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Using multimedia to enhance the consent process for bunion correction surgery

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Abstract

Background: Obtaining informed consent from patients considering bunion surgery can be challenging. This study assessed the efficacy of a multimedia technology as an adjunct to the informed consent process.
Methods: A prospective, cohort study was conducted involving 55 patients (7 males, 48 females) who underwent a standardized verbal discussion regarding bunion correction surgery followed by completion of a knowledge questionnaire. A multimedia educational program was then administered and the knowledge questionnaire repeated. Additional supplementary questions were then given regarding satisfaction with the multimedia program.
Results: Patients answered 74% questions correctly before the multimedia module compared with 94% after it ($P < 0.0001$). Patients rated the ease of understanding and the amount of information provided by the module highly. Eighty-four percent of patients considered that the multimedia tool performed as well as the treating surgeon.
Conclusion: Multimedia technology is useful in enhancing patient knowledge regarding bunion surgery for the purposes of obtaining informed consent.

Introduction

Hallux valgus is a very common problem in Western societies.[1] A recent systematic review estimated the prevalence of hallux valgus to be 23% in the general adult population aged 18–65 years and 35.7% in the population aged over 65 years, with an overall increased prevalence in females.[2] Progressive deformity may result in pain with shoe wear and cosmetic dissatisfaction despite optimum non-surgical management often leading to consideration of surgical correction.[3] Before proceeding with surgery, the risks, benefits, expected outcomes and complications must be understood by the patient in order to satisfactorily complete the informed consent process.[4]

A growing body of evidence has shown patient comprehension to be poor when traditional verbal interaction is the sole means of patient education.[5] A recent study examining medical negligence claims associated with alleged deficiencies in the informed consent process has identified surgeons to be involved in the majority of cases.[6] Techniques utilized by surgeons to obtain informed consent need to optimize accurate knowledge transfer, comprehension and retention of information, thereby establishing realistic expectations and maximizing patient satisfaction.[7]

The use of multimedia aids to assist in patient education and improve the informed consent process has been shown to be a feasible option in orthopaedic populations considering elective surgical management for the treatment of pain.[8–11] The bunion population presents a unique group of orthopaedic patients, as the majority are women who are concerned about pain as well as cosmetic appearance. Additionally, first-line treatment options involve avoiding ill-fitting shoewear, which may or may not be adhered to by patients. Thus, this patient population coincides with the demographic of patients identified to be more likely involved in medico-legal action regarding deficiencies in the informed consent process. To our knowledge, no study has examined the use of multimedia as an adjunct to the informed consent process in this particular patient population.

The aim of this study was to evaluate the effect of a computer-based, patient-controlled, interactive multimedia educational tool on knowledge transfer and patient learning of information specific to bunion deformity surgery to assist with the informed consent

process. Our secondary aim was to examine patient satisfaction with the use of the multimedia program.

Methods

Development of educational objectives

A literature review was performed pertaining to the pathology, natural history and treatment of bunion deformity.[12–19] An informal focus group of patients who had undergone treatment for bunion deformity by the senior author was undertaken to establish their educational needs and to determine deficiencies in the traditional physician-led consultation process. The list of educational objectives of the educational module is shown in Table 1.

Development of multimedia module

A multimedia module was developed based on the educational objectives (Table 1). A script explaining all compiled information was developed by the senior author and reviewed by two linguists who removed unnecessary medical terminology. After several reviews, the script was recorded by a female voiceover professional (narrator). Three-dimensional computer animations depicting details of the educational objectives were then generated and correlated with the script content. All animations were created using 3D Studio Max.[22] Editing was performed using After Effects[23] and animations were exported into a Macromedia Flash interface.[24] 'Back', 'Replay', and 'Next' buttons allowing the patient to interact with the module were incorporated, with the program having a sequential linear design (i.e. patients were unable to select 'next' until the current section had run to completion, ensuring all core material was covered).

Basic computer skills were required to navigate through the educational module. The program was compatible with both Apple[25] and Windows-based[26] computers. An average of 19 min was required to complete the module. A representative module screen shot is shown in Figure 1.

Development of questionnaire

A knowledge questionnaire designed to assess accuracy of knowledge transfer and information retention was developed based on the educational objectives. Twelve questions, each designed to test a key objective, were developed (Table 2). Answer options included: 'true', 'false' and 'unsure'. Five additional questions given following completion of the post-module test were developed to assess the multimedia module's performance and 'user-friendliness' (Fig. 2). The first three questions assessed overall patient comprehension, the module's ease of understanding and the appropriateness of the information. A visual analogue scale (VAS) using a 10-cm line was used to quantify the answers to these three questions. Patients were asked to answer each question by marking on the VAS line how much they agreed or disagreed with the statement. The fourth question assessed module duration and the final question inquired about which method of information delivery best suited patient needs.

Study design

The same fellowship-trained orthopaedic foot and ankle surgeon assessed all patients in a private practice setting. Patients deemed appropriate for bunion correction surgery received a standardized explanation by the surgeon regarding the nature and treatment of their condition, the proposed surgical procedure, the post-operative course and potential complications. Patients were then asked if they would agree to participate in the study. The inclusion criteria included patients who were English literate, who could hear, could read the questionnaire and use the multimedia presentation. Exclusion criteria included poor sight, poor hearing and not being English literate.

Once the patient consented to participate in the study, she or he completed the initial 12-item knowledge questionnaire. They were

Table 1 Educational objectives

Foot anatomy
Bunion pathophysiology
Non-operative treatment
- Success of appropriate shoe selection
- Progression of deformity
- Chance of first metatarsal phalangeal joint arthritis
- Lesser toe involvement and metatarsalgia

Details of the surgical procedure
- Local anaesthetic
- Incision
- Lateral release
- Medial eminence resection
- Metatarsal osteotomy and capsular plication
- Proximal phalanx osteotomy
- Method of fixation
- Sutures, dressing and rigid sole post-operative shoe
- X-ray of correction

Post-operative period
- Day surgery
- Usual post-operative medications including pain relief
- Elevation of the foot and ankle for the first 2 weeks
- Keeping dressing intact and dry for the first 2 weeks
- Heel weight bearing in rigid sole post-operative shoe
- Use of crutches
- Remain in rigid sole post-operative shoe for 6 weeks
- Use roomy shoe after 6 weeks

Smoking
- Not recommended for at least 6 weeks before and after surgery, as it increases the chance of wound and bone-healing complications

Likely outcomes
- 95 in 100 chance of reducing pain in big toe[17]
- 1 in 100 chance of worsening symptoms[14,17,20]

Possible consequences
- Swelling may persist for 6–12 months after surgery
- Joint stiffness in first toe
- Results in problematic scars

Possible complications (common and/or severe)
- Wound-healing problems/infections (2 in 100)[12,13,15,20]
- Nerve injury (5 in 100)[14,20]
- Recurrence of the deformity (10 in 100)[3,12–14]
- Risk of metatarsalgia[13]
- Development of first metatarsal phalangeal arthritis
- Screw irritation (5 in 100)[13]
- Shoeware limitations
- Delayed/non-union (5 in 100)[13]
- Pressure areas
- Medical problems
  - Anaesthetic complications
  - Blood clots in legs (1 in 400)[21]
  - Allergic reactions

Most complications are treatable, and usually do not effect the final outcome of the surgery.

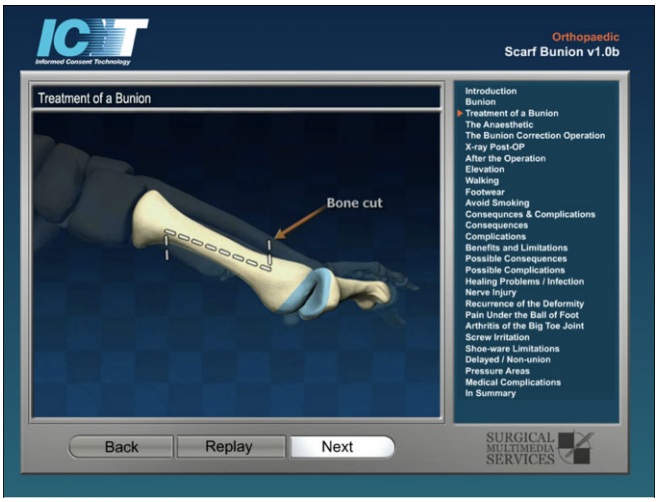

Fig. 1. A multimedia module representative shot. A menu on the right of the animation screen allows the patient to follow her/his progression through the module and enables each patient to review any section of the module that has already been viewed. Three buttons at the bottom of the screen allow the patient to review any section already completed, but does not allow the patient to advance to the next section until the current section is completed.

Table 2 Knowledge questionnaire. Patients were asked to answer 'True', 'Unsure' or 'False' to 12 different statements pertaining to bunion surgery

(1) Smoking does not affect the outcome of the operation	True	Unsure	False
(2) Bunions cannot recur after having had surgery	True	Unsure	False
(3) Bunion correction surgery can lead to arthritis in the joints of the big toe	True	Unsure	False
(4) I do not need to use a special shoe on the operated foot after surgery	True	Unsure	False
(5) To reduce bleeding and pain, I need to keep the foot elevated as much as possible	True	Unsure	False
(6) Problems with bone healing can occur following surgery	True	Unsure	False
(7) Five out of 10 people will have a surgical complication	True	Unsure	False
(8) Nerve injury can occur during bunion correction surgery	True	Unsure	False
(9) Infection never occurs after bunion correction surgery	True	Unsure	False
(10) Getting the dressings wet after surgery is safe	True	Unsure	False
(11) Swelling of the foot never occurs after surgery	True	Unsure	False
(12) Pain underneath the ball of the foot can occur following bunion correction surgery	True	Unsure	False

then instructed on how to navigate the computer module and left alone to view the module at their own pace. Following completion of the module, the patient then repeated the knowledge questionnaire, as well as the additional five-item module performance survey (Fig. 2). Demographic data including the patient age and date of surgical intervention was collected from the office clinical records for patients who agreed to participate in the study. The study design was approved by our institution's ethics review board.

EXPECTED RESULT OF SURGERY

(i) The chance of having a good outcome following surgery is:

No patient has a good outcome — All patients have a good outcome

SATISFACTION WITH COMPUTER CONSENT MODULE

(ii) I found the consent module easy to understand:

Strongly disagree — Strongly agree

(iii) The computer module had the appropriate amount of information to help me make my decision about surgery:

Strongly disagree — Strongly agree

(iv) The duration of the module was:

1. Too long ☐
2. Too short ☐
3. Just right ☐
4. Unsure ☐

(v) The questions that I had about the problem with my foot/ankle was better answered by:

1. My surgeon ☐
2. The computer program ☐
3. My surgeon/computer the same ☐

Fig. 2. Module performance survey. Patients completed this survey following completion of the multimedia learning module.

Statistical analysis

The results from the knowledge questionnaire and the module performance survey were analysed using the Microsoft Excel,[27] in consultation with the institution's biostatistician. For the knowledge questionnaire, unsure responses and incorrect responses were grouped together as 'not correct' and compared with correct responses.

Wilcoxon's signed rank test was used to test the null hypothesis that there would be no change in the correct and 'not correct' response rates, pre- and post-module. Statistical significance was taken as $P < 0.05$.

Patient responses VAS type questions in the module performance survey were collated and the results reported as the median and mode of the data obtained for each question.

Results

Over a 12-month period, 55 consecutive patients deemed suitable candidates for bunion correction surgery were recruited into the study. The mean age was 54 (range 24 to 76) years. There were 48 females and 7 males. All 55 patients completed the pre- and post-module knowledge questionnaires. Fifty patients completed the module performance survey. Twenty-six patients (all female) decided to proceed with the bunion correction surgery. The average time from completion of the multimedia module to the time of surgery was 13 weeks (minimum 3 weeks, maximum 60 weeks).

After the standardized consultation with the treating surgeon and before observing the computer-based education module, of the total 660 questions answered by patients (55 subjects × 12 questions), 488 (74%) were answered correctly. Of the 172 questions (26%) that

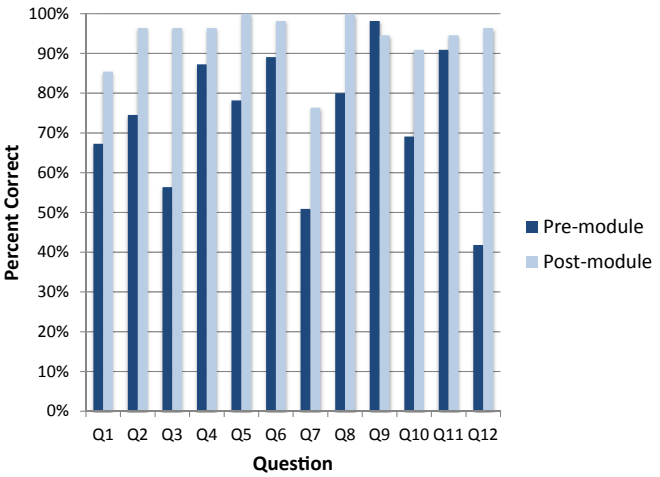

Fig. 3. A comparison of the percentage of correct answers for each item in the knowledge questionnaire pre-module and post-module. Note questions 3, 7 and 12 showed marked improvement following completion of the multimedia education module.

were 'not correctly' answered 119 (18%) were unsure responses and 53 (8%) were incorrect responses.

After viewing the module, 620 (94%) of questions were answered correctly and 40 (6%) 'not correctly' (7 unsure responses and 33 incorrect responses).

The increase in correct answers post-module was statistically significant (Wilcoxon signed rank sum test, $t(s) = -5.943$, $W = 15$, $P < 0.0001$).

Three pre-module questions were poorly answered by patients. These included the possible onset of pain underneath the ball of the foot (metatarsalgia) following bunion correction surgery (42% correct), the average incidence of surgical complications (51% correct), and the possibility of arthritis in the big toe following bunion surgery (56% correct). Improved patient performance was observed post-module, with an increase of correct answers to 96%, 76% and 96%, respectively (Fig. 3). Patients experienced moderate difficulty with two pre-module questions including the impact of smoking on outcomes (67% correct) and the avoidance of getting the post-operative dressing wet (69% correct). Following completion of the module, patient performance improved to 85% correct and 91% correct, respectively.

On the 10-cm VAS pertaining to the chance of having a good outcome following surgery where a measurement of 10 cm correlates with a 100% chance of occurrence, a median of 90% (mode 95%) was obtained from 50 patients. This was similar to that proposed by the multimedia module (95%). On the VAS for ease of understanding, patients rated the module at a median score 90% (mode 100%). For the appropriate amount of information, patients rated the module at a median score 90% (mode 100%).

Eighty-five percent of patients considered the module length to be 'just right' and 15% considered the length to be 'too long'. Eighty-four percent of patients considered the surgeon's verbal explanation equivalent to the computer-based module when answering their questions about bunion correction surgery. Eight percent of subjects considered the surgeon's verbal explanation to be better, and 8% preferred the multimedia module.

Discussion

This study illustrates that a multimedia program may be a useful adjunct to verbal discussion when obtaining informed consent from patients considering bunion surgery. Despite a thorough verbal explanation by the treating surgeon, patients displayed a lack of knowledge with regard to three particular areas focusing on possible sequelae of surgical management. These include the possibility of metatarsalgia, first metatarsophalangeal joint arthritis and the incidence of surgical complications. After completion of the multimedia module, patients demonstrated improved understanding in these areas. The improved post-module scores likely stem from the multimedia module utilizing a variety of learning modalities including graphical representations, verbal descriptions and written explanations. Such a model has been shown to effectively address a number of different learning styles.[8–11,28]

Identification of these knowledge deficient areas has certain implications. Given that issues with bunion deformity typically involve intermittent pain with shoe wear and cosmetic dissatisfaction, an understanding that pain may potentially remain or worsen with surgery is integral to establishing realistic expectations regarding outcome. Nearly half of the patients considered surgical candidates lacked an adequate understanding of possible outcomes following verbal discussion alone. Of the 55 patients that were deemed suitable candidates for surgery, 29 patients decided not to proceed with surgery after the verbal discussion and completion of the multimedia module. We believe this finding identifies that in a significant group of patients considering bunion surgery, being thoroughly informed of the risks and benefits of surgery will dissuade patients from surgical management. Based on the results of this study, we surmise that this subgroup of patients experienced improved comprehension of the pertinent material following viewing of the multimedia module that ultimately contributed to them making a true informed decision.

Several advantages exist when using a computer-based module. Patients are given the opportunity to control the speed of delivery of information, to revisit topics numerous times, to access information via a number of different methods (i.e. verbal, graphical and written modalities) and to interact with the program.[28] Additionally, the computer program has the advantage of recording each step a patient takes in gaining information, which has positive medicolegal implications. By providing patient education through a complete, reproducible and standardized process in a recordable manner, realistic expectations are established and patients become increasingly satisfied. Indeed, the majority of legal complaints actually stem from a lack of communication rather than a problem with treatment, resulting in discrepancies between expected and achieved results.[6]

Another method to improve the informed consent process that has been advocated by professional surgical bodies around the world has been the use of pamphlets. Studies evaluating information delivery to patients through written material have demonstrated variable results.[29,30] The utility of pamphlets as an education tool can be hindered by the use of complex medical terminology, patients with low levels of education and the inability to engage the patient in an interactive manner.[31,32] In a previous randomized controlled trial performed by our group, multimedia technology was found to result

in better comprehension and retention of information than written material or verbal discussion alone in knee arthroscopy patients.[11]

A potential bias of the study design is the presumption that the senior author is a competent patient educator when in fact he may not be. This is unlikely to explain the observed lower average score on the pre-module questionnaire because the surgeon utilized the same well-rehearsed and standardized discourse with each patient, based on the same educational objectives as the multimedia module. A checklist for discussion points was not used in this study, so as to minimize disruption to the flow of conversation and maximize surgeon response to both verbal and non-verbal cues of patient cognition. Hence, the study design is studying the same surgeon's verbal communication with each patient in a real-life clinical setting.

Another possible interpretation of the results is that the observed improvement in questionnaire scores may be due to reinforcement of what was discussed with the surgeon by the multimedia module. Repetition has been shown to improve retention, both in the short and longer terms.[33] Since the goal of this study was to examine the utility of a multimedia aid when used as an adjunct to surgeon–patient consultation, this possibility does not undermine the value of this study. In a practical sense, the change in test scores reflects the real-life impact using a multimedia program can make on patient comprehension. Use of the multimedia educational program did not require the surgeon to be physically present, nor did patients require help from support staff when using the technology. Additionally, this program did not negatively impact upon the flow of a busy clinical practice. As such, regardless of the relative contribution of repetition to patient retention of material compared with the multimedia program itself, it is clear that patients experienced a benefit in the education process.

A limitation of this study is the use of a knowledge questionnaire that has not been validated as an assessment tool. Each question was constructed carefully based on education objectives outlined previously. Unfortunately, the use of a non-validated tool for assessing patient comprehension while obtaining informed consent is an issue with all studies to date that have researched this topic.[34] This is due to the fact that there is a complete absence of a validated tool in current practice to assess patient comprehension. To create a validated, standardized assessment tool to assess patient comprehension with every surgical procedure in orthopaedics would be an extremely difficult task to accomplish. Indeed, of the 33 studies included in a recent literature review analysing the use of multimedia in the informed consent process, 22 studies assessed patient comprehension through internally produced questionnaires.[34]

Another limitation is that this study was not a randomized controlled trial. The purpose of the quasi-experimental design utilized in this study was to assess if multimedia was a useful adjunct to the verbal informed consent process, not to assess if multimedia is better than verbal discussion alone. A direct comparison of both modalities has already been performed as described previously.[11] Despite the lack of control group, meaningful conclusions regarding the effectiveness of multimedia technology in patients considering bunion correction surgery can still be drawn from this study design due to its prospective nature and inclusion of an appropriate number of patients that is reflective previous studies.[34]

The routine use of multimedia in the informed consent process as described in this study may not be practical in all clinical situations because of the resources required and time needed for its use. In today's technological age, universal Internet accessibility is becoming a reality for the majority of individuals both young and old. The Internet provides a solution, whereby this multimedia technology can be accessed by patients considering surgery, in a manner that is cost-effective and does not require additional resources or time in the clinic. Future directions for research by our group will be to evaluate the effect of Internet based interactive multimedia programs in educating patients for the purpose of obtaining informed consent.

The relationship between improved preoperative patient education and increased patient satisfaction following surgery has not been studied extensively when using multimedia as an educational adjunct. In a recent randomized controlled trial focusing on the role of patient information handouts on satisfaction following operative treatment of ankle fractures, participants that received the information handout were more satisfied with treatment at 3 months post-operatively.[35] In the knee replacement population, a recent review illustrated a positive correlation between post-operative satisfaction and how well post-operative expectations were met after surgery.[36] Another future study for our group would be to explore whether preoperative education using multimedia tools adequately prepared patients for what they actually experienced and whether or not these adjuncts influence patient satisfaction.

Conclusion

The multimedia patient education technology, when used as an adjunct to the informed consent process, positively impacted upon the preoperative education of patients considering bunion correction surgery. Patient satisfaction was high regarding the length of the multimedia module, its contents, ease of understanding and amount of information. The technology was well tolerated by all patients regardless of sex and age. We believe that further research into the use of such technology in various clinical settings a well as when accessed via the Internet is warranted.

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Conflict of interest

The senior author is one of the directors and clinical advisors for Surgical Multimedia Services Pty Ltd (Richmond, Victoria, Australia).

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