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PROSTHETIC & ORTHOTIC MAGAZINE

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Patient Profile

Clark Deardorff Making the Most of Life

Lawall Sponsors *First Stride Clinic* for Therapists and Patients

Foreshortened Prostheses Enhanced by Sidekicks™

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Can Therapy Years After An Amputation Help?

After amputation, patients will typically undergo both inpatient and outpatient physical therapy. Once therapy has been completed patients must continue on their own path of recovery and progress. But what if they had some alternatives to help them along? Within the past couple of years, several studies have been conducted looking at the effectiveness of various types of physical therapy years after a patient completes their post amputation therapy.

Phil Stevens, MEd, CPO, FAAOP, recently wrote an article in *The Edge* highlighting three different studies on three different methods of integrating therapy years after a patient's post amputation care. In reality, once therapy is concluded patients often find it difficult to maintain the routine of physical activity and psychological discipline to continue to see gains in their performance.

Wellness clinics are one avenue patients can pursue to help them continue to progress. These clinics are set up to give patients a reason to get out of their homes and receive some light instruction and supervision. Wellness clinics can be beneficial for a wide range of patients. The study highlighted by Stevens was conducted in Georgia with a sample of 16 lower extremity amputees. The participants, aged 22-87, were all community ambulators with well-fitting prostheses.

Participants were measured using the Figure of 8 Walk Test (F8WT), the Activities-specific Balance Confidence (ABC) Scale, and a set of gait parameters measured using a GAIT-Rite walkway. They were separated by the level of their amputation and scheduled to meet for 1 hour twice a week for 6 weeks. The training included elements of stability training, strengthening, balance, dynamic strength and balance, and agility training.

After the 6-week period, improvements were seen in all areas. The average time to complete the F8WT was increased by 17 percent, the balance confidence scores recorded by the ABC scale improved from 63 to 74 out of 100. Self-selected walking speeds also increased 19 percent from 75 cm/s to 89 cm/s. And the reliance on assistive devices decreased 43 percent. Furthermore, a large portion of the participants lost weight, and 63 percent of the transtibial group and 50 percent of the transfemoral group needed a socket change.

Another model highlighted by Stevens was a home-based model. The researchers in this study were concerned over an alarming statistic that the number of amputees dependent on a wheelchair increases over the first 5 years after an amputation from 13 percent to 39 percent. In an effort to see if these trends could be reversed with a structured at-home program, 8 transfemoral amputees were selected for the study.

This treadmill-based exercise program consisted of interval training sessions 3 times a week and progressively increasing walking speeds. Participation was tracked using externally mounted activity monitors to ensure compliance. At the beginning of the study and again during the 4th and 8th week, metabolic energy consumption and gait speed were measured. "The net benefit was a decreased energy expenditure of almost 10%. Similarly, average energy cost, which takes into account distance traveled, decreased by 6 percent through the first 4 weeks, and another 3 percent over the next four weeks for a total decrease of just over 9 percent". (Stevens, 32) Furthermore, self-selected walking speeds increased by 18 percent and maximum walking speed increased an average of 17 percent.

A recall study was also analyzed bringing back prosthetic patients to physical therapy after 3 years had passed since any intervention. This was a small study and therefore some of the results were not statistically significant, but there was improvement demonstrated across the board.

These studies are relevant because they highlight the need for patients to find ways to push themselves to stay active after their therapy has concluded. It is a struggle for all individuals to find what motivates them to stay active and healthy, but individuals who have suffered a traumatic incident, whether it be a stroke or amputation, need to be especially conscious of the need for them to continue to re-evaluate their activity level and take necessary steps to keep moving. Patients should speak with their Lawall practitioner during follow-up appointments and use them as a resource to tap into clinics and other opportunities within the community.

Stevens, Phil. "Take Two" The Edge. *March 2018 pp. 28-33.*

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Patient Profile

Clark Deardorff: Strength to Start Over

It's a possibility most of us can't even begin to imagine: You go to bed feeling unwell, and awaken 2 ½ months later to discover that all four of your limbs have been amputated: that your life as an active husband, parent, coach and neighbor is forever changed.

This is the reality that faced 36-year-old Clark Deardorff of Harleysville, Pennsylvania, when he regained awareness in September 2017 at Lehigh Valley Hospital in Allentown, following an induced coma.

"Things are still a little fuzzy for me," he admits. It is his wife Celeste who has clear memories of rushing him to the hospital on June 16, where he went into cardiac arrest as the result of a Strep A infection—the virulent and aggressive bacteria had found its way into his left shoulder joint, and from there, spread through his body.

A Struggle for Survival

Multiple organs failed as they strove to defeat the infection and he went into septic shock. His blood pressure dropped dangerously low and his heart and lungs were bypassed, their work done by machines as an induced coma allowed Clark to focus on survival and healing for his core organs. His limbs, meanwhile, suffered from the lack of adequate circulation.

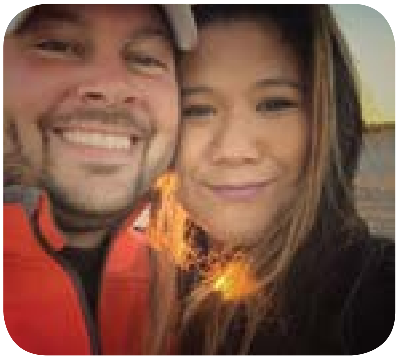
"I was in the ICU for three months," he explained. "My legs were removed 12 days after I was admitted, and the arms about a month after I was admitted."

Celeste, working with doctors and closely involved in her husband's care, was also facing an added responsibility:

"I was 38 weeks pregnant when Clark went into the hospital on June 16; I was due June 30th, so we were two weeks away from having the baby."

Their initial plan to deliver the baby at a hospital closer to their home had to be changed. "The nurses over there were kind enough to transfer me to Lehigh—because at that point we really didn't know if Clark was going to make it or not," said Celeste. "I had to be there to make a lot of the decisions regarding his surgeries."

The baby—a beautiful little girl—arrived on June 28, two days after Clark's legs were amputated. He remained unaware and unable to meet her until two months later.



"The decisions Celeste had to make were very, very difficult," Clark recalled. "They told her if she didn't give them permission to remove my arms, I was going to die––and if they did remove my arms, I would likely die. There was a waiting period, then finally she had to step up and say 'Do it.' As hard as it was for everyone, thinking I would be waking up without arms and legs, she had to do it."

"Clark is very strong-minded," Celeste knew. "I thought that if there were a chance for prosthetics, he would rather live. Now, if the amputations had been higher, with no chance of prosthetics to help him become functional, I think it might have been a different story."

"The amputations alone could have killed me," Clark realizes. "—and they had to leave them open. I had a lot of muscle removed from my back, which was also an open wound for about a month and a half. There was a lot of risk with

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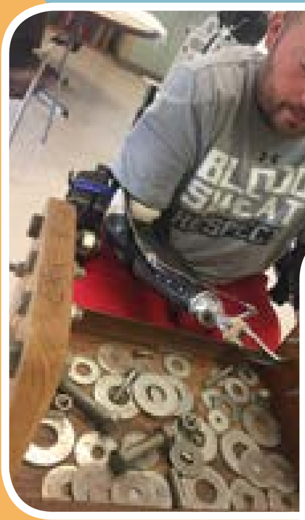
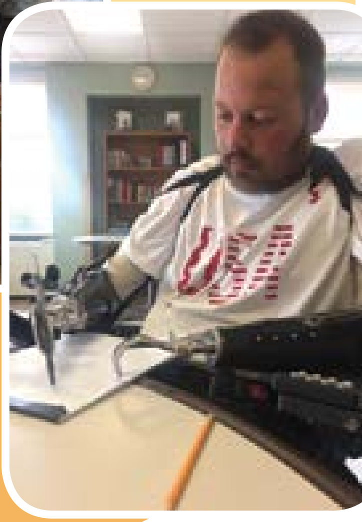
"When I came home from rehab November 10, I couldn't sit up in bed—I still had so much to regain," he marvels. "I look back at pictures of myself in September and see that I've come so far."





> **"He was an inspiration to me—he was not going to let this keep him down. He wanted to do it for his family." *- Jack Lawall***

everything they did."

Weakened by the surgeries, Clark faced myriad additional complications and an uphill battle for survival when he emerged from his coma: he was on kidney dialysis, he had pneumonia, pancreatitis, fevers, a collapsed lung, and more.

He didn't learn that he was out of the woods until early September, when he was told they would discharge him on September 11 and send him to rehab.

The Rehab Challenge

The immensity of the recovery effort that Clark faced is likewise unimaginable. Muscle deteriorates rapidly from disuse; after two and a half months of comatose immobility, he had virtually no muscle.

Clark's therapy team at Moss Rehab at Elkins Park, which included Alba Seda-Morales, PT, DPT; Drew Lerman, OTR/L; and physiatrist Stanley K. Yoo, MD, began his program with basic muscle relearning.

"Even just sitting up took a month," he recalls. "Sleeping on my back every night—I couldn't even move if I had an itch on my face."

After the first month of core muscle rebuilding, his first prosthetic fittings began. "I got one arm to start with, then very quickly Jack *(Jack Lawall, Clark's prosthetist)* made two temporary arms so I could get used to wearing something and building my strength. Prosthetics are actually pretty heavy, because you're not only lifting them, you're lifting them with a smaller part of your leg or arm. The weight is at the end, so it's heavier than it actually feels for you to lift it with your hand," he explained.

In another month, the fitting of his leg sockets began. "They start you with very short leg prosthetics because, again, you have to get muscle strength back in order to stand. I couldn't stand at my original 5'11" height, or I would have just fallen over. With a different center of gravity, you have to relearn everything.

"You start with a straight pole and you walk similar to a penguin, whose knees don't bend. You have to prove that you can walk before insurance even considers getting knees for you. My amputations are both above-the-knee, which are hard to walk with—and even harder when you have two, which is unusual. I just learned recently that I'm the first person that's been through the Moss program that's gotten this far with the knees."

"According to the therapists and Jack," Celeste adds, "Clark is about two years ahead of schedule with his rehabilitation progress."

"That's a credit to my hard work," Clark admits, "but also to my family's hard work, and my therapist's. And nothing is ever held up by the prosthetics moving forward. If I need another two inches to get to the next stage, Jack is there any time we ask him to be available."

Although typically Lawall fits patients at his office, or prepares devices there for a hospitalized patient, in this case he adapted his skills to complete everything at the hospital, recognizing that Clark's nine weeks of in-patient rehab time could not be wasted.

Because Clark's situation as a quadruple amputee is very unusual, he notes that finding solutions is a team effort: "We work together. That's the best thing about Moss and Jack; everything is new for us, and sometimes requires different and creative new approaches. I haven't seen anyone else there who is missing both arms and legs."

He points out a few of the difficulties most lower-limb amputees don't face: "If I had arms, I'd be able to put the legs on, and balance by holding onto railings—it's just a whole different mindset of how you get moving without arms."

Upper-limb difficulties are unique, as well, when both arms are missing below the elbow: "If you lose one arm in an accident, you have your other hand to help or adjust the prosthetic hand. I have hooks right now, and I have a lot of trouble turning the hook into the position that I need, because I don't have another hand to manipulate the hook. That's just one of the many different factors that everyone has been working on.

"Jack tells me to look stuff up—I do, and then we compare notes and we get where we need to go. We've gotten a lot done in a short time, really."

The effort—both mental and physical—for Clark, is huge. According to his therapist, he reports, walking with just one prosthetic leg takes 280% more energy than an able-bodied person uses. Consider that requirement applied to every movement of all four limbs.

"I'm missing a lot of leg muscles—like the calf muscle—that you don't realize that you use. So I'm basically walking with the upper part of my leg—without knees. If I get to the level of walking up steps, I've seen other amputees use their arms to take much of the weight off. I won't be able to do that, so I've got to find a different way or different strength.

"Right now, I'm trying to be independent, but we're not there yet, because I don't have the hands to help me get the leg prosthetics on," he explains.

The worst moment however, was not dealing with pain, or inability to perform a formerly simple task during therapy, said Clark, but upon his arrival home.

"Clark wasn't there for the baby's birth," explains Celeste, "and he was on heavy medication when he first saw her, at two months."

"So it didn't process that I had a daughter until I got home, and that was very hard for me, because she didn't know me," he remembers. "She would be great with Mom and Grandma, but they would give her to me to hold and she would cry. If I couldn't pick her up when she was upset, how was this going to work? That was very hard. But now she knows me and comes down and smiles at me every morning."

His family is all-important—motivating Clark to give the "150%" that enables him to beat the odds and make such astonishing progress in his rehab, according to Lawall. "He has pushed himself to the limits, and that's why he has done so well. Part of my job as prosthetist is to be aware of a patient's mental state, and keep them motivated. I didn't have to do that

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with Clark, because he did it himself. From Day One, he had it, and it came from his heart. He was an inspiration to me—he was not going to let this keep him down. He wanted to do it for his family."

Their nine-year-old son Ares was eight at the time Clark fell ill, and Celeste found that to be perhaps the hardest part for her: "—to see him trying to understand the gravity of all of this. His whole summer was spent in the hospital or at the hotel every single day."

"My wife has done an amazing job," said Clark, "especially explaining to our son everything that was happening. He's in a much better place now that I'm home and is just happy that I'm here. He's very patient and helps me with my prosthetic removal, and putting them on, bringing me water—little things you'd think he wouldn't like to do—but he enjoys it. We had a very close relationship before, but it's even closer now."

Ares even enjoyed the privilege of naming his baby sister. Celeste hoped that Clark would be able to help choose his daughter's name, once he met her, but the hospital needed to complete the documentation within a month and Clark remained unconscious, so Ares made the choice, and selected "Ava" –"I think because it starts with an 'A'," Celeste added with a smile.

Their large extended family has provided both psychological and practical support; Celeste's mother, a retired nurse, stayed at the hotel with Celeste and Ares to lend a hand when Ava was born; their friends and community chipped in to help, as well.

"We're very involved with sports—baseball and basketball, which I also coached when Ares played," said Clark. "They did amazing things for us."

Pride in Today's Achievements

In mid-May, when Clark and Celeste shared their story, it was less than a year since he had first been hospitalized—and only eight months since he had begun rehabilitation therapy.

"When I came home from rehab November 10, I couldn't sit up in bed—I still had so much to regain," he marvels. "I look back at pictures of myself in September and see that I've come so far."

Since then he's regained skills and learned new ones with his prosthetic hands: "I didn't paint before, but I gave it a shot for a fundraising event, and it worked out pretty well! I've always enjoyed neat handwriting, and surprisingly, when I wrote my signature for the first time, it was very, very similar to what it was before. They say that's due to muscle memory, and comes from your brain, not whatever you use to write with."

He goes to therapy three days a week, now—that's what insurance allows. Occupational therapy helps him learn to use his hands and arms for functions like getting into a car, buckling the seat belt, and other daily tasks. Extensive muscle loss in his infected shoulder left scar tissue that his occupational therapist is also stretching to increase his range of motion.

His physical therapy focuses primarily on strength training for his legs, emphasizing technique and walking to help him progress to adding length (and height!) and getting and using new knees.

"Jack puts every effort into ability for me to get where I want to go, because he knows that I want to push it. Even to use the arms is very difficult for people, so they just don't do it. They choose not to walk—because it IS hard.

"If I were 60 years old," Clark speculates, "maybe I'd choose not to go through it all, but I've got so much more to live for with my children, and coaching, that I have to push myself, as hard as it is. The great thing Jack has done is allowed me not to be held up waiting for insurance delays."

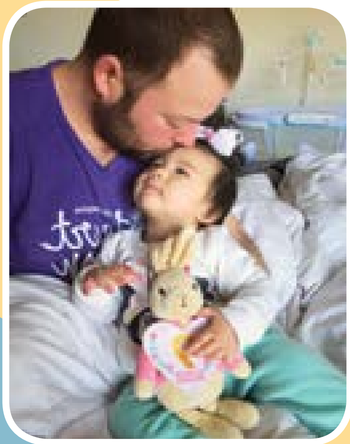
Driven by his spirit and determination, Clark's progress continues on fast-forward:

"We just started the knees this week—no one really knows how long it will take for me to be fully independent with walking, since no one's done it yet," he laughs. "I expect to be able to do everything I did before—to walk, run, drive, coach sports. We've seen people do it on YouTube videos, but most of them have taken at least five years to get those kind of results. I'll find out, I guess."

Lawall expects to complete the final fitting of Clark's definitive prosthetic sockets for his legs—with their new microprocessor knees—by early June.

"He walked in check sockets for about a month," Lawall explains, "so I could make adjustments that will ensure that he walks safely and with less energy. How soon will he be an independent ambulator? That's up to him; I can't put a time limit on him. He's done amazing things during the entire journey."

Currently, Clark uses body-powered prosthetic arms and



hands, and moves his shoulder forward to open or close the hooks that serve as hands.

"We're working with Jack right now to get myoelectric arms, so I won't need all the straps," Clark explains. "I'll be able to trigger muscles in my existing limbs to open and close and rotate the wrist or hand or hook--or whatever specialized attachment I have on."

Lawall confirmed that he, Dr. Yoo, and Ms. Seda-Morales are working as a team in their interaction with the insurance company to help get Clark the prosthetic coverage he deserves. "We're working on it right now—and hoping for quick results."

Hope & Confidence for Tomorrow

The network of family, friends and community that grounds, supports and uplifts Clark on his journey begins with Celeste, whom he first met as a co-worker at Merck Pharmaceuticals, and who is now his most enthusiastic advocate in pursuit of the newest and best technology to help him regain his active lifestyle.

Clark's dad was often present during sessions, challenging the prosthetist "—to make sure his son was being taken care of 100% the right way," Lawall reports. "His father Chip is amazing in every aspect. He's very, very patient, actively participating and helping his son."

Nonetheless, Clark himself is the pioneer in largely uncharted territory—the first person that Moss Rehab has brought this far, about to embark on dual microprocessor knees, aided by myoelectric arms.

So far, everyone he has talked to who has had similar losses, retained their natural knees, and many of them have arms, as well. "I've never seen anyone without arms and legs that walked," he notes.

What has brought him this far, when others have not succeeded? What gives him the confidence to expect to continue his success in reaching future goals?

"I don't really know," Clark reflects. "I never even questioned whether I would really walk again. I just knew when I was in the hospital that I would walk again. I'm not going to get beaten by something that I have control over. Every day I feel very blessed that I have elbows, and I have the opportunity, actually, to perform; because I have seen many that are limited by other health issues and it's beyond their control."

Among his blessings, Clark counts patience and a competitive spirit that has always pushed him to excel at whatever he's done, pushing the limits. "I have a lot of resources; I think things through—and a challenge is rewarding for me. It's really all about the mindset. Where there's a will, there's a way," he believes.

Jack Lawall continues to define it a bit differently: "He's got a great attitude. He's been such an inspiration to other patients that come in; they look at how well he's doing and they learn that anything is possible if it comes from your heart. And Clark has a great heart."

Foreshortened Prostheses (Stubbies) Enhanced by Sidekicks™

Bilateral above knee (BAK) amputees are at a significant disadvantage when it comes to ambulation. Because of the loss of knee function, only the strongest and most determined people with BAK amputations can expect to regain ambulatory control when using conventional bilateral leg prostheses.

Studies show that most BAKs find prosthetic walking to be overtly stressful, physically draining, and for some impracticable, particularly among the elderly and physically unfit, who choose a wheelchair as the preferred mode of transportation, hopeful that this will alleviate all or a portion of these dilemmas.[1]

Foreshortened prostheses (stubbies) are a great solution to get new BAK amputees up because they are more energy efficient and therefore less physically demanding. In fact, stubbies have been shown to decrease the heart rate and oxygen use by 7-23 percent.

For these types of prostheses, the socket is placed directly on top of a rocker bottom type sole or on top of a SACH foot and the foot is turned around to face backwards. This set-up provides an amputee with a lower center of gravity which will lead to better balance.

College Park has developed Sidekicks™, an alternative to the prosthetic feet traditionally used on stubbies. These multi-axial stubbie feet are designed especially for foreshortened prostheses and encourage muscle activity to assist bilateral transfemoral amputees with rehabilitation.

Sidekicks™ are great for:

1. Adjustability. Bumpers can be swapped out and there is a stride control feature that allows the feet to be adjusted as patients progress through rehabilitation.
2. Ankle rotation allows for movement to occur naturally, which reduces socket forces and unwanted torque.
3. Uneven Ground Compliance. They adjust to uneven ground.
4. Molded Tread provides traction and durability.
5. Waterproof. Sidekicks have been tested in the shower and at the beach.

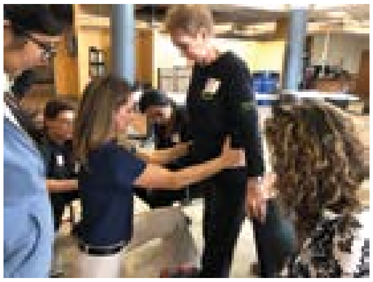
Lawall Sponsors *First Stride Clinic* for Therapists and Patients

On Saturday, April 7th, Harry J. Lawall and Sons sponsored the company's inaugural *First Stride Clinic* provided by the Orthotic and Prosthetic Activities Foundation (OPAF) and led by Sheila Clemens, Ph.D. In conjunction with Moss Rehab, we were able to bring together over 50 therapists, prosthetists and patients from within the Philadelphia area.

It was an informative day beginning with educating the therapists about the need for evidence-based research for proper prosthetic training and prescriptions along with the need for the team approach with the prosthetist to provide the patient with the best available prosthesis.

The event included a hands-on tutorial with the patients and the therapists. Together they worked on strengthening activities as well as balance and gait training. Therapists who don't typically treat a large number of patients with prostheses, were able to become more comfortable with training techniques. In addition, the interaction between the patients themselves was such a positive aspect of the clinic as they encouraged one another to complete the various activities. The patients, ranging in age from teenagers to adults in their 60s, created a great community in such a short period of time.

Despite being geared towards newer prosthetic users, the *First Stride Clinic* provided even longtime prosthetic wearers a few challenges and taught them new techniques to enhance their current walking status.



Lawall is looking forward to partnering with OPAF in the future to offer additional courses to continue educating ourselves and members of our clinical team so we can provide the best quality care to our patients.

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Orlando, FL 32827
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Fax (407) 567-5191

Orlando (Satellite Office)

Nemours Children's Specialty Care
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Orlando, FL 32806
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Lake Mary (Satellite Office)

Nemours Children's Specialty Care
3300 W. Lake Mary Boulevard, Suite 100
Lake Mary, FL 32746
Phone (407) 567-5190

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