

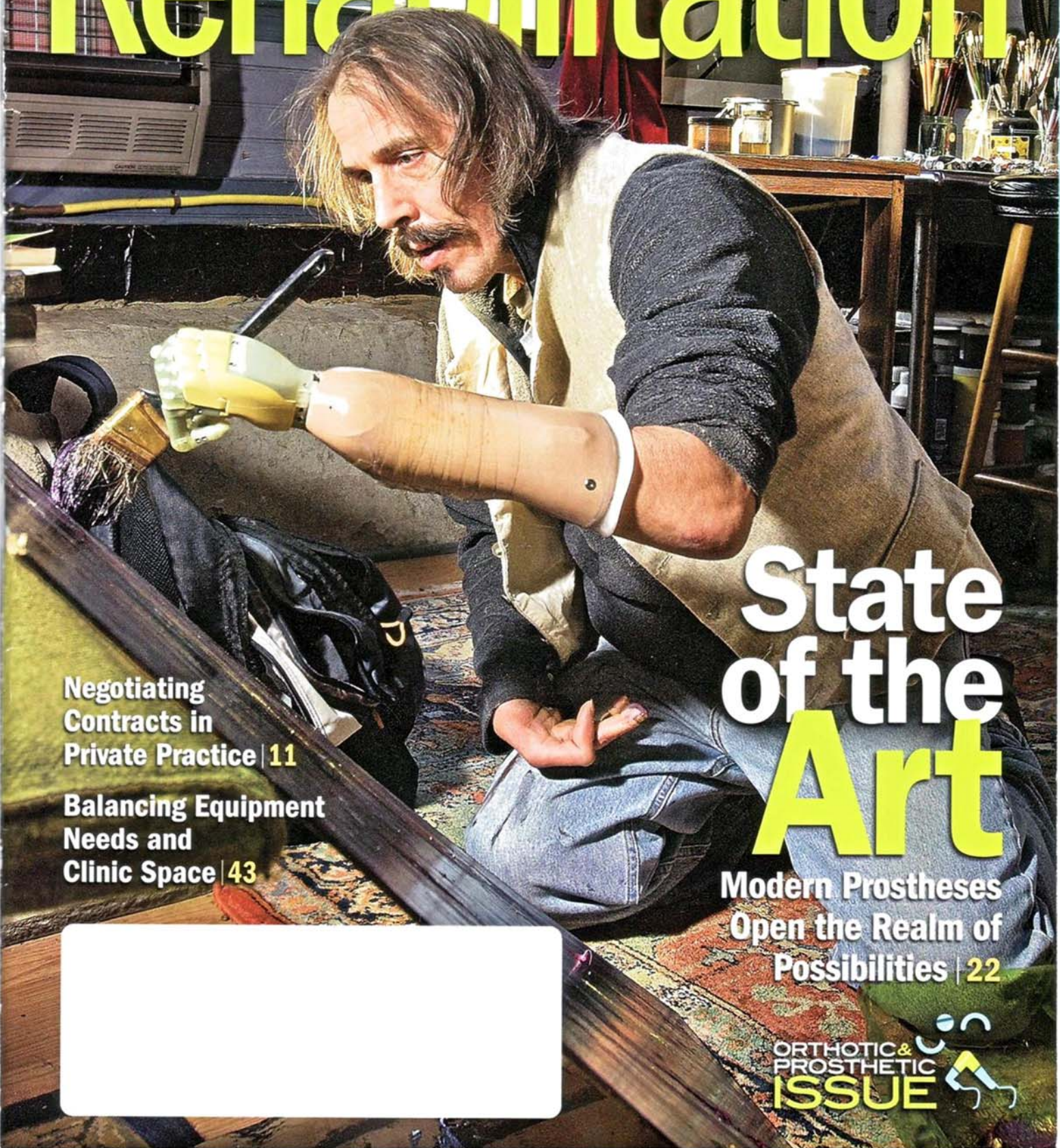
ADVANCE FOR DIRECTORS IN

www.advanceweb.com/rehab

FEBRUARY 2009

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ORTHOTIC &
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STATE OF THE

Comprehensive rehab is vital to people with bilateral upper limb loss.

BY MACJULIAN LANG, CPO, AND KRISTIN GULICK, OTR/L, CHT

SEEING THE SUCCESS STORIES of people with bilateral upper extremity limb loss is moving. And watching them live life to the fullest is even more meaningful.

But due to the relatively small percentage of people affected by bilateral upper extremity limb loss, there are limited resources for comprehensive rehabilitation. However, an interdisciplinary team approach that involves the patient, family, surgeons, physiatrists, therapists, prosthetists, psychologists and social workers is mandatory to return these people to active, satisfying lives. ▶

PHOTOS BY KYLE KIELINSKI

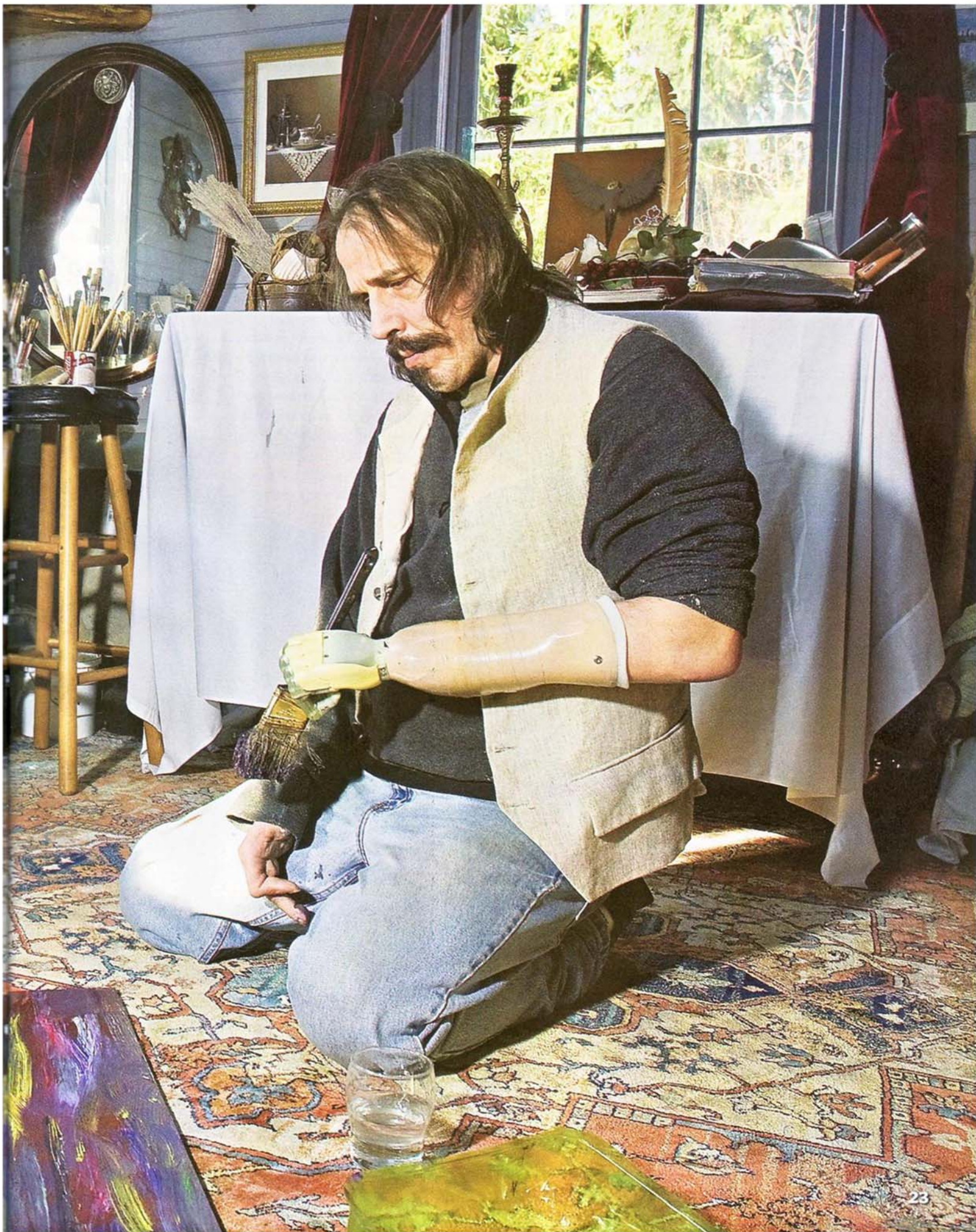
"You have two choices when you lose a limb," says Erminio Bugliana of Chadds Ford, Pa. "You can hide yourself away, or you can be strong and look forward. There's really no in-between."

Bugliana lost his left hand at the wrist, and much of his right hand, in a fireworks accident in 1983. Until November 2008 he got by with conventional prosthetic designs that limited his capabilities and made it difficult to focus on the future.

But with the help of a new myoelectric prosthesis complete with a microprocessor and individually controlled digits, the 53-year-old artist is able to grasp small objects, type numbers, and even paint at the restored 18th century barn and studio of fellow artist William Basciani of Chadds Ford.

"This hand has opened a whole new world for me," Bugliana says. "I never thought I'd see anything like it."





Rehab for bilateral limb loss consists of the following stages.

Medical management. Medical management can begin in various ways, depending on the situation. If a trauma occurs, emergency medical services may be the first to administer aid. But medical management may also start by making an appointment for a child with congenital limb loss.

When planning is possible, it's ideal to begin pre-prosthetic rehab prior to surgery. In unplanned cases, postoperative rehab should follow surgery as soon as it can be medically tolerated by the patient.

Initially, surgeons provide surgical care and pain management. After a patient is discharged from an acute setting and achieves surgical stability, a physiatrist coordinates care and manages ongoing recovery, which may include pain and medication management.

Pre-prosthetic management. To improve outcomes, build a strong physical and psychological foundation for patients as soon as possible. Without support and education, unanswered questions and fear can overwhelm patients and family members. For example, the majority of patients have questions about achieving independence in personal care. Solutions such as remote-operated bidets (foot or bump switch), adapted utensils and grooming tools, and remote controls for electronics offer patients some means of handling a chaotic, uncertain time. Educating the patient and family members about methods and modifications to accomplish activities of daily living (ADLs) also provides hope and reassurance.

Familiarize patients and caregivers about prosthetic options so that a device meets the patient's functional needs and desires. To prepare the residual limb, address edema control, range of motion (ROM), skin desensitization, strengthening, muscle site identification and training for potential use of myoelectric devices, core strengthening, and posture and balance training.

Prosthetic management. Independence is a common goal for people with limb loss. Therefore, the component selection and design of a prosthesis requires careful attention. Make sure the design includes a provision for independent donning, regardless of whether the user chooses to have assistance.

The components of the prosthesis should focus on function and versatility so a patient can use the device in as many positions as possible. Hook-style terminal devices are popular, since they offer superior viewing and finer prehension of handled objects.

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If a patient needs wrist and elbow units, the device should be able to be positioned to improve the functional envelope. It's beneficial for users to be able to actively control wrist flexion and humeral rotation so they don't have to depend on the environment or another prosthesis to position the terminal device.

Training with the prosthesis is essential and should begin immediately after fitting. The combination of a comprehensive pre-prosthetic rehab program, appropriate prosthetic design and componentry, and a well-fitting prosthesis facilitates successful outcomes. Patients who receive pre-prosthetic training should already understand rudimentary operational instructions, which can lead to immediate success with some basic controls.

Training consists of unilateral repetitive activities to develop control;

Portrait of Recovery

Erminio Bugliana never prayed for a new hand. Even in his darkest hours, he only asked God to feel whole again.

Bugliana lost his left hand and most of his right hand in a fireworks accident in 1983. Until last November, he got by with conventional cable-driven prosthetic systems, but struggled with feelings of hopelessness. Now, a new robotic device hailed by *Time* magazine as one of the top health innovations of last year is opening new realms of possibility, and allowing him to focus on the future.

A series of individual sensors and motors in Bugliana's new microprocessor-controlled prosthesis let him operate each digit independently, facilitating fine motor movements, such as grasping small objects, holding a cup of coffee and using an automated bank machine.

But for Bugliana, an artist and longtime friend of Andrew Wyeth—the iconic American painter who passed away in January—this new device isn't about the mechanical act of creating art. It isn't about demonstrating the amazing technical feats he's now able to perform.

It's about feeling emotionally complete.

"So many amputees withdraw," says Bugliana. "They're given a prosthetic that they either don't like or can't use, and are given minimal counseling and training. There's a lot of depression and substance abuse in the amputee community." The 52-year-old resident of Chadds Ford, Pa., now speaks to veterans and other people with an amputation about the device and the potential it holds.

"You're looking at the future of the industry," says Jared Howell, CP, manager of the Exton, Pa., office of Ability Prosthetics & Orthotics, who fitted Bugliana with the device. After an initial evaluation to encapsulate the shape of Bugliana's limb, Howell fabricated a prosthetic fitting for Bugliana that incorporated the robotic hand and microprocessor components provided by a Scottish manufacturer.

EMG tests by a myotester allowed Howell to identify areas where sensors could be placed within the prosthetic to receive muscle signals and respond. By flexing certain muscles in his forearm, Bugliana can initiate specific finger and hand movements.

With time and practice, Bugliana has fine-tuned his mind-body connection to the point that many movements become automatic. "You stick this hand out to grab something, and it seems like it opens itself," he says. When he talks about it, he can almost feel a degree of sensation returning to the limb.

"Erminio was a good candidate for this device," Howell says. "There was a lot of time between his injury and being fitted for the prosthetic, so he had good command over isolating his muscles and using them in sequence." Howell expects future developments will make the technology accessible to a wider group of people with an amputation, especially combat-wounded veterans.

"This is a hand you can put out there and be proud of," says Bugliana, whose prosthesis will soon be outfitted with a life-like skin covering for a natural look. "I can't wait to see what they come up with next."

Jonathan Bassett is managing editor of *ADVANCE*.



bilateral tasks to develop skill and knowledge of pre-positioning for ideal proximal posture; tasks that require prosthetic use at different heights; and prehension of items with different densities to continue control

development. Introduce client-centered ADLs as soon as possible to transfer clinic skills into the home environment. And continue to evaluate the patient's home environment and how he interacts in it to address and solve problems. Constant communication between a prosthetist and therapist enables uninterrupted training as the patient's limb shape and volume change, and his control develops.

Community re-integration. During clinic training, set up activities that the patient will perform in the community. Examples include simulated shopping, cooking, laundering, child care, cleaning and yard work.

Recreating these activities in the clinic ensures that potential challenges in the home and community are resolved

before the patient is expected to perform the task independently. Developing confidence in a supportive environment can alleviate trepidation as the client transitions prosthetic skills into public settings.

Although task analysis in the clinic is critical, it doesn't replace a home/work assessment and practicing in those actual environments. Vocational rehab counselors or case managers can facilitate this transition and provide solutions for different jobs.

Psychosocial support. Regardless of how a person loses a limb—traumatic amputation, disease process or congenital absence—support from loved ones and medical professionals must be ongoing. Assistance can come in many forms and may include emotional and psychological support, help performing ADLs or financial aid.

Peer support can be among the most helpful and important aspects of rehab, but finding someone with similar challenges may be difficult, considering the limited patient population. Make efforts to locate a trained peer for scheduled visits.

The ultimate goal of rehab for a person with limb loss is to lead a full and significant life. For many people, this means a return to independence and previous activities. But remember that patients have different needs and desires.

Reclaiming one's life after limb loss isn't easy. Successful outcomes start and end with the efforts of the patient, his support system and an interdisciplinary team of professionals. ■

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