17 Assistive Devices

John Burdett Redford, M.D.

Assistive technology and environmental adaptations for the disabled are seen widely on TV, in newspapers and magazines, and on the streets with curb cuts, ramps, parking spaces, and so forth. Assistive devices and other appliances that provide more independence to the elderly and disabled are commercially available in department stores, drug stores, specialized medical equipment stores, and catalogs as well as health care facilities. It is estimated that there are nearly 2000 sources of equipment worldwide offering approximately 20,000 to 30,000 products for sale. Not all assistive technology is promoted commercially; in many communities there are assistive technology exhibit areas, usually office space staffed by specialists who provide advice and sometimes services and who demonstrate various kinds of adaptive equipment. Physicians and other health care professionals can refer patients to community adaptive equipment centers for selection and comparison of different products. These displays of assistive devices are often adjacent to offices of voluntary health agencies, and such agencies should be helpful in identifying where they are located in the community.

A national long-term care survey of those over age 65 in 1989 found that about 7 million people were totally disabled. In this population 65% were using assistive equipment.[1] According to a recent study the mean number of assistive devices owned by disabled elderly people was 9.[2] Primary care providers are the most commonly reported source of information on disability services, but many physicians have limited knowledge of assistive technology. The greatest concern of most elderly people, even those with minimal impairment, is how to maintain independence at home and stay out of institutions; they often require assistive technology in the home to do this. All physicians in clinical practice should be aware that for disabled elderly persons assistive devices or environmental adaptations may mean the difference between totally or partially independent living and the complete reliance on others to assist in performing daily personal care. The purpose of this chapter is to help steer the medical practitioner through the maze of options in assistive technology by categorizing devices and providing guidelines on their prescription or use. Various kinds of orthoses and prostheses are not reviewed here; rather, the emphasis is on the equipment needs of the disabled elderly individual.

SOURCES FOR REFERRAL AND SUPPLY

The attentive primary care physician should be prepared to give advice on assistive devices or home adaptations or refer patients with disability to rehabilitation specialists or a rehabilitation facility, when proper selection and training with assistive devices require specialized knowledge. Occupational therapists are the most readily available source of information and evaluation because they are specially trained in activity analysis and disability. Occupational therapists can also train individuals in adaptive techniques when specialized equipment may not be necessary. Nevertheless, for many simpler or inexpensive items, such as feeding adaptations or clothing modifications, the physician can refer patients to special stores featuring assistive devices or provide catalogs without involving the expense of engaging special expertise. Several catalogs are listed under Resources at the end of this chapter.

Therapeutic adaptation is the design or modification of the physical environment to assist the performance of self-care, employment, and play or leisure activities. Therapeutic adaptation includes selecting, obtaining, and modifying equipment as well as instructing the patient and family in its proper use and care. An assistive technology device is an essential aspect of therapeutic adaptation. Such a device is defined as any item, piece of equipment, or product system, whether acquired commercially off-the-shelf, modified, or customized, that is used to increase, maintain, or improve functional capability of individuals with disabilities.[3] Devices range from simple objects for daily use (e.g., spoons with built-up handles, elastic shoelaces, doorknobs with rubber levers) to complex electronic devices such as voice-activated environmental control systems.

Most small or disposable pieces of equipment are not funded by third-party payers, generally because they are considered a "convenience" rather than a "medical necessity." Large items such as wheelchairs and special beds, which are defined as durable medical equipment, frequently are funded but require prescription by a specialist physician knowledgeable in rehabilitation of the disabled. Whatever the kind of equipment ordered it must be properly evaluated and explained to patients; the many choices can be confusing, and over-reliance on commercial promotion may prove expensive.

PRESCRIPTION

Prescription for an elderly patient who needs special assistive devices may require a full rehabilitation assessment to integrate the device effectively into the patient's total rehabilitation program. Figure 17–1 proposes a decision-making process for prescribing assistive technology.

Physicians should be aware of the costs of the assistive technology they prescribe and be able to justify the need for the equipment to insurance companies. They should also help patients identify potential funding sources or refer patients to social workers for such help. Efforts to obtain money for assistive technology must consider initial costs, expenses for maintenance, need for patient instruction, and the economic benefit the technology may provide. Funding by an insurance company often requires certification for medical necessity with written evidence by the physician. Usually completing standard forms is sufficient, but if complex assistive technology is required, dialogue with insurance companies may be needed to prove medical necessity. Advice on how to certify for medical necessity is found in *Guidelines for the Use of Assistive Technology*, published by the American Medical Association (see Resources).

REFERRAL TO SPECIALISTS

Referral to a physiatrist or other medical rehabilitation specialists concerning rehabilitation and assistive technology is recommended for patients with severe strokes or other disabling neurologic disorders; spinal cord injuries; brain injuries; neuromuscular disorders; or advanced, disabling arthritis. Medical advice about assistive technology is also needed with disorders requiring home ventilators, with major amputations, and with severe disorders of communication, vision, and hearing. Consider consultation with a physiatrist when there are unresolved questions about diagnosis and prognosis or when programs and treatment require customized and expensive equipment. If additional consultation is suggested by rehabilitation therapists, referral to a physiatrist is also desirable for additional advice concerning treatment or prognosis.

Occupational therapists generally provide and

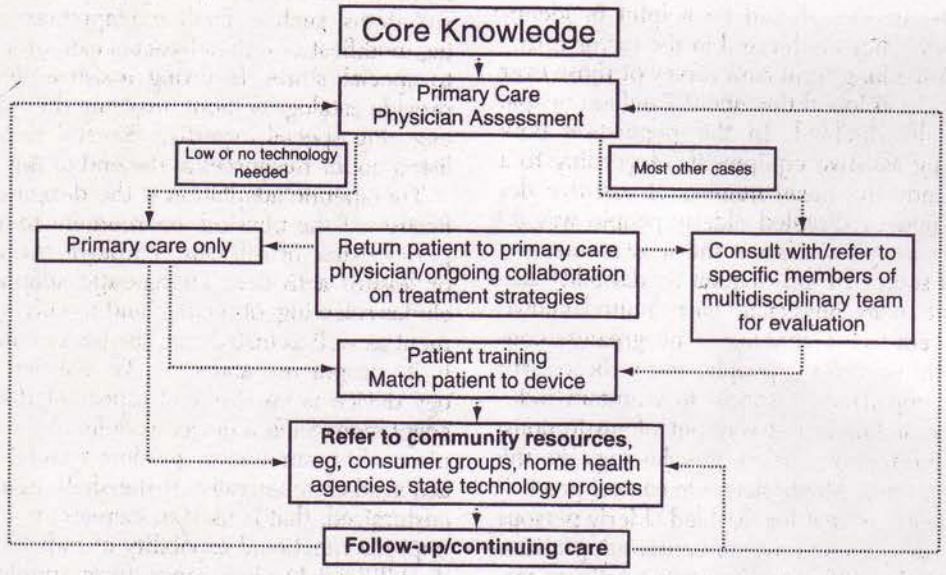

Figure 17–1 Primary care physicians are usually the first to see a person with functional limitations to determine if, when, and by whom assessment will be done. Their longitudinal care responsibilities include acting as a skilled observer of progress, monitoring maintenance of skills, and advising the team of new or changed health care status and loss or change of support systems. (Source: Guidelines for the Use of Assistive Technology: Evaluation Referral Prescription. Chicago, American Medical Association, Copyright 1994.)

recommend self-help aids and orthotic devices. Examples of patients who should be referred to an occupational therapist include those needing assistance in activities of daily living (ADL), splints or orthotic fabrication (primarily for the upper limb), adaptive equipment for work, or assessment of a home environment.

Physical therapists provide help with mobility aids for walking, including assistance and prescription of wheelchairs. Examples of patients needing referral to a physical therapist include those with specific balance or gait disturbances, seating or positioning problems in a wheelchair, or significant range-of-motion or muscular strength impairment.

Speech–language pathologists are experts in the treatment of communication or swallowing disorders. Examples of patients needing referral to speech–language pathologists include those with dysphagia or verbal or written language deficits. When the physician is uncertain of the patient's cognitive ability with language, a referral to a speech–language pathologist may be of assistance.

SELECTION, EVALUATION, AND TRAINING

Some points are worth considering before prescribing any equipment, especially for very old patients. First the practitioner should pay careful attention to the patient's functional disability and proposed living arrangements. If the patient can function reasonably well without the aid or rejects the idea of using an aid to help reduce the impairment, the equipment may never be used. Furthermore, if much training is needed to use the device, it is likely the equipment will be discarded unless training is readily available. Often sufficient time for training is needed before a definite decision can be made.

Another point to consider is cost. Simple aids are better than complex ones often because they are more affordable. In addition, the less conspicuous the aid, the more acceptable it will be. Unfortunately, the walking cane, one of the most effective and cheapest aids, is the most conspicuous. It is often discarded by elderly people who worry over their appearance and freely admit that they are too proud to use a cane. In a lament over this situation, a well-known orthopedic surgeon wrote a memorable editorial, "Don't Throw Away the Cane."[4]

The most decisive basis for evaluation of adaptive equipment is whether it gratifies the need of the user from his or her point of view. Batavia and Hammer[5] have identified four key evaluation and selection criteria for long-term users of assistive devices:

1. Effectiveness—the extent to which the function of the device improves one's living situation, functional capability, or independence
2. Affordability—the extent to which the purchase, maintenance, or repair of the device causes financial difficulty
3. Operability—the extent to which the device is easy to operate and responds adequately to demands
4. Dependability—the extent to which the device operates with repeatable and predictable levels of accuracy under conditions of reasonable use

Decisions made in choosing assistive technology should consider these factors, and written descriptions of equipment should address all or most of them.

PUBLICATIONS

Of the many publications providing information about assistive technology, the *Assistive Technology Sourcebook* by Enders and Hall seems the most complete (see Resources, at the end of this chapter, for more information on this and the following publications). This directory, which has 576 pages, provides the names and addresses of vendors and rehabilitation equipment sources and also includes lists of books and other literature that give further sources of practical information. Another older but excellent guide with outstanding illustrations is edited by Hale. This book ends with eight pages and almost 400 references to resources for the disabled, including extensive literature, national and international organizations, and sources of special supplies. A recent 58-page publication by the American Medical Association, already mentioned above, that gives guidelines for the use of assistive technology is an outstanding summary of information, resources, and services for the disabled. I, along with Basmajian and Trautman, recently edited a book on clinical practice in rehabilitation technology. For sources of information on all aspects of rehabilitation, including evaluation, prescription, and training in the use of assistive technology applied to physical disability, we recommend the textbooks edited by Trombly and DeLisa.

CLASSIFICATION

Most assistive aids fall into one of the following major categories: mobility, eating, dressing, hy-

giene, communication, and recreation. This classification is used for the headings in this section.

Mobility Aids

Most patients with lower limb disorders benefit from a cane, crutches, or a walker for ambulation. Usually, the more disabled the individual, the more complex the walking device required. In nearly all clinical situations the cane should be held in the side opposite the affected lower limb. A cane can transmit up to 25% of body weight away from the lower limb; crutches or walkers can improve balance more effectively and reduce weight-bearing on both limbs by 50%. Canes and crutches should always be inspected to be sure the rubber tips are effective and safe. Details of different designs of walking aids and methods of gait training are widely available.[6, 7] The most useful aid for most elderly hemiplegic persons is the four-legged or quad cane and the pyramid-shaped folding cane/walker, which combines features of a walker and the quad cane. The latter is more versatile and safer because some patients may tend to trip on quad canes (Fig. 17–2).

An important aspect of mobility is the ability to transfer in and out of beds and chairs. A patient who is able to walk may not be able to get up without help. Simple aids such as bed rails, an overhead trapeze, a rope ladder, or a braided bed pull attached to the foot of the bed may be all that is needed for improved bed mobility (Fig. 17–3). For the elderly patient with arthritic knees, or other disorders that make it difficult to rise from low chairs, recessed wooden blocks may be placed under the feet of furniture to elevate them several inches. Chairs are also available with either a spring- or motor-driven rising seat. Some elderly patients have found that these chairs aid them in getting up and are well worth the additional cost. To make dressing simple and safe, the elderly person's bedroom should have chairs with arm supports for stability and firm seats that are not lower than the height of the knees.

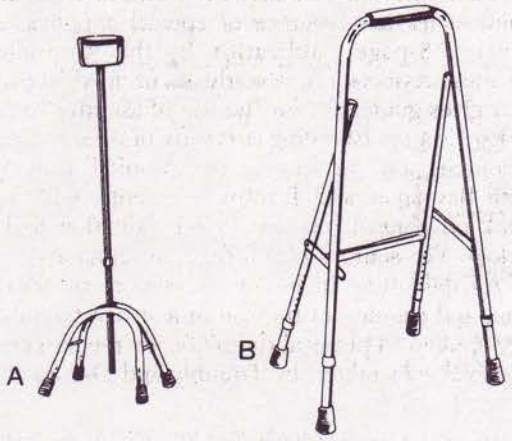

Figure 17–2 Walking aids. *A,* Four-legged, or quad, cane. *B,* Hemiwalker or walk cane. (From Varghese G: Crutches, canes, and walkers. *In* Redford JB [ed]: Orthotics Etcetera, 3rd ed. Baltimore, Williams & Wilkins, 1986.)

WHEELCHAIRS

A wheelchair to suit the individual's lifestyle is often the key element in maintaining independence. Physicians should realize that a wheelchair is more than "a chair with wheels." For the patient unable to walk, his or her whole life and interaction with the environment will revolve around the wheelchair. It is an independence-giving, energy-saving substitute, essential for disabled people to participate in the world around them. Wheelchairs come in a wide variety of models and sizes, few of which can be reviewed here. Any patient with special problems who requires a permanent wheelchair should be referred to rehabilitation programs for advice. When a patient is simply advised to go to the nearest wheelchair dealer for an opinion, a needlessly expensive solution may be offered. However, hospital equipment dealers can be very helpful by listing the various features available—depending on the patient's requests and personal requirements—and discussing these with the prescribing physician.

For the elderly person who needs a wheelchair mainly as an accessory aid to mobility, the basic rear-wheel drive or standard wheelchair with a seat that allows at least 2 inches of clearance on either side should be adequate. This chair may be selected with a standard adult, 18-inch-wide seat or a narrow adult, 16-inch-wide seat, depending on the build of the patient. The chair should be as narrow as possible because every inch saved is important in entering doorways. The standard wheelchair has 8-inch casters in front, a straight back (about 100 degrees in relation to the seat), brakes, and fixed or removable footrests. The arms should be padded (Fig. 17–4). In some wheelchairs, the arms are stepped down in front (desk arms), allowing the chair to slide under a desk or a table. The arms can also be removed or swung away to permit sideways transfer to a bed, toilet, or commode, with or without the help of a transfer board.

Powered wheelchairs, using a standard type of frame as just described, have limited application and generally are prescribed only for those unable to operate a manual chair. They are usually

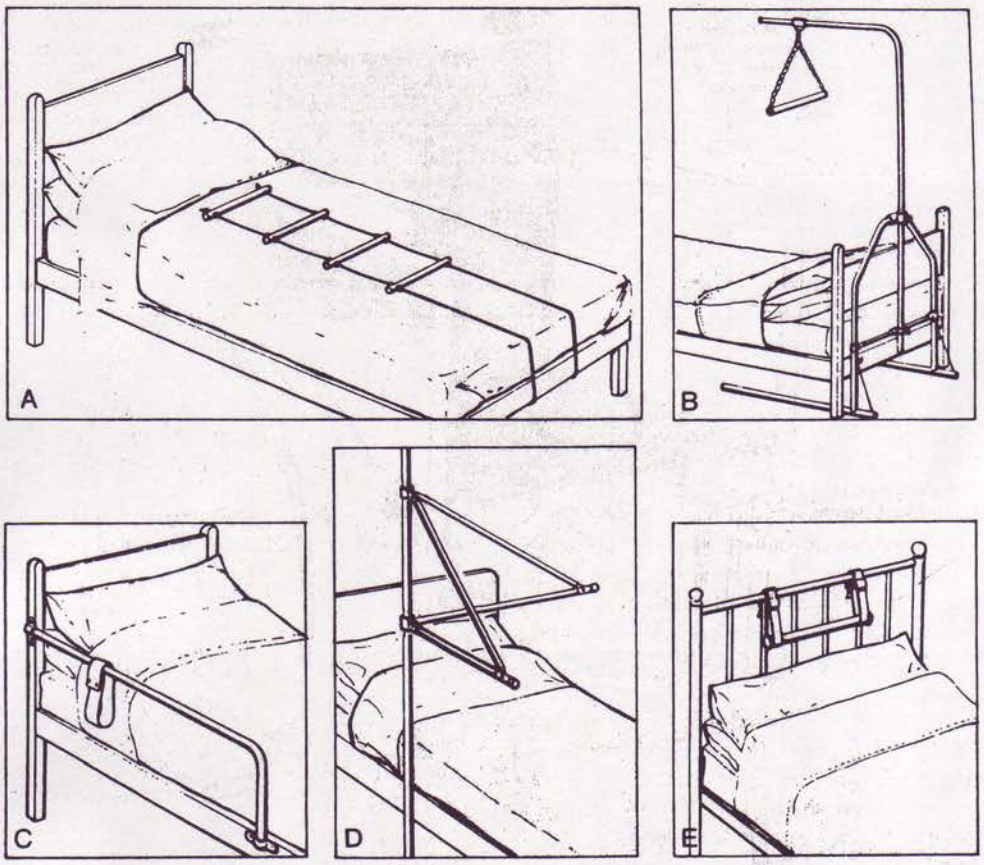

Figure 17–3 Bed aids. *A,* Rope ladder. *B,* Free-standing trapeze. *C,* Handrail with leather loop. *D,* Swivel bar assembly with upright that attaches to floor and ceiling. *E,* Bed bar. (From Hale G [ed]: The Source Book for the Disabled. Philadelphia, WB Saunders, 1979.)

useful only indoors; unless the user has a specially equipped van, they are of little use outside the home. However, in recent years, a vast array of three- or four-wheel powered vehicles, sometimes called "powered scooters," have become available. Most of these scooters are narrower than standard wheelchairs and so are more useful in entering narrow doorways, but, as most are longer than standard wheelchairs, there may be serious problems in turning them indoors. Most scooters are also more unstable than standard wheelchairs and harder to mount. These vehicles are generally usable only by persons with relatively good upper limb function and upper trunk control who are without postural problems or spinal deformities. Many can be easily disassembled into parts and carried in a standard automobile, but the parts can be very heavy for older persons to lift. Because many elderly persons requiring a wheelchair lack the energy to push manual chairs any distance, a scooter will provide them with much better outdoor mobility than a manual wheelchair. Although many third-party payers have regarded these vehicles as a "luxury item," the scooters have provided invaluable mobility to many disabled persons with multiple medical problems. A great variety of seating and assembly options are available in scooters. Potential users should be advised to shop around among the various models, choose the one most suitable for their functional needs, and rent it for a trial before making a final purchase. However, before any powered wheelchair or scooter is purchased one must consider how it will be transported, because in some instances the user will have to buy a van with a powered lift in order to be able to use the equipment anywhere but around the yard.

Most manual wheelchairs weigh 40 lb or more, but more expensive lightweight chairs are available that weigh 24 lb or even less. Lightweight chairs are most useful if the user or caregiver has to move them frequently in and out of vehicles. Most chairs should be provided with wheel-

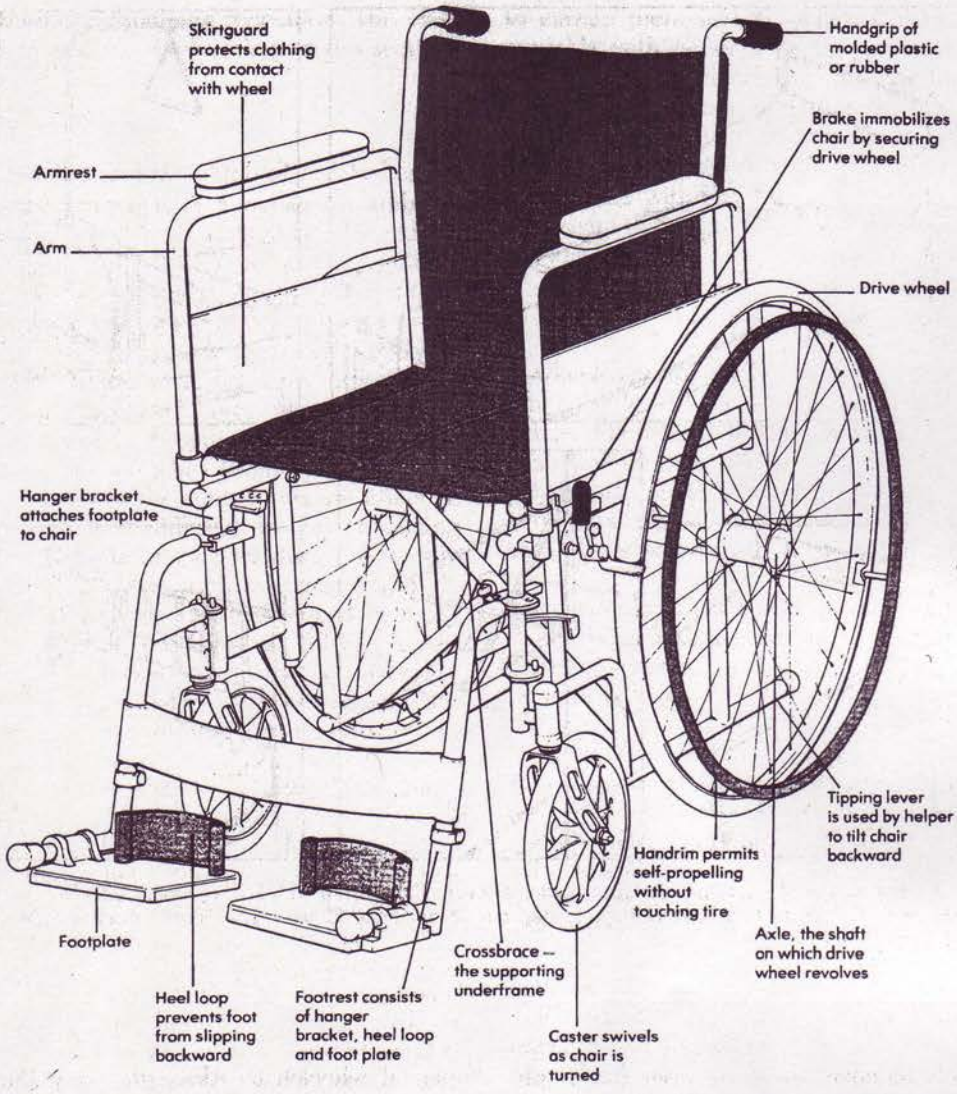

Figure 17–4 Features of a standard wheelchair. (From Hale G [ed]: The Source Book for the Disabled. Philadelphia, WB Saunders, 1979.)

chair cushions. Foam cushions are generally sufficient, but special cushions—filled with air, water, or special gels to minimize pressure over bony points—are absolutely essential for patients with poor sensation or limited sitting tolerance. Many other wheelchair features and accessories are available but need special forms proving medical necessity for prescription. Information on wheelchairs is readily obtained from rehabilitation catalogs, local dealers, or textbooks, including an excellent monograph on wheelchairs published by the Department of Veterans Affairs (see Resources). A new one has just been published by the Rehabilitation Engineering Society of North America (RESNA).[8] I have prepared specific information on various options for wheeled mobility in the elderly.[9]

ENVIRONMENTAL MODIFICATIONS

If a person must be confined to a wheelchair at home, there are a few general considerations regarding home arrangements. Ramps for entrances should be at least 36 inches wide (surfaced with nonskid materials and rising no more than 1 foot in height for every 12 feet of length). Handrails are also very useful on ramps and should be positioned so that the patient can reach both handrails from the chair. The handrails should also be alongside all outside entrances of elderly persons' homes to assist in stair climbing. For wheelchairs, the area at the top of the ramp should be at least 5 feet in depth if the door opens outward. Portable ramps are available but are quite heavy and thus not very practical.

For special situations in which the height of the ground floor is too great, precluding even a two-section ramp and platform, outdoor self-operating elevators can be substituted but are more expensive. Further information on home modifications may be found in the Resources at the end of the chapter.

Doorways should be at least 30 inches and preferably 36 inches wide. Doorknobs and night locks can be fitted with levers for those with poor grasp and limited reach. Indoor stair lifts are available but are very expensive; it is usually cheaper for the family to modify the home to enable the disabled adult to live on the main floor. Floors should be smooth and kept in good repair, and carpets, if used, should have minimal pile. Plastic runners are helpful if the carpet has thick pile. Mossy carpet or loose throw rugs are not only difficult for the wheelchair user but may create mobility problems even for elderly people able to walk unaided.

In a wheelchair, a person's standing height is decreased by one-third and his or her width is doubled. Therefore, to maneuver a turn in a wheelchair a circumference of at least 5 feet is needed. This merits consideration, particularly in the kitchen, bedrooms, and bathrooms. Reach from a wheelchair is very limited and usually done from the side, although forward reach can be aided by removable foot rests. A variety of reachers are available, especially for wheelchair users and others with limited mobility. Length, width of opening, and degree of grasp required should be considered in advising potential users about reachers.

Eating Aids

For persons with poor grasp, impaired coordination, and disorders affecting the shoulder and elbow, many attractive and durable mealtime aids are available from medical supply houses. Poor grasp can be improved readily by enlarging silverware handles either with foam padding, such as pipe insulation, or other materials. A universal cuff that encircles the hand and holds utensils by a sleevelike opening is a useful option. If the patient is one-handed, rocker knives and pizza cutters can replace regular knives. For cooking, microwave ovens or crock pots usually prove simpler to use than the standard oven. Patients with impaired coordination or tremor may be aided by plate guards, scoop dishes, suction cups, or thin Dycem mats made of a versatile sticky plastic material that holds on to furniture (Fig. 17–5). Most occupational therapy departments have kitchens in which therapists can provide excellent advice to families about meal preparation and special equipment such as one-handed kitchen aids and electric devices. An excellent description

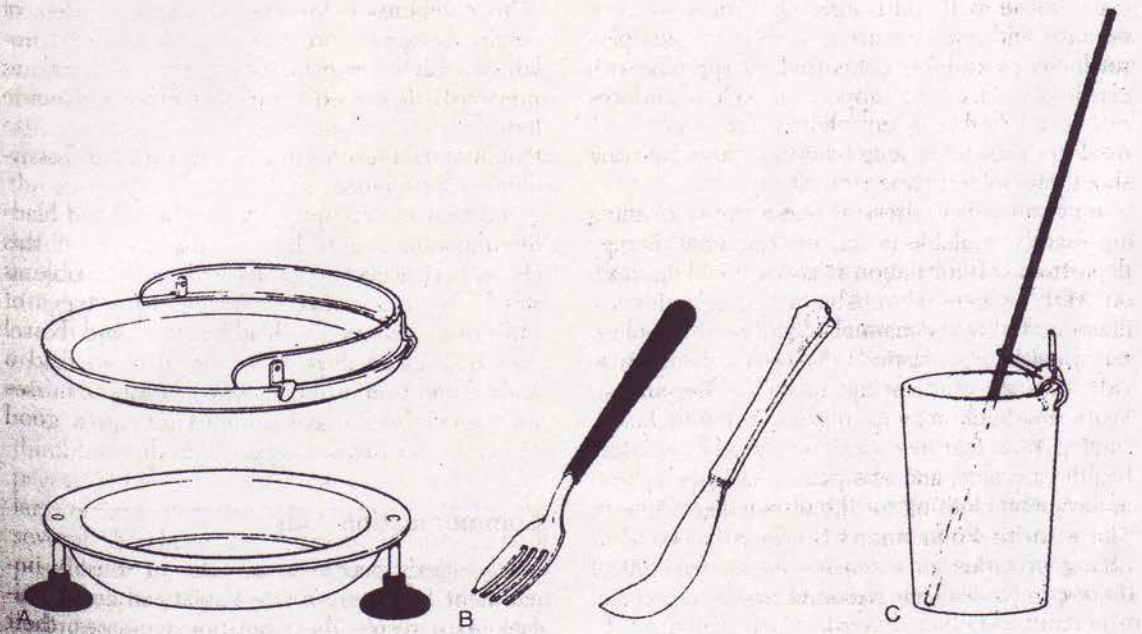

Figure 17–5 Mealtime aids. *A*, Plates with plate guards and suction cups. *B*, Large-handled fork and rocker knife. *C*, Plastic straw with bulldog clip attached to side of glass. (From Hale G [ed]: The Source Book for the Disabled. Philadelphia, WB Saunders, 1979.)

of mealtime aids and food preparation, as well as general advice on housekeeping for handicapped persons, is found in the books edited by Trombly and Hale (see Resources).

Dressing Aids

Clothing for the disabled elderly should be adjustable and expandable, easily put on and taken off, and reinforced against wear by braces and crutches. Above all, it should look attractive. With today's informal fashions of stretchable fabrics, well-chosen garments can enhance physical attributes and conceal flaws. As expressed by a patient who wrote a self-help guide for those with amyotrophic lateral sclerosis, "To feel good, you need to look good."[10]

Easy-to-fasten garments that open in the front provide freedom of movement and eliminate the need to reach upward (e.g., front-fastening brassieres). Such clothing, often using Velcro closures, is now marketed widely and can be bought through many department stores. Enlarging zipper pulls by using a loop or tab makes zipper closure easier. Zipper rings are sold in all fabric stores. Button hooks are also a great aid to those who have inadequate fine grasp to manipulate small buttons. Reachers and a dressing stick tipped with foam allow an elderly person to remain seated while dressing and reduce the risk of falling. Dressing the lower limbs is often difficult for those with poor reach or balance, especially those with stiff hips. A variety of sock donners and reachers are available for such persons. Shoes can be converted to slip-ons with elastic shoelaces, or zippers or Velcro closures can be stitched in by any shoemaker. "No-Bows," used to prevent young children from untying shoes, are sold at shoe stores.

Ideas for aids to dressing and adaptive clothing are readily available in any occupational therapy department. Information is also available in texts on ADL or general rehabilitation, and aids are illustrated in many manuals distributed by voluntary health organizations. Various catalogs provide sources of dressing aids (see Resources). Sears Roebuck now publishes a home health catalog that features clothing as well as many health care aids, and companies have specialized in designing clothing for the disabled and elderly. The Arthritis Foundation's *Guide to Independent Living* provides an extensive list of over 60 of these companies (see Resources).

Hygiene Aids

The bathroom, with its slippery floors and narrow spaces, is the most dangerous place in the home for anyone with impaired balance, joint limitation, or slowness of movement. A call for help may not be heard, especially when water is running or the bathroom door is closed. Thus the bathroom should be made as safe as possible and equipment provided to increase ease in bathing and grooming without mishap.

Grab bars should be placed where needed around tubs, showers, and toilets. Nonskid stripes should be attached to the tub or shower floor, or rubber mats should be placed on such surfaces. Raised toilet seats for persons with weakness or stiffness of the lower limbs are readily available in many medical supply stores (Fig. 17–6). Seats for the bathtub or shower and bath lifters are also widely available. Those with restricted lower limbs who cannot actually sit down in the bottom of a tub can benefit from a hand-held shower. Washing aids include wash mitts, soap-on-a-rope, brushes with suction backs, and long-handled sponges. If the individual cannot walk into the bathroom (for anyone permanently in a wheelchair, bathroom entrances are usually too narrow), a bedside commode may have to be substituted for the bathroom toilet. It should be a sturdy structure with side arms and arranged to permit the feet to touch the floor. Of course, the bathroom doorway can be widened, but this may be very costly. As an alternative, a wheelchair narrower fits almost any folding wheelchair; its crank squeezes the seat to narrow it by 3 to 5 inches.

To compensate for limited grasp, handles of combs, brushes, and fingernail files can be enlarged with foam padding or other material, as previously described for eating utensils. Electric toothbrushes and razors are much easier to use than manual ones for individuals with hand coordination problems.

A discussion of equipment for bowel and bladder incontinence is beyond the scope of this chapter. However, patients with such problems should be aware that there are many types of collecting devices for bladder care and bowel care that make it possible for them to lead a normal life. In most large medical centers, nurses who specialize in colostomy care are a good source of information on such products.

Communication Aids

Many elderly people with motor or sensory impairment have very limited ability to communicate. As a result, their isolation increases, their safety is endangered, and they are cut off from normal sources of intellectual and emotional stimulation, which may even lead to cognitive deterioration.

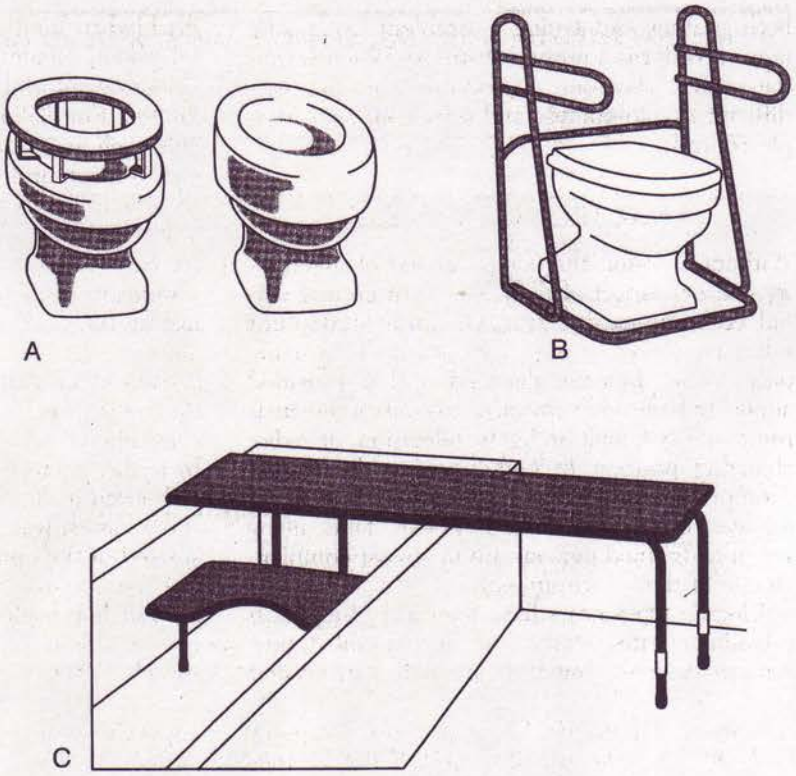

Figure 17–6 Bathroom aids. *A,* Kinds of removable elevating toilet seats. *B,* Grab bars that fit any toilet seat. *C,* Bath bench and tub seat.

Reading materials have been widely adapted for the handicapped, with large-print books and special magnifiers, and magnifying television screen systems are also available. Many large teaching institutions have aid programs for those with low vision that are helpful in providing information in this regard. Reading machines like the Optacon and the Reading Edge (Xerox Imaging Systems, Inc) are available for the severely visually impaired. Research is promising to lower the costs and increase portability of such devices.

If the person's main problem is inability to hold reading matter in a comfortable position, help is readily obtained by a variety of aids. The simplest reading aids are angled book stands that can be placed on tables or on the floor like a music stand, or even racks suspended over beds with the reading material upside down. People with difficulty turning pages can use rubber thimbles or rubber-tipped pencils to grip the pages. Although they cost several hundred dollars, electric page turners are available for the severely handicapped. Prismatic glasses make it possible to see objects at right angles and may aid in reading if a person must lie flat. They can reduce eye strain and neck pain, particularly when neck motion is limited. For those unable to use magnification, even to read or watch television, but who still wish to "keep up with the world," there are now many "talking books." Many of these are on cassette tapes in local bookstores. Services are also available through the local or national Federation for the Blind or the National Council of the Blind. The Library of Congress, Division of Blind and Physically Handicapped, will, on request, send information on reading aids and the availability of "talking books."

Aids can be used to help those lacking good hand grip or coordination in their writing. Handles of writing instruments can be enlarged with many special types of grips; for example, the handle of a pen can be enlarged by sticking it through a plastic practice golf ball. Occupational therapy departments feature a wide variety of special writing aids, many of which are widely available commercially. Notepads are usually easier to use than loose sheets; clipboards often help to stabilize the paper if one hand is weak, as in hemiplegia; and various types of reading stands can double as writing stands for those who are too seriously disabled to write at a table or desk.

Many elderly people cannot write easily; for them, the electric typewriter—and lately the computer—have been a great benefit, especially if the person lacks strength and coordination to use the controls on a manual typewriter. An electric typewriter or computer keyboard can be operated by a hand-held stick or even a stick attached to a mouthpiece. For those who find

both writing and typing a problem, a cassette tape recorder is a useful substitute. When selecting such a recorder, one should consider how difficult it is to operate and select one with simple controls.

ELECTRONIC DEVICES

Without a doubt, the computer has changed almost every aspect of daily life—written and verbal communication, transportation and other scheduling, and employment practices, to name only a few. For the disabled, it has provided almost unbelievable advances to control the environment: switching on lights, television, or radio; changing position in bed; opening doors; and even preparing food can be done with a touch of a finger or even the blink of an eye. Thus, many severely disabled persons are in almost complete charge of their environment.

Electric typewriters have been very helpful in providing writing capabilities for disabled persons in the past, but they are being succeeded almost everywhere by computer keyboards, screens, and printers. Although most computer keyboards use the standard Q W E R T Y typewriter layout, they can be modified to provide almost any combination of symbols required by a person. For the person with a tremor or poor limb coordination, keyboards can usually be expanded to make striking the keys easier. For the nonverbal person, head nods or even eye movements can give signals to the computer to generate verbal commands to relatives or attendants.

A great many programs have been advocated to improve cognitive function by computer technology, including many systems adapted primarily for the cognitively impaired, head-injured person. Research involving computer-aided visual communication systems for global aphasic patients is currently being tested clinically. The value of computers as learning aids remains to be scientifically established, but they have proved extremely popular in many rehabilitation centers. What they offer the cognitively impaired elderly person remains to be seen. However, miniature computers have been widely advocated as memory aids; a person who has failing short-term memory can easily be reminded by a touch of a button what tasks or activities are to be done and in what sequence. These computers can easily be carried in a purse or a pocketbook and are relatively inexpensive.

There is little doubt that the telephone is the most vital tool of communication, especially for elderly people who live alone. Advances in telephone design have made it much easier for the disabled to send or receive calls. Obviously, the telephone should be positioned for the most efficient, comfortable use, especially if reach is limited. For dialing the telephone, simple dialing aids such as a pencil or a dialing tool can solve coordination problems, but most persons will use the touch-tone type of telephone. Giant pushbutton telephone adapters are currently available for easy operation by the disabled. New phone systems have one-touch dialing, completely eliminating the need to dial. If a person has limited arm strength, having a telephone mounted on a gooseneck arm or using handsets can eliminate the need to hold it for any length of time. The conventional telephone can be replaced entirely by a dial, microphone, and speaker set in a special boxed unit. A call to the telephone company is the easiest way for handicapped persons to be advised of the options available.

There are many other types of communication aids, such as sophisticated electronic devices that can provide vocal responses for those without speech. When a serious communication problem develops, the physician is well advised to consult a speech–hearing pathologist whose primary purpose is to develop speech and communication skills in patients. The local chapter of the American Speech and Hearing Association can suggest where to turn for consultation.

Recreation Aids

The easiest and perhaps the only way an elderly disabled person may become part of the community, make new friends, or escape from an institutional setting is through participation in recreational activities. Physicians should therefore encourage disabled elderly people to participate not only in group exercises or outdoor sports but also in any recreational activity that interests them. Disabled elderly people can find many indoor sports and games that have been adapted for various disabilities. For example, special card holders and battery-powered card shufflers are now available. Special tools for indoor gardening and shop work have been developed for specific handicaps. The section on leisure and recreation by Hale is an excellent guide (see Resources); this book also lists various organizations promoting leisure activities for the handicapped.

Table 17–1 is a summary of most of the adaptive equipment solutions described in this chapter.

SUMMARY OF RESOURCES

The aim of this chapter has been to provide medical practitioners and other health profes-

TABLE 17–1 **SUMMARY OF COMMON FUNCTIONAL PROBLEMS AND THEIR ADAPTIVE EQUIPMENT SOLUTIONS**

Condition	Equipment	Special Notes
Mobility Aids—Ambulation		
Minimal balance problem or unilateral lower limb pain or mild weakness	Regular cane with safety tip and various types of grips; long walking stick or staff	Train person to use on unaffected side. Use waist belt for safety at first, depending on individual.
Balance problem or paralysis with support required (e.g., hemiplegia)	Pyramidal cane, quad cane (4-footed), hemiwalker (one-handed walker)	Unstable on grass, sand, or uneven surfaces.
Bilateral lower limb problems with pain or balance loss. No or minimal weight bearing on one side	Standard crutches, forearm crutches (Lofstrand)	Need instruction in crutch use and stair climbing. Waist belt for safety, depending on individual.
Painful wrist or hand (e.g., arthritis of wrist, neuropathy)	Special handgrips or cane or crutch with forearm platform	Platform adds extra weight to the walking aid.
Moderate to severe loss of stability	Walker or weighted walker if very unstable or bad tremor of upper limbs	All cases need instruction in use. Should fold if needed to be transported.
Unable to lift walker during ambulation	Add wheels to front uprights of walker or use 3- or 4-wheeled walker	More wheels increase instability but walkers with 3 or 4 wheels move faster.
Difficulty in climbing stairs and risks of safety on stairs from poor vision or balance	Well-placed and supported hand rails, fully extended; steps with nonskid surfaces and tread markings; stair-climbing walker	
Mobility Aids—Transfer		
Difficulty turning and arising from bed to chair, commode, and so forth	Bed rails; overhead trapeze, manual or electric controls on bed; transfer board—various types	Need instruction in use.
Limited ability to transfer	Transfer board, various types	Need instruction in use.
Total inability to transfer from bed to chair, commode, and so forth	Pneumatic or electric patient lifters	Occupy considerable space. Caregiver needs training in use.
Difficulty arising from chairs (e.g., parkinsonism, lower limb arthritis, weak hip and knee extensors)	Raise legs of furniture, mechanical lifts, or electric seat-lift chairs	Portable seat lifts are heavy. Electric seat-lift chairs are very expensive and limited to use in one area.
Eating Aids		
One-handed: cannot cut food, problems pushing food onto fork or spoon, problems holding plates steady	Rocker knife, pizza cutter; plate guard scooper dish, partitioned plate; Dycem place mats or suction cup on plates	Need occupational therapy advice and trial for best selection.
Limited grasp	Finger loops or built-in handles to utensils for eating; Universal cuff with Velcro closure and a pocket for utensil	Need occupational therapy advice and trial for best selection.
Severe tremor or incoordination	Weighted utensils; use of special cups or straws for drinking	Need occupational therapy advice and trial for best selection.
Dressing Aids		
Difficulty with mobility or weakness in upper extremity; trouble closing fasteners	Reacher, dressing hook or stick, button hook, zipper, Velcro closure	Seek occupational therapy advice.
Difficulty with lower extremity dressing (e.g., pants, shoes, socks)	Reachers, dressing loops on pants with Velcro closures, sock donner, long shoe-horns, Velcro shoe closures, elastic shoelaces	Seek occupational therapy advice.

Table continued on following page

TABLE 17–1 **SUMMARY OF COMMON FUNCTIONAL PROBLEMS AND THEIR ADAPTIVE EQUIPMENT SOLUTIONS** *Continued*

Condition	Equipment	Special Notes
Hygiene Aids		
Inability to use regular toilet	Bedside commode, raised toilet seat, grab bars around toilet; individually designed hygiene aids for cleanup	Selection depends on space in bathroom and ability to enter its narrow doorway.
Inability to use regular bathtub or shower	Bathtub bench with hand-held shower, grab bars on tub or shower; shower chair; inflatable bathtub for use in bed	Survey of home by occupational therapist or other trained person helpful in deciding best arrangement.
Poor grasp or hand coordination for bathing, toilet	Wash mitts, soap-on-a-rope, long-handled sponges, suction-cup soap holders	Seek occupational therapy advice.
Problems with grooming hair, face, teeth	Long-handled or built-up combs or brushes, electric toothbrush, electric razor with custom handle; custom-made makeup kit	Seek occupational therapy advice.
Communication Aids		
Impaired vision for reading	Special magnifiers; large-print book or magnifying television screens	All cases need full ophthalmologic assessment.
Difficulty in using phone	Pushbutton dialing or one-touch dial, speaker phones; various portable phones with special hand sets	Speech and hearing therapy and/or occupational therapy advice.
Writing or typing difficulty	Individual writing aids, typing sticks with various attachments for gripping	Speech and hearing therapy and/or occupational therapy advice.
Inability to dial phone or call for help due to severe paralysis or immobility	Voice-activated tape recorders; electronic speaking devices; simple buzzers or other signaling devices operated by switches needing minimal pressure	Speech and hearing therapy and/or occupational therapy advice.

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sionals with a short guide to resources in assistive technology for the elderly disabled. A complete list of resources would be impossible to summarize in any meaningful fashion, but the *Assistive Technology Sourcebook* by Enders and Hall (see Resources) can largely serve this purpose. For a shorter summary of sources of information, we recommend the American Medical Association's *Guidelines to Assistive Technology,* prepared by Schwartzberg and Kakavas. The National Rehabilitation Information Center (NARIC) is a source of information funded by the National Institute on Disability and Rehabilitation Research (NIDRR) and, on request, will send fax sheets providing information on almost any form of adaptive equipment (see Resources). Another good source of such information for patients is the *Buyers' Guide,* available from Accent on Living.

There are now a number of on-line databases on electronic networks to assist disabled people and others in obtaining information. ABLEDATA has a database of over 21,000 products and services pertaining to children and adults with disabilities. REHABDATA has a database of over 46,000 documents pertaining to assistive technology and rehabilitation. These data are collected by NARIC from anyone who submits the information to its office and are available to anyone who calls or writes to the National Rehabilitation Information Center (see Resources). For information on more databases, the Rehabilitation Engineering Society of North America (RESNA) produces a book entitled "On-line Access to Disability-Related Information." These data bases provide information, lists of vendors and consultants, sources of fabrication of customized equipment, repair sites, and names of organizations and facilities serving the disabled nationwide. For some data bases you may consult information brokers who are trained to search the data base and provide interface between computer hardware and a person needing information. If a person requires a specific rehabilitation product,

local information brokers will provide this information free of charge. Their names can be obtained from the state vocational rehabilitation division or by contacting the National Rehabilitation Information Center.

Under the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (commonly known as the "Tech Act") all states were granted funds to set up regional assistive technology resource projects.[3] The Tech Act as amended in 1994 directs each project to effect "systems change" within its state, namely, to identify barriers that people encounter when trying to obtain assistive technology, such as lack of information, inadequate funding resources, limited expertise among service providers, and gaps in services from public and private agencies. The project should reduce or eliminate those barriers. Many of these projects use electronic mail and are on the World Wide Web, which includes such information as resource lists, where to go locally for assistive technology products and services, and advice regarding funding sources and strategies (Website for Hyper ABLEDATA is http://trace.wisc.edu/tcel/abledata/index.Rtml).

Links are available to local, national, and international resources. Information about any new assistive devices developed by these state projects is sent to NARIC, so this national resource is kept abreast of any new information about rehabilitation technology. Most of these projects are associated with the state's division of rehabilitation services. To find out if there is a center near you, call the rehabilitation office and ask about your state's technology act project for special assistive technology for disabled patients.

The Yellow Pages of the telephone directory may be consulted for volunteer organizations or social service agencies that assist people with various diseases. If a person has a specific chronic disabling disease, a call to the local branch of the national organization should provide information about assistive devices. Voluntary health organizations such as the Muscular Dystrophy Association or the Multiple Sclerosis Society may have equipment pools or "loan closets" near their offices, and this equipment can be made available to needy patients for no charge or sometimes for a small fee. The American Cancer Society is particularly noteworthy in this regard. Information about equipment for handicapped individuals is also available in some large department stores. Local medical supply dealers generally carry an extensive selection of rehabilitation equipment. Their salespersons are usually well informed about living aids or equipment and the options available for different disabling conditions. Many suppliers now employ specialists in assistive technology who can be very helpful to customers. Finally, exhibitions are held annually in large cities to show disabled people, vendors, and other rehabilitation personnel the latest equipment and devices to aid the disabled.

RESOURCES

Catalogs

Abbey Medical Catalog Sales
American Hospital Supply Corporation
13782 Crenshaw Blvd.
Gardena, CA 90249

Alimed Inc. Catalog
297 High St.
Dedham, MA 02026

Sammons Preston Catalog
P.O. Box 5071
Bolingbrook, IL 60440

Publications

Schwartzberg JG, Kakavas VK: Guidelines for the Use of Assistive Technology: Education, Referral, Prescription. Chicago: American Medical Association, 1994

Enders A, Hall M (eds): Assistive Technology Sourcebook. Washington, DC, RESNA Press, 1990

Hale G (ed): The Source Book for the Disabled. Philadelphia, WB Saunders, 1979

Redford JB, Basmajian JV, Trautman P (eds): Orthotics, Clinical Practice and Rehabilitation Technology. New York, Churchill Livingstone, 1995

Trombly CA (ed): Occupational Therapy for Physical Dysfunction. Baltimore, Williams & Wilkins, 1983

DeLisa JA (ed): Rehabilitation Medicine: Principles and Practice. Philadelphia, JB Lippincott, 1993

Letts RM: Principles of Seating the Disabled. Boca Raton, FL, CRC Press, 1991

Department of Veterans Affairs: Choosing a wheelchair system. J Rehabil Res Dev Clin Suppl 2, 1986

Council of American Building Officials/American and National Standard Institute Inc.: Accessible and Usable Buildings and Facilities. Falls Church, VA, Council of American Building Officials, 1992

Sources of Information

Arthritis Foundation: Guide to Independent Living for People with Arthritis
The Arthritis Foundation

1314 Spring St. N.W.
Atlanta, GA 30309

National Rehabilitation Information Center (NARIC)
8455 Colesville Rd. Ste 935
Silver Spring, MD 20916
(800) 346-2742

Accent on Living Buyers Guide 1995
P.O. Box 700
Bloomington, IL 61702
(309) 378-2961

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