Functional and Quality of Life Outcomes of a Hand Surgery Mission to Honduras

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Abstract

Background: The objective of this study was to assess functional, quality of life, and satisfaction outcomes of a hand surgery short-term surgical mission (STSM) to Honduras, and determine whether patient demographics and surgery characteristics during a surgical mission correlate with outcome. **Methods:** A total of 63 patients who received upper extremity surgery at a week-long hand surgery STSM to Honduras in March 2013 participated in the study. A before-after study design was used. Before receiving surgery, participants completed the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire and the Short Form 12 Health Survey version 2 (SF12v2). Four months postoperatively, participants completed the QuickDASH, SF12v2, and Satisfaction Survey. **Results:** The mean QuickDASH score significantly improved preoperatively to postoperatively. Demographics measures of age, sex, education, and income did not correlate with QuickDASH scores. Preoperative QuickDASH statistically significantly correlated with surgery type: Carpal tunnel patients had the highest scores (worst functioning). Postoperatively, mass excision and scar contracture/skin graft patients were correlated with the lowest scores. Carpal tunnel and tendon surgery patients showed greatest correlation with QuickDASH improvement. SF-12 scores revealed improvements in mental domains and declines in physical domains. **Conclusions:** Hand surgery performed during STSMs can result in significant functional improvement, regardless of socioeconomic status. Patients benefited from both simpler and more complex operations. Four months after surgery, general health-related quality of life measures showed improved mental indices. Measured physical indices declined despite improved QuickDASH scores. This may be due to the early general postoperative state. Further outcome research in STSMs in additional countries and specialties is required to expand our conclusions to other STSM contexts and guide best practices in STSMs.

Keywords: surgical mission, hand surgery, surgical outcomes, patient satisfaction, QuickDASH, SF-12

Introduction

Hundreds of short-term surgical missions (STSMs) travel annually to low- and middle-income countries, with over 220 000 surgical procedures performed per year across all surgical specialties, the most common being general surgery, plastic surgery, gynecology, and pediatric surgery.²⁰ This is a tremendous investment of time and resources. Total dollar investment into surgical missions is difficult to estimate due to the many components to account for, including but not limited to number of personnel, travel expenses, medications, equipment, and local coordination. This also does not account for productivity diverted from regular operations in both host and visiting countries. Previous work from our group demonstrated total cost for a hand surgery mission to be \$45 779 to perform 80

surgical cases, or \$572 per case.³² STSM cost-effectiveness studies in other specialties estimated costs as \$879 per

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case, orthopedics; \$554 per case, cleft lip and palate; \$2114 per case, general surgery; and \$3127 per case, neurosurgery.^{7-9,17} There are variable costs depending on the efficiency of the mission. Methods to decrease costs on mission trips include use of a wide-awake approach and use of field sterility instead of main operating room full sterility for carpal tunnel releases, both of which are used in our group.^{15,16} Using a conservative estimate of \$500 per case, with over 220 000 surgical cases annually, this is an investment of at least \$110 000 000 into STSMs annually (excluding other nonsurgical medical mission trips). Outside of number of cases, an additional benefit to recipient countries includes educational efforts and interaction for local physicians and trainees. Funding for STSMs comes from various sources, including corporate and foundation sponsors for large international organizations, and regional hospital support, private fundraising, and team member donations for smaller scale organizations.

Despite this large resource investment into surgical missions each year, there is a relative paucity of literature describing outcomes from these missions. Most existing studies of outcomes are limited to complications occurring immediately or less than 1 month postoperatively, and cleft lip and palate surgery STSMs are most often reported.^{11,18,19,21,25,29,32} Lack of outcomes studies is of concern in STSMs due to the common criticism of suboptimal follow-up care in STSMs.³⁵ One recent study from an orthopedic STSM focusing on orthopedic trauma fixation in the upper and lower extremity reported outcomes over a year postoperatively including complications and basic result classification (Likert scale of poor to good).³⁴ Outside of this type of basic classification of the surgery outcome, functional outcomes reported by STSMs are limited. To our knowledge, there are no published outcomes studies in hand surgery STSMs.

Follow-up in hand surgery is particularly important due to the frequent need for functional healing and physical therapy following surgery for a good result. Outcomes of hand surgery in the limited resource and follow-up setting of STSMs is largely unknown. The objective of this study was to report outcomes and satisfaction 4 months postoperatively for a hand surgery STSM to Honduras during March 2013.

Materials and Methods

Hand Surgery Mission Overview

This study was approved by the university institutional review board, and all participants provided informed consent to enroll into the study. Study funding sources had no involvement in collection, analysis, or interpretation of data, or in manuscript writing or decision for article submission. Participants were recruited from the Hand Help, Inc, hand surgery STSM to San Pedro Sula, Honduras, during March

2013. Hand Help, Inc, is a nonprofit organization, founded in 2007, that carries out a 1-week-long STSM to Central America annually (currently to Aleman Hospital in Managua, Nicaragua; previously to the Ruth Paz Foundation and Leonardo Martinez Hospitals in San Pedro Sula, Honduras). The average team contains 20 members, consisting of hand surgeons, anesthesiologists, postanesthesia care nurses, hand therapists, pediatricians, coordinators, and trainees. The team typically screens 100 to 200 patients and operates on 60 to 90 patients during the week. Funding and resources for the organization come from regional hospital support, general fundraising events, and team member fundraising and contributions.

On the first day (screening day) of the STSM, patients were screened by an experienced, board-certified, fellowship-trained hand surgeon, with primary practice in hand surgery and certification with the Surgery of the Hand (SOTH) exam. Patients identified as good surgical candidates underwent an informed consent procedure with use of medical interpreters. All patients were evaluated preoperatively by board-certified anesthesiologists and underwent a separate anesthesia informed consent with use of medical interpreters. Standard of care provided was equivalent to that provided in the United States, with peripheral nerve blocks used when indicated, same procedures for same indications, and scope of care provided the same as in the surgeons' regular practice. Postoperatively, after the STSM departed, patients were seen for clinical follow-up for suture removal and complications/outcome monitoring with a local Honduran orthopedic surgeon involved throughout the STSM (patient recruitment, STSM evaluation, surgery). A total of 82% of participants attended at least 1 follow-up visit. All patients had at least one session with the Hand Help, Inc, STSM hand therapist before the team left. All patients received instructions for postoperative mobilization from the hand therapist. Patients were referred for continued outpatient hand therapy when deemed appropriate. Of the tendon surgery patients seen at follow-up, 69% received outpatient hand therapy. With general follow-up conducted by a local orthopedic surgeon, STSM patients are not routinely seen the next year the STSM is run unless there is a staged surgery or revision required.

Study Recruitment and Procedures

All participants receiving hand surgery with the Hand Help, Inc, STSM during March 2013 were invited to participate in the study. The sample size was arrived at using a consecutive convenience sample. A designated researcher, fluent in Spanish and not directly providing patient care, administered study instruments to reduce bias. Preoperatively, the participants completed formal Spanish translations of the following survey instruments: (1) QuickDASH (an abbreviated version of the Disabilities of the Arm, Shoulder, and Hand [DASH]

Outcome Measure), a validated self-report measure of upper limb physical function and symptoms, and (2) SF12v2® (an abbreviated version of the Short Form 36 Health Survey or SF-36), a validated self-report questionnaire measuring functional health and well-being in physical and mental domains.^{2,14} By default, able participants completed study assessments independently. When participants were illiterate, study personnel fluent in Spanish administered the assessments verbally in Spanish. These measures were chosen to evaluate the impact of surgery on both upper extremity function outcome and general health-related quality of life outcome. Both measures have low reported floor and ceiling effects.^{5,6,10,22} An objective measurement of upper extremity function such as grip strength or angles of flexion/extension could not be used due to the variability of pathologies treated during the mission. The QuickDASH was originally validated in an adult population, and it has subsequently been found to be consistent and valid in older children and adolescents aged 8 to 18.²⁷ However, because of concern that the QuickDASH may not be valid for pediatric conditions when the instrument was completed by parents/guardians, the QuickDASH analysis only included adults. The SF12v2 is validated in adults only, and the SF12v2 data and analyses only included adult participants.

Long-term Follow-up and Outcomes Measurement

Four months following the STSM (July 2013), one of the authors returned to the host site in San Pedro Sula, Honduras, resided with a local medical student, and contacted each patient through telephone numbers collected during the initial visit to arrange a follow-up visit. This timing of follow-up was selected to allow sufficient time to heal from the postoperative state and gain function from baseline, while not extending so long as to lead to poor follow-up in this international setting. Two phone numbers were collected for each study participant, and follow-up visits were conducted at the same hospital where the patients underwent surgery. Using these methods, 57 of 63 participants (90%) completed the follow-up visit 4 months after the STSM, and it took 2 months to collect the data. At the follow-up visit, participants completed the QuickDASH and SF12v2 again, in addition to a self-developed Satisfaction Survey where participants rated Likert-scale satisfaction with various STSM elements.

Statistical Considerations

Changes in QuickDASH and SF12v2 scores were statistically analyzed using paired *t* tests. Linear regression was used to evaluate the impact of patient factors (age, sex, education, family income, problem type) on QuickDASH scores. QuickDASH scores were correlated with satisfaction scores

using the Spearman rank-order correlation. Strengthening the Reporting of Observational Studies in Epidemiology guidelines were adhered to while preparing this article.

Results

A total of 63 participants were recruited to participate in the study (100% of eligible participants). In total 90% (*n* = 57) of participants completed both preoperative and postoperative study visits; 46% (*n* = 29) were adults and 54% (*n* = 34) were children (Table 1). In both age groups, the participants were about 60% male and 40% female. The average age for adults was 38.6 years (SD 16.9 years), and for children was 6.1 years (SD 5.1 years). The average education time was 8.8 years (SD 4.8 years) for adults and 2.3 years (SD 3.5 years) for children. The mean annual family income was \$4045 (SD \$3377) for adults and \$2446 (SD \$1619) for children. The poverty line in Honduras is an annual income of \$693.50 for a single person.²⁶

Of the surgical cases performed, origin of abnormalities were 30% congenital, 34% secondary to trauma, and 33% acquired (Table 2). The treatment types included 24% tendon transfer/repair, 19% scar contracture/skin graft, 16% mass excision (mostly wrist ganglion excision), 16% polydactyly/syndactyly repair, 9% carpal tunnel release, 5% malunion/nonunion treatment, and 11% other (Table 3).

Scores on the QuickDASH significantly improved from before surgery to after surgery (*P* < .05; Figure 1). The average QuickDASH score before surgery was 31.9 (SD 23.3), and average QuickDASH after surgery was 20.0 (SD 20.8). The lower QuickDASH score indicates better upper extremity function.

Patient demographics including age, sex, education, and family income did not significantly affect the QuickDASH score using linear regression (*P* > .05). Age was kept as the only demographic variable in the regression. Linear regression results showed surgery type was statistically related to the QuickDASH score. Carpal tunnel surgery was correlated with worse preoperative QuickDASH (Table 4). Carpal tunnel surgery and tendon transfer/repair were correlated with improvement in the QuickDASH score (Table 5). Mass excision and scar contracture/skin graft surgery recipients were correlated with better QuickDASH scores after surgery (Table 6).

Scores on the SF12v2 showed variable effects from the preoperative to postoperative time points, with some domains improving and other domains declining (Supplemental Figure S1). Significant improvements (*P* < .05) were observed in the domains of role physical functioning, social functioning, role emotional functioning, and mental component summary. Significant declines (*P* < .05) were observed in the domains of bodily pain, general health, vitality, and physical component summary.

Table 1. Demographics of the Study Participants.

Total N = 63	Adults	Children
N (%)	29 (46)	34 (54)
Sex		
Male, N (%)	18 (62)	20 (59)
Female, N (%)	11 (38)	14 (41)
Age, y		
Mean (SD)	38.6 (16.9)	6.1 (5.1)
Range	18–73	.25–17
Education, y		
Mean (SD)	8.8 (4.8)	2.3 (3.5)
Annual family income		
Mean (SD)	\$4045 (\$3377)	\$2446 (\$1619)

Table 2. Origin of Upper Extremity Problems Seen During the STSM, N = 63.

Origin of abnormality	Percent
Congenital	30%
Trauma	34%
Acquired	33%

Table 3. Surgical Treatments Performed During the STSM, N = 63.

Treatment type	Percent
Tendon transfer/repair	24%
Mass excision	16%
Polydactyly/syndactyly repair	16%
Scar contracture/skin graft	19%
Carpal tunnel release	9%
Malunion/nonunion treatment	5%
Other	11%

Participants reported high satisfaction with various STSM components at the 4-month follow-up, with at least 88% of participants rating each category as either satisfied or very satisfied (Table 7). Better initial and final QuickDASH scores statistically correlated with better satisfaction with hand movement (preoperative correlation coefficient -0.397 , $P < .05$; postoperative correlation coefficient -0.449 , $P < .05$) and surgery results (preoperative correlation coefficient -0.287 , $P < .05$; postoperative correlation coefficient -0.311 , $P < .05$).

Discussion

We reported functional, quality of life, and satisfaction outcomes in patients of a hand surgery STSM to Honduras. Participants demonstrated significant improvement in upper extremity morbidity as measured by the QuickDASH after surgery. Patient demographic factors (age, sex, education, or family income) did not correlate with outcome, suggesting

that patients of diverse socioeconomic backgrounds could benefit from surgery. However, we did identify specific procedure types that resulted in the greatest improvement after surgery (carpal tunnel release, tendon surgery) and best level of functioning after surgery (mass excision, scar contracture/skin graft). Knowledge of what procedures produce the best outcomes can guide resource allocation and procedure prioritization in a time/resource-limited setting to maximize benefit and minimize poor results.

The QuickDASH scores statistically significantly improved by an average of 11.9 points after surgery. The minimal clinically important difference (MCID) of the QuickDASH has been reported between 8 and 16 points.^{12,13,24,31} Although our observed mean difference did not surpass the high end of this range, we believe that the QuickDASH improvement reflected the actual improved functional outcome. Better QuickDASH scores correlated with greater satisfaction with hand movement and surgery results, suggesting that the participants completed the QuickDASH appropriately and that QuickDASH appropriately reflected patients' function. In addition, because various pathologic conditions were included in the cohort, QuickDASH improvement was likely reduced by inclusion of conditions not expected to have poor overall function preoperatively (eg, ganglion cyst) and conditions that may not have achieved final functional outcome at the follow-up time point (eg, tendon injury).

We observed mixed results in health-related quality of life after surgery. Certain domains improved whereas others declined. The general tendency observed was improvement in the mental domains (social functioning, role emotional functioning, mental component summary) and decline in the physical domains (bodily pain, general health, vitality, physical component summary). This may be due to continued postoperative discomfort, including residual pain or edema after surgery. However, the lack of overall physical well-being improvement as measured by the SF12v2 is not consistent with the improvements observed on the QuickDASH. It is possible that despite improvement in hand function, there is a tradeoff in the postoperative recuperation process that takes a toll on overall perceived physical well-being. The MCID for the SF12v2 component summaries is estimated to be 5 points.^{3,30} The physical and mental component summaries changed by less than 5 points from before to after surgery, so this may not reflect a noticeable difference in one's day-to-day life. The modest level of changes in the SF12v2 scores is comparable with the changes observed at a previous hand surgery mission with the same group in 2010.²⁸ In 2010, however, all SF12v2 scores were observed to improve postoperatively, with statistically significant improvements in physical functioning, role physical functioning, mental health, and physical component summary. The 2010 follow-up was performed 6 months postoperatively instead of 4 months postoperatively as was done in

Figure 1. Change in QuickDASH scores from the preoperative to postoperative time point. Error bars indicate 1 SD above and below the mean.

Note. DASH = Disabilities of the Arm, Shoulder, and Hand.

Table 4. Predictors of Preoperative QuickDASH From Linear Regression in Adults (N = 29).

Characteristic	Regression coefficient	95% CI	P value
Age	-0.116	-0.722 to 0.490	.695
Tendon transfer/repair	15.113	-7.679 to 37.904	.182
Mass excision	-16.248	-51.378 to 18.881	.347
Polydactyly/syndactyly repair	-8.883	-54.091 to 36.325	.687
Scar contracture/skin graft	-0.261	-34.923 to 34.401	.988
Carpal tunnel release	38.004	8.247 to 67.761	.015
Malunion/nonunion treatment	-0.706	-30.841 to 29.428	.962

Note. $R^2 = .474$. DASH = Disabilities of the Arm, Shoulder, and Hand; CI = confidence interval.

Table 5. Predictors of QuickDASH Change From Linear Regression in Adults (N = 26).

Characteristic	Regression coefficient	95% CI	P value
Age	-0.290	-19.436 to 28.842	.290
Tendon transfer/repair	19.616	-2.947 to 42.178	.084
Mass excision	19.498	-13.802 to 52.799	.234
Polydactyly/syndactyly repair	19.614	-23.004 to 59.413	.366
Scar contracture/skin graft	15.192	-9.718 to 54.116	.161
Carpal tunnel release	48.338	19.759 to 76.917	.002
Malunion/nonunion treatment	-9.773	-41.650 to 22.184	.530

Note. $R^2 = .517$. DASH = Disabilities of the Arm, Shoulder, and Hand; CI = confidence interval.

this study, which may have given additional time for participants' postoperative physical recovery.

Participants reported high levels of satisfaction with the STSM, including traditionally criticized elements of

understanding of surgery, follow-up care, and communication. Patients also expressed high satisfaction with the outcome, including surgery results, hand movement, and overall care quality. Better initial and final QuickDASH

Table 6. Predictors of Postoperative QuickDASH From Linear Regression in Adults (N = 26).

Characteristic	Regression coefficient	95% CI	P value
Age	0.281	-0.296 to 0.859	.320
Tendon transfer/repair	-13.551	-36.905 to 9.802	.239
Mass excision	-46.314	-80.783 to -11.846	.011
Polydactyly/syndactyly repair	-34.648	-77.302 to 8.005	.105
Scar contracture/skin graft	-29.270	-62.306 to 3.767	.079
Carpal tunnel release	-20.237	-49.818 to 9.345	.168
Malunion/nonunion treatment	4.821	-28.215 to 37.857	.307

Note. $R^2 = .425$. DASH = Disabilities of the Arm, Shoulder, and Hand; CI = confidence interval.

Table 7. Percentage of Likert-Scale Satisfaction Ratings With Various Aspects of the STSM.

Component	Very dissatisfied (%)	Dissatisfied (%)	Unsure (%)	Satisfied (%)	Very satisfied (%)
Registration process	0	2	0	40	58
Surgery understanding	0	2	4	47	47
Surgery quality	0	0	2	30	68
Follow-up care understanding	0	2	0	51	47
Follow-up care quality	0	4	2	44	51
Surgery results	0	4	2	42	53
Hand movement	0	2	11	49	39
Pain level	0	7	5	60	28
Cost	0	2	5	54	39
Overall communication	0	2	0	39	60
Overall care quality	0	2	4	19	75

Note. 1 = very dissatisfied, 2 = dissatisfied, 3 = unsure, 4 = satisfied, 5 = very satisfied (n = 57). STSM = short-term surgical mission.

scores were statistically correlated with better satisfaction with hand movement and surgery results, which is consistent with what would be expected. This provides evidence that participants answered the questionnaires appropriately. Levels of satisfaction reported in this study are comparable with previous studies of hand surgery satisfaction in the United States; it is even higher than one report of Spanish-speaking patients in a US outpatient hand surgery clinic.^{4,23} This may partially be due to the gratitude that patients of an STSM experience when finally obtaining surgical care after being unable to attain help for their problem in their local health system.

Increased outcomes studies in the STSM field are needed to demonstrate impact and increase evidence for best practices in STSMs. With the great resource investment of millions of dollars and many volunteer hours into STSMs each year, it is surprising that STSMs have minimal oversight, guidelines, or quality assurance procedures. Lack of accountability can lead to a slippery slope in not ensuring appropriate standards of care. When complications do occur, the media and public have perceived inadequate accountability and improper standard of care in STSMs.¹ This could be avoided with more rigorous guidelines detailing appropriate care with proper quality assurance procedures. STSM outcome studies will contribute to this effort by characterizing

current outcomes in STSMs and highlighting areas of success to be emulated or areas of improvement for further study. Increased STSM outcomes studies are needed to build a body of literature to inform guidelines with the purpose of improving outcomes and care across STSMs.

A limitation to this study is that follow-up time may have been too short for full postoperative recovery and improvement for some conditions such as tendon transfer/repair. The evaluation of quality of follow-up care and knowledge of local treating surgeons was not within the scope of this study, but these would be useful issues to measure and address in future studies as missions increasingly engage local surgeons in collaboration and education. Addition of local surgeon follow-up assessments in future studies would provide another indicator of outcome to strengthen the results. In addition, this study would ideally include a control group with hand problems who did not receive surgery to observe the impact of time without surgery. However, ethical limitations prevent the STSM to turn away certain patients for research, and it was not logistically possible to recruit other patients in Honduras with the same hand problems who would not receive surgery. Another limitation to this study is the relatively small sample size, especially when only considering the adult participants. Although for the primary comparison of preoperative and postoperative

QuickDASH, the sample size needed to detect a 10-point difference in QuickDASH scores (with $SD = 10$, $\alpha = 0.05$, $\beta = 0.20$) is 32, follow-up studies with larger sample sizes would verify the findings of this study with respect to primary outcome and subanalyses. In carrying out the study, a designated researcher not directly providing patient care administered study instruments to reduce bias. However, using a non-native Spanish-fluent researcher who traveled with the STSM team could still introduce bias in participant responses. Cultural differences may impart bias, and participants may view the researcher as related to the American team and desire to indicate appreciation or pleasing responses related to outcome.

Conclusion

We elicited functional, quality of life, and satisfaction outcomes of a hand surgery STSM to Honduras. Hand surgery STSMs can provide patients with significant functional improvement, regardless of socioeconomic status, as evaluated by the QuickDASH. Simple and complex operations both improved upper extremity function. Overall health-related quality of life showed improvements in mental domains and some decline in physical domains 4 months after surgery despite improvement in QuickDASH scores, possibly explained by postoperative discomfort and inadequate length of follow-up to measure overall quality of life-related physical functioning. Further research on outcomes of different types of surgical missions to various low-income and middle-income countries is necessary to enable broader conclusions to be made. STSMs lack oversight, well-described guidelines, and quality assurance procedures despite many millions of dollars invested per year. STSM outcome studies can provide evidence of STSM impact and inform future guidelines regarding best practices in surgical missions.

Authors' Note

Research materials can be accessed by contacting the corresponding author.

Ethical Approval

This study was approved by the university institutional review board (IRB registration 00000596).

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from all patients for being included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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