Patient Comprehension of Carpal Tunnel Surgery: An Investigation of Health Literacy

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Abstract

Background: Health literacy is the ability of a patient to understand their medical condition. The purpose of this investigation is to determine whether patients are able to obtain an elementary understanding of the fundamental principles of carpal tunnel release and the postoperative instructions after going through the process of informed consent and being provided an additional standardized postoperative instruction document. Our hypothesis is that patients will lack an understanding of these principles and, therefore, will be at risk for being noncompliant in their postoperative care. **Methods:** Fifty patients with a diagnosis of carpal tunnel surgery who elected to undergo carpal tunnel release alone were enrolled. A standardized education process was performed. Patients completed the questionnaire at their postoperative visit. **Results:** The average percentage of correct answers was 75.8% (8.34 out of 11 correct). Fisher exact test analysis demonstrated that patients with a lower education level were less likely to know how long it takes for their preoperative symptoms to resolve ($P = .0071$), and they were less likely to correctly choose all of the important elements of postoperative care during the first week after surgery ($P = .022$). **Conclusions:** Although we made efforts to help patients achieve health literacy in carpal tunnel surgery, we found that patients continued to lack comprehension of pertinent components of carpal tunnel surgery, particularly understanding the involved anatomy.

Keywords: health literacy, carpal tunnel surgery, carpal tunnel syndrome, comprehension, health education

Introduction

As interest in health literacy has grown, the definition utilized to define this concept has evolved.³ Health literacy has been defined as a set of individual capacities that allow patients to acquire information that helps them understand their medical conditions and the interventions that are available for their medical conditions.^{3,13} Health literacy has also been proposed to depend not only on the capacities of the individual but also on the characteristics of the health care system.³ Inclusion of the health care system as a part of the definition suggests that the level of patient's health literacy fluctuates based on the complexity of the medical problem, the thoroughness of the provider, and the features of the health care system that are set in place to support health literacy.³

Orthopedic patients have been demonstrated to have significant deficiencies in comprehension of their orthopedic problem.^{9,11,13} Several patient, provider, and health system characteristics have been implicated in these deficiencies including limited patient vocabulary, inability of providers to explain complicated medical information, and health education resources that are written in language or terms that are not readily understood by patients.^{9,12} Deficiencies

in comprehension have been demonstrated to contribute to noncompliance, poorer health outcomes, increased hospitalizations, and higher health care costs.^{5,8} Health care system interventions such as a standardized health education document have significantly improved comprehension and patient satisfaction.^{11,13}

The purpose of this investigation is to determine whether patients are able to obtain an elementary understanding of the fundamental principles of carpal tunnel release and the postoperative instructions after going through the process of informed consent and being provided an additional standardized postoperative instruction document. Our hypothesis is that patients will lack an understanding of these principles and, therefore, will be at risk for being noncompliant in their postoperative care.

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Table 1. Postoperative Carpal Tunnel Release Questionnaire.

1. What nerve is decompressed/operated on?	A. Ulnar nerve B. Median nerve C. Axillary nerve D. Sciatic nerve E. I don't know
2. What structure in the hand is cut as part of the procedure?	A. Median nerve B. Transverse carpal ligament C. Ulnar nerve D. Flexor tendon E. I don't know
3. When can I get my incision wet?	A. In 1 week postoperatively B. Not until cleared by my surgeon C. Day after surgery D. I don't know
4. How long can it take for my preoperative symptoms to be resolved?	A. Immediately after surgery B. A week or two C. In many chronic cases, symptoms may not completely resolve D. All the above E. I don't know
5. Although there are many different types of complications and having any one of them is rare after hand surgery, when one does occur what are some of the more common complications postoperatively?	A. Infection B. Injury to nerves or tendons C. Wound healing issues D. A & B E. B & C F. All of the above G. I don't know
6. During the first week after surgery, what are important elements in taking care of your hand after your procedure? (circle all that apply)	A. Ice at least 3-4 times per day for 20-30 minutes per session not applied directly to skin B. Elevation of the hand above the heart C. Keeping the dressing clean, dry, and intact D. No sports, heavy work or heavy lifting until your physician gives you permission E. Aggressive activity and food intake
7. When can you return to driving an automatic vehicle?	A. Once you are off narcotic pain medications B. Once you are able to make a fist and grip the steering wheel C. Both A & B D. I don't know

Materials and Methods

After obtaining approval from our institutional review board, 50 patients with a diagnosis of carpal tunnel surgery who elected to undergo carpal tunnel release with a single senior, fellowship-trained hand surgeon were enrolled in the study. The patients were informed that at their postoperative visit they would be asked to complete a questionnaire regarding personal demographic information, use of the postoperative instruction sheet, the carpal tunnel release surgery, and the postoperative instructions (Table 1). The questionnaire was written at an eighth-grade reading level as determined by the Flesch-Kincaid Readability Index through Microsoft Word. In addition to informing patients

about carpal tunnel surgery and obtaining consent for carpal tunnel release at the preoperative visit, a standardized postoperative instruction document was given to them (Figure 1). This document contained scripted postoperative instructions and the basic information regarding carpal tunnel surgery that was reviewed with every patient. In addition to reading this document to the patients, the patients were given a copy of this document to take home with them at their preoperative visit. The postoperative questionnaire was generated solely from information that was present on the document that was provided to every patient. The preoperative education was performed by the attending fellowship-trained hand surgeon while obtaining surgical consent. At their postoperative visit, prior to being evaluated by the

Post-Operative Instruction Sheet for Carpal Tunnel Surgery**About Your Surgery**

- The cause of carpal tunnel surgery is compression on the median nerve resulting in a lack of blood flow to the nerve. In order to reduce the compression, we release or cut your transverse carpal ligament as part of the procedure

Showering/Personal Hygiene

- You should not get your incision wet until seen by your surgeon. Your dressing should not be changed or removed until seen by your surgeon and should be kept clean and dry. We want to give your incision time to heal.

Things to look for post-operatively

- Although there are many types of post-operative complications and having one is rare, the more common complications are infection, injury to nerves or tendon and wound healing issues.

Resolution of Pre-operative Symptoms

- This varies depending on your individual disease process. Most patients have improvement in their pre-operative symptoms of numbness/tingling or pain within the first 2 to 3 weeks. Some have relief immediately after surgery. Some patients with more chronic symptoms may not have complete resolution of symptoms.

What are some of the most important elements in taking care of your hand after surgery?

- Elevating your hand above your heart or shoulder will help control swelling in the operative extremity. A swollen hand can give the sensation of having a "tight bandage" or increase pain in the extremity.
- Ice can be applied at least 3-4 times per day for 20-30 minutes per session not applied directly to skin to help with pain control and swelling.
- Compliance with not using your hand will help your wounds after surgery. Most patients are told to not be involved in any sports, heavy work or heavy lifting until your surgeon gives you permission
- Your dressing should remain clean, dry and intact. A wet or dirty dressing will increase your chance of developing an infection. If you plan to shower, you must keep your dressing covered and not allow it to get wet.
- Adequate food and nutrition intake will help with wound healing.

Driving

- Patients can return to driving an automatic vehicle after hand surgery once they are off narcotic pain medications and are able to make a fist. Patients must feel comfortable with gripping the steering wheel prior to returning to driving. Most patients do not go back to driving until about 1 week after surgery.

Figure 1. Standardized postoperative instructions document.

physician, patients completed the questionnaire. The questionnaire was then reviewed by the physician with the patient at the time of the postoperative visit to clarify any confusion regarding the postoperative instructions.

Statistical Analysis

Statistical comparisons of the overall number of questions answered correctly between patients with a high school education and patients with higher level of education (ie, some college, college, postgraduate), males and females, age 30 to 65 years and 66 years or older, patients who read the postoperative versus those who did not, patients who reviewed the postoperative instructions with family or friends versus those who did not were performed utilizing a 2-sample *t* test with a cutoff of $P < .05$ for significance. Fisher exact test analysis was performed to further assess the proportion of correct and incorrect responses to each question between patients with a high school education and patients with higher level of education (ie, some college, college, postgraduate), males and females, and 65 years or younger and 66 years or older. A 95% confidence interval (CI) was calculated for overall number of questions answered correctly. Statistical analysis was performed utilizing Microsoft Excel (Microsoft Corporation, Redmond, Washington) and StatPlus: LE (AnalystSoft Inc., Walnut, California).

Results

Fifty patients (16 males, 34 females) who reported that they are fluent in English and were planning on undergoing a carpal tunnel release were recruited. Eighty-two percent ($n = 41$) of patients reported that their age was between 30 to 65 years, 4% ($n = 2$) patients reported that their age was between 18 to 30 years, and 14% ($n = 7$) patients reported

that their age was 66 years or greater. Thirty percent ($n = 15$) reported that they completed some college, 28% ($n = 14$) reported that they graduated college, 26% ($n = 13$) reported that they graduated high school, 14% ($n = 7$) reported that they completed some postgraduate or doctorate education, and 2% ($n = 1$) reported they completed some high school. Fifty-eight percent ($n = 29$) reported that they had an orthopedic surgery performed on them in the past.

Ninety-six percent ($n = 48$) of patients reported that they read the postoperative instruction sheet prior to surgery, and 96% ($n = 48$) reported that read the postoperative instruction sheet after surgery. Fifty-six percent ($n = 28$) of patients reported that family or friends read the postoperative instruction sheet prior to surgery, and 56% ($n = 28$) patients reported that family or friends read the postoperative instruction sheet after surgery. In response to a question regarding the form of media, the patient would prefer to have their postoperative instruction delivered, 96% ($n = 48$) reported that they preferred a written handout and 4% ($n = 2$) reported that they would prefer to have their instructions on the Internet. Ninety-six percent ($n = 48$) of patients reported that they were satisfied with the teaching that was performed regarding the postoperative instructions. Ten percent ($n = 5$) reported that they had to call the surgeon's office postoperative prior to their first follow-up appointment regarding the postoperative instructions.

The average percentage of correct answers was 75.8% (8.34 out of 11 correct; 95% CI, 70.8%-80.8%) (Table 2). Comparison of overall percentage answered correctly using a 2-sample *t* test between patients with a high school education and patients with higher level of education (ie, some college, college, postgraduate) ($P = .23$), males and females ($P = .42$), age 30 to 65 years and 66 years or older ($P = .17$), patients who read the postoperative versus those who did not ($P = .19$), patients who reviewed the postoperative instructions with family or friends versus those who did

Table 2. Responses to Questionnaire.

Question	Responses
What nerve is being decompressed/operated on?	Median nerve, 46% (<i>n</i> = 22) Ulnar nerve, 8% (<i>n</i> = 4) Axillary nerve, 2% (<i>n</i> = 1) I don't know, 44% (<i>n</i> = 22)
What structure in the hand is cut as part of the procedure?	Transverse carpal ligament, 50% (<i>n</i> = 25) Median nerve, 10% (<i>n</i> = 5) Flexor tendon, 6% (<i>n</i> = 3) I don't know, 34% (<i>n</i> = 17)
When can I get my incision wet?	Not until cleared by my surgeon, 92% (<i>n</i> = 46) 1 week postoperatively, 4% (<i>n</i> = 2) Day after surgery, 2% (<i>n</i> = 1) I don't know, 2% (<i>n</i> = 1)
How long can it take for my preoperative symptoms to be resolved?	All the above, 66% (<i>n</i> = 33) Immediately after surgery, 10% (<i>n</i> = 5) A week or two, 14% (<i>n</i> = 7) I don't know, 10% (<i>n</i> = 5)
What are common complications postoperatively?	All of the above, 58% (<i>n</i> = 29) Infection, 16% (<i>n</i> = 8) A & B (ie, infection & injury to nerves or tendons), 10% (<i>n</i> = 5) B&C (ie, Injury to nerves or tendons & wound healing issues), 4% (<i>n</i> = 2) answered I don't know, 12% (<i>n</i> = 6)
During the first week after surgery, what are important elements in taking care of your hand after your procedure? (circle all that apply)	Ice at least 3-4 times per day for 20-30 minutes per session, 86% (<i>n</i> = 43) Elevation of the hand above the heart, 94% (<i>n</i> = 47) Keeping the dressing clean, dry and intact, 92% (<i>n</i> = 46) No sports, heavy work or heavy lifting until your physician gives your permission, 88% (<i>n</i> = 44) Aggressive activity and food intake, 12% (<i>n</i> = 6)
When can you return to driving an automatic vehicle?	Both A & B (once you are off narcotic pain medications & once you are able to make a fist), 74% (<i>n</i> = 37) Once off of narcotic pain medications, 18% (<i>n</i> = 9) Once you are able to make a fist, 2% (<i>n</i> = 1) I don't know, 6% (<i>n</i> = 3)

Note. Correct responses shaded gray.

not ($P = .13$) did not reveal any significant differences. However, Fisher exact test analysis demonstrated that patients with a lower education level were less likely to know how long it takes for their preoperative symptoms to resolve ($P = .0071$), and they were less likely to correctly choose all of the important elements of postoperative care during the first week after surgery ($P = .022$). Fisher exact test analysis did not demonstrate any significant difference between level of education and the remainder of the questions ($P > .05$). Fisher exact test analysis did not demonstrate any significant difference between gender or age ($P > .05$).

Discussion

Health literacy is the level of understanding a patient has of their medical condition. This depends and fluctuates based on several characteristics of the patient, provider, and the health care system.³ Our study evaluated the potential of an additional information sheet on improving patient health literacy regarding carpal tunnel syndrome and elective carpal tunnel release. Remarkably, only 46% (*n* = 22) of patients answered correctly that the median nerve was involved in carpal tunnel syndrome, and only

50% ($n = 25$) answered correctly that the transverse carpal ligament was the structure that was transected in carpal tunnel release. The National Assessment of Adult Literacy reported that mean reading level of adults in the United States is eighth grade.^{7,8} Therefore, we utilized the validated Flesch-Kincaid Readability Index to generate a questionnaire at this reading level.^{1,2,6,8} Spandorfer et al demonstrated that reading level is likely to be closer to the sixth-grade reading level.^{9,12} In accordance with this finding, the American Medical Association and the National Institute of Health have suggested that patient health education materials should be written at the sixth-grade reading level.^{8,10,15} A limitation of our study is that we chose to generate a questionnaire at the eighth grade given the specific surgical terminology required to make a comprehensive instruction sheet. This may have had an impact on the ability of our patients to understand the additional information sheet that was provided. Fisher exact test analysis demonstrated that patients with a lower education level were less likely to know how long it takes for their preoperative symptoms to resolve ($P = .0071$), and they were less likely to correctly choose all of the important elements of postoperative care during the first week after surgery ($P = .022$).

In response to a question regarding the form of media the patient would prefer to have their postoperative instruction delivered, 96% ($n = 48$) reported that they preferred a written handout and 4% ($n = 2$) reported that they would prefer to have their instructions on the Internet. This was a remarkable finding given that patient use of Internet materials to research and study their medical problems and the available treatment for their problems has been reported to be a common practice.^{4,8} Cooper et al reported that prevalence of utilizing Internet applications to aide their medical care is based on the demographics of physicians, with use being most associated with being a young physician in an academic institution.⁷ Eltorai et al demonstrated that a major flaw of the information available, most notably from the American Academy of Orthopaedic Surgeons (AAOS), is the educational materials are written at a reading level that exceeds the reading level of the average patient.⁸ Our finding that patients prefer a written handout also suggests that the health education materials patients find on the Internet do not improve their health literacy.

Kadakia et al assessed the health literacy of 146 trauma patients at a level I trauma center. These patients completed a questionnaire at their first postoperative visit.⁹ The mean score was 2.54 correct responses out of 5 questions. Only 47.9% of patients knew what bone they fractured, 18.5% knew the expected healing time, 66.4% knew how their bone was fixed, and 74% of patients knew the deep venous thrombosis (DVT) prophylaxis they were prescribed. Patients with an education greater than the high school

level were 2.5 times more likely to know the bone they fractured and the form of DVT prophylaxis they were prescribed. Overall, patients' lack of comprehension of their condition was remarkable and raises concerns about their ability to be compliant with their medical treatment.

Tsahakis et al assessed the impact of providing patients with an information sheet regarding a patient's treatment and discharge instructions that was intended to supplement the standard documents and verbal instructions that are given to patients routinely at discharge.¹³ Two hundred ninety-nine patients were included; 146 patients were given the standard postoperative information and documents, while 153 patients were given the additional standardized information sheet. At the first postoperative visit, a questionnaire was completed. The mean score for the intervention group was 2.9 out of 5, and the mean score in the group that did not receive the intervention was 2.54 ($P = .013$). Patients in the intervention group were 1.3 times more likely to know what bone they fractured ($P = .013$) and 1.1 times more likely to know the DVT prophylaxis they were prescribed ($P = .03$). Overall, providing patients with an additional standardized information sheet was able to improve health literacy.

Walsh et al surveyed 103 patients regarding their utilization of Internet health education materials in an urban outpatient orthopedic setting, regardless of their socioeconomic background.¹⁴ They demonstrated that significantly less Latinos (33%) than Caucasians (67%) or African Americans (77%) sought information on the Internet regarding their medical condition. They noted that the increasing use of mobile phones with Internet access has narrowed the digital divide among races. All the patients who completed our study identified themselves as fluent in English.

There are several limitations in our study. First, statistical comparison of overall percentage answered correctly between patients with a high school education and patients with higher level of education (ie, some college, college, postgraduate) ($P = .23$), males and females ($P = .42$), age 30 to 65 years and 66 years or older ($P = .17$), patients who read the postoperative versus those who did not ($P = .19$), patients who reviewed the postoperative instructions with family or friends versus those who did not ($P = .13$) did not reveal any significant differences. A post hoc power analysis of the relationship of these variables to the overall percentage of questions answered correctly revealed that our study was underpowered. Our justification for terminating the study early was that a remarkable percentage of patients did not understand fundamental components of carpal tunnel surgery, which led us to reassess our methods for educating patients about the surgery. Given that we terminated the study early, we will use what we learned in this pilot study to improve the design of a future study, which will include a postoperative instructions document written at the sixth-grade reading level as well as a video aide in our patient education process to further help patients achieve

health literacy regarding carpal tunnel surgery. Second, we did not correlate postoperative noncompliance with clinical outcomes. Third, we did not collect race/ethnicity or economic information.

Conclusion

Although we made efforts to help patients achieve health literacy in carpal tunnel surgery, we found that patients continued to lack comprehension of pertinent components of carpal tunnel surgery, particularly understanding the involved anatomy. Patients with a lower education level were less likely to know how long it takes for their preoperative symptoms to resolve, and they were less likely to correctly choose all of the important elements of postoperative care during the first week after surgery.

Ethical Approval

Lifespan/Rhode Island Hospital Institutional Review Board (reference # 514866) approved this study.

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 authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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