

Rehabilitation

SPECIAL ISSUE: VIOLENCE AND REHABILITATION

The incidence and impact of violence-related spinal cord injuries

BY STEVEN KIRSHBLUM, M.D.

SPINAL CORD INJURIES (SCIs)

have always been associated with unintentional and intentional events, including motor vehicle crashes (MVC), falls and self-harm. However, those that are acquired through acts of violence such as firearm injuries or interpersonal assault are also a significant public health concern. For instance, gunshot wounds, which are largely preventable and incur significant health care and legal costs, account for 14 to 18 percent of acute traumatic SCI in individuals aged 16 to 24 years.¹

Epidemiological studies on the incidence and prevalence of traumatic SCI assist in making projections about resource utilization and allocations, and help to better characterize the population. These findings, in turn, provide us with greater insight into patients' specific rehabilitation needs.

PARSING THE NUMBERS

As noted, the most common causes of traumatic SCI are MVC and falls, with violence—particularly from gunshot wounds—a less frequent source. However violence, particularly when related to firearms, remains in most reports the third-leading contributor to traumatic SCI, including in epidemiological data from the National Model SCI Systems (see Sidebar "Averting Future Injuries").



While there are varying reliable sources of U.S. data to consider, commonly reported trends include the following:

- The highest percentage of gunshot-inflicted SCI is among persons in the 18-to-30 age group, followed by the 31-to-45 group.²
- There was an increase in the percentage of violence-related SCI among all people from 1980 to the early 1990s, from 13.3 to 28.9

percent, in Model SCI Systems data. Since then, though, there has been a steady and significant decline in SCI due to violence.

- From 2010–2015, the reported proportion of SCI attributed to violence is 13.6 percent—essentially identical to what it was three-plus decades ago.
- Other recent data have shown that

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firearm-related SCI prevalence may be lower than 10 percent, but the overall age-related patterns of those involved remain similar, with younger individuals affected more than older age groups.

Data on rates of violently acquired SCI provide valuable information about the demographics and health care needs of this population. Violence-related SCI is seen in significantly higher rates in males than females; appears to be more common and a leading cause of SCI for African-Americans; and is also more typically seen in Hispanic than in Caucasian populations.

Model SCI Systems data are reported from the program's specific centers in different regions of the U.S. and have significantly varying percentages of firearm-related SCI. For example, violent SCI is more common in the Model System Centers in California and Alabama than in Missouri, Massachusetts and Colorado. These trends may represent in part discrepancies due to the locations of the Model Systems, changes at the centers over time, referral patterns to the Model Systems, overall incidence rates of SCI, and other factors.

BEYOND THE CLINIC

Medical management and rehabilitation for violence-related SCI can differ somewhat from nonviolently acquired injuries and often entails extensive discharge support and coordination of community-based services. Patients frequently first present to the emergency department, where stabilization is the priority. Associated injuries from gunshot wounds or assault can prolong hospitalization and delay rehabilitation until acute medical issues can be resolved. They also are more likely to lead to neurologically complete injuries, as opposed to SCI from falls, which more often lead to a neurologically incomplete injury. Further, rehabilitation is informed by the type of paralysis sustained. Violence-related spinal cord damage is more typically associated with paraplegia; falls and MVC are more likely to lead to tetraplegia.

Alcohol and illicit drug use frequently precipitate traumatic SCI and need to be addressed as a part of the care plan. Similarly, persons with violently acquired SCI have demonstrated higher rates of post-traumatic stress disorder than in cases related to MVC. Psychological treatment must be integral. Depression, anxiety, anger and other emotional or behavioral issues can impede progress and are associated with negative functional outcomes, such as poor physical health and unemployment.

The often high degree of functional impairment and economic burdens on patients who sustain SCIs from firearms highlights the need for interdisciplinary care from not just rehabilitation physicians but also psychologists, physical and occupational therapists, and social workers. Violence in general

is associated with ongoing mental health concerns, including substance use disorders; lower levels of education; reduced employment and income; and poor social support. Patients with gun-related SCI may live in under-resourced communities that are not conducive to optimal physical and emotional health, particularly if crime is highly prevalent. Such individuals may experience increased stress and fear about safely transitioning to home.

An individual's ability to access outpatient rehabilitation may be hampered by a lack of practical and financial resources, like safe and reliable transportation or family support. Similarly, purchasing—and thus benefiting from—assistive devices or home-based attendant care would likely be limited. Rehabilitation professionals need to be aware of these environmental constraints and accordingly adjust their recommendations about outpatient treatment, vocational needs and daily functioning.

Although violence-related SCI does not represent the majority of spinal cord populations, the complexity of medical, emotional and environmental needs in these cases nonetheless warrants specific attention. Comprehensive treatment from a highly integrated rehabilitation team can help effectively coordinate short- and long-term care and provide patients with the opportunity to thrive outside the hospital setting to the highest degree possible.

¹ Jain NB, Ayers GD, Peterson EN, Harris MB, Morse L, O'Connor KC, Garshick E. Traumatic spinal cord injury in the United States, 1993–2012. *JAMA*. 2015 Jun 9;313(22):2236–43.

² Selvarajah S, Hammond ER, Haider AH, Abularrage CJ, Becker D, Dhiman N, Hyder O, Gupta D, Black JH 3rd, Schneider EB. The burden of acute traumatic spinal cord injury among adults in the United States: an update. *J Neurotrauma*. 2014 Feb 1;31(3):228–38.

³ The University of Alabama at Birmingham UAB Department of Physical Medicine and Rehabilitation. NSCISC National Spinal Cord Injury Statistical Center. Available at: <https://www.nscisc.uab.edu/>. Accessed July 20, 2016.

AVERTING FUTURE INJURIES

Approximately 73,000 nonfatal gun-related injuries occurred in 2013, according to the Centers for Disease Control and Prevention. The ThinkFirst National



LEARN MORE

Get more facts and figures from the country's largest spinal cord injury research database, the National Spinal Cord Injury Statistical Center, at <https://www.nscisc.uab.edu.3>



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Injury Prevention Foundation (thinkfirst.org) is dedicated to helping reverse these and similar statistics by increasing public awareness about how to prevent spinal cord and traumatic brain injuries, including those related to gunshot injuries. The foundation, with chapters across the country, also works closely with health care professionals to develop community- and school-based injury prevention education programs. Dr. Kirshblum is director of the New Jersey chapter, and Kessler's Dr. Bruce Gans is a member of the national board.

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Time to stop the madness

REFRAMING VIOLENCE AS A PUBLIC HEALTH ISSUE

Violence seems to be everywhere these days, with horrendous acts front and center in the news and on social media. It is also a leading cause of traumatic brain injuries (TBI) and spinal cord injuries (SCI) in the patients who continue to fill our beds. One study of 1,229 patients who received inpatient rehabilitation care for TBI found that 26 percent had sustained a violent brain injury.¹ The numbers are similar for spinal cord injuries, with violent acts, primarily gunshot wounds, the third-leading cause of these.²

This makes violence an integral issue within the rehabilitation hospital community.

When I ran an inpatient rehabilitation hospital in Michigan in the 1980s, I told people that on any given day I had more patients with gunshot-related spinal cord injuries in my facility than the entire country of Canada experienced each year.

This public health crisis does not begin and end with guns. It extends to interpersonal and domestic violence, and even war. Ironically, these events, particularly wars, help advance our field. Just consider the improvements in prosthetics management after the Vietnam War, and the focus on TBI care given the unacceptably high numbers of veterans who have returned from the conflicts in Iraq and Afghanistan with these injuries.

We have a social responsibility to bring a medical and public health perspective to this issue, to add a voice of respected reason to the debate. We must take on the issue as our problem, one we can no longer ignore even as it fills our beds.

There is precedent for such attempts. Just consider motor vehicle-related injuries. Once the public health community joined with civil engineers and highway safety experts to reframe the problem as a health issue, real change began. To start, the Centers for Disease Control and Prevention created the Injury Control Research Centers, focused on prevention and rehabilitation. Community organizations like Mothers Against Drunk Driving and the ThinkFirst National Injury Prevention Foundation, which help people learn to reduce their risk for injury, sprang up.

In addition, there have been dramatic improvements in vehicular safety (air bags, antilock brakes, backup cameras), as well as an emphasis on behavioral changes to reduce vehicular injuries (seat belt use and strict penalties for distracted driving or drunk driving).

Now is the time to bring such public health approaches to the issue of violence-related injuries.

The reality is that as long as we allow this issue to be someone else's problem, nothing will change. But if we try to make it our problem, maybe some good will come of it.

¹ Hanks RA, Wood DL, Millis S, et al. Violent traumatic brain injury: occurrence, patient characteristics, and risk factors from the Traumatic Brain Injury Model Systems project. *Arch Phys Med Rehabil.* 2003;84(2):249-54.

² NSCISC National Spinal Cord Injury Statistical Center. Facts and Figures at a Glance. Available at: <https://www.nscisc.uab.edu/Public/Facts%202016.pdf>. Accessed July 20, 2016.

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Population health and the psychological toll of violence

BY MONIQUE J. TREMAINE, PH.D.



THE WORLD HEALTH ORGANIZATION has declared violence a global public health concern in dire need of increased research, prevention efforts and cost-effective interventions. Individuals who experience or witness violent acts are frequently left with unmet or poorly treated medical and mental health needs that are subsequently associated with impaired functional, social and economic outcomes. Such consequences impact victims, perpetrators and society as a whole.

Widespread, near-daily media coverage of public violent acts has created a perception that criminal behavior is highly pervasive in this country. While statistics suggest that being a victim of violence is an anomaly rather than the norm, there is no confusing the seriousness of the effects and the corresponding need to ensure access to and provision of evidence-based psychological care, both within and outside the rehabilitation setting.

DOMINO EFFECTS

Exposure to violence is associated with an increased risk of several psychiatric conditions, such as major depressive and substance use disorders. Among the costly and more burdensome psychological consequences is post-traumatic stress disorder (PTSD) for those who have experienced or witnessed a violent event. On an individual level, mental disorders, and PTSD in particular, are correlated with a greater probability of onerous health issues involving illicit drugs, alcohol and tobacco; suicide; and chronic conditions. Social issues linked to PTSD include poor work performance, financial stress, an increased risk for assault of an intimate partner and weak academic achievement.

The ripple effects of these individual-level outcomes extend to society at large. Poor academic and job performance strains the national workforce and may lead to reduced profit and loss of labor productivity. Exposure to violence also negatively affects one's ability to sustain employment. In one study, after experiencing a violent incident, low-income women who worked 40 hours per week had only one-fifth the odds of maintaining full-time employment status for six or more months compared with women who did not experience violent acts.¹

Persons with PTSD often exhibit a complex constellation of physical and other psychological disorders. The presence of chronic conditions like diabetes, hypertension, stroke, heart disease and cancer is concordant with greater utilization of hospital resources and expenditures. Increased rates of populations collecting unemployment disability due to physical or psychological impairments also leads to higher health care costs. Finally, there is a circular element to trauma in which violence begets more violence; that is, victims have an increased risk of being aggressive themselves, resulting in higher rates of domestic abuse, child maltreatment and similar incidents.

TREAT EARLY AND APPROPRIATELY

As with all mental health disorders, delayed treatment of PTSD and other violence-related stress reactions only exacerbates the likelihood of further negative outcomes for the individual and for our population. Roughly 25 percent of people who have experienced a violent crime will develop acute stress disorder (ASD)—a precondition for full-blown PTSD. For individuals traumatized by violence that is life-



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threatening, and for those who sustain physical harm such as a spinal cord injury related to firearms, rates of developing ASD double to nearly 50 percent. Without appropriate mental health treatment, 80 percent of people diagnosed with ASD will develop chronic PTSD. Effective intervention can reduce the conversion rate to as low as 20 percent.

The dire need for early and appropriate psychological intervention is equally relevant to the rehabilitation setting as it is to the general community. Patients with physical or neurological disabilities who feel depressed or avoidant—common emotional components of PTSD—are less productive in therapy and not as motivated to follow their treatment plan. Hypervigilance, also a key feature of PTSD, may predispose some persons to paranoid thinking and aggressive behavior, which can impede recovery. And recent research has linked the disorder to an increased incidence of chronic pain, a known potential obstacle to successful rehabilitation.

Unfortunately, many rehabilitation facilities cannot employ full-time psychologists because of low rates of reimbursement, and instead must rely on consultant models or community referrals. While this is certainly better than offering no help whatsoever, it remains that PTSD is a multifaceted, potentially lifelong and debilitating disorder that requires evidence-based treatment from a doctoral-level provider with specialized training in the disorder and in working with trauma populations. At Kessler Institute for Rehabilitation, we are fortunate to have psychologists and neuropsychologists on staff to identify at-risk patients and provide a complete range of trauma-related inpatient and outpatient care, allowing individuals to more quickly and effectively engage in rehabilitation while moving toward recovery from trauma.

Short-term coping strategies for managing patients with acute trauma include teaching cognitive restructuring techniques to reframe the event and the person's reaction to it in a manner that is more adaptive and empowering, and replacing the mindset that causes them to feel shame, powerless and prone to self-blame. Both short- and long-term interventions should be provided by a psychologist or psychiatrist who has a significant degree of education, training and experience in PTSD and with trauma populations. While a number of so-called "PTSD therapies" are available, it is essential that only evidence-based treatments utilizing well-designed, robust, longitudinal methodologies are employed. At Kessler, these include exposure and response prevention therapy, cognitive restructuring, systematic desensitization, and relaxation and anxiety management techniques.

QUESTIONS MOVING FORWARD

Public dialogue addressing the impact of violence must walk a fine line to avoid exaggerating the extent to which these events pervade our society, which can unintentionally create a culture of fear and suspicion (see "What the Stats Say"). Questions about how to manage the after-effects of violence logically lead to broader discussions about increasing mental health care access. Greater numbers of people in this country with low incomes and a lack of resources do not have the privilege of readily accessible and affordable medical and mental health care that more resourced persons have come to expect. Unsustainable reimbursement rates for psychological care exacerbate the problem; 22 cents on the dollar is the standard reimbursement for commercial insurance, and these rates are even lower for Medicaid coverage. Consequently, hospital-based mental health care is on the decline.

There is no simple solution to these issues, which will likely require a combination of increased federal funding and bipartisan support and advocacy to cultivate hospital and community-based services; promote research to identify and assess risk factors as well as develop evidence-based early intervention individual and group programs; and expand our qualified mental health workforce.

Violence is clearly a public health problem deserving of national attention. By prioritizing the care of mental health needs with the same urgency that we do physical ailments, we can dramatically reduce the rate of PTSD and other psychological sequelae, allowing us to intercept before larger societal issues arise and break the circle of violence that affects us all.

¹ Browne A, Salomon A, Bassuk S. The impact of recent partner violence on poor women's capacity to maintain work. *Violence Against Women* 1999;5:393-426.

² Truman JL, Langton L. *Criminal Victimization, 2013*. US Department of Justice's Bureau of Justice National Crime Victimization Survey 2013. September 2014. Available at: bjs.gov/content/pub/pdf/cv13.pdf

³ Krogstad JM. Gun homicides steady after decline in '90s; suicide rate edges up. *Pew Research Center*. October 21, 2015. Available at: pewresearch.org/fact-tank/2015/10/21/gun-homicides-steady-after-decline-in-90s-suicide-rate-edges-up

WHAT THE STATS SAY

With mass shootings and incidents of global terrorism making headlines, it seems as if serious crime is infiltrating every aspect of our lives, making us all potential—and likely—victims. But how accurate is this perception?

Rates of violent crime in the U.S., such as firearm homicides and rape or sexual assault, decreased nearly every year from 1994 to 2013.² According to the Pew Research Center,³ the number of victims of nondeadly gun-related crimes, like robbery, likewise dropped dramatically from 725 per 100,000 people in 1993 to 175 per 100,000 people in 2013.



LEARN MORE

The National Institutes of Health supports a wide range of scientific initiatives on causes and outcomes of injury and violence. Learn more at prevention.nih.gov/prevention-research/research-highlights/injury-violence.

Hospitals and the need for social responsibility

MORAL IMPERATIVE REQUIRES ACTION ON COMMUNITY NEEDS BY BRUCE M. GANS, M.D.

HOSPITALS, WHETHER FOR-PROFIT OR NONPROFIT, are entities organized to serve the public good. This can be boiled down to five words: We exist to help people. That means we have a broad social responsibility to improve the health and welfare of the communities we serve and to focus on the greater good. Those responsibilities often manifest in improving the neighborhoods that surround our facilities; advocating for the health needs of our patients as individuals or as a population; and promoting social justice so we can deliver the needed care.

Examples include Ascension Health's development of a mixed-use housing, retail and community space in Baltimore and Toledo, and Denver-based Centura Health's initiative to put full-time community health workers in its emergency departments. In San Francisco, Dignity Health System has taken a multipronged approach through grants to community organizations to address chronic health problems, infrastructure investment and support for entrepreneurial efforts to address community health in low-income neighborhoods.

Such efforts are not limited to nonprofit institutions. The philanthropic arm of St.

Francis Memorial Hospital in San Francisco funds the Tenderloin Health Improvement Partnership, committed to improving the health, safety and well-being of more than 33,000 residents of the Tenderloin district.

These institutions and hundreds more understand their responsibilities, particularly when it comes to preventing avoidable injuries and illnesses, whether related to violence, motor vehicle crashes or chronic health conditions such as diabetes. Far too many of our patients are "victims" of these problems, which have roots in environmental and social issues.

Thus, we have a moral imperative to identify and implement constructive actions that are consistent with our health care mission.

Nonprofit hospitals also have a legal imperative to address health-related needs in their communities. The Affordable Care Act requires that such hospitals, including rehabilitation hospitals, assess the medical needs of their community every three years and use the findings to develop and implement a plan to improve the health of the community.

Many of these needs assessments show similarities. While most areas of focus are medical in nature—chronic disease, access

to health care, immunizations and family planning services—several also address the social and environmental contributors to health, including nutrition and physical activity, substance abuse, and injuries and violence.

In most of these reports, family and community violence ranked as a top concern among those interviewed for the hospitals' needs assessment.

Thus, it should be our concern, particularly since a substantial number of patients are in our facilities as the result of injury or violence.

Kessler Institute for Rehabilitation takes this responsibility seriously. For years, for example, we have sponsored a chapter of the ThinkFirst National Injury Prevention Foundation.

The foundation offers thousands of programs a year to educate children, teens and young adults who are at high risk for injury. Programs demonstrate how an injury can change a person's life forever and the importance of making safe choices, whether that is wearing a seat belt, using protective sports gear or avoiding violence.

ThinkFirst provides on-site or online chapter training to hospitals and health-related facilities, along with extensive materials for use with schools.

One of its most powerful initiatives is Voices for Injury Prevention (VIPs), in which teens and adults explain to students how a traumatic injury needlessly changed their life.

Sponsoring a ThinkFirst chapter represents just one of many opportunities available to hospitals interested in improving the health of their communities. Other approaches include community education, patient support groups, involvement with voluntary health organizations, providing a speakers' bureau to highlight issues of importance in the community, and efforts to promote the well-being of the communities we serve.

It is, after all, our moral imperative.

Bruce M. Gans, M.D., is a ThinkFirst board member.



Populations and circumstances surrounding violent TBIs

BY NEIL N. JASEY, JR., M.D.

Although publicity over worrisome trends in traumatic brain injuries (TBI) has primarily focused on sports-related concussions and military combat incidents, a silent epidemic exists—largely among women and individuals from certain racial and ethnic groups—of TBI caused by interpersonal violence. Understanding the circumstances that surround these irreversible injuries and the populations affected can help improve the recognition, management and outcomes of these disorders.

WHO IS AT RISK?

Recent research on the nature of brain injuries occurring during assault, intimate partner violence, child abuse and other forms of interpersonal aggression underscores the need to expand our attention to brain injuries beyond that of athlete and military populations.

Rates of violently acquired TBI appear higher among underserved racial and ethnic groups versus Caucasian populations, with one recent analysis demonstrating a 1.15-times greater incidence of interpersonal-violence brain injuries in Native Americans versus whites.¹ Earlier data suggest that people of color, and African-American men in particular, experience as much as three-times greater the rate of violent TBI than do Caucasians.² Others who are vulnerable to a higher risk of these incidents include incarcerated adolescents, those with low socioeconomic status and persons with acute alcohol intoxication.

Findings related to teenagers in the criminal justice system are particularly concerning given that a greater incidence of TBI could lead to higher rates of recidivism and crime due to poor impulse control, aggression and substance use associated with brain injuries.

There is a dearth of research on TBI that occurs as a part of intimate partner violence, but the known statistics are troubling.³ The prevalence of these injuries in women seeking

care for abuse ranges from 30 to 74 percent. More than 80 percent of women who present to emergency departments or primary care because of domestic violence have sustained facial damage, which usually indicates blunt-force head trauma. Many of these brain injuries are cumulative and were precipitated by abuse during childhood or previous relationships, compounding the negative emotional, cognitive and physical consequences that result.

Domestic violence victims frequently sustain mild TBI, characterized by such complaints as fatigue, headache and concentration difficulty. The vague and subtle nature of these symptoms makes them easily overlooked and thus underdiagnosed by busy clinicians compared with moderate and severe brain injuries. The incidence of postconcussive syndrome also appears to be high in the partner violence population but is rarely recognized and treated by health care providers.

CAUSE AND EFFECT

Although the Centers for Disease Control and Prevention reports that violence only accounts for about 10 percent of TBI etiologies, its effects are just as serious as those arising from other events. Comparisons of assault-related TBI with those sustained during sports show virtually no differences in physical and cognitive functioning. They do, however, point to significantly greater emotional complaints in populations exposed to interpersonal violence, including higher rates of clinically diagnosable depression and post-traumatic stress disorder; more postconcussive syndrome symptoms; and frequent intrusive and stressful thoughts.⁴ These and other psychological difficulties potentially contribute further to poorer TBI outcomes, such as reduced functional abilities. Violence-related TBIs also are associated with more serious outcomes and greater disability than brain injuries

from motor vehicle crashes and falls.

While the causes and severity of TBI are relevant for understanding outcomes, they do not typically require a drastically different care management approach. However recognition of the role of interpersonal violence should alert clinicians to place a greater emphasis on detecting, monitoring and alleviating psychological symptoms—which are independently impairing and further exacerbate physical and cognitive difficulties. Assault victims also may need additional support and community resources when transitioning to home.

Given that violence is generally preventable, understanding the epidemiology of assault-related brain injuries helps inform risk-reduction efforts and identification of vulnerable populations. Both give health care providers additional tools with which to serve and advocate for patients affected by these devastating conditions.

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Tailoring rehabilitation for patients with trauma-related amputations

BY BRUCE POMERANZ, M.D., MMM

AMPUTATIONS THAT ARE THE RESULT of traumatic events necessitate unique approaches to rehabilitation compared with the treatment of patients whose limb loss is secondary to congenital disorders or medical conditions. Although the trauma population faces significant challenges, comprehensive physical and emotional care from an interdisciplinary medical and rehabilitation team is helping these individuals experience an optimal return to their lives and communities.

A DISTINCT SUBGROUP

Most commonly, amputations are due to vascular problems, affecting primarily the lower limbs of older individuals who have numerous chronic comorbidities, including diabetes and cardiovascular dysfunction. In contrast, traumatic amputee populations are generally younger and have sustained significant injuries due to incidents such as military combat-related events (e.g., blast waves, ballistic insults) and blunt force trauma.

After some traumatic events, there is uncertainty regarding whether the limb can be preserved and how much functionality can be maintained. This may lead to challenging decisions about whether limb salvage procedures or amputation is the preferred course of action. Some trauma patients may have periods of months or even years focused on limb salvage. While such efforts may bring about great overall success, they may also result in a limb with inadequate functional potential or prolong disability and pain prior to ultimate amputation.

For a patient with a vascular type of

amputation, the surgery may be performed in a manner that optimizes the residual limb for prosthetic use. Traumatic amputations are more indiscriminate, though. In some cases, the medical team may have little choice about where, for instance, the site of amputation can occur or how much bone can be preserved to facilitate better functioning and accommodate a prosthesis.

UNANTICIPATED NEEDS

Traumatic events compound rehabilitation in multiple ways. Such incidents are often associated with other musculoskeletal injuries, nerve damage and diminished motor or sensory abilities, or pain issues that further impair functioning and quality of life and make successful use of prostheses more difficult. Further, given that this population tends to be younger, patients typically face an entirely different set of difficulties related to coping, self-esteem, vocational needs and emotional effects. Many individuals were relatively healthy prior to the trauma, making the physical and psychological adaptation to losing a limb challenging. And while there is a sense of grieving or loss associated with amputations in general, those that involve violence include additional negative corollaries from the trauma itself, such as post-traumatic stress, depression or anxiety.

The unexpected, unplanned nature of traumatic injuries presents a distinctive challenge. Congenital amputees, by comparison, have been learning to adapt to their disability their entire lives, and vascular populations usually have had time to plan for and adjust to their need for limb loss. This is not the case for individuals who experience sudden limb loss.

Pain management also can be a significant component in rehabilitation for traumatic amputations, whether severe phantom limb discomfort, pain syndrome from the amputation itself or pain associated with the event.

A personalized, multidisciplinary and comprehensive approach to treatment is necessary to ensure providers meet all physical and psychological ramifications associated with traumatic amputations. The expert collaboration of the therapy team and rehabilitation physician is critical in maximizing the functionality of the residual limb and the patient's overall medical status. The team must work to provide the most appropriate prosthetic device while ensuring each individual realizes his or her full functional potential.

While rehabilitation in general never occurs in a cookie-cutter fashion, the treatment strategy for these patients is even more individualized given their host of accompanying complex emotional, physical and lifestyle needs and aspirations. The ultimate goal is to develop the care plan and provide the expertise that best leads to optimal functioning and quality of life.



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