Table S1. Implementation training and resources.

| STEP 1: ONBOARD TRAINING |
|--------------------------|
| **TOOLKIT REVIEW**       |
| 66-page toolkit mailed to pharmacies three weeks prior to live implementation. Pharmacy project champions were required to review toolkit prior to site visit. |

Contents:
1. Checklist of training activities
2. Study overview
   - Study objectives
   - Introduction to research team members
   - Glossary of key terms
   - Project timeline
3. Fall prevention service
   - Background information
   - Process algorithm
   - Stepwise processes for screening, medication review, sharing recommendations, patient education, and follow-up
4. Documentation requirements
5. Tools
   - Cover fax form [Figure S1]
   - High-risk medication algorithms [Figure S2]
   - High-risk medication index [Table S2]
   - Medication review checklist [Figure S3]
   - Prescriber communication form [20]
   - Prescriber marketing flyer [Figure S4]
   - Prescriber response form [20]
6. Resources
   - STEADI: The Pharmacist’s Role in Older Adult Fall Prevention Resources List [34]
   - Talking about Fall Prevention with Your Patients [35]
   - North Carolina Community-based fall prevention resources [Table S3]
   - STEADI patient education resources [21–23]
7. Acknowledgements

| LIVE WEBINAR |
|--------------|
| A one-hour live webinar held on three alternating (morning/evening) dates, two weeks prior to live implementation. The webinar was recorded and disseminated to pharmacies to ensure training fidelity of future staff. |

Topics:
1. Purpose of project
2. Fall-prevention processes
3. Documentation and compensation processes
4. Site visit expectations

| SITE VISIT |
|-----------|
| A 45- to 60-minute site visit conducted by a member of the research team to meet with the pharmacy project champion and participating staff. Occurred during the first week of live implementation. |

Topics:
1. Staff introductions
2. Housekeeping
• Obtain list of participating staff
• Update contact information
• Log training progress

3. Brief orientation
4. Practice case and review of toolkit resources
5. Q&A

OPTIONAL TRAINING

Two optional training opportunities:

• STEADI: The Pharmacist’s Role in Older Adult Fall Prevention [24]
  o An online continuing pharmacy education module for pharmacists and technicians. Developed by the American Pharmacists Association (APhA) and the Centers for Disease Control and Prevention. Free registration for APhA members and non-members.
• Collaborative Approach to Falls Assessment and Prevention [25]
  o A one-day workshop held at North Carolina Association of Pharmacists Annual Meeting in September 2017. Provided comprehensive training on fall-risk assessment and prevention by an interdisciplinary team of pharmacists, an occupational therapist, and physical therapist. Free registration for meeting attendees.

STEP 2: LONGITUDINAL TRAINING

QUICK TIPS WEBINARS

Series of six 30-minute webinars held during the first six months of project. The webinars were recorded and disseminated to pharmacies to ensure training fidelity of future staff.

Topics
• Webinar 1: Review of screening and medication review processes
• Webinar 2: Peer example – implementing screening and medication review
• Webinar 3: How to talk about falls with your patients
• Webinar 4: Sharing fall risk information with prescribers
• Webinar 5: Peer example – collaborating with prescribers
• Webinar 6: Peer example – Incorporating STEADI into other pharmacy services

QUICK TIPS EMAILS

A biweekly-to-monthly email newsletter shared with pharmacy project champion and other pharmacy staff.

Topics:
• Best practices for:
  o Identifying and screening patients
  o Conducting medication reviews
  o Communicating with patients and prescribers
  o Documenting activities
  o Optimizing non-clinical staff
• Frequently asked questions
• Housekeeping
• News about project, falls research, state and national initiatives

STEP 3: PROJECT COACHING

A project coach was deployed from the investigative team to ensure fidelity of training among pharmacies and to provide technical support and feedback. The coach provided regular follow-up (i.e., every 1-2 weeks) by phone or email with pharmacy project champions for the first six months of the study. Follow-up continued to occur during the final three months of the project, but frequency was on an as-needed basis for each pharmacy.
Figure S1. Cover fax form.

Fax:

| PRESCRIBER: | PHARMACIST: |
|-------------|-------------|
| FAX:        | FAX:        |
| PHONE:      | PHONE:      |
| SUBJECT:    | DATE:       |

COMMENTS: CONTAINS SENSITIVE PATIENT INFORMATION

HELP US PREVENT FALLS IN YOUR OLDER ADULT PATIENTS

What does this mean for your practice?

- This is a pharmacy service supported by a grant from the Centers for Disease Control and Prevention to reduce the risk of falls in older adults through interprofessional collaboration.
- Through collaboration with your community pharmacy, you can meet your quality metrics (e.g. HEDIS measures, annual wellness visits!)
- You may receive a communication from a community pharmacy when they have identified an older adult at increased risk for falling.
- We request you review the pharmacist's recommendations and send your response back to the pharmacy.

How it works:

- Patient identification at pharmacy
- Pharmacist performs medication review
- Care coordination with prescriber
**Anticonvulsant Algorithm for Evaluating the Risk for Falls**

The adverse effects associated with anticonvulsants may increase an individual's risk for falling. These agents cause sedation and dizziness resulting in the impairment of one's gait and balance and these effects are more pronounced in the elderly. Therefore, they should be used with caution in this population, especially when an individual is at increased risk for falls. In studies, anticonvulsants as a class have been found to increase the risk for falls and fracture. Even suggested alternatives may increase fall risk but are generally more tolerable and less likely to have altered pharmacokinetics in elderly patients compared to others in the class. Seizures may be controlled with lower or “subtherapeutic” doses of anticonvulsants in older patients. 1-7

| Anticonvulsants | Fellbamate (Felbatol) | Ocarbazepine (Trileptal) | Tiagabine (Gabitril) |
|-----------------|----------------------|-------------------------|---------------------|
| Brivaracetam (Brivice) | Fosphenytoin (Cerebyx) | Perampanel (Peycompa) | Topiramate (Topamax) |
| Carbamazepine (Tegretol, Carbatrol) | Gabapentin (Neurontin) | Phenytoin (Dilan tin) | Trinethadione (Tridione) |
| Oxcarbazepine (Trileptal) | Lamotrigine (Lamictal) | Phenytoin (Dilan tin) | Valproate (Depakene) |
| Felbamate (Felbatol) | Levetiracetam (Keppra) | Primalone (Mysone) | Vigabatrin (Sabril) |
| Tiagabine (Gabitril) | Methsuximide (Celenion) | Rufinamide (Hunzel) | Zonisamide (Zonegran) |
| Carbamazepine (Tegretol, Carbatrol) | Divalproex sodium can cause tremor, sedation, parkinsonism, and hearing loss. Phenytoin can cause ataxia, osteopenia, and sedation. Phenytoin can cause ataxia, osteopenia, and sedation. |

**Concerns**

Several anticonvulsants can be problematic for the older population due to their potential for causing adverse effects. The adverse effects associated with the drugs may increase an individual's risk for falling. Carbamazepine can cause sedation, neutropenia, and hyponatremia. Divalproex sodium can cause tremor, sedation, parkinsonism, and hearing loss. Phenytoin can cause ataxia, osteopenia, and sedation. Phenobarbital can cause ataxia, memory problems, and sedation.

Consider addition of calcium and vitamin D if on anticonvulsant chronically.

**Suggested Alternatives for Seizures**

Alternatives depend on the type of seizure. Use the lowest possible strength for seizures protection. Monitor serum concentrations of medications.

**Preferred initial agent for all seizure types in the elderly**

Lamotrigine: start at 25mg/day, can increase by 25mg/day every 2 weeks; max 100-300mg day

Other alternatives as adjunct or for select seizure types

Levetiracetam: start 500mg q12h, can increase by 500mg/day every 2 weeks; max 1500mg q12h. Requires renal dose reduction. Gabapentin: start 300mg TID; max 600mg q8-12 hours. Requires renal dose reduction.

**Suggested Approaches for Changing Anticonvulsants or Discontinuing Therapy**

The new anticonvulsant should be within therapeutic concentration before tapering the old one. It may take up to a year to taper an anticonvulsant during discontinuation or crossovers.

If seizures get worse, you may have to revert back to the previous dose and slow down the taper. If adverse effects occur, lowering the dose of the previous medication may help the patient tolerate the new anticonvulsant.

Patients should not drive during the taper and for awhile after.

**Suggested Alternatives for Neuropathic Pain/Chronic Pain**

Must weigh benefit of treating pain with increased risk of falls. Preferred agents

Includes duloxetine, venlafaxine, gabapentin, and pregabalin. May also consider topical agents including lidocaine patch and capsaicin if localized.

Refer to algorithm for tricyclic antidepressants

**Discontinuing Therapy**

Consider slowly tapering patients off the seizure medication if they meet the below criteria.

(1) Seizure-free >2 years with subtherapeutic concentrations

(2) Taking the medication for a long time and were placed on anticonvulsants prophylactically or for a few seizures, especially after stroke, neurosurgery or head trauma.

July 2017
### Antidepressant Algorithm for Evaluating Risk for Falls

It is unclear how antidepressants increase an individual’s risk for falling. Possible mechanisms include their potential to cause sedation and postural disturbances, although these effects vary with each agent and each person. Additionally, antidepressants may be indirectly associated with fall risk attributed to factors such as poor health status, depression, and weight loss. In studies, antidepressants have been found to increase the risk for falls and fracture.8-10

**General Considerations**

- **AVOID** Paroxetine due to greater anticholinergic properties than other antidepressants, which may increase one’s risk for falling. Anticholinergic adverse effects include sedation, confusion, dizziness, gait and balance problems, and weakness.
- **AVOID** Fluoxetine due to long-half life, which may be even more pronounced in the elderly; thereby increasing the risk for excessive CNS stimulation, sleep disturbances, and increasing agitation.
- **AVOID** Fluvoxamine due to drug interactions and availability of effective and safer agents.
- **AVOID** Nefazodone, while not directly linked to falls, is associated with hepatotoxicity and significant drug interactions, which limit its use. Alternatives exist that are safer and as effective for treating depression.
- **AVOID** Isocarboxazid, Phenelzine, and Tranylcypromine should be avoided in the elderly due to their potential for toxicity and risk of drug-drug and drug-food interactions.

**Must weigh benefit of treating depression with increased risk for falls associated with antidepressants. Selection of an antidepressant should be individualized, taking into account patient factors and concomitant medical conditions and medications.**

**Suggested Alternatives**

- **Citalopram**: start 10mg daily; max 20mg/day
- **Escitalopram**: start 5mg daily; max 10mg/day
- **Sertraline**: start 25mg daily; max 200mg/day
- **Duloxetine**: avoid if GFR <30mL/min; start 30mg daily x2 weeks, increase to 60mg daily; max 120mg/day
- **Venlafaxine**: start 37.5mg (XR) or 25mg once or twice daily (IR); max 225mg/day
- **Bupropion**: start 75mg BID (IR), 100mg daily (SR), 150mg daily (XR); max 450mg/day (IR, XR), 400mg/day (SR)
- **Buspirone**: as adjunct start 7.5mg daily; max 7.5mg BID

Educate patient on the potential for increased sedation, dizziness, and postural changes from the antidepressant. Monitor closely for adverse effects and falls. Consider switching agent if adverse effects are apparent.

There is no one antidepressant or class considered the agent or class of choice in reducing one’s risk for falls. The association with antidepressants and fall risk has been attributed to all antidepressant agents.

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**Tables**

| Selective Serotonin Reuptake Inhibitors | S-HT2 Receptor Antagonists |
|----------------------------------------|-----------------------------|
| Citalopram (Celexa)                    | Nefazodone (Serzone)        |
| Escitalopram (Lexapro)                 | Fluoxetine (Prozac)         |
| Fluoxetine (Prozac)                    | Trazodone (Desyrel)         |
| Mirtazapine (Remeron)                  | Noradrenergic Agonist       |
| Paroxetine (Paxil)                     | Fluvoxamine (Luvox)         |
| Sertraline (Zoloft)                    | Vilazodone (Vibryd)         |

| Serotonin Norepinephrine Reuptake Inhibitors | Dopamine Reuptake Blocking Agents |
|---------------------------------------------|----------------------------------|
| Desvenlafaxine (Pristiq)                   | Bupropion (Wellbutrin, Wellbutrin SR) |
| Duloxetine (Cymbalta)                      |                                  |
| Levomilnacipran (Fetzima)                  |                                  |
| Venlafaxine (Effexor, Effexor XR)          |                                  |

| Anxiolytics | Tricyclic Antidepressants Refer to TCA Algorithm |
|------------|-----------------------------------------------|
| Buspirone (Buspar) |                                  |

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**Notes**

- It is unclear how antidepressants increase an individual’s risk for falling. Possible mechanisms include their potential to cause sedation and postural disturbances, although these effects vary with each agent and each person. Additionally, antidepressants may be indirectly associated with fall risk attributed to factors such as poor health status, depression, and weight loss. In studies, antidepressants have been found to increase the risk for falls and fracture.8-10

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**Acknowledgment**

This resource is designed to provide a comprehensive guide to antidepressant Algorithms and their effects on patient health and safety. It is essential for healthcare providers to stay informed about the latest research and best practices in this field. This information is not intended to replace professional medical advice and should be used in conjunction with patient-specific information and guidelines.
Antihypertensive Algorithms for Evaluating the Risk for Falls

There is mixed evidence regarding association of antihypertensives and fall risk. Hypotension and orthostatic hypotension may contribute to fall risk, but evidence is also inconsistent in this aspect. There is no strong evidence indicating a specific class is preferred over others due to lower fall risk. However, with the possibility of orthostatic hypotension contributing to falls and strong evidence of cardiovascular benefits with specific classes of antihypertensives, some may be preferred over others.11-20

| Peripheral alpha-1 blockers | Calcium channel blockers | Diuretics | Beta-blockers |
|-----------------------------|--------------------------|-----------|--------------|
| Doxazosin                   | Amlodipine               | Amiloride | Atenolol     |
| Prazosin                    | Diltiazem                | Bumetanide| Nebivolol    |
| Terazosin                   | Felodipine               | Chlorthamide| Penbutolol|
|                            | Isradipine               | Chlorothiazide| Propranolol|
|                            | Nicardipine              | Flecainide| Timolol      |
|                            | Nifedipine               | Furosemide|              |
|                            | Nifedipine               | Hydrochlorothiazide|      |
|                            | Nifedipine               | Indapamide|              |
|                            | Nifedipine               | Metolazone|              |
|                            | Nifedipine               | Spironolactone|      |
|                            | Nifedipine               | Tramterene|              |
|                            | Nifedipine               | Torsemide|              |
|                            | Nifedipine               | Minoxidil|              |
|                            | Tramterene               |            |              |

**General Considerations**

**AVOID**

Peripheral alpha-1 blockers for treatment of hypertension due to high risk of orthostatic hypotension and availability of alternative agents with superior risk-benefit profile.

Centrally-acting medications due to high risk of adverse CNS effects, bradycardia, and orthostatic hypotension.

Immediate release nifedipine due to potential for hypotension

**Suggested Alternatives**

There is no clear evidence indicating that one medication or medication class should be preferred over others to reduce fall risk.

Selection of agents depends on patient’s comorbid conditions. Generally, angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, calcium channel blockers, or thiazide diuretics would be preferred first-line agents for hypertension based on current guidelines.

Consider beta-blocker if patient has another compelling indication for its use or has resistant hypertension on preferred first-line agents. Selective beta-blockers (acebutolol, atenolol, betaxolol, bisoprolol, metoprolol, nebivolol) may have lower fall risk than non-selective beta blockers.
Antipsychotic Algorithm for Evaluating the Risk for Falls

Antipsychotics are thought to increase one’s risk for falls due to their potential to cause significant adverse effects, including reduced alertness, impaired neuromuscular functioning, sedation, dizziness, postural hypotension, altered gait and balance, and extrapyramidal symptoms. In studies, antipsychotics have been found to increase one’s risk for falls. Although atypical antipsychotics are generally better-tolerated overall and have less extrapyramidal effects, they are also associated with increased risk of falls. Avoid use of antipsychotics for treatment of conditions other than psychiatric conditions.17-20

### General Considerations

**AVOID**
- Thioridazine due to potential for increased CNS and extrapyramidal adverse effects. This drug has a high incidence of sedation, orthostatic hypotension, and anticholinergic adverse effects, which may increase one’s risk for falls.
- Chlorpromazine due to a high incidence of sedation, orthostatic hypotension, and anticholinergic adverse effects, which may increase one’s risk for falls.
- Antipsychotics in elderly individuals with dementia which has been associated with increased mortality. If required use lowest dose for shortest duration needed.

### Other Indications

When discontinuing, consider tapering by 25% of original dose every 1-2 weeks.

Non-pharmacological interventions should be utilized before starting antipsychotic.

Risks and benefits of used should be carefully assessed.

If non-pharmacological approaches have failed and symptoms are severe, dangerous, and/or cause significant distress to patient, low dose, less anticholinergic agent may be acceptable for shortest duration possible. Consider trial discontinuation within 4 months.

#### Suggested Alternatives

**Preferred drugs include:**
- Aripiprazole: start 2-5mg/day, can increase every 2 weeks if needed; max 30mg/day
- Olanzapine: start 2.5mg/day; max 10mg/day
- Quetiapine: start 12.5-25mg/day; max 200mg/day in 1-2 doses
- Risperidone: start 0.25mg/day; max 6mg/day in 1-2 doses

For management of acute psychiatric conditions such as delirium, address any contributing factors and utilize non-pharmacological interventions prior to medications. The previously noted medications may be used.

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**Typical Antipsychotics**

- Chlorpromazine (Thorazine)
- Pimozide (Orap)
- Haloperidol (Haldol)
- Thiothixene (Navane)
- Loxapine (Ioxitane, Ioxitane C)
- Molindone (Moban)
- Perphenazine (Trilafon)

**Atypical Antipsychotics**

- Aripiprazole (Abilify)
- Asenapine Maleate (Sapris)
- Clozapine (Clozaril)
- Iloperidone (Fanapt)
- Olanzapine (Zyprexa)
- Paliperidone (Invega)
- Quetiapine (Seroquel)
- Risperidone (Risperdal)
- Ziprasidone (Geodon)

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**Insomnia**

If low-dose antipsychotic being used, can discontinue without tapering.

**Suggested Alternatives**

The following agents should only be used when all possible reasons for insomnia have been ruled out and behavioral approaches to sleep management (i.e., sleep hygiene) have been addressed. The lowest dose possible for a short-term period is recommended.

Preferred drugs include: melatonin, ramelteon, trazodone, mirtazapine

Refer to algorithm for sedative hypnotics.

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**Behavioral Complications in Dementia**

When discontinuing, consider tapering by 25% of original dose every 1-2 weeks.

Non-pharmacological interventions should be utilized before starting antipsychotic.

Risks and benefits of used should be carefully assessed.

If non-pharmacological approaches have failed and symptoms are severe, dangerous, and/or cause significant distress to patient, low dose, less anticholinergic agent may be acceptable for shortest duration possible. Consider trial discontinuation within 4 months.

**Suggested Alternatives**

**Preferred drugs include:**
- Aripiprazole: start 2-5mg/day, can increase every 2 weeks if needed; max 30mg/day
- Olanzapine: start 2.5mg/day; max 10mg/day
- Quetiapine: start 12.5-25mg/day; max 200mg/day in 1-2 doses
- Risperidone: start 0.25mg/day; max 6mg/day in 1-2 doses

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July 2017
## Antispasmodic Algorithm for Evaluating the Risk for Falls

Antispasmodics have not been studied in association with increasing fall risk; however, the adverse effects associated with the drugs may increase an individual’s risk for falling. These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. These effects are more pronounced in the elderly. Therefore, they should be used with caution in this population, especially when an individual is at an increased risk for falls.\(^\text{29,30}\)

| Skeletal Muscle Relaxants | Gastrointestinal Antispasmodics | Urinary Antispasmodics |
|---------------------------|---------------------------------|------------------------|
| Baclofen (Lioresal) | Belladonna Alkaloids (Donnatal, others) | Darifenacin (Enablex) |
| Carisoprodol (Soma) | Clidinium-Chlordiazepoxide (Librax) | Fesoterodine (Toviaz) |
| Chlorzoxazone (Paraflex) | Dicyclomine (Bentyl) | Flavoxate (Urispas) |
| Cyclobenzaprine (Flexeril) | Hyoscyamine (Levsin, Levsinex) | Oxybutynin (Ditropan) |
| Dantrolene (Dantum) | Propantheline (Pro-Banthine) | Solifenacin (Vesicare) |
| Metaxalone (Skelaxin) | | Tolerodine (Detrol) |
| Methocarbamol (Robaxin) | | Trosplum (Sanctura) |
| Orphenadrine (Norflex) | | |
| Tizanidine (Zanaflex) | | |

### General Considerations

**AVOID MOST AGENTS**

The benefit of using one of these agents in an elderly individual, especially an individual already at an increased risk for falling, will likely not outweigh the risks and adverse effects associated with these agents.

These agents are not recommended to be used in the elderly due to their potential for causing significant adverse effects. While these agents have not been studied in association with increasing fall risk, the adverse effects associated with the drugs may increase an individual’s risk for falling. They are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. Additionally, their effectiveness at doses tolerated by the elderly is questionable.

### Spasms or Pain Associated with Muscle Spasms

Consider nonpharmacologic approaches, such as exercise and/or physical therapy, if appropriate.

If patient has true spasticity and the decision is made to use one of these agents in an elderly individual at an increased risk for falls, the following may be considered:

**Suggested Alternatives**

- **Baclofen**: start 5mg 2-3x/day; max 80mg/day
- Use the lowest dose possible for shortest duration.
- Limit use to 2-3 weeks.
- Document need for medication in light of fall risk.

### Spasms Associated with Neurogenic Bladder or Urinary Incontinence

Nonpharmacologic treatment should be first-line prior to trying medication. All agents have similar efficacy.

Some newer agents and topical agents have less CNS effects and may be preferred over other agents. The following may be considered:

**Suggested Alternatives**

- **Darifenacin**: 7.5mg daily, can increase to 15mg after at least 2 weeks
- **Fesoterodine**: 4mg daily; max 8mg/day
- **Trosplum**: 20mg BID (OR) or 60mg daily (XR)
- **Oxybutynin Transdermal Patch**: apply one 3.9mg patch q3-4 days

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*July 2017*
Benzodiazepine Algorithm for Evaluating the Risk for Falls

The adverse effects associated with benzodiazepines may increase an individual's risk for falling. These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. These effects are more pronounced in the elderly. Therefore, they should be used with caution in this population, especially when an individual is at increased risk for falls. In studies, benzodiazepines as a class have been found to increase the risk for falls and fracture. 36-39

| Anxiety          | Insomnia | Other Indications |
|------------------|----------|-------------------|
| Alprazolam (Xanax) | Lorazepam (Ativan) |
| Chlorzepate (Transene) | Oxazepam (Serax) |
| Chlordiazepoxide (Librium, Limbitrol, Librax) | Quazepam (Doral) |
| Clonazepam (Klonopin) | Temazepam (Restoril) |
| Diazepam (Valium) | Transzepam (Halcion) |
| Estazolam (Hurdon) | Zaleplon (Sonata) |
| Eszopiclone (Lunesta) | Zolpidem (Ambien) |
| Flurazepam (Dalmane) | |

All suggested alternatives may increase a patient’s fall risk. One must determine the risk versus the benefit when selecting an alternative.

**Suggested Alternatives**
- SSRIs [Sertraline (Zoloft), Escitalopram (Lexapro), Citalopram (Celexa)], SNRIs [Venlafaxine (Effexor), and Duloxetine (Cymbalta)], and Buspirone (Buspar), can be used to treat anxiety and they are not associated with the same degree of CNS depression as benzodiazepines.

Refer to algorithm for antidepressants.

In addition, cognitive-behavioral therapy has been shown to be effective in the management of generalized anxiety disorder.

**Tapering Considerations**

Slow tapering recommended when stopping benzodiazepines.

Consider decreasing dose by 25%/every two weeks, and if possible, 12.5% reductions near end of taper and/or planned drug-free days. If dosage form doesn’t allow for 25%/reduction initially and then drug-free days in the latter part of tapering.

If symptoms relapse, can consider maintaining current dose for 1-2 weeks then resume taper at slow rate.
Opioid Algorithm for Evaluating the Risk for Falls

The opioids likely increase an individual’s risk for falling due to their potential for causing adverse effects, including reduced alertness, impaired neuromuscular function, sedation, dizziness, impaired cognition, and unsteadiness or impaired functioning. In studies, opioids/narcotics have been found to increase one’s risk for falls and fracture, although findings are inconsistent.45-49

General Considerations

**AVOID**

- Pentazocine/naloxone as it causes CNS adverse effects, including confusion and hallucinations, which may increase one’s risk for falls.
- Meperidine as it is not an effective oral analgesic in dosages commonly used and may have a higher risk of neurotoxicity, which may increase one’s risk for falls.

Nociceptive Pain

*Must weigh benefit of treating pain and increased risk of adverse effects and falls associated with opioids. If the opioid is continued, educate patient on the potential for increased sedation, dizziness, unsteadiness, and confusion, and closely monitor for the presence of these adverse effects.*

Consider the following:
- Limit dose to 1 tablet at a time rather than 1-2 tablets.
- Switch drug if adverse effects are apparent.

**Suggested Alternatives**

**Localized Pain:**
- Topical Capsaicin: usually applied 2-4 times daily
- Diclofenac gel (Voltaren): 2-4g up to 4 times daily; max 32g/day

**Mild-Moderate pain:**
- Acetaminophen (Tylenol): dose q6-8hrs; max 3g/day
- Ibuprofen, naproxen, diclofenac, celecoxib (use with caution if no HF and eGFR <30mL/min and given with PPI for gastroprotection. Note: avoid indomethacin due to CNS adverse effects; avoid ketorolac due to increased risk of bleeding, renal failure, high blood pressure, and heart failure.

**Moderate-Severe pain:**
- Tramadol ( Ultram): avoid if CrCl<30mL/min, start 25mg (IR) QHS; max 300mg/day (divided QID)
- Oxycodone: 2.5mg QHS; max 2.5-5mg q4-6h
- Morphine sulfate: 7.5mg QHS; max 1.5mg q12h
- Increase slowly and use the lowest dose possible to control pain.

**Neuropathic Pain**

*All suggested oral alternatives may increase a patient’s fall risk. One must determine the risk versus the benefit when selecting an alternative.*

**Suggested Alternatives**

**Topical Agents:**
- Capsaicin: usually applied 2-4 times daily
- Lidocaine patch (lidoderm): apply to affected area for 12 hours, then remove for 12 hours

**Oral Agents:**
- Duloxetine (Cymbalta): avoid if GFR <30mL/min, start 30mg daily; max 60mg/day
- Venlafaxine (Effexor): start 37.5mg daily; max 225mg/day
- Gabapentin (Neurontin): must be renally adjusted, start 100mg QHS, then 100mg q8h; max 3600mg/day
- Pregabalin (Lyrica): must be renally adjusted, start 50mg QHS, then 50mg q8h; max 300mg/day

Refer to algorithm for TCAs
Sedative Hypnotic Algorithm for Evaluating the Risk for Falls

The adverse effects associated with sedative hypnotics may increase an individual’s risk for falling. These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. These effects are more pronounced in the elderly. Therefore, they should be used with caution in this population, especially when an individual is at increased risk for falls. In studies, sedative hypnotics as a class have been found to increase the risk for falls and fracture.50-54

![Sedative Hypnotic Algorithm](image)

| Anxiety | Insomnia | Scizure |
|---------|----------|---------|
| Amobarbital (Amytal) | Doxylamine | Meprobamate (Miltown, Equanil) |
| Butabarbital | Butalbital | Pentobarbital (Nembutal) |
| Diphenhydramine |  | Secobarbital (Seconal) |

**Suggested Alternatives**

All suggested alternatives may increase a patient’s fall risk. One must determine the risk versus the benefit when selecting an alternative.

SSRI/SNRIs can be used to treat anxiety. Preferred agents include duloxetine, venlafaxine, sertraline, escitalopram, and buspirone.

Refer to algorithm for antidepressants.

May consider short term use of benzodiazepines (lorazepam, oxazepam, temazepam) for severe anxiety that has not responded to preferred agents.

Refer to algorithm for benzodiazepines.

**Suggested Alternatives**

The following agents should only be used when all possible reasons for insomnia have been ruled out and behavioral approaches to sleep management (i.e., sleep hygiene) have been addressed.

Melatonin: start at 1mg QHS; max 10mg/night or Ramelteon (Rozerem): start at 8mg QHS; max 8mg/night, Trazodone (Desyrel): start 25mg QHS, max 100mg/night, or Mirtazapine (Remeron): 7.5mg QHS, max 15mg/night if has concomitant depression

AVOID

Diphenhydramine-containing products (e.g., Tylenol PM, Benadryl, Nytol, Sominex) and doxylamine-containing products (e.g., Unisom Nightime). These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. Additionally, their effectiveness for a sleep is questionable.

Newer anticonvulsants lamotrigine, levetiracetam, and gabapentin are preferred in elderly patients due to improved safety and better tolerability.

Refer to algorithm for anticonvulsants.

**AVOID**

Diphenhydramine-containing products (e.g., Tylenol PM, Benadryl, Nytol, Sominex) and doxylamine-containing products (e.g., Unisom Nightime). These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. Additionally, their effectiveness for a sleep is questionable.
Tricyclic Antidepressant Algorithm for Evaluating the Risk for Falls

The tricyclic antidepressants are associated with high incidence of anticholinergic adverse effects, including reduced alertness, impaired neuromuscular functioning, sedation, dizziness, postural hypotension, altered gait and balance, and confusion. In studies, the tricyclic antidepressants have been associated with increased risk of falls.55-59

| Depression          | Neuropathic Pain/Chronic Pain | Insomnia | Other Indications |
|---------------------|-------------------------------|----------|------------------|
| **Suggested Alternatives** |                               |          |                  |
| Citofra (Citalopram (Citalopram (Celexa) ) | Sertraline (Zoloft) | Escitalopram (Lexapro) | Venlafaxine (Effexor) | Duloxetine (Cymbalta) |
| Avoid Paroxetine (Paxil) | Fluoxetine (Prozac) | Nefazodone (Serzone) | Fluvoxamine (lavox) |
| Avoid TCA due to potential for strong anticholinergic and sedating properties which increase fall risk. |
| Avoid l-isocarboxazid Marplan | Phenceline (Nardil) | Tranylcypromine (Parnate) |
| Refer to algorithm for antidepressants |
| **Must weigh benefit of treating pain with increased risk for falls.** |
| **Suggested Alternatives** |                               |          |                  |
| Duloxetine (Cymbalta): avoid if GFR <30 mL/min, start 50mg daily; max 60mg/day | Venlafaxine (Effexor): start 37.5mg daily; max 225mg/day | Gabapentin: must be renally adjusted; start 50mg QHs, then 50mg q8h; max 300mg/day | Lidocaine patch: apply to affected area for 12 hrs, then remove for 12 hrs Other topical lidocaine: usually applied 3-4 times daily Capsaicin topical: usually applied 2-4 times daily |
| If a TCA is used and effectiveness has been demonstrated, ensure that the individual is on the lowest dose possible to control the pain and minimize adverse events. If a TCA is needed, consider nortriptyline (max 30-50mg/day) or desipramine (max 150mg/day) | |
| Refer to algorithm for opioids |
| **Suggested Alternatives** |                               |          |                  |
| The following agents should only be used when all possible reasons for insomnia have been ruled out and behavioral approaches to sleep management (i.e., sleep hygiene) have been addressed. The lowest dose possible for a short-term period is recommended. Preferred drugs are: melatonin, ramelteon, trazodone, mirtazapine | Avoid a diphenhydramine containing products (e.g., Tylenol PM, Benadryl) and doxylamine-containing products (e.g., Unisom SleepTabs). These agents are highly anticholinergic and cause sedation, confusion, dizziness, gait and balance problems, and weakness. Additionally, their effectiveness for sleep is questionable. |
| Refer to algorithm for sedative-hypnotics | **Avoid** |

July 2017

High-risk medication algorithm references

1. American Geriatrics Society 2015 Beers Criteria Update Expert Panel. American Geriatrics Society 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. Journal of the American Geriatrics Society. 2015;63(11):2227-2246.
2. Woolcott JC, Richardson KJ, Wiens MO, et al. Meta-analysis of the impact of 9 medication classes on falls in elderly persons. Arch Intern Med. 2009;169(21):1952-1960.
| Medication          | Algorithm                  |
|---------------------|----------------------------|
| **A**               |                            |
| Abilify             | Antipsychotics             |
| acebutalol          | Antihypertensives          |
| Actiq               | Opioids                    |
| Aldactazide         | Antihypertensives          |
| Aldactone           | Antihypertensives          |
| Aldomet             | Antihypertensives          |
| alprazolam          | Benzodiazepines            |
| Ambien              | Benzodiazepines            |
| amiloride           | Antihypertensives          |
| amitriptyline       | Tricyclic Antidepressants  |
| amlodipine          | Antihypertensives          |
| amobarbital         | Sedative Hypnotics         |
| amoxapine           | Tricyclic Antidepressants  |
| Amytal              | Sedative Hypnotics         |
| Anafranil           | Tricyclic Antidepressants  |
| Apresoline          | Antihypertensives          |
| Aptiom              | Anticonvulsants            |
| aripiprazole        | Antipsychotics             |
| asenapine maleate   | Antipsychotics             |
| Asendin             | Tricyclic Antidepressants  |
| Atacand HCT         | Antihypertensives          |
| atenolol            | Antihypertensives          |
| Ativan              | Benzodiazepines            |
| Avalide             | Antihypertensives          |
| Azor                | Antihypertensives          |
| **B**               |                            |
| baclofen            | Antispasmodics             |
| Banzel              | Anticonvulsants            |
| belladonna alkaloids| Antispasmodics             |
| Benicar HCT         | Antihypertensives          |
| Bentyl              | Antispasmodics             |
| bisoprolol          | Antihypertensives          |

**Table S2.** High-risk medication index.
| Drug          | Class          |
|---------------|----------------|
| Blocadren     | Antihypertensives |
| brivaracetam  | Anticonvulsants |
| Briviact      | Anticonvulsants |
| bumetanide    | Antihypertensives |
| Bumex         | Antihypertensives |
| buprenorphine | Opioids        |
| bupropion     | Antidepressants |
| Medication                  | Algorithm              |
|----------------------------|------------------------|
| Buspar                     | Antidepressants        |
| buspirone                  | Antidepressants        |
| butabarbital               | Sedative Hypnotics     |
| butalbital                 | Sedative Hypnotics     |
| Butisol                    | Sedative Hypnotics     |
| Butrans                    | Opioids                |
| Bystolic                   | Antihypertensives      |
| C                           |                        |
| Caduet                     | Antihypertensives      |
| Calan                      | Antihypertensives      |
| carbamazepine              | Anticonvulsants        |
| Carbatrol                  | Anticonvulsants        |
| Cardene                    | Antihypertensives      |
| Cardizem                   | Antihypertensives      |
| Cardura                    | Antihypertensives      |
| carisoprodol               | Antispasmodics         |
| Cartia                     | Antihypertensives      |
| carvedilol                 | Antihypertensives      |
| Catapres                   | Antihypertensives      |
| Celexa                     | Antidepressants        |
| Celontin                   | Anticonvulsants        |
| Cerebryx                   | Anticonvulsants        |
| chlorazepate               | Benzodiazepines        |
| chlordiazepoxide           | Benzodiazepines        |
| chlorthiazide              | Antihypertensives      |
| chlorpromazine             | Antipsychotics         |
| chlorthalidone             | Antihypertensives      |
| chlorzoxazone              | Antispasmodics         |
| citalopram                 | Antidepressants        |
| clidinium-chlordiazepoxide | Antispasmodics         |
| clobazam                   | Anticonvulsants        |
| clomipramine               | Tricyclic Antidepressants |
| clonazepam                 | Benzodiazepines        |
| clonidine                  | Antihypertensives      |
| clozapine                  | Antipsychotics         |
| Clozaril                   | Antipsychotics         |
| codeine                    | Opioids                |
| Coreg                      | Antihypertensives      |
| Corgard                    | Antihypertensives      |
| cyclobenzaprine            | Antispasmodics         |
| Cymbalta                   | Antidepressants        |
| Medication       | Algorithm                  |
|------------------|---------------------------|
| Dalmane          | Benzodiazepines           |
| Dantrium         | Antispasmodics            |
| dantrolene       | Antispasmodics            |
| darifenacin      | Antispasmodics            |
| Demadex          | Antihypertensives         |
| Demerol          | Opioids                   |
| Depakene         | Anticonvulsants           |
| Depakote         | Anticonvulsants           |
| desipramine      | Tricyclic Antidepressants |
| desvenlafaxine   | Antidepressants           |
| Desyrel          | Antidepressants           |
| Detrol           | Antispasmodics            |
| diazepam         | Benzodiazepines           |
| dicyclomine      | Antispasmodics            |
| Dilacor          | Antihypertensives         |
| Dilantin         | Anticonvulsants           |
| Dilaudid         | Opioids                   |
| diltiazem        | Antihypertensives         |
| Diltzac          | Antihypertensives         |
| Diovon HCT       | Antihypertensives         |
| diphenhydramine  | Sedative Hypnotics        |
| Ditropan         | Antispasmodics            |
| Diuril           | Antihypertensives         |
| divalproex sodium| Anticonvulsants           |
| Dolophine        | Opioids                   |
| Donnatol         | Antispasmodics            |
| Doral            | Benzodiazepines           |
| doxazosin        | Antihypertensives         |
| doxepin          | Tricyclic Antidepressants |
| doxylamine       | Sedative Hypnotics        |
| duloxetine       | Antidepressants           |
| Duragesic        | Opioids                   |
| Dyazide          | Antihypertensives         |
| Dynacirc         | Antihypertensives         |
| Dyrenium         | Antihypertensives         |

| Medication       | Algorithm                  |
|------------------|---------------------------|
| Effexor (Effexor XR) | Antidepressants       |
| Elavil           | Tricyclic Antidepressants |
| Enablex          | Antispasmodics            |
| Medication     | Algorithm              |
|----------------|------------------------|
| eplerenone     | Antihypertensives      |
| Equanil        | Sedative Hypnotics     |
| escitalopram   | Antidepressants        |
| Esidrix        | Antihypertensives      |
| eslicarbazepine| Anticonvulsants        |
| estazolam      | Benzodiazepines        |
| eszopiclone    | Benzodiazepines        |
| ethosuximide   | Anticonvulsants        |
| Exforge        | Antihypertensives      |
| ezogabine      | Anticonvulsants        |
| F              |                        |
| Fanapt         | Antipsychotics         |
| felbamate      | Anticonvulsants        |
| Felbatol       | Anticonvulsants        |
| felodipine     | Antihypertensives      |
| fentanyl       | Opioids                |
| Fentora        | Opioids                |
| fesoterodine   | Antispasmodics         |
| Fetzima        | Antidepressants        |
| Fioricet       | Sedative Hypnotics     |
| Fiorinal       | sedative hypnotics     |
| flavoxate      | Antispasmodics         |
| Flexeril       | Antispasmodics         |
| fluoxetine     | Antidepressants & Antipsychotics |
| fluphenazine   | Antipsychotics         |
| flurazepam     | Benzodiazepines        |
| fluvoxamine    | Antidepressants        |
| fosphenytoin   | Anticonvulsants        |
| furosemide     | Antihypertensives      |
| Fycompa        | Anticonvulsants        |
| G              |                        |
| gabapentin     | Anticonvulsants        |
| Gabitril       | Anticonvulsants        |
| Geodon         | Antipsychotics         |
| guanabenz      | Antihypertensives      |
| guanfacine     | Antihypertensives      |
| H              |                        |
| Halcion        | Benzodiazepines        |
| Haldol         | Antipsychotics         |
| haloperidol    | Antipsychotics         |
| Medication     | Algorithm            |
|---------------|----------------------|
| hydralazine   | Antihypertensives    |
| hydrochlorothiazide | Antihypertensives   |
| hydrocodone   | Opioids              |
| Hydrodiuril   | Antihypertensives    |
| hydromorphone | Opioids              |
| Hygroton      | Antihypertensives    |
| hyoscyamine   | Antispasmodics       |
| Hypovase      | Antihypertensives    |
| Hytrin        | Antihypertensives    |
| Hyzaar        | Antihypertensives    |
| Iloperidone   | Antipsychotics       |
| imipramine    | Tricyclic Antidepressants |
| indapamide    | Antihypertensives    |
| Inderal       | Antihypertensives    |
| Innopran      | Antihypertensives    |
| Inspra        | Antihypertensives    |
| Intuniv       | Antihypertensives    |
| Invega        | Antipsychotics       |
| isocarboxazid | Antidepressants      |
| Isoptin       | Antihypertensives    |
| Isradipine    | Antihypertensives    |
| Keppra        | Anticonvulsants      |
| Klonopin      | Benzodiazepines      |
| Labetalol     | Antihypertensives    |
| Lacosamide    | Anticonvulsants      |
| Lamictal      | Anticonvulsants      |
| Lamotrigine   | Anticonvulsants      |
| Lasix         | Antihypertensives    |
| Latuda        | Antipsychotics       |
| Lentopres     | Antihypertensives    |
| Levatol       | Antihypertensives    |
| Levbid        | Antispasmodics       |
| Levetiracetam | Anticonvulsants      |
| Levo-Dromoran | Opioids              |
| Levomilnacipran | Antidepressants   |
| Levorphanol   | Opioids              |
| Levsin        | Antispasmodics       |
| Medication     | Algorithm        |
|---------------|------------------|
| Levsinex      | Antispasmodics   |
| Lexapro       | Antidepressants  |
| Librax        | Antispasmodics   |
| Librax        | Benzodiazepines  |
| Librium       | Benzodiazepines  |
| Limbitrol     | Benzodiazepines  |
| Lioresal      | Antispasmodics   |
| Loniten       | Antihypertensives|
| Lopressor     | Antihypertensives|
| lorazepam     | Benzodiazepines  |
| Lorvet        | Opioids          |
| Lortab        | Opioids          |
| Lotrel        | Antihypertensives|
| loxapine      | Antipsychotics   |
| Loxitane      | Antipsychotics   |
| Lozol         | Antihypertensives|
| Ludomil       | Tricyclic Antidepressants|
| Lunesta       | Benzodiazepines  |
| lurasidone    | Antipsychotics   |
| Luvox         | Antidepressants  |
| Lyrica        | Anticonvulsants  |
| maprotiline   | Tricyclic Antidepressants|
| Marplan       | Antidepressants  |
| Maxzide       | Antihypertensives|
| Mellaril      | Antipsychotics   |
| meperidine    | Opioids          |
| meprobamate   | Sedative Hypnotics|
| metaxalone    | Antispasmodics   |
| methadone     | Opioids          |
| methocarbamol | Antispasmodics   |
| methsuximide  | Anticonvulsants  |
| methyldopa    | Antihypertensives|
| metolazone    | Antihypertensives|
| metoprolol    | Antihypertensives|
| Microzide     | Antihypertensives|
| Midamor       | Antihypertensives|
| Miltown       | Sedative Hypnotics|
| Minipress     | Antihypertensives|
| minoxidil     | Antihypertensives|
| mirtazapine   | Antidepressants  |
| Medication   | Algorithm             |
|--------------|-----------------------|
| Moban        | Antipsychotics        |
| molindone    | Antipsychotics        |
| morphine     | Opioids               |
| MS Contin    | Opioids               |
| Mysoline     | Anticonvulsants       |
| Nadalol      | Antihypertensives     |
| Nardil       | Antidepressants       |
| Navane       | Antipsychotics        |
| Nebilet      | Antihypertensives     |
| Nefazodone   | Antidepressants       |
| Nembutal     | Sedative Hypnotics    |
| Neurontin    | Anticonvulsants       |
| Nicardipine  | Antihypertensives     |
| Nifedipine   | Antihypertensives     |
| Nimodipine   | Antihypertensives     |
| Nimotop      | Antihypertensives     |
| Nisoldipine  | Antihypertensives     |
| Norco        | Opioids               |
| Norflex      | Antispasmodics        |
| Normodyne    | Antihypertensives     |
| Norpramine   | Tricyclic Antidepressants |
| Nortriptyline| Tricyclic Antidepressants |
| Norvasc      | Antihypertensives     |
| Nucynta      | Opioids               |
| Olanzapine   | Antipsychotics        |
| Onfi         | Anticonvulsants       |
| Opana        | Opioids               |
| Orap         | Antipsychotics        |
| Oretic       | Antihypertensives     |
| Orphenadrine | Antispasmodics        |
| Oxazepam     | Benzodiazepines       |
| Oxcarbazepine| Anticonvulsants       |
| Oxbutynin    | Antispasmodics        |
| Oxycodone    | Opioids               |
| OxyContin    | Opioids               |
| Oxymorphine  | Opioids               |
| Medication     | Algorithm             |
|---------------|-----------------------|
| paliperidone  | Antipsychotics        |
| Pamelor       | Tricyclic Antidepressants |
| Paraflex      | Antispasmodics        |
| Parnate       | Antidepressants       |
| paroxetine    | Antidepressants       |
| Paxil         | Antidepressants       |
| penbutolol    | Antihypertensives     |
| pentobarbital | Sedative Hypnotics    |
| pentazocine   | Opioids               |
| perampanel    | Anticonvulsants       |
| Percocet      | Opioids               |
| Permitil      | Antipsychotics        |
| perphenazine  | Antipsychotics        |
| phenelzine    | Antidepressants       |
| phenobarbital | Anticonvulsants       |
| phenytoin     | Anticonvulsants       |
| pimozide      | Antipsychotics        |
| pindolol      | Antihypertensives     |
| Plendil       | Antihypertensives     |
| Potiga        | Anticonvulsants       |
| prazosin      | Antihypertensives     |
| pregabalin    | Anticonvulsants       |
| primidone     | Anticonvulsants       |
| Pristiq       | Antidepressants       |
| Pro-Banthine  | Antispasmodics        |
| Prolxin       | Antipsychotics        |
| propantheline | Antispasmodics        |
| propranolol   | Antihypertensives     |
| protriptyline | Tricyclic Antidepressants |
| Prozac        | Antidepressants       |
| quazepam      | Benzodiazepines       |
| quetiapine    | Antipsychotics        |
| Raudixin      | Antihypertensives     |
| Remeron       | Antidepressants       |
| reserpine     | Antihypertensives     |
| Restoril      | Benzodiazepines       |
| Risperdal     | Antipsychotics        |
| risperidone   | Antipsychotics        |
| Medication | Algorithm  |
|------------|------------|
| Robaxin    | Antispasmodics |
| Roxidone   | Opioids     |
| Rufinamide | Anticonvulsants |
| Sabril     | Anticonvulsants |
| Sanctura   | Antispasmodics |
| Sapris     | Antipsychotics |
| Sarafem    | Antidepressants |
| Secobarbital | Sedative Hypnotics |
| Seconal    | Sedative Hypnotics |
| Sectral    | Antihypertensives |
| Serax      | Benzodiazepines |
| Seroquel   | Antipsychotics |
| Serpamil   | Antihypertensives |
| Serpasil   | Antihypertensives |
| Sertraline | Antidepressants |
| Serzone    | Antidepressants |
| Sinequan   | Tricyclic Antidepressants |
| Skelaxin   | Antispasmodics |
| Solifenacin| Antispasmodics |
| Soma       | Antispasmodics |
| Sonata     | Benzodiazepines |
| Spironolactone | Antihypertensives |
| Stelazine  | Antipsychotics |
| Sular      | Antihypertensives |
| Surmontil  | Tricyclic Antidepressants |
| Symbyax    | Antipsychotics |
| Tapentadol | Opioids     |
| Taztia     | Antihypertensives |
| Tekturna HCT | Antihypertensives |
| Tegretol   | Anticonvulsants |
| Temazepam  | Benzodiazepines |
| Tenex      | Antihypertensives |
| Tenoretic  | Antihypertensives |
| Tenormin   | Antihypertensives |
| Terazosin  | Antihypertensives |
| Thalidone  | Antihypertensives |
| Thioridazine | Antipsychotics |
| Thiothixene | Antipsychotics |
| Medication   | Algorithm            |
|--------------|----------------------|
| Thorazine    | Antipsychotics       |
| tiagabine    | Anticonvulsants      |
| Tiazac       | Antihypertensives    |
| timolol      | Antihypertensives    |
| tizanidine   | Antispasmodics       |
| Tofranil     | Tricyclic Antidepressants |
| tolterodine  | Antispasmodics       |
| Topamax      | Anticonvulsants      |
| topiramate   | Anticonvulsants      |
| Toprol XL    | Antihypertensives    |
| torsemide    | Antihypertensives    |
| Toviaz       | Antispasmodics       |
| Trancot      | Sedative Hypnotics   |
| Trandate     | Antihypertensives    |
| Tranxene     | Benzodiazepines      |
| tranylcypromine | Antidepressants     |
| trazodone    | Antidepressants      |
| triamterene  | Antihypertensives    |
| triazolam    | Benzodiazepines      |
| Tribenzor    | Antihypertensives    |
| Tridione     | Anticonvulsants      |
| trifluoperazine | Antipsychotics     |
| Trilafon     | Antipsychotics       |
| Trileptal    | Anticonvulsants      |
| trimethadione | Anticonvulsants      |
| trimipramine | Tricyclic Antidepressants |
| trospium     | Antispasmodics       |
| Tussionex    | Opioids              |
| Tylenol #3   | Opioids              |
| Urispas      | Antispasmodics       |
| Valium       | Benzodiazepines      |
| valproate    | Anticonvulsants      |
| Vasoflex     | Antihypertensives    |
| venlafaxine  | Antidepressants      |
| verapamil    | Antihypertensives    |
| Vesicare     | Antispasmodics       |
| Vicodin      | Opioids              |
| Vicoprofen   | Opioids              |
| Medication      | Algorithm          |
|----------------|--------------------|
| vigabatrin     | Anticonvulsants    |
| Viibryd        | Antidepressants    |
| vilazodone     | Antidepressants    |
| Vimpat         | Anticonvulsants    |
| Visken         | Antihypertensives  |
| Vivactil       | Tricyclic Antidepressants |
|                |                    |
| Wellbutrin/Wellbutrin SR | Antidepressants |
| Wytensin       | Antihypertensives  |
|                |                    |
| Xanax          | Benzodiazepines    |
| zaleplon       | Benzodiazepines    |
| Zanaflex       | Antispasmodics     |
| Zarotin        | Anticonvulsants    |
| Zaroxolyn      | Antihypertensives  |
| Zayasel        | Antihypertensives  |
| Zebeta         | Antihypertensives  |
| Ziac           | Antihypertensives  |
| ziprasidone    | Antipsychotics     |
| Zoloft         | Antidepressants    |
| zolpidem       | Benzodiazepines    |
| Zonegran       | Anticonvulsants    |
| zonisamide     | Anticonvulsants    |
| Zyprexa        | Antipsychotics     |
### FALLS RISK CMR CHECKLIST

**Patient:**

**DOB:**

**Date:**

| FALLS RISK FACTOR(S) IDENTIFIED | FACTOR PRESENT? | NOTES |
|----------------------------------|----------------|-------|
| FALLS HISTORY                    |                |       |
| Any falls in the past year?      | Yes | No |
| Worries about falling?           | Yes | No |
| Feels unsteady when standing or walking? | Yes | No |
| POSTURAL HYPOTENSION             |                |       |
| Patient reported symptoms of lightheadedness or dizziness from lying to standing? | Yes | No |

| DRUG CLASSES WITH FALLS RISK | MEDICATION(S) NAME/DOSE/DIRECTIONS | PRESCRIBER |
|-----------------------------|-----------------------------------|------------|
| Anticonvulsant agents       |                                   |            |
| Antidepressant agents       |                                   |            |
| Antihypertensive agents     |                                   |            |
| Antipsychotic agents        |                                   |            |
| Antispasmodic agents        |                                   |            |
| Benzodiazepines             |                                   |            |
| Opioids                     |                                   |            |
| Sedative hypnotics          |                                   |            |
| Tricyclic antidepressants   |                                   |            |
| Other                       |                                   |            |

| OTHER DRUG THERAPY PROBLEMS (DTPS) | MEDICATION(S) NAME/DOSE/DIRECTIONS | PRESCRIBER |
|-----------------------------------|-----------------------------------|------------|
HELP US PREVENT FALLS IN YOUR OLDER ADULT PATIENTS

What does this mean for your practice?

- This is a pharmacy service supported by a grant from the Centers for Disease Control and Prevention to reduce the risk of falls in older adults through interprofessional collaboration.
- Through collaboration with your community pharmacy, you can meet your quality metrics (e.g. HEDIS measures, annual wellness visits).
- You may receive a communication from a community pharmacy when they have identified an older adult at increased risk for falling.
- We request you review the pharmacist’s recommendations and send your response back to the pharmacy.

How it works:

- Patient identification at pharmacy
- Pharmacist performs medication review
- Care coordination with prescriber
Table S3: North Carolina community-based fall prevention resources

| Community-Based Falls Prevention Resources |
|-------------------------------------------|
|                                           |
• **Healthy Aging NC – A Matter of Balance**
  o Description: a structured, group intervention that utilizes a variety of activities to address physical and cognitive factors affecting fear of falling and to teach fall prevention strategies. Consists of eight 2-hour-long sessions, most including a 30-minute exercise component.
  o Location(s): Williamston, NC
  o Website: [healthyagingnc.com/workshop/a-matter-of-balance/](http://healthyagingnc.com/workshop/a-matter-of-balance/)
  o E-mail: healthyagingncinfo@gmail.com
  o Phone: 828-258-7712

• **Otago Exercise Program**
  o Description: an individualized balance and strength fall prevention program that is delivered by a physical therapist over the course of 52 weeks. Designed to benefit older adults who have sustained falls in the past, have difficulty with gait, balance, or leg strength, and are limited in activities because of concerns of falling.
  o Location(s): Greenville, Kinston, Manteo, Nags Head, Oriental, Rocky Point, Whiteville, Wilmington, Windsor
  o Website: [healthyagingnc.com/workshop/otago-exercise-program/](http://healthyagingnc.com/workshop/otago-exercise-program/)
  o E-mail: healthyagingncinfo@gmail.com
  o Phone: 828-258-7712

• **Silver Sneakers**
  o A program sponsored by several participating health plans that provides free access to gyms, exercise classes, and other benefits to adults over the age of 65. See website for locations and offerings near you, and to check your patients’ eligibility.
  o Location(s): hundreds of locations statewide
  o Website: [https://www.silversneakers.com/](https://www.silversneakers.com/)
  o E-mail: support@silversneakers.com
  o Phone: 866-584-7389

• **More Resources**
  o Healthy Aging NC is looking to be a one-stop shop for evidence-based community-based falls prevention programs. They are continually updating their website to include a complete listing of programs, so check back regularly!
    o Website: [http://healthyagingnc.com/falls-prevention-workshops/](http://healthyagingnc.com/falls-prevention-workshops/)
    o E-mail: healthyagingncinfo@gmail.com
    o Phone: 828-258-7712
Central NC

- **Healthy Aging NC – A Matter of Balance**
  - Description: a structured, group intervention that utilizes a variety of activities to address physical and cognitive factors affecting fear of falling and to teach fall prevention strategies. Consists of eight 2-hour-long sessions, most including a 30-minute exercise component.
  - Location(s): Creedmoor, Fayetteville, Lexington, Stovall, Wadesboro, Wagram
  - Website: [http://healthyagingnc.com/workshop/a-matter-of-balance/](http://healthyagingnc.com/workshop/a-matter-of-balance/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712

- **YMCA: Moving for Better Balance**
  - Description: a 12-week evidence-based falls prevention program using the principles and movements of Tai Chi to help older adults increase their strength, improve their balance, and increase their confidence in doing everyday activities.
  - Location(s): Durham, Chapel Hill
  - Website: [http://healthyagingnc.com/workshop/ymca-moving-better-balance/](http://healthyagingnc.com/workshop/ymca-moving-better-balance/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712

- **Fit & Strong!**
  - Description: an 8-week multi-component exercise program aimed at older adults with lower extremity osteoarthritis.
  - Location(s): Mayodan, Raleigh, Troy
  - Website: [https://www.fitandstrong.org/index.html](https://www.fitandstrong.org/index.html)
  - E-mail: see “Contact Us” form on website
  - Phone: 312-413-9810

- **Otago Exercise Program**
  - Description: an individualized balance and strength fall prevention program that is delivered by a physical therapist over the course of 52 weeks. Designed to benefit older adults who have sustained falls in the past, have difficulty with gait, balance, or leg strength, and are limited in activities because of concerns of falling.
  - Location(s): Asheboro, Benson, Burlington, Bules Creek, Carrboro, Chapel Hill, Durham, Elon, Fuquay-Varina, Greensboro, Hillsborough, Lexington, Morrisville, Pinehurst, Pittsboro, Raeford, Raleigh, Reidsville, Rocky Mount, Roxboro, Sanford, Taylortown, West End, Winston-Salem
  - Website: [http://healthyagingnc.com/workshop/otago-exercise-program/](http://healthyagingnc.com/workshop/otago-exercise-program/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712
Central NC, continued

- **Silver Sneakers**
  - A program sponsored by several participating health plans that provides free access to gyms, exercise classes, and other benefits to adults over the age of 65. See website for locations and offerings near you, and to check your patients’ eligibility.
  - Location(s): hundreds of locations statewide
  - Website: [https://www.silversneakers.com/](https://www.silversneakers.com/)
  - E-mail: support@silversneakers.com
  - Phone: 866-584-7389

- **More Resources**
  - Healthy Aging NC is looking to be a one-stop shop for evidence-based community-based falls prevention programs. They are continually updating their website to include a complete listing of programs, so check back regularly!
    - Website: [http://healthyagingnc.com/falls-prevention-workshops/](http://healthyagingnc.com/falls-prevention-workshops/)
    - E-mail: healthyagingncinfo@gmail.com
    - Phone: 828-258-7712
Western NC

- **Healthy Aging NC – A Matter of Balance**
  - Description: a structured, group intervention that utilizes a variety of activities to address physical and cognitive factors affecting fear of falling and to teach fall prevention strategies. Consists of eight 2-hour-long sessions, most including a 30-minute exercise component.
  - Location(s): Asheville, Black Mountain, Charlotte, Gastonia, Huntersville, Kannapolis, Lincolnton, Marshall, Mooresville, Woodfin
  - Website: [http://healthyagingnc.com/workshop/a-matter-of-balance/](http://healthyagingnc.com/workshop/a-matter-of-balance/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712

- **YMCA: Moving for Better Balance**
  - Description: a 12-week evidence-based falls prevention program using the principles and movements of Tai Chi to help older adults increase their strength, improve their balance, and increase their confidence in doing everyday activities.
  - Location(s): Asheville, North Wilkesboro
  - Website: [http://healthyagingnc.com/workshop/ymca-moving-better-balance/](http://healthyagingnc.com/workshop/ymca-moving-better-balance/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712

- **Fit & Strong!**
  - Description: an 8-week multi-component exercise program aimed at older adults with lower extremity osteoarthritis.
  - Location(s): Charlotte
  - Website: [https://www.fitandstrong.org/index.html](https://www.fitandstrong.org/index.html)
  - E-mail: see “Contact Us” form on website
  - Phone: 312-413-9810

- **Otago Exercise Program**
  - Description: an individualized balance and strength fall prevention program that is delivered by a physical therapist over the course of 52 weeks. Designed to benefit older adults who have sustained falls in the past, have difficulty with gait, balance, or leg strength, and are limited in activities because of concerns of falling.
  - Location(s): Belmont, Boone, Charlotte, Columbus, Cullowhee, Franklin, Hendersonville, Hickory, Huntersville, Lenoir, Matthews, Newton, Robbinsville, Salisbury, Valdese, Waynesville
  - Website: [http://healthyagingnc.com/workshop/otago-exercise-program/](http://healthyagingnc.com/workshop/otago-exercise-program/)
  - E-mail: healthyagingncinfo@gmail.com
  - Phone: 828-258-7712
Western NC, continued

- Housing Assistance Corporation Fall Prevention Program
  - Description: educates low-income elderly and disabled people on the risks and prevention of falling and completes modifications and safety upgrades to their homes so they may remain living independently
  - Location(s): Hendersonville
  - Website: www.housing-assistance.com
  - Phone: 828-692-4744

- Pleasant Gardens Baptist Church Fall Prevention
  - Description: Volunteers from the Fishers of Men Sunday School build wheelchair ramps for McDowell County residents.
  - Location(s): Marion
  - Phone: 828-724-4383

- WNC Fall Prevention Coalition
  - Description: a listing of resources related to community screening and referrals for falls prevention services in Western North Carolina
  - Website: http://wncfallpreventioncoalition.org/community-screening-referrals/
  - E-mail: use “Contact Us” form on website

- Silver Sneakers
  - A program sponsored by several participating health plans that provides free access to gyms, exercise classes, and other benefits to adults over the age of 65. See website for locations and offerings near you, and to check your patients’ eligibility.
  - Location(s): hundreds of locations statewide
  - Website: https://www.silversneakers.com/
  - E-mail: support@silversneakers.com
  - Phone: 866-584-7389

- More Resources
  - Healthy Aging NC is looking to be a one-stop shop for evidence-based community-based falls prevention programs. They are continually updating their website to include a complete listing of programs, so check back regularly!
    - Website: http://healthyagingnc.com/falls-prevention-workshops/
    - E-mail: healthyagingncinfo@gmail.com
    - Phone: 828-258-7712
Table S4: Project champion survey

Please provide contact information for the project lead at [your pharmacy].
*The project lead is the person who was responsible for ensuring that the Falls Risk Study was implemented at your pharmacy.*

- [ ] First Name
- [ ] Last Name
- [ ] Email Address

Are you the project lead?

- [ ] Yes (1)
- [ ] No (2)

What is your role at [your pharmacy]?

- [ ] Technician
- [ ] Student Intern
- [ ] Pharmacist
- [ ] Non-Clinical Employee (e.g., office manager)
- [ ] Owner
- [ ] Other (Please Specify)

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What education or certifications do you hold? (Check all that apply)

- Certified Technician (CPhT)
- Bachelor of Science in Pharmacy (BS Pharm)
- Doctor of Pharmacy (PharmD)
- Residency-Trained
- Board Certification (Please Specify)
- Clinical Pharmacy Practitioner (CPP)
- Other (Please Specify)

For how many years have you worked at [your pharmacy]?
If you work at multiple locations within a pharmacy chain, please consider only years worked in the pharmacy location specified above.

- [ ] < 1 year
- [ ] 1-5 years
- [ ] > 5 years
Please rate the usefulness of resources and tools used to conduct a medication review.

| Resource                        | Did Not Use (0) | Not Useful (1) | Somewhat Useful (2) | Very Useful (3) |
|---------------------------------|-----------------|----------------|---------------------|-----------------|
| Medication Checklist            | ○               | ○              | ○                   | ○               |
| High-Risk Medication Index      | ○               | ○              | ○                   | ○               |
| High-Risk Medication Algorithms | ○               | ○              | ○                   | ○               |
| Patient Education Brochures     | ○               | ○              | ○                   | ○               |
| Community Resources             | ○               | ○              | ○                   | ○               |
| Prescriber Flyer                | ○               | ○              | ○                   | ○               |
| Other (Please Specify)          | ○               | ○              | ○                   | ○               |

Please rate the usefulness of tools to share recommendations with prescribers.

| Tool                                  | Did Not Use (0) | Not Useful (1) | Somewhat Useful (2) | Very Useful (3) |
|---------------------------------------|-----------------|----------------|---------------------|-----------------|
| Cover Fax                             | ○               | ○              | ○                   | ○               |
| Prescriber Communication Form         | ○               | ○              | ○                   | ○               |
| Prescriber Response Form              | ○               | ○              | ○                   | ○               |
Please rate the usefulness of the training activities.

| Activity                          | Did not participate (0) | Not Useful (1) | Somewhat Useful (2) | Very Useful (3) |
|----------------------------------|-------------------------|----------------|---------------------|-----------------|
| On-boarding Training Webinar     |                         |                |                     |                 |
| NCAP 2017 Workshop               |                         |                |                     |                 |
| Site Visit                       |                         |                |                     |                 |
| Coaching                         |                         |                |                     |                 |
| APhA CPE Program                 |                         |                |                     |                 |
| Quick Tips Emails                |                         |                |                     |                 |
| Quick Tips Webinars              |                         |                |                     |                 |

Please rate the usefulness of webinar topics.

| Topic                              | Did Not Participate (0) | Not Useful (1) | Somewhat Useful (2) | Very Useful (3) |
|------------------------------------|-------------------------|----------------|---------------------|-----------------|
| Workflow integration               |                         |                |                     |                 |
| Engaging with patients             |                         |                |                     |                 |
| Engaging with prescribers          |                         |                |                     |                 |
| Examples from other pharmacies    |                         |                |                     |                 |