Family physicians commonly care for older patients with disabilities. Many of these patients need help maintaining a therapeutic home environment to preserve their comfort and independence. Patients often have little time to decide how to address the limitations of newly-acquired disabilities. Physicians can provide patients with general recommendations in home modification after careful history and assessment. Universal design features, such as one-story living, no-step entries, and wide hallways and doors, are key adaptations for patients with physical disabilities. Home adaptations for patients with dementia include general safety measures such as grab bars and door alarms, and securing potentially hazardous items, such as cleaning supplies and medications. Improved lighting and color contrast, enlarged print materials, and vision aids can assist patients with limited vision. Patients with hearing impairments may benefit from interventions that provide supplemental visual and vibratory cues and alarms. Although funding sources are available, home modification is often a nonreimbursed expense. However, sufficient home modifications may allow the patient and caregivers to safely remain in the home without transitioning to a long-term care facility. (Am Fam Physician. 2009;80(9):963-968, 970. Copyright © 2009 American Academy of Family Physicians.)

▲ Patient information: A handout on home adaptations, written by the authors of this article, is provided on page 970.

The online version of this article includes supplemental content at http://www.aafp.org/afp.
Home modifications were ineffective.11 The authors note that the studies in the review did not contain enough participants for adequate statistical power. Despite the limited evidence for injury prevention, home modifications appear to decrease dependency on caregivers for instrumental activities of daily living (IADL) and reduce caregiver upset.12 In general, environmental assessment and home modification appear to be most successful in preventing falls in older adults when conducted as part of multidimensional risk assessment (for factors such as medications, vision, environmental hazards, and orthostatic blood pressure) with an individualized action plan.13 This article describes general home modification and safety strategies that family physicians can promote to maximize function, preserve independence, and potentially prevent injuries.

The Physician’s Role
The medical interview allows the physician to identify specific needs and consider possible solutions. Based on these needs, the physician and patient can propose and prioritize potential home adaptations. The physician can then recommend appropriate resources directly or through a referral. The physician is also responsible for supervising home-based therapies.

Table 1 describes the domains the physician can explore with a patient or caregiver coping with chronic illness or disability.14 These include assessment of current and possible future impairments, the patient’s values and priorities, ADL, IADL, current adaptive measures, potential medication side effects, home services, and social support. Physical therapists, occupational therapists, social workers, and visiting home nurses can also help advise the patient about specific home intervention measures. Performing a home visit will help the physician acquire more first-hand information about the home care environment.15

Home Modifications
Planning ahead for hospital discharge after an acute disabling condition can prepare the patient’s home for rehabilitation or continuing care. Often, a patient in the hospital cannot return home unless it is deemed adequate for egress and safety. Many transportation and home health services have “zero lift” policies requiring ramps or mechanical lifts if the home does not have an entry without steps.

The modification priorities for individual homes depend on the patient’s current and anticipated future medical conditions, environmental restrictions, and resources (see Online Table A for a checklist of home renovation priorities). Since the mid-1990s, homes are often built to universal design standards,16 which attempt to maximize accessibility and function while preserving aesthetics and minimizing the need for future modifications. Key features of universal design include one-story living, no-step entries, wide doorways and hallways, and extra floor space. These features allow easier use of a wheelchair or other assistive devices. They also help the caregiver by providing extra room for assisting the patient throughout the house, especially in the bathroom and bedroom.

Some older persons may decide to move to homes built to universal design standards within communities that are developed specifically to meet the needs of this population. Home modification may allow these patients...
<table>
<thead>
<tr>
<th>Priorities</th>
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<tbody>
<tr>
<td>What are your biggest concerns right now?</td>
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<tr>
<td>What is most important to you?</td>
</tr>
<tr>
<td>What are your thoughts about going home, having this procedure, your diagnosis?</td>
</tr>
<tr>
<td>What might it look like if this situation turned out the best you can imagine?</td>
</tr>
<tr>
<td>What could we do to help you and your family with this change in your circumstances?</td>
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<thead>
<tr>
<th>Areas to assess</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities of daily living</td>
<td>Child and family</td>
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<tr>
<td></td>
<td>Child Find</td>
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<td></td>
<td>Childcare</td>
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<td></td>
<td>Education and development intervention services</td>
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<td></td>
<td>Exceptional Family Member Program</td>
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<td></td>
<td>Family-to-family support</td>
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<td></td>
<td>Parent training and information center</td>
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<tr>
<td></td>
<td>Respite program</td>
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<tr>
<td>Instrumental activities of daily living</td>
<td>Logistic supports</td>
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<tr>
<td>What is a typical day like for you?</td>
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<tr>
<td>How does your condition affect the activities you enjoy each day?</td>
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<tr>
<td>How are you doing with (or how will you manage):</td>
<td></td>
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<tr>
<td>Everyday responsibilities</td>
<td></td>
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<tr>
<td>Getting together with people</td>
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<tr>
<td>Managing finances</td>
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<tr>
<td>Transportation</td>
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<tr>
<td>Support and coping</td>
<td></td>
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<tr>
<td>How are you doing with this?</td>
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<tr>
<td>How is your family (e.g., spouse, partner, son, daughter) coping?</td>
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<tr>
<td>Who helps you deal with this?</td>
<td></td>
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<tr>
<td>Who can you call if you need some help?</td>
<td></td>
</tr>
<tr>
<td>Who can you call if you want to talk with someone?</td>
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<table>
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<tr>
<th>Psychosocial services</th>
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<tbody>
<tr>
<td>Adult day care</td>
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<tr>
<td>Alcohol/substance abuse services</td>
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<tr>
<td>Day treatment program</td>
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<tr>
<td>Patient representative</td>
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<td>Psychiatric nurse liaison</td>
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<td>Psychiatry</td>
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<tr>
<td>Psychology</td>
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<tr>
<td>Respite program</td>
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<tr>
<td>Senior citizen program</td>
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<tr>
<td>Social work</td>
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<tr>
<td>Support groups</td>
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</tbody>
</table>

Table 1 continues
to stay within their homes and neighborhoods, and remain engaged in their existing social networks and activities.\textsuperscript{2}

Home modification can prevent or delay transition from community living to assisted living or nursing home care. The cost of home modification (e.g., $3,000 to $7,000 for an access ramp; $5,000 to $15,000 for bathroom modification) may be modest compared with the costs of moving into assisted living or a nursing home (e.g., $32,000 per year for a one-bedroom unit in an assisted living facility; $70,000 per year for a private room in a nursing home).\textsuperscript{17}

\textbf{PATIENTS WITH DEMENTIA}

Home modifications for patients with dementia should promote safety for the patient and peace-of-mind for the caregiver. The modifications listed in \textit{Table 2} allow patients with dementia to receive ongoing care in the least restrictive environment possible, and may be implemented as the need arises.\textsuperscript{18}

\begin{table}
\centering
\caption{Priorities, Activities, Social Context, and Support/Coping Coordination for Patients and Families (continued)}
\begin{tabular}{ll}
\hline
\textbf{Coordination and payment} & \textbf{Resources} \\
\hline
Who helps you coordinate your (health care, help on a day-to-day basis, etc.)? & \textbf{Coordination}  \\
What resources do you have to pay for the services you need? & Care coordinator  \\
What resources do you have to pay for modifications to your home? & Case manager  \\
& Discharge planner  \\
& Hospital administrator  \\
& Military disability counselor  \\
& Primary care physician/medical home  \\
& Social worker  \\
\textbf{Payment/health benefits} & Debt assistance officer  \\
& Health benefits advisor  \\
& Medicaid  \\
& Medicare  \\
& Supplemental Security Income/Social Security Disability Income  \\
& TRICARE  \\
& Veterans Administration  \\
\hline
\end{tabular}
\end{table}

\textbf{Social and family context}

\begin{itemize}
\item Where do you live?
\item Who lives with you?
\item What is your family situation?
\item Who is a friend or source of support?
\item How have your finances been affected by your medical needs?
\item What activities do you enjoy doing with other people?
\end{itemize}

\begin{table}
\centering
\caption{Priorities, Activities, Social Context, and Support/Coping Coordination for Patients and Families (continued)}
\begin{tabular}{ll}
\hline
\textbf{Communication that builds partnership (PEARLS)} & \\
\textbf{Partnership}: “Let’s tackle this together.” “We can work together to figure this out.”  \\
\textbf{Empathy}: “You look pretty upset.” “I can see that this is a difficult time for you.”  \\
\textbf{Apology}: “I’m sorry this happened.”  \\
\textbf{Respect}: “I appreciate your (courage, decision, action).”  \\
\textbf{Legitimization}: “Anyone would be (confused, challenged, bothered, upset) by this situation.”  \\
\textbf{Support}: “I’ll stick with you as long as necessary.”  \\
\hline
\end{tabular}
\end{table}
Table 2. Home Modifications for Patients with Dementia

<table>
<thead>
<tr>
<th>Category</th>
<th>Modifications</th>
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</table>
| **Bathroom** | Install grab rails in tub, shower, and near toilet  
Install handheld shower  
Install nonskid surfaces on tub or shower  
Install tub chair or bench to sit while showering or bathing  
Place sign on bathroom door, keep door open  
Raise toilet seat or commode to higher level  
Remove or reverse inner door locks or keep keys accessible  
Remove rugs and electrical appliances  
Replace glass shower doors with plastic doors or curtains |
| **Bedroom**   | Add night-lights  
Consider bedside commode  
Consider hospital bed  
Install room-darkening shades or curtains  
Lower bed to floor level if patient is falling out of bed  
Remove carpeting if patient has trouble with incontinence  
Use baby monitor to monitor activities |
|              | Install driver-controlled door locks and window  
Notify police of patient’s disability  
Secure garage door opener out of patient’s reach  
Take away patient’s car keys or disable car |
| **Fire prevention** | Add firefighter sticker at bedroom window  
Conduct fire drills  
Install smoke alarms  
Notify fire department of patient’s disability and home measures  
Remove lighters and matches  
Restrict smoking  
Use flame-retardant bedding materials |
|              | Consider electric stove or install hidden shut-off valves or auto-pilots  
Consider locks on cabinets, refrigerators, and freezers  
Cover stove burners  
Disable garbage disposal  
Install locks on oven doors  
Lock up sharp objects and glassware |
| **Car**      | Install driver-controlled door locks and window  
Notify police of patient’s disability  
Secure garage door opener out of patient’s reach  
Take away patient’s car keys or disable car |
|              | Add contrasting color on edge of treads  
Consider barriers or gates at top and bottom  
Install banisters on both sides  
Replace stairs with ramp |
| **General precautions** | Childproof electrical outlets  
Cover radiators  
Cover shiny or reflective surfaces  
Install door alarms  
Install double key locks  
Install scald-proof faucets or reduce water temperature  
Install spring-loaded door closers  
Keep first-aid kit accessible  
Keep legal documents accessible  
Lock up cleaning supplies, chemicals, poisons, and medications  
Make a list of patient’s medications and health conditions  
Notify police and emergency medical services of patient’s disability  
Program emergency phone numbers on speed dial  
Provide neighbors with set of house keys  
Provide patient with identification card and bracelet  
Reduce clutter  
Remove free-standing floor and table fans  
Remove hazardous furniture (e.g., high-back chairs, pedestal tables, easily moved furniture)  
Remove mirrors if they cause delusions or hallucinations  
Remove or lock up sharp or breakable objects  
Remove or reverse inner door locks or keep keys accessible  
Remove small rugs without nonskid backing |

Information from reference 18.

associated with improved caregiver effectiveness and less caregiver upset.12

**PATIENTS WITH LIMITED VISION**

Approximately one in three patients has some form of vision reduction by 65 years of age.19 Loss of vision from common conditions such as cataracts, age-related macular degeneration, glaucoma, and diabetic retinopathy is associated with depression and loss of function. Home modifications for patients with low vision emphasize the promotion of adequate lighting and contrasting colors to identify hazards (Table 3).20 These modifications are particularly important because patients who experience vision loss late in life may have difficulty coping with this change.
**Home Adaptations**

**Table 3. Home Modifications for Patients with Vision Loss**

- Avoid protruding cabinet hardware
- Consider incandescent lighting over fluorescent lighting
- Consider yellow or amber lenses to help patients with sensitivity to glare; hats with brims or visors may also be helpful
- Ensure that printed materials are high-contrast, low-glare, 16- to 18-point simple (nondecorative) font, with wide letter and line spacing
- Install bright lights at exterior doors with motion or sound activation
- Install contrasting material on leading edge of stair
- Install flush door thresholds to reduce tripping hazards
- Install lighted keyholes and doorbells
- Install mirror that can be positioned close to patient for grooming
- Install single-handle scald-proof faucet
- Install strip lighting under cabinets
- Install switches with distinctive "on" and "off" positions
- Install task lighting in areas such as the bathroom, dressing room, kitchen, and laundry room
- Install telephones, thermostats, thermometers, and appliances with large numerals to maximize residual sight
- Provide bold-lined paper and bold felt-tip markers to communicate messages and reminders
- Use blinds or shades to control light entering room to limit glare
- Use contrasting colors to help with object recognition

*Information from reference 20.*

**Table 4. Home Modifications for Patients with Hearing Loss**

- Activate closed captioning on televisions
- Install appropriate furnishings to improve room acoustics (e.g., acoustic tiles, carpeting, furniture, tapestries, wall hangings)
- Install doorbells or intercom systems that activate flashing lights or vibrating pager; or wireless doorbells with volume control and multiple receivers (some have flashing lights)
- Install doors with vibration sensors that activate when visitors knock
- Install security system: hardwiring or plug-in systems for strobes, bedshakers, etc.
- Install smoke detectors and carbon monoxide detectors with flashing strobe light, extra-loud alarm, pillow vibrator, or paging system
- Install spring-loaded handles or motion detectors for faucets
- Provide assistive devices for television, radio, or stereo (e.g., personal amplifiers, FM and infrared systems)
- Provide wristwatches and timers with vibration
- Use personal pager system for communication
- Use telephones and cell phones with special equipment
- Use weather warnings with pager systems or weather radios with sound/strobe/vibration systems

*Information from reference 24.*

**Patients with Hearing Impairment**

Hearing loss affects more than 2 million Americans older than 70 years, and routine screening for hearing loss is recommended by the U.S. Preventive Services Task Force. Hearing loss in older persons is usually progressive and can significantly impair communication, potentially contributing to social isolation and lower quality of life. In addition to hearing aids, home modifications can apply technology to create alarms and notification messages using visual and vibratory alerts (Table 4).

**Resources for Home Modifications**

Local organizations of the National Association of Area Agencies on Aging (http://www.n4a.org/) and the National Association of Home Builders (NAHB; http://www.nahb.org) provide lists of reputable home remodeling contractors. The National Association of the Remodeling Industry (http://www.nari.org), the AARP, and the NAHB have developed a program for Certified Aging-in-Place Specialists (CAPS). Although most CAPS professionals are remodelers, an increasing number are general contractors, designers, architects, and health care consultants. Additional certification is offered by Certified Environmental Access Consultants.

The resident of the home is responsible for paying for most home modifications. Other options include funding via reverse mortgages or insurance policies (e.g., automobile insurance in cases of auto-related injuries, disability, workers compensation, long-term care, Veterans Affairs benefits). Social workers may help patients research funding options. Patients with Medicare Part B (outpatient) coverage may be eligible for home occupational therapy assessment, treatment, and training in the use of home modifications. Medicare will also pay for some indicated durable medical equipment used in the home, but not the cost of home modification. Medicaid services vary by state, but some patients may qualify for Home and Community Based Services or other waiver programs.

The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the U.S. Army or
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Author disclosure: Nothing to disclose.

REFERENCES