Health-Related Quality of Life Following Podiatric Surgery

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This 6-month prospective study investigated the outcomes of foot surgery performed by Fellows of the Australian College of Podiatric Surgeons. The study recruited 140 patients who were treated for orthopedic, neurological, or integumentary diseases of the foot. The majority of subjects who underwent podiatric surgery experienced significant postoperative improvements in a range of health-related quality-of-life dimensions as measured by the disease-specific Foot Health Status Questionnaire (FHSQ) and the generic Short Form 36 (SF-36) questionnaire. Subjects reported a reduction in foot pain, increased levels of physical function, improved general foot health perception, and improved footwear-related quality of life. No significant adverse outcomes or unplanned re-admissions to the hospital were reported. This study demonstrates the advantage of assessing health-related quality of life as opposed to patient satisfaction. (J Am Podiatr Med Assoc 91(4): 164-173, 2001)

Health-care providers in the United States, United Kingdom, and Australia have questioned the need for expanding the role of the podiatric physician to include surgical care of foot problems.1-3 The treatment that stimulates the greatest debate is orthopedic correction of deformities, such as hallux abducto valgus, hammer toe, and related digital deformities, and some peripheral nerve disorders of the foot.3-5

A report on foot and ankle research priorities conducted by the Research Council of the American Orthopaedic Foot and Ankle Society (AOFAS)6 highlighted the need to investigate the outcomes of foot surgery. More specifically, the third most important priority identified in this report was the need to research orthopedic and podiatric outcomes of foot surgery. Bligh and Rice7 have recommended that podiatric physicians, like other health-care professionals, use recognized methods to determine whether their care meets professional standards and to generate evidence to prove that it does.

Deyo,8 Marshall,9 and McPhee10 suggest there is a growing need for—and a movement toward—the use of research methods that accurately measure subjective dimensions of health and, more specifically, quality of life. To achieve this, instruments that disaggregate the concepts of patient satisfaction from health-related quality of life should be used.

Orthopedic and podiatric surgeons usually evaluate surgery outcomes retrospectively, an approach that frequently relies upon ascertaining the patient’s level of satisfaction as a guide to surgical outcome. By definition, patient satisfaction surveys attempt to measure the elements of the care provided as well as the progress of the patient who has received the care.11-14 Satisfaction ratings, however, depend upon a personal evaluation of health-care services, and Pascoe and Attkisson12 argue that this approach is too subjective and injects personal expectations and preferences into the evaluation process.

Alternatives to the retrospective analysis of patient satisfaction can be used to overcome this problem. Prospective studies, in which patients undertake a self-assessment of their health-related quality of life before and after surgery, are becoming more

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widely accepted as a valid means of establishing surgery results.\textsuperscript{15-17}

Kitaoka and Patzer\textsuperscript{18} studied 1,607 articles relating to the foot and ankle that were published in six orthopedic journals from 1980 to 1993. The articles were reviewed with respect to the clinical grading systems they used. Many of the clinical studies used criteria such as patient satisfaction to determine results. Most of the clinical scales and instruments used in the foot and ankle studies have not been validated with either criterion or content validation, and their value, therefore, remains of concern.

Kitaoka and Patzer advocate the adoption of a global foot and ankle scale for all patients with foot and ankle disorders. The AOFAS study of research priorities supported this recommendation, rating the development of outcome instruments as the fourth most important issue requiring attention.\textsuperscript{6} Clearly, the evaluation of podiatric surgical outcomes by means of an appropriately designed instrument is essential so that the treatment process can be adjusted to benefit the patient.\textsuperscript{8, 19}

The Foot Health Status Questionnaire

Until the Foot Health Status Questionnaire (FHSQ) was developed, there was no valid foot-specific quality-of-life instrument that could be used to assess the outcomes of foot surgery. Apart from the FHSQ,\textsuperscript{20} only the Foot Function Index has been subject to validity and reliability assessments.\textsuperscript{21, 22} Moreover, the Foot Function Index originally was designed to assess the feet of people with rheumatoid arthritis; only more recently has it been extended to evaluate the effects of foot orthoses.

Essentially, the FHSQ contains four scales that capture aspects of the patient’s foot health. These scales are foot pain, function, footwear, and general perceptions of foot health. The foot pain and function scales concentrate on physical phenomena, while the footwear scale assesses practical issues associated with footwear availability and comfort. The general foot health perception scale deals with patients’ self-assessment of the state of their feet.

After the questionnaire has been completed, respondents’ scores are recoded, summed, and finally transformed to a scale of 0 (indicating poorest foot health) to 100 (indicating the best possible foot health). A purpose build software package has been developed to undertake these calculations. Detailed reports of the development, validation, and reliability of the FHSQ have been previously published.\textsuperscript{20, 23}

The aim of this study was to establish the extent to which podiatric surgeons alter the self-reported foot health status of patients with common foot diseases. To achieve this, the recently developed FHSQ was used. This article also illustrates the potential usefulness and versatility of the FHSQ in evaluating a wide range of foot care services and, as such, is not restricted to surgical situations.

Methods

Eleven podiatric surgeons from across Australia were asked to recruit between 15 and 20 consecutive patients who met the selection criteria for elective foot surgery (Table 1). For comparative purposes, three groups of patients were recruited: orthopedic, neurological, and those with integumentary conditions.

Surgeons were asked to administer a baseline questionnaire that contained 49 items, including the four foot-health scales (FHSQ) and the Short Form 36 (SF-36) physical function, social function, general health, and vitality scales.\textsuperscript{24} The questionnaire was administered prior to the patient’s foot operation.

All questionnaires were completed without the surgeons’ assistance or advice. Surgeons were instructed to inform subjects to complete the questionnaire “as best they could” if they were unsure of any particular item. Questionnaires were then returned in a stamped, self-addressed envelope to the Queensland University of Technology, Centre for Public Health Research.

Follow-up Surveys

Participants were subsequently contacted by mail 1, 3, and 6 months postoperatively. On each occasion,
they were asked to complete another questionnaire that contained the FHSQ and SF-36 scales as well as additional questions about the patients’ perceived level of satisfaction with their foot operation.25

Missing Items

The most common method for handling missing responses on a questionnaire (when fewer than 50% of the items for any one scale are missing) is to assign the missing item the average value of the completed items.24,26 In this study, missing items were replaced with the median item values for both the SF-36 and FHSQ scales.

Data Analysis

The main form of analysis used in this study was general linear modeling. Group differences of the potential confounding variable (age, gender, co-morbidity, etc) were controlled for in a repeated-measures multiple analysis of covariance (repeated-measures MANCOVA). The SPSS statistical program (SPSS Corp, Chicago, Illinois) was used for this purpose.

Results

A total of 142 subjects were approached to participate in the study. Two subjects declined to participate; data were available for analysis on the remaining 140 subjects. The subject attrition rate was smaller than anticipated: 81.7% follow-up at 1 month, 76.8% at 3 months, and 72.5% at 6 months.

Nonresponse Rates

Nonresponse patterns were assessed with respect to the subject’s age, gender, operative group, level of education, household income, health insurance status, level of co-morbidity, exercise and smoking behavior, and preoperative SF-36 and FHSQ scores. Age was the only statistically significant variable (mean ± SD) that differed between full responders (50.4 ±14.9 years) and nonresponders or partial responders (44.4 ±15.3 years).

Characteristics of Patients

Orthopedic, neurological, and integumentary system patients in the study differed significantly in age; female subjects tended to be older. As expected, level of co-morbidity was strongly associated with age (Table 2). Although an equal number of male and female patients were recruited into the integumentary system group, more female subjects were recruited into the neurological and orthopedic groups (χ² = 8.89, df = 2, P = .01).

Given that age, gender, and co-morbidity levels differed in the three study groups, these variables were entered into the statistical models as covariates in comparisons of the effects of podiatric surgery on quality of life. In addition, the number of feet operated upon (unilateral versus bilateral) and the number of procedures performed (single versus multiple) were controlled for in the analysis. Ninety-seven subjects (69%) underwent unilateral foot operations, while 43 (31%) had bilateral foot operations. Fifty-six percent underwent a single procedure; the remaining subjects underwent multiple foot operations.

Quality-of-Life Outcomes

A MANCOVA analysis can be used to answer two principal questions. First, is a time trend effect apparent for all three operative groups? This test basically evaluates whether health-related quality of life changes over time. Secondly, when a comparison is made among the three operative groups of patients, is the time trend effect significantly different? This is known as the between-group effect.

Figure 1 illustrates the time trend and between-group trends for the four FHSQ scales. The higher the scale score, the better the health status. The solid horizontal line in each diagram represents the population norms from a validation study group of 69 subjects with minor foot complaints, such as onychogryphosis.27 The three study groups each have a separate line that connects their respective scores over the four time periods. In each scale, the patient’s postoperative health scores improvement is statistically significant to a level equal to or greater than the population norms.

Figure 2 illustrates the time trend and between-group trends for the four SF-36 scales. Again, the higher the score, the better the health status. The solid horizontal line in each diagram represents population norms from the Australian Bureau of Statistics’ National Health Survey.28

Patient Satisfaction

Figure 3 summarizes the proportion of subjects who agreed, disagreed, or neither agreed nor disagreed that they were satisfied with the outcome of their foot surgery.

Figure 4 shows that only the general foot health perception scale differed significantly between sub-
jects who were satisfied (ie, agreed or strongly agreed) and those who were uncommitted (neither agreed nor disagreed).

At 6 months after the operation, subjects were also asked, “If you had your time over, would you have the foot operation again?” Eighty-five out of 92 respondents (92.4%) indicated they would have the operation again. Of the seven subjects who indicated they would not, two reported they were satisfied with the outcome of the surgery. There were no differences in response to this question by class of operation performed ($\chi^2 = 2.87, df = 2, P = .23$).

**Discussion**

Increasingly, health-status instruments are being used to measure the benefits of intervention. It is important, however, to establish the appropriateness of each instrument to measure the designated outcomes, taking into account the study’s population, specific interventions, and research design. More specifically, the instrument must be sensitive enough to demonstrate changes in health status over time. The clinical relevance of this study is that, in the absence of a control group, it has been possible to demonstrate that podiatric surgery is associated with improvements in foot-health-related quality of life to a level equal to or greater than established population norms. This was achieved by using the new FHSQ in a prospective study design.

**Foot Pain**

After adjusting for the effects of age, gender, number of feet operated on, and number of operations performed, a time trend effect ($F_{3,58} = 4.23, P < .01$) was
identified on the FHSQ pain scale (Fig. 1) indicating that patients experienced improved quality of life as a consequence of pain amelioration. No differences among groups were identified with respect to the overall trend ($F_{6,138} = 1.04, P = .39$). Neurological subjects recorded significantly lower preoperative pain scores (indicating greater levels of pain) than the orthopedic and integumentary system subjects ($F_{2,87} = 8.92, P < .01$). These gains were most marked 1 month postoperatively, with continued pain reduction by 3 months. All three groups reported a reduction in foot pain 6 months postoperatively. Importantly, pain reduction was demonstrated for all groups of subjects in comparison with their preoperative health status.

Figure 1. The FHSQ pain, function, footwear, and general foot health perception scores for the patients, grouped by operation, over the four time periods. The scores have been adjusted for age, sex, number of feet involved, and number of operations performed. The solid horizontal line in each diagram represents the population norms from a validation study group.
Foot Surgery and Physical Function

The FHSQ function scale is designed to evaluate an individual’s functional abilities specifically on the basis of the health of his or her feet. A low FHSQ function score implies a foot problem that limits the subject in a broad range of physical activities, such as performing regular work, walking, and more demanding activities such as climbing stairs.20, 23

After adjustment for potential confounders, both a time trend effect \( F_{3,76} = 4.90, P < .01 \) and a between-group difference over time \( F_{6,154} = 3.81, P < .01 \) were observed on the FHSQ foot function scale (Fig. 1). Importantly, the course of postoperative recovery

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**Figure 2.** The SF-36 social function, general health, function, and vitality scores for the patients, grouped by operation, over the four time periods. The solid horizontal line in each diagram represents Australian population norms for the 45 to 54 age group. A and B: adjusted for age, sex, income level, and co-morbidity; C: adjusted for age, sex, co-morbidity, number of feet, and number of operations; and D: adjusted for age and sex.
in physical function appeared to differ depending upon the class of surgery performed. Neuroma subjects demonstrated significantly lower preoperative function scores than the orthopedic subjects ($F_{2,87} = 4.35, P = .01$). One month after surgery, orthopedic subjects experienced a significant reduction in functional ability, recording a score of 53.3 (95% confidence interval $[CI] = 43.0–63.6$), when compared with integumentary system subjects ($F_{2,82} = 6.11, P < .01$).

Orthopedic foot surgery clearly results in significant short-term functional incapacity. Notwithstanding this short-term disability, at 6 months after the operation, improvements in the individuals' overall function to the population norms established in the validation study were demonstrated. No significant differences in functional capacity existed among the three groups at 6 months postoperatively.

These findings are similar to those of Katz, who investigated 54 subjects undergoing a total hip arthroplasty and found that the SF-36 physical function scale recorded the greatest postoperative improvement of all the SF-36 scales. Dawson et al also reported significant improvement in SF-36 physical function scores at 6 months after surgery in a prospective study of 220 patients undergoing total hip replacement. Additionally, in a prospective study of 73 subjects who underwent total knee replacement, Krishnan demonstrated an improvement in SF-36 physical function scores at 3 months postoperatively with consequent relief of pain. In a prospective study of 47 subjects undergoing unilateral total knee reconstruction, after adjusting for age, gender, and co-morbidity, Sharma et al found a similar result with the SF-36 physical function scale.

Similar patterns of functional improvement (captured by both generic and disease-specific instruments) after surgery have been identified by Liang et al, who studied five health-status instruments, not including the SF-36, for orthopedic evaluation of hip and knee arthroplasty in 38 subjects. Most function-related health gains were identified in the first 3 months after surgery and smaller gains were recorded beyond 6 months.

**Surgery and Footwear**

Figure 1 shows a significant difference among groups over time with respect to footwear scores ($F_{6,158} = 2.24, P = .04$). Subjects with orthopedic foot problems had FHSQ footwear scores that improved over time from a preoperative 29.9 (95% CI = 21.1–38.7) to a 6-month postoperative score of 53.4 (95% CI = 42.5–64.3), exceeding the population norms. This observation is consistent with the work of O'Doherty et al, who demonstrated a similar significant improvement in footwear-related quality of life of subjects undergoing first metatarsophalangeal joint surgery.

**General Foot Health Perceptions**

Conceptualization of the general foot health domain is based upon the premise that patients have, and can express, “feelings” about their feet. The concept of the well-being of one’s feet may be seen as a specific aspect of overall well-being that Ware et al define as “a subjective bodily and emotional state; how an individual feels; a state of mind distinct from functioning that pertains to behaviours and activities.”
The concept of a general foot health domain may be seen as the composite personal expression of well-being in terms of foot-related function, foot pain, and footwear-related health status. Figure 1 illustrates an overall significant time trend effect \( \left( F_{3,75} = 3.47, P = .02 \right) \), with subjects recording an improved perception of their feet over time. This trend did not differ among the three groups \( \left( F_{6,152} = 1.62, P = .14 \right) \).

**SF-36 General Health Scales**

When confounders are controlled for, no significant time trend effect \( \left( F_{3,73} = 0.70, P = .53 \right) \) or differences among operative groups over time \( \left( F_{6,148} = 1.30, P = .25 \right) \) were observed on SF-36 general health scores (Fig. 2), and none of the three groups appeared to differ significantly from the Australian population norm level of general health. Likewise, Krishnan \( \left( n = 13 \right) \) reported no change in 73 subjects who underwent total knee replacement on the SF-36 general health scale in his prospective study of total knee replacement surgery. Similarly, Temple et al. \( \left( n = 4 \right) \) reported no differences in general health using the SF-36 scale apart from subjects undergoing surgery for clinically significant obesity.

**SF-36 Social Function**

Social function is defined as the ability to participate in social activities with family, friends, neighbors, and special interest groups. After adjusting for confounders, a significant time trend effect \( \left( F_{3,67} = 3.15, P = .03 \right) \) was apparent for all three groups in terms of their social function as captured by the SF-36 social function scale (Fig. 2). Noticeably, all subjects were socially incapacitated by their surgery at 1 month. No significant differences were identified among groups according to operative conditions \( \left( F_{6,162} = 1.62, P = .88 \right) \).

The current study reflects the findings of Krishnan, who found no difference in the level of SF-36 social function at 3 months postoperatively in 73 subjects who underwent total knee replacement surgery. This pattern is consistent with the work of Baker et al., who showed that 1 month after undergoing varicose vein surgery, 150 subjects had significantly reduced social function (preoperative SF-36 score of 88.9 to postoperative SF-36 score of 66.7). Additionally, Baker et al. found that in comparison to preoperative values, all SF-36 dimensions except social function and general health were significantly improved at 6 months post-surgery. Likewise, Temple et al. demonstrated the same pattern of short-term reduction in social and functional interaction in subjects undergoing herniorrhaphy and Roux-en-Y gastric bypass surgery.

**SF-36 Physical Function and Vitality**

The SF-36 physical function scale in Figure 2 demonstrates a pattern that is highly consistent with the FHSQ function scale in Figure 1, suggesting that the two scales capture similar aspects of functional activity and the effects of podiatric surgery on functional activity. The effect of surgery on level of vitality was not conclusive in this study.

**Patient Satisfaction versus Quality-of-Life Outcomes**

Figure 3 illustrates that the proportion of subjects who either agreed or strongly agreed that they were satisfied with the outcome of surgery (80%) did not appear to change during the 6 months following surgery. Over time, a smaller percentage of subjects indicated they strongly disagreed that they were satisfied with the outcome of their surgery \( \left( n = 4 \right) \). Of interest are the “uncommitted” 9.2% of subjects who neither agreed nor disagreed that they were satisfied with their foot operation 6 months after the surgery.

Figure 4 demonstrates the preoperative-to-postoperative change in FHSQ scale scores in subjects classified as either “satisfied” or “uncommitted” about the outcome of their foot surgery. The uncommitted subjects \( \left( n = 13 \right) \) recorded an improvement in foot pain, foot function, and footwear scales that was not statistically different from the satisfied subjects. Moreover, subjects who were uncommitted about their level of satisfaction with surgery demonstrated significantly lower scores on the general foot health scale. No difference existed between satisfied and uncommitted subjects in preoperative health-status scores, suggesting that the uncommitted subjects were not predetermined by their perception of general foot health. However, subjects who were satisfied with the outcome of surgery at 6 months had significant improvement in their FHSQ general foot health scores as compared to uncommitted subjects (Fig. 4).

This observation is consistent with the notion that the domain of general foot health captures a relatively subjective element of well-being related to self-perceived body image. From a theoretical perspective, this scale is broadly analogous to the SF-36 mental health and role-emotional scales that measure feelings and emotional status.

Of key importance in this study is that the uncommitted subjects showed improvements in their health-related quality of life. Typically, these subjects would, like satisfied patients, experience a reduction in their level of foot pain and increased levels of physical function and footwear-related quality of life.
If patient satisfaction alone was used as the main determination of surgical outcome, this suggests that there may be a tendency to underreport the beneficial effects of surgical intervention.

Conclusion

A majority of subjects in this study who underwent podiatric surgery experienced significant postoperative improvements across a range of health-related quality-of-life parameters. Assessment of patients' satisfaction with surgery 1, 3, and 6 months postoperatively tended to reflect a general underreporting of the beneficial effects of foot surgery. Data have been presented that support the view that disease-specific health-related quality-of-life instruments yield significant explanatory power of surgical outcomes compared to the more common approach of evaluating patient satisfaction. It has been recommended that podiatric surgeons use recognized methods to determine whether their care meets professional standards and to generate evidence to prove that it does. This study contributes to meeting this important public health objective.

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