

## Utilization of prostheses among US veterans with traumatic amputation: A pilot survey

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**Abstract--**No random surveys have been done to determine how effectively veterans with amputation can utilize their prostheses, and only one limited survey has been done of Scandinavians' use of lower-limb prostheses. A pilot survey of prosthetic problems was sent to all 170 US veteran soldiers who had traumatic amputations over the last 10 years, whose addresses could be supplied by the VA, and whose medical synopses showed them to be otherwise healthy when leaving the military. This sub-population was selected as a "best case" group: those most likely to be active, young, and healthy enough to use their prostheses, as well as close enough to the military and veterans medical systems to get adequate treatment. If they have problems, the rest of the veterans with amputation, relatively older and more debilitated, are very likely to have far worse problems. Although only 45 responded (26%), all had significant problems using their prostheses for work. Most problems were related to the attachment method. Even if all nonrespondents were problem free, at least a quarter had very significant problems using their prostheses. This means that there are significant problems with current methods for attaching prostheses that need to be addressed. The first step should be a large survey of veterans with amputation to get an accurate assessment of the extent of prosthesis-related problems.

**Key words:** *amputation, pain, prostheses, utilization.*

## INTRODUCTION

Clinicians who frequently work with persons with amputation are aware that most of them require adjustments of their prostheses at least every few years due to the normal bodily changes that occur with age and changes in body composition. It is also common clinical knowledge that many such persons are never able to utilize their prostheses effectively. For example, many apparently healthy individuals with ideal transtibial amputations are frequently never able to walk more than an hour or so without pain and or skin breakdown. The athletes with amputation illustrated in the popular press frequently pay a terrible price in disability due to pain and skin breakdown after participation in an event.

Very little is known about how common problems with prostheses are in the general population of persons with amputation, because practitioners only see those who come in for treatment. In America, most such persons have their amputations due to diseases that debilitate them to a significant extent prior to their operation. Thus, their ability to utilize their prostheses to the fullest extent is limited by their overall physical condition. Since most of these people were near or over retirement age when they had their amputations, they did not need their prostheses to help them work, and the intensity of their outdoors activities had naturally decreased with age. This means that most Americans with amputation have neither the ability, need, nor motivation to make optimal use of a prosthesis.

The military and, to a lesser extent, the VA, have a very different sub-population to deal with. These are relatively young and healthy people who had traumatic amputations while on active duty or just after leaving the military. Records from all 343 soldiers in this category treated at Army medical facilities in the last 9 years indicate that most were healthy (other than their amputations) when they left the facility. Thus, these are the very people who need to make optimal use of their prostheses to get on with their lives, who should be highly motivated to try to overcome any limitations posed by the prosthesis, and about the experience of whom we know virtually nothing.

Buijk (1) surveyed 218 (of 278 letters sent out, 78 percent responded) persons with lower limb amputation in the Netherlands, of whom 56 percent were of working age at the time they responded to the survey and 51 percent had had their amputations due to trauma. Thus, probably about half of the working-age respondents also had theirs due to trauma. About half were transtibial, well known for having much less trouble utilizing prosthetics than do those with transfemoral amputation, because the mechanics of use are far simpler and the loss of limb control is much less. The respondents (all ages and reasons for amputation) could stand for an average of 90 min (SD=147) and walk for an average of 68 min (SD=137). Thirty-seven percent of them had to have their prostheses adjusted at least twice per year, and an additional 33 percent once per year. Although no quantification was presented, it is known that many of the respondents wanted better fitting prosthetics. Buijk's data would have to be reanalyzed to find out how well the currently healthy, working age, individuals with traumatic amputation were doing with their prostheses.

Purry and Hannon (2) reviewed the records of 25 persons under the age of 45 with traumatic lower-limb amputation seen at an English prosthetics center. Nineteen of them had no significant injuries other than the amputation, and so are similar to the group in which we are interested. Only 4 of the 25 were unable to use a standard prosthesis. All four had problems of the residual

limb that prevented its use but were eventually fitted with thigh corset types. All 25 used their prostheses for their work (one was unemployed for apparently unrelated reasons at the time of the evaluation) and 21 used them for at least 13 hrs per day. Eleven had never had to leave their prostheses off during the year prior to the evaluation due to problems with their residual limbs. Eighteen could walk a mile or more without discomfort. Sick leave was very low, but relationships between amputation-related problems and the rate of sick leave could not be determined. Half had severe or troublesome pain, with four reporting constant pain and three frequent pain. Of those with significant pain, five had their pain due to recurrent residual limb problems. Three were very satisfied with their prostheses and three were very dissatisfied. The rest rated their satisfaction as "fair." Of great importance, 6 did not consider themselves disabled at all, while 15 felt they were only mildly disabled. Although four considered themselves quite disabled, none felt they were very disabled.

Millstein et al (3) reviewed the records of 314 working-age Canadians with traumatic upper extremity amputation seen at the Ontario Workers' Compensation Board. They found that 89 percent of those with transradial, 76 percent of those with transhumeral, and 60 percent of those with high level (shoulder transections) amputation made regular use of prostheses. They also found that most used more than one prosthesis for their functional needs. Only 10 percent used a cosmetic prosthesis; the rest made regular use of working prostheses (usually the cable-operated hook-finger combination) in their work and home life. Sixty-six percent used their prostheses at work. Unfortunately, problems with use of the prostheses were not detailed beyond general construction problems, such as electrical units shorting out in bad weather.

Durance and O'Shea (4) surveyed and examined 26 of 38 persons with upper limb amputation at Ontario Clinics. They reviewed the sparse literature and found that about 75 percent of such persons had to change jobs as a direct result of their amputations and that 12 to 23 percent of those under 65 years of age were unemployed. Their own study indicated that 21 used their prostheses for all or part of the day, with half wearing them for up to 10 hrs. The prostheses were not worn more due to discomfort and problems with fit.

Very little work has been done on the reasons for persons with amputation getting so many recurrent superficial infections in their residual limbs. The little that is known was reviewed by Kohler et al (5), who found that most of the infections are caused by bacteria normally resident on the skin. They feel that the raised skin temperature and vascular occlusion caused by tight-fitting sockets, combined with abnormal loading of the skin, is the major cause. The author's mail response surveys of over 10,000 persons with amputation (6,7) and 6-mo study of over a 100 veterans with amputation (8) provide considerable support for the relationship between prosthesis utilization and development of phantom and residual limb pain, as well as disability.

## **METHOD**

### **Subjects**

We conducted a pilot survey of prosthetic problems among all 170 soldiers who had traumatic

amputations over the last 10 years whose addresses could be supplied by the VA, whose medical synopses showed them to be otherwise healthy when leaving the military, and whose surveys were not returned as undeliverable. We have no way of knowing how many surveys actually reached their targets other than those returned by the post office as undeliverable. These were subtracted from the number sent out to leave a total of 170 that could have been returned. As the surveys were anonymous, no follow-up letters could be sent. As debilitation from concurrent injuries could interfere with recovery and rehabilitation after the amputation, no soldiers whose records indicated significant concurrent injuries were included in the sample.

### **Survey Instrument and Cover Letter**

The survey appears here as Appendix A. The cover letter emphasized our interest in their problems with prostheses and asked for their help. The survey asked about the respondent's age, sex, reason for amputation, which limbs were amputated, stump and phantom pain, use of the prosthetic, problems with the prosthetic, changes they would like in the prosthetic, medical problems in the residual limb, and current health.

## **RESULTS**

### **Response Rate**

Forty-five amputees responded to the survey. Twenty-six percent is common with many surveys but was surprising to us because our usual response rate for surveys of veterans is seventy-eight percent. This leads us to feel that many surveys probably never reached their intended targets. As most of the subjects were healthy (other than the amputation) when they left active duty a few years earlier and were relatively young, it is not likely that many had died during the intervening time. There is no reason we can think of that this group would be less likely to answer a questionnaire than other groups of veteran amputees. It is especially likely that there were problems reaching the correct people, because the military only kept social security numbers associated with treatment summaries. The VA was supplied a list of social security numbers and asked to find the related names and addresses. Of 343 numbers provided by the military, the VA was only able to identify 177 names. It is very possible that there were errors in the social security numbers and that many of the surveys were sent to the wrong people, who may simply have disposed of the surveys. However, nobody contacted us with the comment that they had received a survey by mistake.

Thus, it is not really known whether the forty-five subjects responding are representative of the possible group of 343 who met the survey's entrance criteria. Because of this, all results are presented both as they were analyzed and, in addition, as a worst case, scenario. In other words, it is assumed that the 74 percent who did not respond could have been free of problems.

### **Demographics of Respondents**

The respondents were an average of 32 years of age, 2 were female and 43 male, and had had their amputations an average of 8.4 years prior to being surveyed. There were 11 upper- and 51 lower-limb amputations among them. Sixteen rated their health as being as good as it ever was,

19 rated it as good, 9 as fair, and only 1 as poor.

### **Use of Prosthesis**

The most important results were that 32 percent felt their prosthesis was up to half as good as their original limb, while 22 percent said it was not much good for anything. Virtually all had significant problems using their prostheses for work. Most problems were related to the attachment method. Use of the prosthetic as required for work and normal activities (as opposed to extended use, use for very active sports, and the like) caused significant phantom and stump pain, skin breakdown, and other problems. These problems were great enough so that work and normal home life were significantly impaired.

Forty-three of the 45 respondents reported using prostheses. All reported a variety of problems with them. Three said that the prosthesis virtually replaced the original limb, while the rest felt that it was of limited use: 8 reporting it to be about three-fourths as good, 14 reporting it to be half as good, 8 reporting it to be one-fourth as good, and 9 reporting it to be worthless. All, including the three who said the prosthetic was as good as their original limb, reported various limitations it imposed on their activities. Thirty-nine reported that their residual limbs hurt if they used their prostheses too much, and 31 of these reported that this interfered with their use of the devices. Thirty-five said their phantoms hurt if they used their prostheses too much and that the pain interfered with their use of the devices.

Ten subjects did not use their prostheses regularly. The usual reason was that it hurt too much to use it. Of the 42 who used their prosthetics, all reported limitations in its usefulness, 29 specifically reporting that fit and attachment problems prevented their using the prosthetics as they would wish to. Most had experienced medical problems, such as pressure sores, with their residual limb. Of the 27 persons who answered question 14 in the affirmative, 18 reported that use of the prosthetic caused the medical problems in the residual limb and that continued use made those problems worse.

### **Pain**

Although most reported decreases in both phantom and stump pain over time, all but eight had sufficient pain to cause significant problems at work and home. In the residual limbs, 13 reported that they had sufficient pain to prevent them from doing things they wanted to every day, 9 were prevented once per week, 5 every two weeks, 3 once per month, and 6 less than once per month; only 8 reported that their stump pain never prevented them from doing things. Respondents lost an average of 3.7 hrs per mo of sleep, spread over an average of 8.8 days. Of the 20 currently employed, 6 lost an average of 20 hrs of work per mo spread over 3 days due to pain in the residual limbs. For phantom limb, 8 reported pain sufficient to prevent them from doing things they wanted to every day, 6 were prevented once per week, 4 every two weeks, 2 once per month, and 12 less than once per month. Only 10 reported that their phantom pain never prevented them from doing things. They lost an average of 3.4 hours per mo of sleep spread over an average of 7.2 days. Of the 20 currently employed, three lost an average of 12 hrs of work per month spread over 3 days due to phantom pain.

## DISCUSSION

Since only 45 people--a quarter of those receiving letters--answered the survey, it would be a mistake to overinterpret these responses other than as an indication that problems with prosthetic use related to fit exist among at least a quarter of the relatively young, healthy veterans with traumatic amputation recently leaving the US military. However, the importance of this finding can not be underestimated either. This "best case" population cannot use their prostheses adequately, and their prostheses cause significant problems due to poor fit. These veterans have essentially unlimited access to high quality medical and prosthetic care at essentially minimal cost to themselves. Their records indicate that, other than the amputation, they were healthy when they left the military, so should be able to get to and utilize the optimal care available. This indicates that huge problems must exist for more typical persons less healthy and vigorous, with amputation. A full study of this problem needs to be performed, both to find out whether our soldiers are getting the best rehabilitation they can and to determine whether current methods of attachment are simply so flawed that the vast majority actually can not make reasonable use of their prosthetics.

### [Sample Survey](#)

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