

## GUEST EDITORIAL

### Limb loss prevention and prosthetic engineering

During violent conflict, injuries may be sustained to the limbs that are life threatening as well as limb threatening. Initial focus is on life-saving interventions. Fifty-five years ago, before World War II, just keeping the patient alive was considered a very successful outcome. Little attention was focused on the function of patients with limb loss. The large number of Veterans returning from World War II precipitated and evaluation of other outcomes—functional and quality-of-life issues, for example. Dr. Ernest Burgess (see <http://www.vard.org/jour/00/37/6/memor376.htm> or JRR&D Volume 36 number 6 and a special tribute in this volume) spearheaded efforts in the VA by initiating the STAMP (Special Team for Amputation, Mobility and Prosthetics) program, now known as PACT (Preservation Amputation Care Team). The PACT includes orthopedic and vascular surgeons, rehabilitation specialists, and Nurse specialists.

When I arrived at the University of Washington in 1986, I was asked to attend the STAMP service with Dr. Burgess. Prior to working with Dr. Burgess, all the amputations I had seen were done by the least experienced surgeon or anyone with available Operating Room time. Dr. Burgess showed great respect for the soft tissues of the limb because he considered amputation to be a reconstructive operation for recovering function, not a failure of care. The reconstructed limb must be prepared for its new role as an interface between person and prosthesis. This attitude still pervades the PACT service and the Veterans Affairs Medical Centers (VAMC). We as a country, and the VAMC in particular, are committed not just to survival of amputees but to restoration of fullest possible function. While the VAMC once cared for healthy young men with devastating injuries sustained in battle, the current focus is on diseases of aging individuals with lesser capacity to adapt. Most of the amputations performed in the VAMC are now a result of atherosclerosis and diabetes. Between 1989 and 1998,



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37,923 amputations were performed in the VA for treatment of complications of diabetes, 14,256 were performed because of atherosclerotic vascular disease, and only 869 (0.02 percent) due to trauma (1).

This quest for optimizing function requires that we understand what the foot and ankle do both in high-functioning and low-functioning individuals and how that function can be replaced in a prosthetic limb. It requires that we understand how deformity and neuropathy contribute to dysfunction and how dysfunction contributes to limb loss. It requires that we know the role and success rates of salvage procedures such as vascular bypass, joint replacement, correction of deformity, and muscle

balancing through tendon release and transfers. It requires that we understand the special principles of healing in the ischemic and diabetic limb, such as Immediate Post Operative Prosthetic (IPOP) fitting and early functional rehabilitation. It requires that we understand the functional and recreational activities of amputees and the prosthetic designs that are most effective. It requires that we understand secondary disabilities such as shoulder pain in the wheelchair ambulator or back pain in the transfemoral amputee. Finally, it requires that we study the most cost-effective means of getting the right prosthetic limb to the right Veteran. These questions cross many cognitive fields, from epidemiology to vascular and orthopedic surgery to rehabilitation medicine and outcomes measurement.

Because the intact limb is often the most functional limb, this special-focus issue of the Journal begins with strategies for prevention of limb loss. It also includes a survey of current VA practice for postoperative management of transtibial amputees, as well as properties of prosthetic limbs. It includes a survey of amputees' recreational activities, and finally, it provides a review of the role of technology in manufacturing and fitting the limb.

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#### REFERENCE

1. Mayfield JA, Reba GE, Maenad C, Czerniecki JM, Caps MT, Sangeorzan BJ. Trends in lower limb amputation in the Veterans Health Administration, 1989–1998. *J Rehabil Res Dev* 2000(Jan–Feb);37(1):23–30.