GeriNotes

Academy of Geriatric Physical Therapy

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IN HONOR/MEMORIAM FUND

Each of us, as we pass through life, is supported, assisted and nurtured by others. There is no better way to make a lasting tribute to these individuals than by making a memorial or honorary contribution in the individual's name. The Academy of Geriatric Physical Therapy has established such a fund which supports geriatric research. Send contributions to:

The Academy of Geriatric Physical Therapy | 3510 East Washington Avenue | Madison, WI 53704

Also, when sending a contribution, please include the individual's name and any other person you would like notified about your contribution. If you are honoring someone, a letter will be sent to that person, and if you are memorializing someone, the surviving family will be notified of your contribution.

In the field of geriatric physical therapy, we receive many rewards from our patients, associates, and our mentors. A commemorative gift to the Academy of Geriatric Physical Therapy In Honor/Memoriam Fund is a wonderful expressive memorial.

PRESIDENT'S MESSAGE: REHABILITATION TECHNOLOGY

William H. Staples, PT, DHS, DPT, GCS, CEEAA

I found a definition of rehabilitation technology in the state of Iowa's website (http://www.ivrs.iowa.gov/CaseServiceManual/RehabilitationTechnology.pdf). Rehabilitation technology is "the systematic application of technologies, engineering methodologies, or scientific principles to meet the needs of, and address the barriers confronted by, individuals with disabilities in areas that includes education, rehabilitation, employment, transportation, independent living, and recreation. The term includes rehabilitation engineering, assistive technology devices, and assistive technology services." Rehabilitation technology services are provided for people with severe mobility, learning, emotional, visual, hearing, neurological, neuromuscular, and other disabilities. They may be provided to enhance functional capacities by eliminating or minimizing functional limitations imposed by a disability that lead to and/or expand vocational rehabilitation, independent living rehabilitation, and employment opportunities by eliminating barriers of all types. That covers a lot of ground.

When I was a student, yes a long time ago, I was told by several mentors that all I needed was a good set of hands to become a great therapist. Well, times have certainly changed. I'm starting to think that a degree in biomechanical engineering would be most helpful. If you don't work in a first class rehabilitation center or haven't been to a CSM meeting in a while, I would suggest a trip to see everything that is out there in action.

The following are just a few rehab technologies that I have investigated for balance and gait activities. Unfortunately, much of this equipment is reasonably expensive but worth the time to see as the future of rehabilitation progresses. The AlterG® anti-gravity treadmill allows users to exercise at a reduced body weight, allowing for the safe increase of cardiovascular activity without additional wear and tear on the body. I have seen these primarily for rehabilitation of runners. Similarly, the ZeroG® allows for partial body-weight support that reduces the fear of falling for patients. The system includes a database for recording training data and tracking patient progress.

The Bertec Balance Advantage™ system that uses virtual reality to evaluate and treat people with sensory processing disorders and brain injuries. Patients perform a series of exercises that challenge them to maintain balance on a moving floor while watching a virtual scene. The computerized system can incrementally step up the challenge to gradually retrain the brain to overcome balance disorders.

Ekso is a wearable robotic device bionic (exoskeleton) that allows people with lower extremity paralysis or weakness to stand up and walk. The patient provides the balance and proper body positioning, and the device facilitates walking over ground with reciprocal gait.

The GAITRite System is a computerized gait analysis system that uses a series of switches embedded onto a mat on which the patient walks. Data is then collected electronically, putting gait deviations into objective terms in order to show progress over time.

The LiteGait® assists gait training through the use of an overhead suspension system and harness, the LiteGait allows therapists to provide body-weight-supported gait therapy to individuals who have difficulty walking. The system facilitates more normal movement patterns with better postural control. We have one of these at school. Robomedica® is like the LiteGait, and is a body-weight support system, which helps individuals achieve a more normal walking pattern and improved posture. It provides a safe training environment for individuals following spinal cord injury, brain injury, or stroke and can be adjusted to accommodate for bone mineral loss and muscle atrophy.

The Ness L300™ (Bioness, Inc.) is a functional electrical stimulation system designed to help patients with neurological disorders affecting the lower extremities, specifically foot drop. The L300 is worn on the lower leg and foot. Its purpose is to stimulate muscle re-education, prevent atrophy, and promote a more natural walking pattern. The L300 can be used either as a training device or a functional orthotic for patients to use daily when they walk.

The Parastep System® is a microcomputer controlled functional neuromuscular stimulation (FNS) system. It enables independent, unbraced standing and walking by people with spinal cord injury.

The Up N' Go Walker® is a new type of walker used for controlled reduction of weight-bearing load during gait training. It promotes better posture and alignment, strengthens the lower extremities in close-chained activities, and promotes standing balance. The Up N' Go enables a therapist to initiate safe, controlled gait training with a patient at an earlier stage in his or her rehabilitation than previously done.

While we will always need our two hands, the future is here with rehabilitation technology.

EDITOR'S MESSAGE

Meri Goehring, PT, PhD, GCS

Hello GeriNotes Readers,

I consider each and every one of us to be potential writers for *GeriNotes,* so it is time to share the updated author instructions. Please note that there is now a word limit. Thanks so much for all your fine contributions. Please contact me if you have questions or concerns.

Meri Goehring, *GeriNotes* Editor

1. *GeriNotes* serves as a publication option for articles pertaining to clinical practice as well as governance of the Geriatric Academy. It is not considered a peer-reviewed journal. A wide variety of informational articles of interest to the Geriatric Academy are welcome. Articles describing treatment techniques as well as case studies, small sample studies, and reviews of literature are welcome. Papers on new and innovative technologies will be considered for publication. Language and format of articles should be consistent with the *Guide to Physical Therapist Practice*.

Articles must be submitted to the Editor of *GeriNotes*. Email submission is preferred.

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2. *GeriNotes* is published 6 times per year in January, March, May, July, September, and November. Deadlines are two months in advance of each publications or November 10th, January 10th, March 10th, May 10th, July 10th, and September 10th, respectively.

3. **PLEASE NOTE:** There are new restrictions on length. Approximately 900 words is one printed page. Articles shorter than one page will be considered; however, *GeriNotes* will be unable to publish articles longer than 3500 words beginning in January 2016.

4. Authors **MUST** submit a short, 2-3 sentence biography at the end of their article. This should include the author's name, credentials, and a brief statement about his/her workplace. It may include an e-mail address, phone number, and address if the author so desires.

5. Authors are asked to submit a "head shot" type black and white or color photograph of themselves via E-mail attachment. The preferred format for the photograph is a jpeg file. Please contact the Editor if you do not wish to submit a photograph.

6. Articles will be edited and published as space permits. Articles that do not adhere to these guidelines may be returned to the author for edits if necessary. The editor, managing editor, and possibly a member of the editorial board will do initial reviews. Recognized experts may also be queried to review topics in their area of expertise. *GeriNotes* is not considered a peer-reviewed (refereed) journal, and, as such, expert reviews will only be performed as needed. Please DO NOT include an abstract.

7. Articles need to be submitted via E-mail attachment in Microsoft Word.
8. Description of Text.
   a) Text should be double-spaced, using a 12-point font with 1-inch margins on each side. Title page should include the author's name, degree, title, place of work, corresponding address, phone, FAX number, and E-mail address. **Please remember to add the appropriate credentials to your name so that we may list it correctly.**
   b) The diagrams, figures, tables, graphs, and photographs should be submitted as **separate attachments** in the E-mail attachment of the article. Please do not imbed diagrams, figures, tables, graphs, and photographs in the body of the manuscript submitted.
   c) The labels/legends for any diagrams, figures, tables, graphs, and photographs must be in "print-ready" format. That is, they should require no modification or identification to place them with the correct diagram, figure, table, graph, or photograph. Please remember to appropriately label each photograph, graph, table, figure or diagram.

9. Use of headings and subheadings is recommended to enhance the reader' understanding of the subject matter. Please format headings as follows:

   MAIN HEADING
   Secondary Heading
   Tertiary heading
   Fourth heading

10. References **must** be in American Medical Association Manual of Style 10th ed. format.

TECHNOLOGY AND AGING: A CONTINUING EDUCATION MODULE FOR THE ACADEMY OF GERIATRIC PHYSICAL THERAPY

OVERVIEW

Physical therapists and physical therapist assistants who work with the aging adult population will encounter many patients who use or wish to use some form of technology. The physical therapy professionals working with the patients may need to understand and be able to assist these individuals in their desire to use a wide variety of technology in practice. This continuing education module includes information for physical therapy professionals regarding the various forms of technology that is available and of interest to their patients. Some of the technologies talked about in this issue are new, and in some cases, very unique. As such, many of the technologies are still using their trade name to identify the item or concept. Use of specific names and manufacturers is in no way an endorsement of the product by *GeriNotes* or the Academy of Geriatric Physical Therapy, but are provided to allow readers the opportunity to find out more about the options discussed. It should also be noted that all prices were correct at time of article submission.

MODULE CHAPTERS

I. Mobile Health in Older Adults: Benefits & Barriers

II. Assistive Technology Assessment for a Patient Post Stroke

III. Using Technology to Better the Life of Seniors

The last 3 articles found in this CE portion of *GeriNotes* were written by students in the gerontology class of the San Marcos campus DPT program, University of St. Augustine.

IV. The Development of Robotic Technology for the Growing Elder Population

V. Electronically Managed Medication Dispensing Systems

VI. Home Safety Systems: Webcams for the Elderly

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REFERENCE LIST

References can be found at the end of each chapter in the module.

OBJECTIVES

1. Identify the demand for increased technology use in the older adult population.
2. Describe some of the technologies that may be useful to older adults.
3. Be familiar with some ideas for the future of technology use in the older adult population.

CONTACT HOURS/CONTINUING EDUCATION UNITS

Completion of the CE Module is equivalent to 4 contact hours. This converts to .4 Continuing Education Units.

CONTINUING EDUCATION CERTIFICATE OF COMPLETION

A Continuing Education certificate will be provided to each participant after successful completion of the course requirements (post-test and module evaluation) and payment of a processing fee. The Geriatric Academy of Physical Therapists is a recognized component of the American Physical Therapy Association. The AGPT has not applied to any state licensure agency for prior approval of this course. The module has all the components (content, objectives, qualified instructors, reference lists, and post-test) that will allow participants to submit the certificate of completion to meet CE requirements in most chapters. Please seek individual approval for this course from the states of Texas, Ohio, Oklahoma, and Nevada.

HOW TO SUBMIT CEUs

To obtain CEUs for this continuing education unit, participants must complete the ONLINE post-test as well as the ONLINE evaluation form. A processing fee of $40.00 for Geriatric Academy members and $80.00 for non-members is required. To apply for CEUs, complete the post-test and the evaluation form to the online and provide payment online. Test and evaluation forms must be completed online no later than March 31, 2016. Upon submission of materials and a passing score of 80% or higher on the post-test, you will receive a continuing education certificate for .4 CEUs. Those who do not pass the first time will be notified via email and given the opportunity to re-take the exam.

Technology and Aging: A Continuing Education Unit Post-test

Instructions: To obtain CEUs for this continuing education unit, participants must complete the post-test as well as the evaluation form ONLINE. There is only ONE correct answer for each question. NOTE: This is to be performed ONLINE ONLY. The print form here is for your convenience. Please go to the link listed below to complete the post-test and the evaluation form. A written form of the examination questions is provided. However, please note that this must be completed online.

Access the online exam at:
http://www.GeriNotes.org/exams/

1. According to the article by Lee, which of the following statements is correct?
   a. Nearly 70% of all older adults now own some form of a mobile phone.
   b. It is anticipated by 2016, 60% of older adults will visit a smart phone store.
   c. Most older adults have difficulty adapting to changes in technology.
   d. Nearly 30% of all older adults now own some form of a mobile phone.

2. The Center for Disease Control (CDC) has provided what kind of smart phone application?
   a. An application providing information on where flu vaccinations were available.
   b. An application providing older adults with a method to monitor flu symptoms.
   c. Future applications from the CDC are planned but are not currently available.
   d. An application figuring the maximum heart rate based on age.

3. Which of the following is NOT a reason that older adults are limited in their use of computers:
   a. Limited income.
   b. Limited access.
   c. Limited participation in the workforce.
   d. Limited intelligence.

4. Which of the following is NOT generally what seniors that use technology will use it to do:
   a. Connecting with family by email.
   b. Making purchases online.
   c. Researching health and medical information.
   d. Playing games online.

5. Which of the following is NOT generally a reason for a senior to move to an alternate living arrangement:
   a. No support system.
   b. Ran out of money.
   c. Incontinence.
   d. Difficulties taking medications properly.

6. When a patient is exit seeking and wandering, which method is NOT an acceptable deterrent:
   a. Using a sign to distract such as STOP or DO NOT ENTER.
   b. Use of a talking mat to distract and give instruction to the wanderer.
   c. Using medication to sedate the patient.
   d. Using a mobile GPS system to alert the caregiver and track the patient whereabouts.

7. Which of the following issues is currently a primary limitation with robot technology designed to help transfer older clients?
   a. Low weight capacity.
   b. Inability to accurately communicate.
   c. Inability to lift from the floor.
   d. Decreased recognition of human emotions.

8. Wal-bot, RIBO, and Pepper are all examples of which type of technology?
   a. Robots designed to assist older adults.
   b. In home monitoring systems.
   c. Virtual reality programs for exercise.
   d. Nutritional apps for older adults.

9. Which of the following techniques is currently used by robots to assist ambulation in the older adult?
   a. Assessment of weight placed on the robot by the client.
   b. Assessment of height and weight of the client.
   c. Data input of level of assist required by the client.
   d. Medical diagnosis of the client.

10. Which of the following issues, to date, has not always been considered when designing robots to assist the older client?
   a. Social demographics.
   b. Financial issues.
   c. Co-morbidities.
   d. Psychosocial issues.

11. Which of the following technologies allows an individual to monitor an aging client in their home environment?
    a. Webcams.
    b. Fitbit.
    c. Luminosity.
    d. Magna ready.

12. Which of the following issues could be a potential problem for a person using a home monitoring system?
    a. The system fails to monitor food intake.
    b. The system may require the individual to wear a bracelet.
    c. Decrease in caregiver anxiety.
    d. Decrease in human interaction.

13. Which of the following issues is a primary concern when introducing webcam technology to the home environment of an older adult?
    a. Resistance by the older adult to the technology.
    b. Size and potential obstacle dangers of the webcam.
    c. Inability of the older adult to manage internet access.
    d. Availability of the technology for purchase.

14. Which of the following statistics represents the number of hospital admissions of seniors due to medication error?
    a. Ten percent.
    b. Twenty percent.
    c. Fifty percent.
    d. Eighty percent.

15. Which of the following statistics represents the number of older adults that are compliant with their medication management?
    a. Ten percent.
    b. Twenty percent.
    c. Fifty percent.
    d. Eighty percent.

16. Which of the following technologies has been demonstrated to change the balance of time spent on concerns and issues during nursing home health visits?
    a. Medication dispensers.
    b. Fitbit.
    c. Luminosity.
    d. Home monitoring system.

17. Which of the following concerns or issues has been demonstrated with relation to medication dispensers?
    a. Older clients do not like using the dispensers.
    b. Older clients indicated it was unreliable.
    c. Home nurses found them difficult to introduce.
    d. Frequency of missed doses decreased.

18. How was the Tentaculus system used in the case report?
    a. To provide support and reminders for activities for daily living.
    b. To provide electric mobility at low cost.
    c. To enhance the security and safety in the home.
    d. To provide training and assistance with driving.

19. How was the Television Assisted Prompting (TAP) system used in the case report?
    a. To assist in learning to use adaptive devices when cooking.
    b. To assist with performance of the home exercise program.
    c. To provide video games for the patient to play on television.
    d. To create a communication method between patient and family.

20. Why was the Trackball Edge Write used in the case report?
    a. It replaced the mouse on the patient's computer because it was more comfortable.
    b. It was used to assist the patient to write with a large ink pen adjusted with a track-ball.
    c. It improved the patient's ability to see the computer screen easily from a distance.
    d. It improved the patient's speed and accuracy of word prediction and sentence formation.

MOBILE HEALTH IN OLDER ADULTS: BENEFITS & BARRIERS

Daniel J. Lee, PT, DPT, GCS

BACKGROUND

By the year 2030, it is expected that 72 million US citizens will be over the age of 65.[1] Collectively known as "older adults," this population will now make up 20% of the total US population by 2030. A major concern is that health care providers will not be able to meet the demands of the aging nation.[2] Fortunately, we are also entering an age of digital interconnectivity, allowing more and more people to have access to health care in ways that were previously impossible. For example, managing a chronic wound would require frequent trips to the clinic. Now an individual could snap a picture of their wound, text it to the health care provider, and follow-up as appropriate. This concept of aging with technology is something that is being promoted and supported by the Center for Disease Control and Prevention (CDC) and American Association of Retired People (AARP). This paper focuses on mobile phones and its technological benefits, barriers to adoption, and use in the older adult population.

Nearly 70% of all older adults now own some form of a mobile phone.[3] Older adults are more likely to own a mobile phone then they are to own other technologies, like a desktop or laptop computer.[1] While traditional mobile devices allow for text messaging, taking photos, and making phone calls, a category of mobile phones called "smartphones" is rapidly gaining acceptance among older adults. In fact, older adults are one of the fastest growing adopters of smartphones and mobile health technology.[2] Smartphones allow all the features of a mobile phone, but also allows software to run, called apps, and an interactive touchscreen and rich multimedia environment. The interactive environment is a rich medium for a proliferating segment of the market, referred to as mobile health. As of 2012, 20% of smartphone owners have downloaded a mobile health app.[4] And over 39% of surveyed older adult smartphone users have used it to look up information about a health condition, making it the most commonly performed query.[5]

Mobile health is of increasing importance specifically to the older adult population. As the demographic shift occurs, we will embrace more and more older adults looking to age in place, which is stay healthy in their own homes. Complicating matters is the statistics that older adults manage at least one chronic medical disease or age-related condition, usually more.[2] Mismanagement of these conditions can lead to hospitalization and resultant inability to safely stay in their own homes. Potentially mitigating this factor is the increasingly ubiquitous nature of mobile devices and smartphones, and the surging number of older adults who choose to adopt this technology. Given current projected demographic trends, along with rapidly increasing rates of technological adoption, it is feasible to see mobile devices as a platform for health interventions that serves to both empower and support older adults as they age autonomously in place.

Benefits

The major benefit of utilizing mobile health is the ability to access health care information, reminders, instructions, results, and schedules anytime or anywhere. It allows an older adult to manage their health with improved self-efficacy and empowerment.[6] For example, the CDC released an app named FluView that allowed seniors to track the flu in their area as well as find areas where vaccinations are available.[7] Since older adults are a high risk population for developing complications related to the flu, users can now circumvent epidemic areas and quickly find available vaccination centers. In another instance, Stanford researchers provided seniors with loaner smartphones that included a health application. The result after 8 weeks was that the majority of the users reported increased health awareness, increased motivation, and 90% of the older adult participants did not find the mobile application difficult to use.[8]

There are a myriad of mobile health interventions geared at older adults in the past 10 years. In patients with dementia, the camera of their phone was set to take pictures every 5 minutes, producing a slideshow at the end that allowed the patient to review recent events.[9] Congestive heart failure, which affects a large number of older adults in the United States, was managed through mobile telemetry that provided healthcare practitioners with alerts if abnormal readings were detected. This system was found effective in reducing the length of hospitalizations associated with CHF when compared to those who did not participate in the intervention.[10] Patients with chronic obstructive pulmonary disease (COPD) have used mobile phones to improve their scores on functional measures, increase their physical activity level, and improve compliance, all of which are essential to seeing improved clinical outcomes in patients with COPD.[1]

Diabetic patients require strict management of their condition to remain in compliance with prescribed regimens. Several mobile interventions have focused on this issue of managing the complex nature of the disease, and from multiple angles. One study linked glucose meters to a mobile device and transmitted the results to a health care practitioner. The result was better hyperglycemic control and a lower H1C.[11] Another intervention used alerts to empower the patient to manage their condition. It was found that compliance with self care was improved and hyperglycemic events decreased as a result.[12]

Falls are a major cause of injury and accidental death in older adult populations. It is estimated that one-third of older adults fall, with an estimated $19 billion cost for non-fatal fall-related injuries.[13] One mobile intervention utilized the built in accelerometers and

compared them to stand alone sensors. The result was that the mobile phone accelerometers were found to be in agreement with standalone sensors, making the mobile phone a tool for fall detection.[14]

Current apps

Older adults have specific needs when it comes to managing their health. Medication scheduling and dosing, chronic disease management, and lifestyle modifications are all paramount to being successful again at home. Below is an introductory look at some currently available apps that are designed to aid older adults in managing their health. Some apps may be downloaded for free, other apps may require a fee.

Medication management can be one of the most challenging components of an older adult's regimen. Fifty percent of all older adults take on average 5 to 10 medications daily.[15] The schedule and administration of these medications can be difficult to manage for older adults, especially as the number of medications and dosage schedule becomes more complex and time dependent. Adherence to the proper dosing schedule can be critical to successful compliance with a prescribed regimen, and minimizes the nearly $100 billion annual hospitalization costs associated with medication noncompliance.[16] Medication management apps allow the patient or caregiver to track the timing, indications, provider specific notations, dosage, side effects, and potential poly-pharmaceutical interactions in an easy-to-use interface. It also logs the rate of consumption, refills, and triggers an alarm if a patient has missed a dosage. Since most smartphone users maintain their phones on them most of the time, it make accessing the complex regimen of pharmaceutical administration available at the touch of a button. Apps like RxMindMe, MyMedSchedule, and MyMeds are currently available on the marketplace for download.

LimbWISE, a novel prosthetic limb management app, was designed for an older adult lower limb prosthesis user. The app has a simple navigational interface with single menu design that guides users through problem solving their prosthetic socket fit. This app empowers users to solve problems on their own, while also referring them back to their care provider should a solution not be able to be met. The app has been designed from the ground up with an older adult user in mind, and currently undergoing usability and acceptability testing among users.

Preventative care is especially important when it comes to loss of senses. Since hearing loss afflicts older adults disproportionately more than other populations, a smartphone app has looked to address raising awareness of the consequences of hearing loss while promoting early intervention. EarTrumpet is an app that provides a self-administered hearing test to allow users to test their hearing and be able to easily interpret the results. The result was increased self efficacy among the app users, and increased satisfaction among those who then went on to receive hearing aids as a result.[6]

Tracking cardiovascular vital signs are critical to maintaining homeostasis when managing a cardiovascular disease, such as congestive heart failure or hypertension. Instant heart rate allows the user to measure their pulse by using the smartphones built in camera. Combine this with HeartWise Blood Pressure Tracker and you can track changes in your vital signs over time. The apps can alert you to potential dangerous situations if your vital signs fall out of the normal range.

Diet and exercise is a key component to lifestyle change and preventing decreased mobility. Motion Doctor is an app that has been developed by physical therapists for patients to use at home. It provides videos and documented education so that users can correctly perform the prescribed exercises at home. Combining this app with MyFitnessPal allows the user to track their diet and exercise habits over time, discovering potential harmful calorie deficits that could predispose the user to malnutrition.

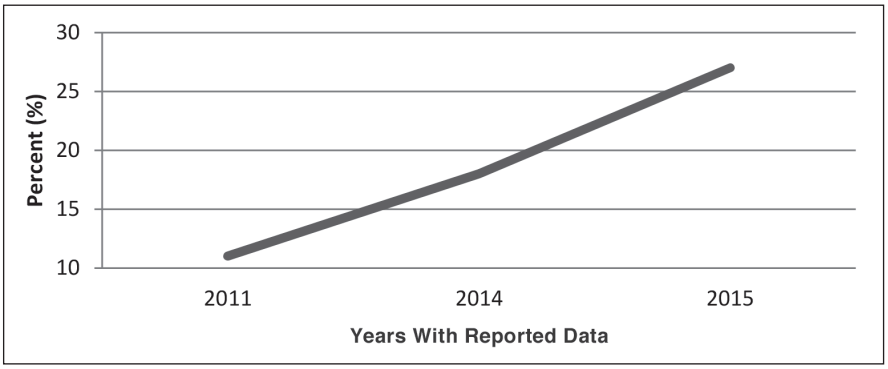
For emergency purposes, an app called Red Pain Button offers GPS, email, and text notifications to a preselected number of individuals chosen to be notified. The app is simple; one press of the button activates the alerts. In the case of an emergency, this beacon will provide those who can help you with your precise location in the event you are unable to call for help. This service is a modified version of the popular Life Alert service, except without the recurring fees.

Barriers

Mobile apps do face particular barriers to widespread acceptance, specifically in the older adult population. While 64% of older adults surveyed by Pew Research indicated they own a smartphone, in older adults the adoption rate is 27%. While significantly less than the general population, it should be noted that older adult smartphone adoption has increased drastically from 11% in 2011 and 18% in 2014. That is a 16% difference in only 4 years, and a 9% difference between 2014 and 2015 (see Figure 1).[5] The trend is expected to continue as the age-technology gap decreases as is evident by current trends.

The design of apps must consider the needs of an older adult. In a recent Pew survey, 40% of older adults reported difficulty in reading or participating in activities.[17] The remaining older adults may have normal physiological changes to their vision, dexterity, and cognition. Considering the relatively fixed size of the screens on mobile devices, developers of these apps must work within the hardware constraints to apply sound

Figure 1. Percentage of Older Adults Using a Smartphone



design methodology.[2] These design elements include making the manipulation screen predictable and compliant with reduced dexterity, high contrast color use, predictable placement of visual elements between screens, and avoiding the use of fast moving animations.[2] In general, larger fonts are preferred, and single level navigation with large buttons improves usability versus nested menus and animated icons. Interesting is the trade-off between larger sized devices and the willingness to keep the device on the user. While the larger screen offers more visual elements, it also becomes cumbersome for the patient, which results in decreased compliance with the device.[1]

Studies have shown that older adult users prefer metallic mechanical buttons to virtual buttons, and that confirming feel and sound of a button press assures the user of proper manipulation.[18] Since many phones and devices now have very few mechanical buttons, older adult users may have difficulty adjusting to the virtual buttons frequently used with touchscreen devices.

Another prominent barrier is the perceived benefits of new technology. Older adults remain divided among those who use the internet and see its advantages, and those who feel that they are not missing out on important information by not using the internet. Over 70% of respondents also mention requiring help to learn how to use technology.[17] Lim et al emphasized the need for education and training for individuals before implementation of a new intervention in the older adult population.[11] Since older adults are more risk adverse and tend to show more caution once an error is made, especially when using newer technology, this supports the need for a thorough training prior to implementation.[1] The training should be part of the standard care however, since older adults prefer not to burden others, therefore they may not ask for assistance or training.[18] Printed material remains the preferred choice for older adults when it comes to learning how to use a smartphone.[19]

Another consideration is the risk of misuse and user injury. The liability one assumes when designing an app is large, considering the ramifications of potential injury. Currently the FDA does not regulate medical apps, unless they require a peripheral, or an add on like a pulse oximeter or blood analyzer. As a result, it is not possible to currently determine which apps contain quality, correct information from those that could contain potential errors or omissions. While ratings and reviews are made public in the app marketplace, it can be cumbersome to work through the many subjective reviews. Currently, the Mobile App Rating Scale (MARS) has been validated for use in determining the quality of mobile health applications.[20]

Financial capabilities will also impact an older adult's ability to adopt mobile technologies. Besides the initial cost of a smartphone or device, subscribers must also pay data access fees that can cost between $50 and $150 a month.[5] Since many older adults remain on a fixed income, this financial hardship can pose a particular barrier to adoption.

Future

Based on current adoption levels of mobile apps, increasing numbers of smart device users, and global acceptance of health technology, the future of mobile apps in the older adult population will continue to proliferate. Mobile device manufacturers, service providers, and app developers are also aware of the trending demographic shift and a largely "untapped market." As a result, it is expected that mobile devices will be marketed directly towards the older adult population, with service plans that are reasonable for most budgets. It is also likely that app developers will continue to promote apps for the older adult population, designing such apps with the end user in mind and constructing such designs to accommodate the needs of the older adult.

With current health care trends demonstrating increased numbers of older adults choosing to stay at home, and declining numbers of enrollment at skilled nursing facilities, mobile health will serve to keep people healthier at home. As current barriers become less prominent, and market saturation increases in this population, we should see a shift away from traditional doctor-patient relationships to one that includes technology as tool in managing one's health.

REFERENCES

1. Joe J, Demiris G. Older adults and mobile phone for health: a review. *J Biomed Inform*. 2013;46(5):947-954.
2. Silva PA, Hlden K, Jordan P. Towards a list of heuristics to evaluate smartphone apps targeted at older adults: a study with apps that aim at promoting health and well-being. In: proceedings of the 2015 48th Hawaii International Conference on System Sciences; Jan 5-8, 2015; Kauai, HI.
3. Zickuhr K, Madden M. Older adults and internet use. Pew Research Center, June 2012. http://www.pewinternet.org/files/old-media/Files/Reports/2012/PIP_Older_adults_and_internet_use.pdf. Accessed September 21, 2015.
4. Pew Research Center, November 2012 Mobile Health 2012. http://pewinternet.org/reports/2012/mobile-health.aspx. Accessed September 21, 2015.
5. Pew Research Center, April 2015. U.S. Smartphone Use in 2015. http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/. Accessed September 21, 2015.
6. Amlani AM. Improving patient compliance to hearing healthcare services and treatment through self efficacy and smartphone applications. *Hearing Review*. 2015;21(2):16.
7. FluView Influenza-like Illness Activity Mobile Application. Center for Disease Control and Prevention. http://www.cdc.gov/flu/apps/fluview-mobile-app.html. Updated April 27th, 2015. Accessed July 18, 2015.
8. King AC, Hekler EB, Grieco LA, et al. Harnessing different motivational frames via mobile phones to promote daily physical activity and reduce sedentary behavior in aging adults. PLoS ONE. 2013;8(4):e62613.
9. De Leo G, Brivio E, Sautter SW. Supporting autobiographical memory in patients with Alzheimer's disease using smart phones. *Appl Neuropsychol*. 2011;18(1):69–76.
10. Scherr D, Kastner P, Kollmann A, et al. Effect of home-based telemonitoring using mobile phone technology on the outcome of heart

failure patients after an episode of acute decompensation: randomized controlled trial. *J Med Int Res*. 2009;11(3):e34.
11. Lim S, Kang SM, Shin H, et al. Improved glycemic control without hypoglycemia in elderly diabetic patients using the ubiquitous healthcare service, a new medical information system. *Diabetes Care*. 2011;34(2):308–313.
12. Durso SC, Wendel I, Letzt AM, Lefkowitz J, Kaseman DF, Seifert RF. Older adults using cellular telephones for diabetes management: a pilot study. *Medsurg Nurs*. 2003;12(5):313–317.
13. Stevens JA, Corso PS, Finkelstein EA, Miller TR. The cost of fatal and non-fatal falls among older adults. *Inj Prev.* 2006;12:290-295.
14. Lee RYW, Carlisle AJ. Detection of falls using accelerometers and mobile phone technology. *Age Ageing.* 2011;40(6):690–696.
15. Abdulraheem IS. Polypharmacy: a risk factor for geriatric syndrome. *Morbidity & Mortality*. 2013;Aging Sci 1: e103.
16. Dayer L, Heldenbrand S, Anderson P, Gubbins PO, Martin BC. Smartphone medication adherence apps: potential benefits to patients and providers. *J Am Pharm Assoc*. (2003)2013;53(2):172-181.
17. Pew Research Center, April 2014. Older Adults and Technology Use. http://www.pewinternet.org/2014/04/03/older-adults-and-technology-use/. Accessed September 21, 2015.
18. Akatsu H, Miki H. Usability research for the elderly people. *Oki Techn Rev*. 2004;71(199):54–57.
19. Mohadis HM, Ali NM. A Study of smartphone usage and barriers among the elderly. In: Proceedings of 2014 3rd International Conference on User Science and Engineering; September 2-5, 2014. Shah Alam, Selangor, Malaysia.
20. Stoyanov SR, Hides L, Kavanagh DJ, Zelenko O, Tjondronegoro D, Mani M. Mobile app rating scale: a new tool for assessing the quality of health mobile apps. *JMIR mHealth uHealth*. 2015;3(1):e27.

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USING TECHNOLOGY TO BETTER THE LIFE OF SENIORS

Patrice Antony, PT, GCS

INTRODUCTION

The population of seniors (people 65 and older) is exploding. It is estimated that the numbers of people over 65 in the United States will double between the years 2000 and 2040. About 28% of non-institutionalized older persons live alone. Older women outnumber older men. Thirty-five percent of these older women are widowed. Between 1980 and 2013, the centenarian population experienced a larger percentage increase than did the total population. In 2013, 0.15% of the total 65+ population was over 100 years old, which reflected more than doubling of that number since 1980.[1] Seniors are living longer and better than at any time in history. One would think that with the development of the personal computer some 30 years ago, that this growing population would benefit from the technological revolution. There still seems to be a "digital divide" between the young and the old when it comes to the use of computers and technology.

Older adults are assumed to be subject to limited access to computers and the internet. Some of this may be a result of limited income and limited participation in the workforce, which also results in, limited IT adaptation in the general population. Seniors with higher incomes and higher levels of education are more likely to be technology users. It is interesting that technology manufacturers seem to ignore the older population. Most devices are not designed for senior use: they employ small plugs, wires, keyboards, interfaces, and mouse/touch pads that are difficult for someone with limited dexterity, low vision, joint mobility, eye hand coordination, and reflexes - all common age-related debilitations.[8] Many seniors simply don't perceive the relevance of technology to themselves. Many feel the need to have someone "walk them through" the learning process to use a computer and are overwhelmed by the technology itself.

Despite this, a new study from the PEW Research Center in April 2014 found that more than half of older adults were internet users and 47% have

a high-speed connection at home. In addition, 77% of seniors have a cell phone. Internet and broadband use among seniors falls off at age 75. Of those seniors who are using the internet, 71% go online every day and an additional 11% go online 3 to 5 times per week.[9] These seniors see the value of the internet for accessing information that they may otherwise be missing.

The type of devices used varies from seniors to their younger counterparts. Of the older cellphone owners, only 18% have smart phones. Very few seniors use text messaging. Interestingly, seniors seem to like tablets and E-books more than smartphones with 27% ownership.[9] This may be because the device is bigger and easier to use for a less dexterous hand. Font sizes can be adjusted on a bigger screen to accommodate aging eyes.

One study polled seniors that use technology to see what they like to use it for. The number one reason was for connecting with family/friends primarily by e-mail, #2= obtaining health and medical information, #3=playing games online, #4=keeping up with news and current events, #5=banking and online money management, #6=researching products.[7] Very few seniors make online purchases with fear of identity theft as a prevalent concern. Only 46% of online seniors use social networking in any capacity despite the need for connecting with people being listed as a primary reason to be online.[9]

TECHNOLOGY CAN HELP

Seniors themselves may be reluctant to use technologies to better their lives, but their children sure get it. Without exception, seniors report that they would rather live at home than any other living arrangement. This can present real challenges as a senior's health or mental capacity starts to decline. There are several reasons that drive seniors or their caregivers to make a decision to move away from home.

1. **Incontinence**. When a senior can no longer control bowel and /or bladder activity, most families throw in the towel for managing this at home.
2. **Medication management**. Seniors that rely on taking medications several times per day often need to be with a caregiver that can oversee this. Polypharmacy is a huge issue among the elderly and a frequent cause for admission to a hospital. Families that are working have trouble ensuring that that their elderly loved one is taking medications properly and timely during working hours—especially if that loved one has memory loss, dementia, or just wants to pick and choose what medications to take.
3. **Exit seeking or alarming behaviors**. Dementia patients often have paranoia behaviors that result in their leaving the house "to go home" even when they are at home. Many insist on driving even though they don't know where they are going or how to get there. Their license may have expired years ago or it may have been suspended from poor driving habits.
4. **Personal hygiene neglect**. Many dementia patients have a resistance to bathing. Some are fearful of water in the face. Others are insistent that they "just took a shower" that may have been days ago. Some will not change clothes insisting that their clothes are clean even though they have been wearing the same thing for days. Some refuse to brush their teeth. Others have difficulties cleaning their private areas after using the toilet (limited range of motion), but refuse to let someone else help them.
5. **Falls.** Some patients don't have the capacity to retain instructions on a safe way to do things such as standing up with a walker, locking a wheelchair, etc. Unless they are carefully watched, they are at a high falls risk.
6. **Medically fragile**. Some patients require careful monitoring of their health status on a daily basis. This can include diabetic monitoring, congestive heart failure, failure to thrive, etc.
7. **No support system**. There are those patients who have no family and very few friends and neighbors that can assist them.

When these situations arise, families have to make tough decisions. Most would like to have their loved one move to an assisted living facility, but the costs may prohibit this. Many times patients flatly refuse to move, and have the capacity to make that decision. In those cases, there is some great technology or strategies that can help.

Simple Methods of Controlling Bathroom Behaviors:

1. **Labeling the bathroom as such**. Sometimes incontinence can be a result of simply not finding the bathroom. Having the door clearly labeled can help dementia clients recognize the room.
2. **Removing mirrors**. I had one dementia client that refused to use the bathroom because "that old woman keeps staring at me." She was seeing herself in the mirror. We covered the problem and had no further issues. Another client would not leave the bathroom. She was having long conversations with her mother in the mirror.
3. If **leaving water running** is an issue, there are water valves that screw onto sink and bath faucets that will turn the water off when the tub reaches a certain level or if someone walks away from the sink.
4. **Grab bars, toilet rails, hand-held showerheads, and shower benches** could make a bathroom safer. Sometimes resistance to bathing can be a fear of falling factor.
5. **Removing shower doors and replacing with shower curtains** can increase the shower space for functional use.
6. **Remodeling a bathroom to have a curbless shower** is also very helpful for getting a patient into the shower area when he/she is resistant to bathing.
7. **Make bath/shower time soothing.** Be sure everything that will be needed is in a convenient place. Get the water warm and the bathroom a little steamy to avoid chilling. Soothing music can help.

Medication Delivery Systems:

1. Some **pharmacies have the ability to dose pack medications** in a bubble packaging. This acts like a medication box, but the pharmacy does it. The only drawback is when there are short-term medications that needed to be added (like antibiotics) or when medications are discontinued. It works well for routine medications.
2. **Computerized medication boxes**. There are several of these on the market. I particularly like the **Tabsafe**© box as it can be loaded for up to 4x/day dosing for 32 days.

This minimizes box fills. The box is programmed to dosing, and calls out "it's time to take your medicine" when the time comes. The patient presses a blue button and the pills come out in a cup. This is great for people with memory loss that need meds delivered during the day when family is working. If a client misses a dose, the box is attached to a phone line, and a live monitor starts calling phone numbers of caregivers to follow up on the missed dose. The box has a 14-hour battery backup for power outages.

3. There are also **talking watches** for medication reminders.
4. There are **medication reminder phone applications**.
5. There are **live phone medication reminder services** that will make calls for a monthly subscription fee.

Wandering/Exit Seeking/ Alarming Behaviors:

1. There are some very **simple solutions for exit seeking**. Sometimes just putting a sign on the door that says DO NOT ENTER or STOP will stop people from going out the door. Putting a door cover that looks like a bookshelf (easily purchased online) on the back of the front door can camouflage the door so that it is not recognized as a door.
2. **Talking doormat**. There is a doormat that is hooked to a speaker. When someone steps on the mat, it can talk to the client saying, "Please step away from the door!" Some can have custom messages recorded such as, " I want to take that walk with you, dad. Can you wait in the living room for me?" Patients have a tendency to follow the instructions and get diverted.
3. They actually make **mobile GPS systems**. The patient wears the receiver and when they get out of range of the transmitter in the house, an alarm goes off with a monitor to show where the patient is. There are mobile versions of this where the caregiver wears a portable transmitter and the patient wears the receiver. This helps the caregiver track the patient in a mall for example.
4. There are **pressure mats** that can provide details to a caregiver. For example, if mom watches a game show every morning, the sensor can be located in her chair. If she fails to sit in the chair by the normal time, the caregiver is texted an alert. Similar mats can be used in front of a refrigerator to monitor if a patient has opened the fridge to get lunch. There are alarm mats for bed and chairs to warn a caregiver that a patient is trying to get up. I like the alarm mat that allows a custom message to be recorded instead of a loud noise. Most patients will follow directions from their caregiver such as "lay back down, mom. I'm coming to help you."
5. There are **simple strategies for prevention of leaving a burner on**. There are motion detectors that will automatically turn off the burner if no motion is detected in front of a stove for a set period of time. I have also used sprinkler timers that the appliance is plugged into that will only allow the appliance to work at certain times.

Fall Prevention:

1. Have a **PT assessment for home safety**. Even if you ARE a PT, you may have trouble seeing the house that you grew up in objectively. Simple furniture arrangement can make all the difference. If clutter is an issue, having a company that helps with organizing can really help get a file system going and junk/trash hauled away.
2. **Personal Emergency Response System**. These have gotten really sophisticated. The button that the patient wears can have an accelerometer in it that detects a fall regardless of whether or not the client pushes the button to report the fall. Families can put realtor lock boxes on the front door and register the code with their local EMTs. This way if the patient passes out and falls, the responders can get in easily.

Medical Monitoring:

1. **Tele monitoring.** Many home health agencies are implementing Telehealth monitoring. These systems have glucometers, sphygmomanometers, scales, pulse oximetry, pacemaker readings, and temperature readings that are transmitted through the phone line and interpreted by a nurse at the other end. This enables a patient to be at home and monitored for changing conditions that could send them back to the hospital.
2. **Skype evaluations.** It is possible to do a PT evaluation by Skype if there is a person on the receiving end to help direct the webcam. This is certainly not optimal, but may be an option for patients that are in hard to cover areas. Grown children can use this to keep an eye on mom from afar. I have used this to determine a level of care for a client out of state that is moving to be closer to their children.

Miscellaneous:

1. **Low vision.** Utilizing service organizations for the blind such as Lighthouse are invaluable. These services have training classes to teach technology to low vision patients and many will do home safety assessments to help determine which technology would be most helpful in individual situations. There are numerous tools such as amplifiers for TV watching and reading, phone applications, talking clocks and watches, etc. The public library offers books on tape with free delivery.
2. **Hard of hearing.** Hearing aides have become miniature computers. Miniature isn't always friendly to seniors, however. There are numerous specialized phones with caption reading. Most TVs offer close caption options. There are simple ways to baffle echoing sound in homes that have tile floors or hard wood floors.
3. **Video surveillance cameras in the house.** These are getting cheaper and easier to obtain. Strategically placed cameras allow a caregiver to log in by phone or computer and actually see what is going on in the house.

SUMMARY

In summary, the digital divide is bound to keep shrinking as veteran computer user's age. Facilities will need to make changes to meet the growing technology demands as baby boomers enter the senior market. Families will continue to seek the highest possible quality of life for the lowest cost for their elderly loved ones. You can be sure that technology will be at the center of that search.

RESOURCES

Drug reference for phones/computers
www.epocrates.com
Free app for phone / computer that provides a comprehensive drug reference list.

Personal Emergency Response systems
http://www.consumerreports.org/cro/2014/06/what-to-look-for-in-a-medical-alert-system/index.htm
Consumer reports comparison of various options.

Medication Management
http://www.tabsafe.com/
http://www.techforltc.org/producttype.aspx?id=2663,2511

TOP APPS FOR ORGANIZING YOUR MEDICAL RECORDS

iBlueButton

iBlueButton is a federal initiative that aims to make it easier for consumers to access their health records online. It began with veterans and Medicare and Medicaid recipients, but it now extends to the general public. The iBlueButton app allows you to securely access and exchange electronic health records, including x-ray images and reports, lab results and visit summaries, with health care providers—health care providers have access to the iBlueButton *Professional* version. There is also a veteran-specific version called iBlueButton *Veterans*.

You may also use iBlueButton to store health information such as medications, allergies, medical conditions, emergency contact information, and more. Blue Button records may be accessed and downloaded from the following portals: MyMedicare.gov, TRICARE online, Aetna, and RelayHealth. You can import and export files by e-mail as well as with cloud services such as Dropbox and apps such as Adobe PDF.

Cost: Free download, but additional charges may apply
Devices: Android and iOS

Track My Medical Records

The Track My Medical Records app is exactly what it sounds like, a handy, streamlined app that allows you to conveniently track your medical records, as well as those of your family members, and access them wherever you go. Data may be accessed offline, but it is backed up and stored on a cloud and transferred via encrypted connection for your security. As with other personal health record apps, you can keep a list of your immunizations, medical conditions, allergies, etc. You may also chart your blood pressure, blood sugar level and any other medical conditions you wish to track. Include a picture in the notes to match files with faces.

There is also a website that can be used to access information from your desktop and other non-Android devices: www.freehealthtrack.com.

Cost: Free
Device: Android (other devices via website)

Capzule PHR

The Capzule PHR app allows you to keep your health and medical records, and those of your entire family, on your device where you can securely store and access them without an internet connection. Features include pill reminders, glucose and blood pressure tracking, immunization and medication records, physician and insurance lists and more. Include photos with files to help caregivers and emergency personnel confirm they have the correct information for the correct person. A step up from free, it is more graphically pleasing than other apps in addition to being neatly organized and easy to use.

Back up your records on your computer or a cloud, depending on your preference. Information can also be electronically shared with family members and health care providers when you are connected to the internet. This app connects with Google Drive, Dropbox, Walgreens, and HealthVault.

Cost: $2.99
Devices: iOS

My Medical

Another comprehensive app that allows you to keep records for yourself, family members, and others in your care, My Medical can also work with your Mac calendars to remind you about doctor appointments, prescription refills, and more. You can also have reminders sent directly from your app.

You may look at the sticker price on My Medical and wonder why you might choose it over something free or low-cost. The answers are in the details of the function, design, and information. In addition to listing conditions, procedures, and drugs, you can get additional details about what they are, any side effects, etc. Medications are listed with photos, dosage information, side effects, frequency, and more, which can be helpful for caregivers. You can also include pictures of everyone whose records are kept in the app, which comes in handy should there be an emergency situation. As with the other apps listed above, you can track lab and test results using the app's charting feature, which allows you to use multiple graphs at once. It meets the industry standard Continuity of Care Record format, which makes it easy to transfer records from one system to another. For extra security, data is stored directly to your advice and not on a remote server.

Cost: $19.99 (free trial available)
Device: iOS
Please note that The IHC Group does not guarantee pricing, and the apps listed at time of publication are subject to change.

HELPFUL WEBSITES FOR SENIOR PRODUCTS

www.thiscaringhome.org
Consumer guide for senior products.

www.elderluxe.com
Products for caregivers of Alzheimer patients.

REFERENCES

1. *A Profile of Older Americans: 2014.* Administration on Aging, Administration for Community Living, U.S. Department of Health and Human Services.
2. Agarwal R, Animesh A, Prasad K. Social interactions and the 'digital divide:' explaining variations in internet use. *Inf Syst Res*. 2009;20(2):277-294.
3. Campbell RJ. Meeting seniors' information needs: using computer technology. *Home Health Care Manage Pract*. 2008;20(4):328-335.
4. Czaja SJ, Hiltz SR. Digital aids for an aging society. *Commun ACM*. 2005;48(10):43-44.
5. Eastman JK, Iyer R. The elderly's uses and attitudes toward using the internet. *J Consumer Marketing*. 2004;21(3):208-220.
6. Iyer R, Eastman JK. The elderly and their attitudes toward the internet: the impact of internet use, purchase, and comparison shopping. *J Marketing Theory Pract*. 2006;14(1):57-67.
7. McMurtrey M, Downey JP, Zeltman SM, McGaughey RE. Seniors

and technology: results from a field study. *J Comput Inf Syst*. Summer 2011:22-39.
8. McMurtrey ME, McGaughey RE, Downey JP. Seniors and information technology: are we shrinking the digital divide? *J Int Technol Inf Manage*. 2008;17(2):1-17.
9. Smith A. Older adults and technology use. Pew Research Center. April 3, 2014. www.pewinternet.org/2014/04/03/older-adults-and-technology-use/. Accessed September 22, 2015.

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CALL FOR NOMINATIONS

Academy of Geriatric Physical Therapy AWARDS 2016

Student Research Award
Recognize outstanding research-related activity completed by entry-level physical therapy students.

Clinical Educator Award
Recognize physical therapists or physical therapist assistants for outstanding work as a clinical educator in geriatrics health care setting.

Fellowship for Geriatric Research
Recognize physical therapists pursuing research in geriatrics which may be conducted as part of a formal academic program or a mentor ship.

Excellence in Geriatric Research Award
Honor research published in peer-reviewed journals based on clarity of writing, applicability of content to clinical geriatric physical therapy, and potential impact on both physical therapy and other disciplines.

Adopt-A-Doc Award
Recognize outstanding doctoral students committed to geriatric physical therapy, provide support to doctoral students interested in pursuing faculty positions in physical therapy education, and facilitate the completion of the doctoral degree.

Clinical Excellence In Geriatrics Award
Recognize a physical therapist for outstanding clinical practice in geriatric health care settings.

Distinguished Educator Award
Recognize an Academy of Geriatric Physical Therapy member for excellence in teaching.

Outstanding Physical Therapist Assistant Award
Recognize a physical therapist assistant who has significantly impacted physical therapy care in geriatric practice settings.

Lynn Phillippi Advocacy for Older Adults Award
Recognize projects or programs in clinical practice, educational, or administrative settings which provide strong models of effective advocacy for older adults by challenging and changing ageism.

Volunteers in Action Community Service Award
Recognize the exceptional contribution of a physical therapist or physical therapist assistant in community service for older adults.

Joan Mills Award
Presented to an Academy of Geriatric Physical Therapy member who has given outstanding service to the Academy.

Nominations are due November 15, 2015 and all awards will be presented at the Academy Membership Meeting at CSM in February of 2016.

For additional information on the criteria and selection process for academy awards, please visit the Academy of Geriatric Physical Therapy website at www.geriatricspt.org or contact the office by email at karen.curran@geriatricspt.org or by phone at 866/586-8247

THE DEVELOPMENT OF ROBOTIC TECHNOLOGY FOR THE GROWING ELDER POPULATION

Yvonne Huang

In the movie, Big Hero Six, there is a robot, Baymax, made by the main character's brother for medical assistance. He would react to human pain, injuries, and emotions and provide appropriate care. In addition, he could improve his knowledge and skills by other program systems. Interesting enough, it is not just something we see in the movies now. As senior populations continue to grow, throughout the world there are robots being used as medical assistants and home care assistants. Many robots are being researched regarding their ability to assist older adults, especially in Japan. Some of the robots that are being developed and applied in assisting the older population in homes and assisted living facilities include RoLa, Wal-Bot, NKR2, RIBA, Paro, and Pepper.

Taiwanese professor, Song, published an article in the *Science Development Journal* about the arrival of robotic generation and their interaction with humans.[1] He specifically mentioned that with the help of a robot, medical doctors can perform more surgeries by conserving their energy and increasing the surgery age limit.[1] He stated that the Intelligent System Control Integration Laboratory of the National Chiao Tung University of Taiwan (ISCI Lab) noticed the increasing growth of the older population and developed RoLa (Robot of Living Aid), a system using the Zigbee wireless sensor and WiFi connection between the robot and the sensor on the seniors to sense movements and act as location trackers.[1] RoLa is being developed to be used in the home setting to detect falling by monitoring body position and posture, provide services to seniors in need, and sending instant video footage to family and health care providers so the older adult can receive immediate and appropriate assistance.[1]

Another robot, Wal-Bot, was developed by the same group, the ISCI Lab.[2] It was specifically developed to prevent falls in older adults. There are handle bars on the robot that sense the amount of weight placed on them by the individual being assisted, to determine how much help the person needs and then helps them walk to their desired destination.[2] It can also sense obstacles and automatically redirect the person to move around the obstacles. In addition, the wheels are designed with different motor engine systems and multiple direction movements to apply appropriate resistance for various inclines and floor types.[2] There is also a GPS style program that provides the shortest travel distance once the person enters their destination.[2]

The Nan Kai University of Technology of Taiwan developed the NKR2 robot.[3] It was also developed specifically for the growing older population to provide monitoring of the elderly. Some of the features were invented after researching and identifying the limitations of the RoLa robot.[3] They found that medications play an important role in the health and welfare of the older adult; however many of them do not correctly use the medications due to various concerns including hearing and vision deficits, memory loss or deficiency, and not understanding doctors' directions.[3] The robot design incorporated a smart medication dispenser, and the NKR2 robot includes the voice/sound alert feature. Its functions include medication reminders, dispensing medications, movement recognition (monitoring the action of taking medications), emergency calls/reports, night light feature, obstacle warning, and communication.[3]

Japan has many robot developments specifically designed to be used in assisting the growing older population in their country. For example, RIBA was developed as a nurse robot to lift a person from one place to another whether in supine or sitting.[4] It is designed as a nursing assistant to help transfer and transport a patient so that nurses experience less physical stress although early models of the RIBA had a weight capacity of 135 lbs that limited its potential for lifting humans, but this has now been extended to 175 lbs and has an additional ability to lift people from floor level.[4,5] This weight capacity can be widely used in Japan due to their smaller average heights and weights.

A research team identified the problem of the growing older population in the United States, and decided to research and develop a personal service robot for elderly.[6] Their goal was to design a robot that can serve 5 primary functions, including cognitive prosthesis, safeguarding, systemic data collection, remote tele-medicine, and social interaction.[6] With the combination of hardware and software that can meet the functional goals of the robot, they developed the Flo robot.[6] After experimental trials with older adults, they are working on developing the second generation with enhanced functions including dialog and scripts commonly used in nursing homes to improve its interaction with people, touch sensor, and removable basket.[6] Research demonstrated that non-mobile devices are less effective in assisting the older adults and they believed that mobile robots will be well-suited to assist older adults particularly those with cognitive-impairements.[6]

One study researched the potential assistance that certain robots can perform for older adults.[7] They identified and researched 147 robots and compared their functions with different types of activities of daily living.[7] They found that due to age-related declines in physical, cognitive, and social issues, robots may have the capacity to provide support to the older population, especially desiring to maintain their independence.[7] They concluded however, that there will be challenges for future development because designers should take into consideration the type of assistance an older adult may need, what they would be willing to accept, the

interface component to provide voice command and communications, adaptation of the robot to the progression of long-term age-related conditions, and the robot's ability to learn new tasks along with the need for privacy control.[7]

At this time, there is limited popularity in today's society towards using mobile robots to provide service or assistance to older adults, especially in nursing homes or assistive living facilities. A literature review demonstrated that social demographic factors play an important role on the acceptance of assistive robots in elderly persons, a concept that few of the researchers took into consideration.[8] There are significantly more news, studies, and experiments on mobile assisting robots being done in Asian countries, such as Japan, Korea, and Taiwan. However, some studies have been done on social interactive effects of social robots. One study reviewed research on the benefits for the older adult with regard to social interaction using different types of social robots.[11] They found that many of the studies demonstrated positive reactions in older adults. They concluded that social interactive robots provided a positive effect by decreasing older adults loneliness, and increasing social connection.[11] Two research studies done by the same researchers also found the effectiveness of social robots in improving social interactions in the elderly population.[9,10] They found that the participants were less active when they turned off the robot, Paro.[9,10] Paro robot has been used in some assistive living facilities and nursing homes in Japan to interact and communicate with the residents. They have found that residents are more social and happy with the presence of Paro, especially in those residents with cognitive impairments.[12,13]

The most recently released robot designed to interact with people is the Pepper robot. Pepper can recognize human emotions, communicate and interact with people, sing, dance, tell jokes, and play games.[12,14-16] In Japan, Pepper has been brought to assistive living facilities and nursing homes to interact with older adults, and showed good outcomes for social interaction.[12] The designing company of Pepper is hoping that Pepper can be used as a social interaction tool with the residents in assisted living facilities and nursing homes, especially those with cognitive impairment to help decrease the physical and mental stress on health care providers.[12,13]

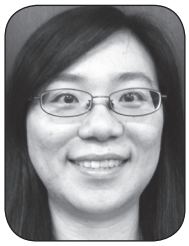
With the fast growing development and improvement of technologies, robots have been designed closer to meeting human needs. Many robots have been designed for use in the healthcare fields, especially in assisting the older adult at home, assisted living facilities, and nursing homes. Different types of functions are available, including ambulation, assisting with activities of daily living and home management, monitoring home safety and medication use, as well as social interaction. The goals for these robots are to take some of the physical load and work stress away from the health care professionals and take some of the stress off family members caring for older family members. Maybe not every older adult will accept the robots in assisting them with their activities of daily living, but can we as health care professionals consider using them as assistants to promote social interaction and decrease depression to promote healthier life? More research needs to be done to determine the best use of these robots in the treatment and assistance of the rapidly growing older population.

REFERENCES

Please note that references 1, 3, and 12 were originally in Japanese and were read and translated by the author.

1. Song KT. The Interaction of Robots and Human: The Arrival of Robotic Generation, Are You Ready to Interact With Them? Science Development. June 2009. http://ejournal.stpi.narl.org.tw/NSC_INDEX/Journal/EJ0001/9806/9806-08.pdf. Accessed April 9, 2015.
2. Tse YL, Huang YT. ISCI Lab Reaches a New Level for Service Robot. 2013. PanSci Corp. http://pansci.tw/archives/40360. Accessed April 10, 2015.
3. Chai CW, Wan SH. The Study of Lago NXT Controller: The Application of NXT in Assistive Living Care Robot Control System. Department of Electronics Engineering, Nan Kai University of Technology of Taiwan. CSMMT. November 2011. http://ee.nkut.edu.tw/files/writing_seminar/16/154_2bdf94a7.pdf. Accessed April 9, 2015.
4. Charova K, Schaeffer C, Garron L. *Computers and Robots: Decision-Makers in an Automated World – Robotic Nurses*. CS181 Course, Stanford University. 2011. http://cs.stanford.edu/people/eroberts/cs181/projects/2010-11/ComputersMakingDecisions/robotic-nurses/index.html. Accessed April 10, 2015.
5. Rinken. *RIBA-II, The Next Generation Care-Giving Robot: New Robot Boasts the Latest in Sensor Technology, Promises a Brighter Future for Japan's Elderly Population*. Rinken Press Release. August 2011. http://www.riken.jp/en/pr/press/2011/20110802_2/. Accessed April 9, 2015.
6. Roy N, Baltus G, Fox D, et al. *Towards Personal Service Robots for the Elderly*. Computer Science and Robotics, Carnegie Mellon University. http://www-preview.ri.cmu.edu/pub_files/pub2/roy_nicholas_2000_1/roy_nicholas_2000_1.pdf. Accessed April 9, 2015.
7. Smarr CA, Fausset CB,Rogers WA. *Understanding the Potential for Robot Assistance for Older Adults in The Home Environment: Technical Report HFA-TA-1102*. School of Psychology – Human Factors and Aging Laboratory, Georgia Institute of Technology, Atlanta, GA. https://smartech.gatech.edu/bitstream/handle/1853/39670/HFA-TR-1102-RobotSupportForHomeTasks.pdf. Accessed April 9, 2015.
8. Flandorfer P. Population aging and socially assistive robots for elderly persons: the importance of sociodemographic factors for user acceptance. *Int J Popul Res*. 2012. http://www.hindawi.com/journals/ijpr/2012/829835/. Accessed April 9, 2015.
9. Kidd CD, Taggart W, Turkle S. *A Sociable Robot to Encourage Social Interaction Among the Elderly*. MIT. http://www.mit.edu/~sturkle/ICRA_Paro.pdf. Accessed April 9, 2015.
10. Taggart W, Turkle S, Kidd CD. *An Interactive Robot in a Nursing Home: Preliminary Remarks. MIT*. http://web.media.mit.edu/~coryk/papers/Paro_AndroidScience05.pdf. Accessed April 9, 2015.

11. Broekens J, Heerink M, Rosendal H. Assistive social robots in elderly care: a review. *Gerontechnology*. 2009;8(2):94-103.
12. Huang GG. Japanese Home-Used Robot is The Great Helper of Caring the Elderly. China Times. 2015. http://www.chinatimes.com/newspapers/20150301000327-260108. Accessed April 9, 2015.
13. Vincent J. *Japanese 'Robot With A Heart' Will Care for the Elderly and Children*. Independent. 2014. http://www.independent.co.uk/lifestyle/gadgets-and-tech/japanese-robot-with-a-heart-will-care-for-the-elderly-and-children-9491819.html. Accessed April 9, 2015.
14. The Aldebaran. Pepper. SoftBank Group. https://www.aldebaran.com/en/a-robots/who-is-pepper. Accessed April 9, 2015.
15. CBC News. Pepper, robot that can read emotions, unveiled in Japan: Pepper has voice recognition, two dozen sensors. CBC News. 2014. http://www.cbc.ca/news/technology/pepper-robot-that-can-read-emotions-unveiled-in-japan-1.2665845. Accessed April 9, 2015.
16. Goss D. *Meet Pepper, The Emotional Robot*. CNN. 2014. http://www.cnn.com/2014/06/06/tech/innovation/pepper-robot-emotions/. Accessed April 9, 2015.
17. Edwards C. Home help: how robots could provide a solution to the problems faced by the increasing number of elderly people. Newelectronics – Technology Watched Assistive Living. November 2013. http://www.newelectronics.co.uk/article-images/57929/P18-21.pdf. Accessed April 9, 2015.



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HOME SAFETY SYSTEMS: WEBCAMS FOR THE ELDERLY

Michael Traficante

There are many different types of home safety systems targeted for the elderly population. These home safety systems range in the type of service they provide as well as their cost. The focus of this discussion will be on web cameras and the service they provide. We will look at the purpose, availability, and the average price of web cameras.

Web cameras (webcams) are video cameras that are connected to the internet and allow users to view still or moving images on their computer monitor or a smart phone. Webcams have become extremely popular for home security and are a growing trend in "adult children" (young adults typically in their 30s-40s who purchase technological advanced gadgets). They are using this technology to remotely monitor their aging parents in the privacy of their home. They are able to remotely monitor the well-being of their parents via a computer, cell phone, or "smart device" while they are at work, out shopping, or if they do not live with or near the parent. Remote monitoring allows for day or night, 24 hours 7 days a week monitoring. Currently, a wide range of home monitoring technologies are being developed that can automatically monitor vital signs, detection of drug intake, and monitor physiological exercises. The 3D webcams are being studied to detect falls by monitoring inactivity and body orientation within a room. Currently, most webcams are used for monitoring the care of an elderly person in their private home, nursing homes, assisted living, or day care facilities. One research project known as the CareMedia project set out to gather data regarding the Quality-of-Care, Quality-of-Life, existing abuse or neglect, and protection from malpractice or wrongful allegations by using webcams in nursing homes.

The New York Times has written about new technology that makes it possible for "adult children" to monitor daily habits of their aging parents.[1] In this article, most aging parents are unwilling to have webcams in their home, but have agreed with their children to use sensor tracking devices installed into their electronics and other home equipment that tracks the parents' daily actions such as opening the refrigerator door or medicine cabinet, and weight and blood pressure measurements. All the data is sent through the internet to the adult caring for the individual and includes the benefit of a time stamp. "The purpose is to provide enough supervision to make it possible for elderly people to stay in their homes rather than move to an assisted-living facility or nursing home."[1] Nancy K. Schlossberg, a counseling psychologist, suggests the key is to ask the parents if this is some-

thing they want or is it something that needs to be negotiated. Otherwise, it can be extremely offensive to the parent. This will help keep the child-parent relationship co-equal and less destructive. Ultimately, the parents must decide if this is something they want and if they can live with the monitoring devices in their home.

My mom is a person who could not afford to send her 89-year-old mother to an assisted living facility. My mom worked full-time as a receptionist in addition to caring for her mother on a full-time basis. After much research, my mom decided to have webcams installed throughout her home to keep an eye on my grandmother while she was away from home. My mom works in front of a computer throughout most of the day, so it was easy for her to keep track of what my grandmother was doing on a daily basis. One day while my mom was at work, she looked at her computer screen and saw her mother had fallen and was not able to get up. My mom was able to call the paramedics and meet them at her home. My grandmother was rushed to the hospital immediately, she suffered some scrapes and bruises and was sent home after a couple of days at the hospital. According to the Centers for Disease Control and Prevention, falls are the leading cause of both fatal and nonfatal injuries among older adults.[2] The point is if it had not been for the web cameras in her home; my grandmother may have laid hurt on the floor for hours before help arrived and could have sustained increased medical issues.

Webcams are widely available at any hardware or electronics store. The price of webcams are based on the clarity of images, and the visual range or distance that is measured in feet. In most cases, more than one camera will have to be purchased. On average, a minimum of 4 cameras will be needed to cover a home adequately and will cost a total of $500 to $1,000.[3] Installation is a separate fee ranging from $600 to $1,800,[3] and there is also a monthly internet fee of $20 per month. The total initial cost is estimated around $1,200 to $2,500 with a minimal $20 internet fee per month thereafter. The average cost of an assisted living facility in California for example is $3,341 per month.[4] The average cost in the United States for adult day care is $64 per day.[5] By comparison, the installation of webcams is a far less long-term expense than an assisted living facility or adult day care center. Webcams are an excellent price option for parents who do not need extensive care and are best suited for family members who have continuous access to the internet and a viewing screen.

As previously mentioned, the parent must agree to have cameras monitoring their daily activities. If the parent agrees and it suits the family's needs, webcams may be the best alternative to remotely monitoring an older adult population, while keeping them in the luxury of their own home. Webcams are more cost effective for a family who cannot afford full-time adult day care or an assisted living facility. Again webcams cannot solve all problems that older adults and the adults caring for them face, but it can help save or prolong the life of a beloved family member through its instant access and live screening availability.

REFERENCES

1. Stout H. Technologies help adult children monitor aging parents. *New York Times.* July 28, 2010. http://www.nytimes.com/2010/07/29/garden/29parents.html?_r=0. Accessed September 22, 2010.
2. Centers for Disease Control and Prevention. Older Adult Falls: Get the Facts. *Centers for Disease Control and Prevention*. July 1, 2015. http://www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html. Accessed September 22, 2015.
3. CostHelper. How much does a home security camera cost? http://home.costhelper.com/home-security-camera.html. Accessed September 22, 2015.
4. Assisted Living. What is the cost of assisted living? http://www.assistedliving.com/assisted-living-costs/. Accessed September 22, 2015.
5. HelpGuide.org. Adult *day care services: finding the best center for your needs*. http://www.helpguide.org/articles/caregiving/adult-day-care-services.htm. Accessed September 22, 2015.
6. Your Dictionary. Webcam Dictionary Definition | Webcam Defined." http://www.yourdictionary.com/webcam. Accessed September 22, 2015.
7. Jansen B, Deklerck R. Home monitoring of elderly people with 3D camera technology. *Biomedicine.* 2000:37-44.
8. Bharucha AJ, London AJ, Barnard D, Wactlar H, Dew MA, Reynolds CF 3rd. Ethical considerations in the conduct of electronic surveillance research. *J Law Med Ethics.* 2006;34(3):611-619, 482.

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ELECTRONICALLY MANAGED MEDICATION DISPENSING SYSTEMS

Kayleigh Marsolini

"The average elderly person uses four to five prescription drugs and two OTC drugs and fills 12-17 prescriptions per year."[1] There are many times during the course of that year that medications could be confused and doses could be missed or doubled. Elderly who are free from cognitive impairments can make mistakes with taking their many pills, and even more worrisome, are the elderly who do have cognitive impairments and are prescribed multiple medications. "One in ten hospital admissions for seniors are a result of medication errors."[2] There are several helpful solutions for individuals who struggle with proper medication and pill consumption such as weekly or monthly pill organizers, automatic pill dispensers, and locked pill dispensers with alert systems. Medication dispensers can help elderly people who have trouble remembering to take their medications, have multiple medications and regimens, have cognitive impairments, or have a history of medication misuse.

The Phillips Medication Dispensing service is one option for elderly individuals and costs $49 per month.[2] The service starts loading the medications into the individual cups in the dispenser, then the medication schedule is given to the company who supplied the medication dispenser, and they then program the dispenser. When the pill reminder signals, the medication due at that time will dispense. If the individual misses the medication dose, the service will call the registered user and/or family member to alert them. The dispenser holds up to 6 doses per day, has 60 individual dosing cups, and offers an option for early-dose if the individual has to leave the house during the time their medication would need to be taken.[2] MedMinder is another company that offers medication dispensing services ranging in price from $39.99/month to $64.99/month. They have machines with locking mechanisms, medical alerting, and flexible programming. If an individual wanting a medication dispenser cannot afford the services above and has family to assist them in loading pills and setting the device, then they can simply purchase an automatic medication dispenser for a $64 to $80 one-time fee. Simple, non-automatic pill boxes are relatively inexpensive and easily found at local pharmacies for elderly without cognitive impairments who want an easy way to organize daily medications.

There is a significant amount of research being conducted to assess the need and efficiency of medication dispensers for elderly prescription compliance. "Lack of compliance with prescribed medication regimens is a well-known and well-documented problem among elderly individuals. Non-compliance results in decreased quality of life, increased health care costs related to acute and long-term care admission, and the need to enhance home care support."[3] A solution has to be found that will allow the older individual to be successful with medication management. Hayes, McDonald, Garg, and Montague note only 50% of older adults adhere to medication treatment.[3] This is of significant concern due to the potential for adverse drug reactions and overdosing.

In a study where patients were given the medication dispensers, home health nurse notes reflected home visit time was spent on other issues in the nursing plan rather than medication compliance and the frequency of missed doses decreased steadily the longer the patients used the medication dispensers.[3] Not only are the nurses seeing results in improved compliance but the patients like the automatic pill dispensers with reminders. Ninety-eight elderly participants completed a study using medication dispensers, 94% of them rated the dispenser very easy to use and 95% said it was very reliable. These patients were taking an average of 11.5 medications per day and had an average of 7 medical diagnoses including diabetes, depression, chronic obstructive pulmonary disease, dementia, and heart disease.[4] Even though increased compliance and successful medication use has been noted with electronic dispensers, there are still improvements to be made. Future research and development of improved medication dispensers is in progress. The objectives of the improved medication dispensers include creating a safer dispenser, implementing a smart medical container capable of including the dosing and directions alongside the drug, minimizing user input to setup, permitting only correct user to receive medication, and monitoring the devices via network interface.[5] There is hope that even with these improvements, the cost of these devices will be kept reasonable for elderly individuals needing the device but who are on fixed incomes. Currently, Medicare does not cover these devices unless the individual has significant dementia and the physician is requesting its use. The goal for these electronic devices is for everyone who needs assistance with medication dispersal to be able to have access to the appropriate machine for their needs.

REFERENCES

1. HSC 5-800-002 Gerontology. Course notes. University of St. Augustine. June 13, 2015.
2. Philips Medication Dispensing Service. 2015. http://www.managemypills.com/content/. Accessed September 23, 2015.
3. Buckwalter KC, Wakefield BJ, Hanna B, Lehmann J. New technology for medication adherence: Electronically managed medication dispensing system. *J Gerontol Nurs.* 2004;30(7):5-8.

(Continued on page 29)

Symptomatic neurogenic orthostatic hypotension (NOH) is caused by disorders such as primary autonomic failure (Parkinson's disease [PD], multiple system atrophy [MSA], and pure autonomic failure [PAF]), which can be associated with norepinephrine deficiency.[1,2]

A (neuro) logical approach

NORTHERA™ (droxidopa) is a norepinephrine prodrug[3] and is the first medication approved for the treatment of orthostatic dizziness, lightheadedness, or the "feeling that you are about to black out" in adult patients with symptomatic NOH caused by primary autonomic failure (PD, MSA, and PAF), dopamine beta-hydroxylase deficiency, and non-diabetic autonomic neuropathy. Effectiveness beyond 2 weeks of treatment has not been demonstrated. The continued effectiveness of NORTHERA should be assessed periodically.

Northera™
(droxidopa) capsules
100 mg • 200 mg • 300 mg

IMPORTANT SAFETY INFORMATION

WARNING: SUPINE HYPERTENSION

Monitor supine blood pressure prior to and during treatment and more frequently when increasing doses. Elevating the head of the bed lessens the risk of supine hypertension, and blood pressure should be measured in this position. If supine hypertension cannot be managed by elevation of the head of the bed, reduce or discontinue NORTHERA.

CONTRAINDICATIONS

- None.

WARNINGS AND PRECAUTIONS

- **Supine Hypertension:** NORTHERA therapy may cause or exacerbate supine hypertension in patients with NOH, which may increase cardiovascular risk if not well-managed.
- **Hyperpyrexia and Confusion:** Postmarketing cases of a symptom complex resembling neuroleptic malignant syndrome (NMS) have been reported in Japan with NORTHERA use. Observe patients carefully when the dosage of NORTHERA is changed or when concomitant levodopa is reduced abruptly or discontinued, especially if the patient is receiving neuroleptics. NMS is an uncommon but life-threatening syndrome characterized by fever or hyperthermia, muscle rigidity, involuntary movements, altered consciousness, and mental status changes. The early diagnosis of this condition is important for the appropriate management of these patients.
- **Ischemic Heart Disease, Arrhythmias, and Congestive Heart Failure:** NORTHERA therapy may exacerbate symptoms in patients with existing ischemic heart disease, arrhythmias, and congestive heart failure.
- **Allergic Reactions:** This product contains FD&C Yellow No. 5 (tartrazine) which may cause allergic-type reactions (including bronchial asthma) in certain susceptible persons. Although the overall incidence of FD&C Yellow No. 5 (tartrazine) sensitivity in the general population is low, it is frequently seen in patients who also have aspirin hypersensitivity.

ADVERSE REACTIONS

- The most common adverse reactions (greater than 5%) were headache, dizziness, nausea, hypertension, and fatigue.

DRUG INTERACTIONS

- Administering NORTHERA in combination with other agents that increase blood pressure (e.g., norepinephrine, ephedrine, midodrine, and triptans) would be expected to increase the risk for supine hypertension. Dopa-decarboxylase inhibitors may require dose adjustments for NORTHERA.

USE IN SPECIFIC POPULATIONS

- Clinical experience with NORTHERA in patients with severe renal function impairment (GFR less than 30 mL/min) is limited. There are no adequate and well-controlled trials of NORTHERA in pregnant women. Women who are nursing should choose nursing or NORTHERA. The safety and effectiveness of NORTHERA in pediatric patients have not been established. No overall differences in safety or effectiveness were observed between subjects aged 75 years and older and younger subjects in clinical trials, but greater sensitivity of some older individuals cannot be ruled out.

Visit NORTHERA.com to download a treatment form, or call the NORTHERA Support Center toll-free at 844-601-0101

Please see the Brief Summary on the following page and the full Prescribing Information, including Boxed Warning, at www.NORTHERA.com.

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DRX-B-00012(1) 03/2015
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References: 1. Goldstein DS, Sharabi Y. Neurogenic orthostatic hypotension: a pathophysiological approach. *Circulation.* 2009;119(1):139-146. **2.** Goldstein DS, Pechnik S, Holmes C, et al. Association between supine hypertension and orthostatic hypotension in autonomic failure. *Hypertension.* 2003;42(2):136-142. **3.** NORTHERA [package insert]. Deerfield, IL: Lundbeck.

NORTHERA™ (droxidopa) capsules, for oral use

Brief Summary of Prescribing Information

(See package insert for full Prescribing Information or visit www.Northera.com)

Rx Only

WARNING: SUPINE HYPERTENSION

Monitor supine blood pressure prior to and during treatment and more frequently when increasing doses. Elevating the head of the bed lessens the risk of supine hypertension, and blood pressure should be measured in this position. If supine hypertension cannot be managed by elevation of the head of the bed, reduce or discontinue NORTHERA *[see Warnings and Precautions]*.

INDICATIONS AND USAGE – NORTHERA is indicated for the treatment of orthostatic dizziness, lightheadedness, or the "feeling that you are about to black out" in adult patients with symptomatic neurogenic orthostatic hypotension (NOH) caused by primary autonomic failure [Parkinson's disease (PD), multiple system atrophy, and pure autonomic failure], dopamine beta-hydroxylase deficiency, and non-diabetic autonomic neuropathy. Effectiveness beyond 2 weeks of treatment has not been established. The continued effectiveness of NORTHERA should be assessed periodically.

CONTRAINDICATIONS – None.

WARNINGS AND PRECAUTIONS – Supine Hypertension: NORTHERA therapy may cause or exacerbate supine hypertension in patients with NOH. Patients should be advised to elevate the head of the bed when resting or sleeping. Monitor blood pressure, both in the supine position and in the recommended head-elevated sleeping position. Reduce or discontinue NORTHERA if supine hypertension persists. If supine hypertension is not well-managed, NORTHERA may increase the risk of cardiovascular events. **Hyperpyrexia and Confusion:** Post-marketing cases of a symptom complex resembling neuroleptic malignant syndrome (NMS) have been reported with NORTHERA use during post-marketing surveillance in Japan. Observe patients carefully when the dosage of NORTHERA is changed or when concomitant levodopa is reduced abruptly or discontinued, especially if the patient is receiving neuroleptics. NMS is an uncommon but life-threatening syndrome characterized by fever or hyperthermia, muscle rigidity, involuntary movements, altered consciousness, and mental status changes. The early diagnosis of this condition is important for the appropriate management of these patients. **Ischemic Heart Disease, Arrhythmias, and Congestive Heart Failure:** NORTHERA may exacerbate existing ischemic heart disease, arrhythmias, and congestive heart failure. Careful consideration should be given to this potential risk prior to initiating therapy in patients with these conditions. **Allergic Reactions:** This product contains FD&C Yellow No. 5 (tartrazine) which may cause allergic-type reactions (including bronchial asthma) in certain susceptible persons. Although the overall incidence of FD&C Yellow No. 5 (tartrazine) sensitivity in the general population is low, it is frequently seen in patients who also have aspirin hypersensitivity.

ADVERSE REACTIONS – Clinical Trials Experience: Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice. The safety evaluation of NORTHERA is based on two placebo-controlled studies 1 to 2 weeks in duration (Studies 301 and 302), one 8-week placebo-controlled study (Study 306), and two long-term, open-label extension studies (Studies 303 and 304). In the placebo-controlled studies, a total of 485 patients with Parkinson's disease, multiple system atrophy, pure autonomic failure, dopamine beta-hydroxylase deficiency, or non-diabetic autonomic neuropathy were randomized and treated, 245 with NORTHERA and 240 with placebo *[see Clinical Studies]*. ***Placebo-Controlled Experience:*** The most commonly observed adverse reactions (those occurring at an incidence of greater than 5% in the NORTHERA group and with at least a 3% greater incidence in the NORTHERA group than in the placebo group) in NORTHERA-treated patients during the three placebo-controlled trials were headache, dizziness, nausea, hypertension. The most common adverse reactions leading to discontinuation from NORTHERA were hypertension or increased blood pressure and nausea.

Table 1. Most Common Adverse Reactions Occurring More Frequently in the NORTHERA Group

	Study 301 and Study 302 (1 to 2 Weeks Randomized Treatment)		Study 306 (8 to 10 Weeks Randomized Treatment)	
	Placebo (N=132) n (%)	NORTHERA (N=131) n (%)	Placebo (N=108) n (%)	NORTHERA (N=114) n (%)
Headache	4 (3.0)	8 (6.1)	8 (7.4)	15 (13.2)
Dizziness	2 (1.5)	5 (3.8)	5 (4.6)	11 (9.6)
Nausea	2 (1.5)	2 (1.5)	5 (4.6)	10 (8.8)
Hypertension	0	2 (1.5)	1 (0.9)	8 (7.0)

Note: n=number of patients. Table displays adverse reactions that were reported in greater than 5% of patients in the NORTHERA group and with at least a 3% greater incidence in the NORTHERA group than in the placebo group.

Long-Term, Open-Label Trials with NORTHERA: In the long-term, open-label extension studies, a total of 422 patients, mean age 65 years, were treated with NORTHERA for a mean total exposure of approximately one year. The commonly reported adverse events were falls (24%), urinary tract infections (15%), headache (13%), syncope (13%), and dizziness (10%).

DRUG INTERACTIONS – Drugs that Increase Blood Pressure: Administering NORTHERA in combination with other agents that increase blood pressure (e.g., norepinephrine, ephedrine, midodrine, and triptans) would be expected to increase the risk for supine hypertension. **Parkinson's Medications:** Dopa-decarboxylase inhibitors may require dose adjustments for NORTHERA.

USE IN SPECIFIC POPULATIONS – Pregnancy: ***Pregnancy Category C:*** There are no adequate and well-controlled trials in pregnant women. Following consecutive oral administration at doses of 60, 200, and 600 mg/kg/day to pregnant Sprague Dawley rats, increased incidences of lower body weight and occurrence of undulant rib were noted in fetuses, but they were slight and spontaneously reversed after birth. Based on dose per unit body surface area, these three doses correspond to approximately 0.3, 1, and 3 times, respectively, the maximum recommended total daily dose of 1,800 mg in a 60 kg patient. Shortening of the gestation period was observed in rats at 600 mg/kg/day. Low incidences of renal lesions (cysts, indentations, or renal pelvic dilation) were observed on the surface of the kidneys of female rats treated with droxidopa during the period of fetal organogenesis. No other potentially teratogenic effects have been observed in rats or rabbits. **Nursing Mothers:** Choose nursing or NORTHERA. In rats, droxidopa is excreted in breast milk, and when the drug was administered to the nursing dams during the period of lactation, reduced weight gain and reduced survival were observed in the offspring. **Pediatric Use:** The safety and effectiveness of NORTHERA in pediatric patients have not been established. **Geriatric Use:** A total of 197 patients with symptomatic NOH aged 75 years or above were included in the NORTHERA clinical program. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. **Patients with Renal Impairment:** NORTHERA and its metabolites are primarily cleared renally. Patients with mild or moderate renal impairment (GFR greater than 30 mL/min) were included in clinical trials and did not have a higher frequency of adverse reactions. Clinical experience with NORTHERA in patients with severe renal function impairment (GFR less than 30 mL/min) is limited.

OVERDOSAGE – Symptoms: There was one case of overdose reported during post-marketing surveillance in Japan. The patient ingested 7,700 mg of NORTHERA and experienced a hypertensive crisis that resolved promptly with treatment. **Treatment:** There is no known antidote for NORTHERA overdosage. In case of an overdose that may result in an excessively high blood pressure, discontinue NORTHERA and treat with appropriate symptomatic and supportive therapy. Counsel patients to remain in a standing or seated position until their blood pressure drops below an acceptable limit.

Manufactured for: Lundbeck
Deerfield, IL 60015, U.S.A.

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DRX-L-00003 August 2014

ASSISTIVE TECHNOLOGY ASSESSMENT FOR A PATIENT POST STROKE

Dayle Armstrong, PT, MS, DPT; Rhonda Felder, PhD, MPT, SCS

INTRODUCTION

Assistive technologies enhance the well-being of people with disabilities as accessibility and the ability to participate in one's community is facilitated. Older adults are a special population with unique considerations in the implementation of assistive technologies. Assessment, matching, and outcome evaluation are of particular importance as this population is more apt to change functional capabilities through aging in a more impactful way than middle-aged adults. Caregiver considerations will impact technology choice as well in these populations. It stands to reason that reducing the burden of care via an assistive technology would be advantageous for the caregiver. Indeed, the definition of "client-centered" may need to expand to include caregiver, client, and any family member involved in the life of the person with disability.

The following is an assistive technology assessment (ATA) on a hypothetical geriatric patient. The aim of this case study is to demonstrate the process by which a thorough ATA supports a client-centered approach to meeting the needs of the patient and caregiver in reducing the impact of disability.

CASE BACKGROUND

Name: John D.

DOB: 6-20-32

Age: 83 years

Date of Assessment: 6-20-15

Diagnosis: Stroke with right hemiparesis with speech and language deficits due to late effect cerebrovascular disease.

Secondary DX: Depression

Referring Physician: Jason Ford, M.D.

Primary Care: Jessica Jones, M.D.

Psychiatrist: Lydia Duran, D.O.

Medications: Zetia for high cholesterol, Adderall for BP, Aggrenox for blood thinner, and Citalopram for depression.

History of Present Condition: John D. is s/p stroke with right hemiparesis on 1-20-15. His wife, Mary noted slurred speech with John complaining of headache and dizziness at 1:00 p.m. on that Tuesday. 911 was called and John was unconscious by the time the ambulance arrived. He was taken to Huntington Memorial Hospital in Riverside, California. Once stabilized, John was transferred to ICU where he remained for 14 days. He was then transferred to the Neuro-Acute Unit where he received OT, PT, and speech therapies. After 2 weeks in acute care, John was transferred to Greenville Rehabilitation Hospital where he received intensive therapy along with neuropsychology for the last 4 months. John presents today for a discharge PT assessment in preparation for his return to home.

Past Medical Hx: High BP and high cholesterol, left MCL repair age 19, right cataract sx 3 years ago.

MRI: Vascular lesions of left middle cerebral artery. Structures involved included somatic motor area, Broca's area, parieto occipital cortex, parietal lobe, optic radiation deep to second temporal convolution, frontal contraversive field, upper portion of posterior limb of internal capsule and premotor cortex.

Social History: John D is a retired accountant. He lives with his wife Mary in a single story home in Banning, California. John enjoyed walking through the surrounding corn fields prior to the stroke. They have 3 grown children living within a 10 mile radius. John and Mary are active members of the First Baptist Church in Banning. They attended classes at the city senior center 2x/wk. They also enjoyed visiting their 9 grandchildren and attended many of their sports and school events. John and Mary have many friends and enjoyed regular get-togethers for meals and games 2x/month.

World Health Organization (WHO), and World Bank (2011). World Report on Disability. Geneva, Switzerland.

PHYSCIAL THERAPY ASSESSMENT

Range of Motion: Within normal limits except:
- (R) Hip IR = 0-20°
- (R) Ankle DF = 0-5°
- (R) Tarsal eversion = 0-3°
- (R) Shoulder flexion = 0-150°

Strength: 4/5 throughout left UE and LE.
Trunk = 3- Unable to test right extremities due limited isolated movement.

Tone: Extensor patterning right LE and Flexor Synergy right UE. Positive for spasticity.

Modified Ashworth scale:
- 3 in quadriceps and plantar flexors.
- 2 in anterior deltoid, biceps, wrist and hand flexors.

Reflex Testing:
- Hyperactive patellar tendon (L2,3,4) and biceps tendon = 3+
- ATNR
- Positive support reaction: (R)+
- Grasp + on (R)

Transfers:

Bed Mobility: Supervision

Sit – Stand: Contact guard

Toilet: Supervision

Shower: Minimal assist

Coordination:

(L) Finger- nose: intact (R)=unable
(L) Pronation- supination: intact (R)=unable
(L) Heel-shin: intact (R)=unable

Upright Motor Control:
- Flexion= Moderate at hip/knee/ankle.
- Extension= Moderate at hip and knee; weak at ankle.

Synergy: Deviating from pattern. Can initiate selective movement at joint but then moves into extensor pattern (R) leg and flexor (R) arm prior to moving through less than 50% ROM.

Fugl-Meyer: Stage IV- Movement combining synergies.

FIM: Level 4-5.

Cranial Nerve Testing:
1. Olfactory: Intact
2. Opic: (R) Impaired
3. Oculomotor: (R)impaired
4. Trochlear: (R)impaired
5. Trigeminal: (R) impaired
6. Abducens: (R) impaired
7. Facial: asymmetrical smile
8. Vestibulocochlear: intact
9. Glossopharyngeal: minimal impairment on thickened liquids
10. Vagus: Minimal impairment
11. Spinal Accessory: (R) impaired
12. Hypoglossal: minimally weak

Balance:
- Get Up and Go test: for a male age 80-89 the normal range is 8-12 seconds. John scored 25 which shows that John requires supervision.
- Dynamic gait index: John scored 19/24.
- Functional testing:
  Sitting=good static and Dynamic.
  Standing= fair and static and Dynamic.
- Functional reach: Normal for 70-87 year old men is 13.2 inches. John scored 10 inches which makes him 2x likely to fall.
- Berg functional balance scale: John scored 35 which places him at the household safe ambulatory range with an assistive device.

Gait: John is able to walk with supervision x10 minute intervals on flat surface. Gait without AFO shows: right forefoot contact at Initial Contact, decreased weight bearing on right at Loading Response, right knee hypertension at Midstance, excessive right PF at Terminal Stance. Swing Limb Advantagement: shows hip hike on right, toe drag with excessive hip ER and tarsal inversion at Initial and Midswing, hip abduction and ankle PF at Terminal Swing.

Gait with AFO: Heel contact now at Initial contact, no knee hypertension in stance, no toe drag during swing and no tarsal inversion during swing. Weight bearing also increases.

Sensory Testing:
- Cortical sensation:
  1. Extinction= moderately impaired.
  2. Graphesthesia= intact (L); impaired (R).
  3. Stereognosis= intact (L); unable to test.
- Proprioception: Intact (L) UE/LE. (R) UE/LE Minimal impaired proximally and moderately impaired distally.
- Kinesthesia: (L) intact; (R) unable to test.
- Sharp/Dull: Intact (L) and minimally impaired (R).
- Light touch: (L) intact and minimally impaired (R).
- Two point discrimination; able to sense 2-5mm on (L); 20-30mm on (R) so impaired.

Vision: Per records and Mary's report, John is far-sighted and has been wearing reading glasses for years. Since cranial nerves 2, 3, and 6 were impaired with testing, I referred John back to his optometrist for evaluation.

Perception: John shows minimal directionality deficits. He is very cautious when it comes to changes in walking surfaces.

Communication:
- **Receptive speech**: Normal
- **Expressive speech**:
  -**Aphasia**
  -**Dysarthria** - problems articulating more than 3 words in a row. (Coincides with MRI involvement of Broca's area). Problems with fluency. Uses key words to express ideas but John knows when sound is not fluent and he becomes frustrated. Verbal perseveration noted when John becomes frustrated.

Motor Planning: Motor and ideational apraxia. Minimal difficulty with sequencing self-care and performing symbolic movements on verbal instruction. Temporal ordering deficits noted reflective of left hemisphere lesion.

Impairments:
- Balance and postural control
- Apraxia
- Visual
- Endurance
- Decreased strength in trunk and right extremities
- Spastic patterns in right arm and leg
- Decreased motor control and isolated movement
- Gait deviations
- Perceptual deficits affecting safety
- Coordination

PT Plan:
- Assistive technology assessment with team
- Core and extremity strengthening
- Selective movement exercises
- Balance and postural control activities
- Endurance training
- Gait training
- Motor planning and motor learning activities
- Home program
- Coordination with all team members
- Training in assistive technology related to PT
- Home evaluation

JOHN'S COLLABERATIVE TEAM:

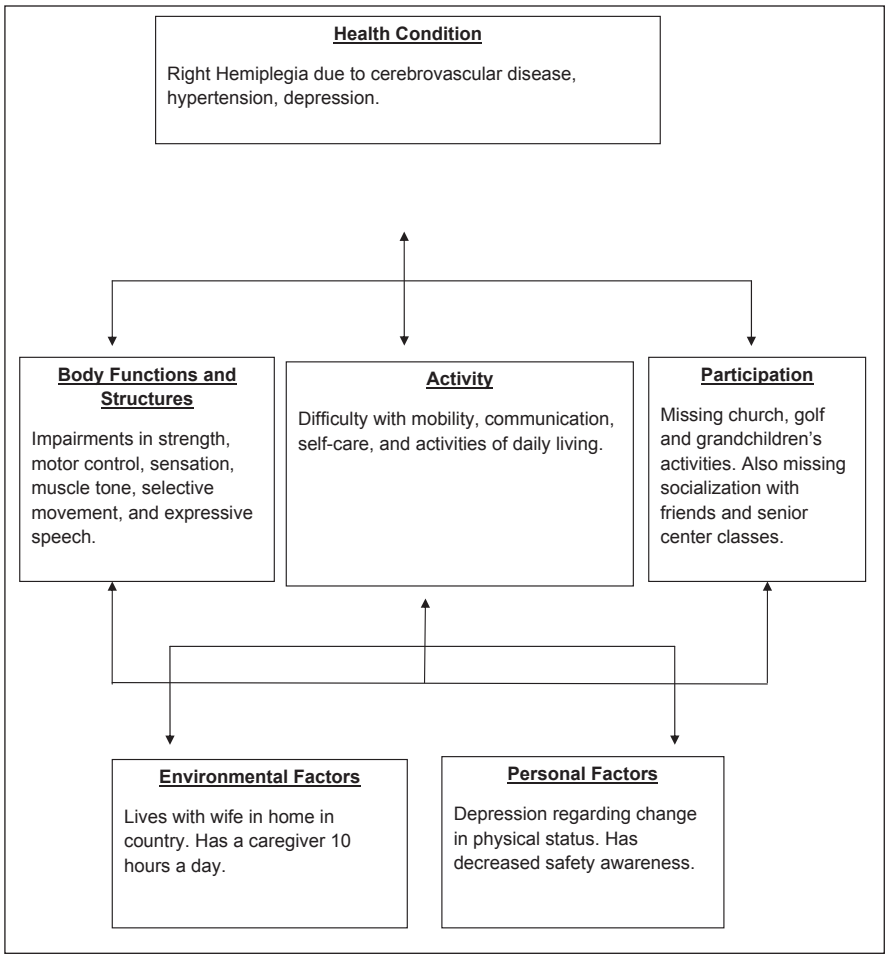
- John
- Physical therapists
- Occupational therapists
- Speech pathologist
- Primary care physician
- Neurologist
- Orthotist
- Mary (wife)
- John's children
- Caregivers
- Optometrist
- Assistive technology specialist
- Psychiatrist
- Social worker
- Nurse
- Pharmacist
- Contractor for home modifications

❖ Psychotechnologist to coordinate team

Multidisciplinary Team and John's Biopsychosocial Condition:

- I used the Stroke Impact Scale[2] to assess the physical, cognitive, emotional/ behavior, and psychosocial func-

Chart 1. John's Profile



tioning with John. The scale assesses physical problems, memory, thinking, mood, control of emotions, ability to communicate, daily activities, mobility in home and community, use of hand, and meaningful activity participation. This scale was administered to John and then Mary to assess each of their perception of how the impact of the stroke is affecting their life presently. I chose this scale because it matched well with the Biopsychosocial Model. John scored 75/100 and Mary scored 70/100.

- **Neuropsychological Report**: John has executive functioning difficulties and ideational fluency impairment. He was given the Halstead-Reitan Neuropsychological Test Battery. The test showed difficulties with short-term memory, expressing ideas, and organization in solving tasks.

- **Biopsychosocial Approach: Domains**
- **Physical**: Limited by motor and sensory deficits on right side. See PT assessment for details. PT and OT will be the primary team members addressing these impairments.
- **Cognitive**: John scored 23/30 on the mini-mental state examination (MMSE). This means he presently requires minimal supervision, support, and assistance.[3]
- **Emotional/ Behavioral**: John is tearful at times about the change in physical status since the stroke. He is in agreement that he should continue appointments with his psychologist.
- **Psychosocial Functioning**: The Hamilton Rating Scale for Depression was used. John's score placed him in the moderate depressed category. Flag indicators on the test was not sleeping well, decreased appetite, and feeling sad. Communication with primary care physician and psychologist will occur through phone and email.
- **Medical**: On medication for high BP and blood thinner for cerebrovascular disease.
- **Affective**: John wavers between having a flat affect, to tearful to being optimistic.
- **Functional**: Walking short distances with a quad cane. Has difficulty with self-care due to right arm involvement. See PT assessment for details.
- **Environmental**: Lives in a one story home in the country. See environmental assessment for details.
- **Present Assist**: Mary provides assistance and a caregiver comes 7 hours per day to assist John in all home programs and self-care.
- **Social Impact**: Mary is the main social support. Many of John's friends from church and the senior center visit. His children and grandchildren visit when they can. John likes visitors but gets frustrated with his lack of ability to have fluent speech.
- **Economic**: John receives social security and receives a generous retirement from the accounting company he worked for 40 years. Medicare covers medical expenses. He was accepted for a clinical trial study looking at appropriate AT for individuals after a stroke. This gave the team open options to recommend AT.

HOME ENVIRONMENT ASSESSMENT

- **Entrance Access:** The walk-way to the ramp is textured[4] to accommodate needs of John's wheelchair or cane. Four steps into the house are present. Per ADAAG guidelines, I recommended a ramp with a slopped between 1:12 and 1:16 inches. I would also texture the surface on the ramp with no gratings to match the walkway. The front door opening width is 35 inches and 35 inches continuously, which meets the guidelines. The door depth is 4 times the guideline of 24 inches. The entry way meets the space required for a wheelchair to make a 180° turn is more than 60 inches, with ample clear floor. The forward reach is 42 inches and meets the maximum of 48 inches. The side reach is 50 inches, which meets the maximum of 54 inches. I would remove a table and chair to add more clear area.
- **Space Allowance and Reach Ranges:** For wheelchair use the house meets ADAAG requirements throughout with a clear width of more than 32 inches and with 36 inches continu-

ously. There is the required wheelchair turning space to make a 180° turn and there is at least 60 inches diameter throughout house. The space does allow for accessibility. There is a step from living room to family room, so I recommend a ramp. Most of the house has non-slip tile flooring. The carpeted areas are securely attached, and have firm padding. There is no loop and is firm along length of the exposed edge. The pile thickness is low and within limits. I recommend getting rid of 6 throw rugs.

- **Bathroom:** The door opening is only 30 inches and would need to be increased to at least 32 inches. The sink and counter are 31 inches and meet the requirement of lower than 34. The knee clearance is 28 inches so meets the requirement of 27 inches. The depth under the sink is 20 inches so meets 19 inch requirement. I would also have automatic on/off faucets installed. In terms of Universal Design[4] this is to provide a safe environment for John. I would recommend taking out the bathtub and installing a sloped walk-in shower, with adjustable/removable hose head (60 inches long), grab bars mounted between 18-27 inches (with grip surface) and an Adaptive Shower Seat mounted between 17-19 inches from floor. This would increase accessibility.[5]

  The toilet height is 17-18 inches high and meets guidelines. I recommend a raised toilet seat. Grab bars would be attached on the walls on either side. I would recommend an automatic flush (Figure 1).
- **Living Room:** Overall, I used the Environment Assessment Process as the guide.[4] In using the Universal Design, I would consider the input from Mary and John. I would recommend moving furniture as needed for increased clearance.
- **Bedroom:** Removal of all throw rugs recommended. A clear floor space is present with 32 inches by 48 inches in all areas.
- **Kitchen:** The kitchen is open to the family room and is very accessible.

Assistive Technology Plan

- To minimize barriers and increase use opportunity, I would use a team approach to assessment of assistive technology for John.[6]

Figure 1. Toilet seat with grab bars.

- Use of computer-based assistive technology will be used to provide support and reminders for ADLs[7]. This will decrease burden on Mary. The tentaculus system has shown to assist in ADLs after a stroke. Specifically, it will be used to provide information on upcoming events, support the completion of tasks, and give reminders for correct sequencing. This was matched through collaboration between neuropsychologist, PT, OT, and augmentative communication specialist.
- The Trackball Edge Write would replace the mouse on John's computer to improve the speed and accuracy of word prediction and sentence formation[8]. This was matched by John's O.T and speech pathologist.
- Use of a Television Assisted Prompting (TAP) system[9] to assist John in doing his home exercise program. This would decrease the burden on Mary. The TAP box is attached to the TV. This was matched by an assistive technology specialist (ATS), PT, and O.T.
- Use of the weight supported treadmill system to increase gait speed and endurance.[10] This was matched ATS and PT.
- Wheelchair.[11] This was matched ATS and PT (Figure 2).
- The use of the Bright Arm integrative rehabilitation system[12] with a motorized training table, and instrumented forearm support, two overhead cameras, a large definition TV, a multicore PC workstation, a sound system, a remote clinical server and a variety of custom designed memory, critical thinking, and problem solving. This would be used for John's neuropsychology program. It will also be used to track right arm movement and grasp. This was matched by OT and PT.

Figure 2. Wheelchair with unilateral arm support.

- The use of FES (Functional Electrical Stimulation) on the elbow and wrist extensors to increase right arm function.[13] Training will be done with caregiver to apply 2x/day for 30 minutes. I will pre-set parameters. This was matched by PT (Figure 3).
- The WalkAide System for strengthening dorsiflexors will be used in PT (Figure 4).
- The Bioness H200 could be used in therapy sessions[14] to increase hand function. This is a mirco-processor based functional electrical stimulation system. It is composed of a forearm/hand molded orthosis containing 5 surface electrodes. The electrodes transmit small electrical currents to muscles and stimulate movement. This was matched by PT and OT.

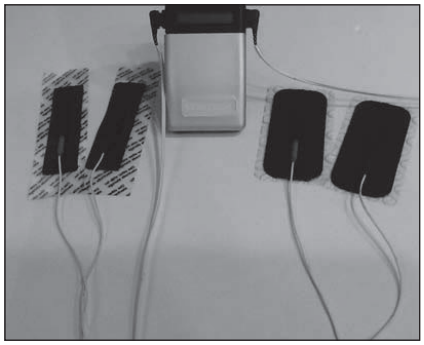


Figure 3. Functional electrical stimulation unit.

Figure 4. WalkAide system.

- Stationary bicycle. This was matched by PT (Figure 5).
- Dynamic ankle-foot orthosis[15] with calcaneal seating, metatarsal relief (to decrease extensor patterning), lateral wedge to increase eversion, and medial trim-line to decrease excessive tarsal inversion (Figures 6-8).
- Shoulder orthosis to increase stability. Matched by PT and OT.
- Kitchen devices such as the following would be help so that John can fix his own snack.
- Shower seat for safety (Figure 9).

Soap mitten, so that John can have privacy in the shower.

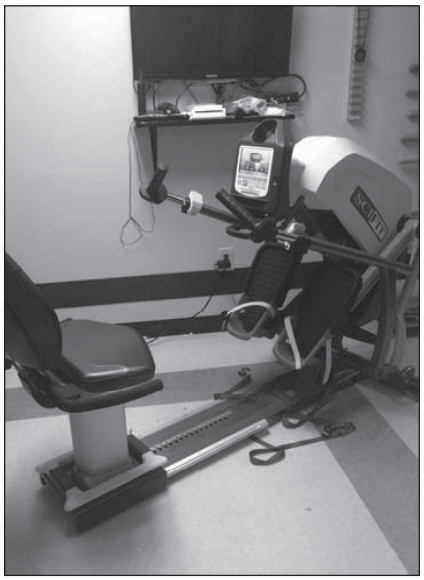
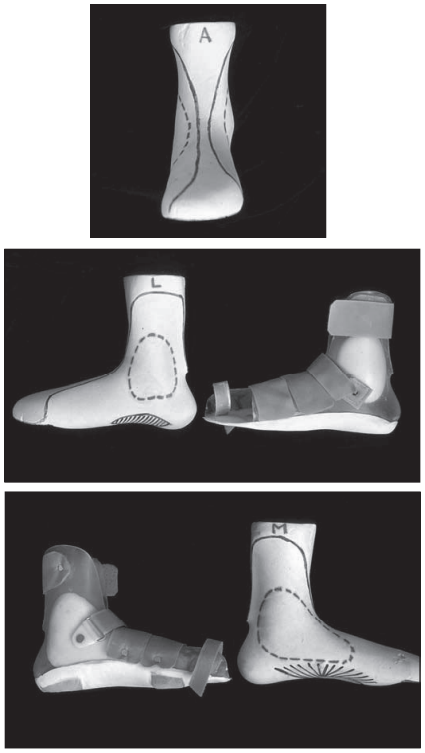


Figure 5. Stationary bicycle.



Figures 6-8. Ankle foot orthosis.

Figure 9. Shower seat.

Tobii Dynavox Communication Devices. Matched by speech therapists and communications specialists[16] (Figures 10-11).

- Tobii Dynavox Aphasia Board for John's keyboard. Matched by augmentative communications specialist[17] (Figure 12).
- Quad cane for gait.[18] Matched by PT (Figure 13).
- Mobile arm support for home exercises. Matched by OT.
- Overall, the goals of each team member would be considered when matching assistive technology according to the guideline of the ICF Model.[19] The matching Person and Technology Model[20,21] will be used as a reference. All assistive technologies were matched to increase John's access to all life domains. Each will also progress John's independence. This will relieve Mary and gradually decrease need for caregivers.

Figures 10-11. Tobii Dynavox communication devices.

Figure 12. Tobii Dynavox Aphasia Board.

RESOURCE

Access board website at: http://www.access-board gov/guidelines-and-standard-buildings-and sites/above-the-ada standards/background/adaaag.

Figure 13. Quad cane.

REFERENCES

1. World Health Organization (WHO), and World Bank 2011; World report on disability Geneva, Switzerland.
2. Duncan PW, Wallace D, Lai SM, Johnson D, Embretson S, Laster LJ. The Stroke Impact Scale Version 2.0: evaluation of reliability, validity, and sensitivity to change. *Stroke.* 1999;30(10):2131-2140. doi:10.1161/01.str.30.10.2131
3. Lindqvist E, Borell L. The match between experienced difficulties in everyday activities after stroke and assistive technology for cognitive support. *Technol Disabil.* 2010:89-98.
4. Mirza M, Zakrajsek G, Borsci S. Chapter 4: The assessment of the environments of AT use: accessibility, sustainability a universal design. In: Federici S, Scherer MJ, eds. *Assistive Technology Assessment Handbook*. Boca Raton, FL: CRC Press; 2012:67-81.
5. Ustun TB, Chatterji S, Kostanjsek N, et al. Developing the World Health Organization Disability Assessment Schedule 2.0. *Bull World Health Organ.* 2010;88:815-823.
6. Hughes A, Burridge J, Demain S, et al. Translation of evidence-based assistive technologies into stroke rehabilitation: Users' perceptions of the barriers and opportunities. *BMC Health Serv Res*. 2014;14:124.
7. Lindqvist E, Borell L. Computer-based assistive technology and changes in daily living after stroke. *Disabil Rehabil Assist Technol.* 2012:364-371.
8. Wobbrock JO, Myers BA. Enabling devices, empowering people: The design and evaluation of Trackball EdgeWrite. *Disabil Rehabil Assist Technol*. 2008:35-56.
9. Lemoncello R, Sohlberg MM, Fickas S, Albin R, Harn BE. Phase I evaluation of the television assisted prompting system to increase completion of home exercises among stroke survivors. *Disabil Rehabil Assist Technol,* 2011:440-452.
10. Kelley CP, Childress J, Boake C, Noser E. A. Over-ground and robotic-assisted locomotor training in adults with chronic stroke: A blinded randomized clinical trial. *Disabil Rehabil Assist Technol.* 2013:161-168.
11. Mandy A, Lesley S. Measures of energy expenditure and comfort in an ESP wheelchair: A controlled trial using hemiplegic users. *Disabil Rehabil Assist Technol.* 2009:137-142.
12. Rabin BA, Burdea GC, Roll DT, Hundal JS, Damiani F, Pollack S. Integrative rehabilitation of elderly stroke survivors: The design and evaluation of the BrightArm™. *Disabil Rehabil Assist Technol.* 2012:323-335.
13. Demain S, Burridge J, Ellis-Hill C, et al. Assistive technologies after stroke: Self-management or fending for yourself? A focus group study. *BMC Health Serv Res.* 2013:334.
14. Graham J. Technology for rehabilitating the upper limb after stroke: The hand. *Br J Neurosci Nurs.* 2014:19-24.
15. Erel S, Uygur F, Simsek IE, Yakut Y. The effects of dynamic ankle-foot orthoses in chronic stroke patients at three-month follow-up: A randomized controlled trial. *Clin Rehabil.* 2011:515-523.
16. Wallace T, Bradshaw A. Technologies and strategies for people with communication problems following brain injury or stroke. *Neuro Rehabil.* 2011:199-209.
17. Pouplin S, Robertson J, Antoine J, et al. Effect of dynamic keyboard and word-prediction systems on text input speed in persons with functional tetraplegia. *J Rehabil Res Dev.* 2014:467-480.
18. Perez C, Fung J. An instrumented cane devised for gait rehabilitation and research. *J Phys Ther Educ.* 2011:36-41.
19. Bernd T, Pijl DV, Witte LD. Existing models and instruments for the selection of assistive technology in rehabilitation practice. *Scand J Occup Ther.* 2009:146-158.
20. Federici S, Scherer MJ, Borsci S. An ideal model of an assistive technology assessment and delivery process. *Technol Disabil.* 2014:27-38.
21. Friederich A, Bernd T, Witte LD. Methods for the selection of assistive technology in neurological rehabilitation practice. *Scand J Occup Ther.* 2010:308-318.

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(Continued from page 20)

4. Reeder B, Demiris G, Marek KD. Older adults' satisfaction with a medication dispensing device in home care. *Inform Health Soc Care*. 2013;38(3):211-222. doi:10.3109/17538157.2012.741084.
5. Alexan AI, Osan AR, Oniga S. Advanced medication dispenser. *Carpathian J Electron Comput Eng*. 2013;6(2):26-31.

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WHAT ARE EVIDENCE-BASED EXERCISE PROGRAMS AND WHY ARE THEY IMPORTANT?

Sherri R. Betz, PT, GCS, CEEAA, PMA®-CPT

Have you ever discharged a patient from physical therapy only to wonder what exercise program to recommend for maintaining the gains achieved in physical therapy?

Evidence-based programs (EBPs) are part of a wide variety of programs available in many communities. Evidence-based programs are research-supported programs to promote health and prevent disease and include components for behavior change and self-management. Programs like "A Matter of Balance," "EnhanceFitness," and "Fit and Strong," are popular, safe, and effective EBPs for older adults.

Evidence-based programs are packaged, ready-to-go programs that have been:

- developed and researched in controlled settings,
- published in a peer-review journal,
- shown to have positive benefits for participants,
- translated so they can be adopted by community organizations,
- delivered by certified instructors (lay, health professionals),
- shown to have high retention rates,
- engaging to participants, and
- designed with fidelity and sustainability strategies.

Not all community programs are EBPs. While general programs are often developed and delivered based on personal interest and experience, they may not be consistent from site to site, and are not systematically tested. Participants are often enthusiastic and give great feedback about these individual programs, but do they really work?

If you are a physical therapist offering group classes for older adults, you might think, "My exercise classes are safe and effective for older adults and they are based upon the latest research," or "I think that I could use my skills as a PT to add a few exercises or combine my program with yoga to make it better." However, even when exercises are selected based on current research, these types of "best practice" or "evidence-based practice" programs have not been tested through randomized controlled trials to prove their safety and effectiveness.

Several federal initiatives are supporting widespread dissemination and implementation of EBPs. The Administration on Aging (AoA; US Department of Health and Humans Services) and the National Council on Aging (NCOA) are leading national administration and support initiatives with a particular focus on efficient utilization of resources for low-cost, but effective programs. Most EBPs are designed to be simple to implement by lay leaders with limited resources.

To support programs, federal funding allocated through the Older Americans Act is disseminated through state aging services agencies to regional Area Agencies on Aging (AAA). Each AAA receives funding to support EBPs that have successfully completed AoA's Title IIID program submission process and meets evidence-based criteria. (Information detailing the AoA evidence-based criteria can be found here: http://www.aoa.acl.gov/AoA_Programs/HPW/Title_IIID/index.aspx#determine)

According to NCOA, EBPs provide value because:

- **Funders** increasingly demand that programming be based on solid evidence.
- **Agency leaders** want to concentrate limited resources on proven programs.
- **Older adults** are looking for programs that have been proven to work.

Ultimately, evidence-based programs represent a thoughtful way to use limited resources to enhance social good.

How do you learn more about evidence-based programs?

Start by going to the National Council on Aging Website: http://www.ncoa.org/improve-health/center-for-healthy-aging/

There are programs in the following categories:

- Chronic Disease
- Physical Activity
- Falls Prevention
- Behavioral Health

In addition to the below EBP descriptions, the NCOA provides a chart providing an overview of key aspects associated with all of the programs approved by the Older Americans Act Title IIID process. (http://www.noca.org/resources/highest-tier-evidence-based-health-promotiondisease-prevention-programs/)

A. CHRONIC DISEASE MANAGEMENT

http://www.ncoa.org/improve-health/center-for-healthy-aging/chronic-disease/

1. **Stanford University's Chronic Disease Self-Management Program (CDSMP):** http://patienteducation.

stanford.edu/programs/cdsmp.html The CDSMP workshops meet once a week for 2 1/2 hours, over 6 consecutive weeks. Workshops are facilitated by two trained leaders, one or both of whom are non-health professionals with chronic diseases themselves. Workshops are highly interactive. Stanford also has a suite of other EBPs to choose from.

B. PHYSICAL ACTIVITY PROGRAMS:

Found on the NCOA Website: http://www.ncoa.org/improve-health/center-for-healthy-aging/physical-activity/community-programs.html

CDC Approved Programs can be found at the following link: http://www.cdc.gov/HomeandRecreationalSafety/Falls/compendium/lowres.pdf

CDC Document with good guidance and resources for implementation of EBPs: www.cdc.gov/aging/pdf/Community-Based_Physical_Activity_Programs_For_Older_Adults.pdf

GROUP EXERCISE PROGRAMS FOR PHYSICAL ACTIVITY:

1. **EnhanceFitness** (http://www.projectenhance.org/EnhanceFitness.aspx). Classes meet 3 times per week for one hour per session. Each class includes warm-up (5-8 min.), cardiovascular endurance (20 min.), cool down (3-5 min), strength training for upper and lower body using cuff weights (20 min.), stretching (8-10), and balance and posture activities (may be incorporated in other areas or separately). Level 1 (seated) and 2 (seated/standing) options with modifications available. In addition, fitness checks are suggested at baseline and every 4 months. Fitness checks are from Rikli/Jones work and include chair stand, arm curl, 8 foot up and go, 2-minute step test, 6-minute walk, and 1 leg stand. Instructors must be trained in the program and maintain a nationally recognized fitness instructor certification. On-going support for the instructor is available from the Master Trainer. Attendance at annual

instructor workshops is encouraged. Target audience is older adults living in the community.
2. **Fit and Strong!** (http://www.fitandstrong.org/). Combines flexibility, strength training, and aerobic walking with health education for sustained behavior change among older adults with lower extremity osteoarthritis (OA). Fit & Strong! works with providers across the country to deliver an 8-week program 3 times per week for 60 minutes that targets improvement in lower extremity stiffness, lower extremity pain, lower extremity strength, aerobic capacity, participation in exercise and caloric expenditure, and self-efficacy for exercise.
   NOTE: The Arthritis Found-ation has transferred administration of their exercise programs to other organizations except for Walk with Ease. Please see the individual exercise programs below for the new administrator information.
3. **Arthritis Foundation's Walk with Ease** (http://www.arthritis.org). This program helps participants develop a walking plan that meets their particular needs, stay motivated, manage pain, and exercise safely. It is a 6-week program with 12 to 15 participants that meets for 60 minutes 3x per week. Also offered is a self-guided format using the Walk with Ease Guidebook that combines self-paced walks with a health topic.
4. **Arthritis Foundation's Exercise Program** (http://www.e-afaa.com/102.e-afaa?PK2=46). (The Arthritis Foundation has partnered with AFAA: Aerobics and Fitness Association of America to administer this program.) Low-impact community-based group exercise program designed for people with arthritis to reduce fatigue, pain and stiffness, and improve functional ability, mobility, muscle strength, coordination, self-confidence, and self-care. Held for 8-12 weeks, 60 minutes, 2-3x per week.
5. **Arthritis Foundation's Aquatic Program** (http://www.aeawave.com). (Arthritis Foundation has partnered with AEA: Aquatic Exercise Association to administer this program.) This water exercise program was created by the Arthritis Foundation for people with arthritis and related conditions. The classes are conducted by a trained instructor and include joint range of motion, stretching, breathing, and light aerobic activities. The classes typically meet 2-3 x per week for 60 minutes (http://aeawave.com/AFInfo.aspx).
6. **Arthritis Foundation's Tai Chi Program** (http://taichiforhealthinstitute.org/). (Supported by, but no longer administered by Arthritis Foundation.) Designed to improve movement, balance, strength flexibility, and relaxation. Developed by Dr. Paul Lam, the program uses Tai Chi's Sun style for its ability to improve relaxation and its ease of use for older adults. The movements are taught backwards and forwards to improve mobility and offer a variety of combinations. Classes are offered for 6 to 8 weeks, 45 to 60 minutes 2-3x per week.

7. **Geri-Fit® Strength Training Workout** (http://www.gerifit.com/). 45-minute, 2x weekly progressive resistance exercise program done without music. Most exercises are performed seated using a set of 2 lb dumbbell weights. Typically performed in a group setting, though can be done in a person's home and/or administered by a caregiver.

MOTIVATIONAL COUNSELING PROGRAMS FOR PHYSICAL ACTIVITY:

8. **EnhanceWellness** (http://www.projectenhance.org/enhancewellness.aspx). A participant-centered motivational intervention. A team of two professionals, Move into action with the support of a health professional and/or volunteer health mentor, who offer ongoing encouragement, feedback, and monitoring. The team helps with problem solving, health education, and referral to support groups and additional services, including individual and family counseling, if indicated.
9. **Active Living Every Day** (www.ActiveLiving.info). A 12 week self-management program to overcome barriers to physical activity. Facilitators lead discussions and help participants set goals and find activities they enjoy. A manual and online tools are provided to participants.

IN-HOME INDIVIDUAL INTERVENTION FOR PHYSICAL ACTIVITY:

10. **Healthy Moves for Aging Well** (https://www.picf.org/landing_pages/22,3.html). A simple and safe in-home physical activity intervention developed and tested by Partners in Care to enhance the activity level of frail, high-risk sedentary seniors living at home. The model was developed for community-based care management programs arranging and delivering services to seniors in the home.
11. **Active Choices** (http://www.ncoa.org/improve-health/center-for-healthy-aging/active-choices.html). 6-month telephone-based individualized program that provides remote guidance and support and builds self-management skills.
12. **Healthy Moves for Aging Well.** In-home physical activity intervention (chair bound and advanced exercises) that is focused on maintaining health status and quality of life of frail elders. Care managers and motivational volunteer phone coaches teach program exercises to participants in their home**.**
    - Movement repetitions 3-5 days per week, multiple times per day.
    - One 15-minute session between participant and care manager.
    - 3-month follow up period with weekly or bi-weekly phone calls.

C. FALLS PREVENTION GROUP EXERCISE PROGRAMS FOR FALLS PREVENTION

1. **A Matter of Balance** (http://www.mainehealth.org/mob). Classes meet for 8 weeks

   1-2x per week for 2-hour sessions limited to 8-12 group participants. Program emphasizes practical coping strategies to reduce fear of falling and teach fall prevention strategies. The class is led by peer/lay leaders who have been trained in the program. Weekly topics include exploring thoughts and concerns about falling, exercise and fall prevention, assertiveness and fall prevention, managing concerns about falling, recognizing faulty habits, and fall hazards in the home and community. Excellent for people who fear falling and or who limit physical activity or community mobility due to fear. The exercise component is taught in week 3 and includes breathing, shoulder rolls, wrist flex/ext, wrist rotation, fist/extend, pectoral stretch, foot circles, seated hip flexion and knee extension, shoulder range of motion, standing plantar flexion, hip flexion, hip extension, hip abduction, hip circles, side stepping, box step, arm chair push up, and heel cord stretch in standing.

   Usually a physical therapist is invited to teach the exercise session.
2. **Stay Active and Independent for Life (SAIL)** (http://livingwell.doh.wa.gov). A group exercise class, which includes strength, balance, and endurance training for adults 65 and older. Classes meet 2-3 times per week for 60 minutes. Each class includes warm-up, cardiovascular endurance, dynamic and static balance and posture training, strength training for upper and lower body using cuff weights, and upper and lower body stretching. All exercises are performed in standing or sitting. Fitness checks are suggested at baseline and on-going periodically.
3. **Tai Ji Quan: Moving for Better Balance™ (TJQMBB)** (http://www.tjqmbb.org/). An evidence-based fall prevention program for community-dwelling older adults. The program consists of an 8-form core routine with built-in exercise variations and a subroutine of integrated therapeutic movements, which collectively, comprise a set of simple yet functional Tai Ji Quan-based moves. The program is delivered in two 1-hour sessions each week for 24 weeks. Each session consists of warm-up exercises; core practices, which include a mix of practice of forms, variations of forms, and mini-therapeutic movements; and brief cool-down exercises. The program is currently being disseminated through the YMCA system.

INDIVIDUAL INTERVENTION FOR FALLS PREVENTION

4. **Fallscape** (http://www.fallscape.org/). Multimedia fall prevention training is delivered through a headset that allows the participant to experience instructional video vignettes for training and specific video clips for evaluation. The video vignettes provide immersion into situations that are tailored to address their unique lifestyle and the characteristics of their environment. FallsTalk software creates a unique profile for each participant and delivers a customized multimedia experience to the participant.
5. **FallsTalk** (http://www.fallscape.org/). FallsTalk™ is user-friendly software that forms the foundation for the

FallScape System. The point & click interview expedites the documentation of key components of the participant's unique features. The ***Falls Talk*** Behavioral Intervention components are constructed using this information. ***Falls Talk*** administrative functions create documentation specifically designed for different users in various clinical, residential, or community settings. Customized participant workbooks, standardized data collection, and reporting tools as well as fall diary forms and instructions are provided.

6. **The OTAGO Exercise Program** *(delivered by PTs. Not a group class)* (http://www.med.unc.edu/aging/cgec/exercise-program). Series of 17 strength and balance exercises delivered by a Physical Therapist in the home that reduces falls between 35% and 40% for frail older adults. This EBP, developed in New Zealand, calls for PTs to assess, coach, and progress patients over the course of 6 months to one year. The training course is a self-paced online training 3 CEUs and costs only $25.

MULTI-FACETED INTERVENTIONS FOR FALLS PREVENTION

7. **Stepping On** (http://www.cdc.gov/HomeandRecreationalSafety/Falls/compendium/3.1_steppingon.html). Multifaceted program consisting of 7 weekly 2-hour program sessions, 1- to 1.5-hour home visit, 6 weeks after the final session, 1-hour booster session 3 months after the final session. The original program, developed in Australia required a team of content experts lead by an occupational therapist, and included physical therapists, roads and traffic authority volunteers, and nurse and guide dog mobility officers. The program has been reformatted for the United States and is administered by the Wisconsin Institute for Healthy Aging (WIHA). The WIHA has permission to use the *Stepping On* North America Leader Manual in its Leader Training programs to WIHA licensees. The leader is a current or retired health care professional, social worker, health educator, fitness expert, or aging network professional. Individuals should have previous experience facilitating a group program based on adult learning or self-efficacy principles, experience working with older adults in a professional setting, and have a sponsoring organization that is willing to commit the resources needed to implement and sustain *Stepping On (*https://wihealthyaging.org/stepping-on).

How do I find out what EBPs may already be in my area?

Before making a decision about the best program to implement, check within your local community for currently conducted EBPs. If none or few exist, contact the **Area Agency on Aging** (AAA) http://n4a.org to find out what programs currently exist and if there is a need for a specific program in your area. The AAAs are charged by the federal government to fund and disseminate programs for aging adults. hey might be able to offer funding for the program you want to implement.

Find out what recreation centers, fitness centers, or senior centers might have available space for an exercise program in your community.

When you find a suitable space, go back to the NCOA website and browse through their tools and resources page that contains a plethora of information and checklists for implementing an EBP (http://www.ncoa.org/improve-health/center-for-healthy-aging/physical-activity/tools-and-resources-1.html). Remember, you don't have to reinvent the wheel to begin a safe and effective exercise program for older adults!

What steps should I take if I want to develop an EBP?

If you do want to reinvent the wheel with some great innovations, then start here at the **US Department of Health and Human Services, Administration for Community Living, Administration on Aging** that lists all of the criteria and requirements for delivering an evidence-based program to older adults (http://www.aoa.acl.gov/AoA_Programs/HPW/Title_IIID/index.aspx#determine). You will also find the definitions of evidence-based program vs. evidence-based practice with some very helpful FAQs at the bottom of the page!

Many thanks to Lori Schrodt PT, MS, PhD, Chair of the Health and Wellness Promotion Special Interest Group and Debbie Hanka, PT, DPT, GCS, CEEAA, Member Bone Health Special Interest Group, for their contributions to this article.

For more information about joining the Bone Health, Health and Wellness Promotion or the Balance and Falls Special Interest Groups please visit www.geriatricspt.org. Best of luck in getting your local communities moving!

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POLICY TALK
TEN…NINE…EIGHT…PREPARING FOR IMPACT: PART 2

Ellen R. Strunk, PT, MS, GCS, CEEAA, CHC

In Part 1 of this series, we explored the fact that as Medicare and other payers have moved toward transparency in reporting clinical performance measures, the post-acute care rehabilitation industry has moved a little slower. The biggest challenge is often trying to consolidate the information in a manner that is useful to the provider.

SO HOW DO WE GET FROM HERE TO THERE?

On October 6, 2014, the Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014 was signed into law. It is a bi-partisan billed introduced in March 2014 that would require standardized patient assessment data for assessment and quality measures, quality care and improved outcomes, discharge planning, interoperability, and care coordination. It will implement significant changes to each of the PAC settings and their applicable assessment instruments. There was immediate attention paid to this bill for two reasons: (1) the bill spent less than 7 months in discussion, flew through both houses of Congress and was signed into law in record time; and (2) the timeframes it implemented are immediate (at least in terms of government regulations).

The IMPACT Act requires the Centers for Medicare and Medicaid Services (CM) implement the use of standardized assessment data no later than October 1, 2018, for SNFs, IRFs and LTCHs, and no later than January 1, 2019 for HH agencies. What are these data categories?

1. Functional status
2. Cognitive function and mental status
3. Special services, treatments and interventions
4. Medical conditions and co-morbidities
5. Impairments
6. And other categories required by the Secretary of Health and Human Services.

The summer of 2015 was a busy one for providers. The CMS responded to the IMPACT Act by including several of these measures in the proposed rules for 3 of the 4 post-acute care settings. (Home Health Agencies are on a different timeline and will be addressed in a later article). The proposals were finalized in the CMS final rules released in late summer for each setting (Table 1). This article will address only the Functional Status domain.

THE GOAL OF STANDARDIZATION

As discussed in Part 1 of this series, therapists in these settings are used to gathering a lot of information. Many of our employers have built systems that facilitate the gathering, analyzing, and disseminating of the information. But one company's data cannot be compared to another company's data because of the different items measured as well as the different scales used for measuring level of assistance. Without standardization, none of it can be used to compare one company's or one organization's clinical performance to another. Even within each organization, standardization is a huge challenge.

> For example, if someone walked into your practice today and asked two therapists to define "minimal assist with transfers," would they give the same answer? They may come close, but "close" is not the same as "consistent." Each piece of the measure must be defined. Does minimal assist mean 0% to 24% assistance? Or 1% to 25% assistance? And how does a therapist determine the difference between 25% assistance that qualifies as minimal assist and 27% assistance that might qualify as moderate assist? The other aspect of item standardization is the task, such as transfers. What is included in that definition? Does it include only bed to/from chair? Or does it also include toilet transfers and car transfers? Does the category "transfers" also include sit to/from standing or is that included in the ambulation item; or is it included in both?

In 2013, this writer took an unscientific survey of 11 large rehabilitation companies and asked questions about how each of them collected information on the clinical outcomes of the patients they served. Each of the companies were actively collecting some kind of outcomes measures; however, their techniques varied (Table 2). Communicating in a consistent language across settings is a key component to improving rehabilitation services, coordinating patient care, and ultimately improving patient outcomes.

SO WHAT IS THE ANSWER?

To comply with the Congressional directive in the 2005 Deficit Reduction Act, CMS developed a uniform assessment instrument to measure the range of patients seen across the post-acute care provider types: the Continuity Assessment Record and Evaluation (CARE) tool. The CARE tool was designed to collect data on patients' medical, functional, and cognitive status at admission and discharge from each PAC setting and at discharge from general hospitals. The CARE items are based on the current state of knowledge in assessing patient acuity and outcomes

Table 1.

Long Term Care Hospitals	42 CFR 412; 80 FR 49325; Medicare Program; Hospital Inpatient Prospective Payment Systems for Acute Care Hospitals and the Long-Term Care Hospital Prospective Payment System Policy Changes and Fiscal Year 2016 Rates; Revisions of Quality Reporting Requirements for Specific Providers, Including Changes Related to the Electronic Health Record Incentive Program; Extensions of the Medicare-Dependent, Small Rural Hospital Program and the Low-Volume Payment Adjustment for Hospital	https://www.federalregister.gov/articles/2015/08/17/2015-19049/medicare-program-hospital-inpatient-prospective-payment-systems-for-acute-care-hospitals-and-the
Inpatient Rehabilitation Facilities	42 CFR Part 412 80 FR 47035: Medicare Program; Inpatient Rehabilitation Facility Prospective Payment System for Federal Fiscal Year 2016	https://www.federalregister.gov/articles/2015/08/06/2015-18973/medicare-program-inpatient-rehabilitation-facility-prospective-payment-system-for-federal-fiscal
Skilled Nursing Facilities	42 CFR 483; 80 FR 46389; Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities (SNFs) for FY 2016, SNF Value-Based Purchasing Program, SNF Quality Reporting Program, and Staffing Data Collection	https://www.federalregister.gov/articles/2015/08/04/2015-18950/medicare-program-prospective-payment-system-and-consolidated-billing-for-skilled-nursing-facilities

Table 2.

What scale to you use to measure levels of assistance or function?	• Responses included 6 different scales
What is your scale range? How many levels of assistance are in your scale?	• Scales ranged from a minimum of 6 levels to a maximum of 14 levels
How many items do you require your therapists collect on each patient?	• For PT: A minimum of 3 items to a maximum of 15 • For OT: A minimum of 6 items to a maximum of 20 • For PT: A minimum of 5 items to a maximum of 14
Do Therapists or Therapist Assistants collect the data?	• 50% of the companies require Therapists to report data • 50% of the companies allowed both Therapists and Therapist assistants to report data
Do you have a credentialing or training/ testing process for therapists to complete?	• Only 3 companies had a process to insure all staff were consistently trained in understanding the definitions of the items and rating scales
If you answer, yes to the above question, how often do you repeat the training?	• Only 2 of the 3 companies indicated they require the test to be repeated annually

measures and experience in what has been found to be important in the current payment systems, and represent standardized versions of items being collected in each setting.

Individual item selection was based on several overriding principles:

(1) Sensitivity to data collection burden.
(2) Consideration of the reliability and validity of items.
(3) Breadth of application to minimize floor and ceiling effects.
(4) Minimization of "gameability" or incentives that might encourage provider behavior that is inconsistent with best practices for patient outcomes and care quality.

From 2007 to 2010, the tool was tested in a demonstration pilot in 11 market areas across 140 providers that included hospitals, LTCHs, IRFs, SNFs and home health agencies. Over 39,000 CARE assessments were collected in parallel with the facility's legacy tools (eg, Patient Assessment Instrument, (PAI) Minimum Data Set (MDS) and the Outcome and Assessment Instrument Set [OASIS]).

Overall, the results showed very good agreement on most items.[1]

- The reliability results were consistent with those achieved in earlier efforts testing the non-standardized items and suggested they could be used to replace the items in the current legacy tools.
- Most of the standardized CARE items performed reliably across settings.
- Participant feedback on CARE items

was generally positive.
- Overall, the inter-rater reliability results showed very good agreement on most items.
- The demonstration showed that uniform versions of the CARE items could be implemented successfully.
- The items showed strong reliability in each of the five settings, including the acute, LTCH, IRF, SNF, and HHAs. Participant feedback on the items was generally positive.

The result? CMS and Congress concluded that there were items from this tool that could be inserted into and/or replace items in the current legacy tools and collected across each of the post-acute settings.

Standardization…..Sort of

The IMPACT Act was written with the goal of standardization. Unfortunately, CMS has taken what might be called a "circular" approach to getting there. The final rules for the long-term care hospitals (LTCHs), inpatient rehabilitation facilities (IRFs), and skilled nursing facilities (SNFs):

- will require the collection of functional status data starting October 1, 2016;
- each of the three facilities will use the same rating scale; and
- each of the three facilities will collect different items.

Why did CMS choose to go this route? We can only speculate. Based on CMS statements in the final rule, they stated that since there were currently no functional status quality measures endorsed by the National Quality Forum (NQF) that they had the authority to choose one to use. They chose their own measure: NQF #2631 *Percent of LTCH Patients with an Admission and Discharge Functional Assessment and a Care Plan that Addresses Function.*[2] While this measure included many items from the original CARE demonstration, it did modify some of the original items. This introduced concern from many provider communities since there was no research to support the item(s) would correlate to meaningful functional change.

Furthermore, CMS proposed to use an "application" of it for the IRF and the SNF settings. It was true that at the time the proposed rules were published, there were no endorsed quality measures for function, and that included #2631. However, there were several that were moving through the NQF endorsement process with the CMS measure.

- NQF #2612: CARE: Improvement in Mobility[3]
- NQF #2613: CARE: Improvement in Self-Care[4]
- NQF #2633: Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Self-Care Score for Medical Rehabilitation Patients
- NQF #2634: Inpatient Rehabilitation Facility (IRF) Functional Outcome Measure: Change in Mobility Score for Medical Rehabilitation Patients

On July 22, 2015, NQF endorsed Measures #2612, #2613 and #2631. However, by that time, the wheels were already in motion for CMS to finalize their proposed rules in August for the LTCH, IRF and SNF and to use their own measure, #2631. As a result, we have a "process" measure rather than a true "outcome" measure which was the stated intent of the IMPACT Act. The "application" of this measure to each of the settings already presents challenges with standardization since there are only a small number of items that will actually be collected across the three settings (Table 3).

There is no question CMS is moving quickly towards a value-based purchasing plan for all post-acute care settings. There have been several other proposals r released throughout the summer. Many therapy professionals welcome the recognition that quality care is better care, and want to be recognized for their efforts at using

Table 3.

Items: (for complete definitions of each item see the Final Rules for each setting)	Section GG of the SNF MDS	Section GG of the LTCH tool	Section GG of the IRF-PAI
• Eating	X	X	X
• Oral hygiene	X	X	X
• Toilet hygiene	X	X	X
• Upper body dressing			X
• Lower body dressing			X
• Wash Upper Body		X	
• Shower/bathe self			X
• Putting on/taking off footwear			X
• Roll left and right		X	X
• Sit to lying	X	X	X
• Lying to Sitting on Side of Bed	X	X	X
• Sit to Stand	X	X	X
• Chair/Bed-to-Chair Transfer	X	X	X
• Toilet Transfer	X	X	X
• Walk 10'		X	X
• Walk 150'	X	X	X
• Wheel 150'	X	X	X
• Walk 50' with two turns	X	X	X
• Wheel 50' with two turns	X	X	X
• Walk 10 feet on uneven surfaces			X
• One step (curb)			X
• 4 steps			X
• 12 steps			X
• Picking up object			X
• Car Transfers			X

clinically sound treatment approaches that are effective in helping patient's achieve their goals and/or manage their impairments successfully. Staying abreast of the changes and staying involved in the process is critical during this time to insure the measuring stick is the "right" one.

REFERENCES

1. Research Triangle Institute. Post-Acute Care Payment Reform Demonstration Report to Congress Supplement – Interim Report. Prepared for CMS. May 2011. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/GAGE_PACPRD_RTC_Supp_Materials_May_2011.pdf. Accessed September 12, 2015.
2. National Quality Forum Measure Search. http://www.qualityforum.org/Qps/QpsTool.aspx#qps=&qpsPageState=%7B%22TabType%22%3A1,%22TabContentType%22%3A1 and search 2631. Accessed September 12, 2015.
3. Endorsed by NQF on July 22, 2015. National Quality Forum Measure Search. http://www.qualityforum.org/Qps/QpsTool.aspx#qps=&qpsPageState=%7B%22TabType%22%3A1,%22TabContentType%22%3A1 and search 2612. Accessed September 12, 2015.
4. Endorsed by NQF on July 22, 2015. National Quality Forum Measure Search. http://www.qualityforum.org/Qps/QpsTool.aspx#qps=&qpsPageState=%7B%22TabType%22%3A1,%22TabContentType%22%3A1 and search 2613. Accessed September 12, 2015.

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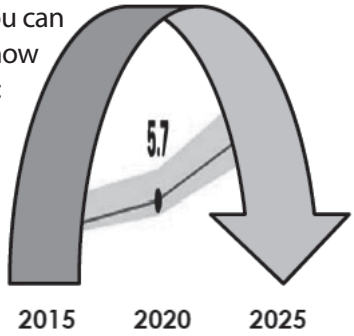
The *A Club* is here!

Are you ready to join?

The year 2020 is expected to bring 5.7 million people with dementia into our healthcare system. To help focus attention on dementia care issues across our country the ***Cognitive and Mental Health Special Interest Group*** (CMH SIG) of the APTA's Academy of Geriatric Physical Therapy (AGPT) is launching a country-wide campaign called the ***A Club***. The "A" conveys the concept of achieving excellence in assessing the whole person. The ***A Club's*** 2015 six-month mini-series highlights physical therapy assessment and care management of cognitive health, hallmark behaviors in different stages of dementia, and pain in people with dementia.

We invite you to join the ***A Club*** and engage your colleagues in discussions about these topics. If you want to provide thoughtful feedback to the leaders of the CMH SIG, please contact your APTA State Advocate. If you are in a state that does not yet have an APTA State Advocate, please help where you can and join our contingency of volunteers at your local or state level. If you want to show your support of our efforts, become a member of our CMH SIG by signing up here:

www.geriatricspt.org/members/special-interest-groups



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Exercise and Physical Activity in Aging Conference II: Blending Research and Practice

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Indianapolis, IN – July 27-30, 2016

Invitation

Posters are to be presented at the Exercise and Physical Activity in Aging Conference II: Blending Research and Practice, to be held July 29-31, 2016 in Indianapolis, Indiana. This conference will be attended by clinicians, educators and researchers with interest and expertise in gerontology.

Purpose

The Academy of Geriatric Physical Therapy is seeking to encourage dissemination of innovation in clinical practice, education or research as related to exercise and physical activity in aging. A variety of report types [case study reports, research reports, special interest reports or theory reports] will be considered. Clinical practitioners, academicians, researchers and physical therapy students are strongly encouraged to submit an abstract.

Peer Review Process

The determination of acceptance/non-acceptance will be made by the ExPAAC Review Committee, whose decisions are final. The Abstract submissions are accepted December 1-Email notification will be made to the primary author/presenter regarding the status of each submission by **March 31, 2016.** All presenters of accepted posters are required to register and pay the conference registration fee. Poster presenters shall be at their poster for two hours, as assigned by the ExPAAC Program Abstract subcommittee.

Publication of Accepted Abstracts

Accepted abstracts will be published on-line on the ExPAAC website.

Categories for Submissions

Abstracts must be submitted within one of the following three categories:

1) **Clinical practice**: Innovative and/or effective approaches/methods for integrating exercise and physical activity in aging into various types of clinical- and community-practices. [Case study, special interest, theory reports or research reports accepted]
2) **Academic**: Innovative and/or effective educational approaches/methodologies for teaching exercise and physical activity in aging in a PT/OT curriculum [case-study, special interest, theory reports or research reports accepted]
3) **Research**: Original scientific data using any established research format (both experimental and non-experimental designs) related to basic, clinical or translational research related to exercise and physical activity in aging [Research, case study or theory reports accepted]

Submission Process

All abstracts must be submitted electronically with a $25 submission fee. Specific abstract instructions/requirements and detailed poster presentation instructions are available at http://www.expaac2.org. Helpful tips are available at the website to assist and encourage first-time poster presenters. The electronic submission site will be opened **December 1, 2015.** Deadline for submission of **abstracts** is Midnight (PCT) **February 26, 2016.**

Questions should be directed to Kayleigh Allen, Project Coordinator, at allenkk@uindy.edu.

ExPAAC Abstract Committee Co-Chairs: Linda Eargle and Ruth Mulvany

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Exercise for Osteoporosis Through Bone Fit Training
Tuesday, February 16 and Wednesday, February 17, 2016
Presenters: Judi Laprade, BA, BScPT, MSc, PhD, and Bonny O'Hare, BScPT

Bladder Control Interventions in Adult Rehabilitation
Wednesday, February 17, 2016
Presenter: Cynthia E. Neville, DPT, PT, WCS, BCB-PMD

Critical Appraisal of Literature for Preparing Evidence-Based Documents
Wednesday, February 17, 2016
Presenters: Keith G. Avin, PT, PhD, Matt Elrod, PT, DPT, MEd, NCS, Joseph Godges, DPT, MA, OCS, Timothy Hanke, PT, PhD, Sandra L. Kaplan, PT, DPT, PhD, Christine M. McDonough, PT, MS, PhD, and Julie Tilson, PT, DPT, MS, NCS

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