



Original Article

## The status of application and physiotherapy-rehabilitation of prosthetics in Turkey

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**Abstract.** [Purpose] The aim of this study was to determine the frequency of prosthetic applications and to appraise the importance of amputee rehabilitation in Turkey. [Subjects and Methods] Questionnaires were administered to owners or employees of 36 institutions and the obtained data were evaluated. [Results] While 75% of institutions had no physiotherapist, 25% had 1 or 2 physiotherapists; there were 4 or fewer technicians in 86.1%, and the majority of employees were out of profession in almost all institutions. A total of 83.3% of institutions reported falls, 75% reported complications, 58.3% of them occasionally noted the need of repair; 55.6% of institutions made preprosthetic assessments, 63.9% used gait analysis, and 50% performed prosthetic rehabilitation frequently. [Conclusion] The results of this study reveal the need for more physiotherapists in these centers, the utilization of standardized-objective assessment methods, and development of rehabilitation processes for successful prosthetic applications and amputee rehabilitation in Turkey.

**Key words:** Physiotherapist, Amputee rehabilitation, Prosthetics

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### INTRODUCTION

Amputation is a complex procedure with physical, social, and psychological components. In developing countries, amputation rates have increased because of accidents, trauma, and various systemic diseases. A study in 2008 estimates nearly 2 million people are living with limb loss in the United States and it is projected that the number will more than double by 2050<sup>1)</sup>. A recent study that demonstrated the impact of limb loss in the US, showed that more than 57,000 (40%) of all amputation procedures were related to diagnose of diabetes<sup>2)</sup>. Unfortunately there is insufficient data about causes, procedures, and team-work for limb loss, and trauma-related amputation is more frequent in Turkey<sup>3, 4)</sup>.

Both traumatic and non-traumatic limb loss is often associated with multiple systemic conditions or complications like diabetes, obesity, cardiovascular disease, musculoskeletal problems, depression, and emotional stress<sup>2, 5)</sup>. Studies also estimate that 50% to 74% of people with limb loss have 5-year mortality rate higher than many cancers, especially due to vascular disease, diabetes, and some chronic conditions based on obesity<sup>2, 3, 6–8)</sup>. Therefore, the amputee requires multi-perspective expertise in coping with these systemic problems<sup>9–11)</sup>.

As a critical part of the rehabilitation program, physiotherapy has an important role in ensuring ideal functional outcome. In 1979, Malone et al.<sup>12)</sup> suggested that significant financial and therapeutic benefits accrue from the application of an accelerated rehabilitation approach. Additionally, recent studies indicated that amputees who were accepted into multi-disciplinary rehabilitation programs reached their highest functional level, and achieved or improved independent mobility and self-care

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with a significant reduction in time<sup>9-11, 13-15</sup>).

Therefore, in accordance with this literature, the aim of our study is to demonstrate the frequency of prosthetic applications and to appraise the importance of amputee rehabilitation in Turkey.

## SUBJECTS AND METHODS

Four hundred prosthetics application centers were contacted by e-mails or interviews. Questionnaires were administered to owners or employees of 36 institutions and the obtained data were evaluated. The questionnaire consisted of 3 subsections including information about the corporation, prosthesis, and rehabilitation. Descriptive information about corporation, number and profession of employees and frequency of professional training and scientific research were questioned in the first subscale. Amputation levels, types of applied prosthesis and the frequency of patient control were questioned in the prosthesis section. Assessment methods, rehabilitation protocols and complications were questioned in the rehabilitation section.

The study protocol was approved by the Non-interventional Clinical Researches Ethics Board of Hacettepe University Faculty of Medicine.

Data were analyzed statistically by using SPSS version 18.0. Survey responses were analyzed by using descriptive statistics such as frequencies and proportions.

## RESULTS

Four hundred prosthetics application centers were contacted by e-mails or interviews. Questionnaires that we created were administered to owners or employees of 36 institutions.

While 75% of institutions had no physiotherapist, 22.2% had 1 physiotherapist, 2.8% had 2 physiotherapists. There were 4 or fewer technician in 86.1% of the institutions and the majority of employees were out of profession in almost all institutions (Table 1); 55.6%, 75%, 16.7%, and 25% of the institutions frequently encountered above-knee, below-knee, above elbow, and below elbow amputees respectively (Table 2).

The frequency of manufacturing and application of classical prosthetics was 8.3%, that of technological prosthetics was 63.9%, and that of advanced technological prosthetics was 30.6% (Table 2).

Falls and complications were reported in 83.3% and 75% of the institutions, respectively, and 58.3% of them reported occasionally encountering cases with need of repair; 55.6% of institutions performed preprosthetic evaluations, 63.9% used gait analysis, and 50% performed prosthetic rehabilitation frequently (Table 3).

The reported evaluation methods were non-standardized, usually comprising measurement of stump and information about patient and amputation. Subjective methods, like observational gait analysis, were often used as a method of gait analysis. Rehabilitation process consisted of basic activities like wearing and removing prosthesis, transfers, stair climbing, and walking on uneven ground.

## DISCUSSION

The results of this study revealed that many of the institutions in Turkey do not employ physiotherapists specializing in prosthetics and orthotics, observational and subjective evaluation methods are used by the institutions, and rehabilitation program consists of only teaching basic activities of daily living with prosthesis.

Amputation is not only an aesthetic loss but also a permanent disability that affects functional independence<sup>16, 17</sup>). Appropriate prosthetic design, rehabilitation programs, and education are important to regain lost functions and improve the quality of life for amputees<sup>17-20</sup>).

At present, new prosthetic designs, technologically advanced, and expensive prosthetic components are available. Some of the prosthesis component manufacturers argue that new components create advantages to learn how to use these devices. However, technological progress and new expensive components do not trivialize the rehabilitation, and make it even more important<sup>21</sup>). Selection of the appropriate prosthetic components and rehabilitation are important for patient's daily life, occupational, and recreational activities<sup>22</sup>). Deficiencies related to physiotherapist employment, evaluation and rehabilitation processes in prosthetic application centers that were interviewed in this study can lead to errors in the choice of prosthesis, inability to sustain daily living and occupational activities and additional problems (wound on the stump, problems arising from gait disturbance, falls, etc.). The patient's health may be impaired due to these factors and patients may be affected socially and economically. Consequently, quality of life can be reduced.

Amputee rehabilitation is a long process and an experienced multidisciplinary rehabilitation team is necessary in order to achieve successful outcomes for upper/lower extremity amputees<sup>23</sup>). Experienced physiotherapists, physicians and technicians should be involved in the amputee rehabilitation process. Twenty-seven of the institutions participating in this study do not employ physiotherapists, 8 employ one physiotherapist and 1 employs 2 physiotherapists. These results indicate that the number of physiotherapists employed in prosthetic application centers is very inadequate. This number should be increased for more success in prosthetic application and amputee rehabilitation in Turkey. As known, physiotherapists contribute to improve balance and functional activities like walking, turning, walking uphill and on uneven grounds independently with or

**Table 1.** Frequencies of physiotherapists and technicians employed by institutions

n=36	0	1	2	3 or more
Physiotherapist	27 (75)	8 (22.2)	1 (2.8)	0 (0)
Technician	0 (0)	17 (47.2)	10 (27.8)	9 (25)

Values in parentheses are percentages.

**Table 2.** Frequencies of different levels of amputees admitted to these institutions and different types of prosthetics manufactured in these institutions

n=36	Frequently	Occasionally	Rarely	Never
Below knee	27 (75)	5 (13.9)	3 (8.3)	1 (2.8)
Above knee	20 (55.6)	10 (27.8)	5 (13.9)	1 (2.8)
Below elbow	9 (25)	13 (36.1)	12 (33.3)	2 (5.6)
Above elbow	6 (16.7)	10 (27.8)	17 (47.2)	3 (8.3)
Classical	3 (8.3)	7 (19.4)	20 (55.6)	6 (16.7)
Technological	23 (63.9)	12 (33.3)	1 (2.8)	0 (0)
Advanced Technological	11 (30.6)	13 (36.1)	9 (25)	3 (8.3)

Values in parentheses are percentages.

**Table 3.** Frequencies of preprosthetic evaluation and prosthetic rehabilitation made by these institutions

n=36	Frequently	Occasionally	Rarely	Never
Preprosthetic evaluation	20 (55.6)	0 (0)	0 (0)	16 (44.4)
Prosthetic rehabilitation	18 (50)	10 (27.8)	7 (19.4)	1 (2.8)

Values in parentheses are percentages.

without prosthesis after lower limb amputation<sup>24-26</sup>. They provide training to perform activities of daily living and self-care after upper limb amputation<sup>26</sup>.

Twenty institutions reported they often perform assessments before prosthetic application; 23 reported they often perform gait analysis; and 18 reported they often performed prosthetic rehabilitation. The indicated assessment methods were non-standardized, usually including knowledge of patient and amputation, stump measurements, and observational gait analysis. The indicated rehabilitation process included basic activities like donning prosthesis, transfers, climbing stairs, and walking on uneven ground. However, amputation is a permanent disability; therefore, amputee rehabilitation is essential not only in early prosthetic stage but also lifelong<sup>23</sup>.

Deathe et al.<sup>27</sup> found that there was no consensus regarding rehabilitation program or patient outcome measurement tools and the common outcome measures and rehabilitation methods were nonstandardized, informal methods in Canada, with their same study. These results are in accordance with the results obtained in our study.

A limitation of this study was the small number of centers participating in the research. Four hundred prosthetic application centers were contacted but only 36 participated in this study. This indicates that awareness of these institutions about the rehabilitation process is insufficient. To our knowledge, the majority of prosthetic application centers do not employ physiotherapists and information about rehabilitation of the other staff in these centers is limited. This may explain the limited participation in this study. In addition, some of the participants may not have answered all questions correctly with commercial concerns. Future studies should investigate the prosthetic applications and rehabilitation in these centers.

This study offers data about prosthetic applications, prosthetic application centers, and the status of the rehabilitation process in these centers in Turkey. The results of this study reveal the requirement for more physiotherapists working in these centers, the utilization of standardized-objective assessment methods, and the development of the rehabilitation process for successful prosthetic applications and amputee rehabilitation in Turkey.

This study can create awareness to develop appropriate recommendations in order to maintain prosthetic applications and ensure healthier amputee rehabilitation. Amputee rehabilitation should be considered in a broader context and physiotherapist employment should be increased for sufficient rehabilitation process in prosthetic application centers.

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