities of daily living (ADLs), instrumental ADLs, driving, falls, incontinence
  - Social
  - Economic
  - Advanced directive
- Information gathered can be used to help decide level of treatment and modality most appropriate to meet patient's needs and limitations
- Care plan should include goal of maintaining independence and quality of life

#### ADDITIONAL READING

1. Stuck AE, Siu AL, Wieland GD, Adams J, Rubenstein LZ: Comprehensive geriatric assessment: A meta-analysis of controlled trials. *Lancet* 342:1032-1036, 1993
2. Reuben DB, Rubenstein LV, Hirsch SH, Hays RD: Value of functional status as a predictor of mortality: Results of a prospective study. *Am J Med* 93:663-669, 1992
3. Cohen HJ, Feussner JR, Weinberger M, et al: A controlled trial of inpatient and outpatient geriatric evaluation and management. *N Engl J Med* 346:905-912, 2002

#### Decisional Capacity and Competency

- Frequently necessary to judge whether an older patient is capable of making an informed decision before a medical procedure
- Delirium and dementia not necessarily barriers to informed consent
- Requirements for informed decision making:
  - Does person understand the information you have presented?
  - Does patient understand the consequences (positive, negative) of decision?
  - Can patient communicate their decision in consistent and meaningful way?
- Asking the patient to describe the treatment planned and positive and negative consequences of their decision usually is sufficient to assess their competency to make their own decisions
- Under most circumstances, formal testing with a cognitive instrument is not necessary
- In difficult cases, consultation with a psychiatrist or geriatrician may be necessary to get second opinion
- If patient is deemed not competent, medical consent should be sought from the designated decision maker (durable power of attorney)
- If no durable power of attorney selected, family member can give consent on patient's behalf; if dispute among family members or no family exists, temporary guardianship may be obtained from court

#### ADDITIONAL READING

1. Resau LS: Obtaining informed consent in Alzheimer's research. *J Neurosci Nurs* 27:57-60, 1995
2. Stanley B, Guido J, Stanley M, Shortell D: The elderly patient and informed consent: Empirical findings. *JAMA* 252:1302-1306, 1984

## Delirium

- Delirium is an acute and potentially reversible change in mental status
- Up to 60% of older patients in hospital will develop delirium
- Patients with renal impairment are particularly vulnerable
- Can take months to clear after severe or prolonged delirium
- Many patients never recover baseline functional and cognitive level
- Significantly increases mortality (~30%)
- Predisposing causes:
  - Age
  - Underlying cognitive impairment
  - Severe comorbid illness
- Precipitating causes:
  - Medications, particularly anticholinergic and psychoactive agents
  - Dehydration
  - Infections
  - Hypoxia
  - Hypotension
  - Metabolic abnormalities
  - Malnutrition
  - Sensory impairments
  - Alcohol withdrawal
  - Immobilization
  - Foley catheter
  - Physical restraints
- Diagnostic criteria:
  - Delirium diagnosis requires features 1 and 2 with either 3 or 4:
    - (1) Acute onset with fluctuating course
    - (2) Inattention
    - (3) Disorganized thinking
    - (4) Altered level of consciousness
  - Recognizing inattention during brief interaction with patient is key to diagnosing delirium
  - Asking patient to recite days of week backwards is easy bedside test to uncover inattention
- Clinical assessment:
  - Look for all precipitating causes listed previously
  - Review medication list
  - Computed tomographic (CT) scan is unlikely to help in absence of new focal neurological signs

- Management:
  - Focus on reversal of precipitating causes
  - Aggressive management of uremia/azotemia
  - Environmental support with frequent re-orientation
  - Use of sleep protocol to minimize nighttime interruptions
  - Use of neuroleptics should be avoided unless patient is danger to self or others or has highly distressing delusions or hallucinations

## ADDITIONAL READING

1. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegel AP, Horwitz RI: Clarifying confusion: The confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 113:941-948, 1990
2. Inouye SK: Predisposing and precipitating factors for delirium in hospitalized older patients. *Dement Geriatr Cogn Disord* 10:393-400, 1999
3. Ely EW, Inouye SK, Bernard GR, et al: Evaluation of delirium in mechanically ventilated patients: Validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *JAMA* 286:2703-2710, 2001
4. Marcantonio ER, Simon SE, Bergmann MA, Jones RN, Murphy KM, Morris JN: Delirium symptoms in post-acute care: Prevalent, persistent, and associated with poor functional recovery. *J Am Geriatr Soc* 51:4-9, 2003

## Depression

- Prevalence ~40% to 45% in patients with CKD
- Quoted incidence varies from 10% to 45% in dialysis population
- Vegetative symptoms very similar to uremia or underdialysis
- Same spectrum of symptoms as in younger patients, but functional and cognitive decline is particularly common in elderly persons
- Depression should be considered in any patient who undergoes rapid functional or cognitive decline
- Diagnostic criteria:
  - Depressed mood
  - Anhedonia/loss of pleasure in life
  - Sleep disturbance
  - Appetite or weight change
  - Decreased energy
  - Increased or decreased psychomotor activity
  - Decreased concentration and attention

- Guilt or feelings of worthlessness
- Suicidal ideation
- Clinical assessment:
  - Many validated assessment scales available, such as Beck Depression Inventory or Geriatric Depression Scale
  - ESRD/uremia carry significant burden of misery related to chronic disease; aggressive intervention should be prompted by suicidal ideation and feelings of guilt and worthlessness
- Management:
  - Educate patient about depression and benefits of treatment
  - Initiate antidepressant at lowest reasonable dose
  - Cautious upward titration at monthly intervals
  - Encourage group or individual psychotherapy

#### ADDITIONAL READING

1. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J: An inventory for measuring depression. *Arch Gen Psychiatry* 4:561-571, 1961
2. Yesavage JA, Brink TL, Rose TL, et al: Development and validation of a geriatric depression screening scale: A preliminary report. *J Psychiatr Res* 17:37-49, 1982-1983
3. Kimmel PL: Depression in patients with chronic renal disease: What we know and what we need to know. *J Psychosom Res* 53:951-956, 2002
4. Watnick S, Kirwin P, Mahnensmith R, Concato J: The prevalence and treatment of depression among patients starting dialysis. *Am J Kidney Dis* 41:105-110, 2003

#### Dementia

- As patients with CKD and ESRD live longer and more older patients are being offered dialysis therapy, nephrologists increasingly are being confronted with patients who manifest cognitive deficits
- Recent study by Kurella et al validated use of Kidney Disease Quality of Life Cognitive Function subscale (KDQOL-CF) as screening tool for patients in this population who show cognitive impairment signs
- KDQOL-CF is self-administered easy-to-score questionnaire; patients who rule in on the KDQOL-CF warrant further workup

#### Alzheimer disease

- Accounts for 70+% of late-life dementia

- Characterized by memory loss and deficits in at least 2 other cognitive domains
- Frequently starts in the seventh life decade
- Affects 50% of persons aged >85 years
- Unlike delirium, is progressive over a slow course
- Often includes such behavior problems as agitation and aggression
- Baseline mental status is confounded by uremia
- Predisposing causes:
  - Age
  - Presence of apolipoprotein E 4 allele
  - History of head trauma
  - First-degree relative with Alzheimer dementia
- Clinical assessment:
  - Magnetic resonance imaging/CT scan of the brain showing volume loss
  - Laboratory tests for vitamin B<sub>12</sub>, thyroid, and syphilis to exclude treatable causes
  - Neuropsychological cognitive testing to document losses
- Management:
  - Education of patient and family
  - Social work to help identify supportive resources
  - Discussion about place of dialysis in presence of dementia
  - Cholinesterase inhibitors, such as donepezil
  - High-dose vitamin E
  - Antipsychotics for problematic behaviors
  - N-Methyl-D-aspartate receptor antagonist, such as memantine
  - Antidepressants/mood stabilizers, when appropriate
  - Geriatric psychiatry consult may help
  - Trial of dialysis therapy to assess role of uremia in cognitive deficits

#### Vascular dementia

- Vascular disease is leading cause of morbidity and mortality in patients with CKD
- Vascular dementia is responsible for 10% to 20% of dementias in general population
- No data available on prevalence of vascular dementia in renal population
- Characterized by abrupt onset associated with vascular event

- Progression is stepwise, rather than gradual, and associated with additional events
- Domains of intact functioning often contrast with domains of profound impairment because this is by nature a focal process
- Postmortem studies show that 50% of vascular dementias also have pathological signs of Alzheimer disease
- Predisposing causes:
  - Strokes: embolic, thrombotic, or hemorrhagic
  - Head injury with subarachnoid/subdural bleed
  - Small-vessel ischemia, particularly in patients with diabetes
  - Autoimmune disease, especially lupus and vasculitis
  - Infections, neurosyphilis, Lyme disease, human immunodeficiency virus
  - Systemic amyloidosis
- Clinical assessment:
  - Focal neurological signs, such as asymmetrical reflexes
  - Urinary dysfunction and gait disturbances common
  - Magnetic resonance imaging/CT scan of brain showing focal deficits or vasculitis
  - Neuropsychological cognitive testing showing focal deficits
- Management:
  - Education of patient and family
  - Social work to help identify supportive resources
  - Discussion about place of dialysis therapy in presence of dementia
  - Drugs developed for Alzheimer disease have not been shown useful
  - Antipsychotics for problematic behaviors
  - Antidepressants/mood stabilizers, when appropriate
  - Geriatric psychiatry consult may help
  - Trial of dialysis therapy to assess role of uremia in cognitive deficits

#### ADDITIONAL READING

1. McKhann G, Drachman D, Folstein M, Katzman R, Price D, Stadlan EM: Clinical diagnosis of Alzheimer's disease: Report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. *Neurology* 34:939-944, 1984
2. Geldmacher DS, Whitehouse PJ: Evaluation of dementia. *N Engl J Med* 335:330-336, 1996
3. Kurella M, Luan J, Yaffe K, Chertow GM: Validation of the Kidney Disease Quality of Life (KDQOL) Cognitive Function subscale. *Kidney Int* 66:2361-2367, 2004

#### Falls

- One third of community-dwelling seniors aged >65 years have falls each year
- One half of seniors aged >80 years have falls
- 5% of falls result in injury
- Fractures 4 times more common in ESRD population than general population
- Predisposing causes:
  - Osteoarthritis
  - Deconditioning
  - Parkinson disease
  - Normal-pressure hydrocephalus
  - Multiple sensory deficits
  - Vestibular disease
  - Stroke
  - Neuromuscular disease
  - Cardiovascular disease
  - Autonomic dysfunction
  - Gait and balance disorders
  - Alcohol abuse
  - Dementia/poor judgment about safety
  - Abuse and neglect by caregivers
- Precipitating causes:
  - Orthostasis
  - Hypovolemia
  - Anemia
  - Electrolyte disturbances
  - Hypoglycemia/hyperglycemia
  - Hypothyroidism
  - Hypercapnia
  - Acute infections
  - Medications, particularly psychoactive medications
  - Environmental hazards
- Clinical assessment:
  - Assess patient for listed pathological states
  - Brain CT only indicated with focal neurological abnormalities
  - Holter monitor only when cardiac symptoms associated with falls
- Management:
  - Minimize environmental risk with home safety evaluation

- Treat any of listed reversible pathological states
- Physical therapy for gait and balance training, strengthening, and endurance
- Appropriate walking aid: 4-prong cane, walker

#### ADDITIONAL READING

1. Tinetti ME, Baker DI, McAvay G, et al: A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *N Engl J Med* 331:821-827, 1994
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3. King MB, Tinetti ME: Falls in community-dwelling older persons. *J Am Geriatr Soc* 43:1146-1154, 1995

#### Osteoporosis

- Complicated by renal osteodystrophy in this population
- One million Americans experience osteoporotic fractures each year
- Incidence of fractures in ESRD population 4 times that of age-matched controls
- Fractures lead to functional impairment
- 50% of patients with hip fracture do not recover baseline function
- 20% of patients with hip fracture die during year after fracture
- Risk factors:
  - Age
  - Female sex
  - Hyperparathyroidism
  - Smoking
  - Low body weight
  - Estrogen deficiency
  - Low calcium/vitamin D intake
  - Alcoholism
  - Inadequate physical activity
  - Family history of osteoporosis
  - Hyperthyroidism
  - Hypogonadism (in men)
  - Long-term steroid therapy
  - Renal transplantation
  - Diabetes
  - Medications: steroids, anticonvulsants, furosemide, heparin
- Diagnosis:
  - Incident fracture, especially compression fracture in spine
  - Bone density t score <2.5 SDs on dual-energy x-ray absorptiometry scan

- Quantitative CT preferred in CKD population because measurements are not confounded by arterial calcification
- Treatment:
  - Treatment of modifiable risk factors
  - Exercise
  - Supplementation with calcium and vitamin D is contraindicated
  - Low-dose bisphosphonates
    - Data on bisphosphonate use in ESRD population are sparse and care is needed with dosing. Small studies have shown measurable increases in bone mineral density and reductions in fractures in dialysis population. They are efficacious in transplant population. Bisphosphonates are contraindicated in adynamic bone disease
  - Calcitonin: probably safe, no efficacy data
  - No safety or efficacy data on use of estrogens and derivatives in patients with CKD

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4. Ball AM, Gillen DL, Sherrard D, et al: Risk of hip fracture among dialysis and renal transplant recipients. *JAMA* 288:3014-3018, 2002

#### Rehabilitation

- Nephrologist often involved in rescue of patients with overwhelming and catastrophic illness
- These patients typically have long and complicated hospital course, with prolonged periods sedated in the intensive care unit
- These patients often are highly debilitated at time of discharge
- If renal function has not recovered and period of outpatient dialysis therapy is

initiated, issue of functional impairment must be addressed at discharge:

- Patients need to be able to get in and out of their home, a vehicle, and the dialysis unit to access care
- Patients need to be able to sit upright in chair for several hours to complete adequate long-term dialysis
- Criteria for referral to rehabilitation program:
  - Patient must have been functional before hospitalization
  - Patient must have potentially reversible deficit
  - Patient must be motivated to work with therapist (assess for depression)
  - Patient must be cognitively able to process and follow instructions
  - Patient must be able to remember a several-step routine from 1 session to the next (eg, safe transfer from wheelchair to dialysis chair)
- 3 Levels of rehabilitation available under Medicare:
  - (1) Acute inpatient rehabilitation:
    - Patients need to be able to sustain 3 hours of therapy a day and show progress over short period to meet reimbursement criteria
    - Method has advantage that dialysis in hospital can be continued
  - (2) Subacute rehabilitation:
    - Typically occurs in subacute facility or nursing home
    - Patients must be able to sustain daily therapy, but less intense than acute rehabilitation
    - Patients must show progress to meet reimbursement criteria
    - Very few nursing homes offer dialysis therapy and do not get reimbursed for transportation
    - Families typically have to bear cost or burden of transportation to and from dialysis
  - (3) Home rehabilitation:
    - Therapists visit 2 to 3 times/wk
    - No specialized equipment available to help exercise patient

- Transportation to dialysis may be an issue

#### ADDITIONAL READING

1. Hoenig H, Nusbaum N, Brummel-Smith K: Geriatric rehabilitation: State of the art. *J Am Geriatr Soc* 45:1371-1381, 1997
2. Hirsch CH, Sommers L, Olsen A, Mullen L, Winograd CH: The natural history of functional morbidity in hospitalized older patients. *J Am Geriatr Soc* 38:1296-1303, 1990

#### Frailty

- No consensus definition
- 50% of people aged >85 years appear frail
- Incidence greater in patients with impaired kidney function
- Carries poor long-term prognosis
- Frail patients show impaired ability to recover from insults
- Characteristics:
  - Unintentional weight loss
  - Sarcopenia
  - Weakness
  - Balance and gait abnormalities
  - Undernutrition
  - Impaired homeostatic reserve
- Clinical assessment:
  - Rule out other causes:
    - Occult malignancy
    - Cardiac cachexia
    - Chronic infection
    - Diabetes
    - Thyroid disease
    - Temporal arteritis/vasculitis
    - Depression
    - Dementia
    - Abuse/neglect
    - Alcohol abuse
    - Dysphagia/malabsorption
- Management:
  - Treat underlying disease process, when appropriate
  - Supportive services
  - Discuss end-of-life preferences with patient

#### ADDITIONAL READING

1. Verdery RB: Clinical evaluation of failure to thrive in older people. *Clin Geriatr Med* 13:769-778, 1997
2. Shlipak MG, Stehman-Breen C, Fried LF, et al: The presence of frailty in elderly persons with chronic renal insufficiency. *Am J Kidney Dis* 43:861-867, 2004

3. Mitnitski AB, Mogilner AJ, MacKnight C, Rockwood K: The mortality rate as a function of accumulated deficits in a frailty index. *Mech Ageing Dev* 123:1457-1460, 2002

### Nutrition

- Uremia characterized by anorexia, nausea, and vomiting
- Maintaining balance between protein malnutrition and azotemia is continuing challenge
- Nutritional status is an important predictor of mortality and morbidity in this population
- Nutritional needs of older patients with CKD or on dialysis therapy are no different from those of younger patients with CKD; challenges are related to impaired functional status—patients may no longer be driving and have less access to food choices, may no longer be cooking, and accommodating complex dietary requirements may be unrealistic
- Barriers to nutrition in older adults:
  - Low income
  - Lack of transportation
  - Lack of mobility
  - Depression
  - Impaired cognition
  - Loss of function from stroke, arthritis, Parkinson disease, etc
  - Impaired sensory function
  - Lack of dentition
  - Drugs that reduce appetite or cause nausea
  - Lack of caregiver
- Goals of nutrition:
  - Maintain good nutritional status:
    - Maintain calorie and energy intake
    - Prevent protein malnutrition
  - Slow rate of progression of renal failure
  - Prevent uremic toxicity and metabolic derangements:
    - Avoidance of azotemia
    - Acid-base management
    - Phosphorus management
    - Potassium management
    - Vitamin supplementation, especially vitamins D, B<sub>6</sub>, folic acid
    - Trace mineral supplementation
  - Anemia management

- Salt restriction to aid in blood pressure control

- Full nutritional practice guidelines for patients with CKD and those on renal replacement therapy can be found at National Kidney Foundation's Web site ([www.kidney.org](http://www.kidney.org)) under Clinical Guidelines

### ADDITIONAL READING

1. Salva A, Corman B, Andrieu S, Salas J, Vellas B, International Association of Gerontology/International Academy of Nutrition and Aging Task Force: Minimum data set for nutritional intervention studies in elderly people. *J Gerontol A Biol Sci Med Sci* 59:M724-M729, 2004
2. Hendy HM, Nelson GK, Greco ME: Social cognitive predictors of nutritional risk in rural elderly adults. *Int J Aging Hum Dev* 47:299-327, 1998
3. Ohri-Vachaspati P, Sehgal AR: Quality of life implications of inadequate protein nutrition among hemodialysis patients. *J Ren Nutr* 9:9-13, 1999
4. Kopple JD, Greene T, Chumlea WC, et al: Relationship between nutritional status and glomerular filtration rate: Results from the MDRD study. *Kidney Int* 57:1688-1703, 2000

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### END OF LIFE

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Issues of planning for withdrawing/withholding dialysis therapy and other end-of-life issues, which are most pertinent in the older population, were addressed in the Core Curriculum on Palliative Care (January 2004 issue). The decision to start dialysis therapy in an older patient with multiple comorbidities is a complex one for which we have few guidelines. It is compounded by the interaction of uremia, delirium, and dementia. Patients often are unable to clearly express their wishes, particularly under acute circumstances. For patients with a gradual decline in renal function, making space in the treatment plan for detailed discussion of an advanced directive can be most helpful.

Referral to hospice at the end of life can be very useful in terms of patient support, family support, and quality of care. If the patient is referred with kidney failure as the primary diagnosis, the hospice provider will withdraw dialysis therapy. Often patients are willing to accept hospice support, but are unwilling to terminate dialysis therapy. Under these circumstances, an alternative certifying diagnosis is required. The patient may have other qualifying conditions, such as heart failure, advanced lung disease, or

cancer. Dementia needs to be very far advanced before it can qualify as the certifying diagnosis. Patients need to have lost the ability to perform ADLs, speak fewer than 6 meaningful words, and be doubly incontinent and unable to walk. Under these circumstances, “general debility/failure to thrive” can be a useful catchall diagnosis for certification. This requires that the patient manifests dependence in 3 of 6 ADLs, or equivalent functional decline, and that the patient has had unintentional progressive weight loss of 10% during preceding 6 months. If there is doubt

about a patient’s suitability for hospice referral, a geriatric consult or palliative care consult can be very helpful.

#### ADDITIONAL READING

1. Moss AH, Holley JL, Davison SN, et al: Palliative Care [Core Curriculum in Nephrology]. *Am J Kidney Dis* 43:172-185, 2004
2. Standards and Accreditation Committee: Medical Guidelines Task Force: Medical Guidelines for Determining Prognosis in Selected Non-Cancer Diseases. Arlington, VA, The National Hospice Organization, 1996