**Factors Associated with Return to Ambulation Following Major Lower Limb Amputation at an Urban US Tertiary Healthcare Center**

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**Statement of Purpose and Literature Review**

Despite a good understanding of risk factors for amputation and the development of multidisciplinary diabetic foot amputation prevention teams, literally hundreds of major limb amputations are performed worldwide on the daily basis. One relatively universal goal following major limb amputation is for the patient to return to ambulation with a prosthesis. In fact, however, there is little published evidence on how many patients actually return to ambulation following major limb amputation and what factors are associated with a successful return to ambulation [1-6].

The objectives of this retrospective, observational investigation were to 1) determine what percentage of patients return to ambulation within one year following major limb amputation, and 2) assess which patient factors may be associated with successful return to ambulation within one year following major limb amputation at an urban tertiary care health system with a multidisciplinary limb salvage team.

**Methodology**

Following approval by our institution’s IRB (Protocol #22923), a retrospective chart review was performed over a two-year data collection period allowing for at least 12 months of follow-up for all major lower limb amputations performed at a single tertiary health care system. The primary outcome measure was documented ambulation in a prosthesis within one year following major lower limb amputation. Comparisons were performed between different amputation groups (unilateral below knee [BKA], unilateral above knee [AKA]), bilateral major amputation and “other” major amputation as well as between ambulators vs. non-ambulators. Extracted patient demographics included age, gender, race/ethnicity, insurance coverage, follow-up, mortality, living situation, body mass index, smoking history and a specific history of diabetes, end-stage renal disease, COPD, dementia, coronary artery disease, and peripheral arterial disease.

**Results**

We extracted data on one hundred and sixty-seven consecutive patients who met study inclusion/exclusion criteria. Seventy-four patients (42.05%) had a final result of a unilateral BKA with a 50.0% return to ambulation. 35 patients (18.99%) had a final result of a unilateral AKA with a 28.6% return to ambulation. 15 patients (8.36%) had a final result of a bilateral major limb amputation with a 27.1% return to ambulation. Patients whose final result was a BKA as opposed to an AKA were statistically more likely to be younger (p=0.0146), Hispanic (p=0.0008), diabetic (p=0.0126), and have an amputation that primarily healed without requiring additional intervention (p=0.0015). Patients whose final result was an AKA as opposed to a BKA were more likely to have a history of dementia (p=0.0001) and to have at least one attempted revascularization (p=0.0005). Ambulators were statistically more likely to be younger (p=0.0010), of male gender (p=0.0258), have follow-up > 6 months (p=0.0001), be ambulatory pre-operatively (p=0.0088), return home following their amputation (p=0.0001), and have an amputation that primarily healed without requiring additional intervention (p=0.0015). Non-ambulators were statistically more likely to be deceased at one post-operative year (p=0.0169), have a history of PAD (p=0.0058), and have at least one attempted revascularization (p=0.0001).

Full study results are demonstrated in the following tables. Table 1 (left) demonstrates descriptive statistics and a comparison between patients undergoing unilateral BKA vs. unilateral AKA. Table 2 (center) demonstrates descriptive statistics and a comparison between ambulators vs. non-ambulators in a pooled BKA/AKA group. Table 3 (right) demonstrates descriptive statistics and a comparison between ambulators vs. non-ambulators in those undergoing unilateral BKA. Descriptive data of continuous variables is reported in terms of the mean ± standard deviation (SD) and compared with the independent t-test. Descriptive data of categorical variables is reported in terms of the frequency count (%) and compared with the Fisher’s exact test. A level of significance was set at p ≤ 0.05.

**Discussion**

While there is already descriptive and inferential information available for amputation patients that can help predict risk factors, there still is a need to understand factors associated with successful return to ambulation. This needs to be understood by the multidisciplinary teams involved in care delivery. We observed a lower than hypothesized documented rate of successful ambulation with a prosthesis. We did not observe an amputation rate >50% in any major amputation group potentially emphasizing the importance of limb salvage techniques and perhaps demonstrating that major amputation may not be as definitive or functional as some sometimes thought. Although many patients may function well with a major amputation, we found that this occurred in the minority of our urban cohort.

We also have these results emphasize the importance of follow-up from a limb salvage team after an amputation. The role of the team should not end with a healed amputation stump, but rather after the patient has achieved their maximal functional outcome.

Finally, we present patient demographic variables associated with ambulation and amputation groups that has the potential to be useful in surgical decision planning. This information could be helpful in determining which patients may be most likely to have a functional result following a specific level of major amputation. We believe this information should factor into our patient education and consent process.

In conclusion, this investigation provides evidence on the outcomes of major amputation at an urban US tertiary healthcare center with a multidisciplinary limb salvage team. Major amputation is a realistic outcome that often occurs despite our best efforts, and we hope these findings emphasize that our care of patients should extend beyond what is sometimes viewed as a short-term or immediate treatment “failure”.

**References**