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Health Promotion and Wellness

**Health Promotion and Wellness Resources to Assist
Wounded, Ill, and Injured Sailors and Marines with
Traumatic Amputations**

October 17, 2013



NAVY AND MARINE CORPS PUBLIC HEALTH CENTER

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The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U. S. Government.

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Contents

Executive Summary.....	2
Introduction	3
NMCPHC Epidemiologic Study Findings.....	4
Literature Review of Early Health Conditions Impacting Amputees	7
Health Promotion and Wellness Resources.....	9
Limitations.....	13
Conclusions	13
Further Study	14
Appendix A. Comorbidities among Sailors and Marines with Traumatic Amputations, 2013 EDC Report Tables.....	15
Bibliography	17

Executive Summary

The Navy and Marine Corps Public Health Center (NMCPHC) conducts health surveillance of Department of the Navy (DON) members and offers support when specific health needs are identified. Our public health outreach aids Sailors and Marines, including the Wounded, Ill, and Injured (WII) population. We recognize the WII population remains at risk for additional health stressors related to injuries and illnesses incurred during combat engagements, including traumatic amputations, and would benefit from public health support services. In fact, major-limb traumatic amputations accounted for over 1700 injuries among service members engaged in combat missions from 2001-2012.

In response to heightened incidences of traumatic amputations, the NMCPHC Health Promotion and Wellness (HPW) Department launched a study of early comorbid risks for service members with traumatic amputations.

As part of this study, NMCPHC's EpiData Center (EDC) conducted epidemiologic surveillance^{2,3} of members who experienced traumatic amputations to identify associated health encounters. This report summarizes the key findings of the surveillance study, which found the most frequent encounters were for mental health concerns and nutrition. Referrals for tobacco use were common among younger patients with traumatic amputations, indicating heavier tobacco use across this demographic.

The goal of our report is to identify HPW resources for use during the early phase of treatment and rehabilitation of WII members, as well as detect potential HPW requirements during their long-term rehabilitation. NMCPHC currently provides an abundance of materials that can be used by all service members to prevent illness or regain optimal health. In addition, certain resources have been specifically designed for WII members. We describe existing HPW resources that help WII members recover and reintegrate back into their units or into the general population, with the goal to achieve optimal level of functioning and quality of life. This report reviews the literature to identify comorbidities among patients with traumatic amputations to confirm areas in which health promotion resources would most benefit their recovery. The literature review clearly illustrates that lifestyle behaviors play a crucial role in facilitating the rehabilitation process.

Risk of Comorbid Conditions Increased with Traumatic Amputations

- Major-limb traumatic amputations comprise over 1700 injuries for service members from 2001-2012¹
- Mental health and nutrition are common health concerns among WII members
- Tobacco use is also common among younger patients with traumatic amputations

Introduction

The NMCPHC HPW Department provides innovative and evidence-based health promotion and wellness programs and services that facilitate readiness and resilience, prevent illness and injury, hasten recovery, and promote lifelong healthy behaviors and lifestyles. Each of these purposes is vital in keeping our commitment to serve all of our Navy and Marine Corps beneficiaries.

Since the end of World War II, we have come to understand that lifestyle behaviors strongly influence many of the common chronic diseases, such as heart disease, cancer, diabetes, and lung disease. These conditions cause roughly seven out of every ten deaths among Americans each year and account for seventy-five percent of the nation's health spending.³ Chronic diseases also limit activity and decrease quality of life for those living with the illness. Preventable, chronic diseases commonly impact individuals, including Wounded, Ill, and Injured (WII) service members, living with traumatic amputations.

One special group of beneficiaries within the military consists of WII members who have experienced traumatic amputations.

Due to their trauma and compromised health status, these members are more susceptible to develop comorbidities. For these cases, addressing lifestyle behaviors is even more important than for those who are not physically and psychologically stressed. HPW resources can be used to prevent comorbid conditions, minimize the impact of trauma on members' health, and inhibit the development of chronic medical problems.

In this report, we discuss the number of coded encounters for common comorbid risks that were identified within 90 days of the amputation or within 90 days of discharge to an outpatient status. We also correlate those results with what has been reported in the literature about the association between traumatic amputations and comorbidities. Researchers continue to debate the definition of comorbidity, which for the purposes of this report refers to the prevalence of health risks associated with amputations for which preventive care is indicated.² Based on the surveillance study and literature review, we then discuss relevant

Impacts of Chronic Diseases Facing Patients with Traumatic Amputations

- Roughly seven out of every ten deaths among Americans each year and seventy-five percent of the nation's health spending can be attributed to preventable chronic diseases
- Chronic diseases limit activity and decrease quality of life for those living with the illness

HPW resources to aid service members with traumatic amputations, and their care givers, in promoting health protection through prevention efforts.

NMCPHC Epidemiologic Study Findings

As an initial step in identifying appropriate products and services for support of the WII population, the HPW Department, in collaboration with the EDC, conducted surveillance on inpatient encounters within 90 days of amputation as well as for outpatient encounters within 90 days of last discharge following amputation.³ Of the 174 active duty Navy and Marine Corps members who experienced a traumatic amputation between 1 January 2010 and 31 August 2011, 171 members had additional encounters to address health concerns.

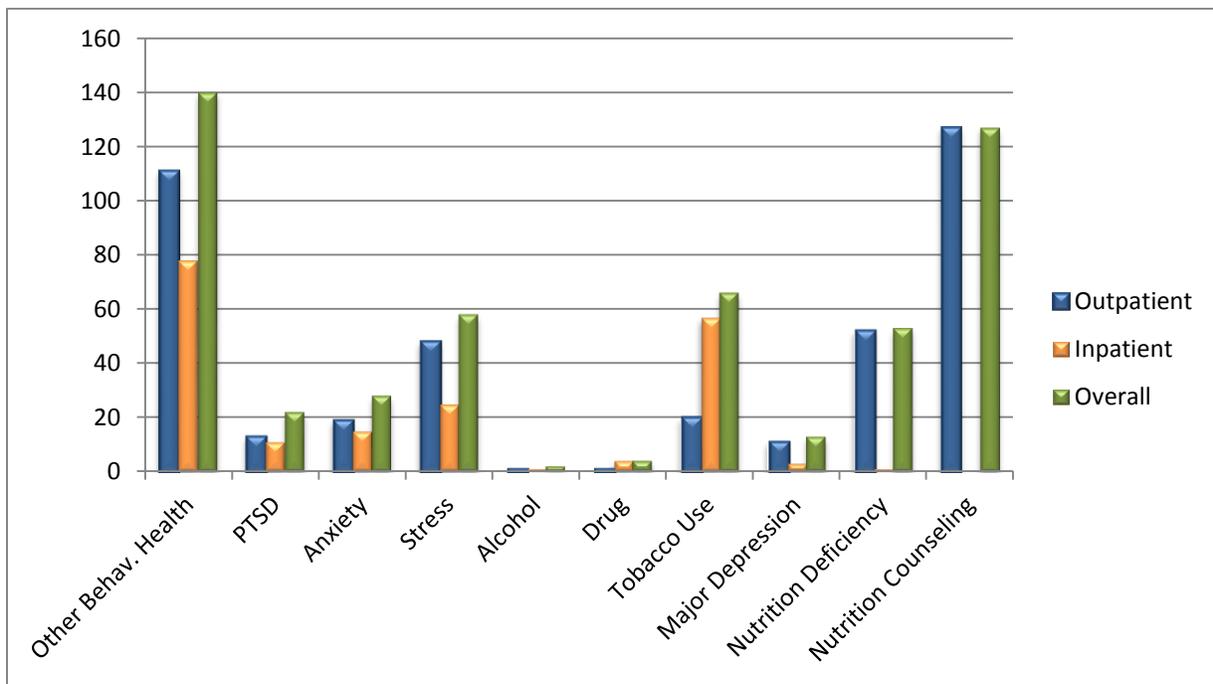


Figure 1. Medical Encounters for Active Duty Service Members with Traumatic Amputations

The data from figures 1 and 2 show that members were referred and seen for a variety of health concerns. The most common referral or diagnosis code among outpatients and inpatients was for other behavioral health (80.5% of the 171 amputees). Encounters were also coded for other mental health related conditions such as stress, anxiety, Post Traumatic Stress Disorder (PTSD) and Major Depressive Disorder (MDD). Of the 171 members, 127 (74%) received nutrition counseling and 53 (31%) were coded for unspecified nutrition deficiency, indicating that nutrition is also a major health concern among WII members. Sixty-seven members (39%) had encounters for tobacco use, indicating a significant proportion of the WII

population in this study were tobacco users. There were only a few encounters related to alcohol and drug use. Appendix A presents the full data table from the surveillance study.³

Leg amputations were the largest proportion of injuries affecting WII members, followed by multiple extremity amputations (figure 2). Young Sailors and Marines, ages 18-25, most commonly experienced traumatic amputations compared to older demographic groups. Within this group, comorbid conditions and amputation location followed similar patterns as for the entire study population (figures 3 & 4).

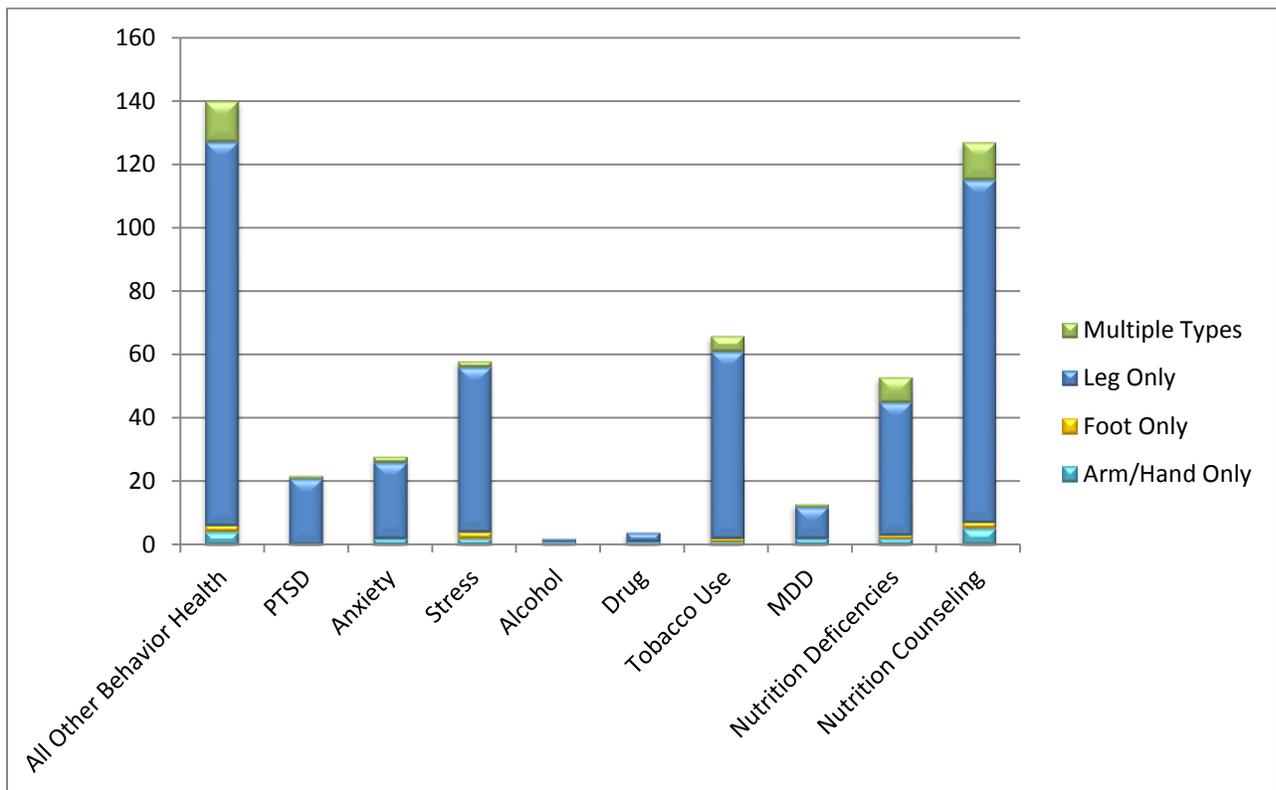


Figure 2. Injury Location across Comorbid Conditions, N=174

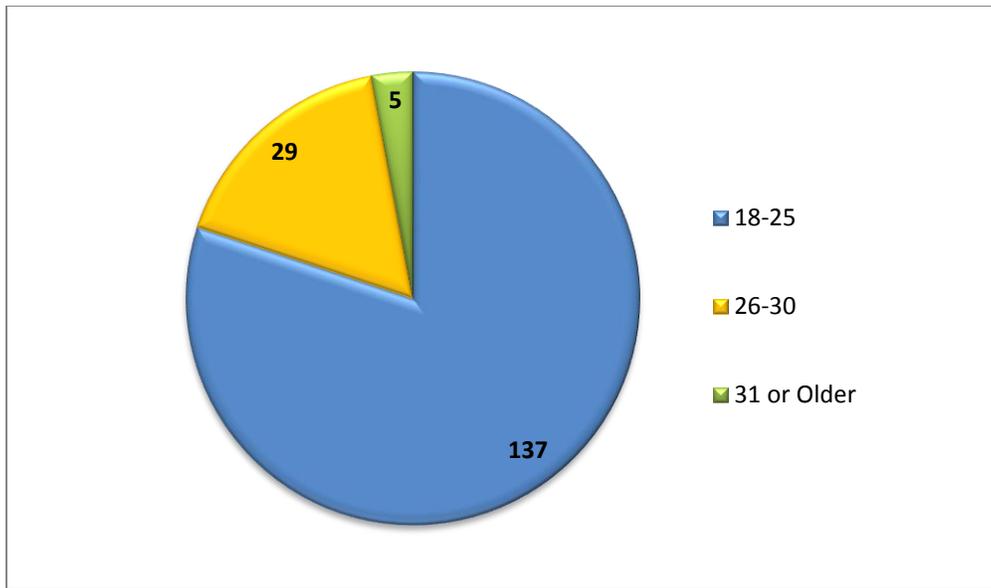


Figure 3. Age Composition of WII Members with Traumatic Amputations, N=171

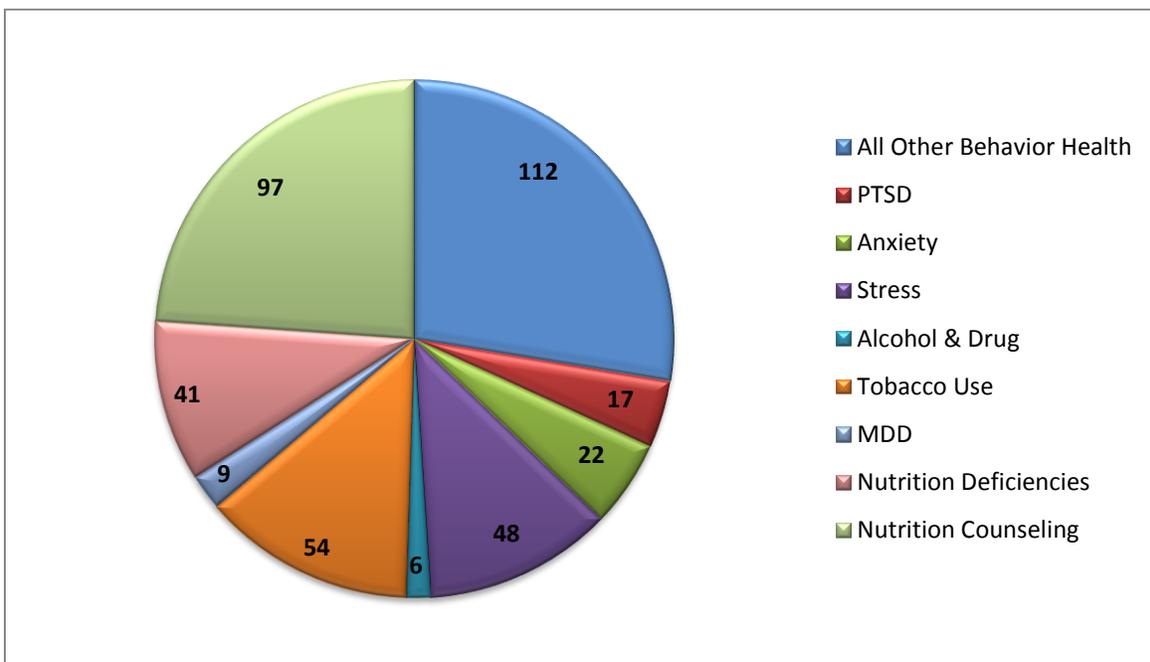


Figure 4. Encounters among 18-25 year old WII Members with Traumatic Amputations, N=137

The data from the EDC study clearly indicates the importance of addressing mental health in conjunction with physical health concerns. A major component of the Department of Defense (DoD) approach in the Veteran Affairs (VA)/DoD Clinical Practice Guideline for rehabilitation of lower limb amputation is to “reduce psychological comorbidities and the mental/emotional

disease burden”.¹⁹ The presence of comorbidities during the short-term phase of recovery may indicate broader implications for chronic conditions over the full recovery and reintegration period.

Literature Review of Early Health Conditions Impacting Amputees

Consistent with epidemiological surveillance, a review of the literature shows that patients with traumatic amputations experience a variety of comorbid risks. These include behavioral health conditions, tobacco and substance use disorders, and metabolic disorders.⁴ Although not examined in this study, the literature suggests that chronic comorbid conditions such as heart disease, sleep disorders, and sexual health should also be examined.

Behavioral Health, PTSD, Anxiety, and Stress. Many associations have been demonstrated between physical trauma and various mental health conditions in the literature, including PTSD, stress, anxiety, and depression.^{5,6,7,8,9,10} Those who have suffered from an amputation due to combat related incidents often suffer from a co-occurring Traumatic Brain Injury (TBI), MDD, or PTSD. Psychological problems can make it more difficult to concurrently address physical needs.

As shown in this initial study of early encounters, coding for mental health encounters is quite common. Although the occurrence of behavioral health encounters does not inform us of the specific reasons for such referrals, they reflect not only an attempt by the treatment team to address the short-term stress of members who experienced a life-altering event, but also to mitigate the risk for chronic mental health conditions. Studies of severe orthopedic trauma, both in civilian and military settings, have illustrated the dramatic impact that physical trauma can exert on psychological health. It is not surprising that service members could experience a myriad of mental health challenges due to the loss of a limb. Losing a body part or experiencing a disfiguring injury can create a feeling of loss, similar to the loss of a significant other.¹¹ Members who experience amputation not only permanently lose a certain amount of physical ability, but they may also lose a feeling of connectedness, at least temporarily, from friends and fellow members of their commands. Long-term acceptance and satisfaction with prosthetic limbs may depend a great deal upon how well these devices facilitate the ability of members to reintegrate into fully functioning work and personal roles.¹⁰

Diminished capacity may also lead to perceptions of being dependent upon others, which may be in conflict with the members' desire for autonomy and self-reliance.¹² Rapid wound healing, obtaining a good fit with a prosthetic device, and relearning skills related to activities of daily living can facilitate a return towards independent function and feeling of "wholeness".¹⁰ Over and above physical limitations created by amputation, perceived body image, self-worth, and cosmetic concerns can create emotional distress.¹³ Members may experience uncertainty about their ability to resume sexual activities^{14,15,16} or to engage with others in all realms of social life, highlighting the need for rapid rehabilitation and reintegration into normal social activities, to include intimate relationships. Members may have to learn to communicate with others about interpersonal concerns, even more effectively than prior to their injuries. Mental health encounters, even in the short-term phase of rehabilitation, should begin to address such psychosocial and physical concerns with members.

Losing a body part or experiencing a disfiguring injury can create a feeling of loss, similar to the loss of a significant other.

Substance Abuse and Excessive Alcohol Use. The stress and pain of amputation may also result in an increased prevalence of substance abuse.^{10,8} In a review of post-combat related alcohol abuse among Vietnam veterans, Stewart¹⁷ identified higher rates of binge drinking and alcohol abuse among combat veterans compared with non-combat veterans and non-veterans, with higher incidence associated with more severe traumatic experiences. Although there were few encounters related to alcohol or drug use in this study of short-term comorbidities, this may be due in part to close case management of patients in their short-term phase of recovery and quickly addressing psychosocial concerns. Nevertheless, substance use should continue to be addressed with WII members in the long term. The National Institute of Drug Abuse reports that "as many as half of all veterans diagnosed with PTSD also have a co-occurring substance use disorder".¹⁸ Melcer⁹ confirms that combat amputees experience substance use disorders; although, he was uncertain as to the amount of substance use disorders that could be attributed to blast injury versus stress.

According to the National Institute of Drug Abuse, "as many as half of all veterans diagnosed with PTSD also have a co-occurring substance use disorder."

Tobacco Use. According to the 2011 Health Related Behavior Survey of Active Duty Military Personnel, prevalence of tobacco use is generally higher among service members than in the general population, and is highest in the Marine Corps, compared to other services.²⁰ The high number of encounters for tobacco use may be attributable to a higher pre-injury smoking rate. Nevertheless, smoking is a major concern that presents an immediate obstacle to wound

healing and respiratory fitness. Continued smoking also places members at high risk for multiple chronic conditions such as heart disease. Cessation may be more difficult for WII members due to the extreme stress and multiple other health challenges occurring during their rehabilitation. Therefore, tobacco use cessation efforts need the most effective health promotion tools available.²¹

Obesity and Metabolic Disorders. Many studies have shown that proper nutrition and weight maintenance are critical considerations after an amputation, and that a diet consisting of optimal nutrients is important to facilitate the wound healing process and maintain a healthy weight.^{22,23,24,25,26,27} Patients recovering after amputations, especially those with lower extremity amputations, may be at an increased risk for prolonged healing, extended hospital stays, and obesity.^{23,25,26,28,29} Not surprisingly, the EDC amputation report study³ found that members were often coded for nutrition encounters once they became outpatients. Certainly, during their initial rehabilitation members are likely to experience significant changes in their activity levels and their eating patterns. Consequently, weight gain can decrease mobility, impede prosthetic fit, and adversely impact quality of life among amputees.^{23,26} Based on the above, most members with amputations should receive anticipatory nutrition guidance, and those with a predisposition for consuming poor nutrition or consuming more calories than they need should be provided with more intensive intervention. As with smoking, chronically overweight individuals are at risk for developing metabolic and cardiovascular disorders, making weight management an important issue.³⁰

Weight gain can decrease mobility, impede prosthetic fit, and adversely impact quality of life among amputees.

Health Promotion and Wellness Resources

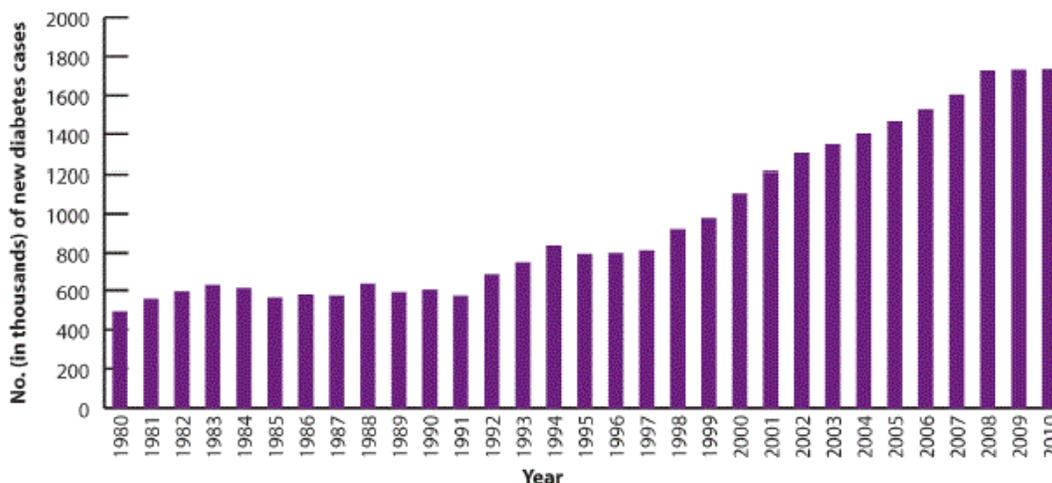
The NMCPHC HPW Department provides valuable resources to address the underlying determinants of health that are necessary to promote a more rapid and successful recovery during the early phase of rehabilitation. HPW resources also aid in avoiding the many complications associated with chronic illnesses among warriors with traumatic amputations.

Early phase of recovery. During the early recovery phase, patients with traumatic amputations will experience significant stress and challenges in modifying their lifestyles to reduce or eliminate health risks and promote wound healing. Key components of a comprehensive HPW strategy include: adhering to nutritious eating habits that maintain a healthy body weight; selecting a physical activities plan that provides for cardiorespiratory fitness, resistance training, flexibility, and neuromotor training; and learning new psychological skills and behavior change strategies to overcome both physical and psychological barriers to recovery. In addition, providers should assist these Sailors and Marines in ceasing any smoking or excessive alcohol intake.

HPW Resources Aid in the Recovery and Resilience of Patients with Traumatic Amputations

- Provide valuable resources to address the underlying determinants of health that are necessary to promote a more rapid and successful recovery during the short-term phase of rehabilitation
- Aid in mitigating and preventing complications associated with chronic illnesses among WII warriors with traumatic amputations

Chronic disease prevention and prevention of medical complications. Heart disease, stroke, and cancer become the most common causes of death among adults in the U.S. from the age of 35 years and older.³¹ The incidence of diabetes has been increasing during the past few decades and is also a leading cause of death, as shown in figure 5.³² It is becoming more common for many adults in the U.S. to possess multiple cardiovascular risk factors, referred to as metabolic syndrome, that significantly raise their risk of heart disease, stroke, and diabetes. The five metabolic syndrome risk factors consist of a large waistline, a high triglyceride level, a low High Density Lipoprotein (HDL) cholesterol, high blood pressure, and high fasting blood sugar. These are lifestyle-based, and result from a sedentary routine and consuming a typical American diet that is high in calories, fats, and simple sugars. The obvious solution to prevent these conditions is to adopt and maintain healthier nutrition eating habits and consistently participate in moderate or vigorous-intensity physical activity. Although smoking is not listed as one of the risk factors for metabolic syndrome, it is an additional risk factor for heart disease, stroke, and cancer.



Source: National Diabetes Surveillance System, National Health Survey data.

Figure 5: Annual Number of New Cases of Diagnosed Diabetes among U.S. Adults Aged 18-79 Years, 1980-2010³²

Patients with traumatic amputations have been shown to have an even higher incidence of atherosclerotic disease and insulin resistance than the general population,^{30,33} indicating a specific need to assist WII members in avoiding smoking and adhering to healthy lifestyles. Although this initial report on amputee health and prevention of comorbidities did not examine the development of chronic medical conditions, it will be essential to monitor patients after their early phase of rehabilitation to assess their cardiovascular disease risk factors. In the meantime, providers and WII members should take advantage of existing HPW resources in a proactive manner.

HPW resources are equally applicable for use during either the short-term treatment phase or during the long-term health maintenance phase that is directed at prevention of chronic health conditions and their medical complications. NMCPHC provides products and services specifically tailored to our military population that support healthy lifestyles (shown in table 1). These products are available in a variety of formats and utilize technologies designed to increase accessibility and usability. As is the case for other WII members, maintaining the health of WII amputees will require ongoing assessment of their health status and development of additional resources that address identified needs.

Table 1. HPW Resources for WII Members with Traumatic Amputations

HPW Topic	Modality			
	Reproducible Materials	Technology	Assessment Tools	Training
Mental Health	<ul style="list-style-type: none"> • Suicide Prevention • Navigating Stress • Anger Management • Sleep Hygiene • Relaxation • Post-Traumatic Stress Disorder • Navy Leader’s Guide for Managing Sailors in Distress • Sexual Health / Intimacy 	<ul style="list-style-type: none"> • Fact Sheets • Posters • Brochures • Articles • Social media outreach • Webinars 	<ul style="list-style-type: none"> • Psychological and emotional well-being webpage • Navy Leader’s Guide for Sailors in Distress mobile application • Relaxation toolkit with audio and visual resources • Fleet and Marine Corps Health Risk Assessment (HRA)/WII HRA 	<ul style="list-style-type: none"> • ShipShape instructor training • Healthy Living workshop for WII caregivers
Nutrition	<ul style="list-style-type: none"> • Crews into Shape • ShipShape Program • Healthy Eating • Dietary Supplements • Performance Nutrition • Navy Operational Fitness and Fueling System (NOFFS) 	<ul style="list-style-type: none"> • Fact Sheets • Posters • Brochures • Articles • Social media outreach • Webinars 	<ul style="list-style-type: none"> • Fleet and Marine Corps HRA/WII HRA • Military Nutrition Environmental Assessment Tool (m-NEAT) community assessment 	<ul style="list-style-type: none"> • ShipShape instructor training • Choosing Healthy Options Wisely (CHOW) Nutrition Course
Tobacco	<ul style="list-style-type: none"> • Tobacco cessation for providers • Tobacco cessation for patients 	<ul style="list-style-type: none"> • Fact Sheets • Posters • Brochures • Articles • Social media outreach • Webinars 	<ul style="list-style-type: none"> • Fleet and Marine Corps HRA/WII HRA • Collect and analyze tobacco metrics 	<ul style="list-style-type: none"> • Tobacco cessation facilitator training

Limitations

Examining coded encounters in the NMCPHC study provided information on the general topics for which members were referred; however, these coded encounters did not provide enough detail to identify the specific health concerns being addressed during the encounters. The initial NMCPHC study only examined short-term care encounters during the first 90 days of recovery or discharge. More detailed assessment of identified health concerns could ensure that HPW resources are addressing the members' specific health concerns. Health care needs will obviously change over time, and HPW resources can be tailored to address both acute and chronic health maintenance concerns.

In addition to the above limitations, the EDC report indicates,³
“Diagnoses in medical encounters depend on correct International Classification of Diseases, 9th Revision (ICD-9) coding practices. Data for medical surveillance are considered provisional and medical case counts may change if the record is updated after the report is generated. Additionally, because records are submitted into the system at different times, there may be patients who had an inpatient or outpatient encounter but were not captured in the current data.... No theater, shipboard, or purchased care encounters are included, and therefore, it is possible that not all encounters for a specific medical condition are captured.”

Conclusions

Advanced lifesaving medical treatment that has been available during the protracted conflicts in Iraq and Afghanistan has resulted in many traumatic amputations that will require both short- and long-term rehabilitation efforts. This report focused on WII amputees, their specific health challenges, and the barriers they face in order to return to optimal functioning and well-being.

Although the basic tenets of health and wellness apply to both the WII population and general population, WII members are especially vulnerable to both acute and chronic medical problems if they have behavioral risk factors that impede their rehabilitation and contribute to chronic physical and psychological illnesses.

As is true for the general population, the causes of these conditions can be complex and multifactorial. In addition, physical factors can influence psychological health and vice versa. Thus, it is often necessary to treat the patient in a holistic fashion.

The advanced lifesaving medical treatment available during the protracted conflicts in Iraq and Afghanistan has resulted in many traumatic amputations that will require both short and long-term rehabilitation efforts.

Further Study

Further study of military WII members is warranted to determine if they reflect similar comorbidities as the U.S. population and to evaluate the efficacy of HPW resources in reducing the incidence and severity of these conditions. Future study should also examine additional conditions associated with traumatic amputation, such as sleep disorders and sexual function.

Appendix A. Comorbidities among Sailors and Marines with Traumatic Amputations, 2013 EDC Report Tables

Table 1. Demographics of Co-Morbid Conditions Among Amputees

	Total	All Behavior Health [§]		PTSD		Anxiety		Stress		Alcohol		Drug		Tobacco		MDD		Nutrition		Nutrition Counseling	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Amputees With Co-morbidity ^a	171	140	80.5	22	12.6	28	16.1	58	33.3	2	1.2	4	2.3	66	37.9	13	7.5	53	30.5	127	73.0
Age Group at Injury[#]																					
18-25	137	112	81.8	17	12.4	22	16.1	48	35.0	2	1.5	4	2.3	54	39.4	9	6.6	41	29.9	97	70.8
26-30	29	23	79.3	3	10.3	5	17.2	8	27.6	0	---	0	---	11	37.9	3	10.3	10	34.5	24	82.8
31 or Older	5	3	60.0	2	40.0	1	20.0	2	40.0	0	---	0	---	0	---	1	20.0	2	40.0	4	80.0
Initial MTF																					
Landstuhl	168	135	80.4	22	13.1	27	16.1	58	34.5	1	0.6	2	1.2	62	36.9	12	7.1	53	31.6	125	74.4
Other	6	5	83.3	0	---	1	16.7	0	---	1	16.7	2	33.3	4	66.7	1	16.7	0	---	2	33.3

Reported percentage is the number of individuals within the group with the co-morbid condition of interest

^aThere were 174 total amputees

[§]Category is inclusive of all behavioral health conditions (ICD9 codes 209-317)

[#]Age was missing for three individuals

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center on 10 May 2013

Table 2. Co-Morbid Conditions by Amputation Type

	Total	All Behavior Health [§]		PTSD		Anxiety		Stress		Alcohol		Drug		Tobacco		MDD		Nutrition		Nutrition Counseling	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Amputation Type																					
Arm/Hand Only	6	4	66.7	0	---	2	33.3	2	33.3	1	16.7	1	16.7	1	16.7	2	33.3	2	33.3	5	83.3
Foot Only	2	2	100.0	0	---	0	---	2	100.0	0	---	0	---	1	50.0	0	---	1	50.0	2	100.0
Leg Only	150	121	80.7	21	14.0	24	16.0	52	34.7	1	0.6	3	2.0	59	39.3	10	6.7	42	28.0	108	72.0
Multiple Types	16	13	81.3	1	6.3	2	12.5	2	12.5	0	---	0	---	5	31.3	1	6.3	8	50.0	12	75.0

Reported percentage is the number of individuals within the group with the co-morbid condition of interest

[§]Category is inclusive of all behavioral health conditions (ICD9 codes 209-317)

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center on 7 May 2013

Table 3. Amputee Co-Morbid Conditions by Location of Encounter

	Total	All Behavior Health [§]		PTSD		Anxiety		Stress		Alcohol		Drug		Tobacco		MDD		Nutrition		Nutrition Counseling	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Encounter Facility																					
Outpatient	153	111	72.5	13	8.5	19	12.4	43	28.1	1	0.7	1	0.7	20	13.1	11	7.2	52	34.0	127	83.0
Inpatient	80	78	97.5	11	13.8	15	18.8	25	31.3	1	1.3	4	5.0	57	71.3	3	3.8	2	2.5	0	---

Reported percentage is the number of individuals within the group with the co-morbid condition of interest

[§]Category is inclusive of all behavioral health conditions (ICD9 codes 209-317)

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center on 7 May 2013

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