

The

Spine Health Journal

Winter 2019 | Volume 1 | Number 1

Get
Better
Faster

*Exploring patient-centered, evidence-based
protocols to help you get better, faster.*

Get Better **Faster**

Winter 2019 | Volume 1 | Number 1

The Spine Health Journal



Helping patients return to the people and activities they love



Our Mission:

The National Spine Health Foundation (NSHF) is a patient-focused 501(c)(3) non-profit dedicated to improving spinal health care through research, education, and patient advocacy. We support those impacted by spinal injuries and disorders by empowering them with knowledge and hope as they regain their health and quality of life.

In This Issue of The Spine Health Journal

Letter from the Editor: A Spinal Research Update	5
Ehsan Jazini, MD <i>Editor in Chief, National Spine Health Foundation</i> <i>Spine Surgeon, Virginia Spine Institute</i>	
Ask the Expert	6
Niteesh Bharara , MD, DABPMR <i>Director of Regenerative Medicine, Virginia Spine Institute</i>	
Opioid Free Lumbar Fusion: A Commentary on Opioid Use in Spine Care & the Downstream Negative Impacts	10
Jeffrey Gum, MD <i>Orthopedic and Spine Surgeon, Norton Leatherman Spine Center</i> Portia Steele, APRN <i>APRN Orthopedic Surgery, Norton Medical Group</i>	
Physical Therapy's Role in Enhancing Spinal Healthcare	14
Rich Banton, PT, DPT, OCS, CMPT, ATC <i>Clinical Director & Physical Therapist, Virginia Therapy & Fitness Center</i>	
Aquatic Program Development for Wounded Warriors	18
Mary O. Wykle, PhD <i>MW Associates</i>	
Invitation to Partner	23
<i>A message from the National Spine Health Foundation</i>	
Call for Papers	25
<i>Information on how to be a contributor in our Spring 2020 Issue</i>	



Letter from the Editor: A Spinal Research Update

Ehsan Jazini, MD

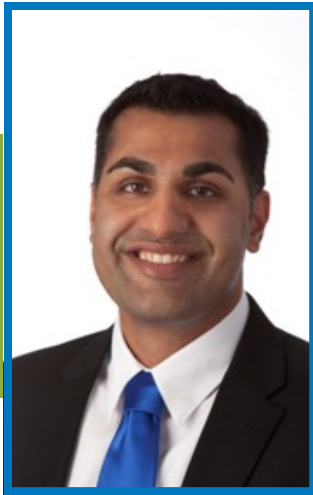
*Editor in Chief, National Spine Health Foundation
Spine Surgeon, Virginia Spine Institute*

The North American Spine Society (NASS) national meeting is a global multidisciplinary medical organization dedicated to fostering the highest quality, ethical, value-based, and evidence-based spine care through education, research, and advocacy. The National Spine Health Foundation holds these same values and has been dedicated to empowering patients with knowledge and hope since 2002. In hopes of making a maximum positive impact on the millions of suffering with debilitating neck or back pain, the Foundation collaborates with top spinal experts through their Center of Excellence program, driving innovation and proving what works.

For one of their most profound studies, the Foundation partnered with Virginia Spine Institute (VSI) to explore how to improve recovery from spinal surgery by adopting a new program called ERAS, enhanced recovery after surgery. By comparing patient outcome measures pre- and post-ERAS, we see that seemingly minimal changes to a surgery protocol can have maximum effects in helping patients get better, faster.

I had the honor of presenting our preliminary findings at the 2019 NASS annual, most notably: Patients awake from surgery with better pain control, which then allows them to often walk the day of surgery. Early ambulation and good pain control also allow for the restoration of normal body functions sooner, such as voiding, eating, and moving bowels, all of which are milestones after spine surgery. Achieving these milestones earlier gets patients home earlier. We have seen a decrease in the amount of opioid medications needed during the hospitalization after spine surgery, and expect this to translate into a reduction in the length of time patients take pain medication after surgery, as well.

It is our hope that other spine surgeons and surgical teams around the nation will want to improve their recovery techniques, as well, and that ERAS will continue to evolve as innovations in spinal healthcare evolve. We will continue to track our patient's outcomes and look forward to sharing our results as we continue this important research.



Ask the Expert:

Niteesh Bharara, MD, DABPMR

Director of Regenerative Medicine, Virginia Spine Institute



What changes should we see with responsible medicine?

Many of the changes we'll see in the spinal industry will be changes that are happening across various fields of healthcare, in general. As much of the national conversation right now is centered on the opioid epidemic, it's no surprise that various stakeholders have reignited a discussion about medical ethics and responsible medicine. The greatest change we can expect to see is more of a push, from various levels of government, for more responsible prescribing practices and accountability at every step of the care continuum. For physicians and surgeons, what we may expect to encounter is a patient that's even more savvy to what

drugs are being prescribed to them and/or greater scrutiny around why a particular type of device or brand of product was used in our process. The changes that'll come down the pike from government in the next 2-4 years are going to be the greatest hurdle for prescribers, but that's also not necessarily a bad thing. The days of medicine being the wild, wild west are long over and that creates an environment where practitioners who put the patient at the center of every step of their decision-making process can possibly be rewarded and the 'bad actors' will have a light shone on them. As a practitioner, I always want the conditions to be ripe for a strong doctor-patient relationship to exist and I've seen, recognized, and realized that bureaucratic red tape makes that incredibly difficult. So, while private industry and the medical field in general are being looked at through a new lens by government, and will seemingly safeguard the patient, it won't come without negative ramifications either. What we can all agree on is that Americans

deserve the best healthcare delivery and these changes around prescribing practices and greater accountability can and should result in that. I'm an optimist who believes that we, as healthcare professionals, must evolve and adapt to any and all changes with the most positive response possible. Because in the end, we all want the same thing: the patient walking away better and healthier than when they came to us for care.



What is the importance of bridging the gap between a patient's physical therapist and their surgeon?

The importance of not using narcotics in response to acute pain cannot be overstated. To that end, physical therapy is so very crucial and often is something that isn't held in as high importance [as the surgery itself] and may sometimes even be an afterthought to some patients. There are all types of patients: those who want to be hyper involved in every step of their care, others who present with a "just take care of me attitude", ones who feel they should listen to themselves and not fully take all the recommendations any health care providers makes, etc. As health care professionals, we have to be in tune with what's going on in the patient's mind - just as much as we do with what is the actual

root cause of their ailment or disease. It brings me no pleasure to say this, but that gap between a patient's physical therapist and their surgeon largely exists because we allow patients to let it exist. That said, I've realized that to bridge this gap, we've got to be in the business of positively changing hearts and minds in patients who don't fully subscribe to how vital the role of physical therapy will be in their lives post-surgery. In full-service practices that strive to deliver top notch care, there is virtually no gap between the practitioners; surgeons and physical therapists are used to and keen on detailed communication about patients both pre-op and post-op; bridging the aforementioned gap is done by intelligently convincing the patient to believe and have faith in the process of physical therapy being pivotal in getting the patient to where he/she wants to be post-surgery. I've had a front row seat to witnessing the importance of the relationship between therapists and surgeons and I can say with a high degree of certainty that if we don't change patients' hearts and minds about the crucial role of both their surgeon and physical therapist, this gap will continue to exist for patients, ultimately having the potential to result in patients feeling that their care was subpar, overall, because of that.

[\(Article continues on pg. 8\)](#)



We've all heard of the opioid crisis; What type of questions should patients be asking their providers before heading to the pharmacy?

Nothing makes me happier than when a patient has questions for me. I mean it! Asking questions is so important because physicians can't guess a patient's concerns. I'm using all the knowledge and skills in my toolbox to diagnose, outline, and prescribe what I think is going to best help treat the source of my patient's ailment or disease. However, I can't always know, despite trying to spend the most time asking questions myself, about a patient's everyday life or recent changes. Therefore, I believe it's important that patients jump in and ask questions like:

- Is there any alternative to what you've just prescribed me?
- Will this medication affect my ability to do my everyday tasks at my job?
- What different sensations can I expect to feel while on this medication?
- What is the timeframe in which this medication will work and when exactly might I expect to no longer need to take this medication?
- Are there any complications, from being on this medicine, that you can foresee me experiencing or that I should be prepared for?



You've recently been named the "Face of Regenerative Medicine" by Washingtonian Magazine. What should people know about during their treatment?

Regenerative medicine therapies are challenging the traditional ways physicians approach a medical problem. I'm essentially utilizing your body's natural processes to heal itself. In my humble opinion, there's almost nothing better than that. Sure, the field of regenerative medicine is new and rather unknown to the layperson, which can cause anxiety for some patients when I make a recommendation. However, the rapid developments in this field should not be discounted simply because they're new in the field of medicine; regenerative medicine procedures are causing people to come away from depending on narcotics to treat their pain, they're reducing the amount of time it takes for an injury to heal, and they're as organic as therapies come. I want people to know that physicians like me who are focusing on providing new, innovative, non-surgical options like therapies in the field of regenerative medicine aren't using people as guinea pigs; we've seen proven and real success when it comes to quality of life and healing

processes. Don't discount these treatments just because you may not have heard about them in the mainstream media or medical narrative; treatments that are rooted in regenerative medicine have been undiscovered "gems" for American patients, especially over the past five years, and we can expect these concepts to continue to spread across the country and the world.



You've also received the 2019 Patients' Choice Award for two consecutive years. What does that mean to you?

It means that the time I spend away from my family is worth it! (Just kidding!) I genuinely enjoy all my patient interactions and derive great pleasure from meeting the various people who come through my Clinic's doors each day. I look at every one of my patients like a family member -- my family often jokes that's the case! My first approach is to think about my patient's care just as if I were taking care of my mother, father, brothers, wife, or daughters. I would want the best for those people who are my blood relatives, and would want any health care practitioner taking care of them to be making the most medically-sound decisions which truly would improve their condition as effectively and in the appropriate amount of time and cost as

possible; all of my patients deserve that level of my commitment to working to get them better, too. I also think it's this mentality that continually strengthens my relationships with patients. In this day and age, the number one challenge in treating patients, I believe, is establishing trust; I feel that I'm working on doing just that in every single minute of every single day in each of my patient interactions. To me, it's incredibly important that a physician be a diagnostician first and foremost, but that doesn't mean we can't be a patient's advocate and friend along the way. I'm beyond humbled and honored to have received the Patients' Choice Award for two consecutive years, and hope I'll always be someone that my patients look to as a trusted caretaker and friend.



Opioid Free Lumbar Fusion: A Commentary on Opioid Use in Spine Care & the Downstream Negative Impacts

Jeffrey Gum, MD

Orthopedic and Spine Surgeon, Norton Leatherman Spine Center

Portia Steele, APRN

APRN Orthopedic Surgery, Norton Medical Group

The national opioid crisis the United States of America is currently facing has caused a Public Health Emergency and the field of spine surgery is working to fight back. With an estimated two-million Americans being dependent on or abusing prescription pain medications, and a reported 63,600 drug-related overdoses resulting in death involving prescription or illegal opioids, it is becoming increasingly clear that a holistic and multidisciplinary approach is needed to impact the public health issue.

Opioids prescribed after spine surgery are the same medications commonly involved in prescription opioid related deaths (CDC, 2018); and when comparing prescription duration patterns in orthopedic surgery nationally, spine surgeons are amongst the highest (Boylan, Suchman, Slover, Bosco, 2018). Opioid related deaths in Kentucky in 2016 nearly double the national average and trends, demonstrating the problem is getting worse (NIH, 2016). According to



NIH, the national opioid prescription average was 70 prescriptions per 100 people; however, in Kentucky, the rate is alarmingly higher at 97 opioid prescriptions written per 100 people (NIH, 2015).

The Norton Leatherman Spine Surgery Team is making efforts to retaliate against the epidemic by conducting research to better understand drivers of opioid consumption and altering practice patterns accordingly.

It should be a universal responsibility of medical practitioners, especially those leading the nation's spine research, in turning our attention toward decreasing

opioids after spinal surgery. In 2017, Norton Leatherman Spine Center sought to evaluate how surgery invasiveness and preoperative opioid consumption effected opioid consumption after spinal surgery. Morphine Milligram Equivalents (MME) in patients with similar baseline characteristics undergoing 1-2 level minimally invasive lumbar fusion (MIDLIF) and open traditional lumbar fusion (TLIF) were compared, in the immediate in-hospital postoperative period. We were surprised to find that surgery invasiveness alone was not associated with increased opioid consumption while in the hospital after surgery, and neither did being on opioids preoperatively. The research team felt that this outcome could have been related to the lack of consistent prescribing patterns immediately post spinal fusion surgery.

After seeing the study results, we created a prescriber driven protocol focused on providing pain medications to patients that were more specific to their individual needs after spinal surgery. We therefore developed a Standard Escalation Pain Protocol (SEPP) in efforts to more purposefully prescribe opioids postoperatively. After a year of protocol utilization, we evaluated if implementation of prescriber-driven SEPP changed the amount of opioids patients consumed in the acute in-hospital postoperative period and

characteristics and preoperative opioid consumption, before and after implementation of the pain protocol, and found that patients using the protocol consumed 54% less opioids and had a statistically significant reduction in Length of Stay (LOS). The results of these studies demonstrate the importance of the prescriber's role in battling opioid consumption in spinal fusion patients postoperatively.

Understanding the drivers of opioid consumption in the acute in-hospital postoperative period lead the team to further focus on identifying factors contributing to opioid use. In a single center study of 1,500 patients undergoing 1-2 level spinal fusion surgeries, we identified patient characteristics that were associated with higher opioid (MME) consumption. The factors that contributed to increased cumulative opioid consumption calculated on post-operative day (POD)#4 were younger age, opioid consumption prior to admission, current smokers, and more levels fused; factors with no association to opioid consumption included surgical approach, zip code, how sick the patients were pre-op, marital status, BMI, race, or insurance type. These results help surgeons identify modifiable risk factors for increased opioid consumption in patients undergoing lumbar spinal fusion surgery. As we prepare to activate Enhanced Recovery After Surgery (ERAS) in Quarter 2 at Norton Leatherman,

we have already begun to study the effectiveness of multimodal analgesia on opioid consumption and patient outcomes. Multimodal analgesia is the use of a variety of different types of pain medications which act on different pain blocking pathways, instead of just using opioid medications. In 2017, we began using Transverse Abdominis Plane (TAP) blocks and a “preoperative pain cocktail” given to patients prior to surgery, in efforts to decrease intra-operative and post-operative opioid consumption and decrease post-operative complications in patients undergoing Anterior Lumbar Interbody Fusion (ALIF). In looking at patients with similar baseline characteristics and preoperative opioid use, before and after implementation of TAP blocks, we found patients were requiring 62% less opioids (MME) starting on POD#1. There was a reduction in length of stay (LOS) from 4.5 to 3.8 days, which was not statistically significant (p.0.246) by research standards; however, the loss of additional midnight stay is clinically relevant and affects hospital dashboard reporting. By decreasing the length of time patients are in the hospital after surgery; these patients are more quickly able to return to the comfort of their home for their recovery, while also avoiding harmful infections that live in every hospital and decreasing the overall cost of their care. Downstream effects of opioid use are sometimes overlooked, however, the

Leatherman team is feeling the impact as the rates of Osteomyelitis related to intravenous drug use (IVDU) increased tenfold from 2013 to 2016 . Osteomyelitis is a serious, and sometimes life threatening, bone infection that occurs as a result of introducing bacteria into one’s blood stream through IV drug use outside of the hospital or from having a decreased immune system from other illnesses. Bacteria introduced into the bloodstream frequently infects the spine, causing severe back pain. These patients require long-term IV antibiotics, and in severe cases where the bone has been destroyed by bacteria causing instability, major invasive spine surgery is needed. When looking at cost of care for these patients, the average cost for patients with history of IVDU requiring surgical intervention was \$29,063; and \$12,615 for the IVDU group treated non-operatively with antibiotics. Variable Direct Cost (VDC) of four diagnosis-related groups (DRG) were also evaluated, with three of the four having increased costs for patients with IVDU when compared to all-comers in the same DRGs. Overall it was found that while IV drug users with vertebral osteomyelitis have similar LOS, lower readmission rates, and similar hospital costs compared to those who do not use IV drugs; the average VDC based on DRG, the IV drug users cost more to care for. There is still much work to be done to further understand the role of

healthcare providers in fighting the opioid epidemic; this is just the beginning. As the Norton Leatherman team and other leaders in the spine community continue to study opioids in efforts to better understand ways to decrease opioid utilization in patients undergoing spine surgery, we are making progress.

Research results and effective changes in provider practice patterns, like the implementation of the SEPP and ERAS protocols, in the field of spine surgery are transferable to other specialties and service lines as well. We invite you to create initiatives to continue to work toward progress, as winning the battle against opioids will take time and a multidisciplinary approach.



**Supporting patients on the
journey to spinal health**



Physical Therapy's Role in Enhancing Spinal Healthcare

Rich Banton, PT, DPT, OCS, CMPT, ATC
*Clinical Director & Physical Therapist,
Virginia Therapy & Fitness Center*



The United States makes up 4.4 % of the world's population, yet consumes more than 80% of the world's opioids! That is a problematic and alarming to many healthcare professionals. Pharmaceutical companies spend billions of dollars each year on drugs that do nothing more than treat symptoms. None of these drugs do anything for patients with regards to preventing or curing their problems.

As a physical therapist of 20 years, I have witnessed narcotic dependency and seen opioids being over prescribed. Alternative to opioid use, early access to physical therapy could be a better solution to solving a patient's pain. When patients are educated about their conditions and learn to move better, they feel better and are able to manage their pain without opioids. The following article will discuss the role physical therapists play in healthcare and how they can offer solutions for pain as compared to addictive drugs and medications.

Considerable evidence supports the benefits of early access to physical therapy care¹ In particular, physical therapists increasingly provide their services without a physician referral (i.e., direct access). 70% of the public reports that they would seek care from a physical therapist without physician referral for musculoskeletal conditions.¹ Multiple studies have demonstrated that physical therapists can provide safe and cost-effective care for patients with musculoskeletal conditions in direct access practice settings, supporting the expansion of direct access physical therapy services. For example, physician referral episodes of care reportedly increased physical therapy claims by 67%, office visits by 60%, and costs by 123% than when patients directly accessed physical therapy without physician referral.¹ Physical therapists are highly trained in a skill called differential diagnosis. This means they are able to determine the type of tissues and severity of injury with special tests that do not require x-rays or MRIs.

The higher trained the physical therapist, the more accurate their ability to differentially diagnose. In addition to differential diagnosis, our next most important skill is our ability to teach and educate our patients on their condition. Too often do healthcare providers generate fear in patients. They use terms like “your spine is unstable” or “you have degenerative disc disease.” Patients need to understand that pain does not always mean tissue damage and that images in an MRI do not always indicate problematic disease.

What do MRIs Tell Us?

In one particular study, magnetic resonance imaging (MRI) was performed on 67 individuals who had never had low-back pain, sciatica, or neurogenic claudication². The scans were interpreted independently by three neuro-radiologists who had no knowledge about the presence or absence of clinical symptoms in the subjects. About one-third of the subjects were found to have a substantial abnormality. Of those who were less than sixty years old, 20% had a herniated nucleus pulposus (inner core of the vertebral disc) and one had spinal stenosis (narrowing of the spaces within your spine). In the group that was sixty years old or older, the findings were abnormal on 57% of the scans: 36% of the subjects had a herniated nucleus pulposus

and 21% had spinal stenosis. There was degeneration or bulging of a disc in at least one lumbar level in 35% of the subjects 20-39 years old and in all but one of the 60-80 year old subjects. The conclusion of this study is that abnormalities on magnetic resonance images must be strictly correlated with age and any clinical signs and symptoms before operative treatment is contemplated. Patients need to be educated that images of disc pathology do not always correlate to their pain. A physical therapy diagnosis should be included in the plan of care for any patient suffering pain to ensure a comprehensive approach is being taken and to educate patients on the best approach to treating or preventing their pain.

What is Pain?

Pain is very much physical as it is mental. Have you ever noticed that there are times where you have injured yourself but you don't notice the pain until you look down and see that there's a bruise? How about when you get a paper cut on your finger but you don't notice the pain until after you've washed your hands, and all of a sudden you notice your hand throbbing all day? Pain is indeed an indicator of tissue damage; however, most tissue types take about four weeks to six months to heal. The real question is why do some of us still feel pain for so long afterwards?

The answer – we catastrophize! We think about the pain which means that we become fearful of any movement that we believe may make the condition worse. This leads to something known as somatization disorder – this means that the physical symptoms that we experience may not necessarily be caused by tissue damage in our body.³

For example, take a case study from the British Medical Journal: *“A builder aged 29 came to the accident and emergency department having jumped down on to a 15 cm nail. As the smallest movement of the nail was painful, he was sedated with fentanyl and midazolam, both controlled substances. The nail was then pulled out from below. When his boot was removed a miraculous cure appeared to have taken place. Despite entering proximal to the steel toecap, the nail had penetrated between the toes: the foot was entirely uninjured.”*⁴

The brain is a remarkable thing – the builder was in so much pain when he thought the nail had penetrated through his foot, but as soon as he realized that the nail did not pierce through anything, the pain was instantly gone.

The takeaway here is this: Pain does not need input. The brain concludes that the body is in danger and action is required. The

perception of the threat determines the brain’s response to pain, not the amount of tissue damage. When patients do not understand the source of their pain, the greater their perceived output of their pain will be. In order to provide the best care and to get patients better, faster, healthcare providers should attempt to educate patients about their body and their pain.

Part of getting patients back to their lives faster means earlier access to physical therapy. Successful treatment of pain starts with effective communication and education. Physical therapists are excellent educators and are trained in many interventions that can help patients eliminate their pain. Don’t let your pain prevent you from moving! Studies show that remaining active during a painful episode is a vital part of your recovery.⁵ Visit a physical therapist and allow them to teach your brain that movement is good, that movement won’t cause you extra pain, and that you can indeed perform activities that you love doing! This is a gradual process that will take time, but being active in physical therapy will definitely have a positive effect on your recovery.



References

1. Boden, Davis, Dina. Abnormal magnetic-resonance scans of the lumbar spine in asymptomatic subjects. A prospective investigation. *J Bone Joint Surg Am.* 1990 Mar; 72 (3): 403 -408
2. Childs J, Whitman J, Sizer P. A description of physical therapists' knowledge in managing musculoskeletal conditions. *BMC Musculoskeletal Disorders* 2005, 6:32: 1-7.
3. Fisher JP, Hassan DT, Connor NO. Minerva. *BMJ.* 1995;310(6971):70.
4. . Louw A, Diener I, Butler DS, Puentedura EJ. The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain. *Archives of Physical Medicine and Rehabilitation.* 2011;92(12):2041-2056.
5. Minnesota Department of Health. Opioids: Perception of Pain. <https://www.health.state.mn.us/communities/opioids/prevention/painperception.html>
6. Searle A, Spink M, Ho A, Chuter V. Exercise interventions for the treatment of chronic low back pain: a systematic review and meta-analysis of randomised controlled trials. *Clin Rehabil.* 2015;29(12):1155-1167.



Empowering patients with
knowledge and hope



Aquatic Program Development for Wounded Warriors

Mary O. Wykle, PhD, ATRIC, AEA
President, MW Associates



The Office of The Surgeon General of the Army and specifically the Proponency Office for Rehabilitation & Reintegration contracted for the development of the Aquatic Rehabilitation and Aquatic Warrior Exercise Programs. The wars in Iraq and Afghanistan presented challenges to the Medical and Therapy Corps because of the number and severity of the injuries. In earlier wars, many of these soldiers would not have survived. The advancement of medical intervention in the field of battle saved the lives of many and overwhelmed medical treatment facilities. In addition to loss of limbs and traumatic brain injuries,

musculoskeletal injuries presented unique challenges because of weight-bearing restrictions to hasten recovery.

The goals of the program were used to implement and evaluate aquatics to speed the healing process, improve quality of life, and return soldiers to duty more quickly than using land-based programs exclusively. The program defines the clinical outcomes data to be collected, analyzed, and postulates the results from completing the program. The programs emphasize the importance of providing options for continuance of physical activities for general health and link the relationship and application of the program for individuals needing a modified physical activity to achieve total fitness.

The purpose of the study was to collect data to develop a standardized aquatic rehabilitation and aquatic exercise programs

for all Army soldiers with musculoskeletal injuries. Requirements of the study included (1) a regular workout of sufficient intensity and duration to improve fitness without detrimental outcomes, (2) multilevel instruction addressing weight-bearing issues, and (3) ability to return to regular unit physical training. Musculoskeletal injuries usually involve weight-bearing limitations. The workout developed included deep water interval cadence running that raised heart rates to the training zone. This was tracked by using heart rate monitors. Balance and core strength exercises assisted in restoring functional activities that allowed for muscular strength and endurance exercises using resistive equipment in the water.

Although the initial goal was the return to full active duty for the soldiers, it was immediately apparent that concentration on improved quality of life was the ultimate goal. In developing the program, the soldiers' musculoskeletal limitations were compounded by weight gain, addiction to prescribed medication for pain and sleep, and other injuries including traumatic brain injury and post-traumatic stress disorder. The program modifications and progressions permitted each soldier to participate at his or her level. Although the emphasis of the study and program development focused on cardiorespiratory fitness, it was necessary to develop an all-inclusive exercise/fitness

program that included elements of balance, endurance, strength (core/general) and flexibility enabling improved function and daily life activities. The study used validated scales for identification of prime areas of concern followed by a cardiorespiratory assessment to gauge improvement of fitness of soldiers participating in the study. The validated land-based scales included the following: 1. Pain scale: 0 to 10 with location of pain 2. The Modified Oswestry Low Back Pain Disability Questionnaire 3. The Upper Extremity Functional Scale 4. The Lower Extremity Functional Scale. Non-validated evaluations included the following: 1. 100-Step Deep Water Test (based on Brennan and Wilder's research and consultation with Dr. Bruce Becker, MD) 2.

Personal Assessments and Evaluations: As medical care becomes more specialized; elements of these programs are being incorporated because of the benefits of exercising in the water. In addition, the program was refined and expanded to the U.S. Marine Corps. Collection of initial data at the beginning of the study from the instruments used recorded location of significant pain with the following indications: 52% with lower extremity injuries, 26% with low back pain/injury, and 22% with upper extremity injuries. Although fewer responses indicated low back pain, the beginning of the data collection showed that the degree of back pain recorded was

highest. At the conclusion of the study, 42% showed reduction in pain. The Modified Oswestry Low Back Pain Disability Questionnaire (Oswestry) indicated that daily functional activities can be achieved without excessive pain, but two specific questions identified an increase of pain with basic soldier activities such as standing in



formation and a reliance on prescribed medication for pain and sleep. Fifty-seven percent required prescription pain medication for activities of daily living; 80% had their pain increase with standing; and 68% required prescription medication to sleep with a range of sleep time from 2 to 6 hours. This is an inadequate amount of sleep for daily recovery. At the end of the study, some personal assessments recorded less reliance on prescription medication for pain and sleep. The Upper Extremity Functional Scale had the least implication. The Lower Extremity Functional Scale presented a clear picture of the importance of non-weight-bearing or limited weight

bearing exercise with 52% of the soldiers in the study. Basic functional tasks with significant responses to this scale showed moderate to extreme difficulty on the following tasks: • Usual hobbies, recreation or sporting activities—66% • Squatting—62% • Walking a mile—64% • Going up or down one flight of stairs—57% • Standing for one hour—67% • Running on even ground—79% • Running on uneven ground—81% • Making sharp turns while running fast—84% • Hopping—75%

The initial and follow-up comparisons of the Lower Extremity Functional Scale continued to indicate that most items on this scale remain extremely difficult because of weight bearing. Meeting the program goals, it was important to emphasize continued participation in challenging aquatic programs closely related to land training—specifically running. The primary exercise used to recondition the soldiers was deep water interval cadence running because it replicated a familiar activity. Heart rate monitors ensured that soldiers were working in their training zones. Deep water exercise is one of the most popular and researched areas in aquatic therapy and exercise. The three measures used for grading deep water running intensity include (1) heart rate, (2) rating of perceived exertion, and (3) cadence/pace. Research by Brennan (1997) and Wilder (1993) found a “quantitative, objective measure (cadence)

could be used to predict cardiovascular response to a particular workout “(Clinical Orthopaedic Rehabilitation, p. 506).

Muscular strength and endurance training, core strength and balance, and flexibility were included in the programs developed. Resistive/drag equipment was selected and purchased for use in both programs. Resistive equipment permits exercises to use muscle action as in land strength training.

Overuse injuries from training are a major concern of the Army and the Marines. According to statistics provided by the Army OTSG, the running injury rate is 2.2 times higher per soldier than other military services, and more than 400,000 physical profiles denoting limited duty are written secondary to musculoskeletal injuries annually. Additionally, more than 25 million days of limited duty annually are due to musculoskeletal injuries and are the third leading cause of hospitalizations in the Army. (Ruscio et al., 2010). In the first six months of 2011, the Marine Corps reported that 15,361 Marines were injured with training-related musculoskeletal injuries and were the leading noncombat cause of service member hospitalizations and outpatient visits resulting in preventable discharges and limited duty days. Of those injured from training, 4744 were placed on limited duty while 605 did not return to duty. For each injury, 16 duty days were lost

on average at a cost of \$1,900 per Marine. The cost for those placed on limited duty was more than \$9 million during that six-month period (Medical Surveillance Monthly Report-USMC, 2011). In addition, obesity is a major concern in all military branches because of inactivity from varied activities; medications; pain (sleep, work/family life); drug and alcohol abuse; and/or motivation due to inability to be functional in daily activities.

Conclusions: As the military continues to shrink in size, it is imperative to keep the forces in fighting shape. Exercise progressions and modifications, selection of equipment, appropriate water depth, and innovative intensity challenges are included in the initial training of trainers.



References

1. Becker, B. E., & Cole, A. J. (2010). *Comprehensive aquatic therapy* (3rd ed.). Pullman, Washington: Washington State University Publishing. Biberdorf, C. (Ed.). (2004). Army lab tackles problem of military stress fractures. *Warrior Magazine* (Special to American Forces Press Service/ May 19, 2004). U.S. Army Soldier Systems Center.
2. Burns, A. S., & Lauder, T. S. (2001). Deep water running: An effective non weight- bearing exercise for maintenance of land-based running performance. *Military Medicine*, 166(3), 253-258.
3. Brotzman, S. B., & Manske, R. C. (2011). *Clinical Orthopaedic Rehabilitation* (3rd ed.). Philadelphia, PA: Elsevier.
4. Bushman, B. A., Flynn, M. G., Andres, F. F., Lambert, C. P., Taylor, M. S., & Braun, W. A. (1997). Effect of 4 weeks of deep water run training on running performance. *Medical Science & Sports Exercise*, 29(5), 694-699. Cohen, S. P., & White, R. L. (2007).
5. Lauder, T., & Burns, A. S. (2001). Deep water running: An effective non weight-bearing exercise for the maintenance of land-based running performance. *Military Medicine*, 166(3), pp. 253-258).
6. Ruscio B., Jones, B. H., Bullock, S. T., Burnham, B. R., Canham-Chervak, M., Rennix, C. P., Wells, T. S., & Smith, J. W. (2010). A process to identify military injury prevention priorities based on injury type and limited duty days. *American Journal of Preventative Medicine*, 38(1), 19-33.
7. Svedenhag, J., & Seger, J. (1992). Running on land and in water: Comparative Exercise Physiology. *Medical Science & Sports Exercise*, 24(10), 1155-1160.
U.S. Army, Office of the Surgeon General/Proponency Office for Rehabilitation and Reintegration. (2009). *Aquatic Rehabilitation Program, Performance Improvement Study, 2009-2010*.
8. U.S. Marine Corps. (Spring, 2011). *Medical Surveillance Monthly Report- USMC*.
Wilder, R. P., Brennan, D., & Schotte, D. E. (1993). A standard measure for exercise prescription for aqua running. *American Journal of Sports Medicine*, 21(1), 45-48.
9. Wykle, M. (2013). *Aquatic programs for injured warriors and athletes* (2nd ed.). Burke, Virginia: MW Associates.



Your
Support
Matters

Invitation to Partner with **The National Spine Health Foundation**

The National Spine Health Foundation operates with the giving of our supporters. We cannot produce our journal or other educational materials without you. Please consider a gift of any amount to help us continue to bring hope to those experiencing fear, confusion, and misinformation when it comes to their spine health. Thank you for your consideration and readership.

The Spine Health Journal

Ehsan Jazini, MD
Editor-in-Chief

Sabrina M. Woodlief
Associate Editor

Beth Fredericks
Assistant Staff Editor

Christopher R. Good, MD, FACS
Colin M. Haines, MD
Rita T. Roy, MS, MD
Thomas C. Schuler, MD, FACS
Editorial Staff

Board of Directors

Brian D. Nault
Chairman

Thomas C. Schuler, MD, FACS
President

Kevin M. Burke, Jr.
Secretary

William H. Evers, Jr., PhD
Treasurer

Raymond F. Pugsley
National Race Liaison

Sheldon Buytenhuys
Gala Liaison

Michael H. Howland
Chairman Emeritus

Members

Christopher R. Good, MD, FACS
Rina Shah
Paul J. Slosar, Jr., MD
Gordon M. Taylor, CPA, CIA, CGMA

Call for Papers

Want to be featured in the **Spring 2020 Issue of The Spine Health Journal?**

The submission deadline is **April 1, 2020.**

Please contact us at [@info@spinehealth.org](mailto:info@spinehealth.org) to submit your abstract or for further information.





The National Spine Health Foundation
11800 Sunrise Valley Dr.
Suite 620
Reston, VA 20191