Can the Toronto Extremity Salvage Score Produce Reliable Results When Used Online?

Mark Clayer MD, Aileen Davis PhD

Received: 4 May 2010 / Accepted: 17 November 2010 / Published online: 3 December 2010
© The Association of Bone and Joint Surgeons® 2010

Abstract

Background Web-based questionnaires have become popular, however, access to the Internet can be biased regarding age, gender, and education, among other factors. Therefore, it is unknown whether this is a reasonable avenue to administer a questionnaire to patients or whether Web-based can be a reliable alternative to paper-based.

Questions/purposes We determined whether the Internet version of the Toronto Extremity Salvage Score is reproducible compared with the paper-based version and the compliance and completion rates.

Patients and Methods The study population consisted of 81 adults who had had surgery for a musculoskeletal tumor of the lower extremity more than 12 months earlier. The Toronto Extremity Salvage Score was administered by paper at a baseline interview and then readministered via Internet 7 to 14 days later to those with access.

Results Sixty of the 81 patients (74%) were able to use the Internet. Increasing age and lower education levels were correlated with a lower likelihood of using the Internet. Questionnaires were done online and on paper by 56 patients but 10 were excluded because of self-reported change in circumstances. The mean TESS was 85.7 (range, 41.1–100; SD, 17.26) for the paper-based questionnaire and 85.2 (range, 42.5–100; SD, 17.47) for the Internet-based questionnaire. The intraclass correlation coefficient was 0.97.

Conclusions The questionnaire can be transferred successfully to the Internet and can be used reliably instead of a paper-based instrument. Recruitment to use an Internet-based questionnaire is limited only by the percentage of patients able to access and use the Internet.

Introduction

The function of patients after treatment is an important consideration in the management of tumors of the extremities. In this context, function has been conceptualized in various ways. Examiner-dependent clinical measures and patient-reported outcomes are the most common. Some authors have used clinical measures, such as ROM and muscle strength [29, 35], activities of daily living (WOMAC), or a combination of symptoms and mobility [16, 17]. Patient-reported outcomes have included the Sickness Impact Profile [40] and the Toronto Extremity Salvage Score (TESS) [9, 11]. The TESS was based on the definitions of disability, impairment, and handicap as documented by the World Health Organization [42]. The TESS has been used for patients in Canada after surgery for extremity sarcoma [9–11, 18, 37], but has not been widely reported outside that country. Currently, the TESS is a paper-based system.

Each author certifies that he or she has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

Each author certifies that the human protocol for this investigation was approved by an Institutional Ethics Research Committee, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

This work was performed at the Royal Adelaide Hospital.

M. Clayer (✉)

Department of Orthopaedics and Trauma, Royal Adelaide Hospital, North Terrace, Adelaide 5000, Australia
e-mail: mark.clayer@health.sa.gov.au

A. Davis

Division of Health Care and Outcomes Research and Arthritis and Community Research and Evaluation Unit, Toronto Western Research Institute, University of Toronto, Toronto, Canada

Web-based questionnaires have become popular more recently owing to the advantages and the increasing number of people who not only have access to the Internet but also have an increasing familiarity with the Internet. A major advantage in conducting a Web-based questionnaire is the ability to involve participants who are difficult to study because of their small numbers or inaccessibility because of geographic location. In addition, Web-based questionnaires may be easier to administer and offer the advantage of immediate checks for incomplete answers, reminder messages to the respondent, automatic summarization of answers, personalized feedback, inclusion of illustrations or sounds to clarify complex questions, hiding nonrelevant followup questions [2], and collection of patient-centered data at multiple locations and at frequent intervals [3]. Web questionnaires require no expense for printing, postage, manual checks for incomplete answers, and transfer of data to an electronic format. Costs involved are therefore only in development of the system and Web maintenance. A Web-based system may be helpful if a high percentage of patients have Web access and are competent in its use and if this system has test-retest reliability [23]. Despite this, paper-based systems have a higher response (or compliance) rate when used in a face-to-face encounter [2, 3, 7, 8, 23, 27] compared with a Web-based questionnaire [7, 27] (Table 1). Posted questionnaires, however, generally have had a poor compliance rate [19, 27]. Studies looking at compliance rate have been variable in their sample group and so wide variations in rate are to be expected. Published data from the Scandinavian countries often use general population registries and solicit participation anonymously [2, 14, 15, 28]. In contrast, studies from the United States usually involve patients attending clinics [21, 36]. It may be argued patients who are approached to participate in studies while attending a clinic may feel more compulsion to

participate than those approached through an anonymous contact via post or e-mail.

However, access to the Internet can be biased regarding age, gender, and education, among other factors. It therefore is unknown whether this is a feasible avenue for administration of a questionnaire to a specific group of patients.

After development of an Internet-based version of the TESS, we determined (1) whether the Internet version of the TESS had test-retest reliability when compared with the paper-based version, (2) the patient compliance rate and completion rate with a Web-based questionnaire, and (3) reasons for failure to comply or complete the questionnaires.

Patients and Methods

The Web-based questionnaire was created using survey-monkey.com software and hosted on the SurveyMonkey Web site [41]. This Web site allowed direct creation of the questionnaire using the same Likert-style format as the paper-based questionnaire. It also allowed for additional questions to be added and this feature was used. Specifically, to ensure the patient believed the retest on the Internet was representative, an additional question was added asking whether they believed their functional status had changed since they completed the paper version. In addition, they were asked to what degree they believed they had changed in the interval between doing the paper version and the Web-based version using the same Likert-style responses. This was done to confirm reproducibility of the data.

This was a prospective study in which participants completed the TESS twice, the paper version and the Web version. Study participants were recruited from the chief

Table 1. Compliance rate between paper and Web-based questionnaires

Study	Country of study	Type of sample	Number	Paper questionnaire (%)	Web-based questionnaire (%)
Jones and Pitt [24] (1999)	Scotland	University employees	500	72%	19%
Harewood et al. [21] (2001)	USA	Gastrointestinal clinic patients	43	85%	70%
Kim et al. [26] (2001)	USA	Urologists	2502	42%	11%
Kumle et al. [28] (2002)	Scandinavia	Women, population registry	96,000	51%	
Saleh et al. [36] (2002)	USA	Orthopaedic clinic patients	160	79%	
Leece et al. [30] (2004)	Canada	Surgeons	442	58%	45%
Bälter et al. [2] (2005)	Sweden	Population registry	585	64%	51%
Bush et al. [5] (2005)	USA	Cancer clinic patients	119		25%
Ekman et al. [14] (2006)	Sweden	Women, population registry	47,859		33%
Cals et al. [7] (2007)	Netherlands	Population registry	1248		75%
Kongsved et al. [27] (2007)	Denmark	Women, mammogram clinic	533	73%	18%
Ekman et al. [15] (2007)	Sweden	Women, population registry	30,615		46%

investigator's practice (MC) from June 2008 to June 2009. Inclusion and exclusion criteria were first developed using the criteria described by Davis et al. [11]. In brief, patients were considered eligible for inclusion if (1) they were between the ages of 18 and 85 years, (2) they had completed their treatment for a primary tumor of the lower extremity a minimum of 12 months before completion of the questionnaire, (3) they had not experienced local or systemic relapse within the last 12 months; and (4) they were able to read and write English. Patients were excluded if (1) they refused to consent to participate, (2) they had known cognitive impairments, or (3) they failed the above inclusion criteria. There were 81 patients who agreed to participate; six subsequently were excluded because they failed the inclusion criteria (all unable to read or write English). There were 32 men and 43 women. The median age of the Internet-competent group was 45 years (range, 18–75 years), compared with 62 years (range, 36–85 years) in the group that did not have or were unable to use the Internet ($p = 0.0002$). The percentage of men who were Internet competent was 78% compared with 81% for women ($p = 0.8$). The education level achieved was above primary in all except one patient. It was secondary in 36 patients (60%) and tertiary in 24 (40%) of those who were Internet competent. In contrast, it was primary in one patient (7%), secondary in 13 (86%), and tertiary in one patient (7%) for those who did not use the Internet ($p = 0.009$). There were 55 patients living in major cities (73%) and 20 (27%) living in rural or regional areas. The percentage with Internet access was 85% versus 65%, respectively ($p = 0.1$) (Table 2).

Patients were reviewed in the investigator's clinic as part of the normal review process after removal of a tumor. As part of that review process, patients were requested to

complete the TESS before interview. The patient's access to the Internet and competence then were recorded, and if appropriate, he or she was invited to participate in the Internet-based questionnaire. Once consent was obtained, the patient's e-mail address was requested, being informed the link to the Internet-based questionnaire would be e-mailed to them 7 days after the current interview. The patient was invited to use that link to access the questionnaire once available and to do so within 7 days of it becoming available. Those who had not done the Internet-based questionnaire within 48 hours of it becoming available were given a reminder by telephone.

The paper and electronic survey answers were entered into an Excel® program (Microsoft Corp, Redmond, WA, USA).

Statistical analysis of the demographic data was done using nominal and continuous reporting. Comparisons then were analyzed for Internet usage against the demographic data using the chi square test (Prism 5 software, GraphPad Software, La Jolla, CA, USA) or Fisher's exact test (SAS 9.0 software, SAS Institute, Cary, NC, USA) for nominal data and Student's *t* test (Prism 5 software, GraphPad Software) for continuous data. The test-retest reliability was analyzed on the paper versus Web-based questionnaires using the intraclass correlation coefficient as described by Shrout and Fleiss [38] using SAS Version 9.2 (SAS Institute Inc).

The compliance rate and completion rate were recorded for both methods of questionnaires in addition to ambiguous answers (ie, when more than one response is given for a single question) for the paper version. In the case of an ambiguous answer, the answer was ranked down for scoring to the lower of the two responses.

Of the 75 patients, 62 had Internet access (83%). Of the 62 who reported they had Internet access, only two reported they did not know how to use it. Internet competence to do this questionnaire therefore was 80% (Table 2).

Table 2. Demographics of the patient group

Variable	Total	Internet capable	Internet incapable	p Value
Gender				0.8
Male	32	25	7	
Female	43	35	8	
Age (years)				0.0002
Mean		45	62	
SD		14.3	13.5	
Location				0.1
City	55	47	8	
Rural/regional	20	13	7	
Education level				0.01
Primary	1	0	1	
Secondary	49	36	13	
Tertiary	25	24	1	

Results

Ability to use the Internet did not bias the TESS with a mean score of 81.3 for those who were not able to use the Internet which compared with 84.3 for those who could ($p = 0.6$; CI -7.1 – 13.1).

The main question of this study was to determine whether the Internet version of the TESS was reproducible when compared with the paper-based version. Fifty-six patients completed the paper and Internet-based questionnaires. Ten reported a change between the two completions. For the 46 who did not report a change, the mean TESS was 85.7 (median, 93.2; range, 41.1–100.0;

SD, 17.3) for the paper-based TESS and 85.2 (median, 91.4; range, 42.5–100.0; SD, 17.5) for the Internet-based questionnaire. The intraclass correlation coefficient was calculated at 0.97 (confidence interval, 0.95–0.99) between the paper and Internet versions for the 46 patients who did not report a change (Fig. 1). Using a Bland and Altman plot, the 95% limits of agreement were -6.6 – 8.2 with a mean difference of 0.7 and a bias of 0.7 , which indicates that there is no major bias (Fig. 1).

The second question was to determine the patient compliance rate and completion rate with a Web-based questionnaire. Four of the 60 patients with Internet access and competence did not do the online questionnaire. The compliance rate therefore was 93%. Ambiguous answers were possible only with the paper version. Two patients (three questions total) of the 75 who completed the paper-based questionnaire answered a question ambiguously. There were 17 questions not answered by six patients using the paper questionnaires (completion rate of 99%). Thirteen questions were not answered by patients who used

the Internet and four by those who did not. There were 18 questions not answered by seven patients using the Web-based questionnaire (completion rate of 99%). The questions most commonly not answered related to sexual activity (five of the 35 unanswered questions; only one patient did not answer the same question for paper and Web-based questions), work duties (three of the 35 unanswered questions), leisure activities (three of the 35 unanswered questions), and sporting activities (three of the 35 unanswered questions).

The third question was to determine any possible reasons for failing to do or complete the questionnaires. Two patients gave explanations for their noncompliance. In one case, Internet access was via a computer at work. The patient stated the company firewall prevented him from accessing the Web site for the questionnaire. In the other case, the patient's computer experienced a terminal malfunction and had to be replaced, which was completed outside the 14 days allowed for the retest. Eleven patients needed one reminder telephone call to enact compliance.

Fig. 1A–B (A) A graph shows a comparison of paper and Web-based scores. (B) A Bland-Altman plot compares the two questionnaire results. The 95% confidence limits are included as dotted lines and the mean difference (0.7) as a dashed line.

Discussion

Functional assessments after surgical procedures are now a mandatory requirement for the assessment of that procedure. Surgeon-reported outcomes are subject to bias and patient-reported outcomes have had variable success owing to compliance and completion. Web-based questionnaires have become more accessible and offer some advantages over paper-based questionnaires. It remains to be seen whether Web-based questionnaires can produce reliable results and improved compliance and completion. This study therefore determined whether the Internet version of the TESS was reproducible when compared with the paper version and improved patient compliance/completion rates. We also sought reasons for noncompliance or noncompletion.

Our study is subject to several limitations. The first was that the number of participants was small. This is partly a function of the fact that these are rare conditions (1.1% of all malignancies). Large sample sizes cannot be achieved by any individual practitioner. Second, all participants were patients of the investigator and were personally requested to participate in this study. Despite reassurances, there may have been a perception that failure to participate would impair the patient-clinician relationship. As a consequence, the participation and compliance rate may have been artificially elevated. There also may have been bias in the actual function scores because it has been reported patients who survive a life-threatening condition tend to underreport problems on self-report measures [33]. Third, patients were given the second questionnaire 7 days after

the original. We assumed little would change in 7 days, but 10 reported a change within that period, almost 20%, and these individuals were excluded from the comparison of the paper- versus Web-based scores.

The main objective of this study was to determine whether the Internet version of the TESS was reproducible when compared with the paper version, in essence, whether the scores obtained using these two methods were reliable, which would imply consistency. In our study, the intraclass correlation was high (0.97), indicating a high concordance between the paper and Web-based questionnaire. This study therefore shows an Internet-based TESS at work or home is reliable. However, there have been concerns raised regarding the reliability of Internet-based versions of questionnaires [4, 12, 22, 24, 34]. The main concern has been that paper-based questionnaires completed with the knowledge that the clinician will be seeing the results will bias the responses in contrast to questionnaires completed anonymously or through the Internet [7, 22]. Many studies have evaluated the reproducibility of electronic versions of various paper-based questionnaires [1, 6, 32, 36], and although intraclass correlations between 0.6 and 0.96 have been reported, all have used a computer in the clinic and not the Internet at work or home.

The compliance rate, that is, the percentage of participants prepared to complete the questionnaire, in this study was very high (compliance rate of 93%). This compared favorably with all published reports (Table 1). The compliance rate, or response rate, appears to be directly related to the method of delivery. Posted questionnaires traditionally have had a much better response rate (50%–72%), especially if the questionnaire is personally addressed [2, 24, 30]. Anonymous e-mails requesting completion of a questionnaire have the worst response rate (11%–50%) [24, 26] (Table 1). Some authors have suggested the low compliance rate to do a Web-based questionnaire is related to patients' unfamiliarity with the Internet, perception of e-mail as junk mail, or the added burden of accessing a Web site to respond to a questionnaire [24, 27]. Kongsved et al. [27] reported a compliance rate of only 18% when a group of patients were asked to complete an Internet-based questionnaire in association with an appointment for a mammogram. This improved to 64% when a reminder was sent. In addition, the response rate appears to be influenced by the target audience [25, 26, 31].

The completion rate, that is, total number of questions answered, also has been examined, but the definition of completion remains problematic. Some authors report completion as the total number of questionnaires that have had every question answered [27] whereas others have compared the number of individual questions answered [39] against the total. In our study, the completion rate was high, with only 13 questionnaires not answered in full of

Table 3. Completion rate between paper and Web-based questionnaires

Study	Number of respondents	Percentage completing a paper questionnaire	Percentage completing a Web-based questionnaire
Bliven et al. [3] (2001)	55	85%	85%
Hanscom et al. [20] (2002)	18,500	97%	98%
Wilson et al. [43] (2002)	70	76%	100%
Kongsved et al. [27] (2007)	533	63%	98%
Ekman et al. [15] (2007)	30,615		41%
Smith et al. [39] (2007)	77,047	98%	98%
Current study	75	92%	88%

the possible 135 paper and Web-based questionnaires combined (completion rate of 90%). Completion rates also have varied with the different methods of questionnaire administration and format. In general, online or computer format improves the completion rate and most formats remind the responder when they have missed a question [20, 43]. All of these (with one exception [27]), however, were reporting on using a computer-based questionnaire in the clinic, not Web-based. For paper questionnaires, it has been reported the completion rate can be improved by numerous factors but mostly by prenotification, designing questionnaires that are of interest to participants, reduced length, delivery of the questionnaire by recorded delivery, and incentives (especially monetary) [13]. For Web-based questionnaires, starting with easy questions and progressing to harder questions improved their completion rate by 6% [15] (Table 3).

The data suggest this questionnaire is appropriate for an Australian population and confirmed the answers are reproducible. The Internet can be used to communicate quality-of-life information from home and may allow this to be performed at home rather than having to create information hubs in the clinic. It also suggests questionnaires could be transmitted before clinic appointments, which may assist in identifying those with problems before consultation and/or a research tool. Recruitment to use an Internet-based questionnaire was limited by the percentage of patients able to access and use the Internet, which, in this study, was 80%. Those who are most likely to benefit from an Internet-based questionnaire, those geographically disadvantaged, were the ones most likely not to use the Internet because of a lack of interest in the Internet, not lack of access.

Acknowledgment We thank Thomas Sullivan, Lecturer in the Data Management and Analysis Centre, Discipline of Public Health, University of Adelaide, for assistance with the statistical assessments.

References

1. Athale N, Sturley A, Skoczen S, Kavanaugh A, Lenert L. A web-compatible instrument for measuring self-reported disease activity in arthritis. *J Rheumatol*. 2004;31:223–228.
2. Bälter KA, Bälter O, Fondell E, Lagerros YT. Web-based and mailed questionnaires: a comparison of response rates and compliance. *Epidemiology*. 2005;16:577–579.
3. Bliven BD, Kaufman SE, Spertus JA. Electronic collection of health-related quality of life data: validity, time benefits, and patient preference. *Qual Life Res*. 2001;10:15–22.
4. Buchanan T, Smith JL. Using the Internet for psychological research: personality testing on the World Wide Web. *Br J Psychol*. 1999;90:125–144.
5. Bush N, Donaldson G, Moinpour C, Haberman M, Milliken D, Markle V, Lauson J. Development, feasibility and compliance of a web-based system for very frequent QOL and symptom home self-assessment after hematopoietic stem cell transplantation. *Qual Life Res*. 2005;14:77–93.
6. Bushnell DM, Martin ML, Parasuraman B. Electronic versus paper questionnaires: a further comparison in persons with asthma. *J Asthma*. 2003;40:751–762.
7. Cals JW, Boumans D, Lardinois RJ, Gonzales R, Hopstaken RM, Butler CC, Dinant GJ. Public beliefs on antibiotics and respiratory tract infections: an internet-based questionnaire study. *Br J Gen Pract*. 2007;57:942–947.
8. Cantrell MA, Lupinacci P. Methodological issues in online data collection. *J Adv Nurs*. 2007;60:544–549.
9. Davis AM, Bell RS, Badley EM, Yoshida K, Williams JJ. Evaluating functional outcome in patients with lower extremity sarcoma. *Clin Orthop Relat Res*. 1999;358:90–100.
10. Davis AM, Sennik S, Griffin AM, Wunder JS, O'Sullivan B, Catton CN, Bell RS. Predictors of functional outcomes following limb salvage surgery for lower-extremity soft tissue sarcoma. *J Surg Oncol*. 2000;73:206–211.
11. Davis AM, Wright JG, Williams JJ, Bombardier C, Griffin A, Bell RS. Development of a measure of physical function for patients with bone and soft tissue sarcoma. *Qual Life Res*. 1996;5:508–516.
12. Davis RN. Web-based administration of a personality questionnaire: comparison with traditional methods. *Behav Res Methods Instrum Comput*. 1999;31:572–577.
13. Edwards P, Roberts I, Clarke M, DiGuseppi C, Pratap S, Wentz R, Kwan I. Increasing response rates to postal questionnaires: systematic review. *BMJ*. 2002;324:1183–1191.
14. Ekman A, Dickman PW, Klint A, Weiderpass E, Litton JE. Feasibility of using Web-based questionnaires in large population-based epidemiological studies. *Eur J Epidemiol*. 2006;21:103–111.
15. Ekman A, Klint A, Dickman PW, Adami HO, Litton JE. Optimizing the design of Web-based questionnaires: experience from a population-based study among 50,000 women. *Eur J Epidemiol*. 2007;22:293–300.
16. Enneking W. Modification of the system for functional evaluation in the surgical management of musculoskeletal tumours. In: Enneking W, ed. *Limb Salvage in Musculoskeletal Oncology*. New York, NY: Churchill Livingstone; 1987:626–639.
17. Enneking WF, Dunham W, Gebhardt MC, Malawar M, Pritchard DJ. A system for the functional evaluation of reconstructive procedures after surgical treatment of tumors of the musculoskeletal system. *Clin Orthop Relat Res*. 1993;286:241–246.
18. Gerrand CH, Wunder JS, Kandel RA, O'Sullivan B, Catton CN, Bell RS, Griffin AM, Davis AM. The influence of anatomic location on functional outcome in lower-extremity soft-tissue sarcoma. *Ann Surg Oncol*. 2004;11:476–482.
19. Gilmour JA, Scott SD, Huntington N. Nurses and Internet health information: a questionnaire survey. *J Adv Nurs*. 2008;61:19–28.
20. Hanscom B, Lurie JD, Homa K, Weinstein JN. Computerized questionnaires and the quality of survey data. *Spine (Phila Pa 1976)*. 2002;27:1797–1801.
21. Harewood GC, Yacavone RF, Locke GR 3rd, Wiersma MJ. Prospective comparison of endoscopy patient satisfaction surveys: e-mail versus standard mail versus telephone. *Am J Gastroenterol*. 2001;96:3312–3317.
22. Joinson A. Social desirability, anonymity, and Internet-based questionnaires. *Behav Res Methods Instrum Comput*. 1999;31:433–438.
23. Jones JB, Snyder CF, Wu AW. Issues in the design of Internet-based systems for collecting patient-reported outcomes. *Qual Life Res*. 2007;16:1407–1417.
24. Jones R, Pitt N. Health surveys in the workplace: comparison of postal, email and World Wide Web methods. *Occup Med (Lond)*. 1999;49:556–558.
25. Khalily C, Behnke S, Seligson D. Treatment of closed tibia shaft fractures: a survey from the 1997 Orthopaedic Trauma Association and Osteosynthesis International-Gerhard Kuntzsch Kreis meeting. *J Orthop Trauma*. 2000;14:577–581.
26. Kim HL, Gerber GS, Patel RV, Hollowell CM, Bales GT. Practice patterns in the treatment of female urinary incontinence: a postal and internet survey. *Urology*. 2001;57:45–48.
27. Kongsved SM, Basnov M, Holm-Christensen K, Hjollund NH. Response rate and completeness of questionnaires: a randomized study of internet versus paper-and-pencil versions. *J Med Internet Res*. 2007;9:e25.
28. Kumle M, Weiderpass E, Braaten T, Persson I, Adami H, Lund E. Use of oral contraceptives and breast cancer risk: The Norwegian-Swedish Women's Lifestyle and Health Cohort Study. *Cancer Epidemiol Biomarkers Prev*. 2002;11:1375–1381.
29. Lampert MH, Gerber LH, Glatstein E, Rosenberg SA, Danoff JV. Soft tissue sarcoma: functional outcome after wide local excision and radiation therapy. *Arch Phys Med Rehabil*. 1984;65:477–480.
30. Leece P, Bhandari M, Sprague S, Swiontkowski MF, Schemitsch EH, Tornetta P, Devereaux PJ, Guyatt GH. Internet versus mailed questionnaires: a controlled comparison (2). *J Med Internet Res*. 2004;6:e39.
31. Matarasso A, Elkwood A, Rankin M, Elkowitz M. National plastic surgery survey: face lift techniques and complications. *Plastic Reconstr Surg*. 2000;106:1185–1195; discussion 1196.
32. Meropol NJ, Egleston BL, Buzaglo JS, Benson AB 3rd, Cegala DJ, Diefenbach MA, Fleisher L, Miller SM, Sulmasy DP, Weinfurt KP; CONNECT Study Research Group. Cancer patients' preferences for quality and length of life. *Cancer*. 2008;113:3459–3466.
33. O'Leary TE, Diller L, Recklitis CJ. The effects of response bias on self-reported quality of life among childhood cancer survivors. *Qual Life Res*. 2007;16:1211–1220.
34. Ritter P, Lorig K, Laurent D, Matthews K. Internet versus mailed questionnaires: a randomized comparison. *J Med Internet Res*. 2004;6:e29.
35. Robinson MH, Spruce L, Eeles R, Fryatt I, Harmer CL, Thomas JM, Westbury G. Limb function following conservation treatment of adult soft tissue sarcoma. *Eur J Cancer*. 1991;27:1567–1574.
36. Saleh KJ, Radosevich DM, Kassim RA, Moussa M, Dykes D, Bottolfson H, Gioe TJ, Robinson H. Comparison of

- commonly used orthopaedic outcome measures using palm-top computers and paper surveys. *J Orthop Res.* 2002;20:1146–1151.
37. Schreiber D, Bell RS, Wunder JS, O'Sullivan B, Turcotte R, Masri BA, Davis AM. Evaluating function and health related quality of life in patients treated for extremity soft tissue sarcoma. *Qual Life Res.* 2006;15:1439–1446.
38. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. *Psych Bull.* 1979;86:420–428.
39. Smith B, Smith TC, Gray GC, Ryan MA; Millennium Cohort Study Team. When epidemiology meets the Internet: Web-based surveys in the Millennium Cohort Study. *Am J Epidemiol.* 2007;166:1345–1354.
40. Sugarbaker PH, Barofsky I, Rosenberg SA, Gianola FJ. Quality of life assessment of patients in extremity sarcoma clinical trials. *Surgery.* 1982;91:17–23.
41. SurveyMonkey.com. Available at: <https://www.surveymonkey.com/Default.aspx>. Accessed July 29, 2010.
42. World Health Organization. *International Classification of Impairments, Disabilities and Handicaps*. Geneva, Switzerland: World Health Organization; 1990.
43. Wilson AS, Kitas GD, Carruthers DM, Reay C, Skan J, Harris S, Trehanne GJ, Young SP, Bacon PA. Computerized information-gathering in specialist rheumatology clinics: an initial evaluation of an electronic version of the Short Form 36. *Rheumatology (Oxford).* 2002;41:268–273.