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Use of an economical wheelchair in India and Peru: Impact on health and function

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Summary

Background: The overall impact of a wheelchair on its user must be evaluated in light of both benefit and risk. Evaluation should include not only physical function, but also overall quality of life, integration into society, and cost effectiveness. The current study examined the impact of a donated, inexpensively made wheelchair on recipients in 2 different countries.

Material/Methods: 188 recipients of the Free Wheelchair Mission (FWM) wheelchair in India and Peru were surveyed in their local setting and language by social workers. Results were entered and transferred electronically for analysis.

Results: At the time of the survey, the wheelchairs had been in use for an average of 18 months. 93.1% of recipients used their wheelchair more than 1 hour/day. Receipt and use of the FWM chair resulted in a significant shift toward independent function in 5 of 6 areas drawn from the International Classification of Functioning, Disability, and Health. The greatest maintenance problem was with the tires (19.7%), similar in frequency to reported U.S. users. There was an unexpected 11.7% decrease in the incidence of pressure ulcers with use of the wheelchair, most likely associated with increased mobility. Reported pain levels were not believed by participants to be related to use of the wheelchair. The impact on health and quality of life was generally viewed as positive. Monetary cost of the wheelchair is minimal.

Conclusions: In summary, recipient evaluation of the Free Wheelchair Mission wheelchair in 2 different countries has shown a positive, cost-effective benefit to both health and function without unusual risk.

key words: **wheelchairs • pressure ulcer • cross-cultural comparison • World Health Organization**

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Background

According to the 58th World Health Assembly (resolution WHA58.23), 80% of the world's disabled population lives in low income countries [1]. The World Health Organization Action Plan 2006–2011 for Disability and Rehabilitation envisions all persons with disabilities living in dignity, with equal rights and opportunities [2]. It reports, however, that in many developing countries only 5–15% of people who need assistive devices and technology have access to them.

When local needs remain unmet due to poverty, war, or lack of resources, the international community may help to fill the void. This is often done, however, without retrospective analysis to determine the impact. One example of this is in the production and distribution of wheelchairs worldwide. Although standards for wheelchair construction and durability have been developed by the International Standards Organization (ISO) and Rehabilitation Engineering and Assistive Technology Society (RESNA), there is no requirement for adherence [3].

Mukherjee and Samanta examined the fate of 162 donated wheelchairs in India [4]. They found that 57.4% of donated chairs were not used and 14.2% had been sold. Reasons for low usage included pain, fatigue, discomfort, and unsuitability to the climate.

This is explained, in part, in a study by Mulholland et al. [5] who evaluated the mobility needs of 10 disabled women from one state in India. Authors examined the physical environment (house and surrounding area), and usual activities. Five families had running tap water; five retrieved it from a separate location outdoors. Some had toilets and bathing facilities indoors; others went outdoors. During monsoon season, the ground outside was muddy and slippery. Authors concluded that a mobility device for this population would need to be rugged and able to maneuver over rough terrain. The donated wheelchairs in Mukherjee's study may not have met these criteria.

Related to the environment, are issues of durability. Mechanical failure has been found to influence both wheelchair usage and user satisfaction. Fitzgerald et al. [6] examined the quantity of wheelchair repairs encountered by 130 wheelchair users, and found that user satisfaction was linked to the amount of repair.

There are also major health concerns to be considered in the population of wheelchair users, including the development of pressure ulcers and the presence of pain [7–10]. Any benefit received from use of a wheelchair must be evaluated in light of the associated risk in safety and overall health of its recipient.

This impact is best evaluated by feedback from the user. Vos et al. [11] received feedback on 2 prototypes of a low cost wheelchair for use in South Africa. Sixteen people evaluated prototype 1 and thirty-four evaluated prototype 2 for maneuverability on various surfaces, ease in turning, transfers, and comfort. One person evaluated it on outside terrain for 1 month and experienced no operational problems or material wear. Authors concluded that the wheelchair was comfortable, safe, durable, and highly maneuverable.

Mulholland et al. [12] evaluated responses of eight women in India who tested a prototype mobility device for 20 minutes. Women were asked questions related to comfort and maneuverability, and to envision its use during daily activity in terms of usefulness. Authors highlight the importance of consumer feedback in the process of product development, and that the needs of the individual must be balanced with medical concerns and engineering constraints.

Function in a wheelchair is typically evaluated in terms of performance on a series of tasks as summarized by Kilkens and Post [13]. It focuses on the user's skill level in a wheelchair. There are few examples in the literature of studies which evaluate the broader impact of a wheelchair on the function and quality of life of recipients. Reid et al performed a meta analysis of literature reports on the impact of wheeled seated mobility on the occupational performance of users and their caregivers [14]. They concluded that studies emphasized the physical performance component, with not enough attention to the effect on occupational performance, and the broader environmental context.

The International Classification of Functioning, Disability, and Health was developed by the World Health Organization to provide a broad framework for the description of health and health-related states [15]. It includes a description of body functions, body structures, activity and participation, and takes into account the interaction of environmental factors. According to Ustun et al. [16], the ICF offers a tool for understanding function and disability in clinical, research, and policy development. Use of the ICF in Physical Therapy evaluation and treatment has been shown by Finger et al., to be a helpful tool in providing an international common language and frame of reference [17].

Wheelchair mobility is believed to be influenced by various factors including the user's medical and physical profile, psychological characteristics, personal attitudes, sociocultural and spiritual characteristics, and participation in community activities [18]. Routhier et al's conceptual model includes bi-directional arrows between influencing factors and mobility. It presupposes that as these factors affect mobility, so use of a wheelchair affects factors such as social roles and activities. Authors state that there is little evidence in the literature to support such a supposition, although it is reasonable.

The current study has solicited feedback from wheelchair recipients to provide a comprehensive evaluation of the impact on their lives. It examined daily usage of the wheelchair, change in function since receiving the chair, repair statistics, and the broader impact on health and quality of life.

Material and Methods

Subjects

Using records obtained from the Free Wheelchair Mission (FWM), 100 recipients of its wheelchair in India and 100 in Peru were identified. These 2 countries were chosen because they represent 2 different continents and because more detailed record keeping was available relative to the diagnosis of recipients. Each wheelchair participant had received the chair during the previous 33 months, and could be reached

Table 1. Demographic Variables n=188.

Age		Level of education		Gender		Diagnosis	
	% of recipients		% of recipients		% of recipients		% of recipients
1–10 years	4.8%	No formal education	20.2%	Male	56.4%	Amputee	9.6%
11–20 years	15.4%	Primary	33.0%	Female	43.6%	Accident	13.3%
21–30 years	7.4%	Intermediate	6.9%			Stroke	12.0%
31–40 years	12.2%	High school	25.0%			Congenital disability	25.0%
41–50 years	9.6%	University/technical	7.4%			Spinal cord injury	5.3%
51–60 years	10.6%	Special education	7.5%			Arthritis	8.0%
61–70 years	16.0%					Other orthopedic	5.0%
71–80 years	12.8%					Other neurologic	21.0%
81–90 years	10.1%					Other general	2.1%
91–100 years	1.1%						

for an interview. Subjects who had used the wheelchair for less than 6 months were excluded. Final data for the study included responses from 100 recipients in Peru and 88 in India. No other attempt was made to randomize subjects.

Age range of recipients was 3–93 years with an average of 50±25 years. Slightly more males than females received chairs. Average BMI was 22.8±4.8. The level of education ranged from no formal education through university. The greatest number had completed elementary school as the highest educational level. Of the 188 wheelchair recipients, 7.4% were employed, and of those, 43% said the wheelchair was responsible for their ability to be and remain employed. The largest group of wheelchair users had a diagnosis of congenital disability (25%) including Cerebral Palsy and Spina Bifida.

Prior to receiving a chair for mobility, 47.9% of recipients were carried, 10.1% crawled, 11.2% used a roller device, 21.8% used crutches or a cane, 4.3% used a borrowed chair, and 1.1% did not move. Of the 188 recipients, 26.6% walked short distances and 1.1% walked long distances. In terms of daily activity, 41.5% spent their days lying in bed; 10.1% either sat or lay on the ground, and 42.6% sat in another chair. Further demographic data is presented in Table 1.

Wheelchair recipients learned about the chair from friends or family members (36.2%), from the media (26.6%), or from the government (20.2%). In India distribution was made through a local charity; in Peru distribution was made through the government.

The wheelchair

The wheelchair is a product of the Free Wheelchair Mission (Figure 1). The parts are mass produced in China and shipped around the world, where they are assembled and distributed by local workers. The chair weighs 35 pounds (16 kg), has 8 inch natural rubber castors in the front, and 24 inch pneumatic (mountain bike) tires with brakes in the rear. It has a rigid non-folding frame made of Q195 cold rolled steel tubing. The chair itself is made of polypropylene resin with a UV stabilizer. It uses nylon insert stay-tight nuts. There is a tubular footrest with 2 possible leg lengths. Later wheelchair recipients received a one inch thick polyurethane foam cushion, an air pump, a patch kit, and a 5 strap adjustable harness along with the chair. Current cost of the wheelchair, including production, assembly, and delivery to the client, is $51.29 [19]. Wheelchairs are provided free of charge through private donations.

Survey

A survey was developed to evaluate the impact of the FWM wheelchair from the perspective of recipients and their families (Appendices 1 and 2). It was designed to evaluate risk and benefit, and included the following areas:
1. Usage of the chair (number of hours/day).
2. The change in function (activities and participation).
3. Wheelchair maintenance and repair.
4. Health and quality of life of recipients.

Change in function was based on the World Health Organization (WHO) International Classification of Functioning, Disability, and Health (ICF) activities and participation section. Survey questions were drawn from the following ICF areas: Mobility, self-cares, domestic life, interpersonal interactions and relationships, major life areas, and community, social, and civic life. They are listed in Appendix 2 with the associated ICF classifications.

Issues related to maintenance and repair were separated by area: the frame, tires, brakes, and resin chair. Feedback was solicited on the frequency of breakdown, perceived strengths and weaknesses of the wheelchair with suggestions for improvement. Questions on health and quality of life included the areas of pain, skin breakdown, overall health and quality of life.

Figure 1. The free wheelchair mission wheelchair.

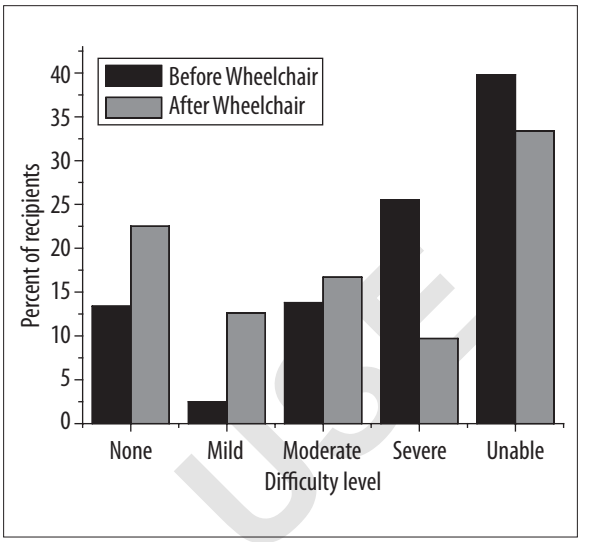

Figure 2. Total of all categories: Change in function n=188.

Data analysis

Permission to conduct the study was granted by the Institutional Review Board of Azusa Pacific University. Using local contact information gathered at the time of wheelchair distribution, each person was interviewed in their home by a national social worker. Subjects were informed about the purpose of the survey and the confidential use of information, then given the option to participate. The choice to participate was considered voluntary consent. Parents were allowed to complete the survey on behalf of their child.

The social worker collected data on a paper form of the survey, and at a later date, entered it electronically into a file in Survey Monkey©. Summary descriptive data with means and standard deviations was then calculated from each section of the survey. Data from the two countries was combined in the areas of health and function since the effect of the wheelchair was assumed to be the same. A paired-sample t-test (significance level $p<0.01$) was used to evaluate the reported incidence of pressure ulcers before vs after use of the wheelchair. Data on wheelchair usage, repair and maintenance was separated by country to account for differences in the environmental context.

To evaluate the change in function, the reported level of difficulty for each area in the activities and participation section of the survey was compared before versus after receiving the wheelchair using a paired-sample 't' test (significance level $p<0.01$). As in the ICF, each area of participation (e.g. self care) contained several questions, each with an assigned a 0–4 point scale (e.g. washing self, brushing teeth, toileting). Values from the individual questions were then combined in each area of participation, and summary values were treated as continuous data. Scores in the mobility section, therefore, ranged from 0–24, whereas in the self-care section from 0–32.

Results

Wheelchair usage

Prior to the survey, recipients had been using the FWM chair from between 6 and 33 months; average usage was 17.9±8.0 months. 62.2% of recipients were able to use the chair independently for mobility. All others were transported in the chair by family members or friends. In terms of daily usage, only 6.9% reported using their chair less than 1 hour/day, 46.3% used it 1–4 hours/day, and 46.8% used their chair more than 4 hours/day.

Effect on function

Compared to function before receiving the wheelchair, there was a decrease in the percentage of participants who performed tasks with severe difficulty and an increase in the percentage who experienced moderate, mild, or no difficulty, representing a significant shift ($p<0.001$) (Figure 2). A similar pattern of change ($p<0.001$) was evident in the individual categories of mobility, self cares, domestic life, interpersonal interaction and relationships, and community, social, and civic life. Change in major life areas was not significant.

Repair and maintenance

The most common maintenance problem reported was with the wheels (6.4% front, 13.3% back) including flat tires or difficulty with the valves. The problem with the rear wheels was greater in India (21.6%) than Peru (5.0%). There were no reported problems with the steel frame, cushion, or harness. 2.7% reported problems with the resin chair. Reporting a problem in one area did not exclude reporting in another area as well.

Effect on health and quality of life

Skin breakdown.

19.7% of recipients reported having experienced skin breakdown at some point in their lives. 18.6% of the population had one or more ulcers/year before receiving the chair; 6.9% had one or more afterward, a significant change ($p<0.003$) (Figure 3). Eighty-one percent of reported ulcers occurred in the buttock region. 75.7% of those with a history of ulcers were in Peru; 24.3% were in India.

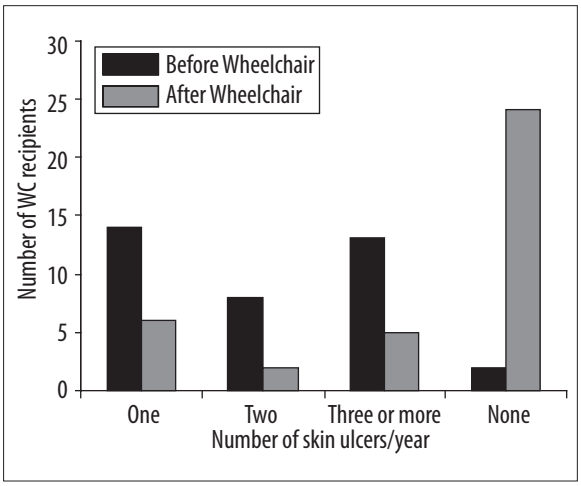

Figure 3. Frequency of wheelchair users with skin ulcers: Before vs after receipt of wheelchair n=37.

Pain

48.4% of recipients reported the presence of chronic pain. Of those, 40.7% had back pain, 65.9% had leg pain, 18.7%, buttock pain, and 17.6%, upper extremity pain. 96.7% believed that their pain was not due to use of the wheelchair.

Overall health and quality of life

Participants rated the status of their overall health as fair to poor. Health was the largely the same (45.2%) or improved (42.6%) since receiving the wheelchair. 12.3% experienced worsening health. For those whose health had changed, the wheelchair was believed to be at least partially responsible for the change in 72.9% of cases. In addition to the wheelchair, factors reported to cause a change in health or function included diet, medication, rehabilitation, dialysis, and faith. Asked how the wheelchair had affected their quality of life, 56.2% said it was improved, 42.8% said their life was about the same, and 1.1% believed it was worse.

Discussion

Subject characteristics

Participants were spread throughout the lifespan, educational, and diagnostic continua, thus providing a representative sample. Their means of mobility, or lack of it, prior to receiving the wheelchair underscores the plight of the disabled when financial resources or equipment are unavailable. Only 4.5% had the option of borrowing a wheelchair; none owned one. The fact that 41.5% had previously spent their days lying in bed highlights the enormity of the gift of mobility.

Wheelchair usage

The usage statistics in this study stand in stark contrast to those reported by Mukherjee and Samanta [4]. In India, 31% of recipients could use the wheelchair independently for mobility as opposed to 7.4% in Mukherjee and Samanta's study. In the current study, only 6.9% reported using the chair for less than 1 hour/day versus 57.4% of chairs in the other study which were not used. This discrepancy may, in part, be explained by the tires used in the two different models of wheelchairs. FWM chairs have rear pneumatic tires which are better for uneven terrain, along with standard 8 inch castors in the front. Tires in the other model were locally made 24 inch solid tires in the rear, with 4.5 inch castors. The FWM chair weighs 16 kg (35#) versus 25 kg (55#) in the other model. Mukherjee and Samanta concluded that hand rim-propelled manual wheelchairs are unsuitable for outdoor ambulation, and of little use indoors because of difficulty maneuvering. In the current study, 93.1% of participants used their wheelchairs more than 1 hour/day, both indoors and outdoors.

Effect on function

Areas most commonly measured in functional wheelchair assessments focus on skillful performance of the user. For example, the Wheelchair Skills Test (WST) developed by Kirby et al. [21,22] consists of 50 skills (version 2.4). It includes manipulation skills such as applying brakes and footrests, turning, negotiating curbs, wheeling on various surfaces, and transferring in and out of the chair.

The current study focused on daily function at home and participation in society. The reported change from tasks being severely difficult to becoming minimally difficult represents a significant improvement in the quality of life for wheelchair users. Increased mobility, increased independence in self cares, and an increased ability to interact within the community represent an increased contribution to family and society. This is supported by the fact that 89.8% of recipients believed the wheelchair had helped their family.

Since there was not a significant change in major life areas, activities such as employment and education may be dependent on factors other than an available wheelchair. Such factors might include access to public transportation and buildings, accommodations for the disabled at school and the workplace, and attitudes of discrimination.

These results lend support to Routhier et al's model [18] with bi-directional arrows between wheelchair mobility and factors such as the user's profile, environment, and daily activities. Just as these factors influence wheelchair mobility, so availability of a useful wheelchair influences socio-cultural interaction, independence in personal care, and participation in domestic activities.

The use of the International Classification of Functioning, Disability, and Health to evaluate assistive technology represents a recognition that technology is beneficial only when it translates into increased function and health. Although commonly used to describe disability in various patient populations [23–29], van der Woude [30] and Scherer [31], believe the ICF also relates to research and the development of assistive technology. Lenker et al. [32] note that the model "does not clearly delineate parallel interventions that affect performance" (such as assistive technologies), thus requiring modification for this application. The current study has used components of the model to assess change in function resulting from a donated wheelchair. Although it drew largely from the activities and participa-

tion section, it also included the effect of the wheelchair on pain levels (b280).

In describing the ICF, Arthanat et al. [33] explain that, "the successful completion of activity and participation involves the integration of body structures and functions in a purposeful manner within various contexts". This study has shown that a culturally appropriate wheelchair facilitates this process, and that the ICF activities and participation framework is a useful tool in describing the change.

Repair and maintenance

The largest amount of maintenance reported was with the tires, particularly the rear tires in India. This can partly be attributed to incompatibility between FWM wheelchair tire valves (Shradder) and the valve stem on Indian air pumps. Many participants in the study did not have easy access to the air pump currently supplied with each wheelchair, making routine filling with air difficult. Common precipitating factors for maintenance in both countries were reported to be a defective part (16.0%), usual wear and tear of the environment (7.4%), or an accident (2.7%).

There is little public information related to wheelchair durability in a patient population, and it is, therefore, difficult to compare maintenance statistics with other manufactured chairs. Fitzgerald et al. [6] administered a questionnaire to 130 wheelchair users from the National Veterans Wheelchair Games and others about satisfaction with their current wheelchair. The study included a wide variety of wheelchairs, including both manual and power, ultralightweight, depot, and lightweight. They found that 26.3% of participants had incurred repairs within the past 6 months. In the current study, 28% of FWM recipients reported a repair at some time during use (average 18 months). In Fitzgerald's study, 27.2% had tire problems with a higher percentage in manual wheelchair users. Of FWM recipients, 19.7% reported tire problems; all participants used a manual wheelchair. Although Fitzgerald et al found no correlation between the age of the chair and the number of repairs, average daily usage in their study was 12 hours/day; in the current study, only 11.7% used their chair more than 8 hours/day. Outdoor environmental conditions are assumed to be more rigorous in India and Peru than in the United States, which may have exacerbated the need for maintenance in the current study.

Effect on health and quality of life

Skin breakdown

In a study by Sumiya et al., [20] 85.6% of paraplegic participants had a history of pressure ulcers. The number in current study (19.7%) is considerably smaller, most likely due to the varied diagnoses. 50% of FWM recipients reported that their diagnosis affected 2 lower extremities, consistent with paraplegia among other diagnoses. The higher number of ulcers in the Peru population is most likely due to the number of hours spent seated in the wheelchair/day. 60.7% in Peru versus 11.1% in India spent more than 4 hours/day in the wheelchair.

In participants who were able to use the chair independently for mobility, 15.5% reported ulcers prior to receiving the wheelchair (one with constant ulcers), and only 1.4% reported ulcers afterwards (one/year). The simple act of wheeling the chair may provide some form of pressure relief. Therefore, acquisition of a wheelchair for those who can be independently mobile may provide a means of protection against pressure ulcers. Further study is needed to confirm this.

In the current study, two individuals reported having one skin ulcer/year after receiving the chair who had none beforehand. Both were in Peru and sat in the chair 5–8 hours/day. One was a 74 year old male with a history of diabetes who was on dialysis and developed a foot ulcer. This may be a diabetic ulcer rather than a true pressure ulcer caused by the wheelchair. The other was a 12 year old male with hydrocephalus. Neither of these recipients used the chair independently for mobility, and both reported diagnostic involvement of all 4 extremities, causing dependence on caregivers for pressure relief.

Pain

The incidence of pain in the current population (48.4%) is not uncommon. Gironda et al. [8] reported that 81% of their population (veterans with paraplegia) reported a minimal level of ongoing pain. Sixty-nine percent complained of upper extremity pain. According to Boninger et al. [7] 66% of veteran participants reported neck pain since becoming a wheelchair user; 60% had pain within the previous month. Since most in the current sample (96.7%) believed that use of the wheelchair was not responsible for their pain, it is most likely related to their primary diagnosis.

Overall health and quality of life

The overall impact of the wheelchair on health and quality of life of participants is a positive one. Change in health from other factors was not evaluated in this study and cannot be completely isolated from the effect of the wheelchair. In the two participants who reported a worsened quality of life, there is apparent inconsistency. One stated that he had excellent health, much better because of the wheelchair, no ulcers and no maintenance problems. He was employed, and used the chair less than 1 hour/day for long distance mobility. The other was a 28 year old male who rated his overall health as poor and worsening due to factors other than the wheelchair. His number of skin ulcers decreased from 3/year to 1/year; he reported no chronic pain, no wheelchair repairs, and the function rating showed improvement in every area. Therefore, it seems likely that these two individuals misinterpreted the question.

Cost effectiveness

Since WHO estimates that in developing countries, only 5–15% of people who need assistive devices have access to them, there is need for an increased supply of cost- effective wheelchairs. The monetary cost of the FWM chair stands in contrast to those commercially available in both the U.S. and Europe. This study confirms that a basic, durable wheelchair can be produced for under $52.00. However, the provision of an economical chair can only be considered beneficial if other requirements of health, safety, and function are met. In the two populations surveyed, these requirements appear to have been met.

Limitations of the study and suggestions for future research

The donation of FWM wheelchairs is in keeping with the organization's mission to serve the underprivileged [34]. Because the chair was a gift, however, this may have created a favorable bias to reported data.

Use of a survey required participants to retrospectively report on the incidence of pressure ulcers and the details of function. Since the passage of time may alter memory, future studies may wish to collect data at the time of wheelchair distribution and then again in 12 months.

This study examined the use of the FWM chair in 2 different countries and continents. However, both areas of distribution took place in temperate climates. Since the durability of polypropylene construction may be influenced by temperature, future studies should account for variations in temperature and topography. Furthermore, examination should be made of the energy cost required to propel this chair in comparison to other models.

Conclusions

The overall impact of a wheelchair on its user must be evaluated in light of both benefit and risk. In the current study, this effect was evaluated through usage of the chair, change in function as defined by 6 areas from the ICF, repair statistics, monetary cost, and the impact on health and the quality of life.

Receipt and use of the FWM chair resulted in an important shift toward independent function in 5 of the 6 areas evaluated. There was significant improvement in mobility, self cares, domestic life, interpersonal interaction and relationships, and community, social, and civic life. The positive impact may be reflected in overall health and quality of life scores.

While daily wheelchair usage is less than in some reported studies, the FWM chairs had a small abandonment rating over 18 months of use. Despite the problem with tire valves in India and harsher environmental conditions, repair statistics are similar to reported U.S. users. The impact on health was evaluated through the number of pressure ulcers and pain levels. There was an unexpected decrease in the overall number of ulcers with use of the wheelchair, most likely associated with increased mobility. Reported pain levels were less than others reported, and not believed by participants to be related to use of the wheelchair. The impact on overall health and quality of life was generally viewed as positive. These benefits were provided in a cost-effective manner.

In summary, an evaluation of benefit versus risk associated with use of the Free Wheelchair Mission chair in 2 different populations has shown an important, cost effective benefit to both health and function without unusual risk.

Appendix 1

Questions from initial survey.

A. Demographic Data
1. Date of Interview and Interviewer
2. Date of receipt of wheelchair
3. City, county, country where wheelchair recipient lives
4. Age, gender, height, weight, education level, employment
5. Medical diagnosis or reason for use of wheelchair

B. Mobility
1. The mode of mobility prior to receiving the wheelchair (e.g. carried, crawled, crutches)
2. Able to walk? (long distances, short distances)
3. Use the wheelchair independently for mobility?
4. Prior to receiving the wheelchair, where spent waking hours? (e.g. sitting in another chair, sitting on the ground, lying in bed)
5. Factors other than the wheelchair which have caused changes in mobility or function during this time (e.g. change of address, loss of spouse or caregiver, medication, rehabilitation)

C. Health and quality of life
1. Overall health and well-being
a. Current health status (good, fair, poor)
b. Change in health status since receiving the wheelchair (better, worse, no change)
c. If health has changed, how much of the change is due to the wheelchair? (percent)
d. How the wheelchair has affected quality of life (better, worse, no change)
e. Helped the family?
2. Pressure Ulcers
a. Number of skin ulcers per year before and after receiving the wheelchair (e.g. one, two, three/yr)
b. Location of skin ulcers
c. Number of hours/day spent sitting in the wheelchair
d. Use of cushion in the chair (FWM cushion, family made)
e. Sense of touch (normal, decreased in feet, legs, pelvic area)
f. Ability to control bowel and bladder (normal, decreased)
g. Adequate nutritious meals (number/day)
3. Pain
a. Severity of pain before and after receiving the wheelchair (No pain, mild, moderate, extreme)
b. Location of the pain (back, leg, buttock, arm and shoulder)
c. Due to use of the wheelchair?

D. Repair and Breakdown
1. Number of problems with individual parts (front wheels, back wheels, brakes, plastic chair, metal frame)
2. Cause of the breakdown (usual wear and tear, accident, defective part)
3. Suggestions to improve the wheelchair design

E. Function (Appendix 2)

Appendix 2

Change in function.

Using this **SCALE** rate the ability to participate in the following activities **before and after receipt of the wheelchair. Only record differences produced by the wheelchair.**
0= no difficulty **1= mild** difficulty **2= moderate** difficulty **3= severe** difficulty
4= unable to perform NA = not applicable

Mobility	**Before**	**After**
d4153 Maintaining a sitting position		
d4209 Transferring self from one location to another (from chair to bed, to toilet, etc.)		
d4309 Carrying an object from one place to another		
d4600 Moving around within the home		
d4602 Moving around outside home and other buildings		
d4702 Using public transportation		
Self-care		
d5109 Washing self		
d5201 Brushing teeth		
d5202 Caring for hair, shaving		
d5309 Toileting		
d5409 Dressing		
d550 Eating		
d5700 Ensuring personal comfort (light, heat, shade, position)		
d5702 Maintaining personal health (avoiding risk for injury, disease)		
Domestic life		
d6200 Shopping (selecting food, household items)		
d6201 Gathering daily necessities (food, fuel)		
d6309 Preparing meals		
d6409 Doing housework		
d6508 Caring for household objects (furnishings, plants)		
Interpersonal interactions and relationships		
d7509 Forming and maintaining social relationships (neighbors, friends, acquaintances)		
d7609 Forming and maintaining family relationships (parent, child, siblings, extended family)		
Major life areas		
d839 Acquiring education (school, vocational)		
d8509 Acquiring or keeping employment (for self, or for family member if recipient is a child or dependent)		
d855 Engaging in non-remunerative work (charity, voluntary work)		
Community, social and civic life		
d9109 Engaging in community social life (clubs, associations)		
d9209 Engaging in recreation/leisure activities (hobbies, play, sports, travel)		
d9309 Engaging in religious activities (church, temple, mosque)		

Adapted from The International Classification of Functioning, Disability and Health: ICF. WHO, 2001.

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