

Patient reported outcomes in an assistive technology clinic

Julie M. Faieta MOT, OTR/L¹; Theresa Berner MOT, OTR/L ATP¹; Wendy Koesters, PT, ATP/SMS¹; Carmen P. DiGiovine, PhD, ATP/SMS, RET^{1,2,3}

Carmen P. DiGiovine, PhD, ATP/SMS, RET^{1,2,3}

¹Assistive Technology Center, The Ohio State University Wexner Medical Center; ²Biomedical Engineering Department, The Ohio State University; ³Occupational Therapy Division, The Ohio State University

INTRODUCTION

This study aims to investigate the satisfaction with functional mobility among individuals with a mobility impairment who use assistive technology. Retrospective quality assurance data was utilized to determine client demographic and satisfaction levels as reflected by their patient reported Functional Mobility Assessment (FMA) scores. The FMA ranges from 1 to 6, with a higher score indicating greater satisfaction. These scores were averaged and compared by both diagnostic and mobility device type group. The average baseline FMA for 569 individuals (2011 and 2016) was 3.7 ± 3.7 . Diabetes, osteoarthritis, and chronic obstructive pulmonary disease were associated with lower satisfaction scores, while spinal cord injury, cerebral palsy and multiple sclerosis were associated with higher satisfaction scores. Clients not yet using an assistive device, or those using a cane or manual wheelchair were found to have statistically lower satisfaction scores as compared to individuals using power wheelchairs.

Potential factors for satisfaction scores may include the rate of disease progression (static vs dynamic), health literacy of the client, and client's ability to communicate their preferences specific to their unique environments and lifestyles. Clinical implications related to the study outcomes include considerations as to the value of prescribing mobility devices *dependent* on the client's highest level of function versus prescribing to *facilitate* the highest level of function. These results describe the population attending a clinic based assistive technology center, and can be used by clinicians to anticipate and address the mobility requirements of clients.

BACKGROUND

With the growing number of wheelchair users over past decades it is imperative that the individualized needs of this population be evaluated to ensure best outcomes along the continuum of care. [1] This aim is supported through improved mobility device fit and prescription for clients of varying diagnoses. Perceived functional ability outcomes can then be used to guide clinicians on how best to continue, or to adjust their interventions to fit the needs of each client based on their specific situation, condition, or device. Healthcare value has been described as outcomes, specific to a condition, relative to costs, across the continuum of care. [2,3] Better understanding of how to interpret and utilize outcome measures that are client centered, and both time and cost-effective directly influences a provider's ability to offer high value health care.

This study describes the results of a patient reported clinical outcome measure used to evaluate satisfaction of mobility device users attending a clinic based assistive technology center. Increased understanding of the client's perception of their wellbeing and health related quality of life, specifically as it is seen among diagnostic and device type groups, allows us to begin hypothesizing about the underlying reasons for higher satisfaction in one group versus another. Furthermore, by increasing awareness of potential differences between these groups, we can begin to develop clinically translatable guidelines on the individualized needs of various consumer groups, ultimately increasing client centered care. The objective of this study was to describe patient reported satisfaction with functional mobility according to diagnostic and device type groups.

METHODS

Retrospectively collected data for 569 individuals between 2011 and 2016 was considered in this analysis. Data was collected upon each client's initial visit as part of a quality assurance program at the Ohio State University Wexner Medical Center Assistive Technology Center. Inclusion criteria included individuals with a mobility impairment who completed the baseline Functional Mobility Assessment and a Uniform Dataset (UDS) survey as part of the quality assurance program. Demographic data was collected and stored on a database collaborate hosted by the University of Pittsburgh. The UDS information included client age, gender, diagnosis, and device type. Client data was organized and evaluated by diagnosis and mobility device type.

Device types included power wheelchair, scooter, manual wheelchair, cane, or no device. Client's satisfaction scores were measured using the Functional Mobility Assessment (FMA), a reliable patient reported outcome

measure that evaluates the individual's satisfaction with functional ability while using an assistive device [4]. This assessment was revised from the Functioning Everyday with a Wheelchair Assessment (FEW) which has established validity. [5,6,7] The revisions differentiating the FEW from the FMA include simplified verbiage on assessment items, making it more user friendly to clients, and rewording to make the assessment applicable to those not yet using a wheelchair or using a mobility device other than a wheelchair. The FMA quantifies client satisfaction with functional ability while using a mobility device in 10 areas: daily routine, comfort needs, health needs, operability, reach to various surface heights, transfers, personal care, indoor mobility, outdoor mobility, and use of transportation. Each assessment item is rated by the clients on a 6-point Likert scale yielding a highest possible score of 60. Scores were totaled and divided by the number of items answered to address the potential impact of unanswered questions. This scoring method results in a 1-6 range with 6 indicating completely satisfied. For example, a score of 40 divided by 8 items answered yields a calculated score of 5. FMA score averages were calculated for each diagnostic and device type category. Diagnostic group averages with N>5 were considered when reporting highest and lowest average scores to ensure that the average based on a small N would not dominate the rankings. A one-way ANOVA was conducted to evaluate any main effect of group. If significant main effects were found, post hoc pairwise comparisons were used to determine significant differences between each device type groups. Statistical analyses were completed using RStudio 1.0.153 software.

Table 1. Diagnosis groups

Diagnosis	N (% of total)	FMA Ave Score (SD)
Spinal Cord Injury	108 (18.98)	4.44 (1.31)
Cerebral Palsy	98 (17.22)	4.24 (1.35)
Multiple Sclerosis	49 (8.61)	3.65 (1.45)
Stroke/CVA	48 (8.44)	3.3 (1.45)
Osteoarthritis	42 (7.38)	2.61 (1.18)
Chronic Obstructive Pulmonary Disease	31 (5.45)	2.61 (1.57)
Amyotrophic Lateral Sclerosis	27 (4.75)	3.64 (1.38)
Traumatic Brain Injury	20 (3.51)	3.11 (1.57)
Muscular Dystrophy	20 (3.51)	3.94 (1.55)
Spina Bifida	16 (2.81)	3.81 (1.42)
Parkinson's Disease	15 (2.64))	3.45 (1.52)
Above Knee Amputation	13 (2.28)	2.97 (1.37)
Below Knee Amputation	11 (1.93)	3.56 (1.58)
Rheumatoid Arthritis	11 (1.93)	2.36 (0.99)
Congestive Heart Failure	9 (1.58)	3.47 (1.53)
Post-Polio Syndrome	9 (1.58)	3.86 (1.53)
Degenerative Joint Disease	8 (1.41)	2.76 (1.12)
Diabetes	7 (1.23)	2.53 (1.17)
Friedreich's Ataxia	6 (1.05)	3.43 (1.41)

Table 2. Device type groups

Device Type	N	FMA Score (SD)
Power Wheelchair* **	181	4.07 (1.33)
Scooter **	14	3.99 (1.65)
Manual Wheelchair **	260	3.76 (1.56)
Cane	91	2.8 (1.12)
No Device	23	2.36 (1.55)
* Significant difference with Manual Wheelchair,** with cane, and no device.		

RESULTS

Data analysis of the entire sample population revealed a mean FMA score of 3.65, SD 3.7 (out of 6 possible points) reflecting a moderate level of satisfaction. Of 27 diagnostic categories, the highest proportion of individuals within our sample had a primary diagnosis of spinal cord injury (SCI) 19%, cerebral palsy (CP) 17%, and multiple sclerosis (MS) 9% (see Table 1). The diagnostic groups presenting with the highest satisfaction scores were SCI, 4.44; CP, 4.24; and Muscular Dystrophy, 3.94. The groups reporting the lowest satisfaction were those with Diabetes, 2.53, Osteoarthritis, 2.61; and Chronic obstructive pulmonary disease (COPD), 2.61. Evaluation of groups by device type showed that the power wheelchair group was the most satisfied, with a mean FMA score of 4.07, followed by the scooter group, 3.99, manual wheelchair group, 3.76, cane group, 2.8, and those not yet utilizing a mobility device, 2.36 (see Table 2). Differences between device type scores were analyzed for significance, $p < .05$. There was a significant main effect of device type group. Significant differences were found between manual and power wheelchairs; between canes and power wheelchairs, scooter, and manual wheelchairs; and between no device and power wheelchairs, scooter, and manual wheelchairs.

DISCUSSION

The results of this investigation demonstrate the spectrum of satisfaction levels seen among those coming to a clinic based assistive technology center. The FMA scores by diagnosis ranged from very low satisfaction ratings to almost completely satisfied, reflecting individualized needs, available devices and the policies that are designed to support these individual groups. The outcomes by device type showed that groups utilizing devices of higher

levels of assistance such as power wheelchairs or scooters, presented with higher satisfaction scores as compared to those using lower assist devices, such as manual wheelchairs and canes. This discrepancy could be the result of a number of factors such as extent of assistive technology professional involvement in attaining the device, the sub-type of the mobility device (e.g. group 2 PWC, group 3 PWC), and the frequency of follow-along care provided. This component of care, follow-along after the initial device prescription, helps to ensure that the device continues to meet the functional needs of the individual across time. Further investigation into the factors that lead to poor satisfaction ratings by individuals with specific conditions will help to determine whether they are related to the nature of the condition, standard care, or to the reimbursement standards specific to that condition.

Clinical implications

The results of this study provide information on the diagnoses that appear to carry lower functional satisfaction while using a mobility device, within the assistive technology clinic setting. Causation for the discrepancies between diagnostic groups of high versus low satisfaction averages was not directly investigated. However, there are a number of characteristics that should be considered and that may warrant future research. Diagnoses in which individuals remain at a relatively static functional level versus those that are progressive or dynamic in nature may affect functional ability levels. In a more static disease progression, such as SCI or CP, the individual may develop compensatory abilities, functional preferences, and over time may grow in their health literacy specific to the symptoms and factors associated with their condition. In contrast, individuals with conditions that develop and worsen over time and/or progress with aging, such as osteoarthritis and COPD, may have less experience dealing with the mobility factors associated with that condition. Even if the individual and his or her clinician is invested in their care and willing to advocate for the most efficacious interventions, the dynamic or variant nature of the condition may hinder best care efforts. Placing emphasis on client centered care necessitates that patients be meaningfully involved in their own care, which requires a patient to evaluate and understand their condition in the context of their environment and as it affects their ability to participate in the activities that are meaningful to them. A patient's understanding of their condition both in terms of health literacy and functional implications, is at the center of their ability to develop functional preferences and to self-advocate for their individualized mobility needs, and subsequently improve the match between mobility device fit and client needs. Frequent changes in the severity and therefor functional impact of a condition has the potential to negatively impact the clients understanding of their mobility needs and preferences. While the satisfaction scores did not clearly delineate between diagnoses of more static versus dynamic natures, and while each diagnoses carries within it variation between static and dynamic cases, the relationship between the variant nature of a diagnosis and patient reported satisfaction with functional mobility warrants further research to determine whether or not a correlation exists.

In addition to the difference in baseline satisfaction seen across diagnostic groups, statistically significant differences were found between various mobility device types. Both no device and cane groups were significantly lower than all other mobility device types, similarly the manual wheelchair group was significantly lower than the power wheelchair group in terms of functional satisfaction. Here too we can hypothesize factors influencing these differences. One hypothesis is that the lower baseline satisfaction seen with the manual wheelchair group versus the power wheelchair group results from a mismatch between the mobility device and the individual client's day-to-day environment and preferred or valued activities. It can be argued that manual wheelchairs should be prescribed to those who are technically able to safely utilize them, and that prescribing power wheelchairs to these same individuals would in a manner hinder their independence and lead to a decline in functional status. However, even if an individual is able to self-propel a manual wheelchair, this device may limit their functional participation in activities that require upper extremity reach or cardiorespiratory endurance, or other factors that might be addressed with a power wheelchair. While a manual wheelchair could offer increased exercise opportunity, using a power wheelchair would not prohibit involvement in exercise prescriptions and recreational activity. Furthermore, a power wheelchair may increase the likelihood that an individual will participate in physical activity if appropriately fit for maximized comfort and tailored to the needs of individual context and activity preference. From this point of view, a power wheelchair may facilitate the highest level of function and participation for an individual who technically could manage with a manual wheelchair.

Limitations and future research

Limitations of this study include the small sample size within a number of the diagnostic categories. Future studies should confirm satisfaction levels in these populations using larger sample sizes. In addition, due to the specificity of the population investigated, these results may have limited generalizability. However, this investigation provides detailed description of the population attending a clinic based assistive technology center. Continued

research is needed to further investigate the impact of client factors on mobility device outcomes in order to develop impactful and feasible standards of care for mobility impaired populations.

Future studies should further investigate more detailed wheelchair categories and their corresponding functional satisfaction levels. Additional research is needed to better understand the relationship between the current, predominant reimbursement models and functional outcomes. Finally, continued investigation into definitive causations between diagnoses and functional mobility levels is needed to further improve the standards of care provided to individuals utilizing mobility devices.

CONCLUSIONS

With over 3.5 million wheelchairs users in America alone, it is imperative that research continue to investigate effective methods of care for individuals with mobility impairments. [8] These results describe the characteristics and varying needs of individuals attending an assistive technology clinic. The significant differences in satisfaction with functional mobility factors between users of different mobility devices and the variation in satisfaction by diagnostic groups provides clinically relevant information to inform healthcare providers working with this population. Continued research to better understand the causal factors associated with these discrepancies in satisfaction should build on this information in order to improve current standards of care and to support the highest level of independence and quality of life for individuals with mobility impairments.

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