Update on Medication Use in Older Adults
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Objectives
• Review pharmacokinetics and pharmacodynamics as they relate to older adults
• Summarize common medications prescribed to older persons and their appropriate dosages, their known side effects, and drug-drug interactions
• Discuss evaluation and management of polypharmacy in older adults

Aging in the United States
• Projections-older than 65 years
  • 50 million by 2020
  • 70 million by 2030
  • 80 million by 2050
• Older adults account for about 13% of the population but are responsible for:
  • 34% of medication costs
  • 35% of hospital stays
  • 40% of medication-related hospitalizations
  • 50% of medication-related deaths
• Roughly $30 billion/year is spent on medication-related morbidity

Klotz U. Pharmacokinetics and drug metabolism in the elderly. Drug Metabolism Reviews 2009; 41:67-76.
Optimal Medication Use

- Optimal medication regimen:
  - Correct doses and dosage forms
  - Appropriate duration
  - Affordable
  - Avoid drug-induced loss of patient function
  - Avoid drug-related problems
- Medication doses must be adjusted because of age-associated changes

Aging Changes that Affect Drugs

<table>
<thead>
<tr>
<th>Organ system</th>
<th>Changes with age</th>
<th>Effect on drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal</td>
<td>↑ Stomach pH</td>
<td>Rate of absorption may be longer</td>
</tr>
<tr>
<td></td>
<td>↓ GI blood flow</td>
<td>Distribution and accumulation of fat soluble drugs</td>
</tr>
<tr>
<td>Skin</td>
<td>Thinning</td>
<td>Transdermal medications may not be as effective</td>
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<tr>
<td></td>
<td>Loss of subcutaneous fat</td>
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<tr>
<td>Body composition</td>
<td>Total body water</td>
<td>Distribution of water soluble drugs</td>
</tr>
<tr>
<td></td>
<td>Lean body mass</td>
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<td></td>
<td>Body fat</td>
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<td></td>
<td>Albumin</td>
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<tr>
<td>Liver</td>
<td>Liver mass</td>
<td>Clearance of drug through liver</td>
</tr>
<tr>
<td></td>
<td>Liver blood flow</td>
<td>Time the drug stays in body</td>
</tr>
<tr>
<td>Kidney</td>
<td>Kidney mass</td>
<td>Elimination of drugs by kidney</td>
</tr>
<tr>
<td></td>
<td>Kidney blood flow</td>
<td>Time the drug stays in body</td>
</tr>
</tbody>
</table>

Drug effects on the body

- Change in receptors in the body
  - More sensitive to benzodiazepines
  - More sensitive to opioids
  - Increased response to warfarin
  - Decreased response to β-blockers
  - Increased sensitivity to extrapyramidal effects (tremor, slurred speech, muscle rigidity, restless movements) and tardive dyskinesia (slow involuntary movements)
- Age-related change in homeostasis
  - Postural hypotension
  - Sodium and water conservation
  - Mobility and balance
Drug-related problems in older adults

- Use of inappropriate medications
- Adverse drug events
- Drug interactions
- Medication adherence
  - Intentional non-adherence related to perceptions
  - Unintentional non-adherence
  - Adverse drug effects
  - Cost
- Overuse
- Underuse
  - Angiotensin-converting enzyme (ACE) inhibitors in CHF
  - Anticoagulation in atrial fibrillation
  - Drug therapy post myocardial infarction
  - Untreated depression
  - Untreated osteoporosis

Adverse Drug Reactions (ADRs)

- 7 times more common in persons aged 70 to 79 than in those 20 to 29
- Up to 17% of elderly hospital admission
- Antibiotics, anticoagulants, digoxin, diuretics, hypoglycemic agents, antineoplastic agents and NSAIDs are responsible for 60% of ADRs leading to hospital admission and 70% of ADRs occurring in hospitals

Symptoms of ADRs

- ↑ Frequency of falls
- ↑ Confusion
- Excessive sedation
- Constipation
- Urinary retention
- ↓ Oral intake
- Failure to thrive
Managing ADRs

• Discontinue the drug
• Change drug therapy
• Modify the dose

Possible Complications of ADRs

• Necessitates admission to the hospital
• Prolongs stay
• Complicates diagnosis
• Affects prognosis
• Results in harm or death

Avoiding ADRs

• Avoid combinations with toxic effects
• Titrate slowly
• Monitor levels
• Keep drugs to a minimum
• Limit number of physicians/pharmacies
• Report ADRs
Drug Interactions

• 50% probability for having a drug interaction when a patient is receiving 5 medications and the probability increases to 100% when 7 drugs are used

• Avoiding drug interactions
  • Avoid the combination
  • Adjust the dose of the object drug
  • Alter the administration times
  • Monitor for early detection

Polypharmacy

• Definition: refers to problems that can occur when a patient is taking more medications than are actually needed
  • Adverse drug reactions
  • Drug-drug interactions
  • Decreased compliance
  • Drug expense

Factors leading to polypharmacy

• Complex medication regimen
• Multiple physicians/pharmacies
• Lack of reporting all medications/symptoms
• Prescribing without compete diagnosis
• Lack of medication instructions
• Daily activities
Patient education

- Pill boxes/timers
- Medication log
- Report missed doses
- Avoid skipping pills
- Avoid cutting medication in half to extend life of Rx
- Don’t stop medication if they “feel good”
- Report adverse effects of medication

Highest rates of Noncompliance

- Elderly living alone
- Using > 2 medications
- No assistance taking medications
- Using more than 1 pharmacy
- Women traditionally > men regarding noncompliance
- Patient recall/Forgetfulness
- Increased number of physicians
- Cost of medication
  - Higher monthly cost after insurance reimbursement
  - Not covered by insurance
  - Perceived expense
  - Household income

Potentially Inappropriate Medications

BEERS List

- Common offenders
  - Diphenhydramine
  - Long acting benzodiazepines (Diazepam, Chlordiazepoxide)
  - Skeletal muscle relaxants (Carisoprodol, Cyclobenzaprine, Metaxalone, Methocarbamol)
  - Amitriptyline, Doxepin, Imipramine
  - Anticholinergics
  - Indomethacin, Piroxicam
  - Promethazine
  - Z-drugs (sleeping agents: zolpidem, zaleplon, eszopiclone)
Insomnia

• Annual incidence = 5% of elderly patients

• Risk factors
  • Lower socioeconomic
  • Lower education
  • Widow
  • Female sex

Impact of Insomnia

• Physical and mental problems
  • Fatigue, irritability, anxiety
  • Decreases memory and concentration
  • Impairs performance and psychomotor tests
  • Increases risk for falls
Management

- If insomnia is due to other medical conditions, treat the primary disease process
- Sleep hygiene
- Physiologic interventions
- Behavioral therapy

Management

Controlled Substances
- Benzodiazepine
- Non-benzodiazepine
  - Zolpidem (Ambien®)
  - Zaleplon (Sonata®)
  - Eszopiclone (Lunesta®)
- Orexin receptor antagonist
  - Suvorexant (Belsomra®)

Non-controlled substances
- Antihistamine Drugs
  - Diphenhydramine
  - Hydroxyzine
- Melatonin receptor agonist
  - Ramelteon (Rozerem®)
  - Tasimelteon (Hetlioz®)

Benzodiazepines

- Effects on insomnia
  - Reduce REM sleep
  - Decrease sleep delay
  - Decrease night awakening
- Notes
  - Rebound insomnia can occur within 1-2 weeks of therapy
  - Avoid long acting benzodiazepine
  - Can cause dependence
Benzodiazepines

- **Short-acting**
  - Triazolam
- **Intermediate-acting**
  - Alprazolam, lorazepam, oxazepam, temazepam
- **Long-acting**
  - Diazepam, clonazepam, chlordiazepoxide, flurazepam, clorazepate

**Adverse effects include:**
- Morning sedation
- Amnesia
- Anxiety
- Impaired balance
- Increased falls/hip fractures

Non-Benzodiazepine

- **Zolpidem**
  - Most commonly prescribed
  - Use with caution in elderly
  - Use lowest dose available
  - Recommended not to use > 90 days
  - Lower dose in women
  - Adverse effects
  - Delirium
  - Dizziness
  - Falls
  - Fractures
  - Decreased blood pressure

- **Zaleplon**
  - Shortest acting
  - Adverse effects
  - Headache
  - Dizziness
  - Drowsiness

- **Eszopiclone**
  - Adverse effects
  - 30% experience unpleasant taste
  - Headache
  - Dizziness
  - Drowsiness

Melatonin Receptor Agonists

- **Ramelteon**
  - Acts on melatonin to induce sleepiness
  - Can be used for long-term treatment of sleep-onset insomnia
  - Few adverse effects aside from sedation
  - Many drug interactions
  - Contraindicated in use with fluvoxamine

- **Tasimelteon**
  - Acts on melatonin to induce sleepiness
  - Many drug interactions
  - Side effects
  - Headache
  - Abnormal dreams
  - Increased liver function tests
Antihistamines

- Over-the-counter:
  - Diphenhydramine
  - Doxylamine
- Adverse effects are numerous including:
  - Cognitive impairment
  - Urinary retention
  - Constipation
  - Little data to support use

Orexin receptor antagonist

- Suvorexant
  - Blocks the binding of wake-promoting neuropeptides orexin to suppress wake drive
  - Approved August 2014
  - Many drug interactions!
  - Side effects
    - Headache
    - Dizziness
    - Abnormal dreams
    - Physical dependence
    - Depression

Other agents for sleep

- Trazodone has been studied and shown comparable with zolpidem
  - Morning sedation can be a problem
  - Immediate release tablets used
- Herbals:
  - Melatonin
    - Hormone secreted during the night
    - Shown to help with falling asleep but not staying asleep
    - Not FDA approved
    - Morning sedation can be a problem
  - Valerian
    - Most used herbal for sleep
    - Variety among preparations leads to variability in results
    - Not FDA approved
### Benzodiazepines

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triazolam (Insomnia)</td>
<td>Initial dose: 0.125 mg at bedtime</td>
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<tr>
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<td>Maximum dose: 0.25 mg once daily</td>
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<tr>
<td>Alprazolam (Anxiety)</td>
<td>Immediate release: Initial dose: 0.25 mg 2-3 times daily</td>
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<td></td>
<td>Extended release: Initial dose: 0.5 mg once daily</td>
</tr>
<tr>
<td>Lorazepam (Anxiety)</td>
<td>Initial dose: 0.5 mg not to exceed 2 mg initially</td>
</tr>
<tr>
<td>Oxazepam (Anxiety)</td>
<td>Initial dose: 10 mg 3 times daily</td>
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<tr>
<td></td>
<td>if necessary, increase cautiously to 15 mg 3-4 times daily</td>
</tr>
<tr>
<td>Temazepam (Insomnia)</td>
<td>Initial dose: 7.5 mg in elderly or debilitated patients at bedtime</td>
</tr>
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### Benzodiazepines

<table>
<thead>
<tr>
<th>Medication</th>
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<tbody>
<tr>
<td>Diazepam (Anxiety)</td>
<td>2 to 2.5 mg 1 to 2 times daily initially; increase gradually as needed and tolerated</td>
</tr>
<tr>
<td>Clonazepam (REM sleep behavior disorder; off-label)</td>
<td>0.25-2 mg 30 minutes prior to bedtime</td>
</tr>
<tr>
<td>Chlordiazepoxide (Anxiety)</td>
<td>5 mg 2-4 times daily</td>
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<tr>
<td></td>
<td>Avoid use if possible due to long-acting metabolite</td>
</tr>
<tr>
<td>Flurazepam (Insomnia)</td>
<td>15 mg at bedtime</td>
</tr>
<tr>
<td>Chlorazepate (Anxiety)</td>
<td>7.5 mg 1-2 times/day</td>
</tr>
<tr>
<td></td>
<td>Use is not recommended in the elderly</td>
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### Non-Benzodiazepine

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
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</thead>
<tbody>
<tr>
<td>Zolpidem (Insomnia)</td>
<td>Immediate-release tablet, spray: 5 mg immediately before bedtime (maximum)</td>
</tr>
<tr>
<td></td>
<td>Extended release tablet: 6.25 mg immediately before bedtime</td>
</tr>
<tr>
<td>Zaleplon (Insomnia)</td>
<td>Usual dosage 5 mg immediately before bedtime</td>
</tr>
<tr>
<td></td>
<td>Maximum dose: 10 mg once daily</td>
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<tr>
<td>Eszopiclone (Insomnia)</td>
<td>Initial dose: 1 mg immediately before bedtime</td>
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<tr>
<td></td>
<td>Maximum dose: 2 mg once daily</td>
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</table>
Melatonin Receptor Agonists

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramelteon (Insomnia)</td>
<td>8 mg tablet within 30 minutes of bedtime</td>
</tr>
<tr>
<td>Tasimelteon (Non-24-hour sleep-wake disorder)</td>
<td>20 mg once daily at the same time each night before bedtime</td>
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Antihistamines

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
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<tbody>
<tr>
<td>Diphenhydramine (Insomnia)</td>
<td>Initial dose: 25 mg at bedtime</td>
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<tr>
<td></td>
<td>Maximum dose: 50 mg at bedtime</td>
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<tr>
<td>Doxylamine (Insomnia)</td>
<td>25 mg once daily before bedtime</td>
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</table>

Other Sleep Agents

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
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<tbody>
<tr>
<td>Suvorexant (Insomnia)</td>
<td>Usual dose: 10 mg once daily within 30 minutes of bedtime; Maximum dose: 20 mg once daily</td>
</tr>
<tr>
<td>Trazodone (Insomnia: Off label use)</td>
<td>50 mg to 100 mg at bedtime</td>
</tr>
<tr>
<td>Melatonin (Insomnia)</td>
<td>3 to 5 mg at least 1 hour before bedtime</td>
</tr>
<tr>
<td>Valerian (Insomnia)</td>
<td>Valerian extract 400 to 600 mg taken 1 hour before bedtime</td>
</tr>
<tr>
<td>Doxepin (Insomnia)</td>
<td>3 mg once daily within 30 minutes of bedtime; increase to 6 mg once daily if clinically needed; maximum dose: 6 mg daily</td>
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</tbody>
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Depression
Depression

• Prevalence of major depression
  • 1-2% in general population
  • 1-3% in community-dwelling older adults
  • 10-15% in hospitalized patients
• Depression in combination with other medical conditions causes worsening outcomes


Treatment

• Psychotherapy
• Pharmacological
  • Serotonin Selective Reuptake Inhibitors (SSRI)
  • Serotonin Norepinephrine Reuptake Inhibitors (SNRI)
  • Other second generation antidepressants
  • Tricyclic antidepressant (TCA)
• Augmentation
  • Lithium
  • Atypical antipsychotic


SSRI

• First line treatment for elderly depression
• Takes approximately 6 weeks for full effect
• Watch for suicidal ideation
  • Risk factors: men, age > 75 years old, physical illness, persistent pain, mood disorders, alcohol abuse, anxiety, bereavement, and social isolation
• Increases risk for falls
  • Fluoxetine, fluvoxamine, paroxetine, citalopram, and sertraline

SSRI Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoxetine</td>
<td>Initial dose: 10 mg once daily with dosage increases of 10 mg and 20 mg every several weeks as tolerated.</td>
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<tr>
<td></td>
<td>Maximum dose: 80 mg once daily</td>
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<tr>
<td>Fluvoxamine</td>
<td>Initial dose: 50 mg once daily at bedtime with dosage increases to 100 mg daily as tolerated with usual dosage range: 100 mg to 200 mg once daily</td>
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<tr>
<td></td>
<td>Maximum dose: 300 mg once daily</td>
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<tr>
<td>Paroxetine</td>
<td>Immediate release: initial dose: 16 mg once daily, maximum dose: 40 mg/day</td>
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<td></td>
<td>Controlled release: initial dose: 12.5 mg once daily, maximum dose: 50 mg/day</td>
</tr>
<tr>
<td>Citalopram</td>
<td>Elderly &gt;60 years: initial dose: 20 mg once daily</td>
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<tr>
<td></td>
<td>Maximum dose in adults &gt;60 years: 20 mg once daily due to increased exposure and the risk of QT prolongation</td>
</tr>
<tr>
<td>Escitalopram</td>
<td>Initial dose: 10 mg once daily</td>
</tr>
<tr>
<td></td>
<td>Maximum dose: 20 mg once daily</td>
</tr>
<tr>
<td>Sertraline</td>
<td>Initial dose: 50 mg once daily</td>
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<td></td>
<td>Maximum dose: 200 mg once daily</td>
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</tbody>
</table>

SSRI Side Effects

- Insomnia
- Anxiety
- Nausea
- Diarrhea
- Sexual dysfunction
- Urinary incontinence
- Headache
- Decreased sodium

Serotonin Norepinephrine Reuptake Inhibitors

<table>
<thead>
<tr>
<th></th>
<th>Venlafaxine</th>
<th>Desvenlafaxine</th>
<th>Mirtazapine</th>
<th>Duloxetine</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS</td>
<td>↑</td>
<td></td>
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<tr>
<td>APPETITE</td>
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<tr>
<td>SEXUAL DYSFUNCTION</td>
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<tr>
<td>ANTICHOLINERGIC</td>
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<tr>
<td>GI TRACT</td>
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</table>

Serotonin Norepinephrine Reuptake Inhibitors Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venlafaxine</td>
<td>Immediate release tablets: Initial dose: 75 to 150 mg/day, administered in 2 or 3 divided doses; Immediate-release daily dose: 375 mg Extended-release capsules or tablets: Initial dose: 375 mg once daily; maximum daily dose: 750 mg</td>
</tr>
<tr>
<td>Desvenlafaxine</td>
<td>Initial dose: 50 mg once daily. Maximum dose: doses up to 400 mg once daily have been studied and have shown to be effective, however, the manufacturer states there is no additional benefit at doses &gt;50 mg per day</td>
</tr>
<tr>
<td>Mirtazapine</td>
<td>Initial dose: 15 mg to 45 mg nightly, may titrate dose up to more frequently than twice/3 to 4 weeks; Maximum dose: 45 mg daily</td>
</tr>
<tr>
<td>Duloxetine</td>
<td>Initial dose: 40 mg to 60 mg daily; dose may be divided twice daily (For some patients it may be desirable to start at 30 mg once daily for 1 week to allow patients to adjust to the medication before increasing to 60 mg once daily; Maximum dose: 120 mg daily</td>
</tr>
</tbody>
</table>

Tricyclic Antidepressants (TCA)

- Amitriptyline
- Nortriptyline
- Preferred
- Imipramine
- Desipramine
- Properties (highly)
- Lipid soluble
- Protein bound
- Doxepin
- Nortriptyline
- Amoxapine
- Desipramine
- Neurontin
- Doxepin
- Nortriptyline
- Amoxapine
- Desipramine
- Neurontin
- Doxepin
- Nortriptyline

Tricyclic Antidepressants Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amitriptyline</td>
<td>Usual dose: 10 mg 2 times daily and 20 mg at bedtime; In geriatric: lower doses are recommended for elderly patients</td>
</tr>
<tr>
<td>Amoxapine</td>
<td>Initial dose: 25 mg 2 to 3 times daily; Usual dose: 100 mg to 150 mg daily; Maximum dose: 300 mg daily</td>
</tr>
<tr>
<td>Desipramine</td>
<td>Initial dose: 25 mg to 50 mg (increase based on tolerability and response); Maximum usual dose: 100 mg daily; doses up to 300 mg daily may be necessary in severely depressed patients</td>
</tr>
<tr>
<td>Doxepin</td>
<td>Initial dose: 25 mg to 50 mg as a single dose at bedtime or 1/2 divided doses; Usual dose: 100 mg to 300 mg daily; Maximum dose: 300 mg daily</td>
</tr>
<tr>
<td>Imipramine</td>
<td>Initial dose: 25-50 mg at bedtime; Maximum dose: 200 mg daily</td>
</tr>
<tr>
<td>Nortriptyline</td>
<td>Initial dose: 10 mg to 50 mg/day, given as a single daily dose or in divided doses; Maximum dose: 150 mg daily; Nortriptyline is one of the best tolerated TCA's in the elderly</td>
</tr>
</tbody>
</table>
TCA pearls

• Has anticholinergic side effects (dry mouth, constipation) and cardiac toxicity
• Watch for patients with suicidal ideation
• Increased risk for fall
• Many drug interactions

Dopamine Reuptake Inhibitor

• Bupropion
  • Multiple different forms available
    • Immediate release
      • Initial dose: 37.5 mg twice daily
      • Maximum dose: 300 mg daily in divided doses
    • SR (typically dosed twice daily)
      • Initial dose: 100 mg once daily
      • Maximum dose: 300 mg daily in divided doses
    • XL (typically doses once daily)
      • Initial dose: smallest dose size is 150 mg XL so would initiate with immediate release before switching to XL products
      • Maximum dose: 300 mg once daily

Dopamine Reuptake Inhibitor

• Bupropion
  • Side effects
    • Seizures
    • Restlessness/insomnia
    • Mild conduction abnormalities
    • Weight loss
    • Less sexual dysfunction
New therapies

• Vortioxetine (Brintellix®)
  • Works by enhancing the activity of serotonin in the brain by blocking serotonin reuptake (SSRI)
  • Partial agonist at serotonergic 5-HT1A receptors
  • Antagonist activity at 5-HT3 receptors
  • Initial dose: 10 mg once daily; increase to 20 mg once daily as tolerated; consider 5 mg once daily for patients who do not tolerate higher doses
  • Maximum dose: 20 mg once daily

New therapies

• Vilazodone (Viibryd®)
  • Enhancement of serotonergic activity in the CNS through selective inhibition of serotonin reuptake (SSRI)
  • Partial agonist at serotonergic 5-HT1A receptors
  • Initial dose: 10 mg once daily for 7 days, then increase to 20 mg once daily
  • Maximum dose: 40 mg once daily

New therapies

• Vortioxetine (Brintellix®) and Vilazodone (Viibryd®)
  • Side effects (similar to other SSRI’s)
    • Nausea (dose-related, females > males)
    • Sexual dysfunction
    • Decreased sodium
    • Headache
  • Many drug interactions
New Therapies

• Trazodone (Oleptro®)
  • 24 hour controlled release form of an old drug
  • Initial dose: 150 mg once daily at bedtime (may increase by 75 mg daily every 3 days)-tablet scored so may be split
  • Maximum dose: 375 mg daily
  • Serotonin inhibitor
  • Side effects
    • Somnolence
    • Sedation
    • Constipation
    • Vision blurred
    • Headache
  • Watch drug interactions

New Therapies

• Levomilnacipran (Fetzima®)
  • Inhibitor of norepinephrine and serotonin reuptake (SNRI)
  • Initial dose: 20 mg once daily for 2 days; increase to 40 mg once daily; may then be increased in increments of 40 mg at intervals of 2 or more days
  • Maximum dose: 120 mg daily
  • Side effects
    • Orthostatic hypotension
    • Nausea
    • Constipation
    • Erectile dysfunction
    • Decrease appetite
  • Watch for drug interactions

Discontinuation Syndrome

• Abrupt discontinuation or interruption of antidepressant therapy
• Greater risks associated with antidepressants with shorter half-lives, longer durations of treatment, and abrupt discontinuation
• For antidepressants of short or intermediate half-lives, symptoms may emerge within 2 to 5 days after treatment discontinuation and last 7 to 14 days
• Best to taper all depression medications slowly over a few weeks
Discontinuation Syndrome

- Symptoms
  - Nausea
  - Vomiting
  - Diarrhea
  - Headaches
  - Lightheadedness
  - Diminished appetite
  - Sweating/chills
  - Tremors
  - Fatigue/somnolence
  - Sleep disturbances

- Psychological symptoms
  - Agitation
  - Anxiety
  - Panic attacks
  - Irritability
  - Aggressiveness
  - Mood changes
  - Hyperactivity
  - Mania/hypomania
  - Decreased concentration
  - Confusion
  - Memory/concentration difficulties

Anxiety

- Prevalence
  - 3.2% to 14.2% in older adults
  - Majority of anxiety disorders develop between childhood and young adulthood with < 1% developing an anxiety disorder after the age of 65
  - Can see symptoms of depression in addition to anxiety

- Medical conditions associated with anxiety
  - Gastrointestinal
  - Hyperthyroidism
  - Diabetes
  - Cardiovascular
  - Respiratory
  - Parkinson’s disease
  - Depression

  - Most common comorbidity with any type of anxiety disorder

Anxiety

- Risk Factors
  - Female
  - Several chronic medical conditions (80-85% have at least one condition)
  - Being single, divorced, or separated
  - Lower education
  - Stressful life events
  - Traumatic events (serious accidents or life threatening illness)
  - Physical limitations in daily activities
  - Adverse events in childhood

Anxiety Types

- Specific Phobia
  - Most common anxiety disorder in older adults
  - Situational (6.7%) vs. environmental fears (3.7%)
  - Fear of falling
    - Reduced physical activity
    - Depression
    - Decreased social contact
    - Lower quality of life

Anxiety Types

- Generalized Anxiety Disorder (GAD)
  - Second most common anxiety disorder close after specific phobia
  - Closely linked with depression
- Social Phobia
  - Prevalence rates from 1.9% to 6.6%
  - Chronic disorder: less probability of recovery compared to other anxiety types
Anxiety Types

• Post Traumatic Stress Disorder
  • Prevalence rate of 2.5%
  • Risk factors
    • Sex
    • Race
    • Psychiatric history
    • Type of trauma


Anxiety Types

• Panic Disorder
  • Prevalence rate of 0.4% to 2.8%
• Obsessive Compulsive Disorder (OCD)
  • Late onset OCD is rare and prevalence rates (1%) decrease with age
  • Often associated with depression


Treatment

• Psychological and pharmacological treatment in combination produce better results for treatment than either alone
• First line treatment for anxiety
  • Serotonin Selective Reuptake Inhibitors (SSRI)
  • Serotonin Norepinephrine Reuptake Inhibitors (SNRI)
• Buspirone, hydroxyzine and pregabalin used for GAD
• Lower doses are recommended in elderly to reduce initial adverse effects

Treatment

• Less favorable treatment options
  • Benzodiazepines
    • Common practice to prescribe this class of medications
    • Concerns with long-term use:
      • Risk of accidents/falls
      • Risk of cognitive impairment
      • Development of tolerance and addiction
  • Antihistamines
  • Treatment duration: 6-24 months following remission


Treatment

• Less favorable treatment options
  • Tricyclic Antidepressants (TCA)
    • Less preferred in elderly due to side effects
      • Anticholinergic properties
      • Orthostatic hypotension
  • Atypical antipsychotics
  • Treatment duration: 6-24 months following remission


Antipsychotics
Antipsychotics

• Aging in schizophrenia
  • Decline in positive symptoms (delusions/hallucinations)
  • Increase in negative (anergia, adhedonia, alogia) and cognitive symptoms
• 0.3% incidence in patients > 65 years
  • Problems with finances, transportation, forming friendships, and caring for their home
  • Less likely to live independently
• Typically require lower doses of antipsychotics
  • Suicide rates decrease with age

Antipsychotic pearls

• June 2008, the Food and Drug Administration extended the following warning to include all antipsychotics: Dementia-related psychosis have increased risk of death and stroke
• Prescribe at the lowest effective dosage and for the shortest period
  • Hypotension
    • Clozapine (9%)
    • Quetiapine (7%)
    • Risperidone and olanzapine (5%)
  • QT prolongation
    • Highest risk: ziprasidone
    • Midrange risk: chlorpromazine and quetiapine
    • Low risk: haloperidol (higher risk with IV form), clozapine, risperidone, olanzapine, and aripiprazole

Antipsychotic pearls

• Clozapine and olanzapine, as well as typical antipsychotics should be avoided in cases of diabetes, dyslipidemia, or obesity
• Olanzapine
  • Efficacious for negative symptoms
  • Tardive dyskinesia may be less likely than others
• Schizophrenia:
  • Risperidone between 1.25–3.25 mg/day is the first-choice treatment for late-onset schizophrenia
  • Quetiapine (100–300 mg/day), olanzapine (7.5–15 mg/day), and aripiprazole (15–30 mg/day) are identified as second-choice drugs
• Although the use of antipsychotics for dementia is off-label, antipsychotics are probably the best option for short-term treatment (6–12 weeks) of severe, persistent, and resistant aggression
Antipsychotic pearls

- Risperidone commonly used in the treatment of psychotic disorders in the elderly
  - Long-acting form of risperidone is also well tolerated and safe in the psychosis of the elderly
  - Start with 0.5–3 mg/day to ascertain tolerability before long-acting administration
  - Quetiapine is indicated in the treatment of psychotic and behavioral disorders
  - Ziprasidone can be used intramuscularly or orally in the treatment of acute psychosis and is effective on positive and negative symptoms

Antipsychotic pearls

- Haloperidol
  - Standard agent for treatment of delirium despite FDA approval for this indication
  - IM/IV/PO dosing 0.5-1 mg
  - Use outside of hospital should be limited due to side effects (EPS and increased mortality)
  - Aripiprazole may be effective for the treatment of a variety of psychiatric conditions in the elderly, such as psychosis due to schizophrenia, bipolar disorders, depression, Parkinson’s disease, and dementia (off-label use)

Antipsychotic pearls

- Clozapine is used in schizophrenia refractory to other medications and in bipolar disorders; it has been shown to be very effective at very low doses for the management of psychosis in elderly patients with Parkinson’s disease, schizophrenia, and dementia (off-label use in dementia)
  - At the moment, little data are available on the treatment of psychosis in Parkinson’s disease
    - Clozapine and quetiapine are the first-choice antipsychotics in Parkinson’s disease
### Doses Per Day

<table>
<thead>
<tr>
<th></th>
<th>Schizophrenia</th>
<th>Parkinson’s disease (off-label use)</th>
<th>Dementia (off-label use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aripiprazole</td>
<td>15–30 mg</td>
<td>Little evidence 10–15 mg</td>
<td>Little evidence 10–15 mg</td>
</tr>
<tr>
<td>Clozapine</td>
<td>50–150 mg</td>
<td>25–100 mg</td>
<td>25–100 mg</td>
</tr>
<tr>
<td>Quetiapine</td>
<td>10–20 mg</td>
<td>5–7.5 mg</td>
<td>5–7.5 mg</td>
</tr>
<tr>
<td>Paliperidone</td>
<td>3–12 mg</td>
<td>3–6 mg</td>
<td>3–12 mg</td>
</tr>
<tr>
<td>Ziprasidone</td>
<td>200–1000 mg</td>
<td>25–200 mg</td>
<td>25–200 mg</td>
</tr>
<tr>
<td>Ziprasidone</td>
<td>2–3 mg</td>
<td>0.25–1 mg</td>
<td>0.25–1 mg</td>
</tr>
<tr>
<td>Ziprasidone</td>
<td>40–160 mg</td>
<td>Little evidence: up to 120mg/day</td>
<td>Little evidence: up to 120mg/day</td>
</tr>
</tbody>
</table>


### Side Effects

<table>
<thead>
<tr>
<th></th>
<th>Clozapine</th>
<th>Risperidone</th>
<th>Olanzapine</th>
<th>Quetiapine</th>
<th>Ziprasidone</th>
<th>Aripiprazole</th>
<th>Paliperidone</th>
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</thead>
<tbody>
<tr>
<td>EPS</td>
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<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tardive dyskinesia</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Seizures</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Sedation</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td></td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Hypertension</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>QT prolonged</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

**Paliperidone (Invega®)**

- Extended release once daily dosing (must remain whole)
- Dose range 3-12 mg po daily in younger patients
- Undissolved residue may appear in stool
- Food increased absorption
- Dose adjustments in kidney disease
- FDA approved 2006

**Iloperidone (Fanapt®)**

- FDA approved in 2009
- Starting dose 1 mg po twice daily
- Dose range 12-24 mg/day given twice daily
- Side effects
  - Dizziness
  - Orthostatic hypotension-titrate dose slowly
  - Tachycardia
  - Somnolence
  - QT prolongation
  - Weight gain
  - Low risk EPS and akathisia
  - Low risk anticholinergic effects

**Asenapine (Saphris®)**

- FDA approved in 2009
  - Acute treatment of schizophrenia
  - Sublingual dissolving tablet (avoid eating/drinking for 10 min)
  - Starting dose 5 mg po twice daily
- Side effects
  - Somnolence
  - Headache
  - Hypertension
  - Orthostatic hypotension
  - Reduced sense of touch/sensation
Lurasidone (Latuda®)

- FDA approved 2010
- Acute treatment schizophrenia
- Starting dose 40 mg po once daily with food
- Dose adjustments in kidney and liver disease

Side effects
- Somnolence
- Akathisia
- Parkinsonism
- Agitation
- Demonstrates improved cognition
- Low risk of hypotension and QT prolongation

Pain

Types of Pain

- Estimated 60% to 75% of people over 65 years report persistent pain
- Osteoarthritis back pain (65%)
  - Increased age
  - Obesity
  - Sport injury
  - Trauma
  - Post menopausal (women more likely than men to report pain)
  - Genetic predisposition
- Musculoskeletal pain (40%)
- Postherpetic neuralgia (35%)
- Chronic joint pain (15% - 25%)
- Dementia (30% - 50%)
  - Urinary tract infections
  - Pressure ulcers
  - Fall induced fractures
- Rheumatoid arthritis (2%)
  - Requires disease modifying treatments unlike osteoarthritis
Pain complications

- Functional impairment
- Falls
- Depression
- Decreased appetite
- Impaired sleep
- Social isolation
- Decline in physical activity (weight gain/obesity)

Pain Assessment

<table>
<thead>
<tr>
<th>Facial</th>
<th>Verbal</th>
<th>Body movement</th>
<th>Personal</th>
<th>Activity</th>
<th>Mental status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frowning</td>
<td>Sighing</td>
<td>Rigid</td>
<td>Aggressive</td>
<td>Refusing food</td>
<td>Crying</td>
</tr>
<tr>
<td>Frightened</td>
<td>Moaning</td>
<td>Tense posture</td>
<td>Combative</td>
<td>Appetite change</td>
<td>Irritability</td>
</tr>
<tr>
<td>Grimacing</td>
<td>Screaming</td>
<td>Guarding</td>
<td>Withdrawn</td>
<td>Sleeping</td>
<td>Obstrosism</td>
</tr>
<tr>
<td>Wrinkled forehead</td>
<td>Grunting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed/tight eyes</td>
<td>Calling out</td>
<td>Increased pacing</td>
<td>Disruption</td>
<td>Increased wandering</td>
<td></td>
</tr>
<tr>
<td>Rapid blinking</td>
<td>Noisy breathing</td>
<td>Rocking</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Treatment

- Factors leading to under treatment
  - Patients downplay symptoms
  - New or worsening disease process
  - Fear of being prescribed opioid
  - Fear of addiction
  - Previous dismissal of pain report by healthcare provider
  - Labeled as a weak or difficult patient
  - Cultural/religious belief
  - Fear of diversion when an opioid prescribed
  - Fear of opioid side effects
  - Lack of training in pain assessment/management

Treatment

• STEP 1 (MILD Pain)
  • Acetaminophen
  • Nonsteroidal anti-inflammatory drugs (NSAIDs)
  • Combination of both drug classes

• STEP 2 (MODERATE Pain)
  • Mild opioids
  • Typically combination products added to an opioid or tramadol
    • Acetaminophen + hydrocodone or codeine
    • Nonsteroidal anti-inflammatory drugs (NSAIDs) + hydrocodone

• STEP 3 (SEVERE Pain)
  • Strong opioids
    • Morphine
    • Oxycodone
    • Hydromorphone

**Note decision to use opioids should be individualized and consider drug interactions, drug-disease interactions as well as risk of diversion and addiction.**


Acetaminophen

• Most commonly used analgesic
• Indicated for mild to moderate pain
• Does not have anti-inflammatory or antiplatelet properties
• Safe when taken at recommended doses - adverse effects rare
  • Starting dose: 325 mg po every 4 hours as needed
  • Available in a large number of over-the-counter products
  • Half of liver failure cases are due to unintentional overdose
  • Risk of liver toxicity lead FDA to lower the recommended maximum daily dose from 4 grams to 3 grams and limits the dose in combination products to 325 mg
  • Doses ≤ 2 grams/day or avoidance is recommended in patient with liver disease or who consume ≥ 3 alcoholic beverages daily
  • Malnourished patients (weight < 50kg): ≤ 2 grams/day


Nonsteroidal anti-inflammatory drugs (NSAIDs)

• Studies suggest NSAIDs may be more effective compared to acetaminophen for mild inflammatory pain
  • American Geriatric Society states that NSAIDs should be considered “very rarely and with extreme caution”
• Use for shortest time possible
• Large individual patient response (if one fails another NSAID may work)

Nonsteroidal anti-inflammatory drugs (NSAIDs)

• Starting doses:
  • Naproxen sodium 220 mg po every 12 hours
  • May have lower cardiovascular risk
  • Ibuprofen 200 mg po every 8 hours
  • Diclofenac extended release 100 mg po every 24 hours
  • Also available in immediate release and delayed release
  • Celecoxib 100 mg po every 12 hours
  • Does not block antiplatelet effects of low-dose aspirin
  • Ketorolac
    • 4x risk of GI bleed - Avoid use (increased risk with age)
  • Indomethacin
    • High risk of GI bleed (increased risk with age) and many drug interactions - Avoid use
  ***Non-selective NSAIDs block anti-platelet effect of low-dose aspirin

Adverse Effects of Nonsteroidal anti-inflammatory Drugs (NSAIDs)

• Gastrointestinal (bleeding, abdominal pain, indigestion)
  • Risk increases with age, dose, and duration of therapy
  • Prevention with proton pump inhibitor with NSAID may help
• Cardiovascular
  • Fluid retention
  • Hypertension
  • Congestive heart failure
  • Myocardial infarction
  • Stroke
• Kidney
  • Sodium and water retention
  • Decreased kidney blood flow
  • Electrolyte imbalances
  • Acute and Chronic renal failure
• If NSAIDs are being considered for osteoarthritis then topical products preferred

Drug Interactions with NSAIDS

• Avoid combination with Aspirin - interfere with cardio-protective effects
• Enhance the anticoagulant effect (ex. Warfarin, apixaban, dabigatran, rivaroxaban)
• Loop Diuretics (ex. furosemide, bumetanide): Nonsteroidal Anti-Inflammatory agents may diminish the diuretic effect of Loop Diuretics
• Thiazide Diuretics: Nonsteroidal Anti-Inflammatory agents may diminish the therapeutic effect of Thiazide Diuretics
Drug Interactions with NSAIDs

• Agents with Antiplatelet Properties (ex. clopidogrel, NSAIDs, SSRIs, SNRIs): May enhance the antiplatelet effect of other agents with antiplatelet properties
• ACE Inhibitors/Angiotensin II Receptor Blockers: May enhance the adverse/toxic effect of Nonsteroidal Anti-Inflammatory Agents. Specifically, the combination may result in a significant decrease in renal function.
• Nonsteroidal Anti-Inflammatory Agents may diminish the antihypertensive effect of ACE Inhibitors and Angiotensin II Receptor Blockers

Opioids

• Selecting opioids
  • Response to opioids in the past
  • Kidney and liver function
  • Drug interactions
  • Available formulations
  • “Start low and go slow”
    • 25% to 50% of recommended adult doses
  • Onset
    • Oral: 30 minutes
    • IV: 10 minutes
    • Sub Q: 15 minutes
  • Peak
    • 1 hour
  • Duration
    • 5-6 hours in elderly

Opioids

• Hydrocodone
  • Typically used in combination with acetaminophen and ibuprofen
  • 2.5 mg – 5 mg po every 4 hours as needed (comes in many combination strengths)
  • Hydrocodone in ER formulation dosed every 12 and 24 hours
• Codeine
  • 15 mg – 30 mg po every 4 hours as needed
  • Products: combination with acetaminophen and by itself
  • Tablets and oral solution
• Meperidine
  • Use not recommended in elderly
  • Accumulates in kidney disease
  • Products: immediate release, oral solution and injection
Opioids

• Tapentadol (Nucynta®)
  • Initial dose: 50 mg immediate release every 6 hours as needed
  • Products: immediate release and extended release

• Tramadol (Ultram/Ultracet®)
  • 25 mg po daily or twice daily to start titrating every 3 days to initial goal of 100 mg per day
  • Maximum dose: 300 mg in elderly
  • Products: immediate release, oral disintegrating and extended release
  • Combination with acetaminophen
  • Seizure risk
  • Suicide risk
  • Serotonin syndrome (drug interaction with serotonin medications)
  • Constipation and sedation less than more potent opioids

Opioids

• Morphine
  • 1 mg – 5 mg po every 4 to 6 hours as needed
  • Morphine can accumulate in renal disease
  • Products: immediate release, ER, oral solution, suppository and injection

• Oxycodone
  • 2.5 mg – 5 mg po every 4 to 6 hours as needed
  • Oxycodone not available in injection preparation
  • Products: immediate release, ER and oral solution

Opioids

• Oxymorphone
  • 5 mg po every 6 hours as needed
  • Products: immediate release, ER and injection

• Hydromorphone
  • 0.5 mg – 1 mg po every 4 hours as needed
  • Considered safer in renal disease
  • Products: immediate release, ER, oral solution, suppository and injection
**Opioids**

- **Fentanyl**
  - Never initiate in patient who has never received an opioid before: high risk of toxicity and over-dosing since lowest available dose is too high
  - Products: buccal/sublingual tablet, lozenge, transdermal patch, intranasal and injection
  - Patch offers convenient delivery lasting 72 hours (can’t be cut)
  - Takes 12 – 24 hours to reach maximum effect
  - Can be used in liver or renal disease

**Opioids**

- **Methadone**
  - Many drug interactions
  - QT prolongation leading to arrhythmias and death
  - Safer in renal disease
  - Should only be started by an experienced practitioner
  - Products: tablet, oral solution and injection

**Opioids**

- **Buprenorphine**
  - Products: sublingual tablet, injection and transdermal patch
  - Patch offers convenient delivery lasting 7 days
  - Can’t be cut
  - Safer in renal disease
  - Lower incidence of constipation and respiratory depression
  - Not recommended for long term use
Opioid Dose Titration

- Starting doses are 50% of that recommended in younger adults
- Titration by 25% to 50% of total daily dose every 24 hours until analgesic dose achieved
- Initiate short acting opioid with close follow-up and dose titrations every 2-3 days
  - Have a surveillance plan to monitor: efficacy, tolerability and adherence
  - Sustained-release preparations can be started after successful short acting use
  - Improve adherence and patient satisfaction
  - Immediate-release medications should be continued to control breakthrough pain at a dose of 10% the 24 hour sustained-release dosage

Kidney disease
- Hydromorphone and oxycodone are preferred over morphine and codeine if used at all

Liver disease
- Initial opioid doses should be decreased by 50% with significant liver dysfunction

Black box warning
- Risk of abuse, diversion and fatal over-dose leading to respiratory depression
- Risk of respiratory depression increases when combined with benzodiazepines, alcohol, or barbiturates
- If pain goals not met with medication it should be tapered off and discontinued

Opioid Side Effects

- Constipation
- Nausea
- Vomiting
- Appetite loss
- Drowsiness
- Dizziness
- Sweating
- Respiratory depression (most feared)
  - Unlikely if opioid started at a low dose and slowly titrated
  - Increased risk of falls/hip fracture
- Use of walking aids and extreme caution in these patients

**Note:** tolerance develops to most side effects except constipation**
- Prevention of constipation is important
  - Adequate hydration
  - Bowel stimulant with senna or bisacodyl titrated to effect
  - Osmotic agents such as miralax, lactulose, and milk of magnesium typically only work if used with stimulant

**Adverse effects can be resolved by discontinuation or dose reduction**


Opioid allergies

• Most often intolerances
  • Most common with natural opioids
  • Often respond to treatment with structurally dissimilar opioid
  • Ex. change morphine to oxycodone
  • Severe reactions responding to naloxone are NOT allergies

• True allergies are rare yet possible
  • Most often immune-mediated
  • Require prior opioid exposure
  • Switching to structurally dissimilar opioid may or may NOT help

Adjuvant Analgesics

• Duloxetine
  • Studies show benefit in peripheral neuropathy, fibromyalgia, chronic low back pain and osteoarthritis knee pain
  • Can be used as monotherapy or in combination with acetaminophen and opioids
  • 20 mg po daily to a max dose of 60 mg po daily

• Venlafaxine
  • 37.5 mg daily to a max dose of 300 mg po daily (when depression present)

• Side effects
  • Dry mouth
  • Nausea
  • Constipation
  • Diarrhea
  • Fatigue
  • Dizziness
  • Somnolence
  • Insomnia
  • Avoid in liver disease

Adjuvant Analgesics

• Gabapentin
  • Indicated for post-herpetic neuralgia
  • Dosing requires slow titration starting at 100 mg/day and increasing every 3-7 days to a maximum dosage of 3600 mg/day in divided doses

• Pregabalin
  • Indicated for post-herpetic neuralgia, diabetic peripheral neuropathy, fibromyalgia, and neuropathic pain due to spinal cord injury
  • Dosing titration is quicker starting at 100 mg/day and increasing over several weeks to a maximum dosage of 300 mg/day in divided doses

• Side effects
  • Dizziness
  • Sedation
  • Peripheral edema
  • Accumulated in renal disease- dose reduction necessary
Adjuvant Analgesics (Topical)

- **Topical NSAIDs**
  - Alternative to oral NSAIDs to avoid adverse effects
  - Carries same black box warning as oral NSAIDs for GI and cardiovascular adverse effects
  - Good when pain is localized
  - **Osteoarthritis (OA)**
    - Diclofenac gel (Voltaren®)
      - Applied every 6 hours (OA – knees, ankles, feet, elbows, wrists, and hands)
    - Diclofenac topical solution (Pennsaid®)
      - Applied twice daily (only for knee OA)
  - **Strains/Sprains**
    - Diclofenac patch (Flector®)
      - Applied twice daily

- **Capsaicin**
  - **Post-herpetic neuralgia**
    - 5% patch applied for 12 hours at a time daily
    - Patch may be cut
    - Headache most common side effect

- **Topical lidocaine**
  - Post-herpetic neuralgia
  - 5% patch applied for 12 hours at a time daily
  - Patch may be cut
  - Headache most common side effect
**Adjuvant Analgesics**

- **Corticosteroids (Oral)**
  - Used for short period of time
  - Useful for inflammatory causes of pain
  - Many side effects

- **Corticosteroids (Intra-articular)**
  - Triamcinolone and Methylprednisolone
  - No long term benefit
  - Does not alter disease progression
  - Pain relief goal is 3 months
  - No more than 3-4 injections per year

- **Glucosamine/Chondroitin**
  - Idea is that they aid in cartilage repair or slow cartilage destruction
  - Expensive
  - More studies needed


**Postherpetic Neuralgia**

- Chronic pain from herpes zoster persisting 90 days after zoster rash
  - Ongoing spontaneous pain (burning pain)
  - Shooting or electric shock-like pain
  - Sensations to light touch

- **Treatment**
  - No disease modifying therapy available
  - Symptom control is goal for therapy
  - Topical therapy alone is first line for mild pain or in combination with systemic drugs for moderate-severe pain

**Treatment**

- **Topical**
  - 5% lidocaine patches
  - Max 3 patches/day (can be cut)
  - Local reactions
  -Capsaicin cream
  - Applied 4 times per day
  - Burning sensation and skin redness
  - Capsaicin patch
  - A single, 1 hour application can provide up to three months of pain relief
  - Applied in office by professional
  - Burning sensation and skin redness

- **Gabapentin/Pregabalin**
  - Sedation, dizziness, peripheral edema
  - Avoid in renal disease

- **Tricyclic antidepressants (amitriptyline/nortriptyline)**
  - Sedation, dry mouth, blurred vision, weight gain, urinary retention

- **Opioids/tramadol**
  - Third line due to side effects and dependence

- **Acetaminophen and nonsteroidal anti-inflammatory drugs** are ineffective for neuropathic pain
Physical/Occupational Therapy

• Physical therapy
• Exercise
• Movement programs
  • Tai chi
  • Yoga
• Massage
• Acupuncture
• Cognitive behavioral therapy

Diabetes

• 65 and older: estimate 11.2 million (25.9%) patient that have diabetes
• The prevalence of diabetes in nursing facilities is even higher

Diabetes

Diabetes

Diabetes

Diabetes
### Hypoglycemia

**Risk Factors**
- Older age (>80 yrs)
- Insulin therapy
- Insulin dosing errors
- Poor cognition
- Erratic eating
- Impaired vision
- Dexterity
- Insulin secretagogues (sulfonylurea drug class)
- Poor nutritional status
- Kidney and liver impairment

**Symptoms**
- Confusion
- Unsteady gait/falls
- Difficulty speaking
- Impaired vision
- Fatigue/drowsiness
- Lightheadedness
- Tremor *
- Hunger
- Anxiety
- Palpitations *
- Feeling warm or sweaty *

*Warning signs that may not be present due to impaired body response


### Treatment

**Nutrition therapy and exercise**
- Type 2 DM: weight loss 5% - 10% body weight
- Supervised physical activity when necessary
- Most older adults who have type 2 diabetes can be treated with oral agents but may require insulin use
- Type 1 diabetes requires insulin use


### Glycemic goals

**Goals should be individualized**
- Home glucose monitoring is important
- American Diabetes Association/American Geriatric Society Goals
  - Healthy
    - \( A1c < 7.5\% \)
    - Fasting/preprandial BG: 90-130 mg/dL
    - Bedtime BG: 90-150 mg/dL
  - Frail with complex/intermediate health
    - \( A1c < 8\% \)
    - Fasting/preprandial BG: 90-150 mg/dL
    - Bedtime BG: 100-180 mg/dL
  - Frail with poor health or resident of long term facility
    - \( A1c < 8.5\% \)
    - Fasting/preprandial BG: 100-180 mg/dL.
    - Bedtime BG: 110-200 mg/dL

Type 1 Diabetes Mellitus

- Requires multiple insulin injections daily or use of insulin pump
- Combination Insulin
  - Long-acting basal insulin
    - Once daily insulin glargine
    - Once daily or twice daily insulin detemir
  - Rapid-acting bolus insulin
    - Dosed with meals
    - Insulin aspart
    - Insulin lispro
    - Insulin glulisine

- Insulin Cost
  - Long-acting basal insulin can be expensive so substitution with an intermediate acting NPH (neutral protamine Hagedorn) insulin can be given before breakfast and at bedtime
  - Associated with increased risk of hypoglycemia if lunch is missed

Type 1 Diabetes Mellitus

- Basal (rapid acting) insulin should not be withheld during illness or during periods of poor oral intake
- If unreliable food intake, rapid acting insulin can be given immediately after the meal so that a lower dose can be given with less food
- If rapid acting insulin is too expensive regular insulin can be used before meals (less expensive)
  - Regular insulin has slower onset and longer duration of action so can see hypoglycemia several hours after a meal—snacks may be required
- Insulin pump/continuous subcutaneous insulin infusion
  - Uses rapid acting insulin (lispro, aspart, glulisine) delivered continuously to provide basal requirements with boluses delivered for meals and to correct hyperglycemia
  - Sets changed every 2-3 days
  - Use may be difficult for elderly

Type 2 Diabetes Mellitus

- Initial treatment is with oral agents, only adding insulin when needed to maintain glycemic goals
- Metformin low-dose preferred 1st line in older adults
  - Avoid > 80 yo with presence of kidney dysfunction
  - Caution with doses > 1000 mg/day
- Glipizide preferred sulfonylurea in elderly
  - Least dependent on kidney function
  - Less hypoglycemia than longer acting sulfonylurea
  - Glyburide should not be used (hypoglycemia)
- Dipeptidyl peptidase 4 (DPP-4)
  - Safe
  - Weight neutral
  - Well tolerated
  - Expensive
  - Increased rate of heart failure
  - Some require dose adjustments/avoidance in kidney failure

**Type 2 Diabetes Mellitus**

- Meglitinides
  - Short acting
  - Flexible meal dosing but must be given with each meal
  - Hypoglycemia potential risk but less than other oral agents
- Thiazolidinediones
  - Fluid retention
  - Weight gain
  - Worsening heart failure
  - Risk fractures
  - Pioglitazone increased risk bladder cancer
  - Not recommended in elderly


**Type 2 Diabetes Mellitus**

- α-Glucosidase inhibitors
  - Gastrointestinal side effects (flatulence/diarrhea)
  - Taken with each meal
- Glucagonlike peptide 1 receptor
  - Injectable
  - Nausea, vomiting, weight loss
  - Not recommended in elderly as not well studied
- Sodium-glucose cotransporter 2
  - Predispose elderly to volume loss and decline in kidney function
  - Worsen urinary incontinence and lead to urinary tract infections
  - Weight loss


**Type 2 Diabetes Mellitus**

- Insulin indicated for monotherapy or combined with oral agents
- If postprandial hyperglycemia main cause of increased A1c, rapid acting insulin can be added to largest meal rather than starting basal insulin with long acting insulin
- Elderly with kidney dysfunction may have less hypoglycemia when using rapid acting insulin compared with longer acting insulin
- Insulin using syringes and vials can be difficult for elderly
  - Prefilled insulin pens may be useful but expensive

**Treatment A1c lowering**

<table>
<thead>
<tr>
<th>Agent</th>
<th>A1c lowering</th>
<th>Starting Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>3.5%</td>
<td>Metformin: 500 mg po daily**</td>
</tr>
<tr>
<td>Sulfonylureas</td>
<td>1.2%</td>
<td>Glipizide: 2.5 mg po daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glimepiride: 1 mg po daily**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glyburide: Avoid use in elderly**</td>
</tr>
<tr>
<td>Meglinides</td>
<td>1.2%</td>
<td>Repaglinide: 0.5 mg po with meals**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nateglinide: 60 mg po with meals**</td>
</tr>
<tr>
<td>Thiazolidinediones</td>
<td>0.5-1.5%</td>
<td>Pioglitazone: 15 mg po daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rouglitazone: 4 mg po daily</td>
</tr>
<tr>
<td>Alpha-glucosidase inhibitors</td>
<td>0.5-1%</td>
<td>Acarbose: 25 mg po with meals**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miglitol: 25 mg po with meals**</td>
</tr>
</tbody>
</table>

**renal dosing required**

**Treatment A1c lowering**

<table>
<thead>
<tr>
<th>Agent</th>
<th>A1c lowering</th>
<th>Starting Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dipeptidyl peptidase-4 inhibitors</td>
<td>0%</td>
<td>Alogliptin: 25 mg po daily**</td>
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<tr>
<td></td>
<td></td>
<td>Linagliptin: 5 mg po daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sitagliptin: 100 mg po daily**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saxagliptin: 2.5 mg po daily**</td>
</tr>
<tr>
<td>Sodium-glucose co-transporter 2 inhibitors</td>
<td>0.5-0.7%</td>
<td>Canagliflozin: 100 mg po daily**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dapagliflozin: 5 mg po daily**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empagliflozin: 10 mg po daily**</td>
</tr>
<tr>
<td>GLP-1 analogs</td>
<td>0%</td>
<td>Albiglutide: 30 mg SubQ weekly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dulaglutide: 0.75 mg SubQ weekly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exenatide: Immediate release 5 mg SubQ twice daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liraglutide: 0.6 mg SubQ weekly</td>
</tr>
<tr>
<td>Pramlintide</td>
<td>0.6%</td>
<td>Type 1DM: 15 mcg SubQ before big meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type 2DM: 60 mcg SubQ before big meals</td>
</tr>
</tbody>
</table>

**renal dosing required**

**Diabetes Monitoring**

- Glycemic Control
- Blood Pressure Control
- Lipid Management
- Eye care
  - Annually
  - Diabetic retinopathy
  - Macular edema
  - Glaucoma
- Foot care
  - Daily monitor by patient/caregiver
  - Exam by physician at each visit
- Kidney Function
Blood Pressure

• Decreased elasticity and increased stiffness of large arteries
• 60 years or older treatment goal systolic blood pressure (SBP) of < 150 mm Hg or diastolic blood pressure (DBP) of < 90 mm Hg
• Goal SBP < 140 mm Hg provides no additional benefit compared to a higher goal SBP of 140 to 160 mm Hg or 140 to 149 mm Hg
• Treatment for hypertension does not need to be adjusted if treatment results in SBP lower than 140 mm Hg and is not associated with adverse effects on health or quality of life
• All ages with chronic kidney disease and diabetes treatment goal is SBP of < 140 mmHg or DBP of < 90 mm Hg
• Hypertension is present in 70% of males and 80% of women > 70 years

Blood Pressure

• Treatment should begin with lifestyle changes
  • Weight reduction
  • Diet changes (reduce salt intake, increase fruit/vegetables)
  • Increase physical activity
• Most elderly patients will require 2 or more blood pressure medications to reach goal systolic BP of < 150 mmHg
  • Consider low dose combination medications if blood pressure goal not met with single agent
• Starting doses of an antihypertensive for elderly should be about half that used in younger adults; titrating every 4 weeks as needed
Diuretics

- Thiazide diuretics (hydrochlorothiazide and chlorthalidone) are first line for hypertension
- Often combined with other hypertension medications for additive effects
- Reduce cardiovascular events
- Ineffective (once daily dosing) and well tolerated
- Not as effective when kidney damage is severe
- Side effects: Low potassium, low sodium, low magnesium

**Note:** Loop diuretics (furosemide, bumetanide) should not be used as first-line treatment in hypertension and are reserved for conditions where fluid overload is a problem (e.g., heart failure)

Renin-angiotensin-aldosterone Blockers

**Angiotensin converting enzyme inhibitors (ACEI)**
- ACEIs are the preferred blood pressure agent for elders with CHF and diabetes
- e.g. (enalapril, lisinopril, captopril)
  - Side effects: Hypotension, Chronic dry cough, Decreased kidney function, Increased potassium

**Angiotensin Receptor Blockers (ARB)**
- ARBs are an alternative to ACEIs when not tolerated
  - e.g. (valsartan, losartan, olmesartan, candesartan)
  - Side effects: Hypotension, Decreased kidney function, Increased potassium
  - **Note:** no cough

Calcium channel blockers (CCB)

- Dihydropyridine CCB (amlodipine, felodipine, isradipine)
  - Combination with a β-blocker is well tolerated in elderly
  - Side effects: Headaches, Peripheral edema, Postural hypotension
- Non-dihydropyridine CCB (verapamil, diltiazem, nifedipine)
  - Long acting preparations preferred
  - Start at lowest dose and increase slowly
  - Should not be combined with β-blocker to prevent decreased heart rate
  - Constipation is common with verapamil
  - Lots of drug interactions
**β-blockers**

metoprolol, carvedilol, atenolol, labetalol, propranolol

- Benefit has not been consistent for use in elderly to treat hypertension
- Established benefit in patients with myocardial infarction, systolic heart failure, and some arrhythmias in elderly
- Reduction in blood pressure with this group of medications should be slow and started at lowest dose available
- Beta-blocker therapy should not be withdrawn abruptly, but gradually tapered over 1-2 weeks to avoid acute increased heart rate and hypertension
- Side effects
  - Can hide symptoms of low blood glucose in patients with diabetes
  - Postural hypotension
  - Decreased heart rate
  - Dizziness, fatigue, and depression

---

**Other agents**

- α-blockers (doxazosin, terazosin) cause postural hypotension especially when combined with diuretics
- Clonidine, methyldopa, and reserpine are not recommended in elderly due to sedation and causing/worsening depression
- Direct renin inhibitor aliskiren has been studied but no cardiovascular outcomes are available in elderly

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**Anticoagulation**
Warfarin

• Warfarin use is rising
  • Aging population
  • Increase in atrial fibrillation and venous thromboembolism
• Narrow therapeutic index
  • Decline in cognitive function
  • Lack of awareness of drug and food interactions
  • Problems administering the medication

Warfarin

• Risk of bleeding
  • Increased sensitivity to warfarin
  • Reduced drug clearance
  • Lower body weight
  • Lower dietary vitamin K intake
  • Concurrent use of other drugs
  • Co-morbidities that increase bleeding risk
  • Fall risk

Monitoring Warfarin

• International Normalized Ratio (INR)
  • World Health Organization developed INR with the PT test for patients who are receiving warfarin
  • Calculation that adjusts for changes in the PT reagents and allows for results from different laboratories to be compared
• INR will need to be monitored at least once monthly
  • Narrow therapeutic window
  • Dose is not fixed but rather based upon INR
  • INR below goal- blood clots cannot be prevented
  • INR above goal- increased risk of bleeding
Medications that Increase INR/Risk for Bleeding

• Anti-infectives
  • Fluoroquinolones
  • Cotrimoxazole
  • Macrolides
  • Metronidazole
  • Triazole antifungals
  • Amoxicillin
• Analgesics
  • NSAIDs
  • Aspirin
  • Acetaminophen
• Anti-inflammatory medications
  • COX-2 inhibitors
• Antihypertensives
• Antihypoglycemics
• Antihistamines
• Antipsychotics
• Anticoagulants
• Antibiotics
• Antimycotics
• Antivirals
• Anticonvulsants
• Antidepressants
• Antipsychotics
• Antineoplastic agents
• Antithyroid agents

Medications that Decrease INR

• Rifampin
• Carbamazepine
• Bile acid sequestrants
• Sucralfate
• Oral contraceptives
• Antithyroid agents
• Green tea
• St. John’s Wort

Diet

• Significant changes in vitamin K intake can upset warfarin stability-consistency is key!
  • Increased intake - decreased INR
  • Decreased intake - increased INR
• Foods high in vitamin K
  • Fruits and vegetables
  • Especially avocado, mango, broccoli, spinach, cabbage
  • Mayonnaise-based dressings
  • Chewing tobacco
  • Arise
  • Found in some cookies and black licorice
• Oils
  • Canola, corn, olive, peanut, safflower, sesame seed, soybean, and sunflower
• Alcohol
  • Acute alcohol consumption enhances warfarin’s availability, increasing the patient’s risk for hemorrhaging
  • Chronic alcohol consumption reduces warfarin’s availability, lessening the patient’s anticoagulation
Side Effects

• Immediate medical attention should be sought out for the following:
  • Signs of stroke/ intracranial bleeding
  • Severe/unusual headache, confusion, weakness, numbness
  • Coughing up large amounts of bright red blood
  • Vomiting blood
  • Bleeding that will not stop
  • Bright red blood in stool
  • Fall or injury to head

Dabigatran

• Indications
  • Non-valvular atrial fibrillation (to prevent stroke and systemic embolism)
  • Primary prevention of venous thromboembolism in adults who have undergone total hip and knee arthroplasty
  • Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE)

• MOA: directly inhibits formation of thrombin

• Dosing considerations:
  • Dose needs adjusted based on Creatinine clearance (CrCl) and its use is not recommended in dialysis
  • Capsules must be swallowed whole
  • Increased availability of the drug by 75%

Advantages of Dabigatran

• Requires no monitoring
• Unaffected by food
• Few Drug-Drug interactions
  • Concomitant use of following increase bleeding risk:
    • NSAIDs
    • Clopidogrel
    • Prasugrel
    • Aspirin
  • Drugs that decrease effect include: rifampin, carbamazepine, phenytoin and St. John’s Wort
  • Drugs that increase effect include: amiodarone, verapamil, clarithromycin, and ketoconazole
Disadvantages of Dabigatran

• Lack of a way to monitor adherence
• Difficult to reverse in event of overdose/severe bleeding
• Cost is > than warfarin
• Twice daily dosage regimen
• Limited indications

Dabigatran side effects

• Bleeding
  • Should be withheld before invasive or surgical procedures
• GI:
  • Dyspepsia (11.3% vs. 5.8% warfarin)
  • Abdominal pain
  • GERD
  • Gastric hemorrhage
  • GI ulcer

Rivaroxaban

• Indications
  • Nonvalvular atrial fibrillation (to prevent stroke and systemic embolism)
  • Primary prevention of venous thromboembolism in adults who have undergone total hip and knee arthroplasty
  • Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE)
  • Reduce the risk of recurrent DVT and PE after initial treatment
• MOA: direct factor Xa inhibitor
• Dose considerations:
  • Dosing varies on the indication
  • Daily doses > 10 mg should be given with food to increase absorption
  • It may be crushed & administered through a gastric feeding tube but not through a NJ, J-tube or GI tube
  • Creatinine clearance (CrCl) cutoffs vary with indication but it is never recommended for use in dialysis patients
Rivaroxaban side effects

- **Bleeding**
  - Should be withheld before invasive or surgical procedures
- **Other**
  - Musculoskeletal pain
  - Itching
  - Blisters
  - Upper abdominal pain
  - Dizziness

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Apixaban

- **Indications**
  - Nonvalvular atrial fibrillation (to prevent stroke and systemic embolism)
  - Primary prevention of venous thromboembolism in adults who have undergone total hip and knee arthroplasty
  - Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE)
- **MOA:** direct factor Xa inhibitor
- **Dosing considerations:**
  - If patient is ≥ 80 years of age and either weighs ≤ 60 kg or has a serum creatinine ≥ 1.5 mg/dL, then reduce dose
  - Dosing varies based on kidney function
  - Drug interactions (e.g., clarithromycin, ketoconazole, itraconazole, ritonavir): Potential dose reduction or avoidance
  - Use not recommended in severe hepatic failure
  - May be crushed and given through any gastric tubes

---

Apixaban side effects

- **Bleeding**
  - Should be withheld before invasive or surgical procedures
- **Other**
  - Nausea
  - Liver enzymes elevations
  - Dizziness
  - Rash
**Edoxaban**

- FDA approved in January 2015
- Indications:
  - Nonvalvular atrial fibrillation (to prevent stroke and systemic embolism)
  - Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE)
- MOA: direct factor Xa inhibitor
- Dose considerations:
  - Edoxaban may be administered with or without food
  - No data on crushing, mixing into food/liquids or giving through feeding tube
  - Drug interactions: Increased risk of bleeding with other anticoagulants, antiplatelets and thrombolytics; AVOID with rifampin
  - Do not use in patients with CrCl >95 mL/min due to an increased risk of ischemic stroke with edoxaban 60 mg daily when compared to warfarin therapy (Black Box Warning)
  - Dosing varies based on kidney function

**Edoxaban side effects**

- Bleeding
  - Should be withheld before invasive or surgical procedures
- Other
  - Rash
  - Abnormal liver function tests
  - Anemia

**Antiarrhythmics**
Antiarrhythmics

- Cardiac changes
  - Heart rate decreases with age
  - Atrial fibrillation and ventricular tachycardia are not considered normal
  - Increased prevalence of orthostatic hypotension and supine hypertension
- Factors influencing dosages
  - Oral absorption not typically affected
  - Drug class as effective in elderly as younger patients
  - Changes in kidney, liver and heart function
  - Overweight and obesity
    - Amiodarone is highly lipophilic (fat is primary site for distribution)
    - Sotalol is hydrophilic (lean tissue primary site for distribution)
- Genetics
  - How these drugs get used and cleared from the body differ based on genetic makeup
- Drug interactions

Antiarrhythmics

- QT Prolongation
  - Risking torsades de pointes-life threatening tachyarrhythmia
    - Disopyramide
    - Quinidine
    - Procainamide
    - Sotalol
    - Amiodarone
    - Dronedarone
    - www.crediblemeds.org
- Class II antiarrhythmics (ex. Beta blockers) are only class that isn’t proarrhythmic

Amiodarone

- Incidence of adverse effects reported to approach 90% after 5 years
- Pulmonary toxicity (10% at 2 years)
  - Higher risk with older age and higher doses
- Hypothyroidism
  - 5-25% of patients
  - Treatment with levothyroxine if this develops
- Hyperthyroidism
  - 2-10% of patients
  - Amiodarone should be discontinued if this develops
- QT prolongation
  - Especially when combined with other prolonging medications
  - Many drug interactions!
### Dronedarone

- Not as many drug interactions as amiodarone but still significant
  - Digoxin
  - Calcium channel blockers
  - Beta-blockers (bradycardia)
  - Simvastatin (max dose 10mg)
  - Sirolimus and tacrolimus
  - Warfarin/Dabigatran
  - Rifampin and other CYP 3A inducers
  - Potent CYP 3A inhibitors such as ketoconazole, itraconazole, voriconazole, ritonavir, clarithromycin, and nefazodone are contraindicated
  - QT prolongation
  - New or worsening heart failure
  - Liver Injury
  - Pulmonary toxicity
  - Hypokalemia and hypomagnesemia with potassium-depleting diuretics

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### Disopyramide

- Anticholinergic side effects
  - Dry mouth
  - Urinary hesitancy
  - Constipation
- Kidney function monitoring required
- Cardiac toxicity
  - Heart failure  
    - Typically within first three weeks from starting  
    - (range 48 hours to months)
  - QT Prolongation  
    - Risk greater when combined with other cardiac meds like amiodarone or sotalol
- Hypoglycemia
  - Enhanced insulin release

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### Procainamide

- GI
  - Anorexia
  - Nausea
  - Vomiting
- CNS
  - Headache
  - Insomnia
  - Dizziness
  - Psychosis/Hallucinations
  - Depression
- Lupus-Like Syndrome
- Positive Antinuclear Antibody (ANA)
- Fever (allergic response)
- Rash
- Myalgias
- Vasculitis
- Blood dyscrasia
- Cardiac toxicity
  - QT Prolongation
  - Proarrhythmia
  - 3-12% with usual doses
  - Hypotension
- Fever (allergic response)
- Rash
- Myalgias
- Vasculitis
- Blood dyscrasia
- Cardiac toxicity
  - QT Prolongation
  - Proarrhythmia
  - 3-12% with usual doses
  - Hypotension
**Quinidine**

- CNS
  - Hearing loss/ringing
  - Confusion
  - Delirium
  - Vision disturbance
  - Psychosis
- Cardiac toxicity
  - Proarrhythmia
  - Conduction disturbances
  - Hypotension
  - CHF
  - QT Prolongation

**Mexiletine**

- GI
  - Nausea
  - Diarrhea
  - Abdominal bloating
  - Immune reactions
    - Rash
    - Fever
    - Hemolytic anemia
    - Thrombocytopenia
    - Leukopenia
    - Hepatotoxicity
    - Anaphylaxis
- CNS
  - Dizziness
  - Lightheaded
  - Nervous
  - Change in sleep habits
  - Numbness
  - Difficulty with coordination

**Flecainide**

- Limited use due to following:
  - Bradycardia
  - History of MI
  - Structural heart disease
  - Kidney, liver and lung disease
  - Thyroid disease
  - Diabetes
- Cardiac toxicity
  - Proarrhythmia
  - Sinus bradycardia
  - Heart failure
  - Hypotension
- Dermatologic
  - Facial edema
  - Erythema
  - Pustules
- Hypersensitivity syndrome
  - Fever
  - Rash
  - Elevated liver enzymes


*Many drug interactions!*
Propafenone

- GI
  - Unusual taste sensation
  - Nausea
- CNS
  - Dizziness
  - Nausea
  - Blurred vision
- Dermatologic
  - Lupus like syndrome
  - Pustules
- Cardiac toxicity
  - Decreased ejection fraction (EF)
- Heart failure
- Bradycardia
- Conduction disturbances
- Proarrhythmia
- Pulmonary
  - Due to beta-blocking activity *caution in lung disease*

Dofetilide

- Dose regulated by renal function
- Started in hospital only by registered prescribers
- Cardiac toxicity
  - QT Prolongation
  - Chest pain
- Headache
- Dizziness
- Contraindicated with following medications:
  - Hydrochlorothiazide
  - Verapamil
  - Cimetidine
  - Trimethoprim (alone or in combination with sulfamethoxazole
  - Ketoconazole
  - Prochlorperazine
  - Dolutegravir
  - Megestrol

Digoxin

- Used for atrial fibrillation and CHF
- Has narrow therapeutic range (especially in elderly)
- Renal function determines how drug cleared from body
- Side effects
  - Visual disturbances
  - Depression
  - Confusion
- Many drug interactions!
- Disease State interactions
  - Low potassium and low magnesium blood levels
  - Lung disease
  - MI
  - Hypothyroidism
Conclusions

• These chronic disease states have many debilitating effects for the patients.
• It becomes more difficult to differentiate between progression of the disease and the normal aging process in elderly.
• Identify and report any new side effects from medications to prevent negative consequences for your patients.

Conclusions

• Effect of aging on medications for elderly populations
  • Confounding factors such as co-morbidities (frailty)
  • Drug interactions and adverse drug effects
  • Impairments in organ functions
• Compliance is key to managing the various elderly diseases
• Not all potentially inappropriate medications can be avoided
  • Weigh benefit against risks
  • Based on quality of life, function and prognosis

References

References


References

- Klotz U. Pharmacokinetics and drug metabolism in the elderly. Drug Metabolism Reviews 2009; 41:67-76.

References

References


Questions?