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Table of Contents

10 Integrated Standing Wheelchairs: Examining the Evidence
Magdalena Love OTR ATP

19 Scrambler Therapy: Effective use of artificial neurons for the treatment of chronic neuropathic pain
Francis R. Sparadeo PhD and Stephen D’Amato MD

33 Evolution of Deep Brain Stimulation and Functional Neuroscience
Lin Zhang MD PhD and Laura Sperry MSN RN ANP-C

40 The Demise of Science Fiction: Cutting-Edge Options in Prosthetics
D. Ryan Hixenbaugh

49 Web-based Healthcare Technology: A Telemedicine Primer for Nurse Life Care Planners
Trish Councell RN, BSN, LNCC

59 Selecting Databases to Search in EBSCO Host and Applying Them to a Life Care Planning Search, Part I
David Dillard BA MLS

Departments

2 Editor’s Note
Wendie A. Howland RN-BC MN CRRN CCM CNLCP LNCC

3 Information for Authors

4 Contributors to this Issue

6 Letters to the Editor

8 Ethics in Action: An attorney client with a friend ...

On the cover: Dr. Hugh Herr, Director, Bio-mechatronics Group, MIT Media Lab

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In order to make safe and effective judgments using NANDA-I nursing diagnoses it is essential that nurses refer to the definitions and defining characteristics of the diagnoses listed in this work. Other diagnoses may be relevant depending on patient needs.
Welcome to the Spring 2014 issue of the Journal of Nurse Life Care Planning, full of exciting technology updates. Before we get much further, though, please take a minute to check the link to our annual readership survey below. Our number of returns has increased every year; we’d like to be able to hear from more of you, any type of life care planner, an attorney, a therapist, a techie, anyone who reads our Journal, AANLCP member or not.

This issue brings us another detail-packed offering from Dr. Dave Dillard on searching, specifics on getting the most out of the EBSCOHost databank. I have found that a careful reading of his work is rewarding, and I keep copies of his articles stored on my computer for easy cut-and-paste reference when I am asked to do a literature review.

Our Core Curriculum has been out for a few months now. I’d like to ask anyone who has a suggestion for additional material or chapters to be included in the next edition to please drop me a line. I have a (so far, very) small file for those updates in the works. It’s sooner than you think! We would love to hear words of wisdom from previous authors, aspiring authors, and eagle-eyed fact-checkers!

Cordially,
Wendie Howland

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Information for Authors

AANLCP® invites interested nurses and allied professionals to submit article queries or manuscripts that educate and inform the Nurse Life Care Planner about current clinical practice methods, professional development, and the promotion of Nurse Life Care Planning within the medical-legal community. Submitted material must be original. Manuscripts and queries may be addressed to the Editorial Committee. Authors should use the following guidelines for articles to be considered for publication. Please note capitalization of Nurse Life Care Plan, Planning, etc.

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Manuscript length: 1500 – 3000 words
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- Put the title and page number in a header on each page (using the Header feature in Word)
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All photos, figures, and artwork should be in JPG or PDF format (JPG preferred for photos). Line art should have a minimum resolution of 1000 dpi, halftone art (photos) a minimum of 300 dpi, and combination art (line/tone) a minimum of 500 dpi.

Each table, figure, photo, or art should be on a separate page, labeled to match its reference in text, with credits if needed (e.g., Table 1, Common nursing diagnoses in SCI; Figure 3, Time to endpoints by intervention, American Cancer Society, 2003)

Live links are encouraged. Please include the full URL for each.

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Manuscript Review Process

Submitted articles are peer reviewed by Nurse Life Care Planners with diverse backgrounds in life care planning, case management, rehabilitation, and the nursing profession. Acceptance is based on manuscript content, originality, suitability for the intended audience, relevance to Nurse Life Care Planning, and quality of the submitted material. If you would like to review articles for this journal, please contact the Editor.

AANLCP® Journal Editorial for this issue

Wendie Howland MN RN-BC CRRN CCM CNLCP LNCC
Journal Editor

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Contributing To this Issue

Trish Councell (“Web-based Healthcare Technology”) is the owner of Hummingbird Legal Nurse Consulting.

Stephen D’Amato (“Scrambler Therapy”) is currently the Medical Director of Calmar Pain Relief, LLC. He received his medical degree at the University of Padua, Padua, Italy. He was the first medical doctor board certified in Emergency Medicine in the state of RI. In 1980 he became the Medical Director of the first "Free Standing Emergency Room" in the US until he retired from Emergency Medicine to pursue his studies on chronic pain. He was certified in Italy by Professor Guiseppe Marineo in November, 2009 on the technology, use, and application of the MC-5A Scrambler Therapy device. He was appointed Clinical Assistant Professor of Emergency Medicine, Boston University School of Medicine, Roger Williams Medical Center Campus, Providence, RI in 1999.

David Dillard (“Selecting EBSCO Host Databases”) has degrees in history and library science. He has worked at Temple University Libraries since 1970, first in the Business Library; he moved to Reference and concurrently began to learn bibliographic database searching. He now does collection development for Tourism, Hospitality, Sports Management, Recreation, Therapeutic Recreation, Public Health, Kinesiology, Disabilities, Social Work and Communication Disorders. Dave started sharing information sources and answers to questions on internet discussion groups around 1998 and that has grown to a cottage business. He started a network of public search engine indexed discussion groups and archives for sharing of posts of good websites, bibliographies of sources on a wide variety of topics, and news story summaries with source citations and links to those sources. He is a regular on several nursing specialty lists and is very open to contact from anyone to help with searches on any topic.

D. Ryan Hixenbaugh (“The Demise of Science Fiction”) is the Senior Marketing Strategist for BiOM. He has been involved in new medical device technology for over fifteen years. His last contribution to the JNLCP was an article on personal bionics and the VA in the December 2012 issue (XII.4). He lives aboard the yacht Pleiades in a Seattle WA marina.

Magdalena Love (“Integrated Standing Wheelchairs”) is the clinical education specialist at Permobil, Inc.

Frank Sparadeo (“Scrambler Therapy”) is a clinical neuropsychologist whose practice focuses on neuropsychological assessment and pain management. He serves on the graduate faculty of Salve Regina University in Rhode Island, teaching graduate courses in neuroscience and psychopharmacology. He was formerly on the faculty of Brown University School of Medicine in the School of Psychiatry and Human Behavior. He has a particular interest in efficacy of different treatments and management of pain, and is a research consultant to Calmar Pain Relief and clinical consultant to a program for people with co-occurring addiction and chronic pain.

continued next page
Laura Sperry (“Deep Brain Stimulation”) is at the Center for Neuromodulation at the University of California, Davis Medical Center in Sacramento, CA and helps to manage the Deep Brain Stimulation patients within the program. She previously worked as a nurse practitioner with the Center for Women’s Health and Continence and Pelvic Floor Center at the University of California, Davis Medical Center.

Lin Zhang (“Deep Brain Stimulation”) is the co-Director of the Center for Neuromodulation at the University of California, Davis Medical Center in Sacramento, CA. Dr. Zhang’s clinical and research interests focus primarily on Parkinson’s disease, including its epidemiology and the association between past nutritional deficiency and current prevalence of the disease. He is testing new drugs with neuroprotective properties that may slow down the progression of Parkinson’s. He also is investigating the clinical manifestation of the disease in patients with atypical Parkinson’s disease, and those with a family history of premutation for Fragile X Syndrome, a genetic disorder that typically affects children.
Letters on any topic are welcome and may be sent to the Editor at howland@howlandhealthconsulting.com. Letters may be edited for brevity.
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The CNLCP® Certification Board is a separately incorporated entity that facilitates consumer health and safety through credentialing/certification of nurse life care planners. It ensures that their practice is consistent with established standards of excellence in the development and defense of the life care planning document.

Similar to consumers knowing to seek out certification status within other professions (e.g., dentists, pharmacists, etc.), certification within the field of nurse life care planning has become an important indicator that a certified nurse not only holds state licensure to practice nursing, but is qualified, competent and has met rigorous requirements in the achievement of the CNLCP® credential.

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Ethics in Action

An issue with a vendor

This scenario came from a nurse life care planner. The comments are from a group of nurse life care planners who were asked to share their opinions. Nothing in this column is to be taken as legal advice.

I had an incident about a year and a half ago with an attorney I no longer work with. This attorney took a case regarding the daughter of a good friend from law school. I questioned the ethics myself, but took on the case. I could not find the merit the attorney claimed his friend stated was obvious. The daughter had a severe neurological condition that had complications which were par for the course with this condition. When I wrote my report and told him the news, he was less than pleased. We parted ways. Bottom line, is it ethical for attorneys to take cases for friends? How would you deal with such a request?

Q.

A.

The ethics of this type of situation depend on the nature of the friendship and the ability of the attorney to remain objective. What would not be ethical is for the consultant to base an opinion upon the relationship with the friend or attorney. The attorney is merely representing a friend. There is no breach here, anymore than it would be a breach for me, as a nurse, to care for a friend that was sick. The attorney can also be upset if the expert does not come up with the opinions he hoped for, but "it is what it is," and the expert cannot bend the rules because the client is the attorney’s friend.

In my opinion, accepting the case isn’t necessarily unethical in itself but it does set the stage for bias. Legal counsel or any other referral source for that matter refers cases to us because we are professionals in the field of life care planning and are obligated to base our findings and recommendations on research, facts, evidence-based practices, and nursing diagnosis.

Our code of ethics states, “The Code of Professional Ethics and Conduct for the American Association of Nurse Life Care Planners® is based upon the belief that all members have an ethical obligation to practice nurse life care planning with the utmost integrity, competency and accountability.” I would specifically refer to statements 3, 5, and 6 in our code of conduct.

Where I see the ethical dilemma is not in the fact that the report was completed in an objective, unbiased, and professional manner but in the fact that the referring counsel had a preconceived opinion as to what the results of the report should have been before it was even completed. In the scenario presented it was unclear if the attorney had any medical background.

If he was unable to accept the case without preconceived opinions and bias then he should have declined it.

In a similar situation, I stated that I would take the case, however, I would be honest about what I found even if it meant that the attorney had no case. He wasn’t pleased and tried to contest my findings. I told him again that my focus was on reviewing the facts in the medical record; unfortunately, the facts of the records did not support his friend’s claim. He rehired me a few months later, thanking me for my honesty.

Professional dealings involving family and friends can challenge both relationships and objectivity.

However, I do not believe that this occurs in the ma-
majority of cases. As a consulting Life Care Planner or Legal Nurse Consultant, I have no standing to judge the ethical merits regarding an attorney’s choice of clientele. However, I do have the choice regarding with whom I work, what cases I take, and to what standard my reports are written. Perhaps we’re dealing with the wrong question when we ask if it is ethical for attorneys to take cases for friends.

Your opinion should always reflect a thorough and objective review of the information. You have to call it like you see it. In the end, attorneys want to understand all sides of the case; opposing counsel will surely address them. If all they want is “yes men” to agree with them, chances are they will find one out there. In my experience, life care planners who frequently compromise their integrity usually don’t experience long successful careers. Even if you lose a client, you will never really lose when you practice with integrity.

This is a very interesting question that goes to the heart of morality and the law. The responsible and reasonable attorney must be able to put aside any personal or emotional influences in order to objectively and effectively represent their client’s interest. To do otherwise and to allow personal attachments to influence one’s decision in case selection and client representation is to do a serious disservice to both parties and the profession. It has been said many times before that the attorney who represents himself/herself or a family member has a fool for a client.

Not to be argumentative, but the adage says nothing about family members...or friends for that matter. And there are plenty of foolish attorneys out there that are completely ethical.

To my surprise, the Model Rules of Professional Conduct by the American Bar Association do not include a conflict of interest when an attorney represents a friend or member of a friend’s family. [http://www.americanbar.org/groups/professional_responsibility/publications/model_rules_of_professional_conduct.html](http://www.americanbar.org/groups/professional_responsibility/publications/model_rules_of_professional_conduct.html)

Setting aside conflict of interest concerns then, does the attorney accepting the case think he or she can do the best job for the friend’s daughter? Is there no one else who can handle the case more expertly? It may not come down to a conflict of interest according to the American Bar Association but embarrassing confidential issues may arise or a negative case outcome may tarnish their friendship.

I think that the chance of bias occurring is more likely than not. Because of the potential for bias and/or negative effects on a friendship, in my opinion, the smartest thing the attorney can do for a friend’s daughter is refer her case to an attorney he or she knows will handle the case in the best possible way.

For the next issue: What does your panel think about this? I have recently been asked to review some really bad life care plans produced at a fixed price. Our standards of practice require that we develop comprehensive plan that identifies all needs and includes peer-reviewed, evidence-based research, and personal assessment (when possible, as allowed) or record review on which to base our opinions. When an expert prices LCP work at a fixed rate in order to attract a larger volume of attorney clients, isn’t this in conflict with the needs of the patient, when the methods used to produce the plan meet few if any professional LCP standards?
Individuals with disabilities often suffer a wide variety of secondary health consequences as a direct result of immobility. Standing can be vital to maximize function and minimize comorbidity. In addition, there are many vocational and psychosocial benefits to standing. This article will explore the current research for standing and differences between a separate static stander and an integrated wheelchair stander. For further information, I highly recommend referencing the RESNA Position on the Application of Wheelchair Standing Devices, a comprehensive review of current literature and recommendations, available free online.


Who should stand?
Every individual benefits from regular standing; the human body is engineered to be upright and standing. Prolonged immobility causes many health problems. While this classic study would never pass an institutional review board approval today, in 1948, a group of scientists studied the effects of immobility by having a healthy group of subjects stay in bed for 6 weeks. The men were found to have decreased bone mineral density, pressure ulcers, joint contractures, bowel and bladder impairments, and gastrointestinal problems (Deitrick, Whedon, & Shorr, 1948). Most recently, there has been evidence that people who work sitting for prolonged periods at a desk are at risk for many serious complications of immobility (JustStand.org, 2014). A 2010 American Cancer Society study reported, “Time spent sitting was independently associated with total mortality, regardless of physical activity level.”

Another study of individuals with no neurologic deficits by the University of Queensland concluded that even when adults exercise the recommended

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amount of time, this was not enough to counteract the metabolic changes from prolonged sitting (American Cancer Society, 2010; Healy, 2010). If these consequences have been observed in able-bodied individuals who sit on average 7.5 hours a day, imagine the compounded effects of immobility from an individual who is never able to reach a standing position.

Who is appropriate for a standing device?
Any individual who is not able to stand functionally with independence may be appropriate for a standing device. Most of the research on the medical benefits of standing has been conducted on individuals with spinal cord injury (SCI) and children with cerebral palsy (CP). However, individuals with a variety of neurologic conditions such as multiple sclerosis, muscular dystrophies, spina bifida, and traumatic brain injury (TBI) can benefit from standing.

Medical Benefits of Standing
The medical benefits of standing can be divided into several categories. There is evidence that standing can help with:

- Slowing decrease of bone mineral density (BMD)
- Reducing spasticity
- Decreased risk of contractures/increased range of motion (ROM)
- Improved cardiopulmonary function
- Decreased incidence of urinary tract infections (UTIs)

- Improved bowel functioning
- Reduced occurrence of pressure ulcers
- Improved psychological functioning

For a more in-depth overview of the research with references, please refer to Table 1.

Options for Standing
There are different types of standing devices available. There are ambulation aids (e.g., pressure relief ankle-foot orthoses (PRAFO), walkers, gait trainers) which can be good if one is able to use them, but the quality of the weight bearing and functional use of upper extremities needs to be considered. There are separate standing devices, also great for weight bearing, but adherence to a standing program can be an issue. Lastly, there are integrated wheelchair standing devices, the main focus of this article. Note: Comprehensive comparisons between different brands of standing devices are outside the scope of this article. Pictured devices are for illustration only; other models and manufacturers should be evaluated by qualified professionals as part of the continued next page
Table 1. Medical benefits of standing.

**Bone Health**
Of all the medical benefits, improvements in bone mineral density (BMD) following weight bearing in standing has the greatest amount of evidence. BMD is significantly reduced in individuals who are not weight bearing, including children with CP and individuals with SCI, among others. Mechanical loading through standing is one method of decreasing risk of osteoporosis and fractures, and should be included in any proactive approach to improving bone health following injury. BMD was increased in children with cerebral palsy who adhered to a standing program – with a dose-dependent relationship (Chad, Bailey, McKay, Zello, & Snyder, 1999; Caulston, Ward, Alsop, Dunn, Adams, & Mughal, 2004). Following SCI, standing was found to slow down the loss of BMD in the first two years after injury (Alekna, Tamulaitiene, Sinevicius, & Juocevičius, 2008; Goemaere, Van Laere, De Neve, & Kaufman, 1994).

**Spasticity, ROM, and Contractures**
Spasticity or abnormal muscle tone is common in individuals with an upper motor neuron disorder and can be very detrimental to independence in daily activities. Tilt table standing was shown to reduce spasticity in case studies (Bohannon, 1993) and surveys of people with SCI (Dunn, et al., 1998). The spasticity reduction is reported to be short lasting – making the need to complete a regular standing program vital for consistent results. ROM limitations and subsequent contractures are also a secondary condition of immobility. The use of a tilt-table in individuals with MS was found to increase ankle and knee ROM when compared to an exercise/stretching program (Baker, Cassidy, & Rone-Adams, 2007). In individuals following a stroke, the tilt table increased ROM in the ankle and decreased the spastic muscle’s excitability (Tsai, Yeh, Chang, & Chen, 2001).

**Cardiopulmonary Function**
When the body is in an upright position, there is an increase in the volume of the chest and abdominal cavities and consequently improve vital capacity of the organs (Arva, et al., 2009). Participation in a tilt-table regime for 5 minute intervals was found to increase the respiratory function of individuals who were requiring ventilation – the results were short lived, disappearing 20 minutes post intervention (Chang, Boots, Hodges, Thomas, & Paratz, 2004). Standing was also found to elicit cardiovascular responses similar to exercise when achieving a standing position (Edwards & Layne, 2007).

**Bowel and Bladder Function**
Urinary tract infections are a common occurrence for individuals with SCI and those in a wheelchair. In surveys, standing wheelchairs have been found to increase bladder emptying and decrease incidence of UTIs (Dunn, et al., 1998; Eng, Levens, Townson, Mah-Jones, Bremner, & G., 2001). In a survey of 99 individuals with SCI, standing was believed to decrease UTIs and improve bowel functioning. A case study of an individual with a chronic SCI who experienced significant issues of constipation found that with standing, the frequency of his bowel movements improved and time to complete the bowel program decreased (Hoenig, Murphy, Galbraith, & Zolkewitz, 2001). Further evidence has indicated that participation in a standing program has improved voluntary sphincter control (Netz, et al., 2007).

**Skin Integrity**
Pressure ulcers are of major concern for many individuals who are in a wheelchair – particularly if there is decreased sensation. When standing, pressure is offloaded from the ischial tuberosities and sacrum – providing a very functional weight shift (Sprigle, Maurer, & Sorenblum, 2010). As part of a comprehensive pressure ulcer prevention program, participation in standing is recommended for any individuals who can tolerate weight bearing (Edlich, et al., 2004).
Types of integrated standing wheelchairs:

- Manual wheelchair with manual standing option (LifeStand Helium), Figure 1
- Manual wheelchair with power standing option (e.g., LEVO compact-easy LCEV, XO-101, Figures 2 and 3)
- LifeStand LSE Power Wheelchair with power standing option (e.g., LEVO, Permobil C500VS, Figure 4, Redman)

**Benefits of an Integrated Wheelchair Stander**

A separate stander (standing frame) provides all the medical benefits of standing. However, consider adherence. Use involves an extra transfer; once standing, the individual is immobilized in the frame for as long as the standing program prescribes.

With an integrated wheelchair stander, one is able to stand intermittently throughout the day (at work or at school), to relieve pressure on the ischial tuberosities and sacrum, and to reach daily items functionally. Many power wheelchairs allow for driving at reduced speeds while standing, and manual wheelchairs typically have decreased the time needed to return to a seated position and move about. To maximize gains, an individual should stand at least an hour a day, five times per week. Research has indicated that more frequent, shorter bursts of standing are better for bone health than prolonged standing once a day (Rubin, Sommerfeldt, Judex, & Qin, 2001). Simply by being convenient and functional, an integrated standing wheelchair increases compliance and frequency of participating in a standing program, thus maximizing the medical benefits of standing.

As a clinician, I have heard many of my clients’ personal stories about how a wheelchair stander benefits them in everyday life. I have had individuals tell me that they regained the ability to sense when they have to perform self-catheterization, had decreased neuropathic pain, or healed a pressure ulcer faster than they imagined.

There are the psychosocial benefits of seeing eye-to-eye with others, as well as increased confidence returning to meaningful vocations (Figures 5 and 6).

**What the Life Care Planner Needs to Know**

First, consider your client’s needs. Power or manual chair? If power, the user must be able to safely operate a power wheelchair. Are specialty control devices required? Some standing power chairs are able to perform tilt, recline, and standing functions (Redman, Permobil C500 VS, Figure 4), while other chairs only perform standing (XO-202).

*continued next page*
Consider device weight. This is especially important for a manual unit, as shoulder preservation is critical for someone dependent on manual propulsion.

Manual chairs with power standing options (e.g., XO-101, LifeStand LSE, LEVO LCEV, Figures 2 and 3) typically weigh around 55 pounds. This may not be recommended for prolonged propelling but can be a good option for increasing accessibility around the house or workplace. Currently, there is only one manual wheelchair with a manual standing option, the Life Stand Helium (Figure 1), weighing around 36 pounds and using gas struts to achieve the standing position.

Once the decision on which product works best for the end user has been made, find a qualified individual who is familiar with the product to be involved with fitting and training. Many of the options are custom built to the customer specifications. Contact the manufacturer if a qualified professional is not available locally.

Involve a qualified therapist (OT or PT) to consider all relevant precautions. If possible, arrange for a home trial of the product. All participating parties, especially the end user, must know what they are ordering to increase the chance of success and minimize the risk of equipment abandonment.

Consider transportation adaptation with use of this technology, as the weight and shape of extra components for standing could reduce an individual’s ability to load/unload the device in a vehicle independently.

What the End User Needs to Know
First, individuals need to be know that this technology exists.

The UsersFirst Website has a Mobility Map – it can help guide individuals through the process of getting the equipment needed.

What the Clinician Needs to Know
Common misconceptions are that standing wheelchairs are impossible to fund, or that the individual continued next page
hasn’t stood for a very long time and it is now con-traindicated. *These are wrong.* Just because it may be difficult to get medically necessary equipment for the individual does not mean that a clinician should not be aware of it. It also doesn’t mean that clini-cians should give up justifying standing benefits to payer sources. Both state Medicaid programs and private insurances cover standing wheelchairs with good documentation. Don’t hesitate to contact the manufacturer to ask questions regarding wording for recommendations in a plan. Check through local voca-tional rehabilitation agencies. Never underesti-mate a patient’s willingness to find resources for things of value.

While fracture risks in individuals with chronic spi-nal cord injuries are a concern, generally speaking they arise from torqueing forces, like trying to put shoes on, or getting an ankle caught under-neath the footplate during a transfer, not me-chanical loading on aligned joints. Of course a physician’s approval for standing can be an extra safeguard. Clinicians should always contact wheelchair dealers to trial this equip-ment prior to ordering it.

**LifeStand Helium**

**Frequently Asked Questions**

*How much does it cost?* The retail cost new for the Helium line begins at about $9,500 and can go to near $14,000 depending on the model and options and accessories. While this may seem expensive, the client is getting both a lightweight wheelchair and a standing frame in one package. Costly home modifications can often be avoided with the use of this wheelchair.

*How much does it weigh?* Manufactured from tita-nium and aircraft aluminum, this device weighs about 37 lbs. The rear axle is adjustable, allowing balance customization to increase maneuverability. To my knowledge, this is the lightest-weight inte-grated standing wheelchair on the market.

*What is the maximum weight capacity?* It will ac-co-modate a maximum user weight of 220 pounds.

*Do certain parts need to be replaced more frequently due to use?* This chair has reliability similar to a regular ultra-lightweight wheelchair. The gas lifting struts component might eventually need to be re-

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*Figure 5.* Dr. Ted Rummel is seen working from his stand-up wheelchair. Read more: [http://www.dailymail.co.uk/news/article-2513994/Paralyzed-doctor-performs-surgery-thanks-stand-wheelchair.html#ixzz2ozTw10PS](http://www.dailymail.co.uk/news/article-2513994/Paralyzed-doctor-performs-surgery-thanks-stand-wheelchair.html#ixzz2ozTw10PS)

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placed. That is an easy task and they are inexpensive.

*How often does it need replacement?* That, of course, depends on how well people care for the device. I find that people with the Helium tend to treat it well. I am aware of one client that used it every day for seven years and then bought another one new. Typically the chair does make it to the five-year mark, so this is a reasonable replacement interval for a life care plan.

![Figure 6. LifeStand Helium in the workplace](image)

**Figure 6.** LifeStand Helium in the workplace

**References**


American Cancer Society. (2010, July 23). More time spent sitting linked to higher risk of death; risk found to be independent of physical activity level. Science Daily.


*continued next page*
Nursing Diagnoses to Consider  NANDA-I Nursing Diagnosis, 2012-2014

- **Risk for Disuse Syndrome** At risk for deterioration of body systems as the result of prescribed or unavoidable musculoskeletal inactivity (Domain 4, Activity/Rest; Class 2, Activity/Exercise)

- **Impaired Physical Mobility** Limitation in independent purposeful physical movement of one or more extremities (Domain 4, Activity/Rest; Class 2: Activity/Exercise)

- **Impaired Transfer Mobility** Limitation in independent movement between two nearby surfaces (Domain 4, Activity/Rest; Class 2: Activity/Exercise)

- **Impaired Walking**: Limitation of independent movement within the environment on foot (Domain 4, Activity/Rest; Class 2: Activity/Exercise)

- **Activity Intolerance**: Insufficient physiological or psychological energy to endure complete required or desired daily activities (Domain 4 Activity/Rest, Class 4: Cardiovascular/Pulmonary Responses)


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Rubin C, Sommerfeldt D, Judex S, & Qin Y. (2001). Inhibition of osteopenia by low magnitude, high frequency mechanical stimuli. DDT, 848-858.


Late-breaking news: TEK Robotic Mobilization Device

Not yet available in US, pending FDA approval
Interesting new mobility device for individuals with SCI. Total cost is expected to be $15,000.

Video: [http://vimeo.com/37343809](http://vimeo.com/37343809)

Website: [http://www.matiarobotics.com/index.html](http://www.matiarobotics.com/index.html)

From the developer: “We are initially producing a single unit adjustable for people between 1.4 and 1.9m in height and 40 and 120kg in weight. This translates to 4ft 7in to 6ft 3in and 88lbs to 265lbs. The adjustments can be made at the factory by the user filling in a form measuring a few vital dimensions or by a local support facility. We are commencing the process of establishing sales and support channels.”
The experience of pain is a normal sensation existing as an expedient mechanism for preservation of life, reduction of injury and/or the initiation of healing. It is formally defined in many research studies as an unpleasant sensory and emotional experience associated with real or potential tissue damage (Merskey & Bogduk, 1994). When pain persists beyond the reasonable timeframe of healing (e.g., six months) and seems to have separated from its purpose of warning, it is labeled as chronic.

Chronic pain, for the most part, does not seem to have a specific purpose. While acute pain is usually time-limited, chronic pain can persist for decades. Chronic pain persists beyond a point when natural healing and in some cases surgical healing has resolved. Subjective components seem to increase in importance and the behaviors or responses of the individual appear disproportionate to underlying pathophysiology and often become the disorder itself. Chronic pain disrupts every aspect of life and over time produces significant emotional and behavioral changes. People experiencing chronic pain seem to report the pain as treatment-resistant, thereby increasing exposure to more and more treatment approaches, including the use of opioids in combination with various cocktails of anticonvulsants, anti-inflammatories and antidepressants. As pain persists in the presence of varying and increasing interventions, the focus of treatment begins to move toward the psychological. Referrals are often made for “behavioral pain management,” usually focused on improvement in coping as well as improvement of specific psychophysiological manifestations of the pain (e.g., muscle tension).

Theoretical pain control
The theoretical basis of most chronic pain treatment approaches is the gate-control theory (Melzak and
Wall, 1966). The use of this theory has led to the development of treatments designed to suppress pain in the theoretical gating system in the dorsal horn of the spinal cord and brain and suppressing pain from an assumed sensory source in the periphery. Melzak (1999) has suggested the gate-control theory is more effective in understanding acute and sub-acute pain than chronic pain.

The *neuromatrix theory* proposes a sequentially established central source for pain that becomes independent of the initial sensory source (e.g., phantom limb pain). The neuromatrix theory suggests that key brain structures (anterior cingulate, insular, parietal lobes and perhaps other structures) are involved in the perpetuation of pain, and it is only when this pain matrix is interfered with and the brain returns to homeostasis that pain is reduced or eliminated. The neuromatrix theory has led to numerous investigations on the role of the brain in chronic pain.

Current methods of treatment for chronic pain, such as surgery, epidural steroid injections, medications, various forms of exercise, alternative treatment methodologies, and psychotherapy, are based on the gate-control model. Unfortunately, they have less than stellar levels of efficacy. Neuroscience advances have produced significant evidence, now widely accepted, that chronic pain is the result of a *central nervous system dysregulation*, with hyperexcitability and expansion of peripheral and central receptive fields and cerebral reorganization. These are often associated with *hyperalgesia* (Martelli et al., 2003).

Marineo et al. (2003) stated that, “the pain system … is characterized by a high level of information content which forms its essence.” He states that specific neural receptors are biological elements capable of converting chemical, physical or mechanical events into specific pain information. Over time this biological system reestablishes homeostatic equilibrium. The purpose of the pain is achieved and the system returns to a “silent state” (Marineo et al., 2003).

This pain system is sometimes challenged, and the silent state is not achieved, resulting in chronic pain. This challenge is due to either the inability to remove the biological pathology or “intrinsic dam-

*continued next page*
When this occurs, complex reactions set up a circular process that ultimately makes treatment approaches ineffective. Marineo postulated that it is reasonable to assume the lower levels of complexity in the pain system (e.g., chemical reactions regulating the coding of pain information and subsequent feedback) could be influenced by manipulating the “information” variable alone, but at higher levels of complexity. The chemical reactions are in essence a black box. Knowing the input and output of the black box does not require complete knowledge of its contents.

**A practical analogy for ST**

Marineo has offered a practical analogy to explain scrambler therapy to clarify this: the traffic control model.

Imagine an observer who is not familiar with traffic lights. He stands watching the flow of traffic through an intersection. Think of his position and this intersection as subsystem of the entire city’s traffic control system. The entire city’s complex traffic control system is made up of many of these subsystems.

Being able to correctly describe the whole traffic system depends on whether he can accurately understand its smaller parts. Our observer, in time, will probably learn to recognize and understand the way the colored lights regulate the flow of vehicles by color and timing: He has discovered the function of the traffic lights at one intersection, and now he can generalize that to the whole city’s system.

Now, our observer understands that if he wants to arbitrarily change the city’s traffic flow, all he has to do is to change the colors of the lights, perhaps by choosing his own sequence of colors instead of the programmed one.

If traffic lights suddenly stop working, traffic will probably go haywire. Since our observer has figured out how the traffic light system works, now he can imagine traffic going from an extremely disordered state (due to a breakdown in color code information) to a more orderly one, as soon as the information has been correctly re-established.

He can also imagine replacing the traffic lights with his own system, the characteristics of which are sufficiently compatible with the one it replaces. Although he might not know anything about the overall city traffic control system, he can make replacement system because he has learned its processing logic, which, in the final analysis, is what really regulates the traffic flow.

Once our observer has figured out the traffic rules, he doesn’t need to know why lights stopped working properly to be able to restore them if they become disordered. All that is important to know is which

*continued next page*
electric cables are involved, the voltage of the lights themselves, and how to program the correct color sequences. Then he can develop his own control panel to replace a defective original, while respecting the original established rules. If he does this correctly, the drivers will not notice any difference, and traffic will resume normal flow.

Based on this simple example, Marineo infers:

- Increase in the disorder of traffic flow is strictly related to bad information, in this case, traffic light colors that drivers can’t understand.
- Subsystems are part of a more complex system. This complexity itself amplifies and extends a disorder, even when it is initially small and localized, eventually increasing disorder throughout the city. A disorder caused by bad information grows and spreads, expanding with time and involving other systems (side streets) even if their local traffic lights function properly.
- The only way to avoid uncontrolled chaos caused by information errors is to correct them. This will work regardless of the method used to do it, although outcome will depend on the accuracy of the coding and its output.

**Scrambler Therapy**

Scrambler therapy uses this principle. When long-lasting pain information loses its protective or informational value and becomes something else, a pathological event itself, greater disorder results. We see its serious consequences (chronic pain, neuralgia, causalgia) in people with indescribable suffering.

Having thus characterized the pain system in terms of its information content, both in the active phase and in the remission or quiescent phase, Marineo developed a way to create a synthetic antagonistic signal delivered through skin surface electrodes to deceive the nerve centers that decode information and recognize it as pain.

Marineo et al. (2003) applied his theory of pain modulation and elimination by using a device that uses a low amperage electrical stimulation applied to the healthy skin above and below the pain focus of an individual suffering from chronic pain.

The electrical stimulation provides information to the CNS (using 16 different types of nerve action potentials, resembling endogenous ones, using algorithms to assemble them into sequences) through the dorsal horn and up to the brain via C-fibers.

In ST, bioelectrical non-pain information goes to the CNS, deceiving the brain into reading this non-pain...
information as real, as if it were generated by the body. When this occurs, there is an immediate reduction of the chronic pain, and in some cases it is eliminated. This is scrambler therapy.

Clinical researchers further postulate that due to repeated exposure to the non-pain code, changes in the brain (CNS plasticity) will result in a long-term relief of perceived pain, and the individual will continue to have this positive response for months or years following treatment.

**Outcome studies in the literature**

In one of the first published investigations of ST, Marineo (2003) reported on the treatment of 11 terminal cancer patients suffering from drug-resistant neuropathic pain. He applied ten treatment sessions of ST to these patients and reported that 81.8% of the patients were able to discontinue pain medications and 18.2% were able to reduce their dosage of pain medication.

These results were encouraging. Another investigation was conducted and published in 2003 (Marineo, Spaziani, Sabato & Marotta, 2003) in which 33 patients suffering from drug-resistant chronic neuropathic pain were treated with 10 sessions of ST. The entire sample responded positively to the treatment with significant declines in VAS (Visual Analog Scale) scores. Seventy-two percent of the patients stopped taking pain medications. The remaining 28% significantly reduced their medications after ST.

Sabato, Marineo & Gatti (2005) treated 226 patients with various forms of neuropathic pain (e.g., sciatic and lumbar pain, post-herpetic pain, post-surgical nerve injury pain, pudendal neuropathy, brachial plexus neuropathy, and others). They applied only five ST treatments of 30 minutes and were able to demonstrate significant improvement with 80% of the sample reporting a better than 50% relief from pain, and only 9% with no positive response to the treatment.

More recently several studies have continued to demonstrate efficacy of ST. In a study of 40 cancer patients and 33 non-cancer pain patients VAS scores were compared at the initiation of treatment, after the 10-session treatment and again at 2 weeks following treatment (Ricci et al., 2011). In their sample the average VAS score was 6.2 just before treatment. After ten treatment sessions the average VAS was 1.6. Two weeks following treatment the average VAS score was 2.9.

Marineo et al. (2012) conducted a clinical trial with patient randomized to either guideline-based pharmacological treatment or ST. Patients were matched by type of pain (i.e. post-herpetic neuralgia, postsurgical neuropathic pain, and spinal canal stenosis). The VAS score was recorded prior to the initiation of the first treatment and after each of ten treatment
sessions. The control group VAS was 8.1 and the ST group 8.0. At one month after ST treatment the ST group VAS score was 0.7 while the control group was 5.8. At two and three months, the mean VAS scores in the control group were 5.7 and 5.9; the ST group scores were 1.4 and 2. These results clearly suggest that ST is far superior at relieving neuropathic pain than drug management.

The mechanism for this treatment effect may be raising the gate threshold for pain at the spinal cord, reducing wind-up (central sensitization of the spinal cord and brain that amplifies the abnormal feelings), reducing impulses from the damaged nerve, and reducing psychological mal-adaptation to pain (Jenson, 2010).

The most recent investigation (2012) has demonstrated similar levels of treatment efficacy in the treatment of post-herpetic pain with ST (Smith, Marineo, Coyne and Dodson, 2012). Sparadeo, Kaufman & D’Amato (2012) recently published an outcome study comparing the impact of ST on three diagnostic groups (spine pain, complex regional pain syndrome, and complicated multisite cases). They found that ST was equally effective for spine pain and CRPS, with six-month follow-up demonstrating significant improvement lasting more than six months in more than 75% of these patients.

Comparison to other methods No direct investigations comparing ST to implanted devices (i.e., intrathecal morphine pump and spinal cord stimulator) have been conducted to date. However, it is important to note that implanted devices result in only a 50% reduction in pain at best (Harke, Gretenkort, Ladleif et al., 2002; Kumar, Taylor, Jacques, et al., 2007; Smith, Staats, Pool et al., 2005) and involve invasive procedures with risk for infection and other surgical and technical problems. There is also a subset of patients that are successfully treated initially, only to request the implanted device be removed as the pain returns.

It is quite clear that the use of ST before considering the use of an expensive surgically implanted device should be part of the protocol for these procedures.

Recent Applied Data Analysis Calmar Pain Relief is a free standing pain treatment center in Rhode Island exclusively dedicated to the treatment of chronic neuropathic pain. As part of ongoing evaluation of program efficacy, a data analysis

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was conducted in late 2013 on 46 consecutive admissions for the treatment of complex regional pain syndrome (CRPS) and 49 consecutive admissions for the treatment of single site spine-based pain.

**Method**

**Sampling and Procedures**

This investigation analyzed the pre- and post-treatment data of 95 individuals entering a ST program for the treatment of chronic neuropathic pain. The patients were divided into two diagnostic groups: those with complex regional pain syndrome (CRPS) and those with chronic spine-based pain. Each patient was asked to rate their pain using the Visual Analog Scale (VAS) before initiation of ST. Each patient was also asked to rate the effect pain had on life activities using the Brief Pain Inventory (BPI, a ten-point rating scale in which a higher score represents greater pain effect). Each patient was asked to report the number of hours of pain relief between ST applications. All patients were weaned from opioids and anticonvulsant medications being used for pain reduction.

The data were composed of pretreatment pain levels using the ten-point VAS and BPI. Each treatment session included a VAS measure before ST was applied and following the ST. We called patients six to 12-month post treatment to obtain VAS pain levels and administer repeat BPI.

**Data Analysis**

Means and standard deviations of pretreatment VAS and BPI measures were calculated and plotted graphically representing pre- and post-treatment states. Paired comparisons using T-tests were conducted comparing pretreatment VAS mean levels to post-treatment levels as well as pretreatment BPI results to post-treatment results (means). A simple analysis of the number of hours of pain relief between treatment sessions was also computed and graphed.

**Results**

In the first analysis the subjects were asked to keep track of the number of hours of pain relief between sessions. This data was plotted on a graph across ten ST Sessions (Graph 1).

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**Pain rating measures used in this study**

**Brief Pain Inventory (BPI)** (Cleeland & Ryan, 1995) 7-item rating scale from 0 to 10 to rate the degree of negative pain effect, with 10 most severe. Variables: activity level, mood, ability to walk, ability to work or conduct household chores, interpersonal relations, sleep and life enjoyment. Add the item ratings for total score.

**Visual Analog Scale (VAS)** 10-point scale to measure subjective level of pain. Numerous studies have demonstrated the validity and reliability. (Price, McGrath, Rafii & Buckingham, 1983)
Analysis of variance (ANOVA) was conducted in which VAS means were compared between subjects with CRPS and those with spine pain. No differences were found between these diagnostic groups before treatment or at follow-up. There were statistically significant differences within subjects comparing VAS levels before treatment and at follow-up using paired comparisons (t-tests).

Table 1. Means and Standard deviations by diagnosis for Pre and post treatment VAS.

<table>
<thead>
<tr>
<th></th>
<th>CRPS (N=46)</th>
<th>Spine Pain (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Pre Treat VAS</td>
<td>7.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Post Treat VAS</td>
<td>3.4</td>
<td>3.4</td>
</tr>
</tbody>
</table>

ANOVA was conducted on the total score means pre and post-treatment for both diagnostic groups. No statistical differences were present prior to the initiation of ST and likewise at follow-up. Within subjects differences were significant. The following table includes means and standard deviations for both diagnostic groups before ST and at follow-up.

Table 2. Means and Standard Deviations for Pre and Post ST BPI total scores

<table>
<thead>
<tr>
<th></th>
<th>CRPS (N=46)</th>
<th>Spine Pain (N=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Pre Treat BPI</td>
<td>46</td>
<td>14</td>
</tr>
<tr>
<td>Post Treat BPI</td>
<td>20</td>
<td>18</td>
</tr>
</tbody>
</table>

An analysis of success versus failure was conducted using a cutoff of 30% relief. Specifically, those patients reporting less than 30% relief at follow-up were considered failures and those reporting 30% or greater were considered successes. Table 3 summarizes the results of this analysis.

Table 3. Success v. failure and % of pain decrease at follow-up

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Percent</th>
<th>% pain decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>67</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td>Failure</td>
<td>28</td>
<td>30</td>
<td>13</td>
</tr>
</tbody>
</table>

Discussion

The data analysis is consistent with previous program evaluation data analyses (Sparadeo et al., 2012) indicating that ST is highly effective for chronic neuropathic pain. The results indicate that

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six to 12 months following treatment, 70% of patients had an average improvement of 76% in their pain levels. Even those patients considered failing treatment reported an average level of improvement of 13%. The analysis indicated that during the treatment process the vast majority of patients experienced significant pain relief between sessions in an ascending pattern to 48 hours of relief by the final (tenth) treatment session. There does not appear to be any other treatment for chronic pain with the same levels of positive impact.

Implications
Scrambler therapy has been available in the United States for approximately five years. At the Calmar Pain Relief Center in Rhode Island over 700 patients have been treated with success rates over 70%, depending on the diagnosis and complexity of the case. Scrambler therapy is a noninvasive direct treatment of the chronic pain with no known side effects. The use of ST in chronic pain is cost-effective and more effective than any other form of direct treatment for chronic pain. This treatment will likely be used in more cases, especially as more reports appear in scientific literature.

Important factors to consider
Scrambler therapy is very operator-dependent. While the MC-5A ST device manual describes electrode placement sites derived from knowledge of dermatomes, standardized placement does not seem to result in the best outcomes. The physician, nurse, or certified technician applying ST must listen to every patient and be willing to move the electrodes if the results are not satisfactory.

Electrode placement is at the pain margins above and below the pain location. These margins can change from session to session and therefore successful electrode placements one day may not be the same the next day.

Patients using anticonvulsant medications or patients on high doses of opiate analgesics seem to have delayed responses to the ST, and therefore it is necessary to reduce or eliminate these medications before initiating ST.

Patients with surgical hardware still in place may experience significant improvement, if not optimal results. Implanted electrical devices, such as spinal cord stimulator or medication pump, are contraindications for ST. Patients who have such devices re-
moved will experience the same results as the general population.

Patients with significant psychiatric illness are less likely to have good results with ST; this includes patients with active major depressive disorder, psychotic disorder, and somatoform disorder.

**Clinical use**

The application of ST begins at intake. The patient’s past medical record is read, records are reviewed by the physician, and the patient is interviewed and examined. The patient is then educated about ST. This visit can take two hours. During this visit the patient is allowed to see the ST device and to feel the electronic signal. If the patient is cleared to begin treatment, ten sessions will be planned.

On the first session the physician and nurse apply the treatment by placing electrodes on uninvolved areas but along dermatomes as close to the dermatome(s) at the epicenter of the pain (but not on the pain), usually one or two dermatomes above and below it. This guarantees that the ST electronic code will travel along healthy fibers. The device is turned on and the patient gives the clinician feedback regarding what he or she feels. If the placements are in the correct position, the patient will report a precipitous drop in pain to zero, usually within two minutes. Once this occurs the patient will be treated for an additional 45-60 minutes. This process will be repeated for nine more visits applied on consecutive days, usually with a two-day hiatus after the first five treatments.

After the series is complete, the patient is offered an opportunity to return for booster sessions should they experience an increase in their pain level. Most patients returning for booster sessions do so at approximately six months following the treatment. Booster sessions seem to re-stimulate the non-pain memory that was created in the initial treatment process, and therefore the number of booster sessions is minimal.

**Differentiating ST from TENS**

- Standard transcutaneous electrical nerve stimulation (TENS) transmits an electronic signal through the skin to the spinal cord. Scrambler therapy is a neuromodulation procedure using electricity on the surface of the skin to transmit a coded signal to the spinal cord and ultimately to the brain through C-fibers.
Scrambler therapy voltage is significantly lower than TENS and ST cannot burn the skin.

ST is placed above and below the pain and never on the pain, whereas TENS is placed on the pain.

ST sends information to the cord and brain (coded action potentials indistinguishable from real human action potentials). TENS transmits individual wave forms (which are not codes).

TENS is an attempt to “close the gates” and reduce the pain experience, based on gate control theory. ST serves as a source of information that transmits this information ultimately to the brain where it is decoded as non-pain.

ST is assumed engineered to capture A-delta and C-fibers only. TENS is designed to stimulate beta fibers and therefore the brain will accommodate to these electronic signals rendering the treatment ineffective over time.

**Indications for ST**

- Neuropathic pain
- Spine-based pain (radicular pain, stenosis, sciatica, cervicalgia)
- Complex regional pain syndrome
- Pudendal pain
- Post-herpetic neuralgia
- Peripheral neuropathy
- Trigeminal neuralgia
- Chemotherapy induced peripheral neuropathy
- Post-surgical nerve pain

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**Nursing Diagnoses to Consider**

- **Readiness For Enhanced Sleep**: A pattern of natural, periodic suspension of consciousness that provides adequate rest, sustains the desired lifestyle, and can be strengthened (Domain 4, Activity/Rest; Class 1, Sleep/Rest)

- **Activity Intolerance**: Insufficient physiological or psychological energy to endure complete required or desired daily activities (Domain 4 Activity/Rest, Class 4: Cardiovascular/Pulmonary Responses)

- **Readiness for Enhanced Self-Care**: A pattern or performing activities for oneself that helps to meet health-related goals and can be strengthened (Domain 4, Activity/Rest; Class 5, Self-Care)

- **Risk for Powerlessness**: At risk for perceived lack of control over a situation and/or one’s ability to significantly affect an outcome (Domain 9: Coping/Stress Tolerance; Class 2: Coping Responses)

- **Impaired Comfort**: Perceived lack of ease, relief, and transcendence in physical psychospiritual, environmental, and social dimensions (Domain 12: Comfort, Class 1: Physical comfort)

- **Chronic Pain**: Unpleasant sensory or emotional experience arising from actual or potential tissue damage or described in terms of such damage (International Association for the Study of Pain); sudden or slow onset of any intensity from mild to severe without anticipated or predictable end and a duration of greater than 6 months (Domain 12: Comfort, Class 1: Physical comfort)
• Complex pain presentations with a neuropathic component
• Phantom limb pain

Contraindications for ST
• Scrambler therapy should not be used in patients who have an implanted electronic device (spinal cord stimulator or medication pump).
• Scrambler therapy is most effective in patients who are not using anticonvulsant medications for pain.
• Scrambler therapy does not work as well in patients on high doses of opiates. Once the medication is reduced or eliminated, a good response to the treatment is expected.
• Patients with a significant psychiatric history, especially those with a history of somatoform disorder, are not good candidates for ST. Patients who are actively psychotic or suffering from severe major depressive disorder are not good candidates
• Patients experiencing dementia are not good candidates.
• Patients with a history of traumatic brain injury may experience less than an optimal response to ST.
• Patients with non-neuropathic pain (arthritis, vascular pain, bone pain) do not respond as well to ST.

Cost
While there is a Category III CPT code for ST (0278T), there is no consistent universal reimbursement coverage. Several workers’ compensation carriers and third-party administrators now cover ST. While some private insurance companies have been willing to cover the treatment, others have not, and those patients presently have to pay out of pocket. The cost per session varies depending on the provider but in general the cost is approximately $500 per session. Patients who do well in the first few sessions usually will need only seven treatment sessions (based upon data analysis at Calmar Pain Relief, 2011) and more complicated patients may require as many as fifteen sessions.

Future
It is expected that research will continue to be conducted on ST. Currently, trials are being conducted at a number of institutions of higher learning including a sham study being designed at the University of Wisconsin. There is no doubt that more research is needed and it is likely that various modifications in treatment approaches will be developed. Currently, there are no studies on the use of ST with children, although the Calmar Pain relief Center has extensive experience using ST to treat children from age 8-18.

There are no studies on ST comparing treatment responses of the elderly versus younger patients. A barrier to some of the research may be the subjective aspects of the treatment. As mentioned above, standardized electrode treatments often weaken the treatment response. This can be a barrier to double blind research designs.

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The number of ST devices being used across the U.S. is increasing and such prestigious institutions as Mayo Clinic, Johns Hopkins University Medical School, the Massey Cancer Institute and the U.S. military are using the device. (For a list of civilian and military centers using Calmare ST throughout the US, see http://www.calmarett.com/locations.html) Physicians at other major institutions such as the Cleveland Clinic have been referring patients for ST regularly. It is anticipated that as the excellent treatment results continue the use of ST across the U.S. will continue to grow.

**References**


**Late-breaking news: Federal judge opines “Medicare should cover ST”**

February 7, 2014  Anson, P. *A federal judge has ruled that a novel medical device called the Calmare Scrambler is effective at relieving pain and should be covered under Medicare. The decision could lead to Calmare’s non-invasive therapy becoming more affordable and more widely available to thousands of chronic pain patients.*

The ruling involved a 69-year-old breast cancer patient who suffered from chronic neurogenic pain after undergoing mastectomy and chemotherapy. She was treated with the Scrambler and 2011 at a pain clinic in Staten Island, New York, but her Medicare claim was initially denied because Calmare therapy wasn’t included in the treatment code used when the claim was filed.

The pain clinic appealed the decision and Administrative Law Judge LeAnn R. Canter allowed the appeal, which permits the clinic to receive reimbursements for Calmare treatments on behalf of the woman. 


Retrieved February 21, 2014

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Evolution of Deep Brain Stimulation and Functional Neuroscience

Lin Zhang MD PhD and Laura Sperry MSN RN ANP-C

Abstract
Deep brain stimulation provides a less invasive surgical option for many patients with movement and psychiatric disorders that are no longer maximally responsive to pharmacotherapy. Currently, Parkinson’s Disease, Essential Tremor, Dystonia and Obsessive Compulsive Disorder are the only FDA approved indications for this procedure; however, there are many more neurological and psychiatric disorders that are currently being studied. This paper is intended to build upon the general introduction that was published in the Summer 2012 JNLCP, which see, and provide an overview of the advancements in the field of functional neuroscience with respect to deep brain stimulation therapies. The readers are expected to understand the evolution of deep brain stimulation therapies as well as present and future applications.

Keywords: deep brain stimulation, DBS, Parkinson’s Disease, Essential Tremor, Dystonia, Obsessive Compulsive Disorder, surgery, movement disorders, psychiatric disorders

Deep Brain Stimulation (DBS) is one of the driving forces behind the recent expansion of the field of functional neuroscience. DBS is a neurosurgical procedure that implants a brain pacemaker device to deliver constant electrical stimulation to specific targets in the brain (Zhang, Sperry & Shahlaie (2012). Its use is recommended when pharmacotherapy no longer provides adequate symptom relief. Patients undergo an extensive evaluation prior to undergoing the surgery. In the Summer 2012 issue of the Journal of Nurse Life Care Planning, Zhang et al. published a detailed description of DBS patient selection, the procedure, surgical outcomes, risks and complications. This paper is intended to build upon that general introduction and provide an overview of the advancements in the field of functional neuroscience with respect to deep brain stimulation therapies.

Lead Placement
DBS leads are placed in different areas of the brain according to the symptoms involved (Table 1, Figure 1). DBS of the subthalamic nucleus (STN) or of the internal segment of globus pallidus (GPi) has been shown to significantly reduce rigidity, tremor, bradykinesia, dystonia and, occasionally,
disturbances of gait, subsequently improving motor complications in patients with moderate to severe Parkinson’s disease (PD) or dystonia (Rezai et al., 2008; Rodriguez-Oroz et al., 2005). DBS of the ventral intermediate thalamic nucleus has been shown to reduce tremors in PD and non-Parkinsonian Essential Tremor (ET) (Benabid et al., 1991). Additionally, DBS of the anterior limb of the internal capsule appears to provide relief from the recurrent, unwanted thoughts and/or repetitive behaviors of obsessive-compulsive disorder (OCD) (Heeramun-Aubeeluck, & Lu, 2013; Medtronic, Inc., 2013).

Table 1. Deep brain stimulation summary, site selection (Benabid et al., 1991; Hariz, 2002; Rodriguez-Oroz et al., 2005)

<table>
<thead>
<tr>
<th></th>
<th>Subthalamic nucleus (STN)</th>
<th>Internal globus pallidus (GPI)</th>
<th>Ventral intermediate thalamic nucleus (Vim)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease intended to treat</td>
<td>• PD</td>
<td>• PD</td>
<td>• ET</td>
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<td>• Blepharospasm</td>
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<td>• Confusion/memory disturbances</td>
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<td>• Personality changes, mood changes, apathy</td>
<td>• Induction of gait or speech disturbances</td>
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DBS, deep brain stimulation; ET, essential tremor; HDE, humanitarian device exemption; GPI, internal segment of globus pallidus; OCD, obsessive-compulsive disorder; PD, Parkinson’s disease; STN, subthalamic nucleus

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Evolution of Deep Brain Stimulation and Functional Neuroscience

DBS evolved from functional stereotactic neurosurgery techniques designed to produce selective lesions of the thalamus and cerebellum (Sironi, 2011). In 1952, Irving S. Cooper discovered the potential of ligation therapy when he unintentionally occluded the anterior choroidal artery, a branch of the internal carotid artery which supplies the internal capsule, thalamus and optic tract in the brain. This caused a medial globus pallidal infarction, which, surprisingly, alleviated rest tremor, rigidity and contralateral cogwheeling in a patient with PD. Throughout the 1950s and 1960s, techniques for ablative procedures were refined with much focus on identifying the ideal targets. The motor thalamus and GPi were considered the most effective targets (Das et al., 1998; Rezai et al., 2008).

In the 1960s, L-dopa became the standard of care for PD and the popularity of ablative surgeries significantly decreased. During this time, ablative surgeries were primarily limited to thalamotomy to treat tremor and pallidotomy and thalamotomy for dystonia; they were rarely done to treat PD. However, by the 1980s, the limitations (motor fluctuations and dyskinesias) of L-dopa became apparent and invasive, ablative surgeries for PD regained popularity (Rezai et al., 2008; Sironi, 2011).

Building on the experience of ablative surgeries, stimulation procedures started to become commonplace in the management of movement disorders by the 1990s (Weaver et al., 2009). These procedures offered a less-invasive, adjustable and potentially reversible alternative to the previously commonly used ablative procedures which were associated with potentially serious complications (hemiparesis, spasticity, ataxia, continued next page
dysphagia, and dysarthria) and were essentially irreversible. This introduced a new era in functional neuroscience for movement disorders.

**Present and Emerging Applications for DBS**

Over the last 20 years, DBS has become the surgical treatment of choice for movement disorders due to its superior safety profile over ablative procedures and the ability to adjust and potentially reverse the stimulation effects (Benabid et al., 1991; Rezai et al., 2008; Weaver et al., 2009). Since 1995, Medtronic reports over 80,000 individuals have been implanted stereotactically worldwide (Medtronic, 2012).

Currently, PD and ET are the only FDA approved indications for DBS, with dystonia and OCD being approved under a Humanitarian Device Exemption (HDE); however, many more neurological and psychiatric disorders are currently being studied (Marks, 2001; Medtronic, 2012).

Beyond the currently approved neurological indications, Hagerman et al. (2012) has shown DBS to have significant impact in tremor control for patients with the neurodegenerative disorder, Fragile X-associated Tremor Ataxia Syndrome, where patients initially present with intention tremor followed by gait ataxia. As technologies continue to advance, functional neuroscience will not only be the future of clinical neurology but likely will have a stronghold as an accepted treatment alternative for disease processes such as depression, epilepsy, eating disorder, cluster headaches, chronic and phantom limb pain, Tourette’s syndrome, drug resistant hypertension and posttraumatic coma (Pluta, Perazza, & Golub, 2011; Rezai et al., 2008).

The SANTE Trial, a multicenter, double-blind, randomized trial of bilateral stimulation of the anterior nuclei of the thalamus for localization-related epilepsy, demonstrated a reduction in seizure activity and improvement in quality of life (Fisher et al., 2010). Based on these results, DBS has been approved in Canada and Europe for this indication. Despite a positive review from the FDA Advisory panel in 2010, it is still considered investigational in the United States (Anderson, 2012).

The American Society for Stereotaxic and Functional Neurosurgery recently held a research conference to discuss the future of neuromodulation, much of which focused on emerging applications of DBS (The Parkinson Alliance/DBS-STN Research Team, nd). Not only are there many studies focusing on the use of DBS to reduce seizure activity, there is a group with The Department of Neurosurgery at the Medical College of Georgia investigating the use of “responsive neurostimulation,” where the DBS is triggered by intrinsic brain activity that precedes a seizure, thus, intervening before the seizure even starts.

*continued next page*
Another emerging application is the use of DBS on neuroregulation of feeding behavior to target severe overeating disorders and morbid obesity. Currently, the research is being done on rodents, pigs and large animal models to demonstrate weight control with ventromedial hypothalamus DBS (Melega et al., 2012).

**Challenges in DBS Programming**

While the advent of DBS has revolutionized the field of functional neuroscience, it is still very much in its infancy. Despite its popularity, there is still controversy over the superiority of medical therapy versus DBS. One of the challenges in programming patients with PD is balancing out their need for therapy without affecting gait or balance. Potter-Nerger and Volkman (2013) recently published a review on the impact of DBS on gait and postural symptoms in PD discussing how DBS stimulation improves certain aspects of Parkinson gait disorder but not others. Lead position, adjusting parameters to account for stride asymmetry, or using lower frequency stimulation all influence the effect of DBS on PD gait disturbances.

**Conclusions**

While there are still many unanswered questions regarding targeting, patient selection criteria, and timing of the procedure, the field of functional neuroscience, with DBS currently at the forefront, has positioned itself to be a considerable therapeutic option in a variety of refractory neurologic and psychiatric disorders (Sironi, 2011). As research progresses on drug resistant hypertension, it is conceivable that DBS will undoubtedly expand beyond these fields and become the flagship of functional neuroscience (Patel et al., 2011).

**References**


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**Nursing Diagnoses to Consider**

- **Impaired Physical Mobility**  Limitation in independent purposeful physical movement of one or more extremities (Domain 4, Activity/Rest; Class 2: Activity/Exercise)
- **Impaired Walking:** Limitation of independent movement within the environment on foot (Domain 4, Activity/Rest; Class 2: Activity/Exercise)
- **Readiness for Enhanced Self-Care:** A pattern or performing activities for oneself that helps to meet health-related goals and can be strengthened (Domain 4, Activity/Rest; Class 5, Self-Care)
- **Impaired Social Interaction:** Insufficient or excessive quantity or ineffective quality of social exchange (Domain 7, Role Relationships; Class 3, Role Performance)
- **Ineffective Activity Planning** Inability to prepare for set of actions fixed in time and under certain conditions (Domain 9, Coping/Stress tolerance; Class 2, Coping Responses)
- **Risk for Injury:** At risk of injury as a result of environmental conditions interacting with the individual's adaptive and defensive resources (Domain 11: Safety/Protection, Class 2: Physical Injury)
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The Demise of Science Fiction: Cutting-Edge Options in Prosthetics

D. Ryan Hixenbaugh

I was having dinner with Dr. Hugh Herr the other day. Dr. Herr is the Director of the Bio-mechatronics Group at the Massachusetts Institute of Technology’s Media Lab. He is also a bilateral amputee from a climbing accident in his youth. Today he owes his mobility to bionic technology he created. He made an observation that was full of wonder to me. We were talking about the various aches and pains and lost capability of aging. Hugh had been thinking about his future aging when it occurred to him that though his body will age, his legs will not. They will maintain the very same capacity to perform that they have today. Then he corrected himself. His bionic legs will improve over time. They will become stronger, faster and more adaptive.

Hugh quipped “Amputees today are the test pilots for technology that will one day be ubiquitous.”

As prosthetics transition into personal bionics, they will become more like knee and hip replacements. They will become just another body part that can be replaced when damaged or worn out. Dr. Herr’s latest iteration uses a tablet to adjust the powered propulsion that drives the user against a graphic overlay of the gait of a non-amputee. This bionic tuning is the first time a prosthettist has been able to measure and confidently deliver a normalized gait to their people with an amputation. It is also the first time a payer has had access to quantitative data demonstrating that a prosthetic device achieves the performance level promised. (See Figure 1)

It seems that there is no science fiction anymore. There is only science. Technology has far surpassed Dick Tracy’s wrist watch, once futuristic beyond our lives. It seems if we can imagine it, someone is probably working on it. There has been an explosion of new bionic, robotic, nano-, and manufacturing technologies over the past five years.

Dr. Herr likes to change his height from time to time. It is a little known nuance of his personal bionics. It is also a reflection of his wry sense of humor. When a physician asked why he did it, Herr smiled and replied simply, “Because I can.” Imagine a world where height is a choice.

Hugh believes prosthetics are improving so dramatically that the concept of disability will be largely

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eliminated by the end of the century. We can already see those transitions happening for people with amputations. An example is the K-level. A prosthetist evaluates a person with a lower limb amputation in terms of their mobility and assigns them a K-Level (Table 1). A K2 is a limited ambulator, able to wander from the kitchen to the bathroom and perhaps out for the mail, while a K3 is able to navigate steps and ramps and other obstacles to go shopping at the mall.

Once a “K” level is assigned, insurance will only pay for devices designed for that level. But personal bionics is changing limitations. Suddenly it isn’t a question about the user’s ability. With the right technology, a house-bound ambulator becomes a community

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**Table 1. Evaluating people with amputations by K-level.**

(Gaily RS, Roach KE et al., 2002)

**K-Level 0** No ability or potential to walk or transfer safely with or without assistance. Prosthesis does not enhance quality of life or mobility.

**K-Level 1** Ability or potential to use a prosthesis for transfers or walking on level surfaces at a fixed cadence. Typical of the limited and unlimited household ambulator.

**K-Level 2** Ability or potential for walking with ability to transverse low-level environmental barriers, e.g., curbs, stairs, or uneven surfaces. Typical of the limited community ambulator.

**K-Level 3** Ability or potential for walking with variable cadence. Typical of the community walker who can transverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic use beyond simple locomotion.

**K-Level 4** Ability or potential for prosthetic walking that exceeds basic skills, exhibiting high impact, stress, or energy levels. Typical of the prosthetic demands of a child, active adult, or athlete.
walker. This means a person’s K-level should no longer be established apart from technology. Insurance should certainly not preclude a device based on a person’s capabilities without it. Life care planners need full access to technology that can return people to their pre-injury abilities. Hugh puts it best when he says, “There are no disabled people, only disabled technology.”

In the future we will see this bionic technology transition from specialty prosthetists to mainstream clinics. Right now, Herr at MIT and BiOM, the company he founded, are envisioning designs that will apply bionic technology platforms without the amputation. Imagine a 70-year old running to work each day with bionic legs providing all the metabolic energy. Seniors using walkers for balance becomes a thing of the past. Rising from chairs and couches and even toilets becomes less daunting and dangerous.

**Disability and medical necessity**

Able-bodied isn’t about the body part. It is about function. If we can’t repair it biologically or with pharmacology, then replace it. The goal is no longer to limb preservation, it’s functional restoration. In our society, we need mobility. How we get it is a detail.

That thinking calls into question the entire concept of “medical necessity.” How do we determine the medical necessity of new technology? Is the old way good enough? Traditional prosthetics cannot replicate a natural gait. Without the power of the gastrocnemius and soleus muscles and the Achilles tendon, a person with an amputation must power themselves using his residual limb, hips and back. (see Figure 2.)

Gait deviation is the primary cause of the pain people live with after an amputation (Morgenroth et al., 2012, 2011; Linberg et al., 2012; Hill & Herr, 2013). Pain is one of the barriers to return to work. Gait deviation is also a root cause of osteoarthritis, which is a common comorbidity of lower limb amputation (Gailey et al., 2008; Morgenroth et al., 2011). It results in less mobility and activity, the path to obesity, depression and even diabetes. A clinical study partially funded by the Department of Defense has demonstrated that bionic technology, in this case the BiOM® Ankle System,
may resolve gait deviation and thus these associated comorbidities (Grabowski and D’Andrea, 2013). Is that medically necessary? Is returning to work medically necessary? (Figure 3.) It is if we intend to do away with disabilities in the future.

It is difficult in our healthcare system to weigh the high cost of new technology with the long term costs of pain, osteoarthritis, joint replacement, obesity and the depression that afflicts those whose lives have changed so dramatically. Does resolving gait deviation deliver the promise of a job as well as improved joint and cardiovascular health? Time will tell. In the meantime, physicians, prosthetists, insurers and case managers must weigh the cost against the promise. The Center for Medicare/Medicaid Services recently recognized personal bionics as new, unclassified technology that foretells an emerging trend, creating the new code, L5969, “endoskeletal ankle-foot or ankle systems with power assist.” Though they recognized the advanced technology, they have not supported the costs required to make these devices available to people who have pain and joint deterioration or limited mobility after amputations. As providers, it becomes our responsibility to speak out when the payer system begins to interfere with advancements that can change the lives of our patients.

**Research in progress: bionics**

We know even greater improvements are being explored in laboratories right now. Progress on prostheses controlled by our nervous system has been steady since the first bionic devices were tested in the 1950s (Handa, 2006). Dr. Herr has begun thinking about better-performing prostheses firmly attached directly to the body using titanium rods. His vision begins to blur the boundary between man and machine, as devices improve body parts instead of just replacing them. These challenges become less about biomechanics and more about dataflow and power sources.

Myoelectric limbs first came on the scene in the 1960s and have been slowly improving ever since (Ortiz-Catalan et al., 2012). *Myoelectric* refers to the electric properties of muscles. The idea is to control
the prosthesis’s functions using electrical signals in
the muscles of the person’s residual limb or body.

Today, their functionality falls short of a natural
limb. But the challenge isn’t the biomechanics. It is
developing an effective bidirectional, neuromuscular
interface capable of providing a steady stream of
information to control fine motor skills. It is, in a
word, dataflow.

Currently, myoelectric transtibial prostheses receive
three channels of electrodes for bidirectional com-
munication with transected nerves. The channels
take up about 100 microns. For reference, the period
at the end of this sentence is over 600 microns. Elec-
trodes from the prosthesis are in one end; the other
end connects to muscles and skin cells and carries
descending commands from the spinal cord.

According to Dr. Herr, stable communications for an
exemplary myoelectric prosthesis, capable of pro-
viding the digital control that flexes toes, shapes an
arch or powers mobility, will require a micro array
of these 100 micron channels, containing perhaps 80
or more hundred-micron channels. This array will
run through a tube no more than 2-3 millimeters, to
provide the dataflow required for nuanced biome-
chanics.

Dr. Herr feels we are probably no more than a few
years away from expanding our 3-channel capacity
to five or ten. Quickly thereafter the number will
grow to dozens until we finally reach the dataflow
capacity that can link prosthetic devices to our su-
percomputer, the brain. “Within ten years, we’ll be
able to connect prostheses to the body and achieve
natural human biomechanics,” said Herr.

It will be up to life care planners to advocate for this
technology on the front end, when costs are high and
long term studies nonexistent. Payers will question
whether it is medically necessary and label it ex-
perimental. It will be the case managers and life care
planners who make the patient aware and forge a
team of physicians, payer relations specialists and
other influencers to make the science a reality.

Three-dimensional printing
Besides mastering the dataflow for natural human
control and movement, there are other technologies
that will dramatically change medical devices during
the span of our careers. We will witness the main-
streaming of 3D printing. This additive process is
replacing the machining, grinding, turning, filing
and drilling we’ve come to know as precision manu-
facturing with a printer that sprays polymers with
digital exactitude to build up a product. The meta-
phor of printing comes from the way the equipment
lays down liquid polymer like a printer lays down
ink.

A 3D printer takes a computer-aided design (CAD)
blueprint and slices it into digital cross sections.
These cross sections are what the printer builds, lay-
ering the material into the three dimensional shape.

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The system can replicate almost any geometric shape. Interestingly, a typical layer is approximately 100 microns in thickness; in other words, capable of layering material to build an array of micron electrode channels for a myoelectric prosthesis.

The materials aren’t limited to plastic. Colorful acrylics can be sprayed into high tolerance micron-sized shapes formed by UV light or lasers. It can ‘print’ items in almost any medium that can be liquefied or sprayed, including nylon, ceramics, sandstone, gold, bronze, silver and even steel. Some materials, like nylon, can be layered in an ultra-thin lacework pattern to create a fabric-soft hand (Economist Technology, 2011). Items that used to take weeks to manufacture and were affordable only through mass production can be 3D printed in a matter of hours for a fraction of their old cost, in any quantity. In 2011 the Economist (2011) declared that three dimensional printing has “forsaken the concept of economies of scale by making it as cheap to produce a single unit as it is to produce thousands.”

3D printers once cost tens of thousands of dollars. Today consumer-friendly desktop models can be found for $500 (Figure 4, Williams, 2014). Imagine a world where you can go online, download a blueprint for almost any product, add your polymer beads, and hit Print to create your own, functioning three-dimensional product.

Has 3D printing proven itself in healthcare? Fripp Design in the UK has applied 3D printing to produce prosthetic eyes. Eyes used to cost just under $5,000 and take 10 weeks to deliver. The company now manufactures up to 150 prosthetic eyes an hour for $163 each (Hornyak, 2013).

3D printing is being studied in biotechnology for possible use in tissue engineering. Layers of living cells are placed in a sugar matrix and using this inkjet technique, layered to form three-dimensional structures, including a vascular system. Terms like bio-printing are beginning to find their way into the vernacular (Silverstein, 2006).

Manufacturers Robohand, Bespoke Innovations and others are already creating colorful toy-like, almost disposable prosthetic hands, fingers and arms using 3D printing (Bespoke Innovations, 2012). A team of

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researchers at Tel Aviv University has been creating biocompatible sensors for bionic arms. These tiny sensors and actuators are powered by MEMS, or microelectromechanical systems, that have traditionally been made of silicon. The TAU group has found a way to 3D print MEMS using a more energy efficient, non-toxic organic polymer that can be more safely and comfortably implanted in the human body. The MEMS may eventually provide internal diagnostic testing or controls for prosthetic devices implanted with osseogeneration (American Friends of Tel Aviv University, 2013).

The Department of Defense (DoD), one of the funders that launched the BiOM Ankle System technology, is also helping to establish 3D printing. The DoD invested in the BiOM because they sought a prosthetic device able to power an individual by emulating the work of the missing gastrocnemius and soleus muscles and Achilles tendon. Walter Reed National Military Medical Center in Bethesda, MD, who is the largest user of bionic ankles, is also pioneering 3D Bio-Printing. At Walter Reed, soldiers with damaged limbs are scanned and custom prosthetics are made on a 3D Printer. "Medical enhancement through bio-printing is one potential area of interest for the military," according to US Navy Lieutenant Commander Michael Llenza. “Imagine the Centers for Disease Control and Prevention emailing us the blueprints for a vaccine to avert an impending pandemic or defend against a possible biological attack,” Llenza wrote in an article for Armed Forces Journal (Lenza, 2013).

In other examples, this past year Chinese scientists began producing ears, livers, and kidneys with a 3D bio-printer that uses living cells instead of plastic. The system developer, Xu Mingen, said that it takes the printer under an hour to produce a mini liver sample or a four to five inch ear cartilage sample (Quigley, 2013).

In 2013 researchers at the University of Hasselt, in Belgium successfully printed a new jawbone for an 83-year-old Belgian woman who is now able to chew, speak and breathe normally (Marks, 2012).

After Dr. Herr lost his legs to frostbite on that mountain as a teenager, he began developing his own prostheses to facilitate his return to climbing. Imagine what he would have created if he owned a 3D printer. Rapid iteration is the promise of 3D printing.

Terms like bio-printing are beginning to find their way into the vernacular.
Every amputee imagines alterations and revisions they would like to add to their prosthesis. 3D printing enables experimentation. Imagine engineers with the most detailed knowledge of biomechanics and a tool that promotes low cost testing. 3D printing is changing every industry it touches. We will watch it accelerate innovation not only in prosthetics, but in all medical devices. It may be the anchor technology that helps us eliminate the concept of disability.

Life care planners are at the forefront of making science fiction reality. They help make their clients aware of emerging technologies that can improve lives. Life care planners become critical advocates for emerging technology that reduces comorbidities, improves life and helps people return to work, even when those costs are at their highest due to an early stage of development. They anticipate the product life cycle and future costs for the entire life of the patient. Without that kind of financial advocacy, technology cannot improve in our healthcare system, which would mean all of these “what-if” improvements would remain right here on the pages of this journal.

References

Nursing Diagnoses to Consider NANDA-I Nursing Diagnosis, 2012-2014

- **Risk for Disuse Syndrome** At risk for deterioration of body systems as the result of prescribed or unavoidable musculoskeletal inactivity (Domain 4, Activity/Rest; Class 2, Activity/Exercise)
- **Impaired Physical Mobility** Limitation in independent purposeful physical movement of one or more extremities (Domain 4, Activity/Rest; Class 2: Activity/Exercise)
- **Impaired Transfer Mobility** Limitation in independent movement between two nearby surfaces (Domain 4, Activity/Rest; Class 2: Activity/Exercise)
- **Impaired Walking:** Limitation of independent movement within the environment on foot (Domain 4, Activity/Rest; Class 2: Activity/Exercise)
- **Activity Intolerance:** Insufficient physiological or psychological energy to endure complete required or desired daily activities (Domain 4 Activity/Rest, Class 4: Cardiovascular/Pulmonary Responses)
- **Disturbed Body Image:** Confusion in mental picture of one’s physical self (Domain 6, Self-perception; Class 3, Body Image)


Eileen Sheehan
Web-based Healthcare Technology: A Telehealth Primer for Nurse Life Care Planners

Trish Councell RN, BSN, LNCC

Individuals with catastrophic injuries and illnesses can benefit from internet-based technology in a number of ways. Appropriate use of developing technologies can result in privacy, flexibility and increased independence as well as a greater sense of control for the individual and/or caregiver. The individual can live in a remote or rural area and still receive appropriate care at home. Local providers can work with specialists maintaining high level of care and reducing the need for travel. Professionals can monitor vital signs, glucose levels, INR, and other data quickly and accurately without needing manual data uploads, and provide consistent, quality therapies with or without special equipment. With some web-based technologies an individual may even be continue care and therapy while traveling. This article provides an overview of web-based technology and examples of different types of technologies that may be useful in returning an individual’s life to as normal as state as possible.

What are Telehealth and Telemedicine?

Telemedicine, broadly defined, is the delivery of any healthcare service or transmission of wellness information using telecommunications technology. Telehealth, a closely-related term, is more broadly defined as remote healthcare not always involving clinical services and includes such items as electronic medical records (EMR). Videoconferencing, transmission of still images, e-health including individual portals, remote monitoring of vital signs, continuing medical education and nursing call centers are all considered part of telemedicine and telehealth. (American Telehealth Association (ATA), 2014). The term “telehealth” is used in this article.

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Evolution of Telehealth

On March 10, 1876, Alexander Graham Bell, while working on developing the first telephone, knocked over a transmitting liquid--battery acid, perhaps burning himself. Mr. Bell is alleged to have shouted, "Mr. Watson, come here. I want you!" Did Watson answer the first telehealth (911) phone call?

Following the invention of the telephone, people no longer had to send someone for the doctor. The switchboard operator would search until he was found, the first MD answering service.

For many years, physicians had to call into an answering service to pick up messages. Emergency or not, messages just sat there until retrieved.

Doctors were among the first to embrace the pocket pager. People didn’t have to wait too long for a callback (if the physician could find a phone). However, the person who returned the call was often not the primary physician and had no access to the individual’s medical records, so the answer was often, “Go to the emergency room.” Advice was seldom documented.

Telephone advice from non-physician personnel could be haphazard or inconsistent. If a parent called a pediatrician’s office because a child had a fever of 103, perhaps a receptionist would advise her to give him some aspirin and set up an appointment for the next day. A call to an ER might result in some more suggestions or more often, “Just come to the ER.”

Nurse advice lines and triage call centers came next. Kaiser Permanente had one of the first 24-hour dedicated call centers staffed by RNs. These nurses initially worked with thick notebooks of guidelines. These gave way to computerized triage/treatment algorithms. In the late 1990s in Colorado Kaiser gradually switched to an all-electronic medical record system (EMR).

Some medical centers developed their own nurse advice lines. Commercial groups, such as McKesson, established nurse advice lines contracting services to insurers, hospitals and providers. McKesson and health insurance providers also started programs

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for telephonic disease nurse case management for chronic illnesses such as CHF, diabetes, COPD, etc.

It wasn’t long before studies began to document significant positive results for these intensive case management programs. As telehealth became economically viable, administrative programs, software and telehealth devices developed faster, became more sophisticated, user friendly and in more affordable. (ATA, 2013; Slabodkin, 2013)

**Telehealth Today**

Most home telemonitoring devices today are modular systems. A web portal access device (WebPAD) *(right, with peripherals)* can be programmed for a variety of diagnoses. It can be connected to the internet or a “POTS” (“plain old telephone service”).

A WebPAD can be programmed with specific questions to monitor individual symptoms, and can have educational information that is geared to the responses. Self-reporting can offer insights and increase awareness of symptoms.

This type of Q&A can be very effective for psychiatric conditions, such as depression and bipolar disorder, where answers are normally subjective. Using the system on a daily basis provides a focal point to plan around. The case manager can follow up if the individual has not used the system for a day or two.

**Peripheral devices**

Individuals can still record manual readings but automatic readings eliminate individual error. Manipulation of readings is reduced or limited, thus preventing the individual with a bedtime blood glucose of 400 from concealing the effects of the huge piece of birthday cake she had a dinner.

Peripheral devices are available that can communicate with the WebPAD by hardware, Wi-Fi or Bluetooth connections. (Authentidate Holding Corporation Telehealth Solutions, 2013) *(some shown at left)* Examples can be seen at http://tinyurl.com/mr7qtur.

These devices can include:

- Blood pressure cuff
- Pulse oximeter
- ECG recorder (upload)
- Digital weight scale
- Blood glucose meter
- PT/INR meter
- Peak flow meter/ digital spirometer
- Body temperature sensor
- Fluid status sensor
- Medication reminders

The WebPAD can remind the individual when it is time to do the measurements, and instruct the individual how to use peripherals. The data is saved and at predetermined times, e.g. midnight, forwards the

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data to the healthcare provider, most frequently a nurse case manager. This **CJPS VitalPoint® Home Monitoring System** video demonstrates a representative system in action.

http://www.youtube.com/watch?v=YHRWtUKorQA

Alerts can be programmed into the system that indicates when specified readings are outside acceptable range. This allows the case manager to handle a large number of individuals while still being alerted to critical readings such as an elevated blood pressure or significant weight gain.

Warfarin remains the gold standard for anticoagulation therapy. Individuals no longer have to go to a laboratory or have somebody come to their home for blood draws. **Alere**, for example, has a handheld home system for testing PT/INR, Alere INRatio®/INRatio®2 PT/INR Monitoring Systems


**IDEAL LIFE®** has developed a system where the sensor devices communicate through a wireless gateway known as the IDEAL LIFE Pod™ (*below*) that can plug into a regular phone line. The sensors can also access the gateway via smartphone and the internet itself. This system provides a high level of mobility for the individual. http://www.idealifeonline.com/products

Sending an individual's clinical examination findings, such as breath or heart sounds, from remote provider offices to specialists has been possible for some time. Soon, this technology should be available for home telehealth. An example of the technology is the **Cardionics Tele-Health Systems Ausculette** [http://www.cardionics.com/ausculette.html]

Real time telemetry

Live EKG monitoring via Bluetooth technology to a smart phone for various diagnostic, emergency and monitoring services facilitates quality of life and therapeutic activities, such as safe participation in a remote cardiac rehab program. An example is the **HeartLine™** ECG remote monitoring system (*above*). [http://tinyurl.com/ljbtezo]

Videoconferencing

Videoconferencing is usually done through dedicated secure systems. WebPADs can be provided that serve this function. The benefits of videoconferencing are self-evident in most of these areas.
The clinician can observe symptoms that the individual may not express verbally or be aware of. The connection leads to a more personal relationship with the provider; the clinician is more than just a voice in a box.

Real time videoconferencing has any number of applications such as:

- Nurse case management
- Pain management
- Psychiatric therapy
- Psychological counseling (e.g., Web-based Follow-up Information for and Research on Victims of Sexual Assault http://ojni.org/issues/?p=1272)
- Speech/language therapy (e.g., American Speech-Language-Hearing Association (ASHA) Telepractice Overview http://www.asha.org/Practice-Portal/Professional-Issues/Telepractice/ including video)
- Respiratory therapy
- Neuropsychiatry and cognitive behavioral therapy (CBT)
- Pharmacy (medication consulting, education)
- Audiology
- Dermatology
- Wound care management (e.g., “A Soothing Salve for Wound Healing: Telemedicine” PowerPoint at http://tinyurl.com/m33r5pv)
- Occupational therapy
- Physical therapy

Videoconferencing can be exceptionally helpful in physical and occupational therapy.

The therapist can monitor the individual’s progress and encourage effort. The therapist can demonstrate activities and perform the activities with the individual such as stretching exercises.

MediTouch® has taken videoconferencing to the next level with their TeleRehabilitation program utilizing ergonomic motion detection devices such as the Hand Tutor™ (below). This can be used independently by the individual or in conjunction with a therapist who can customize the workout in real time and have immediate feedback on the exercises. See video demos at http://tinyurl.com/mepdzok and http://tinyurl.com/m74bgqz. A TeleRehabilitation PDF is available at http://tinyurl.com/kgtd55g.

Arm Tutor™ for the elbow and shoulder and Leg Tutor™ for the knee and hip are also available.

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Expanded settings
In addition to individuals using these devices at home, visiting nurses and therapists can use monitoring during visits; clinic or rural based health care providers can have instant access to specialists.

Other Useful Gadgets
Activity monitors that leave pedometers in the dust such as the Fitbit FLEX™ Wireless Activity & Sleep Wristband (below) [http://www.fitbit.com/flex].

The Beddit sensor is marketed as a sleep apnea and respiratory monitoring system. It is placed under the bed sheets and “automatically tracks sleeping patterns, heart rate, breathing, snoring, movements and environment.” (Not yet on the market.) [http://www.beddit.com/]

MC10's BioStamp is a flexible device consisting of a number of sensors that can be placed directly on the body. BioStamp is thinner than a temporary tattoo and can be applied to the skin like an adhesive bandage. The clinician can program sensors to collect data such as the body temperature, heart rate, and other physiological processes. The BioStamp can be used continuously for long-term constant monitoring, which may aid in the diagnosis of certain conditions such as arrhythmias. Each BioStamp lasts for about 2 weeks before needing replacement. Each BioStamp is expected to cost approximately $10 per unit. Much of the cost will likely be related to monitoring and interpretation. [http://tinyurl.com/ldbhlc]

Virtual reality applications
Virtual reality exposure therapy (VRET) for use in anxiety and phobia treatment have attracted attention in recent years. A meta-analysis of 21 studies of 300 subjects from 2008 (Parsons and Rizzo, 2008) showed large decreases in anxiety symptoms after VRET, but noted limited analyses and called for more studies with standardized reporting for demographic and clinical details pre- and post-treatment. If used remotely, these interventions could be tied to physiological and personal monitoring to help persons with psychological disorders recognize and modify their responses to stressors.

Other benefits of virtual reality therapies are being studied in schizophrenia (Rus-Calafell et al., 2014), stroke rehabilitation (Wuest et al., 2014; Cavalcanti Moreira et al., 2013; and Deutsch et al., 2013). traumatic brain injury (Dvorkin et al., 2013), and others.
The Future
Individual monitoring devices will increasingly be tied to smartphones and tablets. Miniaturization will lead to new technologies.


Cost Considerations
Costs vary widely and can drop quickly when newer versions of hardware or software are released.

Choice of programs and technology needs to be based primarily on ease of use and acceptance by the individual and caregivers. A thorough assessment is required to determine if the individual and caregivers are willing and able to participate in telehealth activities. Trials of equipment and services may be required.

Providers or insurers may have a preferred program for cost reasons, but if the individual can’t or won’t use it and its associated equipment, it’s worthless.

Access for data uploading is mandatory. People in remote or rural areas may not have hardwire telephone service; cellular service may be required.

Cost items associated with telehealth set-up for an individual may include:

- Internet access initial setup and ongoing charges
- Phone system with a modem
- Cable or fiberoptic
- Satellite
- Cellular service
- Hardware
  - Desktop computer, monitor, keyboard and sound system and/or laptop
  - Adaptive equipment
  - Wireless routing equipment
  - Smartphone and/or tablet
  - Desks, tables, chairs, etc.
  - Upgrade or adaptation and replacement of services and equipment
  - In-home healthcare provider services for education and training
  - Service personnel for delivery, setup and repair

Other Issues in Telehealth
- HIPAA compliance: security, privacy
- Interstate health care provider licensing
- Liability
- Reimbursement
- Medical necessity

These issues are beyond the scope of this article. For more information, the Zur Institute, an online provider of continuing education for mental health, has compiled a set of references applicable to all disciplines, Telehealth & TeleMental Health: The New Standard, the Ultimate Resource Page for Ethical, Legal, Clinical, Technological, & Practice Considerations.
Online Case Studies

One hypothetical individual is a 55 year old male with a history of MI, CHI, diabetes, bipolar disorder and a number of other significant diagnoses. See this at http://ojni.org/issues/?p=2034.

Six spinal cord injury and/or disorders (SCI/D) case studies are available at “What's happening now! Telehealth management of spinal cord injury/disorders.” These are scenarios with pressure ulcers, proper skin care, DME, psychological counseling, urological consultations, and case management (discharge planning, care coordination). Each includes history and assessment, indication for telehealth, interventions and treatment, goals achieved, and outcomes. (Woo C, Guihan M, and Ho CH (2011). These are available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3127362/

A variety of other case studies are available at the ATA Case Studies website, http://www.americantelemed.org/learn/telemedicine-case-studies. continued next page

Nursing Diagnoses to Consider NANDA-I Nursing Diagnosis, 2012-2014

- **Ineffective Self-Health Management:** Pattern of regulating and integrating into daily living a therapeutic regimen for treatment of illness and its sequelae that is unsatisfactory for meeting specific health goals (Domain 1, Health Promotion; Class 2, Health Management)

- **Ineffective Family Therapeutic Regimen Management:** Pattern of regulating and integrating into family living a program for treatment of illness and its sequelae that is unsatisfactory for meeting specific health goals (Domain 1, Health Promotion; Class 2, Health Management)

- **Readiness for Enhanced Self-Health Management:** A pattern of regulating and integrating into daily living a therapeutic regimen for treatment of illness and its sequelae that is sufficient for meeting specific health-related goals and can be strengthened (Domain 1, Health Promotion; Class 2, Health Management)

- **Deficient Community Health:** Presence of one or more health problems or factors that deter wellness or increase the risk of health problems experienced by an aggregate (Domain 1, Health Promotion; Class 2, Health Management)
References


United States Department of Health and Human Services, Health Information Technology and Quality Improvement.
What are the reimbursement issues for telehealth?
http://www.hrsa.gov/healthit/toolbox/RuralHealthITtoolbox/Tel
cehealth/whatarethereimbursement.html
http://tinyurl.com/m596r6t Retrieved 2/8/2014

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3127362/
Retrieved 2/1/2014


Zur Institute, (Revised 2014) “Telehealth & TeleMental Health: The New Standard, the Ultimate Resource Page for Ethical, Legal, Clinical, Technological, & Practice Considerations.”
http://www.zurinstitute.com/telehealthresources.html

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Michael McDonald
Before you start a search, you must decide where you want to search. Many people make the quickest decision: Google! Those seeking higher quality and more precise results may select Google Scholar or Google Books. (See Dillard D, The science of searching databases, JNLCP XIII.3, Fall 2013)

However, if you have a complex search topic or need very accurate, targeted results, searching with EBSCOHost may be a better alternative. This article discusses the databases provided by EBSCOHost useful in life care planning or medical fields in general. Future articles will explore some techniques for searching the databases of EBSCO Host.

Database or Databank?
You probably use medical dictionaries and legal dictionaries for terms in these disciplines. Fortunately, an internet dictionary provides meanings for terminology used in information science, particularly for database searching, the ODLIS Online Dictionary for Library and Information Science (ABC-CLIO).

**Database**: A large, regularly updated file of digitized information (bibliographic records, abstracts, full-text documents, directory entries, images, statistics, etc.) related to a specific subject or field, consisting of records of uniform format organized for ease and speed of search and retrieval and managed with the aid of database management system (DBMS) software.

Content is created by the database producer (for example, the American Psychological Association), which usually publishes a print version (Psychological Abstracts) and leases the content to one or more database vendors (EBSCO, OCLC, etc.) that sell electronic access. (ABC-CLIO, [http://www.abc-clio.com/ODLIS/odlis_d.aspx](http://www.abc-clio.com/ODLIS/odlis_d.aspx))

EBSCOHost is not a database; it is a *databank*, a collection of databases from a variety of sources, including some they own.

The methods used for searching EBSCO databases are more complex and powerful than academic internet search engines. EBSCOHost provides methods that are much more sophisticated than putting the Boolean operator **AND** between two words that many Google users consider to be effective searching.

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David Dillard has degrees in history and library science. He has worked at Temple University Libraries since 1970. He started sharing information sources and answers to questions on internet discussion groups around 1998 and started a network of public search engine indexed discussion groups and archives for sharing of posts of good websites, bibliographies of sources on a wide variety of topics. He is a regular on several nursing specialty lists and is very open to contact from anyone to help with searches on any topic. He can be reached at [jwne@temple.edu](mailto:jwne@temple.edu), 215-204-4584
Access to EBSCOHost and other such banks’ databases, however, is very expensive. End-users access is often via a college, organization, public library, or state with a subscription to specific databases. Many institutions provide a link to a list of the databases to which they subscribe and from which you may choose. For example, here is the link to all the databases provided at Temple University:

http://library.temple.edu/databases/a-z

Fortunately, you can search in more than one database at a time, so you don’t have to repeat the search for each database individually. To access a linked list with more information about the database content for each database provided by EBSCO, go to

http://www.ebscohost.com/academic

Major colleges and universities usually subscribe to a large number of EBSCO databases. So it’s useful to know which ones will be useful for your search topic. The overall subject coverage of each database is a core consideration in your selection.

Did you know that EBSCOHost owns the Combined Index to Nursing and Allied Health (CINAHL)? The only way to access this database is by using it in EBSCO. (Ed. note: The JNLC is indexed in CINAHL.)

Let’s search some databases for ...

Life care planning is clearly a topic found in medical literature. The MEDLINE database is a core resource for finding this subject. MEDLINE is provided by the National Library of Medicine and is primarily devoted to indexing and abstracting journal articles in the field of medicine. Access is free on the internet as the PubMed database with some content differences between MEDLINE and PubMed.

Searching life care planning in MEDLINE returns 76 articles, certainly not overwhelming. PubMed finds 77 articles. Searching this phrase in CINAHL finds 152 articles, nearly twice as many.

Academic Search Premier, like CINAHL, is an exclusive EBSCO database, covering all major academic disciplines. You might guess that the coverage of a specific topic in a database covering so many fields would yield an insignificant number of articles. You would, however, be wrong. Academic Search Premier finds 94 articles on this topic. In general, it has a surprising level of coverage in the field of medicine and a substantial body of full text medical journals. In fact, this is a big reason why you should always include this database in any searches of EBSCO databases.

You might not consider it important to include psychology in the form of the PsycInfo database in a search of life care planning and it only provides 34

continued next page
sources in a search of this phrase, but would you want to miss titles like these?

- Do personality traits moderate the impact of care receipt on end-of-life care planning?
- Exploring issues during special needs adoptions and the applicability of life care plans to address them
- Investigation of implementation of life care plans and impact on the quality of life of individuals with spinal cord injuries
- Health care costs in end-of-life and palliative care: The quest for ethical reform.
- Life care planning evaluation.
- Ethics and advance care planning in a culturally diverse society.
- Advance care planning: An opportunity for person-centred care for people living with dementia.
- Ensuring informed end-of-life decisions.

How about a database that indexes business journals and the business trade press? **Business Source Premier** finds only 28 citations for a search of this phrase, but consider these titles and their importance as well as their difference from the coverage found in other databases on this subject with these few examples:

- Voluntary hospices in England: A viable business model?
- Polytrauma and life care planning: Managing the complex interaction of multiple injuries.
- Calculating the Value of a Life Care Plan With Contingent Costs.

**Ageline** is a very specialized and small database, but it does find 12 articles on this subject.

Searching for *life care planning* in Business Source Premier, Academic Search Premier, CINAHL, PsychInfo and MEDLINE simultaneously returns a substantial number of citations for this phrase: 384 sources.

**Widen your search to identify more articles**

Up to now, we have only searched for *life care planning* and not *life care plan, life care plans, life care planner or life care planners*. Fortunately, in EBSCO there’s useful feature called *truncation*: the dropping of characters and the addition of a symbol at the end, beginning, or within a word in a keywords search to retrieve variant forms. Truncation is particularly useful in retrieving the singular and plural forms of a word in the same search. (ABC-CLIO, op cit.)

In EBSCO host for these database we can change the phrase *life care planning* to *life care plan* using their truncation symbol, the asterisk, to get all of the variations of this phrase cited above in one search result, with fewer characters than the original search.

Using this in the same group of databases returns 492 sources, a very significant body of literature regarding this field.

Somebody might, however, write about “planning solutions for life care” or about “plans that work for life care.” Our search of the exact phrases will not find these variant phrasings. One may be familiar with the fact that quotation marks in Google, Google Scholar, Google Books and other search engines cre-
ate exact phrases. EBSCOHost, however, provides two versions of positional operators or proximity operators.

We find this definition for proximity:

The search software of some bibliographic databases allows a proximity operator to be used in search statements to specify that a record will be retrieved only if the keywords typed as search terms appear within a designated number of words of each other or within the same sentence or paragraph. The proximity operator is not standardized (in some databases it is "adj," for “adjacent to;” in others it is "w," for “with”).

Example: publication adj1 date or publication w1 date

This query will retrieve records where "publication" appears within one word of "date," for example, records containing the phrase date of publication or publication date (or both) and also date for publication, publication and date, publication to date, publication with date, etc.

If proximity searching is available in a specific database, instructions concerning its use can usually be found in the Help screen(s), synonymous with adjacency. (ABC-CLIO, op cit.)

Up in the upper right hand corner of the EBSCO search page is the useful four letter word: HELP. This leads to a directory that, among other things, lists the link to the EBSCO discussion of proximity searching.

We learn that the W tells the search to find word one always on the left and word two always on the right. Using N allows them to flip. These letters must always be followed by a number, to specify the number of words apart they can go to. W0 and N0, (W zero and N zero) find the words next to each other and as the number goes up, they are found up to a corresponding number of words apart. For example, literature n3 review* will find literature review, literature reviews, reviews of the literature and review of the literature.

Returning to life care plan*, we can try: life w0 care n6 plan* to see if the exact phrase life care within six words of plan and its variations on either side of the phrase life care finds more pertinent literature for us.

Indeed it does. This new search almost doubles the number of citations found to 967 sources found in the group of databases we selected to use above.

Because we can search in steps and each step is recorded and usable, we can now eliminate the results for the search life care plan* from the results for life w0 care n6 plan*.

In so doing, we find titles like these:
Figs. 1 and 2. Sample screen shots from EBSCOHost search interface
Dynamic preferences for site of death among patients with advanced chronic obstructive pulmonary disease, chronic heart failure, or chronic renal failure.

The rapid response system and end-of-life care.

Dynamic Preferences for Site of Death Among Patients With Advanced Chronic Obstructive Pulmonary Disease, Chronic Heart Failure, or Chronic Renal Failure.

Measuring quality in cancer care: overview of initiatives in selected countries.

Do the elderly have a voice? Advance care planning discussions with frail and older individuals: a systematic literature review and narrative synthesis.

Service use at the end-of-life in Medicare advantage versus traditional Medicare.

Palliative care for Parkinson's disease: a summary of the evidence and future directions.

We have not only come up with a substantial number of additional sources with the new formula, but we have also found an additional search phrase to consider using in the search results titles, the phrase advance care planning, yielding (life w0 care n6 plan*) OR (advance w0 care n6 plan*)

This new search strategy in the same databases leads to over four times as much content, 4,460 source citations and the new search (minus the results of life w0 care n6 plan*) search leads to sources like:

- Neurologic aspects of palliative care: the end of life setting.
- The evaluation of a palliative care programme for people suffering from life-limiting diseases.

Living and dying: responsibility for end-of-life care in homes without on-site nursing provision - a prospective study.

Lesbian, Gay, Bisexual, and Transgender Aging Concerns.

Quality of care factors associated with unplanned readmissions of older medical patients - a case-control study.

Respecting Choices® and Advance Directives in a Diverse Community.

Understanding of Advance Care Planning by Family Members of Persons Undergoing Hemodialysis.

Summary
This discussion demonstrates that EBSCO provides tools that combined with planning and thinking about ones search strategy enables one to take a small number of search results on a topic and expand them into a much larger but still relevant search result for that topic. You’ll need to study and practice these skills, like any others, to gain facility in their use. One key ingredient in this thought process is taking time to consider a variety of ways people speak and write about a concept. “Life care planning” can also be planning for life care and advance care planning and perhaps more. Failure to use variant language results in fewer found sources and can result in a failure to find very important publications about your topic.
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