

# Internet self-diagnosis in hand surgery

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Published online: 2 December 2014  
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## Abstract

**Background** Some Internet sites have programs that attempt to help patients find their diagnosis based on symptoms. This study tested the null hypothesis that there are no factors associated with correspondence between online diagnosis and the hand surgeon's diagnosis in an outpatient hand and upper extremity surgeons' office.

**Methods** Eighty-six outpatients were prospectively enrolled and used *WebMD*® symptom checker to guess their diagnosis. We collected demographic information, hours spent on the Internet per week, and the following questionnaires: Pain Catastrophizing Scale (PCS) and Center of Epidemiologic Studies Depression scale (C-ESD).

**Results** Thirty-three percent of online diagnoses matched the final diagnosis of the hand surgeon. Factors associated with an online diagnosis corresponding to the hand surgeon's diagnosis included sex (women) and patients who studied their symptoms online prior to the visit. The best multivariable model included sex, more years of education, and prior use of the Internet to research their medical condition and explained 15 % of the variation in correspondence of diagnosis.

**Conclusions** The majority of online diagnoses for hand and upper extremity conditions do not correspond with the diagnosis of the treating hand surgeon. Psychological factors do not influence the correspondence of online diagnosis with the hand surgeon's diagnosis.

Level of Evidence: Prognostic, level II

**Keywords** Online medical self-diagnosis · PSEQ · Orthopedic setting

## Introduction

Patients have access to public sources of information on a variety of health concerns [11, 13]. Some patients make a self-diagnosis based on their online studies. There are also Internet sites with programs that attempt to guess the patients diagnosis based on their symptoms [12, 17]. Some patients are successful in finding the correct diagnosis through the Internet, in some cases identifying rare diseases that their physicians had not yet considered [4]. In fact, a study examining a sample of the clinicopathological case conferences that focused on diagnosis rather than management from the 2005 volume of the *New England Journal of Medicine* found that Google searches with a select three to five key terms correctly diagnosed 15 of the 26 cases [15]. On the other hand, a study of 101 patients attending a genitourinary medicine clinic in the UK who researched their symptoms online found that only 14 made the correct diagnosis [14].

Along with symptoms of depression, the ineffective coping strategy of catastrophic thinking and its converse, the effective coping strategy of self-efficacy consistently accounts for more of the variation in pain intensity and magnitude of disability than diagnosis or pathophysiology in hand and upper extremity illness [6, 16]. In other words, they are an integral part of hand illness and should always be taken into account. Patients

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with greater symptoms of depression and less effective coping strategies tend to report more symptoms, in more areas, with a less discrete description [3]. It is therefore plausible that psychological factors would affect the accuracy of an online program that tries to guess their diagnosis.

This study tested the null hypothesis that there are no factors associated with correspondence between online diagnosis and the hand surgeon's diagnosis in an outpatient hand and upper extremity surgeon's office.

## Materials and Methods

### Study Design

After approval of our institutional review board, all new patients, who were nonpregnant, fluent in written and spoken English, and aged at least 18 years or older, were asked to participate in this prospective study. Patients were enrolled in the examination room, while they were waiting for their first encounter with the orthopedic surgeon. They were either self-referred or referred by their primary care physician for the first evaluation by a hand specialist. Patients referred by another specialist or those who had previously received the results of their physical testing, e.g., radiographs and electrodiagnostic testing and patients with reoccurrence of an old problem or laceration were excluded.

### Subjects

We enrolled 86 patients with a mean age of 46 years treated by three different hand surgeons (Table 1).

### Measurement Tools

After obtaining consent, participants completed a survey composed of demographic information, the number of hours spent on the Internet per week, and the following questionnaires: Pain Catastrophizing Scale (PCS) and Center of Epidemiologic Studies Depression scale (C-ESD).

Next, the patients were asked to use *WebMD*<sup>®</sup> symptom checker to attempt to guess their diagnosis [5]. The *WebMD* Symptom Checker is designed to help patients understand what their medical symptoms could mean and provide the patient with a list of potential diagnoses with additional information [5]. Patients were provided with instructions if assistance was requested. The online tool asks participants to enter their sex and age, the body part, and the symptoms. Depending on these selections, additional questions are asked regarding the intensity of the symptoms, associated symptoms, etc. The online tool then presents a list of potential diagnoses with a description of each, allowing patients to decide which diagnosis was most likely. After reading the additional

**Table 1** Demographics ( $N=86$ )

Parameter	Mean	SD	Range
Age (years)	46	15	21–79
Education (years of school, $n=84$ )	17	2.9	11–22
	Number	%	
Sex			
Male	44	51	
Female	42	48	
Marital status			
Single	23	26	
Living with partner	3	3.5	
Married	52	61	
Separated/divorced	6	7.1	
Widowed	2	2.4	
Work status			
Working full time	52	60	
Working part time	7	8.1	
Homemaker	5	5.8	
Retired	11	13	
Unemployed, able to work	5	5.8	
Unemployed, unable to work	3	3.5	
Currently on sick leave	1	1.1	
Missing	2	2	
Physician			
Surgeon 01	2	2.3	
Surgeon 02	20	23	
Surgeon 03	64	74	
Diagnosis group			
Contusion	4	4.6	
Acute injuries	2	2.3	
Nonspecific arm pain	10	12	
Trigger finger	7	8.1	
Carpal tunnel syndrome	6	7.0	
Ganglion	22	26	
Osteoarthritis	6	7.0	
Tendinitis	8	9.0	
Dupuytren	5	5.8	
Lateral epicondylitis	6	7.0	
Rotator cuff tendinosis	4	4.6	
Other	6	7.0	
Referred by			
Patient self	20	23	
Primary care physician	46	54	
Other	20	23	
Hours spent on the Internet per week			
0	3	3.5	
1–5	27	31	
6–10	12	14	
11–15	7	8.1	
16+	38	44	
Online medical research			
Medical research in the past	70	81	
Medical research current condition	39	45	

information, patients were asked to choose the top three most likely diagnoses in order of likelihood. The final diagnosis of the physician was documented after the encounter with the physician to compare with the chosen diagnosis by the patient.

**Statistical Analysis**

A sample of 82 patients was chosen to detect an effect size of 0.3 with an alpha error of 0.05 and an 80 % power. Continuous data was presented as the mean when normally distributed. When data was not normally distributed, we reported the median with interquartile range. The Pearson chi-square test was used to determine the level of correspondence of the provided diagnosis by the diagnostic application and the final diagnosis of the physician. The outcome was positively categorized when the outcome was corresponding and negatively categorized when this was not corresponding. We used the Student's *T* test for differences at enrollment, regarding continuous dependent variables. We conducted a backward, step-wise, logistic regression to determine predictors of corresponding diagnosis. All variables with  $p < 0.10$  were included in the models.

**Results**

Thirty-three percent of the diagnoses derived by the diagnostic application matched the final diagnosis of the hand surgeon. There was a significant difference between the final diagnosis found with the online tool compared to the given diagnosis by the physician ( $p=0.03$ ). The final diagnoses with greatest correspondence with the online tool were carpal tunnel syndrome (66 %), ganglion cyst (55 %), rotator cuff tendinosis (50 %), and acute injury (50 %), while nonspecific arm pain (0 %), trigger finger (0 %), and lateral epicondylitis (20 %) corresponded less often (Table 2). Factors associated with an online diagnosis corresponding to the hand surgeon's diagnosis included sex (women) and patients who studied their symptoms online prior to the visit (Table 2). The best multi-variable model included sex ( $p < 0.01$ , odds ratio (OR) 4.3), years of education ( $p=0.02$ , OR 1.2), and prior use of the Internet to research their medical condition ( $p=0.02$ , OR 3.7) and explained 15 % of the variation in correspondence of diagnosis (Table 2).

**Discussion**

We found that the online diagnosis found with *WebMD*® symptom checker may not correspond with the hand surgeon, although the correspondence was greater than 50 % for some common diagnoses with characteristic symptoms and signs

**Table 2** Bivariate analyses ( $N=86$ )

	Correspondence of diagnosis <sup>a</sup>			
	Yes	No	<i>p</i> value	
Parameters at enrollment	Mean (SD)	Mean (SD)		
Age	49 (±16)	45 (14)	NS	
Education	17 (±2.9)	16 (±2.8)	0.1	
Overall health	8.4 (±1.1)	8.0 (±1.4)	NS	
PCS	17.6 (±5.3)	22 (±9.5)	NS	
C-SED	7.1 (±7.1)	8.1 (±9.7)	NS	
Sex	<i>N</i> (%)	<i>N</i> (%)		
Male	9 (10)	33 (38)	0.03	
Female	19 (22)	25 (29)		
Marital status				
Single	6 (7.0)	16 (19)	NS	
Living with partner	0 (0.0)	3 (3.5)		
Married	19 (22)	33 (39)		
Separated/divorced	1 (1.2)	5 (5.8)		
Widowed	1 (1.2)	1 (1.2)		
Work status				
Working full time	18 (21)	35 (42)	NS	
Working part time	3 (3.6)	4 (4.8)		
Homemaker	2 (2.4)	2 (2.4)		
Retired	3 (3.6)	8 (9.5)		
Unemployed, able to work	1 (1.2)	4 (4.8)		
Unemployed, unable to work	0 (0.0)	3 (3.6)		
Others	0 (0.0)	1 (1.2)		
Diagnosis				
Contusion	3 (3.6)	1 (1.2)		0.03
Fracture	0 (0.0)	2 (2.3)		
Nonspecific arm pain	0 (0.0)	10 (12)		
Trigger finger	0 (0.0)	7 (8.1)		
Carpal tunnel syndrome	4 (4.7)	2 (2.3)		
Ganglion	12 (14)	10 (12)		
Osteoarthritis	2 (2.3)	4 (4.7)		
Tendinitis	2 (2.3)	6 (6.7)		
Dupuytren	2 (2.3)	3 (3.4)		
Epicondylitis lateralis	1 (1.2)	5 (5.8)		
Rotator cuff tendinosis	2 (2.3)	2 (2.3)		
Other	0 (0.0)	6 (6.7)		
Hours spent on the Internet per week				
0	1 (1.2)	2 (2.3)	NS	
1–5	8 (9.3)	19 (22)		
6–10	2 (2.3)	10 (12)		
11–15	3 (3.5)	4 (2.7)		
16+	13 (15)	24 (28)		
Online medical research				
Medical research in the past				
Yes	22 (26)	48 (56)	NS	
No	6 (7.0)	10 (12)		
Studied current medical condition				
Yes	8 (23)	31 (31)	0.03	
No	20 (33)	27 (67)		

<sup>a</sup> Diagnosis chosen by patient from top three shows diagnoses by *WebMD*

such as carpal tunnel syndrome and ganglion cysts. The correspondence between online diagnosis and hand surgeon diagnosis is associated with demographical factors and is not associated with psychological factors.

These data should be interpreted in light of the fact that the presented diagnoses are limited to the upper extremity. Also, we evaluated the correspondence of the diagnoses, not accuracy. Finally, study subjects used one tool, whereas actual patients likely get information from several sites. This may be reflected in the fact that patients that had done their own searches prior to coming in were more likely to have corresponding diagnoses.

Previous studies found the people with more education, more experience using the Internet, and women are more likely to search for health information online [7–10]. It is possible that more educated patients and women are more accustomed to using the Internet for health searches, which might facilitate optimal use and interpretation of the tool [1]. On the other hand, this study did not show that more experienced Internet users were more likely to find the corresponding diagnosis.

The lack of age as a discriminating factor in finding the corresponding diagnosis indicate that, over time, the older generation is getting more comfortable using online diagnostic tools, which is in line with previous results showing that older adults are more frequently using the Internet seeking for health information [8].

Although a previous work suggested that obtaining health information online is associated with greater self-efficacy, psychological factors were irrelevant in our study [2]. While depression was also not related to correspondence, one important psychological factor worth testing in future studies is heightened illness concern given its relationship to nonspecific arm pain [16]. Also, little is known about patient's comorbidity in relation to the ability to find the corresponding diagnosis. It is known that physically impaired and disabled persons are less likely to use the Internet to obtain health information [9].

It is not surprising that the majority of online diagnoses were discordant with the surgeon's diagnosis given the substantial additional information gleaned from interview, examination, and diagnostic tests. Indeed, the high rates of correspondence for common diseases with characteristic symptoms reflect that the diagnosis of many upper-limb diseases is straightforward. The overall poor performance of the diagnosis guessing program relates to the high percentage of nonspecific conditions and conditions that are either uncommon or have many overlapping symptoms (e.g. de Quervain and trapeziometacarpal arthrosis). We speculate on the following potential areas for future research. It may be possible to increase the accuracy of a diagnosis guesser by taking into account the uniqueness of various symptom clusters and the

probability of specific diseases. The inclusion of useful information such as the probability that the diagnosis is accurate, a list of initial nonoperative treatments, and the probability of adverse events if a doctor is not consulted within a few months would help patients which symptoms to quickly bring to the doctor's attention and which can be managed initially with nonspecific measures and time.

**Acknowledgments** M.G. Hageman is supported by Dutch research grants from Marti-Keunig Eckhart Stichting and Anna Foundation. No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

**Conflict of Interest** Michiel G.J.S. Hageman declares that he has no conflict of interest.

Jade Anderson declares that she has no conflict of interest.

Robin Blok declares that he has no conflict of interest.

Jeroen K. J. Bossen declares that he has no conflict of interest.

David Ring declares that he has no conflict of interest.

**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** The authors confirm that informed consent was obtained from all patients included in the study.

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