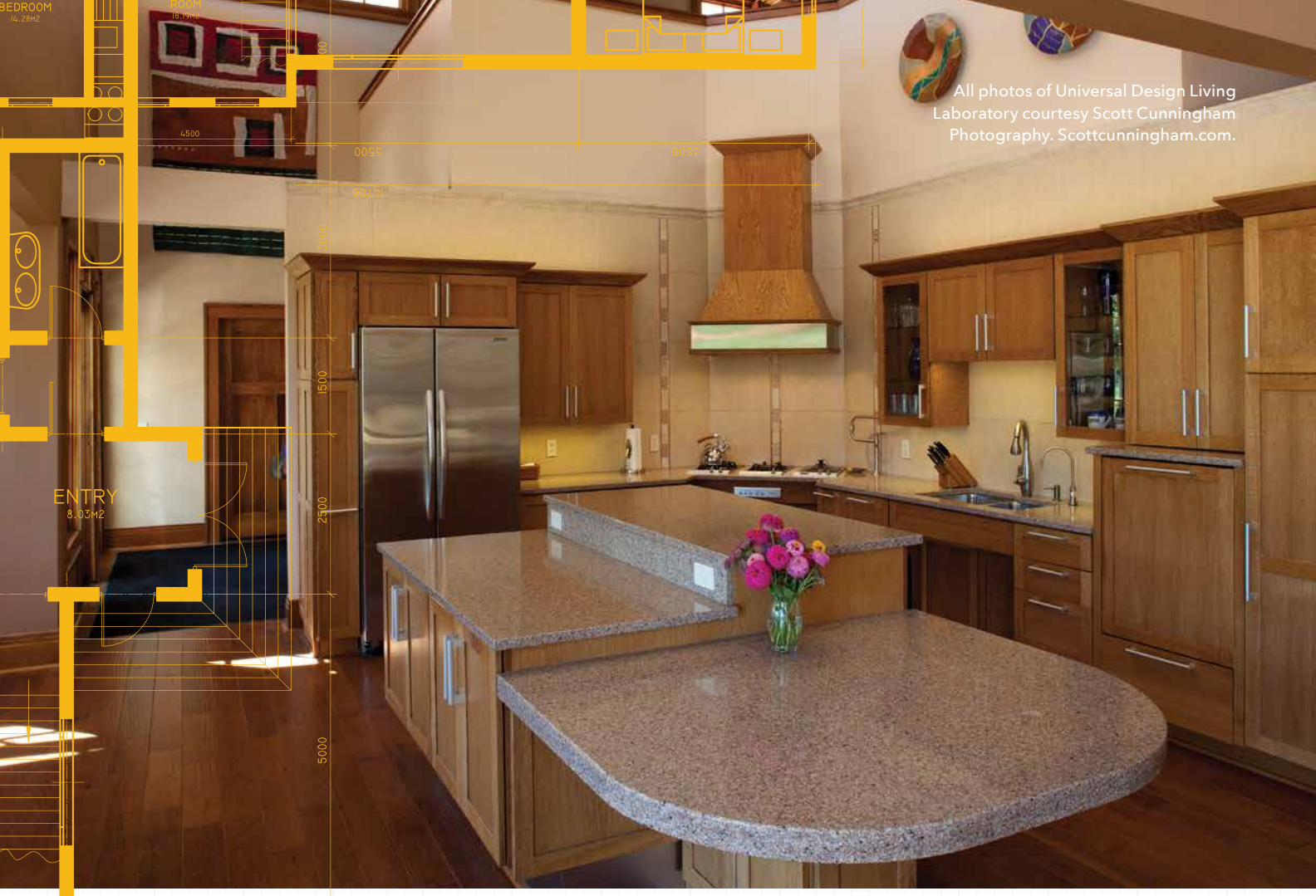
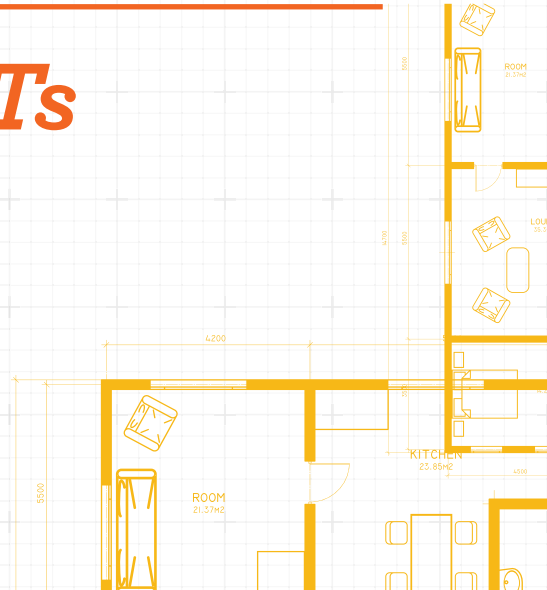


All photos of Universal Design Living Laboratory courtesy Scott Cunningham Photography. Scottcunningham.com.

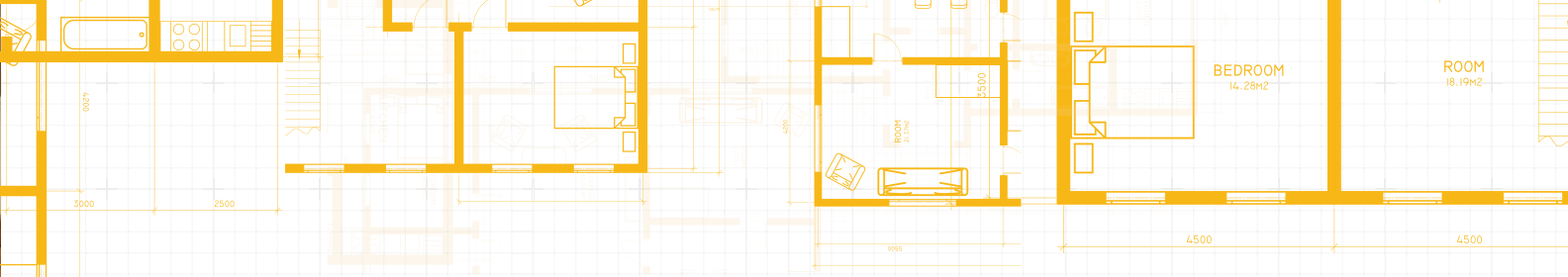
Making a House an Accessible Home

The Role of PTs

By Donald Tepper



Kitchen counters at Universal Design Living Laboratory. Shallow cooktop inserts provide space underneath for a wheelchair user to move closer to cook pans, front-mounted control knobs, and a pot filler. The exhaust fan controls are mounted both under the hood and below cooking surfaces to accommodate people of all heights.



Changing demographics, rising health care costs, and disability-related regulations all are driving a movement to help people stay in their own homes for as long as possible. PTs are an important resource in these efforts.

"I don't know anybody who yearns to live in a facility as they age," observes Dina Leyden, PT. "They just want to live in their home."

That pretty much sums up the goals of accessible home design and the aging-in-place movement.

In addition to the emotional component, many demographic, financial, and regulatory factors are contributing to this trend. The aging of the Baby Boom generation, rising health care costs, pressure to reduce hospital stay length, and technology advances all have led to a "perfect storm" that has created opportunities and incentives to help people remain in their own homes.

This drive, however, isn't restricted only to those who are aging. It applies, as well, to patients who have experienced sudden health changes—such as a stroke or spinal cord injury—and to those with degenerative conditions such as amyotrophic lateral sclerosis (ALS) or Parkinson disease (PD).

A growing number of physical therapists (PTs) are becoming key players in this movement. But the paths they've taken differ.

Leyden has been a PT for more than 30 years and still sees patients—many with balance issues—in an outpatient setting. But her business partner "saw that it was getting more difficult for me to do hands-on work with patients," Leyden says. "She has a design business and enjoys working with people who are older. She found out about the National Association of Home Builders' Certified Aging-in-Place Specialist (CAPS) program. We both became CAPS-certified and designed our business—AIP Design—around that certification."

Rob Horkheimer, PT, MPT, followed a different route. "I come from a family with a lot of therapists. My sister-in-law and mother-in-law both are PTs. My wife is an occupational therapist (OT). On the other hand, my brother-in-law is a contractor. That's how the 2 worlds met," he says. "We saw a common theme: patients who needed adaptations for their specific needs—rather than Americans with Disabilities Act (ADA) specifications that weren't customized. Either the specs weren't forward-looking for their future needs or best-suited to their current ones. That's how we got into accessible home modifications." Horkheimer went on to found Milwaukee-based Bridgeway Independent Living Designs. He, too, is CAPS-designated.

Kathryn Cieniewicz, PT, MSPT, meanwhile, had worked in subacute rehab, outpatient therapy, and, most recently, in home care. She discovered a love for the geriatric community, and, as it happens, her location in southern Delaware is a popular retirement area. "Forming my company was born out of frustration," she says. "I wanted to get my patients' homes structured to work for them, not against them. I knew that if I could lessen their struggle, their confidence would improve and they'd become more independent." She started Aging in Place Specialists.

Universal Design vs Aging in Place vs ADA

All the PTs interviewed for this article use elements of a strategy called "Universal Design" (UD), but they emphasize that there is much more involved in making (or keeping) a home functional for residents who are aging and/or have impairments.

The guiding principle of UD (see "Universal Design" on page 24) is: "The design of products and environments [should] be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." Or as one team of researchers put it, "A key concept of universal design is to provide accessibility without stigmatization by integrating accessibility features such that they benefit all users while going essentially unnoticed." In residential settings, features can include lever-handle faucets, no-threshold walk-in showers, zero-step entrances, wider doorways and halls, and kitchen counter tops at varying levels to accommodate standing and seated users, as well as people of different heights.

Bonnie Lewis, an interior designer active in the aging-in-place movement, says, "People who don't know the

Ceiling track-based patient lift systems are more flexible than are floor-based lifts, and can be cost-effective.

definitions of universal design and aging in place use them interchangeably, but there's a difference. Aging in place is designed for a specific person. Universal design is designed to meet most aging-in-place needs, but not for a specific person." Lewis is founder of 55+ TLC Interior Designs in Scottsdale, Arizona. She is CAPS-designated and an allied member of the American Society of Interior Designers.

UD is easier to accomplish in new construction; retrofitting a home with UD elements can be difficult and expensive. Frank Gucciardo, PT, MS, says, "If you're building new, you have a clean palette. But [most] of the population is not dealing with new construction. They're dealing with a 1952 Cape Cod that they've lived in for 40 years. Universal design has more to do with the building than the client. We have to look at clients through their functional ability. If the homeowner is building new and there's a functional change, then you're clearly in the universal design category. But you're always designing to the client's ability. The environment imposes itself on the client. When there's an injury, it's not about the building. It's about the client."

Gucciardo is a PT who in 2003 began offering design and construction services. In 2013, he narrowed the focus of his firm to consulting and design, leaving the construction to other builders. He owns Frangeli Consulting & Design in Dix Hills, New York, and also is CAPS-designated.

As for requirements specified in the Americans with Disabilities Act (ADA), they don't apply to most residential structures. But even if they did, many PTs say, they're still not appropriate for the situations they encounter. For instance, the ADA generally permits ramps with slopes as steep as 1:12—a 1-inch incline for every 12 inches of length. Cieniewicz comments, "If you have an older adult living in a home by himself, and he'll have to navigate the ramp himself, it may need to be a 1:20 ratio for him to easily get in and out of his home. These are the things we can miss if we don't look at the individual, his or her situation, and what the expected outcome will be."

Patient Profiles

So, accessible design and aging in place focus on the patient, not the bricks and mortar. What, then, is the

Universal Design

Universal Design (UD) is defined as the "design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." It has 7 principles:

1. **Equitable Use**
   The design is useful and marketable to people with diverse abilities.
2. **Flexibility in Use**
   The design accommodates a wide range of individual preferences and abilities.
3. **Simple and Intuitive Use**
   Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. **Perceptible Information**
   The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. **Tolerance for Error**
   The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. **Low Physical Effort**
   The design can be used efficiently and comfortably and with a minimum of fatigue.
7. **Size and Space for Approach and Use**
   Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

The Principles of Universal Design, Version 2.0 (1997). The Center for Universal Design North Carolina State University. https://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm. Accessed June 24, 2016.

profile of the typical patient or client? There really isn't one, PTs say.

In Horkheimer's experience, "80% to 90% of our clients have experienced an acute episode or are living with a chronic disability that has required them to do modifications. Maybe only 10% to 20% are thinking ahead to the aging process."

Gucciardo is more blunt. "I could count on 2 hands, with fingers left over, the number of people I've seen who plan for this. It's crisis-driven."

Cieniewicz, on the other hand, reports, "Most of my clients haven't had an acute injury or stroke. Rather, it's the people who fall through the cracks—who have a steady decline in their function but are doing just well enough to get by. I get calls from the adult child of an aging parent, or the spouse. The person is becoming less mobile. The activities of daily living are getting very difficult. The person calling me is reaching out for help."

The Typical (And Not So Typical) Assignment

Although each client has his or her own needs, and projects can occur anywhere inside or outside the house, 1 area consistently receives the most attention. "The most common projects are bathrooms," Leyden says. "That's the first place people begin to notice the loss of independence, or difficulty with bathing, self-care, toileting, and grooming." Redesigns may involve taking out

Roll-in showers are a frequent bathroom modification.

Senior Care Costs

It's usually far less expensive for a patient to live at home than to be cared for in a facility or institution. That's the case even when continuing care is required in the home environment.

Care Type	National Average Monthly Cost
Home Health Care *8 hours per week*	$693
Adult Day Care *Weekdays only*	$1,492
Assisted Living	$3,600
Homemaker Services *44 hours per week*	$3,721
Home Health Care *44 hours per week*	$3,813
Nursing Home *Semi-private (double-occupancy room for 1 person)*	$6,692
Nursing Home *Private (single-occupancy room for 1 person)*	$7,604

http://www.skillednursingfacilities.org/resources/nursing-home-costs/. Accessed June 27, 2016.

a tub and installing a walk-in or roll-in shower, or handheld shower, with grab bars in the right place and at the right height for that person. "In the sink area," she notes, "you want things to be accessible and within reach—which means recognizing whether the client is right hand- or left hand-dominant."

Horkheimer also cites the bathroom. "We deal in a broad spectrum, but 1 common adaption is a ceiling track system for transfers and bathroom access," he says, adding that ceiling track-based patient lift systems are becoming more common for home installations, as patients see them increasingly being used in hospital and rehab settings. "They can give us a lot of versatility while helping protect patients and caregivers," Horkheimer says. "They're more flexible than a floor-based lift. And there are very cost-effective ways we can do them that cost far less than it would to remodel the bathroom."

On the other hand, because each patient is unique, PTs and those who work with them can face an unusual array of challenges. Lewis gives this example: "When homeowners are remodeling a bathroom, they often have materials that they like. I usually can accommodate them, but I may have to go off the path. Maybe they want a certain look but the material they specify isn't safe. For instance, I had a client who wanted travertine [stone] flooring for her remodeled bathroom. It's not slick, but it has natural divots large enough that you can get caught on one. I found an alternative that gives the look of travertine but is much safer."

Rosemarie Rossetti sustained an injury in 1998 that resulted in paralysis from the waist down. After trying unsuccessfully to retrofit their previous home, she and her husband, Mark Leder, eventually built a home—the Universal Design Living Laboratory in Columbus, Ohio—that followed UD principles and was adapted to her. She researched flooring surfaces but found that carpeting was impractical because she uses a wheelchair. She chose hickory engineered-hardwood flooring, but it wouldn't have absorbed sound the way carpeting does. So, she sought a better option. "Under the hickory flooring, we placed a rubber mat—a very green product, from recycled automobile tires," she says. "When I walk on it, it's easier on my joints, and it quiets the surface noise."

Getting the Timing Right

The timing of the home modifications can vary.

In the case of sudden disability or change in health, quickly installing needed modifications can be a challenge. One issue is deciding whether longer-term modifications should be made immediately or delayed weeks or even months.

Gucciardo offers this advice to PTs: "When you see a patient who requires moderate assistance, get started right away. You've got to have the conversation immediately. Don't wait until discharge. If the plan is for the patient

Modifications in the Universal Design Living Laboratory kitchen include raising a standard pullout dishwasher for loading and unloading whether someone is standing or seated. Additional drawer storage space is underneath. Below the sink is a cutout for seated access. Toe kicks below the cabinet are 9" tall, allowing a wheelchair user to move closer to the countertop.

to go home, start pulling resources at once. The family is depending on that. They need that guidance. The family should be made aware that such services exist."

Horkheimer, whose company provides both consultation and installation, says, "We've stocked an inventory of modular ramps. An advantage to a modular system is that we can get them up very quickly. Some jurisdictions don't even require permitting, so we can get them up in a day. We also keep ceiling lifts in inventory. Stairs often are the major barrier to a safe discharge, so we can provide mechanical stair lifting devices. There are lots of solutions for immediate temporary access."

But the quick solution—while often necessary—may not be the best long-term answer.

"Often in the acute phase, we don't have the full certainty of the person's long-term needs," Horkheimer explains. "We may look at temporary solutions just to adjust to the home environment, buy a bit of time, and see how someone interacts with the environment. On the other hand, sometimes people do make a commitment right away to renovate their bathroom; for instance, from a traditional tub to a barrier-free one. They may not know if they'll experience significant recovery, but they want to do it in any case."

The master tub in the Universal Design Living Laboratory has built-in grab bars. A wide deck allows a user to sit, spin around, and slide into the tub, reducing the likelihood of bath slip-and-fall accidents. Hidden in the ceiling is heavy-duty blocking for future installation of a track lift system.

On the other hand, Gucciardo recalls a case involving a 27-year-old patient who'd been injured in a parachuting accident. "I was responsible for preparing the property with a transitional package to get the needs met," he says, "but then the family waited 6 months to do the bathroom. It may not always make sense for families to jump into it right away." Sometimes it can make sense to wait.

Also influencing the timing of home modifications in many cases is growing pressure on hospitals to shorten patients' length of stay and to reduce readmissions. "With reduced length of stay, the residence has to be considered an extension of the health care facility," Gucciardo explains. "Otherwise, a patient is likely to cycle back and forth—hospital, home, hospital, home. We have to facilitate independence on multiple levels. If that means forgoing some UD principles just to get the person home to take a shower, you do it."

Sometimes the course of a disease is predictable. In such cases, modifications should anticipate the likely progression. "If you have a client with a child with Duchenne muscular dystrophy," Gucciardo says, "you have to prepare for caregiving. If you're designing today for a 4-year-old child and looking toward where he or she might end up, that's the realm of the health care professional."

A different scenario unfolds when the future is less certain. The patient may not need—and in fact may never need—a particular modification. That can lead to delicate negotiations among the PT, patient or client, and caregivers.

"At one house, the customers were seniors but they didn't want grab bars in the bathroom," Lewis recalls. "I tried to educate them about aging in place and what their needs might be. They let me implement most of my recommendations, but not grab bars. For proper grab bar installation, the walls need to be blocked inside. Toggle bolts aren't sufficient. So, we compromised. When we were doing the bathroom, I put in blocking for grab bars. Once they need them, they can hand the design to a builder—showing the locations of the blocking—so that grab bars can be installed."

Rossetti faced a similar question. "We have our own elevator in the house," she says. "Some people are surprised by how big it is. That's because we sized it for the future. I'm in a small manual chair now, but who knows what the future holds? We planned it to accommodate larger mobility devices."

And hidden away above the ceiling in Rossetti's bedroom is something else that may become important. "When we built our home, we chose 2-by-8-foot southern yellow pine blocking to reinforce the attic rafters from the bedroom to the bathroom. So, if we ever need a lift system, we've already got the structure in place. We had a consultant work with us, and when he suggested it, we thought, 'What a great idea.'"

Discovering Resources

Not all the solutions to a client's situation are immediately apparent. It's often up to the PT to discover or develop them.

In some cases, for instance, a product may exist but may be difficult to find. "A kitchen renovation is expensive in any case. Choose products that are easy to use, and position them for less physical effort," Leyden says. "For

example, some refrigerators are difficult to open, and if a client is weak it can be even more difficult. There are many helpful products out there that people aren't aware of. They may not be sold at The Home Depot. For instance, there are side-opening ovens, so a person doesn't have to reach across the hot open door.

"Another example is a microwave drawer," Leyden adds. "The appliance is a specially sized microwave that takes the place of a kitchen drawer. It opens with a soft touch. You place what you're warming in the microwave just as you'd place a sweater in the drawer. You have better body mechanics when you take the item out. It's easy to use, and it's attractive."

Rossetti, too, emphasizes the importance of easy-opening devices. In her powder room, an interior pocket door hides the toilet from the front door. Once inside the room, she can slide the door out of the way for easier transfers. "The pocket door slides so easily that even our cat can open it," she notes.

Moving to the bedroom, Cieniewicz describes a client with severe lymphedema and rotator cuff issues. "She couldn't use traditional leg lifters. She wanted a motorized leg lifter. I found one that attached to the bed that took her from a seated position and slowly and comfortably swept her legs into bed," she recalls. "No one I'd spoken to had seen or heard of that. There's so much assistive technology being developed that it's hard to keep up with it all."

Working as a Team

The first step to make a home accessible is to develop a design based on the patient's or client's needs.

"Design first, build second," Gucciardo advises, "The design piece is the blend

Bathroom modifications may include a cutout below the sink for wheelchair access. The open space allows for wheelchair maneuvering, with strategically placed grab bars.

Resources

American Physical Therapy Association

Academy of Geriatric Physical Therapy
http://geriatricspt.org/index.cfm

Home Health Section
http://www.homehealthsection.org/

Academy of Neurologic Physical Therapy Inc
http://www.neuropt.org/

Orthopaedic Section
http://www.orthopt.org/content/home

Other

Accessible Design Resources
http://www.makoa.org/accessable-design.htm

Aging in Place
http://aginginplace.com/

The Center for Universal Design
NC State University
https://www.ncsu.edu/ncsu/design/cud/index.htm

Charles Schwab Universal Design Smart Homes
http://www.universaldesignonline.com/index.html

National Association of Home Builders
Certified Aging-in-Place Specialist (CAPS) Designation Program
https://www.nahb.org/en/learn/designations/certified-aging-in-place-specialist.aspx

National Resource Center on Supportive Housing and Home Modification
Andrus Gerontology Center
University of Southern California
http://www.homemods.org/index.shtml

Rehabilitation Engineering and Assistive Technology Society of America
http://www.resna.org/

United States Access Board
https://www.access-board.gov/

Universal Design Living Laboratory
www.UDLL.com

Ramps are a frequent exterior modification. Their slope should be determined by the abilities of the user, however, not by minimum regulations.

of the medical chart, understanding the as-built environment, and the design. The execution follows."

Rossetti agrees. "The design is where it begins," she says. "The key is finding the proven professional who understands adapting the home for someone with a disability, whether it's physical or cognitive. Design is crucial: If it's not done right, it costs a lot of money to fix later."

Leyden, whose business partner is an interior designer, says, "We go into a person's home when they're thinking about renovating a bathroom or making a kitchen more accessible. Part of our business model is: You get 2 for the price of 1. I provide a health professional's perspective on aging, even if there's nothing 'wrong' with the client. Reaching up high or handling stairs are abilities that change during the normal process of aging. My role is to assess a person's needs, such as range of motion, cognitive deficits, and physical deficits. We identify a need and then develop space around that need. Much of our goal is not only to create accessible space, but also to make it beautiful and visually appealing to the person living in the home."

Sometimes the team may involve individuals more than the patient and family, the health care professionals, the architects and designers, and the builders. Consider involving manufacturers if it's a big job or new construction, Rossetti advises.

She gives these examples that occurred when the Universal Design Living Laboratory was being built: "Eventually, we were ready for the kitchen cabinets, and we spent an entire day with interior designers at the Kraft Maid Cabinetry showroom. We asked their design team what improvements they'd make," she recounts. "They'd spot things—'Do you mind if we redesign the center island?'—for example. They saw a space where we could add another cabinet. They put an audio-video cabinet on wheels that is recessed flush with the fireplace stack. When we were meeting with a tile supplier, he suggested a separate powder room. On the spot, he took a pencil and started sketching on the blueprint to come up with a powder room separate from the master bath. We came home and asked the carpenter to deconstruct the already-built walls to create the powder room."

Although the builder is a key player in the process, he or she shouldn't be the first person to be consulted, the PTs interviewed for this article caution. "I don't think the answer is with the builders," Gucciardo says. "The builder has to [be guided by] a therapist. The real answer is that you have to put the solutions on paper first. If you have a set of documents where everything is spec'd out, the builders love that. Their job is to do what the homeowner tells them to do."

On the other hand, all members of the team must know their limitations in spec'ing solutions. Regarding PTs and OTs, he says, "The therapist might say, 'Widen the door.' But the house is old, it's plaster, and there's wiring in the wall. Or, he or she might ask, 'Why can't we move the toilet over here? Why can't we move that wall?'" The therapist needs to know when what's being recommended is beyond a structure's accommodation, based on the expertise of the building experts.

Cieniewicz adds some final advice. First, "it helps to have a contractor who's CAPS-designated. That person has taken the initiative to get educated and certified in this particular area." Second, "Get at least 2 or 3 bids. Compare and contrast. Ask a lot of questions. That process alone usually weeds out the ones who aren't up to par." And third, "References are really important; get more than 3. Talk to people—use word of mouth."

"The key person in the process is the rehab specialist," Gucciardo sums up. "The goal is the patient returning home and staying there. Accomplishing this requires an understanding of the disease process and the recovery. The therapist frequently is a hidden asset who's being underutilized." ■

Donald Tepper is editor of *PT in Motion*.

REFERENCES

1. Carr K, Weir P, Azar D, et al. Universal design: a step toward successful aging. *Journal of Aging Research*. 2013. http://dx.doi.org/10.1155/2013/324624. Accessed June 24, 2016.
2. Disability Rights in Housing. US Department of Housing and Urban Development. http://portal.hud.gov/hudportal/HUD?src=/program_offices/fair_housing_equal_opp/disabilities/inhousing. Accessed June 24, 2016.