Improving Unsafe Environments to Support Aging Independence with Limited Resources

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Q2 Q3 Q4 Q5 Q6

KEYWORDS

• Function • Older adults • Disability • Interprofessional

KEY POINTS

- Aging with independence benefits individuals, family, and society but can be hard to achieve.
- Function is determined by both the person and the environment in which they maneuver.
- This article describes a promising program that intervenes with both older adults and their home environments to improve function.
- This program, called CAPABLE (Community Aging in Place, Advancing Better Living for Elders), is funded through the Affordable Care Act and can be scaled up nationally if determined to be a success.

Aging with independence is important to older adults for multiple reasons: it affords better quality of life for older individuals and their families,[1] and is a foundational American value that, when achieved, saves resources for society to use in other ways. The Q8 number of older adults in the United States is projected to continue growing,[2] making it increasingly urgent to identify ways to support aging with independence. For many older adults, the challenges are socioeconomic.[3] However, for almost everyone, at every income level, aging brings functional challenges that can compromise independence. These functional challenges result from interactions between an individual's health and the surrounding environment. Low-income older adults face even greater challenges to independence because they have more comorbidities[3]; experience more functional limitations as a result[4,5]; and, by definition, have fewer resources to modify their home environments. This combination places them at even greater risk

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for reduced activity levels, social isolation, falls, and other adverse events. This article explains how unsafe environments affect older adults with functional limitations, and describes an interprofessional model of care, called CAPABLE (Community Aging in Place, Advancing Better Living for Elders), which addresses both individual and environmental aspects of aging with independence. This article also provides tools and lessons for use while implementing this innovative model of care within a community of urban-dwelling, low-income older adults with multiple functional limitations.

UNSAFE EXTERIOR ENVIRONMENTS POSE BARRIERS TO AGING WITH INDEPENDENCE

Every level of the environment supports or inhibits function and health.[6] From the neighborhood surrounding an older adult's home, to the steps leading up to their front doors, to the interior of the house and each room; all of these environments affect an older adult's ability to function well enough to age in place.

Neighborhood

The neighborhood of residence can affect health and safety in later life, particularly in urban settings where factors such as broken or littered sidewalks and busy streets, a lack of safe spaces to exercise, or the geography of gun violence and other threats[7–10] pose risks that keep some older adults indoors. Some neighborhoods also contain food deserts, meaning places lacking markets with ready supplies of produce and other options essential to a healthy diet. Unsafe neighborhoods not only prevent older adults from engaging in the types of activities associated with sustaining an independent living situation (eg, shopping, medical appointments, outdoor exercise), they can also interfere with older adults' ability to visit the places many associate with a high quality of life (eg, green spaces, houses of worship, senior centers, the homes of family and friends). Other barriers that may be more common to suburban and rural environments, such as the absence of sidewalks and other walkways, adequate lighting, and public transportation; geographic features such as steep inclines; or natural features such as mud and brush, can render older adults homebound.

House Exterior

On opening their front doors, many older adults are stuck at the top of their own front steps because of broken stairs, a lack of adequate railings, or stairs that are too steep or slippery for increasingly weak leg muscles to navigate. Each time they descend or ascend these steps, these individuals face the risk of falling, which can lead to serious injury or even death. Unsafe stairs pose a threat when older adults must go out (for example, to attend a medical appointment) and also bar exiting the home for optional activities such as volunteer work, socializing with friends and family, or participating in religious services. These disparities in housing conditions can lead to health disparities because community-dwelling older adults derive benefits from social engagement outside their homes, such as caregiving for friends or neighbors,[11,12] working part time,[13] or attending church and family activities.[14] Onset of functional decline, which can put older adults at risk when entering or exiting their homes if proper safety measures are not in place, has been linked to cessation of these types of potentially beneficial activities.[15]

UNSAFE HOME INTERIORS CAN POSE EVEN GREATER THREATS TO AGING WITH INDEPENDENCE

Although unsafe exterior environments, such as communities with neighborhood violence and broken sidewalks, pose some of the most visibly obvious threats to the health and well-being of older persons, often the most dangerous place for these

adults is inside their own homes. Interactions between underlying health conditions and unsafe home interiors result in functional limitations that not only place older adults at risk for injury but also prevent them from doing the things they associate with living well. Given the severe challenges of addressing the problems that may exist outside an older adult's home, the rest of this article focuses on strategies for supporting aging with independence by addressing the safety issues that often exist inside older adults' homes and that contribute to functional limitations in later life.

Fall Risk and the Home Environment

One in 3 adults fall every year with subsequent morbidity including nursing home admission and mortality.[16,17] Not only are the falls dangerous but so is remaining on the ground if unable to arise. Individual (intrinsic) factors contributing to falls include decreased mobility, decreased balance, decreased vision, and medications that act on the central nervous system. External (extrinsic) factors are equally important and include clutter, uneven or hole-ridden floors, inadequate railing or banisters, steep stairs, oxygen tubing, wires in walking spaces, and slick surfaces such as bathroom floors. In addition, there are extrinsic factors that are made more dangerous by interactions with intrinsic factors; for example, slippery bathtubs with high sides in the home of someone with poor balance, or toilets without grab bars in the home of someone with weak legs (**Fig. 1**).

Activities of Daily Living/Instrumental Activities of Daily Living and Environmental Factors Q9

Activities of daily living (ADLs), including bathing, grooming, getting on and off of the toilet, getting in and out of the bed, and dressing are, by definition, essential to daily

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Fig. 1. A client practices using grab bars to exit the bathtub.

life. Community-dwelling older adults who cannot safely do these activities on their own must rely on informal or paid caregivers in order to age in place. Because of a tendency to focus on illness management rather than function, medical and nursing professionals may fail to adequately assess and address older adults' functional challenges, even though function is the key to staying independent. An estimated $350 billion each year are spent on nursing home care for people unable to function independently. An additional $450 billion in unpaid care are provided by informal or family caregivers assisting older adults in performing everyday self-care tasks.[18] Without intervention, these costs will continue to increase as the population ages.

AN INNOVATIVE MODEL FOR PROMOTING AGING WITH INDEPENDENCE: THE CAPABLE INTERVENTION

Practical realities related to both older adults' preferences for living independently and increased demands on families and other caregivers associated with a growing aging population show a clear need to find sustainable models of care that address both the intrinsic and extrinsic factors that improve safety and function in older adults seeking to age in place. First-hand experiences providing house calls to low-income urban community-dwelling older adults brought this need to the forefront of the first author's (Dr Sarah Szanton) attention. Acting in response to the many older adults she had encountered who were struggling to age independently and safely, she found a program called ABLE (Advancing Better Living for Elders) that had already been proved effective in addressing similar challenges. ABLE had previously been evaluated through a randomized controlled trial of 306 older adults in Philadelphia. The program provided occupational and physical therapy sessions involving home modifications and training in their use; instruction in problem-solving strategies, energy conservation, safe performance of ADLS/instrumental ADLs (IADLs) and fall recovery techniques, as well as muscle and balance training. The evaluation of this model provided strong evidence that a program focused on improving community-dwelling older adults' function and control over their circumstances could help to promote aging with independence in these populations and even delay mortality.[19,20] Dr Szanton sought to build on the strengths of ABLE, and also to modify the intervention to address additional threats to aging with independence (such as perilous home environments and their interactions with underlying health issues) more explicitly. The result of these efforts was the CAPABLE intervention. CAPABLE augmented ABLE by adding support for repairs to unsafe home environments (as opposed to strictly home modifications such as grab bars and raised toilet seats) and a nurse who comprehensively assesses and addresses health concerns that could contribute to functional limitations within the home environment, such as pain, depression, medication reconciliation, and primary care provider (PCP) advocacy/communication. These realms were added in the service of increasing clients' capacity to perform ADLs and IADLs independently. The CAPABLE intervention involves universal assessment of every client by a registered nurse (RN)/occupational therapist (OT) team that then allows an interdisciplinary team including the client, the nurse, the OT, a home repair specialist (handyman), and a pharmacist to tailor an individualized plan of care that addresses potential threats to aging independence in the home environment while working toward functional goals set by the client. **Table 1** provides a description of the visits and their sequencing and the protocol and description of what the nurse does in CAPABLE is given by Pho and colleagues.[21]

Between 2009 and 2010, a randomized controlled pilot trial of CAPABLE was conducted with a sample of 40 low-income older adults, randomly assigned to receive the

Table 1
Home visits and collaboration with CAPABLE clients over a 4-month period Q12

Team Member	OT Visit 1[a]	OT Visit 2	After Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
OT and client together	Introduction Function-focused OT assessment. Fall risk and recovery education	Determine client's functional goals, conduct home safety assessment and identify necessary repairs or modifications	Develop work order for home repairs/ modifications and sends to HM	Brainstorm and develop action plan with client for client-identified goal #1	Brainstorm and develop action plan with client for client-identified goal #2	Brainstorm and develop action plan with client for identified goal #3 Review HM work and train participant on new assistive devices	Wrap up, help participant generalize solutions for future problems Review goals and client's achievement of them
HM	HM visits client's home, reviews repairs/modifications and associated costs with OT, starts work and continues until complete						

	RN Visit 1	After RN Visit 1	RN Visit 2	RN Visit 3	RN Visit 4
RN and client together	Introduction Function-focused RN assessment including pain, mood, strength, balance, medication information, health care provider (PCP) advocacy/ communication	Make medication calendar for client Review client's medications, including side effects, interactions, and possible changes Consult with pharmacist if on high alert or more than 15 medications	Determine goals in RN domain together, start to brainstorm goals Demonstrate CAPABLE exercises Review, clarify, and modify medication calendar Consider how to improve communication with PCP Develop correspondence to PCP	Complete brainstorming/ problem-solving process. Develop action plans with client. Assess PCP response to communication of client needs. Review/assess/ troubleshoot exercise regimen	Review progress and use of strategies for all target areas. Complete action plans. Review RN section of flipbook that summarizes program. Evaluate achievement of goals and readiness to change scale

Abbreviation: HM, handyman.

[a] The visits are staggered so that OT visits 1 and 2 occur before RN visit 1. RN only has 4 visits, whereas the OT has 6.

CAPABLE intervention. This pilot showed that those receiving CAPABLE improved on all primary outcomes, compared with a control group, and also had less difficulty with ADLs and IADLs, less pain, and improved falls efficacy.[22] Based on those findings, the CAPABLE team was funded by the National Institutes of Health to conduct a 300-person randomized clinical trial assessing whether the intervention improves function, well-being, and health care costs on a larger scale. Also, the Center for Medicare and Medicaid Innovations, created by the Affordable Care Act, funded the team to provide the CAPABLE intervention to 500 people and test whether the program delayed nursing home admission and preventable hospital costs. Results from these trials will be available between 2015 and 2017. In the meantime, much has been learned about implementing such a program in the community and assessing what is working so far.

THREE INNOVATIONS OF THE CAPABLE MODEL IN ACTION: A CASE EXAMPLE

CAPABLE is innovative in 3 ways. First, it is not just client centered but client directed. Second, unlike most forms of home health care, the nurse and OT strive to address the functional goals of the client, not just their medical issues. Third, the CAPABLE model treats the home environment as a key influence on health, such that fixing up an older adults' home interior is done for the primary purpose of achieving health-related goals. The following case is an example of this 3-pronged CAPABLE approach:

The Client

When first enrolled in CAPABLE, Mrs R was a frail obese woman in her late 60s who experienced debilitating pain and depressive symptoms, had difficulty managing her multiple medications, and lived in an unsafe home environment that put her at risk for falls. Although she described herself as a "people person," functional limitations had limited her ability to go out for activities such as shopping, church, and family gatherings. As a result of lower extremity weakness, holes in her living room floors, kitchen flooring that was sticking up, and lack of environmental supports (railings and other home fixtures), she also had extreme difficulty doing things in her own home. She found difficulty in cooking for herself, going down to her basement, or going up to her second floor.

The Client's Functional Goals

Mrs R expressed a desire to do more in her home, including cooking and improving her ability to access different levels of her house. She wanted to be able to leave the house for activities such as family events and church.

Issues Affecting Goal Achievement and Resulting Interventions

Assessment by the CAPABLE nurse/OT team revealed the following issues affecting Mrs R's safety and ability to achieve her functional goals: medication side effects, symptoms such as pain and low mood, lower extremity weakness, and unsafe walkways and stairways in the home. Working collaboratively with other members of the interdisciplinary team over a 4-month period, the CAPABLE nurse worked to address these issues in a manner tailored to Mrs R's unique circumstances and home environment.

Medication side effects

When she enrolled in CAPABLE, Mrs R took both Celebrex 200 mg twice a day and Motrin 200 to 400 mg 4 times a day as needed for pain. In addition, Mrs R had 3 to 4+ edema in her lower extremities. On noting the edema, the CAPABLE nurse reached out to Mrs R's PCP to suggest discontinuing the Celebrex. The nurse then suggested

replacing the nonsteroidal antiinflammatory drugs with Tylenol, Voltaren topical cream, and exercise.

Pain and low mood

Mrs R's depressive symptoms, in combination with her pain, were a barrier to many types of activity including standing long enough to cook for herself and socializing with others. Following the nursing intervention regarding her prescription to Celebrex, Mrs R started Tylenol instead. She continued to take Motrin on occasion. Mrs R stated that since her pain had decreased, her mood had improved. She began cooking for herself and her family, and began making trial runs to family gatherings, building toward her ultimate goal of attending church services.

Lower extremity weakness

Lack of strength in her lower extremities prevented Mrs R from walking around as well as leaving her home. The RN taught Mrs R a series of simple lower extremity exercises. On the first nursing visit, Mrs R had so much difficulty demonstrating the exercises she had been taught (because of pain) that the CAPABLE nurse thought Mrs R would not continue exercising on her own. However, the adjustments to Mrs R's medications, in addition to the exercise, started to make a difference. Mrs R began exercising more regularly and asked the nurse for more advanced exercises on subsequent visits. She also started a walking routine inside the house after the handyman had fixed the holes in her floors and the kitchen linoleum trip hazard.

Lack of railings on stairways

The lack of second railings on stairs to the basement and upper floor of the house constituted a serious fall risk for Mrs R that impeded her from navigating her own home. The CAPABLE handyman installed second railings on both the stairs to the second floor and to the basement. Mrs R reported that the second railing had made going up and down the steps much easier and safer. She said, "You all have made my life easier. I was going up the steps on my hands and knees and coming down the steps sideways. I now have the 2 banisters where I can come down safely, facing forward holding onto both banisters."

Value Added by the CAPABLE Approach

An older adult with Mrs R's risk profile is likely to have been admitted to a hospital or a nursing home over time, because of her multimorbidities, multiple medications, social isolation, and frail physical and emotional state.[23] The CAPABLE team took an innovative approach to addressing these challenges by focusing on Mrs R's functional goals, rather than solely addressing medical issues. Taking their cues from Mrs R, an interprofessional team consisting of a nurse, an OT, a pharmacist, and a handyman designed a 3-pronged combination of functional, medical, and environmental adjustments that worked synergistically over a 4-month period to meet Mrs R's unique needs within her home environment.

Innovation 1: client-directed care

Mrs R's goals became the CAPABLE team's goals and directed development of the plan of care. The team's efforts to improve pain control, medication management, and strength/balance were in the service of Mrs R's overall goals to cook for herself, get around and out of the house, and eventually to attend church services.

Innovation 2: addressing medical/functional issues through an RN/OT team

In a similar way, nursing assessment and related interventions were driven by functional (rather than strictly medical) goals of the client and were designed to complement

Table 2
Role differences between the traditional home health RN and the CAPABLE RN

Role	Home Health RN	CAPABLE RN
Goal-setting and plan of care	Nurse-driven goal-setting and plan of care centered on the patient illness or injury as identified by the client's health care provider	Client-driven goal-setting and plan of care centered on the functional goals and activities of interest identified by the client
Collaboration with client	RN works as a treatment provider to the client for a specific medical problem as directed by the client's health care provider RN-delivered treatments based on prescriptions from client's health care provider	RN serves as a consultant to clients for achieving their functional goals In partnership with the client, the RN helps to determine and shape the intervention by paying special attention to the clients' preferences, pain, mood, medications, fall risk, and strength/balance
Interdisciplinary collaborations	RN works apart from other specialists, but refers client to specialists and other services as needed (eg, physical or occupational therapy, social work)	RN works as an integral part of an interdisciplinary team that includes the client, an OT, a home improvement specialist, and a pharmacist. RN refers client to social work services from local agencies as needed
Provision of skilled nursing care	Skilled nursing care (eg, physical assessment, phlebotomy, administration of intravenous medications, wound care, patient education) provided as prescribed by client's health care provider	Skilled nursing care provided as needed to meet client-directed functional goals of care, in consultation with interdisciplinary team Client's health care provider alerted to medical situations and to recommend adjustments to medications/therapies requiring a prescription Examples: orthostatic hypotension, foot wounds

Focus on medications	RN reconciles client's medications with a general focus on side effects. Notifies client's health care provider of significant interactions. Client education provided as needed	RN reconciles client's medications with a specific focus on falls prevention and high-alert medications. Notifies client's health care provider of significant interactions. Additional activities include: • Creates medication calendar for client • Assesses for and advises client on issues related to medication adherence • Assesses medications with focus on reducing client costs • Works with pharmacist in situations in which client is on high-alert medications or more than 15 medications
Focus on pain	RN performs general assessment for pain and more specific assessments as directed by client's illness or injury. Client education provided as needed	At each visit, RN performs thorough assessment for pain with a focus on how pain affects client function and progress toward client-identified goals of care Based on assessment, RN provides client-specific education on pain identification, alleviation, or prevention, and pharmacologic and nonpharmacologic approaches to pain management
Duration of care	Home health services provided for up to 60 d per episode of care as defined by Medicare; RN visit frequency may vary	CAPABLE intervention delivered over 4 mo; RN sees client a maximum of 4 visits
Other demands on RN	RN may supervise other home health workers (licensed practical nurses or home health aides) RN may be on-call nights, weekends, or holidays RN may regularly do extensive bending, lifting, or standing	RN does not supervise other home health workers No need for RN coverage on nights, weekends, or holidays Limited amount of bending/lifting (required only on occasion)

Table 3
Recommendations to nurses collaborating with OTs

Recommendation	Application to CAPABLE Study	Specific Example
Understand the OT's scope of practice	When working with CAPABLE clients, nurses recognize the OT's role in promoting client independence and function by: • Promoting clients' own strategies to maintain and improve different areas of their lives amplified with OT clinical knowledge • Facilitating client's access to and use of durable medical equipment and adaptive equipment, as appropriate • Prioritizing necessary modifications to client's home environment	A client goal is fall prevention. In a typical CAPABLE plan of care, the OT brainstorms with the client safe ways to get into the bath and training on using new grab bars and railings inside or outside the house, and so forth. The nurse complements but does not duplicate the OT role by focusing on client's medications, nutrition, and disease and symptom management, all of which can also lead to falls
Maintain constant communication with the OT and other interdisciplinary team members	As in any other health care environment, open communication leads to better client outcomes and success Determine the personality and communication styles within the team and use appropriate communication strategies, as needed	The nurse attends routine meetings of the interdisciplinary team and maintains regular communication with OTs (via phone, email, or face to face) to debrief following client visits and to discuss collaborative approaches to meeting emerging client needs and strengths
Be aware of OT's activities with clients and reinforce when appropriate	By maintaining excellent communication and familiarizing themselves with client goals and the plan of care (including activities of each of the interdisciplinary team members), nurses reinforce OT activities/teaching when interacting with CAPABLE clients	The nurse teaches balance and strength exercises. The OT works with a client to use assistive devices such as walkers or home modifications such as railings and grab bars. The OT reminds the client to perform the exercises. On subsequent visits, the nurse watches the clients use appropriate assistive devices/home modifications

and reinforce the activities of an OT. Working as an RN/OT team, in conjunction with other specialists such as the handyman and the pharmacist, the two types of clinicians were able to implement a plan of care that helped Mrs R to meet her functional goals.

Innovation 3: treating housing as health

The efforts of the RN/OT team would not have been as successful without the addition of important safety measures within Mrs R's home environment. Mrs R had many small alterations to her home that helped her function there independently as well as to get out to her important activities. In turn, these should help her health costs through increased activities and quality of life.

Through these efforts, the CAPABLE team sought to reverse the vicious cycle that affects so many older adults with similar risk profiles as Mrs R, who become increasingly deconditioned, depressed, and frail over time. The hope is that consequently these actions will also decrease Mrs R's future risk for serious medical consequences, injury, or further functional declines that would require costly care.[23]

LESSONS LEARNED WHILE IMPLEMENTING THE CAPABLE MODEL

To date, implementation of the prior pilot randomized controlled trial and larger on-going clinical trials funded by the National Institutes of Health and the Centers for Medicare and Medicaid Services- has taught the CAPABLE research team valuable lessons about improving unsafe home environments and supporting aging independence by applying a client-directed model of care, addressing both medical and functional issues using an interdisciplinary team approach, and incorporating home repair into health care.

1. Lessons learned about client-directed care. In our experience, prioritizing the clients' goals makes clients likely to follow through. When clients say they are worried about falls, and the CAPABLE nurse presents core strengthening exercises to help prevent falls, then the client is likely to follow through on the exercises because they relate to the goal. Client-directed care can be hard at first for the RN to get used to because RNs are used to having medical goals and imparting them to the client. See **Table 2** for lessons learned about how the CAPABLE RN role is different from home care RN.
2. Lessons learned about addressing medical and functional issues through an interdisciplinary team. Similar to addressing the client's goals, addressing the specific functional goals is the key to motivation. Clients are often not as concerned about their medical disease as they are about the ability to function. When both are addressed, it is a support for the client to be able to live with independence and dignity and leads to durable uptake of the new strategies. See **Table 3** for recommendations to nurses collaborating with OTs.
3. Lessons learned about housing/environment as health. The changes to the home environment are durable and serve as visible reminders for clients to approach their daily functions with their new CAPABLE approaches. After CAPABLE is over, if someone forgets to take their pain medications, they will still have repaired holes, taped down rugs, and sturdy banisters to help them move around the home with increased function. It is hoped that these extrinsic changes will work with the intrinsic changes and new problem-solving strategies to approach inevitable new issues as they age.

SUMMARY

Aging with independence is important for older adults. Independence means not only living in one's home but also being able to choose how to spend one's days. Both of these rely on function, which is a product of the interaction of health and the

environment. Drawing on successful interventions and clinical experience, we developed an innovative program that (1) allows clients to set their own goals; (2) involves an interdisciplinary team addressing issues of function and medical problems to help clients meet their goals; (3) treats the housing and the environment as an aspect of health care worthy of health care investment. This article shares the lessons learned in the project. If current testing is successful according to the actuaries at the Centers for Medicare and Medicaid Services, CAPABLE can be scaled up nationally through the Affordable Care Act. If this happens, the lessons learned and the resources we have developed will be important to explore in different contexts and states. It is hoped that this program, designed to improve lives and independence, will also save health care costs for families and the nation.

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