

Comparing Diagnostic and Treatment Recommendations of Carpal Tunnel Syndrome Available on the Internet With AAOS Clinical Practice Guidelines

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Abstract

Background: Carpal tunnel syndrome (CTS) is one of the most common diagnoses in a hand surgeon's office, with estimated cost exceeding US \$2 billion annually in the United States. Due to this prevalence and cost, patients often turn to the Internet for their medical care. It has been estimated that 72% of Internet users have looked online for health information in the last year. There is concern that patients may be getting misinformation with their Internet medical searches. **Methods:** An informal survey of the Internet was conducted to evaluate the content available to the public on the Internet and social media platforms regarding the diagnosis and treatment of CTS. The top 20 listings of 3 major search engines and information within 3 major social media sites were included. **Results:** Information gleaned from the search showed that while most listings were helpful in providing accurate diagnostic information and appropriate treatment modalities, there was also a great number of treatment modalities mentioned that may not be recommended by the treating physician. The guidelines established by the American Academy of Orthopaedic Surgeons both in 2007 and in 2008 and more recently in 2016 were used as a general reference but not directly compared with the informal Internet search for statistical analysis. **Conclusions:** This search outlines the importance of the information readily available to patients and how this may potentially alter patients' expectations prior to their arrival in the office.

Keywords: American Academy of Orthopaedic Surgeons, carpal tunnel syndrome, electrodiagnostic studies, Internet search, social media

Introduction

Carpal tunnel syndrome (CTS) is one of the most common diagnoses in a hand surgeon's office. It is also the most expensive upper-extremity musculoskeletal disorder at an estimated cost exceeding US \$2 billion annually in the United States.¹ The prevalence in the general population ranges from 1% to 5%.²⁻⁴ However, the prevalence in the working population tends to be much higher, with rates ranging from 7.8% to 14.8%, varying by industrial and occupational classifications.⁵⁻⁷ This accounts for lost work time from work-related CTS at a mean of 27 days, which is longer than any other work-related disorder except fractures.^{8,9} In addition, one study found that 18% of workers who develop CTS reported leaving their job within 18 months.¹⁰

Because CTS is such a common problem in the general and working population, the information available to those same people is vital in helping to reduce the burden placed

on themselves, their families, and the general public. A total of 74% of adults use social media. In addition, Facebook was the second most commonly accessed Web site behind Google based on a 2013 survey.¹¹ Approximately 72% of Internet users have looked online for health information in the last year.¹² That being said, 3 of the most accessed search engines (Google, Bing, Yahoo) and social media sites (Facebook, Twitter, LinkedIn) were used.^{13,14}

Several studies have looked at the availability of information on the Internet regarding CTS. These studies ranged from evaluating for indicators of accuracy and readability

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Table 1. 2007 American Academy of Orthopaedic Surgeons Clinical Practice Guidelines Regarding Diagnosis of Carpal Tunnel Syndrome.

Recommendation	
B	Electrodiagnostic studies only when considering treatment options
C	Using history alone, physical examination alone, or electrodiagnostic studies with clinical suspicion based on history and physical examination
	Against utilizing magnetic resonance imaging, computed tomographic scans, or pressure-specified sensory device in diagnosis

to evaluating for quality of content using independent scoring systems.¹⁵⁻²⁰ While these studies outline the importance of information available at the fingertips of the general public, none have used the American Academy of Orthopaedic Surgeons (AAOS) Clinical Practice Guidelines (CPG) as a side-by-side comparison.

Materials and Methods

An Internet search was conducted to gain information about the content available from 3 of the most visited search engines and social media Web sites regarding CTS. The search was performed between December 1, 2015, and December 20, 2015. The first 20 Web sites listed within the search engine, excluding ads, from Google, Bing, Yahoo, were used. Ads within the first 20 listings of each source material, as well as content found within social media sites, were reviewed as well. Three individuals performed separate searches during the same time period and gained agreeable information. The information gained from this search was then combined and organized into tables for comparison with the AAOS CPG established in 2007, 2008, and 2016 as an all-inclusive review of the material. The tables were organized to compare Web sites common to all 3 search engines (most accessible to the public by being present on all 3 search engines), common to 2 search engines, and solely listed within 1 search engine. The information within the Web sites was then determined to either contain or omit recommendations established by the CPG.

The initial AAOS CPG established in 2007 and 2008, in terms of diagnosis and treatment, as well as an updated version of the CPG established in 2016, was used as a general reference. The grading of the recommendations in the 2007 and 2008 versions is as follows: A = good evidence (level I studies with consistent finding) for or against recommending intervention; B = fair evidence (level II or III studies with consistent findings) for or against recommending intervention; C = poor quality evidence (level IV or V) for or against recommending intervention; I = there is insufficient or conflicting evidence not allowing a recommendation for or against intervention. The grading of the recommendations in the

2016 version is as follows: strong = evidence from 2 or more “high” quality studies; moderate = evidence from 2 or more “moderate” quality studies or 1 “high” quality study; limited = evidence from 2 or more “low” quality studies with consistent findings or evidence from a single “moderate” quality study or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention; consensus = there is no supporting evidence, and recommendation is based on clinical opinion.

An abbreviated version of the 2007 AAOS CPG based on diagnosis includes the following²¹: grade B recommendations = electrodiagnostic studies only when considering treatment options; grade C recommendations = using history alone, physical examination alone, or electrodiagnostic studies with clinical suspicion based on history and physical examination. Recommendation against utilizing magnetic resonance imaging (MRI), computed tomographic (CT) scans, or pressure-specified sensory device (PSSD) in diagnosis was also grade C recommendations. This information can be found in Table 1.

An abbreviated version of the 2008 AAOS CPG based on treatment includes the following²²: grade A recommendations = surgical release; grade B recommendations = trial of a steroid injection or splinting before surgery, trial of a different modality if first fails, recommendation against postoperative immobilization, and using a scoring system postoperatively; grade C recommendations = oral steroids or ultrasound therapy, and using preoperative antibiotics; inconclusive = modalities which include activity modifications, acupuncture, exercise, and medications (including anticonvulsants, antidepressants, and nonsteroidal anti-inflammatory drugs [NSAIDs]). This information can be found in Table 2.

An abbreviated version of the 2016 AAOS CPG based on diagnosis includes the following²³: strong evidence = observation of thenar atrophy to rule in CTS, but not to rule out, against using single physical examination tests to diagnose CTS because each test alone has a poor or weak association with ruling-in or ruling-out CTS, and that body mass index and high hand/wrist repetition rate are associated with an increased risk of developing CTS; moderate evidence = not using independent history

Table 2. 2008 American Academy of Orthopaedic Surgeons Clinical Practice Guidelines Regarding Treatment of Carpal Tunnel Syndrome.

Recommendation	
A	Surgical release
B	Trial of a steroid injection or splinting before surgery Trial of a different modality if first fails Against postoperative immobilization Using a scoring system postoperatively
C	Oral steroids or ultrasound therapy Using preoperative antibiotics
Inconclusive	Modalities which include activity modifications, acupuncture, exercise, yoga, heat, ice, massage, and medications (including anticonvulsants, antidepressants, diuretics, and nonsteroidal anti-inflammatory drugs)

Table 3. 2016 American Academy of Orthopaedic Surgeons Clinical Practice Guidelines Regarding Diagnosis of Carpal Tunnel Syndrome.

Recommendation	
Strong	Observation of thenar atrophy to rule in CTS, but not to rule out Against using single physical examination tests to diagnose CTS because alone each has a poor or weak association with ruling-in or ruling-out CTS Body mass index and high hand/wrist repetition rate are associated with an increased risk of developing CTS
Moderate	Not using independent history interview topics to diagnose CTS Not routinely using magnetic resonance imaging for the diagnosis Using questionnaires and electrodiagnostic studies to aid the diagnosis The fact that physical activity/exercise is associated with a decreased risk of developing CTS The use of oral contraception and female hormone replacement therapy is not associated with an increased or decreased risk of CTS
Limited	Not routinely using ultrasound for the diagnosis Patients who do not report frequent numbness or pain might not have CTS A hand-held nerve conduction study device might be used for the diagnosis of CTS

Note. CTS = carpal tunnel syndrome.

interview topics to diagnose CTS, not routinely using MRI for the diagnosis, using questionnaires and electrodiagnostic studies to aid the diagnosis, the fact that physical activity/exercise is associated with a decreased risk of developing CTS, and that the use of oral contraception and female hormone replacement therapy is not associated with an increased or decreased risk of CTS; limited evidence = not routinely using ultrasound for the diagnosis, patients who do not report frequent numbness or pain might not have CTS, and that a hand-held nerve conduction study device might be used for the diagnosis of CTS. This information can be found in Table 3.

An abbreviated version of the 2016 AAOS CPG based on treatment includes the following²³: strong evidence = the use of immobilization other than in the postoperative period (brace/splint/orthosis) and steroid injection may improve symptoms, not using magnet therapy; surgical release should improve symptoms and function and it should have a greater treatment benefit at 6 and 12 months compared with splinting, NSAIDs/therapy, and a single steroid injection; moderate evidence = no benefit of oral

treatments not including steroids (which has moderate evidence of improving patient-related outcomes compared with placebo), ketoprofen phonophoresis could provide reduction in pain, and the fact that there is no benefit to routine inclusion of the following adjunctive techniques: epineurotomy, neurolysis, flexor tenosynovectomy, and lengthening/reconstruction of the flexor retinaculum (transverse carpal ligament); limited evidence = therapeutic ultrasound might be effective; laser therapy might be effective; if surgery is chosen, an endoscopic carpal tunnel release based on possible short-term benefits may be considered; the use of local anesthesia rather than intravenous regional anesthesia because it might offer longer pain relief after surgery; and there is no benefit for routine use of prophylactic antibiotics. This information can be found in Table 4.

In addition, the information regarding the advertisements' content and social media (Facebook, Twitter, LinkedIn) content was reviewed, but felt to be disorganized and limited in terms of information and thus not included in the tables.

Table 4. 2016 American Academy of Orthopaedic Surgeons Clinical Practice Guidelines Regarding Treatment of Carpal Tunnel Syndrome.

Recommendation	
Strong	The use of immobilization other than in the postoperative period (brace/splint/orthosis) and steroid injection may improve symptoms Not using magnet therapy Surgical release should improve symptoms and function and it should have a greater treatment benefit at 6 and 12 months compared with splinting, nonsteroidal anti-inflammatory drugs/therapy, and a single steroid injection
Moderate	No benefit of oral treatments not including steroids (which has moderate evidence of improving patient-related outcomes compared with placebo) Ketoprofen phonophoresis could provide reduction in pain The fact that there is no benefit to routine inclusion of the following adjunctive techniques: epineurotomy, neurolysis, flexor tenosynovectomy, and lengthening/reconstruction of the flexor retinaculum (transverse carpal ligament)
Limited	Therapeutic ultrasound might be effective Laser therapy might be effective If surgery is chosen, an endoscopic carpal tunnel release based on possible short-term benefits may be considered The use of local anesthesia rather than intravenous regional anesthesia because it might offer longer pain relief after surgery There is no benefit for routine use of prophylactic antibiotics

Table 5. Breakdown of Web Site Listings.

Source	Number of sites common to all 3 (out of 20)	Number of sites common to one other source (out of 20)	Number of sites exclusive to that source (out of 20)	Total number of unique sites out of the 60 visited
Google	10	4 (2 with Yahoo, 2 with Bing)	6	31
Yahoo	10	7 (2 with Google, 5 with Bing)	3	
Bing	10	7 (2 with Google, 5 with Yahoo)	3	

Results

The first 20 listings for the search term “Carpal tunnel syndrome” were reviewed from Google, Bing, and Yahoo. In all, there were 31 distinct site listings among the 60 that were listed across the 3 search engines. Additional information regarding the characteristics of the Web sites is included in Table 5.

Of the 31 distinct Web sites listed, 28 of 31 (90.32%) mentioned gathering information about history. Physical examination modalities to aid in diagnosis was mentioned in 22 of 31 sites (70.97%). Ordering electrodiagnostic testing with a clinical suspicion of the underlying diagnosis was mentioned in 20 of 31 sites (64.52%), while 5 of 31 (16.13%) mentioned ordering electrodiagnostic testing to aid in treatment planning. Ordering supplemental diagnostics including MRI, ultrasound, and PSSD was mentioned in 7 of 31 Web sites (22.58%). This information is detailed in Table 6.

In terms of treatment, 28 of 31 (90.32%) mentioned a trial of steroid injections or splinting before surgery. A trial of oral steroids or ultrasound therapy as a treatment option was mentioned in 9 of 31 Web sites (29.03%). Mentioning

surgery as a treatment modality was portrayed in 26 of 31 sites (83.87%), while 27 of 31 sites (87.10%) mentioned using additional modalities including yoga, NSAIDs, vitamin B₆ injections, acupuncture, weight loss, elastic therapeutic taping, ice/heat, massage, and diuretics, among others (Table 7).

The information of the advertisements within the search engines as well as social media was variable and unreliable. Most of the postings included links to commercial products or practice groups' web pages.

Discussion

The purpose of this search was to identify and organize the information available on the Internet using already established CPG as a general reference for comparison. Patients are increasingly reliant on information from the Internet in today's society. Because of this, patients are presenting to the hand surgeon's office with oftentimes misguided information regarding their complaint. There is a large degree of variability of the information on the Internet regarding diagnosis and treatment of carpal tunnel. Furthermore, while most of the Web sites listed within the popular search

Table 6. Diagnostic Recommendations of Site Listings.

Source	Mentions history	Mentions physical examination	Mentions electrodiagnostics with clinical suspicion	Mentions electrodiagnostics with treatment in mind	Mentions magnetic resonance imaging/computed tomography/pressure-specified sensory device
Google exclusive (6 sites)	5	3	2	0	1
Yahoo exclusive (3 sites)	3	2	0	0	0
Bing exclusive (3 sites)	3	1	1	0	0
Google + Yahoo (2 sites)	2	2	2	0	0
Google + Bing (2 sites)	2	2	2	1	1
Yahoo + Bing (5 sites)	5	3	3	0	2
Google + Bing + Yahoo (10 sites)	8	9	10	4	3
Total (31 Sites)	28	22	20	5	7

engines contain relevant and accurate information, they are often intermixed with questionable recommendations.

The Web sites listed within the 3 search engines were consistent in mentioning obtaining a history and physical examination findings, as well as informing on the utilization of electrodiagnostic measures to help with diagnosis. However, 7 of 31 Web sites (22.6%) mentioned using ultrasound, MRI, or PSSD testing to help with diagnosis, which appears to have limited evidence for support based on the CPG. Graham²⁴ demonstrated that electrodiagnostics do not change the probability of the diagnosis that is clinically relevant. The benefit of ordering electrodiagnostics, then, may be in determining conservative treatment options versus surgery, which most of the Web sites lacked in mentioning.

The Web sites fared well in providing appropriate treatment recommendations, including the recommendation of surgery in all but 5 of the Web sites. However, less than 30% of the Web sites mentioned utilizing oral steroids or ultrasound therapy as a treatment option. According to the most recent CPG, there is moderate evidence of oral steroids being able to improve patient-related outcomes compared with placebo.

While most of the Web sites provided generally agreed-upon treatment modalities, nearly 90% of them recommended treatment modalities with limited evidence or no consensus based on the most recent CPG. This potentially may result in the trialing of potentially unsuccessful modalities as well as the possible delay in presentation to a health care practitioner, as patients may be more inclined to trial these readily available modalities first. These include, in most commonly cited order, NSAIDs, ice therapy, massage, vitamin B6, and yoga.

The 10 Web sites that were common among all 3 search engines mentioned trialing a steroid injection or immobilization as well as surgical release as treatment modalities, both strong evidence recommendations based on the most recent CPG. This is reassuring, given that these Web sites would likely reach a greater audience being available as first page listings across several search engines. However, 9 of 10 of these Web sites mentioned modalities with limited evidence or no consensus.

One aspect of the search that may cause the greatest degree of confusion among patients is the advertisement links embedded within each search engine. Oftentimes, advertisements appear as the first 2 or 3 links prior the Web site listings, and these contain primarily enticing commercial products. To the novice Internet user, it may be difficult to decipher the validity of the advertisements from the Web sites that provide more appropriate recommendations.

Regarding the social media search, the information found within the search field tends to be quite variable and depends on the followers, friends, contacts, and focus of the user's profile. In general, it is our assumption that information found within the social media search tends to be unreliable and should be taken with caution.

There were some limitations to this Internet survey. First, our search was limited to one geographic region, which may affect the content of the search. Second, the search was limited to the first 20 listings across the 3 search engines. The content may be different had we expanded to the top 50 listings, for example. Third, regarding the social media search, the information could be drastically different depending on the user performing the search. Finally, our

Table 7. Treatment Recommendations of Site Listings.

Source	Trial steroid injection or splinting before surgery	Try a different modality if first fails	Recommends oral steroids or ultrasound	Mentions ice, heat, massage, yoga, acupuncture, taping, weight loss, medications other than steroids	Mentions surgery	Recommends against postoperative immobilization	Mentions a postoperative scoring system
Google exclusive (6 sites)	5	4	0	4 (Yoga, NSAIDs)	5	0	0
Yahoo exclusive (3 sites)	2	1	0	3 (acupuncture, B6, yoga, NSAIDs)	2	0	0
Bing exclusive (3 sites)	2	1	1	3 (B6, taping, NSAIDs)	1	0	0
Google + Yahoo (2 sites)	2	1	0	2 (ice, massage, NSAIDs)	1	0	0
Google + Bing (2 sites)	2	2	0	2 (weight loss, acupuncture, ice, NSAIDs)	2	0	0
Yahoo + Bing (5 sites)	5	5	2	4 (heat/ice, acupuncture, NSAIDs)	5	0	0
Google + Bing + Yahoo (10 sites)	10	10	6	9 (ice, diuretic, acupuncture, B6, NSAIDs)	10	2	0
Total (31 sites)	28	24	9	27	26	2	0

Note. NSAIDs = nonsteroidal anti-inflammatory drugs.

Internet search took place in December 2015, prior to the most recent CPG, which makes the information discussed potentially outdated information.

As the availability of information to patients increases, the importance of accurate Web sites for the general public becomes imperative. While most Web sites provide some degree of appropriate recommendations, there also exists a vast amount of misinformation, even within some of the more reliable sources. This search outlines the importance of the information readily available to patients compared with already established guidelines and how this can alter patients' expectations prior to their arrival in the office.

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Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

No humans or animals were involved or harmed in this study.

Statement of Informed Consent

No human subject testing was conducting for this study.

Declaration of Conflicting Interests

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