



Annual Review

2019

Mission

Founded as a Christian ministry of healing, Baylor Scott & White Health promotes the well-being of all individuals, families and communities.

On the cover

Pat Widhalm (center) is a stroke survivor and former patient who volunteers his time to teach a LEGO therapy class as part of recreational therapy at Baylor Scott & White Institute for Rehabilitation – Frisco. This year's project was all about the State Fair of Texas, with working models that included State Fair staples like Big Tex, the Texas Star Ferris Wheel and a Fletcher's Corny Dog stand.

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Fabian Polo, PhD, MBA, president

A message from Fabian Polo, PhD, MBA, president

We had a great 2019 at Baylor Scott & White Institute for Rehabilitation (BSW Rehab). We cared for nearly 100,000 lives across our many lines of rehabilitation services (Acute Care Inpatient Therapy, Inpatient Rehabilitation, Outpatient Rehabilitation, Day Neuro Rehabilitation, Home Health and Neuro Transitional Care), and our research funding reached an all-time high.

Our acute therapy teams focused their efforts around early mobility in the acute hospital units to improve patient quality of life and prevent deconditioning. Our Day Neuro programs are growing and continue to provide the intensive therapy services of an inpatient rehabilitation hospital without the need for overnight stays. And our adoption of blood flow restriction training in the outpatient setting has led to improved patient outcomes and experiences. We are also very proud of our physical therapy leaders who continue their work promoting the value of our “Keep Your Move in the Tube®” program so it will become the standard of care everywhere for cardiovascular rehabilitation patients.

We have made tremendous progress in advancing our spinal cord injury research as the team completed one funded four-year study and initiated three newly funded projects. The work has continued to address improving the health, function, independence and community participation for those living with spinal cord injury.

And lastly, Rita Hamilton, DO, was officially named chief medical officer of BSW Rehab in September of 2019. The CMO position was vacated by Amy Wilson, DC, who was promoted to CMO of our flagship 1,000-bed Level I Trauma Center at Baylor University Medical Center, part of Baylor Scott & White Health. Dr. Wilson served as CMO for more than 10 years, and her impact will be felt for many years to come. Dr. Hamilton brings to us an impressive local and national reputation as a leader in the field of spinal cord injury rehabilitation and in graduate medical education as the PM&R Residency Program director at Baylor University Medical Center in Dallas.

We hope you enjoy reading our Annual Review.

Everybody moves



This year, BSW Rehab researchers participated in the **#everyBODYmoves** campaign, a grassroots effort spearheaded at Johns Hopkins University that targets immobility harm in acute and post-acute care settings. The campaign is part of the worldwide initiative **#EndPJPparalysis**, a three-day global virtual summit that shares best practices to get people up, dressed and moving to improve their quality of life and prevent deconditioning. BSW Rehab researchers presented at this year's #EndPJPparalysis summit, which included case studies, research presentations and clinical sessions, as well as information about leading change, storytelling and creating social movements.

“The purpose of the summit is for all hospitals and partners to highlight their mobility initiatives so others can use those initiatives or repurpose them to fit their own organizations,” says Emelia Exum, PT, DPT, GCS, advanced clinical specialist level therapist at Baylor University Medical Center.

Dr. Exum and Brian L. Hull, PT, DPT, MBA, director of rehabilitation at Baylor University Medical

Center, presented their research on using mobility technicians in the general medicine and surgical populations to increase patient mobility and improve performance on hospital quality measures. This pilot study, published this year in the *Journal of Acute Care Physical Therapy*, showed that mobility technicians could help to increase patient mobility in non-intensive care hospital units and reduce or eliminate the need for facility-based, post-acute care rehabilitation for some patients. Positive trends were also observed in improving patient experience, as well as decreasing length of stay, fall rate and post-acute care spending.

“This is a relatively low-tech intervention that, if structured correctly, can lead to some significant positive changes,” says Dr. Hull. “It’s an example of how going back to the basics can improve clinical outcomes. It’s common sense—and the literature backs this up—that the more active patients can be in the hospital, the better off they will be when they leave.”

The program implemented at Baylor University Medical Center in Dallas required nurses to assess patients’ medical stability and mobility using the Johns Hopkins Highest Level of Mobility score to identify patients who were appropriate for receiving assistance from a mobility technician. Mobility technicians then trained selected patients to the next appropriate level of mobility.

“The work was a multidisciplinary, collaborative effort to help patients who fall into the gap between needing physical therapy and being independent,” Dr. Exum says. “Sometimes these patients became weak while hospitalized. They may be capable of getting up with assistance or may just need someone to hand them a mobility device they use at home. Bedrest can make these patients worse when all they need is supervision.”

– Emelia Exum, PT, DPT, GCS

The study has national significance in light of the Centers for Medicare and Medicaid Services value-based purchasing reimbursement program, which aims to link payment to the quality of a hospital’s care. “In addition to the positive effects on patient outcomes and experience, the use of a mobility technician may have the potential to decrease hospital expenses,” says Dr. Hull. “But getting patients home more quickly with better mobility is the most important goal.” The next step for research is to examine the use of mobility technicians on a larger scale to better characterize statistical significance across a variety of clinical and financial outcomes.



Drs. Brian Hull and Emelia Exum presented research on the benefits of mobility in patients’ long-term recovery.

Day Neuro programs



Day Neuro programs provide post-acute rehabilitation care for patients with an acquired brain injury after they leave the hospital and need to continue their rehabilitation in the outpatient setting. Recently, we expanded our Day Neuro program to four locations in North Texas: Dallas, Frisco, Las Colinas and Fort Worth.

“Our Day Neuro programs provide a true transitional approach and focus on patient functionality,”

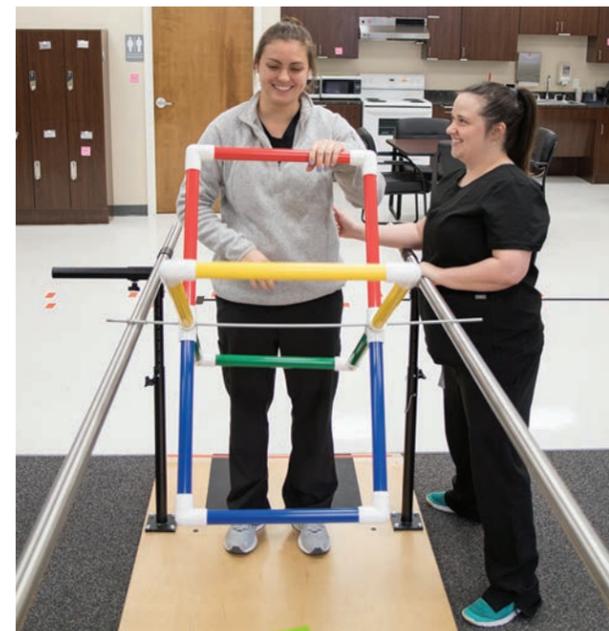
says Kathy Powers, chief operating officer, BSW Rehab - Frisco. “Our programs are unique in that patients can stay within the Baylor Scott & White system throughout their entire journey, from the emergency department to Day Neuro. We focus on the entire continuum of care and take a transdisciplinary approach to rehabilitation.”

This interdisciplinary team approach is essential to providing patient-centered care in the Day Neuro programs. The programs deliver one-on-one time

with patients who may need physical, occupational and speech therapy or some combination of the three. Additionally, recreation therapists help patients identify community activities; case managers and social workers help to identify psychosocial needs, as well as community resources; nurses help patients with clinical needs, including medication adherence; and physicians oversee each patient’s care. Neuropsychological testing is used to determine cognitive, intellectual and behavioral changes that may result from brain injury, and the



neuropsychologist/rehabilitation psychologist plays an important role in planning cognitive rehabilitation activities with all team members. The team shares the goal of helping patients identify and achieve individual



with a therapist working on personal goals,” says Mendi Lancaster, MS, CCC-SLP, CBIS, neuro market manager and speech program coordinator. “We offer group therapy to help patients translate skills to less structured formats amidst distractions to simulate real-world activities, but we emphasize individual therapy and independent work to achieve long-term goals.”

The Day Neuro environment attempts to simulate life at home with a kitchen, laundry room and other features to help patients engage in activities of daily living. Community outings are also an important component of the Day Neuro program and include activities such as going to a museum, shopping at a grocery store, using public transportation or volunteering at a food pantry.

goals so they can adjust to the neurological changes they have experienced and return to the highest possible level of functioning.

“One thing that makes our Day Neuro programs unique is that the majority of a patient’s day is spent in one-on-one therapy

The program also offers an adaptive driving program with a certified driver rehabilitation specialist who conducts a behind-the-wheel evaluation and training to help patients resume driving after their injury. Other activities include dietary education and peer-led community support groups.

“Since we’ve grown from one to four programs, we are able to touch so many more lives in the metroplex,” says Ms. Lancaster.

“We have more flexibility to address each patient’s lifestyle and help them meet their individual goals. We are getting better patient-reported outcomes sooner because of the intensity and patient-centered focus of the programs.”



Blood flow restriction

This year, our clinicians have intensified their engagement with a growing movement to adopt blood flow restriction training—application of a tourniquet to a proximal limb to reduce arterial blood flow out of the limb during exercise—to speed up the rehabilitation process. This process has long presented a dilemma: While strength and hypertrophy are essential to successful rehabilitation, these require loading, and most patients in a rehabilitation setting cannot tolerate high loads.

Blood flow restriction training addresses this dilemma by stimulating hypertrophic adaptations using a low load (typically 15% to 30% of a one-repetition maximum). These adaptations are similar to those observed with high-intensity training (which uses approximately 70% of a one-repetition maximum).

“Blood flow restriction training tricks the body into thinking it’s lifting heavy weight,” says Aaron Carr, PT, DPT, center manager and board-certified specialist in orthopedics. “It fatigues the muscle by restricting blood flow. The technique benefits post-operative patients who have load restrictions by allowing them to lift lighter weight or no weight as per their post-operative protocol while achieving similar effects to lifting heavier.”

A decade of research has consistently demonstrated that gains in muscle hypertrophy and strength from blood flow restriction training are similar to those made with heavy load lifting and that the technique can also lead to increased VO2 max (the maximum rate of oxygen consumption measured during incremental exercise) and improved tendon healing. It may also help to

reduce healing time for bone fractures. The hypertrophic response can be observed in as little as two weeks if the technique is used three times per week.

To restrict blood flow, clinicians use an FDA-approved, Delfi personalized tourniquet system with Doppler technology to determine each patient’s limb occlusion pressure. The system includes limb protection sleeves, tapered tourniquet cuffs that rapidly inflate and deflate, and exercise and reperfusion timers. To prevent complications such as blood clots, the cuffs are designed not to completely obstruct blood flow into or out of the limb.

“The research has been there for years, and we’re seeing great results with patients,” Dr. Carr says.

These results include increased muscle hypertrophy, improved strength and VO2 max. The technique is being used with all patient populations, from young athletes with strains to post-operative elderly patients with joint replacements, radiculopathy or overuse injuries, although the decision to use blood flow restriction training is made on a patient-by-patient basis. “The anaerobic state that blood flow restriction training puts the muscle into builds up lactic acid and causes a feeling of muscle burn,” Dr. Carr explains. “Some patients have never worked out before and find that feeling uncomfortable, whereas other patients such as athletes like the feeling because it is familiar to them. Blood flow restriction training is gaining a lot of traction, and we plan to continue using it in the future to help to improve patient outcomes and experience.”

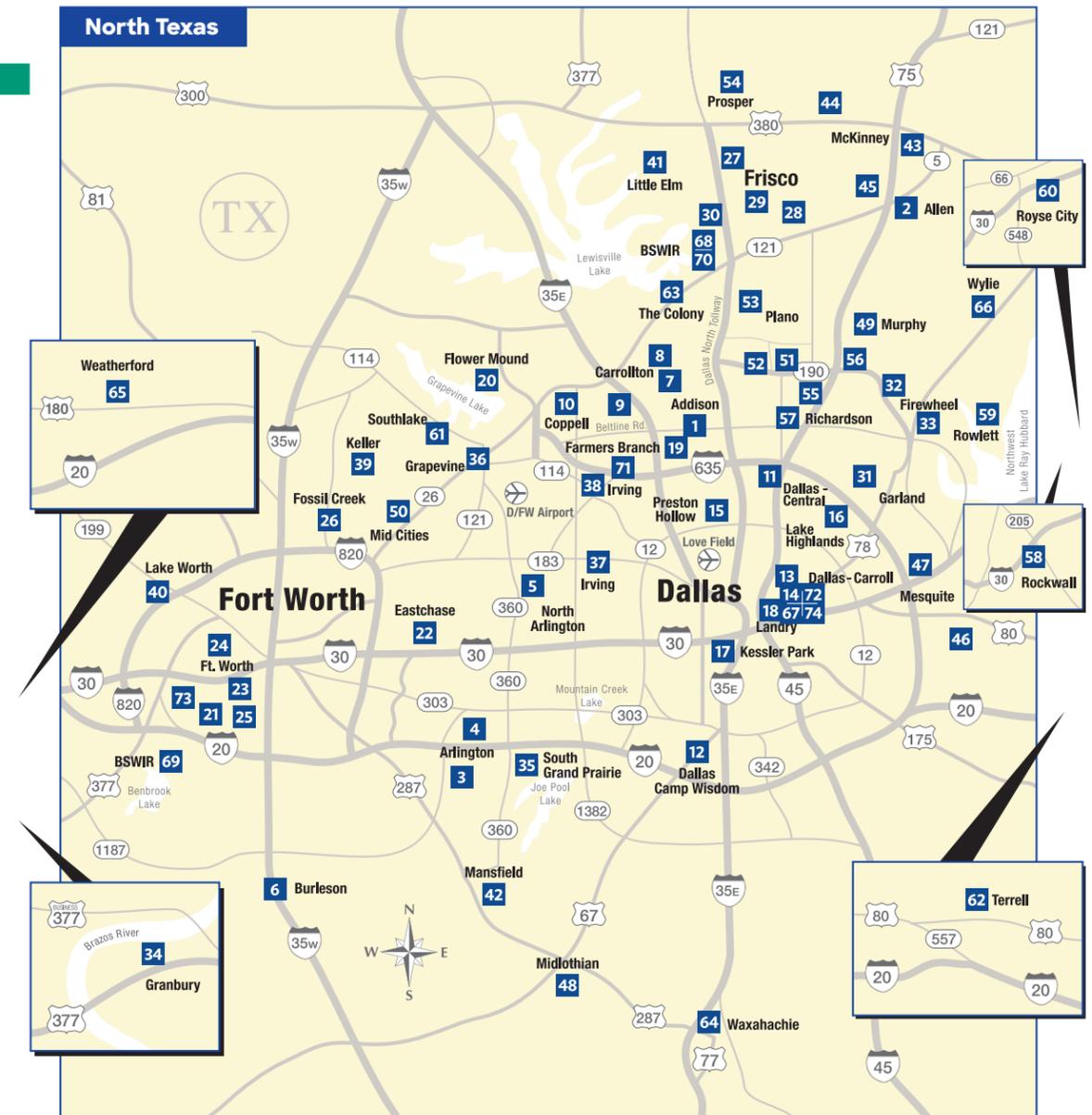
Clinic expansion

In 2019, BSW Rehab Outpatient Therapy continued to expand its presence across North and Central Texas, increasing from 92 to 96 clinics. It is expected that we will have 100 clinic locations throughout the state by mid-2020.

“We are looking to create opportunities to develop clinics wherever new communities are expanding,” says P.J. Gillard, PT, vice president of outpatient therapy. “Our goal is to increase our footprint to deliver high-quality rehabilitation services to as many people and communities as possible.”

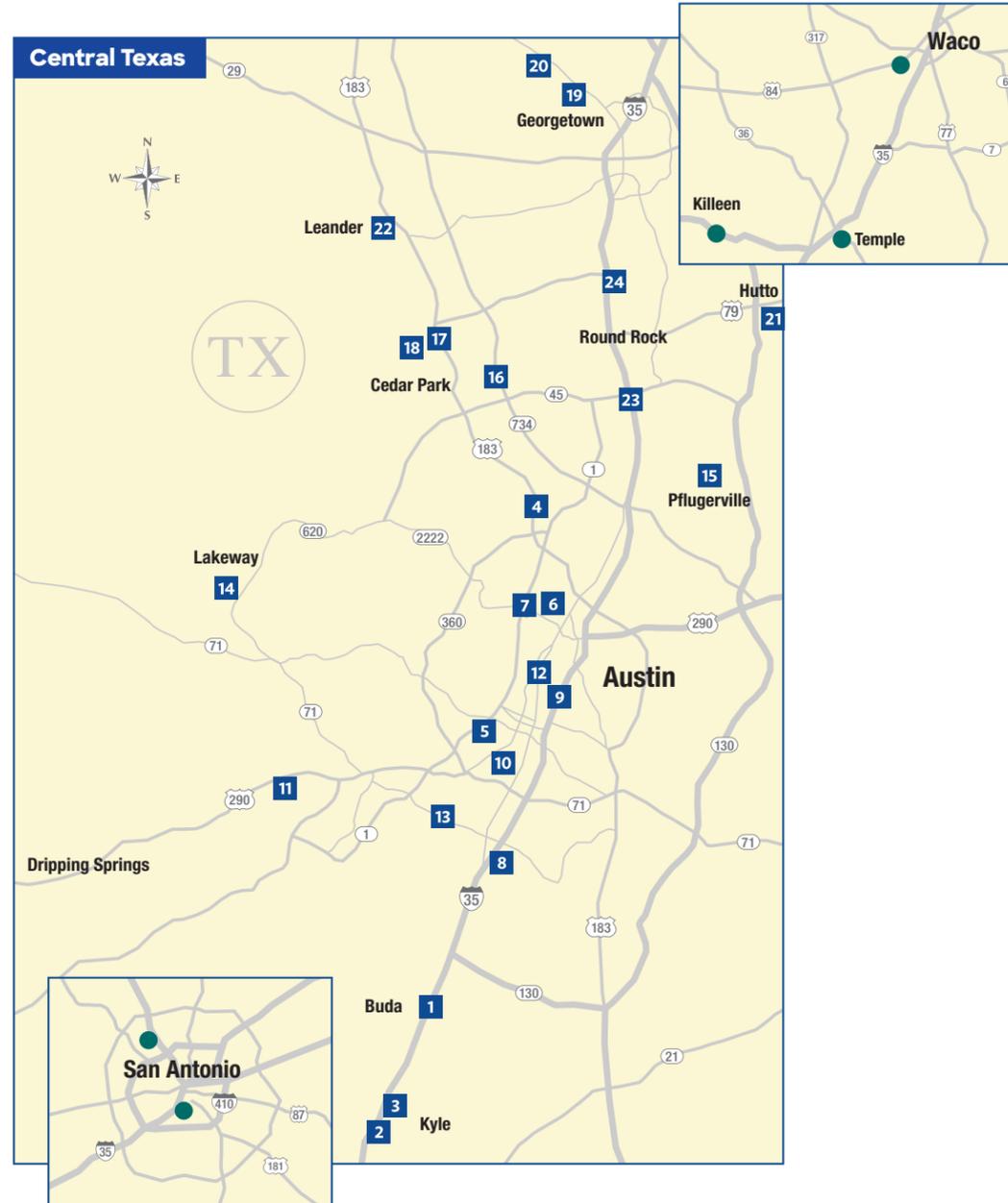
Our expansion began in 2011, when BSW Rehab (then owned by Baylor Health Care System) partnered via a joint venture with Select Medical, one of the leading post-acute service providers in the country, to offer 30 clinic locations in North Texas. In 2013, Baylor Health Care System and Scott & White Healthcare merged into Baylor Scott & White Health, enabling additional clinic growth in the Central Texas market.

In the past year, 21 outpatient clinics were added in the Austin region. According to Gillard, “We start by looking for locations that meet market needs and are easy for people to get to.”



We want to be convenient to where patients live or work, making sure that we are visible and parking is available. “Our goal of delivering patient-centered rehabilitation care is facilitated by strong community relationships. We’ve become more intent on connecting with our communities before we even open our doors. We survey the area to identify strong medical partners and study local demographics to ensure we promote our services to the appropriate populations.”

Gillard adds, “In 2020, we will continue to focus on providing patient-centered care in convenient clinic locations, establishing strong community ties, and expanding our visibility and footprint even further across the North and Central Texas regions.”



Renovations and improvements



Our hospitals in Dallas and Frisco have undergone numerous expansions, renovations and improvements during 2019 to make rehabilitation care more patient-centered.

The Neuro Transitional Center was opened on the Dallas campus with

the goal of improving independence, reducing complications and decreasing hospital readmissions for patients who have an acquired brain injury or spinal cord injury and are not ready to return home. Each patient has their own suite, a kitchen and laundry area in the nine-bed, 7,000-square-foot facility. Patients have the opportunity to engage in intensive occupational, physical and speech therapies by incorporating functional, meaningful activities in a home-like setting while in a community and clinical environment. The Neuro Transitional Center utilizes the Dallas hospital’s large therapy gym, advanced equipment and aquatics center.

“The center enables patients who do not need the daily medical oversight of a hospital but are not ready to live at home to continue their recovery through specialized neuro rehabilitation and medical coordination within the community,” says David Smith, chief executive officer, BSW Rehab – Dallas. “The addition of the center allows patients to take advantage of the full continuum of care that is available through the BSW Rehab infrastructure.”

In addition to opening the Neuro Transitional Center, plans are being finalized for a renovation that will bring neurological outpatient rehabilitation services back into the hospital.

“The renovation will improve alignment and coordination of services, as well as access for patients who need specialized rehabilitation services in the outpatient arena,” adds Smith.

At BSW Rehab – Frisco, ground was broken on a 12,000-square-foot addition to house the outpatient neurological rehabilitation program, as well as the Day Neuro program, a post-acute care rehabilitation program that serves patients with acquired brain injuries who are medically stable but still require intensive therapy. The renovation will help us grow these programs.



“Since the Day Neuro program began in 2015, we’ve seen a drop in readmission rates and a rise in discharge-to-home rates, and we’ve seen patients flourish once they’re back home and at work,” says Ryan Seymour, chief executive officer, BSW Rehab – Frisco. “It is important to provide inpatient, immediate outpatient and then ongoing outpatient care. This allows us to provide a continuity of care that addresses the longitudinal health of patients and their families. If you do the right things for the right reasons, you get the right outcomes.”

Keep Your Move in the Tube®

In the mid-1990s, one of our teams at Baylor Scott & White Heart and Vascular Hospital developed an innovative approach to providing sternal precautions to patients after coronary artery bypass grafting and other procedures that require median sternotomy. These procedures can lead to sternal wound complications, increased mortality and other negative patient outcomes. To prevent these complications, clinicians often order sternal precautions to patients that limit the amount of weight they can lift for a certain period of time following surgery, but these restrictions are usually arbitrary and may impede recovery by limiting physical activity.

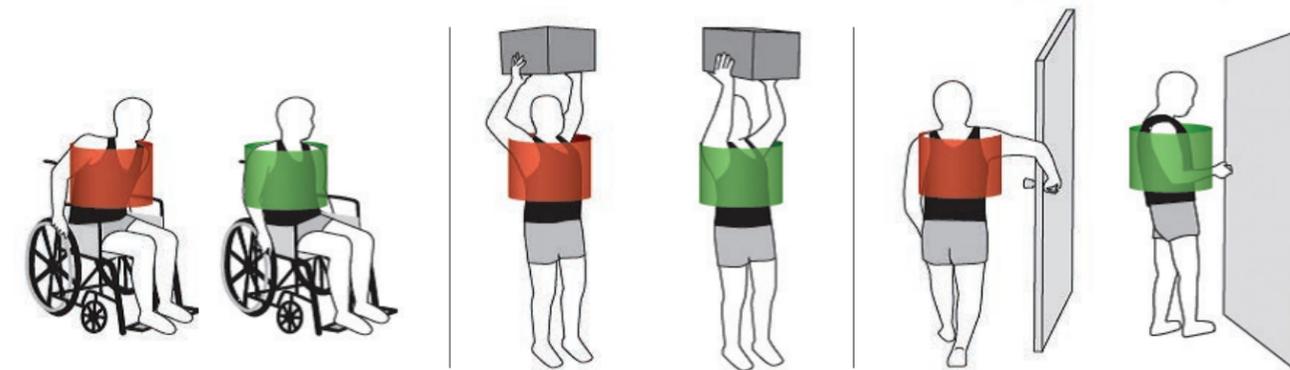
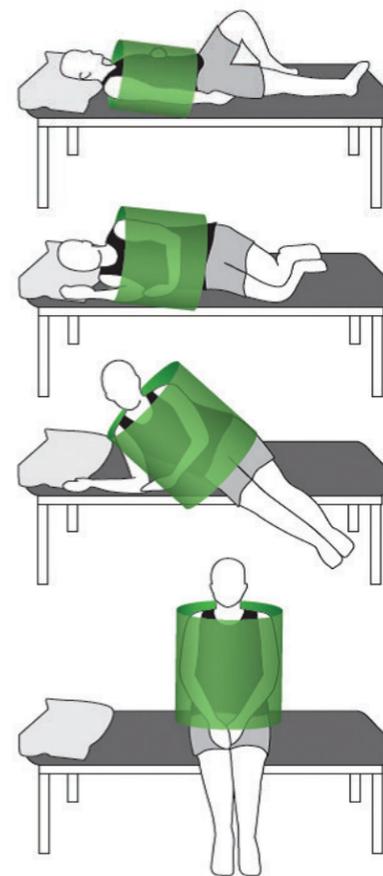
Keep Your Move in the Tube®, the innovative approach developed by our team, shortens the length of the outstretched arm to enable patients to perform previously restricted movements (figure on page 13). By keeping their arms close to their bodies as if they were inside a tube, patients can avoid excessive sternal stress, protect the sternum and continue to move while healing.

Guideline development of Keep Your Move in the Tube began in the 1990s when the team conducted a series of research studies that measured the forces exerted during various activities and their effect on the sternum and discovered that patient variation made it impossible to identify a single ideal load restriction. These studies were published in the *American Journal of Cardiology*, *Journal of Cardiopulmonary Rehabilitation and Prevention*, and *Journal of Thoracic and Cardiovascular Surgery*.

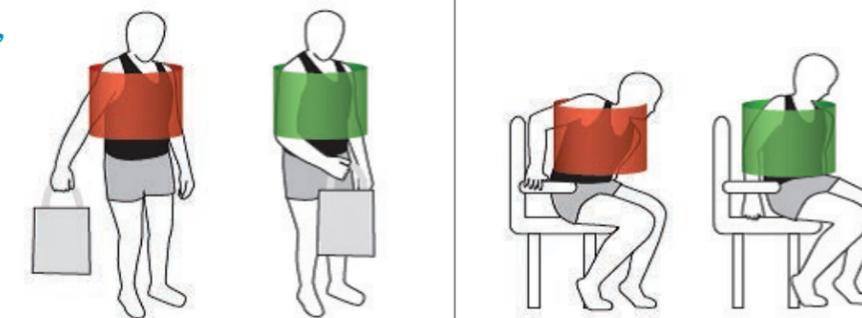
“For decades, precautions were being handed down that were limiting patients, and there was no good reason to have them,” says Jenny Adams, PhD. “They didn’t make sense given the way patients move in day-to-day life. With Keep Your Move in the Tube, wherever patients are in the recovery continuum, they can use the guidelines to help them get them out of bed and be as mobile as possible, so they can become more independent and get back to their life and leisure activities.”

“Keep Your Move in the Tube liberates patients’ extremities to help them with function,” says Ana Lotshaw, PT, PhD, CCS, advanced clinical specialist at BSW Rehab. “It’s not just about movement and ambulation. It relates to activities of daily living, everything from basic skills like dressing and grooming to occupational therapy and getting patients back into the community. It helps caregivers as well as patients. Instead of restricting patients and causing fear, it inspires confidence because it tells them what they can do.”

Part of the reason for the successful adoption and spread of the Keep Your Move in the Tube guidelines is our commitment to multidisciplinary collaboration. “The whole team has to be on board as we’re thinking about how to adopt a more patient-centered model of care,” Dr. Adams says. “Everyone needs to work together, the guidelines need to be explained to new employees, and reminder classes may be helpful. This collaboration helps move us toward our ultimate goal and hope, which is that Keep Your Move in the Tube will become a standard of care everywhere for cardiovascular rehabilitation patients.”



“Keep Your Move in the Tube liberates patients’ extremities to help them with function,” says Ana Lotshaw, PT, PhD, CCS, advanced clinical specialist at BSW Rehab.



Home health



Our goal at BSW Rehab Home Health is to improve the functional status of patients experiencing an array of acute and chronic conditions and to return them to as independent a lifestyle as possible. We provide nursing, physical therapy, occupational therapy, speech therapy, medical social worker and home health aide services for patients residing in Collin, Dallas, Denton, Tarrant and surrounding counties.

“Independence is our goal,” says Nicole Briscoe, LVN,

director of business development for BSW Rehab Home Health. “We want patients to be able to safely continue to the next level of care, whether that’s outpatient or hospice or Day Neuro or another level of care.”

According to the Centers for Medicare and Medicaid Services website Home Health Compare, which compares home health agencies across various quality indicators, BSW Rehab Home Health consistently outperforms both state and national averages in patient outcomes, including

30-day rehospitalization rates; 60-day acute care hospitalization rates; improvements in ambulation, bed transfers and bathing; number of visits per episode; and average length of stay.

“We work hard to continuously improve our rehospitalization rate by educating patients about calling us first to allow us to triage and treat them in the comfort of their home when appropriate,” Ms. Briscoe says. We can arrange for labs, X-rays or electrocardiograms in a patient’s home to help the patient avoid an emergency department visit, and we can also provide intravenous medications at home in the event of an infection or an exacerbation of a disease process.

Our large network of providers and our commitment to the continuum of care help to distinguish us from our many competitors in the region,” Ms. Briscoe says. “We also help patients to take the initiative in their care and be advocates in their health so they can become as independent as possible as soon as possible.”

Rita Hamilton, DO, appointed as chief medical officer



Rita Hamilton, DO

Rita Hamilton, DO, was appointed as chief medical officer of BSW Rehab effective September 1.

Dr. Hamilton has been an integral part of the BSW Rehab family for more than a decade, leading our SCI and PM&R Residency programs, and most recently serving as interim medical director since March 2019.

Additionally, she is actively involved with the Academy of Spinal Cord Injury Professionals, American Spinal Injury Association and the Association of Academic Physiatrists and is frequently tapped to speak at various forums across the country on topics involving spinal cord rehabilitation and graduate medical education.

Dr. Hamilton holds a BS in biological sciences from Southern Arkansas University and a DO from the College of Osteopathic Medicine at Oklahoma State University.

Brain injury research



Weight loss after brain injury

Brain injury researchers at BSW Rehab are working on two federal grants from the National Institute of Disability, Independent Living, and Rehabilitation Research to examine the efficacy of an evidence-based healthy lifestyle intervention called the Diabetes Prevention Program Group Lifestyle Balance (GLB). The study is being completed as part of the North Texas Traumatic Brain Injury (TBI) Model System (90DPTB0013) and a field initiated grant for people after stroke (90IFRE0021). “People are more likely to become overweight or obese after brain injury, increasing their risk for heart disease, diabetes and hypertension. As researchers, it is critical that we investigate ways to tackle obesity and develop a rigorous, scientific, evidence-based intervention,” says Simon Driver, PhD, director of rehabilitation research and project director for both grants. The GLB program is accredited by the Centers for Disease Control and Prevention as a self-management intervention demonstrated to result in weight loss and reduce the risk for Type 2 diabetes through improved physical activity and healthy eating behaviors. The GLB has been used extensively with the general

population, resulting in 5 – 7% weight loss, so Dr. Driver and the research team worked with a group of 25 stakeholders to adapt the program and meet the unique needs of people with TBI and stroke. Stakeholders include people who have experienced a brain injury and their caregivers, physicians, therapists and community partners from organizations like the American Heart Association. “Our stakeholders have been invaluable to the design of our research activities, modification of the program and ongoing efforts,” according to Dr. Driver. “We meet with them quarterly to provide study updates and get their input on next steps.” The study team is currently delivering the program to over 130 people with brain injury to see how participation affects their weight, lipid levels, physical activity behaviors and patient-reported outcomes.

Novel biomarker research to better understand the angiogenic response to weight loss

The team has partnered with the Center of Metabolomics, part of the Institute of Metabolic Disease at BSW Rehab, to explore the angiogenic effect of a healthy lifestyle and weight loss after

brain injury. The work was initiated because models of recovery after brain injury and response to lifestyle change (e.g., increased physical activity; activity and healthy eating behaviors) remain limited by imprecision and present challenges when discriminating to the level of an individual. “Recovery after brain injury begins immediately after acute onset and can continue across the lifespan, with many different levels of biological responses involved,” says Chad Swank, PhD, PT, research scientist and co-investigator. Thus, discovery of the unique biomarkers that respond to lifestyle changes and recovery may provide an enhanced and individualized approach to disease prevention and management. “The cardio-metabolic and angiogenic biomarkers we’re collecting will help us understand the metabolic responses that are occurring in response to the participant’s lifestyle change,” Dr. Swank says. “Data will shed light on the recovery and repair happening after brain injury and complement the functional and patient-reported outcome data.” The investigators are collecting plasma concentrations of “biomarkers” such as irisin, vascular endothelial growth factor, lipoprotein-associated phospholipase A2, insulin-like growth factor 1, and “brain-derived neurotrophic factor.” “We are excited as our data will be the first of its kind examining the response to lifestyle change in people with brain injury,” Dr. Swank says.

North Texas Traumatic Brain Injury Model System

For the past 17 years, BSW Rehab, in a unique collaboration with University of Texas Southwestern Medical Center, has been designated as the North Texas Traumatic Brain Injury Model System (TBIMS). Every five years, NIDILRR competitively funds 16 TBIMS programs nationally, recognizing them as leaders in rehabilitation research and clinical care. “We provide the highest level of comprehensive specialty services from the point of injury through eventual reentry into community life,” says Randi Dubiel, DO, medical director of TBI services at BSW Rehab and co-investigator.

As part of the TBIMS program, investigators complete innovative research for people living in North Texas and collaborate with investigators from the 15 other Model Systems across the United States on national projects. “As a Model System of care, we are expected to complete innovative research that supports the



recovery and lifelong health of our TBI patients,” says Dr. Dubiel. “To achieve this goal, we are systematically completing projects addressing the needs of

our inpatients, outpatients and constituents with TBI living in our community.”

Ongoing local and national Model System projects include:

- Efficacy of an Evidence-Based Healthy Lifestyle Intervention Post TBI
- Problem Solving Training for Care Partners of Adults with TBI
- Physical Activity and Its Relationship with Disabling Secondary Conditions After TBI
- Development and Assessment of Crosswalks in the TBIMS Database
- Characterization and Treatment of Chronic Pain After Moderate to Severe Traumatic Brain Injury

Updates on other TBI funded research



The **Brain Injury Rehabilitation Improving the Transition Experience (BRITE)** project, funded by the Patient-Centered Outcomes Research Institute (PCORI), moved into year three. The project, led by the University of Washington, includes six TBI Model System

sites. The primary aim of the research is to examine if enhancing the transition from the hospital to home after an injury can improve the lives of people with TBI and their families. Patients and caregivers in the intervention group are assigned a case manager to support them for the first six months after injury. Maria Cole, LMSW, MPH, research case manager at BSW Rehab, notes that “helping patients and families adjust to life after TBI has provided a unique opportunity to better serve people as they recover in their communities and connect them with new support systems.” To date, Maria has worked with over 100 patients and families to address barriers associated with concrete needs and navigate their rehabilitation experience.

Marie Dahdah, PhD, (site principal investigator) completed the third and final year of the PCORI funded study, “Comparison of Sleep Apnea Assessment Strategies to Maximize TBI Rehabilitation Participation and Outcome (C-SAS),” which is a collaborative project among the VA and six TBIMS inpatient rehabilitation

centers. “We concluded data collection in January of 2019, and the *Archives of Physical Medicine and Rehabilitation* published our first paper examining the comparative effectiveness of the STOP-BANG, Berlin and MAPI against Level 1 polysomnography, which was one of the main hypotheses of the study,” explains Dr. Dahdah. In total, 896 individuals with moderate to severe TBI were screened, 452 were eligible, and 248 individuals with TBI successfully completed inpatient beside polysomnography across all sites.

The C-SAS team has explored a number of clinical questions to date, including feasibility of completing Level 1 polysomnography (PSG) on a subacute medical rehabilitation unit; the relationship between obstructive sleep apnea diagnosis and biometric data, injury characteristics, and medications prescribed at the time of PSG; coherence between actigraphy and PSG; and the impact of recommended scoring criteria (American Academy of Sleep Medicine vs. Centers for Medicare and Medicaid Services) on diagnosis and access to treatment for this patient population. Some of these findings are being presented at national sleep and rehabilitation conferences. According to Dr. Dahdah, “67% of our sample was diagnosed with sleep apnea. This means that sleep apnea is three times more prevalent in TBI survivors than in the general population. This is why early diagnosis and treatment are essential for TBI survivors with sleep-disordered breathing. We want to reduce known factors that could limit critical neural repair, in order to improve physical and cognitive outcomes.”

Spinal cord injury



Our spinal cord injury (SCI) research program, led by Katherine Froehlich-Grobe, PhD, was highly productive in 2019 as the team completed one funded four-year study and initiated three new funded projects. The work has continued to address improving the health, function, independence and community participation for those living with SCI.

Promoting health and function

People with SCI are at increased risk for cardiometabolic diseases, and much of our current research focuses on promoting lifestyle changes to become more physically active and follow a healthy diet. These programs target teaching participants about the benefits of a healthy lifestyle and having them practice self-management skills.

Our research team completed a NIDILRR-funded study (#90IF0106), known as Workout On Wheels Internet Intervention (WOWii), which investigated the feasibility and effectiveness of delivering a 16-week virtual exercise program to people with SCI. This web-based program is designed to support exercise adoption, increase an individual’s

confidence and decrease any barriers to their participation. The manuscript describing our process for and outcomes of collaborating with individuals with SCI to create the website was published in the *Journal of Medical Internet Research: Rehabilitation and Assistive Technology*. Following pilot testing of the website with a sample of 10 participants, the study team ultimately screened n=388 interested individuals between 2017



– 2019 from across the Dallas-Fort Worth metro area and the nation and enrolled n=168 into the randomized controlled trial (n=87 into the intervention group and n=81 into the waiting-list control group). The middle-aged sample (49.5 + 12.3 years old)



was mostly male (57.0%) and white (77.6%), with some Hispanic representation (7.9%). Most experienced paraplegia (60.0%), were more likely to use a manual (62.4%) rather than power chair (35.2%), and they lived an average of 15.3 + 12.2 years with SCI. Interim study results have been presented at the American Spinal Injury Association, American Congress on Rehabilitative Medicine and the American Public

Health Association. All intervention activities were completed at the end of September 2019, and the study team has been invited to publish their work in a special issue on Spinal Cord Injury and Exercise in the journal *Spinal Cord*.

Dr. Froehlich-Grobe initiated another NIDILRR-funded study (#90IFRE0022) in 2019 investigating the effectiveness of different approaches to help people with SCI lose weight, as current evidence is limited. The study is designed as a series of

four, single-group pretest, post-test studies in which a specific component is tested—one that is supported by evidence from the general population as facilitating weight loss. “Based on results from earlier research in this area, we recognized that people with SCI may face unique barriers to following traditional recommended approaches to promote weight loss, such as complying with daily calorie counts by weighing and measuring their food due to inaccessible kitchen environments and limited finger and hand function or weighing themselves weekly due to the lack of accessible scales for home use,” explains Dr. Froehlich-Grobe. Three approaches will be tested separately and then combined into a multicomponent package to determine whether the package is more effective than the individual components. An advisory board of 10 individuals with SCI plus several rehabilitation professionals is meeting with our team to provide insight and guidance as we test each component and develop the multicomponent package. The first study arm began in September of 2019, with the second arm scheduled to begin in late winter of 2020.



In complementary work, Craig H. Neilsen Foundation funds (#541948) are supporting efforts to investigate the impact that contextual factors have on nutrition and physical activity on weight gain in the first year following spinal cord injury. Physical measures assess participants’ weight, height, hemoglobin A1c, C-reactive protein, pressure and dietary intake on three occasions during this 12-month period to understand how modifiable factors in the environment impact people’s health. To date, n=33 people have enrolled, and many have returned for their six- and 12-month follow-up visits. Our researchers hope the study will provide insights as to what modifiable factors can be addressed to prevent problematic weight gain over their life.

Enhancing independence and community participation

We received one year of funding from the Neilsen Foundation (grant #581754) to expand and enhance our Dana and Christopher Reeve Peer Mentoring program. The funds allowed us to hire five Reeve-trained peer mentors to work four to five hours a day Monday through Friday and maintain mentor relationships with patients for up to six months post-discharge, to purchase tablets to loan to discharging patients who lack internet access at home to connect to our monthly Support Challenge Inspire support group and education classes, and to create educational/informational content to support people with SCI as they transition home. Having peer mentors on-site since spring 2019 provided mentoring to 49 patients before discharge, during 316 sessions (average of 4.5 sessions). The most common topics patients and mentors discussed were activities of daily living (240 sessions), accessibility/mobility barriers (105 sessions) and recreation/leisure (81 sessions). Surveys indicate high satisfaction from patients and clinical staff. Patients rated overall helpfulness as 4.9 out of 5.0 at discharge, and 20/21 providers reported they



“agreed” or “strongly agreed” recommending their patients to the program. According to Dr. Froehlich-Grobe, “The peer mentoring has been so well received that we hope to expand it. First, by obtaining additional funding, we will hire a full-time peer mentor to operate and manage the program. Then, we will more formally incorporate mentors into the patient education programming and explore implementing the program across our continuum of healthcare at BSW Rehab.”

Technology - an expanding role in rehabilitation research



Dramatic advances in technology are being rapidly adopted into clinical rehabilitation practice. To help us safely and effectively integrate this technology into inpatient clinical care, researchers and clinicians have partnered to develop an evidence base. Under the direction of Chad Swank, PT, PhD, research scientist, we have begun to systematically investigate how and when to utilize functional electrical stimulation - cycling ergometry (FES-CE) and robotic exoskeleton gait training (RGT) to maximize rehabilitation potential and promote return of function after a neurologic injury.

Functional electrical stimulation cycle ergometry programming

Despite the established benefits of habitual functional electrical stimulation (FES) use in people with chronic spinal cord injury (SCI), there are no nationally recognized clinical protocols for implementing FES within inpatient rehabilitation settings. However, our clinicians and researchers have implemented a feasible and effective FES program for patients during inpatient rehabilitation. “We know FES use can improve limb function,

decrease spasticity, and reduce the risk of overuse injury in people with SCI over the long-term. But the benefits are unknown during the acute phase of recovery,” says Dr. Swank. “We believe that a similar, if not greater, benefit can be harnessed during inpatient rehabilitation based on the principles of neuroplasticity, the ability of the brain to form new neural pathways.”

FES uses an electrical current to stimulate peripheral motor units to partially innervate paralyzed musculature to perform a functional task. At the right dose, FES has been shown to activate and re-educate the neuromuscular system below the injury level in people with chronic injury. Our team is collecting evidence on the effect of FES-CE programming during inpatient rehabilitation. To support implementation, the team has successfully integrated the patient and family/caregiver into the therapeutic process by encouraging daily FES-CE participation.

“With no clinical practice guidelines or gold-standard program to use as a model, we combined existing scientific evidence with the requirements

of inpatient rehabilitation to create a safe, feasible and therapeutically meaningful program,” shares Christina Fazio, PT, ATP, rehabilitation therapy manager. “Utilization of our FES-CE program increased 264% from 2016 to 2017 after we established the protocol and implemented the staff and patient training.”

The research team is now examining questions specific to the dosage of FES-CE and its impact on functional outcomes for our patients with SCI. “The evidence that we will gather will help us integrate FES-CE into the rehabilitation process at the right time and dose to maximize their recovery. We hope to create a model of use that can be implemented by programs across the country,” notes Dr. Swank.

Robotic exoskeleton gait training



An exciting application of robotic exoskeleton for gait training is using the technology during the acute recovery phase, when recovery is most likely to improve functional outcomes. Our clinical and research team has been evaluating how to integrate robotic exoskeleton technology into clinical practice during inpatient rehabilitation for patients with mobility impairments.

Initial results from the team’s research suggest that integrating an RGT program into clinical practice is feasible, enjoyed by patients and did not increase their risk of injury. Over the past three years, our therapists have worked with nearly 200 patients

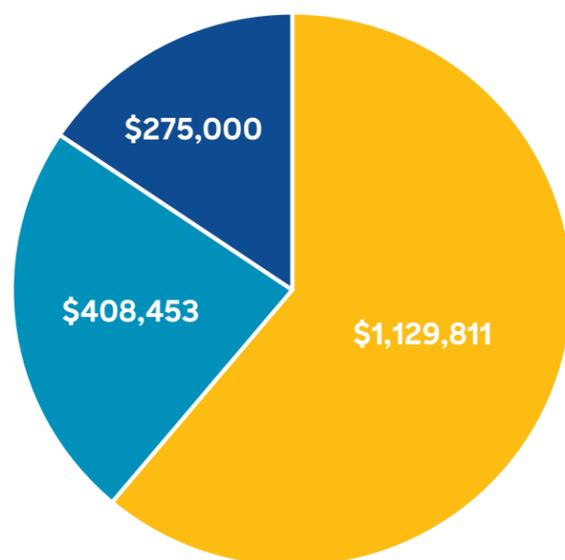
and completed over 700 RGT sessions with benefits noted as including lessened physical burden on therapists and enhanced patient motivation. Molly Trammell, therapy supervisor and lead RGT physical therapist, concluded, “Our therapists’ level of training and clinical knowledge has fostered RGT implementation during inpatient and outpatient rehabilitation, allowing for safe use with on-label and off-label patients.” Dr. Swank echoed, “Use of RGT allowed the therapists to overcome barriers associated with traditional gait therapy and achieve early mobility even when faced with common clinical obstacles of increased muscle tone, incontinence and difficult patient communication.”

Initial data generated by research and clinical team suggests that this technology may offer a better approach for gait training when compared with traditional approaches. While traditional gait training approaches such as body-weight supported treadmill training and over-ground gait training with braces can be burdensome to the therapists, patients who completed five or more RGT sessions spent more time each day in gait training, which resulted in improved mobility. An interesting observation was that our patients with SCI responded differently to RGT sessions than our patients with stroke. “RGT is not a one-size-fits-all approach. Because of unique patient characteristics, use of RGT requires diverse approaches for patients with differing diagnoses during inpatient rehabilitation,” observed Seema Sikka, MD, director of spinal cord injury research and quality.

Our research team is now exploring the difference in RGT ingredients based on clinical diagnosis to maximize the potential for walking recovery of patients with different types of neurologic injury. “We hope to efficiently utilize the brief time in inpatient rehabilitation to maximize outcomes for our patients. And based on our initial findings, we think RGT is helping us do so,” summarized Dr. Swank.

Research fact and figures

BSW Rehab 2019 funding portfolio \$1,863,264



Federal funding
PCORI contracts
External foundation



Five federal grants supported by the National Institute on Disability, Independent Living, and Rehabilitation Research

1. Building an Evidence Base for Weight Loss Strategies among those with Chronic SCI – 2018–2021 – Grant # 90IFRE0022 (PI Grobe)
2. Efficacy of an Evidence-Based Lifestyle Intervention for People Following Stroke – 2018–2021 – Grant # 90IFRE0021 (PI Driver)
3. Project WOWii: Developing and Testing a Web-Based Intervention to Promote Exercise Among Those with Spinal Cord Injury – 2015–2019 – Grant # 90IF0106 (PI Grobe)
4. North Texas Traumatic Brain Injury Model System – 2017–2022 – 90DPTB0013 (PI Driver)
5. Characterization and Treatment of Chronic Pain After Moderate to Severe Traumatic Brain Injury – 2018–2023 – Grant # 90DPTB0017 – (site PI Driver)

Two contracts with the Patient-Centered Outcomes Research Institute

1. Improving Transition from Acute to Post-Acute Care following Traumatic Brain Injury – 2017–2022 – Contract # 1604-35115 (site PI Driver)
2. Comparison of Sleep Apnea Assessment Strategies to Maximize TBI Rehabilitation Participation and Outcome – Contract # CER-1511-33005 – 2016–2019 – (site PI Dahdah)

Two Craig H. Neilsen Foundation grants

1. Impact of Contextual Factors on Nutrition and Weight Gain over 12 Months after Spinal Cord Injury – 2018–2020 – Grant # 541948 (PI Grobe)
2. Enhancing Peer Mentoring to Promote Independence and Community Participation after Rehabilitation – 2018–2019 – (PI Grobe)

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Physician resident research



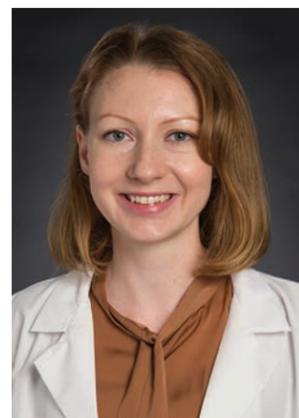
The physician residents continue to be actively engaged in innovative research projects. In 2019, three graduates presented their work at the annual meeting of the American Spinal Injury Association, Association of Academic Physiatrists, American Congress of Rehabilitative Medicine and Baylor University Medical Center Scholarly Day.



Kara Bunting, DO, conducted a research project entitled, “Establishing an Aquatic Therapy Protocol for Patients with AIS-A/B Spinal Cord Injury (SCI).” The aims of the project were to conduct a retrospective chart review to evaluate current practices of physicians and aquatic

therapists in the prescription of aquatic therapy in patients with AIS-A/B SCI and to establish a standard documentation protocol for prospective

patients. She found that patients who received aquatic therapy were typically younger, had longer length of stays and were more likely to be discharged home. Dr. Bunting also helped to establish a standard documentation protocol to track aquatic therapy session data, which includes pain assessment, affect and perceived exertion during therapy activity. She presented this work at the 2019 American Spinal Injury Association annual conference and at Baylor University Medical Center Scholarly Day 2019, where she was awarded “Best Quality Research Poster.” Dr. Bunting completed her residency in the summer of 2019 and is now practicing as a staff PM&R physician at St. Francis Physical Medicine and Rehabilitation in Tulsa, OK.



Cassandra Kaiser, DO, conducted a retrospective research project entitled, “Characteristics and Outcomes of Inpatient Rehabilitation Patients Readmitted to Acute Care.” The aims of the project were to determine common reasons for readmission to acute care from acute inpatient rehabilitation and identify potentially preventable diagnoses among patients who were discharged from BSW Rehab from January 1, 2017, through December 31, 2017. She found the overall readmission

rate was 11.7%, and predictors for readmission to acute care included race/ethnicity, Medicare insurance, days from diagnosis to admission to rehabilitation, case mix index, and comorbidities as measured by the Elixhauser Comorbidity Index. The top diagnoses for readmission were abnormal symptoms and labs, digestive issues, injuries, and circulatory issues. These findings helped to inform focused efforts to provide quality care to

minimize unplanned events. Dr. Kaiser presented this work at the 2019 Association of Academic Physiatrists annual conference and at Baylor University Medical Center Scholarly Day 2019, where she was awarded “Best Quality Research Oral Presentation.” Dr. Kaiser completed her residency in the summer of 2019 and is now practicing as a staff PM&R physician at Emory University School of Medicine in Atlanta, GA.



Sabrina Young, DO, conducted a cross-sectional analysis using baseline data from a research project entitled, “Health Literacy and Functional Outcomes among Patients Undergoing Inpatient Rehabilitation.” The purpose of the project was to describe health literacy levels and associations for patients as they underwent inpatient rehabilitation. Health literacy levels were assessed using an objective outcome measure (FLIGHT/VIDAS) and correlated with a four-question, self-reported health

literacy outcome measure (BRIEF). The two measures were significantly correlated ($p=0.0014$) indicating that the short questionnaire was an adequate assessment tool for health literacy in the inpatient rehabilitation setting. This finding is important, as health literacy affects the ability of patients with chronic disease to manage their care after discharge from inpatient rehabilitation. Dr. Young completed her residency in the summer of 2019 and is now employed as the associate medical director of PM&R at Norman Regional Hospital in Norman, OK.

Community collaborations



We are proud of our many community collaborations and the support we offer to patients and families through our strong community ties.

One example is our relationship with the city of Fort Worth. Starting in March 2018, the city asked us to provide athletic training for tactical athletes such as fire department personnel. Athletic trainers work with department trainees and veterans to deliver injury prevention programs, provide early symptom intervention, and help promote general health and wellness. The success of this collaboration has led to the addition of two athletic trainers, one for the water department and one for the parks department.

Our ability to deliver high-quality care in the community is enhanced by our extensive network of providers throughout the entire care continuum. “We have an online injury report link that allows our trainers to log in and see if any of our trainees need follow-up care,” says Kendall Goldberg, MLA, ATC, LAT, director of athletic training services. “If they do, we can set up appointments with a physical



therapist, physician or another care provider. This infrastructure enables us to provide strong outreach.”



In addition to the city of Fort Worth, we collaborate with other organizations throughout the community, including the Dallas Stars high school hockey league, FedEx at Alliance Airport, the Lake Highlands Girls Classic League, Dallas Cowboys Rhythm & Blue Dancers, and the annual Dallas marathon.

BSW Rehab director of Sports Health, Kendall Goldberg, provides athletic training services to the Dallas Cowboys Cheerleaders.



BSW Rehab has a long history of partnering with RISE, a north Texas organization that provides adaptive sports opportunities to spinal cord injured patients.



BSW Rehab employees annually participate in the North Texas MS150 Bike Ride, which raises money for multiple sclerosis.

Outpatient division wins three Pinnacle of Excellence Awards

Three of our outpatient therapy locations have earned the prestigious Pinnacle of Excellence Award® by Press Ganey for 2019. This award recognizes top-performing healthcare organizations nationwide on the basis of extraordinary achievement and consistently high levels of excellence over three consecutive years in the category of “Patient Experience.”

The three outpatient centers—Addison, Frisco-Main and Little Elm—were announced recently by Press Ganey, a national provider of patient experience measurement, performance analytics and strategic advisory solutions for healthcare organizations. “It’s an incredible honor for our outpatient centers to be recognized for this award in the category of ‘Patient Experience,’” said Fabian Polo, president of BSW Rehab. “The fact that not just one, but three of our outpatient centers won this reward provides affirmation that our patient-focused attention to care is making a difference.”

The Pinnacle of Excellence Award® recognizes top performers in each category based on their performance on designated award survey measures over a three-year award period, from May 2016 - April 2019. Each year, only four awards are handed out in the category of Outpatient Services. This year, our locations won three of the four allocated spots. In addition, only one other healthcare organization—Mayo Clinic—produced as many winners this year as us. “To be recognized by our patients as consistently delivering the highest level of patient experience is the ultimate compliment,” said P.J. Gillard, vice president, BSW Rehab Outpatient Therapy.



Annual Review 2019

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