

September 16, 2010

# **Assistive Technology for People with Dementia and Their Caregivers at Home: What Might Help**

## **Final Report**

Prepared for

**Administration on Aging**  
One Massachusetts Avenue NW  
Washington, DC 20001

Prepared by

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## Executive Summary

Dementia is a leading cause of disability and institutionalization among older persons, and the number of people with dementia will increase dramatically with the aging of the population. Caregiver burden and the high costs of care combined with a projected long-term care workforce shortage have increased interest in the potential for assistive technology (AT) to substitute for, complement, or supplement paid and unpaid caregiving for people with dementia. The term *assistive technology* commonly denotes some type of electronic or computerized device that helps people with disabilities to function more easily and independently.

The purpose of this report is to provide an overview of AT products that are designed for persons with dementia and their caregivers. Its target audience is the general public, caregivers, home and community service providers, and public programs that provide long-term care services and supports, including the federal Alzheimer's Disease Supportive Services Program.

Compared with AT products available for people with physical, sensory, and communication impairments, very few products are available that can help compensate for the cognitive deficits common in persons with dementia. Failure to recognize the complexity of dementia—the type and range of common cognitive impairments and other symptoms—results in the development of AT products designed to address a single deficit: generally, memory impairment.

Such products do not take account of the features of dementia that can influence the product's acceptance, use, and effectiveness, including an individual's specific pattern of cognitive abilities and deficits, emotional and behavioral issues, personality characteristics and attitudes toward technology, and his or her physical and social environment. Any or all of these factors can result in an AT product not being used effectively or *at all*—even if it has been proven to be highly effective in a research setting. Given the lack of research on the effectiveness of many AT products, caregivers need to introduce such products on a trial basis and determine for themselves whether they are both effective and beneficial.

About 60 to 65 percent of persons with mild cognitive impairment develop clinical dementia during their lifetime. Some assistive technologies aimed at compensating for memory impairment may be more effective if directed to persons with mild cognitive impairment rather than those with dementia. Doing so would give them time to learn to use the AT product, become familiar with it, and establish behavioral routines for using it that might persist into the early and moderate stages of dementia.

Although many AT products designed to compensate for memory impairment are unlikely to be effective for persons with dementia, technology to facilitate monitoring and supervision

by caregivers has grown increasingly sophisticated and has the potential to reduce caregiver burden. However, prior to introducing any AT product or monitoring system, a thorough assessment must be performed to determine if it is a good match for an individual's or caregiver's needs, abilities, environment, and preferences. Although monitoring technology can only *manage* risk, not remove it completely, a system that is designed well and customized for individuals and their caregivers may decrease the risk of harm and reduce caregiver burden. The use of monitoring technology needs to be carefully introduced and implemented so that it does not cause distress to a person with dementia.

## Introduction

Dementia is a group of symptoms caused by diseases and conditions that lead to a progressive decline in a person's cognitive functioning and ability to live independently.<sup>1</sup> Alzheimer's disease is the most common cause of dementia; other causes include damage to the blood vessels supplying the brain (vascular dementia), head trauma, Parkinson's disease, and drug toxicity. The prevalence of dementia increases with age, and it is the leading cause of institutionalization. Prevalence among elderly nursing home residents is estimated to be 60 to 80 percent.<sup>2</sup> With the aging of the baby boom generation, the incidence and prevalence of dementia will increase.

Dementia results in a heavy burden for both family and paid caregivers. Yet, as the number of people over age 65 increases, there will be relatively fewer younger adults to assist older persons with long-term care needs, including those due to dementia. Caregiver burden and the high costs of care—particularly institutional care—combined with the projected long-term care workforce shortage have increased interest in the potential for assistive technology (AT) to substitute for, complement, or supplement paid and unpaid caregiving for people with dementia. Frequently cited goals for AT products for persons with dementia include maintaining their independence and sense of autonomy, helping to ensure their safety, and reducing their caregivers' burden, thereby enabling them to live longer in their own homes than would otherwise be possible.

Some researchers also believe that assistive technology has the potential to reduce the cost of care by reducing the need for paid and unpaid caregiving at home, thereby delaying costly institutionalization. Consumer advocates, however, stress the importance of ensuring that assistive technology not be used to substitute for good quality home care provided by family or staff who are properly trained in caring for people with dementia.<sup>3</sup>

This report provides an overview of three major categories of AT products for people with dementia and their caregivers. These products aim to

- compensate for memory impairment and disorientation,
- help ensure safety, and
- improve emotional status and decrease behavioral problems.

In addition to describing examples of available products, the report discusses factors to consider when selecting and using them. An appendix to the report includes a list of print and Internet resources for obtaining additional information about AT products, including potential funding resources.

## What Is Assistive Technology?

Section 508 of the Federal Rehabilitation Act defines AT devices as any item, piece of equipment, or product system—whether acquired commercially, modified, or customized—that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.<sup>4</sup> Many organizations that support people with disabilities also define assistive technology broadly to include any device or piece of equipment that helps individuals with disabilities to function more independently. Such broad definitions include a wide range of products that the general public does not typically consider to be “technology,” such as a wheelchair. Health insurance companies generally categorize wheelchairs as durable medical equipment.

More commonly, the term *assistive technology* denotes some kind of electronic or computerized device that helps people with disabilities to function more easily and independently.<sup>5</sup> This report uses this narrow definition and focuses on AT products designed for persons with dementia and their caregivers to use in their own homes.

The AT products discussed in this report include only those that are currently commercially available and that were developed for

- persons with dementia;
- persons with cognitive impairments caused by other conditions, such as a traumatic brain injury; or
- the general population but can be used to enhance the independence and safety of persons with dementia.

The report does *not* discuss assistive technology for

- persons with physical, sensory, or communication impairments;
- persons with developmental disabilities; or
- use in monitoring medical conditions.

The remainder of this report discusses three major categories of assistive technology for persons with dementia and provides examples of available products. Information about all of the products described was obtained through Internet searches. The report is not a comprehensive catalog. Instead, it provides an overview of available products with illustrations of the type and range of products currently available within each category. Products are not identified by name, and *their inclusion in this report does not constitute an endorsement.*

## Assistive Technology Products to Compensate for Memory Impairment and Disorientation to Time

Many AT products designed to compensate for memory impairment are available, as well as some products that orient people with dementia to time. Several common products are described in the text box below. Because many of these products offer only reminders or prompts, they appear to equate dementia with memory impairment. But persons with dementia are not merely forgetful; they have lost the ability to recall information, recognize objects, and form new memories—they cannot store, retain, or recall new knowledge. Thus, their ability to learn how to use an AT device and to remember how to use it is impaired.

Many “reminder” products marketed for persons with dementia appear to have been designed without taking account of the type and range of cognitive impairments common among persons in this population. To receive a diagnosis of dementia, individuals must have *multiple* cognitive deficits severe enough to impair their performance of usual activities of daily living. Memory impairment alone is not sufficient for a diagnosis; an individual must also have at least one other cognitive impairment, such as deficits in executive cognitive function (ECF).<sup>6</sup> ECFs include, but are not limited to, the ability to solve problems and make decisions; to establish goals; to plan, assign priority to, initiate, and sequence tasks; and to regulate emotions and control impulses. Other symptoms of dementia include a decline in reasoning abilities; confusion; disorientation; problems with speech and understanding; and changes in mood, personality, and behavior.

In individuals with intact ECF, memory impairment is not necessarily disabling because they are aware of the impairment and can take actions to compensate for it. For example, they may keep a book with them at all times in which they—or a caregiver—have written lists of things they need to do each day, or they may use technological devices such as a personal digital assistant. In contrast, ECF impairment can cause severe functional limitations even in the absence of memory impairment. Individuals with ECF impairment are unable to plan and perform activities to achieve even simple daily tasks, such as meal preparation. Thus, they lack the ability to use AT products that require planning and initiation. For example, to use a product to find lost items that have been tagged, individuals not only have to remember that a device exists that will help them to find a lost item, but they have to plan to use the device when they lose the item, which requires them to be aware of their memory loss, put the device in a place where they will always find it, and initiate its use when needed. ECF impairment limits the ability to engage in such purposeful problem-solving activities.

Similarly, medication reminders and dispensers assume that the user is capable of remembering the purpose of the alarm and of initiating activity to find, dispense, and take the correct dose of medication at the correct time in response to the alarm. Some of the prompting products described require users to have fairly sophisticated computer skills, highlighting the impracticality of such technology for persons with dementia.

## Products to Compensate for Memory Impairment and Disorientation

### Finding Frequently Lost/Misplaced Items

Several electronic products are available to help people find commonly lost or misplaced items, such as keys, purses, wallets, or television remote control devices. An electronic tag, which is linked wirelessly to a sending unit, is attached to a specific object.

Sending units vary in size from those similar to remote car door openers to those the size of a television remote control device. Products differ in how they operate; in most units the tagged item lights up or beeps loudly when a button on the sending unit is pushed. These devices generally work within a 60- to 100-foot indoor area and range in price from \$30 to \$80.

### Making and Receiving Phone Calls

A few technologies used on a daily basis—such as telephones and hand-held electronic *personal assistants* or *personal digital assistants*—have been adapted to provide assistance to persons with memory and other cognitive impairments. For example, for people who cannot remember phone numbers and who are unable to look them up in a personal phone book, certain telephones have programmable speed dialing capabilities with places to insert photos of family and friends next to or on top of buttons that when pushed will automatically dial the person in the photo. Models vary in the number of photo buttons, generally from 4 to 10. Prices for such phones are in the \$50 to \$75 range.

Some phones are designed so that nearly every operation can be completed by touching one large button, including receiving incoming calls, placing an emergency call, and dialing one of several preprogrammed numbers. In one model, users can write the first name of the person they want to reach next to the automatic dial buttons. For individuals who make calls at inappropriate times or to strangers, one phone model allows incoming calls but no outgoing calls. Prices for mobile phones with these special features range from \$65 to \$170; phones with additional features—including the ability to use customized images and audio to enable individuals to make and receive phone calls without assistance—can cost as much as \$849.

### Medication Reminders

The inability to take medications in the correct dose at the correct times may have negative and possibly even life-threatening effects. Numerous pill organizers are available to help the general public remember to take medications in correct dosages at the right times. More sophisticated products have been designed to help persons with memory and other cognitive impairments to comply with prescribed medication regimes.

Some of these reminder devices are lightweight (under 3 ounces); are battery powered; and can be worn on the wrist, placed around the neck, or carried in a pocket. They can be set to give an alarm at pre-set times when medications should be taken and to display the name of the medication on the face of the device. A vibrating device is available for users with hearing or visual impairment. Prices for these products range from \$15 to \$50.

A more advanced device requires the user to press a button when the alarm sounds (at a time set by the caregiver). Once the button is pushed, the user hears a message from the caregiver. The caregiver can set the date and time for the alarm and record up to 90 messages of 10 seconds duration, which can be stored for up to 3 months without reprogramming. Such a device costs in the \$200 range. These devices can also be used to provide reminders to perform other activities, such as preparing meals, drinking fluids during hot months, and locking doors.

For individuals who have difficulty dispensing the correct dosage of medication, medication dispensers that prompt with audible or visual alerts are available. The dispensers can provide prompts up to four times a day, and many store a week's worth of medication. Some dispensers have a carousel design with a timer that can be programmed to rotate to the next dose and undo the lock on each dose container just prior to the reminder tone. To prevent double dosing, some dispensers lock each dose container after a set amount of time.

Medication dispensers can be wireless, lockable, and portable and can communicate via a radio transmitter that links to a receiver worn on the wrist. Some of these devices can also be programmed to alert a remote caregiver if the person has not taken the medication. Some systems can alert caregivers within the short range of a radio signal or at longer distances by cell phone via a central monitoring system. Prices for most of these devices range from \$35 to \$150, but more sophisticated systems range from \$700 to over \$1,000.

### **Reminding and Prompting**

Hand-held devices such as personal digital assistants and smart phones can be programmed by caregivers to provide a series of reminders, verbal instructions, or messages. Some devices allow the user to play back messages in sequence or as a verbal "to do" list; the simplest of these devices will store up to five recorded reminder messages. More complex models will record more messages. For example, a morning routine can be recorded, and the user can listen to each message and then indicate when each task is finished. A personalized message can be played to provide positive reinforcement once all the tasks are completed.

Task instructions can be played back in a step-by-step manner. One model offers three modes of operation: (1) in the "Play" mode, the user simply presses an on-screen "play" button to hear each step in sequence; (2) in the "Play/Done" mode, the user must press a "done" button after each step before he or she can move on to the next step; and (3) in the "To Do List" mode, the user selects from a list of nonsequential tasks.

A more sophisticated prompting device employs two software modules: one is worn by the care recipient in the form of a personal digital assistant with a touch screen (about 3x5x1 inches), and the other resides on a web server that enables the caregiver to enter a schedule of tasks, edit them, and monitor the user's responses. The caregiver can program the device to provide prompts at specified times, and the device can also transmit the user's responses for immediate feedback to the caregiver via the Web. For successful operation, both the caregiver and the user of this prompting system need fairly sophisticated computer skills. Prices range from below \$100 for the simplest product to \$2,000 for the most complex.

### **Orienting to Month, Day, and Time**

Disorientation to time is a common symptom of dementia. Many electronic devices are available to help orient individuals, such as clocks that display the month, day, and time. These products range in price from \$28 to \$140. To be effective, the clocks must be placed where they can be seen easily and may be most helpful when used in more than one room.

Basically, reminder aids will not be effective for persons with dementia who lack the cognitive capacity to use them. For many in this population, prompting and cueing for the duration of a task is needed to ensure its completion, and those with moderate to severe cognitive deficits may need more than reminders, prompts, and cues to ensure completion of even basic tasks, such as proper hand washing. The assistive technology currently available is incapable of addressing more complex tasks.<sup>7</sup>

Nonetheless, reminders and prompts *can* be effective for individuals in the very early stages of memory impairment or mild cognitive impairment that often precede a diagnosis of dementia. Introducing AT products at these stages would give individuals time to use and become familiar with the device and establish behavioral routines that include it. These routines might then persist into the early and moderate stages of dementia.<sup>8</sup>

## **Assistive Technology Products to Help Ensure Safety**

Because of their cognitive deficits, persons with dementia may put themselves at risk for injury inside and outside the home. The ever-present possibility of injury causes anxiety for caregivers, and the need for monitoring and supervision both day and night is a considerable burden. Several AT products have been developed to alert caregivers to unsafe situations, and more sophisticated technologies can both alert caregivers and prevent unsafe situations. Some alarm and security systems developed for the general population

can also provide basic monitoring functions for persons with dementia, such as a home security system that can be set to chime every time an exterior door is opened.

## **Automobile Safety**

Convincing someone with dementia that it is unsafe to drive can be a very difficult task, and physically attempting to prevent someone from driving may result in harm to the caregiver. To address this problem, caregivers can install an inexpensive battery switch, costing about \$20, that makes it impossible to start a car. The device attaches to the car battery and battery cable and is turned off and on by a knob. The device is designed to preserve clock, radio, and other computer settings. Another low-cost item can be installed to set off an alarm to alert the driver when a passenger unbuckles the seatbelt. Many newer cars have this technology for front seat passengers.

## **Summoning Help**

For individuals with very early stage dementia who have the ability to recognize a potentially dangerous situation and initiate action to summon help, personal emergency response systems can provide a sense of security for the user and peace of mind for the caregiver. Such systems generally have a device with a button for summoning assistance, which is worn around the neck on a lanyard. The distance between the sending unit and the device can range up to 500 feet. Some systems work only in the home, and others work outside the home, which would enable someone working in the garage or garden to summon help if needed. Pricing varies depending on custom features, and a monthly monitoring fee is required.

## **Preventing Injuries in the Home**

People with dementia are at risk for injuries or even death when they are not able to properly use appliances, water faucets, and room temperature controls. Many products are available to decrease the risk of exposure to such dangers, including heat and gas detectors, water temperature monitors, and room air temperature monitors. Most of the items described here were designed specifically for the safety of people with cognitive impairments. The discussion does not cover technology that is required or considered standard for homes, such as smoke and carbon monoxide detectors.

To reduce the risk of injury when someone forgets to turn off a stove burner, several products are available that will turn off stoves at certain times or in response to specific situations. For example, a motion sensor can be placed in a kitchen and when a set amount of time has passed without any motion, the stove—if on—will be turned off. More sophisticated models allow a caregiver to override the device with a password. Another product, which attaches magnetically to the exhaust fan hood over a stove, can detect

excessive heat when a burner is left on or food is burning and activates a fire extinguisher that discharges bicarbonate of soda on the flames.

If a person turns on a gas stove or other gas-operated appliance without ignition, the resulting gas may be life threatening because of toxicity or fire. To prevent this situation, gas detectors can be installed that will provide an audible or visual alarm to the caregiver in case of dangerous gas levels in the home. More sophisticated devices link to a cut-off valve that automatically stops the gas supply. Prices for these stove devices range from \$200 to \$300.

Devices are also available to alert caregivers if the temperature in a room is too high or too low. An audible alarm can be sent to the caregiver, or a more advanced device can send a message to a central monitoring system. Such systems were originally developed for the general population to monitor their homes while away. The prices for such systems include the cost of the equipment and a monthly fee for monitoring. Set prices are not available for inclusion in this report because systems are customized.

Devices that monitor water levels can prevent accidents and damage from flooding due to faucets that are left running. Some devices attach to a wall where overflowing water is most likely to occur, such as in a toilet or a sink, and will alert a caregiver with an audible alarm if the water reaches a pre-set level. A similar device can be placed directly on the wall next to a bathtub and set off an alarm when touched by water.

People with dementia may be at high risk for burns because they may be less sensitive to excessive temperatures and often are unable to verbalize that they are experiencing pain.<sup>9</sup> Devices are available that provide an audible or visual warning to a caregiver when the water temperature in a faucet rises above a safe level. More sophisticated electronic devices can be inserted into a faucet or shower head that will automatically shut off the water if the temperature is above a pre-set limit. Such devices cost under \$50.

## **Monitoring Activity in the Home**

Many technologies are available to assist caregivers in monitoring persons with dementia and can provide respite, particularly important for caregivers who have to provide constant supervision, day and night, to ensure safety.

### ***Door and Window Alarms***

The simplest AT products alert caregivers when doors and windows are being opened. One system uses an insert that fits into the gap between a door and a door jamb or a window and its frame. If the door or window is moved even slightly, a loud alarm sounds. Some products sound an alarm only at the door or window, which may frighten individuals with dementia, especially at night. Other products provide remote audible and visual alarms to alert caregivers.

More sophisticated systems play a recorded voice message from the caregiver to warn the person with dementia to stay inside (e.g., “Don’t go outside; I am coming to help you”), while awakening the caregiver with an alarm. One system has a transmitter—worn on the wrist—that sets off an alarm when the user exits the home through any door. Caregivers can bypass the alarm systems by entering a code on a panel installed by each door; with more complex systems, anyone not wearing a transmitter can open the door without setting off the alarm. Another system uses a device that triggers a portable pager carried by a caregiver in the home.

Some systems provide the option of a visual alert (e.g., turning on a light in the caregiver’s room when a person enters or leaves specific areas), which can be less startling than an audible alarm, particularly at night. Sensors that automatically turn lights on when detecting movement can also help to prevent falls. Prices for the simplest devices range from \$15 to \$35. Pressure-sensitive pads placed under a mat at exterior doors to alert caregivers that a person is about to leave the house cost about \$275. Prices for more sophisticated systems are not readily available and vary based on customization.

### ***Monitoring for Fall Risk and Detecting Falls***

People with memory loss and other cognitive impairments are more prone to falls because they are unable to plan their route around obstacles. Several products are available to alert caregivers when an individual who is at risk for falling has gotten out of bed or a chair. More complex systems require a person with dementia to wear a device that triggers an alert to the caregiver if an impact is detected or if the person remains in a lying position for a certain period of time.

The simplest of the prevention-oriented devices are sometimes referred to as *tab alarms*, which are activated when a detachable tab is pulled from the device. The device is attached to the bed or chair, and the tab is attached to the clothing of the person with dementia. When the person gets up, the alarm is activated when the tab is pulled off the clothing. Some systems employ pressure-sensitive pads that can be placed on (and in some cases under) a bed, chair, or floor mat to detect when a person moves from the bed or chair or steps on the mat. Prices for these pads range from \$190 to \$275.

Technology is also available to alert a caregiver or emergency response system when it is likely that a fall has occurred. Some of these advanced systems assist in detecting a fall by measuring a pre-set time period in which no activity occurs and may be part of a remote monitoring system, as well (described below). Another monitoring system detects falls through a floor impact sensor and includes motion sensors to detect other activities throughout the home. A round-the-clock data collection server provides information to the caregiver by cell phone or by wired or wireless broadband. Because of the considerable

variation in types and number of monitors and their placement, manufacturers of these products must be contacted directly for pricing information.

### ***Monitoring Movement in the Home***

Activity monitors can enable caregivers to know an individual's location in the home, which is particularly useful when there is more than one floor or multiple rooms. Because certain locations pose particular risks—such as stairs, kitchens, bathrooms, and exterior doors—activity sensors can be used to facilitate monitoring and enable the caregiver to rest or engage in other activities, secure in the knowledge that he or she will be alerted if the person enters a risky location. For people in large homes, several sensors can be used. These systems are particularly useful for alerting caregivers about activities during the night. Most monitoring systems trigger an alarm, but at least one model offers a quieter chime option. As with room and door alarms, to avoid startling persons with dementia, some models enable the alarm to be sounded in the caregiver's room.

Wired or wireless sensors can be placed around the home to detect movement or inactivity, which may indicate that someone has fallen or has failed to perform an essential activity, such as taking medications at a particular time or eating a meal (particularly important for persons with diabetes). Because the movement of pets and even curtains may also activate the sensors and set off an alarm, careful placement of the sensors is essential. Devices can be pre-set to measure time intervals—such as every 4 hours during the day. If no activity has occurred, a caregiver or a monitoring center is alerted. Caregivers may also use an “away” option when leaving the home. If the door opens after they leave, an alarm will be activated. The most sophisticated monitoring devices can both alert a caregiver and be routed through a monitoring center, such as a police or emergency provider outside the home, in case the caregiver is unable to respond.

Emergency notification systems use units that can automatically dial the caregiver's phone number, a monitoring center, or both, when a sensor is triggered under certain conditions (e.g., inactivity for a predetermined period, a flood, or smoke). Typically the monitoring is passive (i.e., actions or responses by the person being monitored are not required). Some of the units allow a responder at a central monitoring place to talk with the person through a speaker.

These types of monitoring systems can facilitate caregiver monitoring of persons with early stage dementia who are alone during the day. However, such systems are appropriate only if a responder can arrive in the home very quickly if needed. Prices for these systems vary depending on particular features.

Some motion- or sound-detection systems developed for other populations can also be useful for monitoring. For example, home security systems can generally be set to provide a chime when an exterior door is opened or closed. Also, systems that enable parents to

audibly and visually monitor infants and young children in a remote room can also be used to monitor persons with dementia.

## **Helping to Ensure Safer Walking and Address Wandering**

People with dementia are often motivated to walk for a variety of reasons, such as boredom, discomfort, restlessness, or habit. As long as the environment is safe, walking provides both psychological and physical benefits. If walking is unsupervised, however, and persons are unable to return home safely on their own, they are at risk for harm due to accidents; harm/abuse by others; exposure to temperature extremes; and failure to take medications, food, or fluids.

*Wandering* is a term applied to meandering, aimless, or repetitive walking that exposes a person to harm.<sup>10</sup> The prevalence of wandering is difficult to establish. One study found that wandering begins in 40 percent of individuals with the diagnosis of dementia on average at 10 months after their diagnosis.<sup>11</sup> Another study found that wandering eventually occurs in up to 80 percent of all people with dementia.<sup>12</sup> Estimates vary widely because studies use different methods for estimating rates and typically do not take into account the duration or severity of the dementia.<sup>13</sup> The inability to find someone who is wandering can be a source of severe stress for caregivers.

Several types of assistive technology are available to help ensure safer walking: active systems designed to help individuals find their way home and passive systems that allow individuals with dementia to be monitored and that help to find them when lost.

### ***Active Systems***

Active systems require individuals to use a simplified and programmed phone or a personal emergency response system device (described above) to summon help. Several products use Global Positioning Satellite (GPS) systems, which the general population uses for getting directions and finding locations. Even simplified versions of these user-operated technologies are likely to be beyond the capability of many—if not most—persons with dementia. As discussed above, the inability to form new memories prevents learning how to use a device, and deficits in recall and recognition can prevent its effective use. Impairments in ECF, confusion, and disorientation also preclude the use of such products.

If, however, persons with mild cognitive impairment or very early stage dementia have the ability to recognize that they are lost and have the capacity to use devices that will help them find their way home—or help others to find them—several AT products may be useful. Simplified mobile phones (described above) may be used to call someone to obtain directions, or the individual called may be able to obtain sufficient information to locate the person and arrange for him or her to be taken home. For persons without cell phones or who lack the ability to use one, personal emergency response systems that only require the

person to push a button on a device worn as a lanyard or on the belt can alert the caregiver or an emergency response system. Many of these devices display an emergency phone number in case someone comes to the aid of the lost person and can call for help. Some of the devices allow the caregiver or emergency responder to converse with the individual while assistance is on the way. Limited information about pricing was available on the Internet for this report. One advanced product using GPS technology was listed for leasing at \$8 a day for a minimum of 90 days (\$240 a month), a cost that would be prohibitive to many families.

### *Passive Systems*

Several AT products are available to help caregivers locate persons who have left the home and not returned. These products have different capabilities, and the range of products is increasing with the introduction of new technologies for use by the general population. Adapting the technology commonly used to monitor children and pets when outside the home or in dangerous areas, such as pools, one product sets an electronic boundary up to 500 feet in diameter around the home. The person being monitored must wear a transmitter on the wrist—about the size of a watch—which causes an alarm to sound when he or she steps beyond the established perimeter. The alarm device, which is portable, can be used at home or in other settings and can either be plugged into a wall socket or operated on batteries.

Among the more sophisticated systems are those that use GPS technology to provide the exact location of a person who is wearing a tracking device. These systems are only as reliable as transmission and reception capability, and buildings or other large objects can impede signal transmission. Systems that use a combination of GPS, cell phone signals, radio frequencies, or similar technology have fewer geographic limitations, but no system is completely reliable.<sup>14</sup>

Some systems enable a radio frequency signal to be sent to a local police station or other emergency response resource that has compatible tracking equipment, which can then track and find the lost person. One system also allows the lost person to communicate with the central system and others, such as the caregiver, by phone, but as mentioned earlier, many individuals have limited ability to use these phones.

One web-based system includes a location-based mapping service that provides information about a person's location through a GPS tracking device. Caregivers can log into the web system, view the person's location on a map, and determine whether he or she is lost or just taking a usual walk. If caregivers believe the individual is lost or wandering (based on the pattern of the walking), they can communicate with the emergency response system via e-mail. The device updates the location every 5 minutes, enabling the caregiver to track the person with dementia and, if someone is attempting to reach that person, guide the

searcher. With this system, families can decide on the level of monitoring needed and can elect to receive alerts when the person has traveled in or out of a zone or to alert emergency assistance for someone who is wandering. Monitoring plans cost about \$45 a month with a \$45 activation fee. Prices for GPS tracking devices are in the \$250 range.

Tracking devices can be worn as an ankle or wrist bracelet or can be carried or attached to clothing. Clearly, these devices will work only if worn or carried, and a person with dementia may be irritated or confused by the device and remove it and lose it. Physical wounds and infection can result from scratching and other efforts to remove a wrist or ankle bracelet that is designed to prevent removal.<sup>15</sup>

A tracking device that can be inserted into the user's shoe offers the least obtrusive means of tracking. Whenever the wearer wanders off more than a pre-set distance, the caregiver receives an alert by telephone and computer. However, the device works only when there is cell phone coverage. Such a device will be available commercially in December 2010 and will retail for \$200 to \$300, with a monthly tracking fee of \$23 to \$40.

These and similar systems can help persons with mild cognitive impairment or early dementia to experience a sense of freedom to walk where they wish, knowing that someone will be able to find them and help them return home. However, caregivers need to understand that these products help to *manage* risk—not remove it completely.<sup>16</sup> For example, tracking devices do not prevent the possibility that someone will get lost or guarantee that they will be found within a very short time. Thus, even with a tracking system, a risk exists that a person with dementia who is lost or wandering will experience harm before being found. The risk increases the longer it takes to find the person, particularly for more vulnerable people who require an immediate response, such as a person with diabetes who needs food or medication.<sup>17</sup>

At the same time, a system that is designed well and customized to individuals' specific needs, abilities, environment, and preferences—and the needs of their caregivers—can be effective in decreasing the risk of harm and reducing caregiver burden. When considering the use of any safety technology, it is important to recognize its limitations as well as its potential. Such technology is not intended to serve as a complete substitute for caregiver presence or to replace caregiver supervision for a user who is not safe alone outside the home.

## **Ethical Considerations**

Several analysts and the Alzheimer's Society in the United Kingdom have noted that the use of 24-hour real-time surveillance and tracking devices to manage symptoms of dementia raises ethical issues.<sup>18</sup> Some experts view electronic tracking technology, in particular, as potentially violating individuals' civil rights, impinging on their privacy, freedom, and right to take risks.<sup>19</sup> However, by definition, autonomy is lost with dementia; caregivers and others

with the authority to make decisions on the person's behalf are responsible for making decisions about monitoring technology.<sup>20</sup>

Although some experts view the use of assistive technology to monitor persons with dementia as intrusive, an invasion of privacy, and controlling, others see it as a means to prevent more onerous restrictions, such as locking a person indoors or institutional placement.<sup>21</sup> Persons with dementia and their caregivers may welcome such technology because they view it as the least restrictive solution to a behavior that can cause problems.<sup>22</sup>

Even though it is the caregiver who will employ monitoring technologies to help ensure safer walking by persons with dementia, some of these technologies require persons with dementia to wear an electronic device, and it is important to recognize that the needs of persons with dementia and those of their caregivers may conflict. The person with dementia may refuse to wear a transmitter, believing it is unnecessary or not understanding its purpose, whereas the caregiver may require it to reduce the amount of time spent directly supervising the person and to lessen stress related to safety concerns.<sup>23</sup>

Persons with dementia who are incapable of understanding the technology may remove the monitoring device, throw it away, or fail to put it on. In such instances, the caregiver may believe that the risk of harm due to getting lost or wandering is so great that the only alternatives are to lock the person inside the house or to attach a device that cannot be removed. Caregivers must weigh the benefits of each approach. Whether the trade-offs are acceptable depends on the specific circumstances of the persons with dementia and their caregivers. If the burden of safety monitoring has become so severe, monitoring technology that cannot be removed may be the only alternative to institutionalization.

#### **Documenting Preferences Regarding Monitoring Technology**

Once a diagnosis of mild cognitive impairment or early dementia has been made, it is generally recommended that, as soon as possible, the person affected should designate a surrogate to handle finances and to serve as a health care proxy. Treatment and end-of-life preferences should be discussed with family members and health care providers and documented. Given the concerns raised about monitoring technologies, the Alzheimer's Society in the United Kingdom suggests that preferences regarding the use of such technologies also be documented.<sup>24</sup>

Individuals for whom safety and security are major concerns can make clear in advance that, regardless of what they may say when they are no longer able to understand risks, they want monitoring technology to be used—to help ensure their safety and to prevent the need for more restrictive interventions, such as being locked in the house or institutionalized. Ideally, persons with dementia and their caregivers will have comprehensive information about the various types of monitoring systems—their effectiveness, pros, and cons—so they can make informed decisions about the type they prefer.<sup>25</sup>

Although research on the effectiveness of safer walking technology is lacking and a review of several studies found a lack of robust evidence to support any intervention,<sup>26</sup> such technologies have the potential to be effective if they are carefully selected to meet

individuals' needs and to address the specific risks their behavior poses. For example, if a monitoring technology requires an immediate response, it will not be effective unless a caregiver or another designated person is available to provide it. Caregivers who are considering using monitoring technology need to understand the capabilities and limitations of various systems, as well as the advantages and disadvantages for their specific situation.

## **Technology to Improve Emotional States and Decrease Behavioral Problems**

Few proven technologies are available to improve the emotional state of persons with dementia and to decrease behavioral problems. Those that have shown promise based on preliminary research findings are discussed below.

### **Light Therapy**

People with dementia are likely to experience disturbance in their circadian rhythms, which results in disrupted sleep patterns, such as increased daytime napping and long periods of wakefulness at night.<sup>27</sup> These patterns are often commonly associated with aging, but they are more pronounced among people with dementia. Sleep disruptions may contribute to cognitive dysfunction, behavioral disturbances, and depression. The need to monitor nighttime activity because of sleep disturbances places tremendous physical and emotional stress on caregivers.

The research on the effectiveness of light boxes for improving sleep patterns is inconclusive, but some benefit may be obtained from light therapy, particularly when combined with other measures to encourage productive sleep patterns, such as regular bedtime routines and physical activity during the day.<sup>28</sup> Some attempts to help restore more normal sleep patterns involve increased exposure to light at specific times, whether indoors or outdoors.

The most common means of increasing indoor light entails the use of light boxes that provide intense light and are meant to be used for specific periods of time, such as 30 minutes to an hour. However, it may be difficult to get persons with dementia to sit by the light for this period, unless they are also doing another activity that holds their attention. Before trying light therapy, caregivers need to understand how many other activities and environmental conditions affect sleep patterns. For example, physical activity, noise, and light levels in the evening; bedtime routines; and medications can all affect sleep patterns and quality.

Prices for light boxes range from \$150 to \$475. The simpler and less expensive models sit on a desk or counter and resemble a plain box or a desk lamp. The larger, more expensive models are on a stand and can be adjusted to shine the light at specific angles; most can be moved easily.

## **Facilitating Exercise, Entertainment, and Relaxation**

Emotional distress and behavioral problems may be decreased by helping persons with dementia to engage in exercise and other activities that provide satisfying experiences.<sup>29</sup>

### ***Interactive Computer Games for Physical Movement and Exercise***

Some evidence suggests that the benefits of physical activity for people with dementia living in the community may include slowed progression of cognitive decline, improved mood and reduction in depression, and improved sleep.<sup>30</sup> Certain computer-based, interactive sports games developed to help sedentary people become more active can also be used for persons with dementia. These games require the user to wear a transmitter on the wrist. The user's hand and arm movements affect the motion of a ball or other sports item displayed on the computer monitor.

Such sports games can be played while standing or sitting, so even people in wheelchairs can participate. The level of exertion of these games is unlikely to be sufficient to improve cardiovascular fitness, but these activities may encourage social engagement, focused attention, and active involvement in something pleasurable. Although familiarity and previous experience with a sport may make it easier to participate, experience is not necessary.

### ***Simplified Remote Controls for Watching Television***

Simplified television remotes developed for the older population may make it easier for people with dementia to watch television shows or digital video discs (DVDs). The degree to which this activity holds the attention and is pleasurable for a person with dementia varies greatly according to cognitive abilities. Simplified remotes have a few large and clearly labeled buttons for a limited number of functions: volume, channel, on/off, and in some cases up to five buttons for programming specific channels. Such products may still be too complicated for many people with dementia to operate. Some remotes allow programming by caregivers to limit channels to those that the person with dementia likes, with a lock to prevent changes. Prices range from \$17 to \$60.

### ***Customized Music Playlists***

Listening to enjoyable music may have positive effects on persons with dementia, such as reduced agitation and anxiety, improved mood, a decrease in depression, and improved social engagement.<sup>31</sup> Preferred music is the key factor, as personal taste determines whether music will be perceived as pleasant and enjoyable. Family members can develop a playlist of preferred music using various technologies regularly available on home computers to "burn" an MP3 disc or compact disc (CD). If the caregiver does not want to listen to the music, the person with dementia can use hard-wired or wireless headsets.

When listened to with another person, music may facilitate conversation about the songs and associated memories. In addition to access to a computer to burn the discs, an MP3 or other portable media player will be needed. Caregivers can download music from the Web, generally priced at a dollar per song. One long-term care service provider makes customized playlists for portable media players for people with dementia.<sup>32</sup>

### ***Aiding Reminiscence Therapy***

Communicating with persons who have dementia can contribute to their sense of well-being. Reminiscence therapy is one approach for facilitating communication. It consists of a semistructured discussion of past activities, events, and experiences—particularly those of personal and emotional significance—with another person or group of people, often with the use of aids such as videos, pictures, archives, and life story books. Although the research on the benefits of reminiscence activities for people with dementia and their caregivers is inconclusive,<sup>33</sup> some studies of these activities have shown improved psychological well-being and quality of life in older adults.<sup>34</sup> For example, one study found that reminiscence therapy led to improved cognition and mood 4 to 6 weeks after the treatment and that participating caregivers reported lower strain.<sup>35</sup>

Technology is not necessary for reminiscence therapy, but some products incorporate the use of technology, such as a photo album with a recording capability that allows caregivers to record up to a 10-second message to accompany each photo (one per page). The user presses a play button to activate the messages. Music that is meaningful to a person with dementia may also help to stimulate conversation associated with those memories, such as the customized playlist described above.<sup>36</sup> Interactive DVDs are available to stimulate memories for specific time periods—e.g., the 1940s and 1950s—but the person with dementia may need assistance in using the control devices (either television remote or computer mouse). Prices for these various devices range from \$30 to \$75.

### ***Simulated Presence***

Some studies have shown that persons with dementia can be calmed by listening to a recording of the caregiver's voice.<sup>37</sup> In a home setting, if a person with dementia is capable of playing a recording on a simple device or can do so with the help of another person in the home, the caregiver's voice may have a soothing effect and reduce agitation. A typical device of this kind costs about \$20.

## **Considerations When Selecting and Using Assistive Technology**

To be useful, an AT product must be both effective *and* beneficial. A product that is effective (i.e., achieves its intended purpose) but causes distress is not beneficial. Because

individuals have different needs, abilities, and preferences, no AT product will be useful for everyone with dementia.

## **Importance of Assessing an Individual's Deficits, Abilities, and Preferences**

If an AT product is not matched to a person's needs, abilities, and preferences, it may be ineffective or may even cause distress. The features of dementia that can influence the acceptance, use, and effectiveness of assistive technology include, but are not limited to, a person's

- specific pattern of cognitive abilities and deficits,
- specific emotional and behavioral changes,
- personality characteristics and attitudes toward technology,
- attitude regarding assistive technology that appears to exert "external control," and
- physical and social environment.<sup>38</sup>

Any or all of these factors can result in an AT product not being used effectively or *at all*—even if it has been proven to be highly effective in a controlled setting. An individual must be both willing and able to use a product and comfortable with its use. Research has indicated that the use and acceptance of an AT product may also depend on individuals' personality, motivation, and insight into their deficits.<sup>39</sup>

Thus, prior to introducing an AT product or monitoring system, a thorough assessment must be performed to determine if the person with dementia can use it and will benefit from it. Assessment to ensure that an AT product matches a person's deficits, abilities, and preferences must be ongoing because dementia is characterized by progressive decline, and symptoms can vary from day to day and week to week.

An initial assessment may require a trial period with a specific AT product. Monitoring technology to ensure safety can be of enormous benefit to caregivers, but its use needs to be carefully introduced and implemented so that it is effective and does not cause distress to a person with dementia. For example, if a bracelet with a tracking device is uncomfortable to wear, a person with dementia may try to remove it. Similarly, the sound of an alarm when a person opens a door can be frightening.<sup>40</sup>

A person's physical and social environment also needs to be assessed to help determine which types of assistive technology are appropriate. The needs of individuals who live alone differ from the needs of those living with a caregiver. A large, two-story, multiroom house presents different mobility and navigation challenges from those of a small, one-bedroom apartment; an isolated rural setting may pose different safety challenges from those of an urban or suburban area.

Assistive technology can also be used in the assessment process to help develop a service plan that is consistent with an individual's needs and preferences. Certain localities in England are using an activity monitoring system to assess the needs of people with dementia who live alone in their own homes. This system uses small, wireless movement sensors placed in key rooms of a person's house to understand daily living patterns. The sensors are triggered as the person goes from room to room, and the data obtained are represented as a line on a 24-hour chart, which is accessed via a password-controlled website.<sup>41</sup>

This chart gives family caregivers and case managers information about daily activities, which can then be used to develop a service plan that will support the individual to live independently. In one case, monitoring kitchen and bathroom use determined that aide home visits were not needed to ensure that the person with dementia was eating regular meals. Discontinuing the visits was particularly important because the person considered them intrusive. Similar monitoring technologies are available and used in the United States for monitoring in-home and outside-the-home activities.

## **Determining Whether an Assistive Technology Product Will Be Effective**

As noted throughout this report, just because an AT product is designed to compensate for a specific cognitive impairment does not necessarily mean that it will be effective for that purpose. Persons with dementia have multiple cognitive deficits, yet many products are designed to compensate only for one deficit: memory impairment. Even if an AT product has been proven effective in a research setting, its usefulness may be limited when used in the home of a person with dementia or when used inappropriately—either in general or for a specific individual's circumstances.

Individual studies have found that technology can be helpful in providing more freedom for persons with dementia to move around, in reassuring and reminding, in supporting circadian rhythms to improve sleep and time orientation, and in decreasing stress and anxiety. However, most of these studies concluded that far more research is needed to identify who can benefit from the specific technology and the optimal time for introducing it.<sup>42</sup>

Nonetheless, technology can be and is used to support persons at various stages of dementia and their caregivers.<sup>43</sup> Caregivers can experiment with some simple and low-cost AT products, such as electronic night and day calendars, to determine their effectiveness for a specific individual. One study found that such calendars enabled persons with dementia to be more oriented to the date and time of day, thereby reducing repeated questions to the caregiver, which resulted in a greater sense of well-being for both.<sup>44</sup>

However, given the lack of research on the effectiveness of many commercially available AT products, caregivers need to introduce such products on a trial basis and determine for themselves whether they are useful—that is, both effective and beneficial.

### **Determining Whether to Use a Specific Assistive Technology Product<sup>45</sup>**

When considering whether to purchase an AT product for a person with dementia, caregivers should

- Determine whether it will help the person to do something he or she needs and wants to do.
- Determine whether the person is comfortable using a product and finds it easy to use.
- Ask experts, such as an occupational therapist who knows the person, about the type of AT products that might be useful for him or her.
- Ask other caregivers what AT products they have found to be helpful.
- Pick the simplest product available to meet the need. Simpler devices are often easier to use, less expensive, and easier to repair and maintain than more complex devices. For example, a person who remembers to take his or her medications but gets confused about which pills to take at which times can use a weekly pill organizer that a caregiver can fill. An automated pill dispenser with reminder alarms would be more complicated than necessary and certainly more expensive.
- Ask to use the device on a trial basis to see if it is truly going to meet the person's and caregiver's needs, particularly if it is expensive.

## **Conclusion**

Although there is hope that technology can help to meet the increasing care needs of persons with dementia, compared with AT products available for people with physical, sensory, and communication impairments, few products can help compensate for the cognitive deficits common in persons with dementia to enable them to live more independently. This lack of suitable products is not surprising given that a recent review of the literature on assistive technology to meet the needs of persons with dementia found that this research area is in its “infancy” and that much more study is needed to develop methods for assessing the relevant technologies’ efficacy, acceptability, and usefulness. Additionally, the review concluded that more research is needed to improve our understanding of technology’s possibilities and limitations in supporting persons with dementia and their caregivers.<sup>46</sup> Reimbursement for the expense of AT products by public and private insurance is highly unlikely until efficacy is proven.

Another review of assistive technology for persons with cognitive impairment concluded that very little is known about the relationship between dementia’s clinical features (e.g., specific cognitive impairments as well as behavioral symptoms) and the characteristics of assistive technology that are most suitable for individuals with specific impairments and symptoms.<sup>47</sup> The author of a major review of available technology noted that we are only beginning to recognize the complexities of matching persons and technology—for persons with cognitive impairments, generally, and dementia specifically.<sup>48</sup>

Conflicting views exist about the potential for assistive technology to compensate for the cognitive deficits associated with dementia. Researchers participating in the Everyday Technologies for Alzheimer’s Care initiative<sup>49</sup> noted that many researchers, family members, social workers, and policy makers assume that older people in general—and persons with dementia in particular—are incapable of using information and communication technologies.<sup>50</sup> With regard to older persons generally, this view is reflected in the marketing of “simplified” versions of widely used technology, such as mobile phones and television remote controls, for the older population. Other experts disagree and believe that computing, consumer electronics, and telecommunications technologies have the potential to improve the quality of life for persons with dementia and their caregivers.<sup>51</sup> Certainly, monitoring technologies have the potential to relieve caregivers from the strain of constant supervisory attentiveness.

Approximately 60 to 65 percent of persons with mild cognitive impairment develop clinical dementia during their lifetime.<sup>52</sup> Thus, some assistive technologies aimed at compensating for memory impairment may be more effective if directed to persons with mild cognitive impairment rather than those with dementia. Doing so would give the person time to learn to use the AT product, become familiar with it, and establish behavioral routines for using it that might persist into the early and moderate stages of dementia.<sup>53</sup>

## Appendix I

### Resources for Additional Information

#### Publications

Administration on Aging. (n.d.). *Fact sheet on assistive technology*. Available at [http://www.aoa.gov/aoaroot/Press\\_Room/Products\\_Materials/fact/pdf/Assistive\\_Technology.pdf](http://www.aoa.gov/aoaroot/Press_Room/Products_Materials/fact/pdf/Assistive_Technology.pdf)

#### Websites

Several websites focus on assistive technology (AT) for people with memory loss, mild cognitive impairment, and dementia, whereas others provide information about assistive technologies for persons with all types of impairment, including physical, sensory, and communication impairments. Because dementia is a progressive disease that eventually leads to physical impairment, the information available at these sites will be useful for many caregivers.

<http://www.alz.org/library>

The Alzheimer's Association Green-Field Library is a national, privately funded organization that offers information and materials about Alzheimer's disease. It is the nation's largest library and resource center specifically devoted to increasing knowledge about the clinical, scientific, and social aspects of Alzheimer's disease and other dementias. Alzheimer's Association publications are generally available from the website, and other items may be borrowed directly from the library, located in Chicago, through a local Alzheimer's Association chapter or through interlibrary loan.

The site includes specific information about assistive technology. Resource lists include citations for articles, such as *Designing Environments for Dementia*, which covers articles about safety, wandering, and other environmental issues. Useful website lists include one for safety, which has links to several online sources for additional information and products.

<http://www.atdementia.org.uk>

Under the direction of the Trent Dementia Services Development Centre, this website is an online public information resource based in the United Kingdom that provides information on assistive technologies for use by people with dementia, caregivers, and professionals. The website seeks to raise the profile of assistive technology to meet the specific needs of people with dementia by furnishing information about available products along with resources for additional information.

The website lists products in four categories of assistive technology—prompts and reminders, leisure, communication, and safety—and also allows users to search for products

by keyword, type of assistive technology (stand-alone or monitored by outside entity), residential setting, location in the home, and type of product. Each product entry has a description of the product, its price, and supplier contact information, with a link to user reviews. A separate provider list supplies weblinks to provider websites.

Other resources on the website include (1) a research and development page that lists organizations developing new assistive devices; (2) a news and events page listing upcoming conferences and meetings related to dementia and assistive technology; and (3) a resource page with links to information sheets and other publications, including sample protocols, guidelines for the ethical use of assistive technology, and resources for environmental design. A discussion forum and frequently asked questions page complete the website offerings.

[https://www.sworps.utk.edu/alz\\_website](https://www.sworps.utk.edu/alz_website)

The Alzheimer's Safety Catalog located at this site was developed by the Area Agency on Aging in Knoxville, Tennessee, through a project funded by an Administration on Aging Alzheimer's Disease Demonstration Grants to States Program grant. The catalog begins with general suggestions to Alzheimer's caregivers for helping to ensure safety in the home, followed by information on a variety of support products, including books, clothing, and devices for bathroom safety, falls prevention, feeding, fire safety, kitchen safety, lifelines, lighting, medication management, monitoring, telephones, temperature regulation, and wandering prevention. The illustrated entries include a brief description of the item, the name of the supplier, and the price at the time the catalog was published. The catalog includes an index of retailers with contact information and a list of helpful Internet sites.

<http://www.abledata.com/>

The AbleData website is maintained by the National Institute on Disability and Rehabilitation Research in the U.S. Department of Education. The site provides information about AT and rehabilitation equipment available from domestic and international sources. No products are sold or endorsed. The website's main resource is the AbleData database, which contains information on more than 35,000 AT products (about 22,000 of which are currently available). Most are for people with physical or sensory impairments. For each product, the database provides a detailed description of the product's functions and features, price (when available), and contact information for the product's manufacturer and distributors. A search function allows users to identify products by company or function, or users may browse the products by category.

In addition to commercially available products, the database includes information on noncommercial prototypes and customized, one-of-a-kind, and do-it-yourself products. The database also includes links to consumer reviews posted on the website, as well as classified ads from private individuals and small organizations selling or seeking to purchase

previously owned AT and rehabilitation equipment. Users may register at the website to save product links, searches, and preferences and to submit product reviews and classified ads.

Other resources on the AbleData site are the following:

- weblinks to resources about assistive technology and more than 60 additional disability topics
- a listing of upcoming meetings, conferences, calls for papers, workshops, and educational opportunities about AT and disability issues
- a listing by state of the AT companies represented in the AbleData database
- a listing of resources, organizations, and AT companies outside the United States
- the AbleData Library, which includes fact sheets and consumer guides to help select various types of AT products; a searchable list of books, articles, reports, and other paper and electronic publications; and a selection of news items relating to AT and disability issues

<http://www.techforltc.org/>

The Technology for Long-Term Care website was developed under a research initiative of the U.S. Department of Health and Human Services to address barriers to introducing new technologies in residential care settings. The site contains information on more than 1,200 technology products to improve the quality of life and care for people in long-term care settings, such as nursing homes, assisted living, boarding care, and adult day service programs. The website excludes mainstream technology (e.g., simplified cell phones and remote controls) and focuses on both high- and low-technology applications (e.g., sensor-based monitoring systems and anti-slip footwear). Although the website is focused on technologies for use in formal long-term care settings, some of the products can also be used in the home.

The site is organized to allow searches for products by categories. Users may also browse by company or search by keyword. Most of the products are for individuals with physical impairments, but one category of products—communication and memory—may be useful for some persons with mild cognitive impairment or early stage dementia.

Products cannot be purchased through the site, although contact information is included for the companies that provide the products. Product information was obtained through literature and Internet searches, from long-term care buyer's guides, and by speaking with technology manufacturers and vendors at various conferences.

In addition to product information, the site contains resources for obtaining additional information about assistive technology. For each product category, the site lists "Key Issues to Consider" to help people determine whether a product will be useful. It also lists

“Questions for Vendors” to obtain detailed information about a product. Although the focus of this site is on the use of assistive technology in residential care settings, the information presented may also be of use to individuals providing care at home.

[http://www.aahsa.org/article\\_cast.aspx?id=10235](http://www.aahsa.org/article_cast.aspx?id=10235)

The Center for Aging Services Technologies (CAST) is an international coalition of more than 400 technology companies, aging-services organizations, businesses, research universities, and government representatives working together under the auspices of the American Association of Homes and Services for the Aging. The CAST website presents available technology in four general areas: Safety, Health and Wellness, Social Connectedness, and Electronic Documentation. Listings for individual items include a brief description of the technology, contact information for the organization offering the technology, and links to similar products.

The site also includes reports on the state of technology in aging services, summaries of federal policy initiatives regarding assistive technology, descriptions of pilot projects examining the usefulness of technology products, and information about conferences and educational opportunities.

## Appendix II

### Potential Funding Sources for Assistive Technology

Other than devices to compensate for physical impairments, public funding for assistive technology (AT) is meager: a patchwork of incomplete and irregular coverage.<sup>54</sup>

Medicare is a *health care* program that generally requires substantiation of *medical* necessity to cover an assistive technology, as opposed to an improvement in functioning. For that reason, Medicare does not cover cognitive assistive technologies or home modifications. Medicaid is both a health and long-term care program. About 80 percent of states cover some type of assistive technology under their regular Medicaid State Plans to help persons with physical impairments, but AT products for persons with cognitive impairments are not federally authorized as Medicaid services, and so no states cover them.<sup>55</sup>

Federal law, however, allows states to cover a broad range of long-term care services needed to prevent institutionalization—including assistive technology—in programs called home and community-based services (HCBS) waiver programs. The Centers for Medicare & Medicaid Services waives certain federal provisions for these programs to provide states with greater flexibility to serve persons of all ages with disabilities in their homes and communities. Almost all HCBS waiver programs include assistive technology or home modifications as listed services.<sup>56</sup>

A review of 202 HCBS waiver programs found that 159 cover assistive technology and 124 include personal emergency response systems. For example,

- Florida's waiver program for persons 60 and above with Alzheimer's disease, who are living at home with a caregiver, covers wanderer alarm and identification systems.
- Colorado's waiver program for disabled persons aged 16 to 64 with brain injury covers "cognitive orthotics and memory prostheses, lifeline and medication monitoring, . . . memory phones," and other devices.

Veterans' benefits can cover some portions of the cost of a broad range of assistive technologies, although not all veterans receive the most comprehensive coverage. Programs that focus on maintaining a person's ability to work or returning a person to work may also provide some support for assistive technologies that fulfill vocational goals.<sup>57</sup> For more information about benefits for assistive technology from the U.S. Department of Veterans Affairs, call the VA Health Benefits Service Center toll-free at 1-877-222-VETS or visit the department's website at <http://www1.va.gov/health/index.asp>.

The Assistive Technology Act of 2004 creates and partially funds—with federal money—a number of projects that further the use of assistive technologies but does not significantly fund the direct purchase of assistive technology. The website for the Association of Assistive

Technology Act Programs includes links to its members, including several statewide programs of nonprofit organizations, some of which include equipment that might be helpful to persons with dementia (see <http://www.ataporg.org/atap/index.php>).

However, an Internet search conducted for this report found that most nonprofit organizations with AT initiatives target people with physical or sensory disabilities and generally facilitate access to funding for assistive technology rather than provide funding themselves. When nonprofit organizations do provide direct funding, it is usually in the form of discounts and low-interest loans. Some have AT lending programs, which enable caregivers to try a product before buying it; for example, the North Carolina Assistive Technology Program has an AT loan program, and products available include memory aids and security systems. The program also has an online exchange site for used devices (see <http://www.ncatp.org>). The North Dakota Interagency Program for Assistive Technology has a loan library that charges a fee for borrowing AT products, some of which may be useful for people with memory impairment and their caregivers (see <http://www.ndipat.org/>).

## Endnotes

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<sup>2</sup> Merck & Co. (2006). *The Merck manual of geriatrics*. Retrieved from <http://www.merckusa.com/mkgr/mmg/sec5/ch40/ch40a.jsp>

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<sup>4</sup> <http://www.section508.gov/docs/AssistiveTechnologyActOf1998Full.pdf>. The term *assistive technology* (AT) is defined as any technology designed to be utilized in an assistive technology device or assistive technology service. AT services include those that directly assist an individual with a disability in the selection, acquisition, or use of an assistive technology device.

<sup>5</sup> [http://www.medicinenet.com/learning\\_disability/glossary.htm](http://www.medicinenet.com/learning_disability/glossary.htm). Some Medicaid home and community-based services waiver programs cover assistive technology, which is generally defined to include only electronic and computerized devices.

<sup>6</sup> <http://www.minddisorders.com/Del-Fi/Dementia.html>. Although memory loss is a common feature of nearly all dementias—once sufficiently advanced—in the earliest stages of non-Alzheimer's dementias, cognitive decline is characterized by other abnormalities of thinking that do not necessarily involve memory.

<sup>7</sup> M. Alwan, Ph.D., Director for the Center for Aging Services Technologies, personal communication, June 17, 2010.

<sup>8</sup> D. Royall, M.D., Professor and Chief, Division of Aging and Geriatric Psychiatry, University of Texas Health Science Center at San Antonio, personal communication, June 28, 2010.

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- <sup>16</sup> Alzheimer's Society. (2007). Op. cit.
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- <sup>18</sup> Ibid.
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- <sup>20</sup> D. Royall, M.D, Professor and Chief, Division of Aging and Geriatric Psychiatry, University of Texas Health Science Center at San Antonio, personal communication, June 28, 2010.
- <sup>21</sup> Alzheimer's Society. (2007). Op. cit. Alwan, M., & Nobel, J. (2007). *State of technology in aging services*. Center for Aging Services Technologies. Retrieved from [http://www.aahsa.org/article\\_cast.aspx?id=6312](http://www.aahsa.org/article_cast.aspx?id=6312). Price, C. (2007). *Monitoring people with dementia: Controlling or liberating*. *Quality in Ageing*. Brighton, UK: Pavilion Journals Ltd. Retrieved from <http://www.britannica.com/bps/additionalcontent/18/26916560/Monitoring-people-with-dementia--controlling-or-liberating>
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<sup>41</sup> The description of the system and the example of its use draws heavily from Price, C. (2007). Op. cit.

<sup>42</sup> Topo, P. (2009). Op. cit.

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<sup>49</sup> An initiative launched by the Alzheimer's Association and Intel Corporation in 2003 to identify and fund promising research in the use of technology for monitoring, diagnosing, and treating Alzheimer's disease. See [http://www.alz.org/professionals\\_and\\_researchers\\_everyday\\_technologies\\_for\\_alzheimer\\_care.asp](http://www.alz.org/professionals_and_researchers_everyday_technologies_for_alzheimer_care.asp). Jones, K. (2004). Op. cit.

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However, considerable variation exists in how states define and refer to assistive technology. Both Medicaid State Plans and HCBS waiver programs describe coverage of AT services in their provider manuals, but states rarely refer to these services as "assistive technology"; rather, they appear in the coverage manuals under "durable medical equipment" or "prosthetics" services.

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