

## **Comparing Four Online Symptom Checking Tools: Preliminary Results**

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### **Abstract**

The Internet has become an increasingly important source of health-related information. Among the most common purposes for Internet use in health matters is to obtain preliminary diagnosis for deciding whether to see a doctor. However, few studies focus on the usability of online symptom checking tools. In this study, we compare the usability of three different online symptom checkers, as well as Google search. The online symptom checkers were from EverydayHealth.com, FamilyDoctor.org and WebMD.com. Each symptom checker uses a different interface. Ten participants took part in the experiment. Each participant first completed an initial questionnaire, and then completed each of the three symptom checking tasks using four methods. Following each task was either a success task questionnaire, which asked the participant to rate the difficulty or the easiness of the task if the task was completed, or a non-success questionnaire if the task was not completed. At the end of the experiment, participants completed a final questionnaire. The results showed that 70% of the participants preferred the symptom checker on FamilyDoctor.org, which used a flowchart, over the other symptom checkers. All participants preferred to search for self-diagnosis using Google search over the symptom checkers in the selected health websites.

### **Keywords**

online self-diagnosis, symptom checker, online health information, health informatics, usability evaluation

### **1. Introduction**

One of the most popular resources to get health-related information is the Internet; e.g. using e-health websites that have a symptom checker that allows users to enter their symptoms and get a diagnosis, and simply using Google search to get more detailed information about a specific health issue. The Social Life of Health Information [1] found that 61% of American adults look online for health information, and 52% have searched for health information on behalf of another person, and two-third of e-patients talk with someone else about what they find online. A study of seven countries in Europe [2] investigated patterns of health-related Internet use, its consequences, and citizens' expectations about their doctors' provision of e-health services. Results showed that 44 % of the 7,934 respondents and 71 % of the Internet users had used the Internet for health purposes, of which the most common ones were to read information, decide whether to see a doctor, and to prepare for a follow up on doctor's appointments.

Although the Internet has become a common source for health information, researchers are concerned about the actual impact of this information on the users and their health. A review paper showed that most users of online health information look for information about specific health disorders because they were or someone they know was diagnosed with a medical disorder [3]. They typically use a general search tool to find online health information and enter short expressions; however, these are often misspelled. They rarely go past the first page of the search results. Both their search and evaluation skills are limited, even although they are concerned about the quality of online health information. People looking for health information often obtain their first opinion by using the Internet, and then, from doctors. This may lead to problems due to the fabrication, misunderstanding of valid information, and lack of medical knowledge, inexperience, and limited perspectives [4]. Self-diagnosis could have strong potential for value co-destruction between the customer and the provider, due to deficiencies in and misuse of the resources (health information) [5]. Tang and Kwoon's study found that Google lead to the correct diagnosis in 58% (95% confidence interval 38% to 77%) of the cases [6].

The above studies focus mainly on the use of Internet for health purposes and health information found. Few studies have examined the usability of the e-health websites or specific tools in such websites, such as the symptom checker. Lauterbach compared the symptom checker and general search capability of WebMD.com and HealthCentral.com in terms of usability, satisfaction and preference. The results showed that people prefer WebMD

over HealthCentral [7]. Another comparative study by Lauterbach was on the WebMD iPad application and the WebMD.com website[8]. The results showed that people were more satisfied with the iPad App in ease of use, portability, and navigation. Some recommendations for both website and mobile app were discussed. Another user test [9] evaluated the usability of WebMD symptom checker and came up with suggestions to enhance the user experience. However, those studies did not evaluate usability comprehensively beyond user preferences. Nor did they propose recommendations for different types of symptoms checker interfaces [7-9].

### **Objective**

The purpose of this study is to test the usability of three online symptom checkers and compare the differences between these tools as well as Google search in perceived difficulty, preference and satisfaction. Design guidelines for symptom checker interface will be discussed based on the results of the usability tests.

## **2. Method**

### **2.1 Participants**

Ten students (four males, six females; mean age = 26.7, SD=4.39) at Binghamton University participated in the study. All the participants reported that they searched the Internet daily. At the time of the study, 90% of the participants reported that they turned to the Internet when trying to diagnose symptoms. Thirty percent of the participants reported that they used the Internet multiple times a week to search for health-related information and 70% stated that they searched for health information multiple times a month. All participants had used Google for self-diagnosis, and 10% of the participants had used WebMD.com. None of the participants had prior experience with the symptom checker on either FamilyDoctor.org or EverydayHealth.com.

### **2.2 Materials**

Google search and three web-based symptom checkers were compared in this study, including WebMD.com, EverydayHealth.com, and FamilyDoctor.org. The symptom checkers allow users to search for diagnosis by entering information about their symptoms. Each uses a unique type of interface for the symptom checker application. The descriptions below are based the interfaces each website had at the time of the study, i.e. April 2016. The websites have already made changes and improved their symptom checker interfaces since then.

#### ***EverydayHealth.com***

The symptom checker on this website uses a search tool that allows users to enter their symptoms or to select their symptoms from a list of the most common symptoms, such as fever. Then, the application asks about the person's age and gender, followed by a series of questions about whether a symptom is being experienced.

#### ***FamilyDoctor.org***

The symptom checker first lets users select their symptoms then show the user a decision tree. Users are supposed to walk through the decision flow chart based on their symptoms and find a diagnosis on the decision tree. This application does not require users to enter their demographic data.

#### ***WebMD.com***

The WebMD Symptom Checker first asks users to enter their age and gender, and click on the corresponding location on a body map to show the location of the symptom. Then the application asks a series of questions that ask about the severity of the symptom as well as any other issues that may affect the selected symptom. The application will present a long list of possible conditions. Each condition is a super link; i.e. the user could click on the name of the condition and read more about it.

UserZoom software was used to run the web-based usability tests. Each participant received an invitation link by email to complete the test using his/her own computer. Mouse movement, facial expression, and participants comments (think-aloud) were collected. Seventy percent of the participants used Windows 7 operating system, 20% used Windows 10, and 10% used Windows 8. Ninety percent of the participants used Chrome while 10% used Mozilla Firefox.

### **2.3 Procedure**

Each participant was first asked to complete an initial questionnaire about demographic information and use of computers, Internet and online self-diagnosis tools. Then they were asked to find the diagnosis in three scenarios, including

- Find the diagnosis for a 25-year old male who has a headache associated with fever, vomiting and diarrhea.
- Find the diagnosis for a 25-year old female whose face is covered with red bumps.
- Find whether the allergic reaction could cause your eyes and lips to be swollen.

Each scenario was completed four times, using each of the three symptom checkers and Google search. For each task, the participant was asked to rate the difficulty of the task on a 1-7 scale ((1= extremely easy, 7= extremely difficult) if the users successfully completed the task, or answered a non-success questionnaire that asks the participants to select the reasons why they could not complete the task. Participants were also asked to complete a final questionnaire about which interface they found to be the easiest to use (body map, flow chart or search tool), whether they preferred the follow-up questions to be optional or mandatory, whether the symptom checkers interface match users' expectations, whether the display of the search results was clear to the users, and if they found searching on Google easier than using the symptom checkers

**2.4 Design**

Within-subject design was used. Dependent measures include task completion rate, task completion time, perceived difficulty, and preferences. In addition to the think-aloud usability tests, five participants participated in an interview about their opinions about the symptoms checkers.

**3. Results**

**3.1 Effectiveness**

The percentage of users who completed the tasks and who were able to find the diagnosis for the given scenarios was different while using different websites (see Figure 1). The overall mean completion rate using EverydayHealth, FamilyDoctor, WebMD and Google was 73%, 83%, 50% and 100%, respectively.

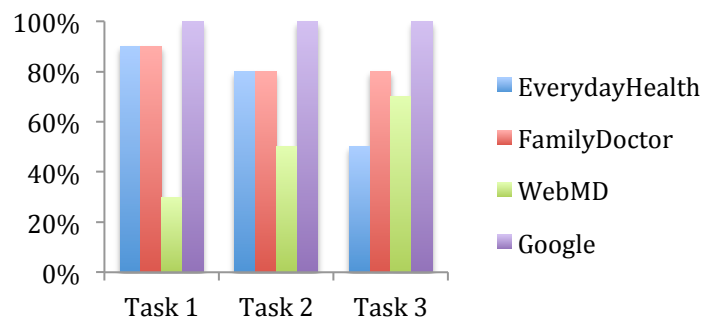


Figure. 1. Percentage of users completed the tasks.

**3.2 Efficiency**

The mean time to find the diagnosis for all tasks using EverydayHealth, FamilyDoctor, WebMD and Google was 3.66m, 1.17m, 2.18m, and 0.87m, respectively. The time to find diagnosis for Scenarios 1 and 3 are significantly longer using EverydayHealth than using the other symptom checkers (see Figure 2).

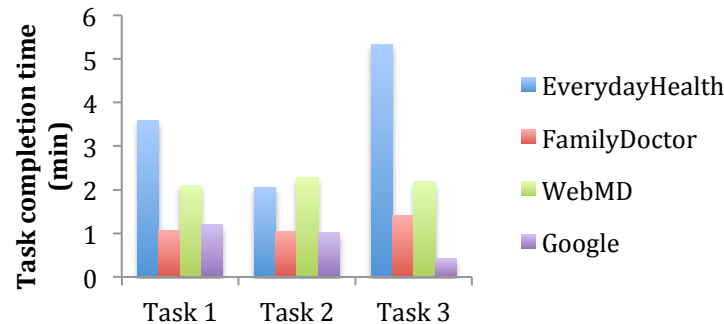


Figure. 2. The average time used in finding the diagnosis.

On EverydayHealth.com, users had to answer many questions before they reached the correct diagnosis, which was restrictive and time consuming for the users. On FamilyDoctor.org, the average time of finding the diagnosis using the flow chart was shorter. Using the body map in WebMD took users longer to complete the tasks, in part due to

the difficulties of dealing with this tool. According to the abandon questionnaire, most of the users reported that they were not able to find symptoms in steps/places they expected, and did not know where to find the correct information. Most of the users did not want to spend more time looking for the diagnosis, which made them skip the task. Finding the diagnosis using Google search took less time than any of the symptom checkers.

### 3.3 Difficulties of finding the diagnosis

The perceived level of difficulties of completing each task is shown in Figure 3. Users' average rating of difficulty was 3.73, 2.63, 4.30, and 1.67 on a 1-7 scale for using symptom checking tools in EverydayHealth, FamilyDoctor, WebMD and Google, respectively. Using WebMD was perceived to be more difficult for Scenarios 1 and 2, but easier for Scenario 3. Using FamilyDoctor was perceived to be easier for Scenarios 1 and 2.

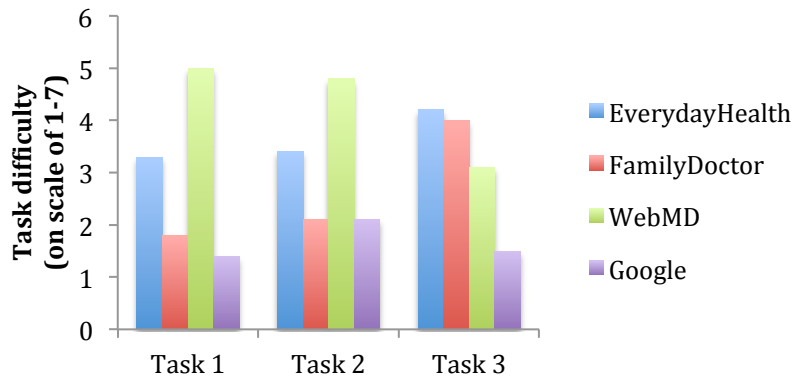


Fig. 3. Difficulties of finding the diagnosis.

The mean difficulty using Google to perform Scenario 3 (1.5 on a 1-7 scale) was significantly lower than using EverydayHealth (4 on a 1-7 scale), FamilyDoctor (4.2 on a 1-7 scale), and WebMD (4.5 on a 1-7 scale) ( $p = .005$ ). Participants also tended to use the search tool in the symptom checkers to complete this scenario.

### 3.4 Preferences

The symptom checker used in FamilyDoctor was preferred by more (70%) participants over the symptom checker (F=7.63,  $P=.002$ ) on the EverydayHealth (30%) and WebMD (0%). In particular users preferred finding the diagnosis using the flow chart over the body map or the search tool in Everyday Health.

All users preferred searching for diagnosis using Google over using the symptom checkers (F =13.8,  $p<.001$ ). In particular, users found searching for diagnosis using Google less restrictive, faster, easier and more flexible compared to the other symptom checker on the health websites.

### 3.5 Usability issues related to the symptom checker

Usability issues were observed from the screen recording or reported by the participants for all three symptom checkers.

#### EverydayHealth

Issue 1: No tolerance of misspelled or alternative names for the symptoms/diagnosis.

The users felt the system restricted them because it did not give users the option to type symptoms the way they wanted. For example, for Scenario 1 one participant wanted to type all the symptoms at the same time, but the search tool did not accept this. Instead, the participant had to type the name of the symptom in the same way as the system has it listed. For Scenario 2, participants had to type "skin bumps" exactly in order to find the diagnosis. When participants misspelled one of the symptoms, they would not be able to proceed until they corrected the spelling.

Issue 2: Too many mandatory questions.

The symptom checker requires users to answer many questions before giving possible diagnosis. Due to the large number of questions, the task completion time was also relatively long. In addition, the users did not have the option to skip any questions. Based on results from the final questionnaire, 60% of the participants reported that they prefer these clarifying questions to be optional. Some sample comments given by the users while using this symptom checker include: "It is boring."; "Oh, should I answer all these questions?"; "Why should I choose yes or no? What if I don't know?"

### **WebMD**

In Scenario 1, 70% of the participants were not able to find the diagnosis while the three users who were able to complete the task rated the task as difficult (5 on a 1-7 scale). The abandon questionnaire showed that 71% of the participants did not find the information in the place they were expecting to find it.

Issue 1: Does not allow users to select more than one body part at a time.

The interviews and think-aloud recording showed that participants found the body map to be misleading and difficult to deal with, especially when they wanted to find the diagnosis for cases where more than one body part had some symptoms. For example, in Scenario 1, in order to enter three different symptoms (headache, vomiting and diarrhea), participants first clicked on the head and chose headache from the symptoms list; then they normally started to look for the vomiting and diarrhea in the same list. However, vomiting and diarrhea were not on the list. The participants actually should first zoom out and then select stomach for vomiting. Participants thought that it would be easier for them if the interface allowed them to select two parts of the body at the same time.

Issue 2: The symptoms that are not associated with a specific body part, such as skin rash, are harder to mark on the body map.

Half of the participants failed to complete Scenario 2 using WebMD. The abandon questionnaire results showed that 80% of the participants did not find the information in the place they expected. Participants found it frustrating and disappointing while finding a diagnosis on WebMD.com.

Issue 3: The rating for the most possible conditions was unclear to users.

After the user selected their symptoms, a list of most possible diagnoses was presented. Each item on the list had a rating. However, 60% of the participants stated that these ratings were unclear.

### **FamilyDoctor**

Overall, participants were pleased about using the flow chart/decision chart to find a diagnosis for given symptoms. However, for Scenario 3, participants had difficulty finding the symptoms for the given diagnosis. This kind of scenario is also difficult while using the other symptom checkers, and they preferred searching in websites to find the information in this task instead of using the symptom checker tools.

## **4. Discussion and Conclusions**

In this study, we compared three web-based symptom checker and Google search using a usability test. The results showed that symptom checker on FamilyDoctor leads to the shortest task completion time and best user preference. The preferred symptoms checker uses flow charts as opposed to a body map (and follow-up questions) or a series of questions.

Google search was preferred by all of the participants over the symptom checkers. This was due to the effectiveness of the tool and efficiency of finding the diagnosis. Task completion time was shorter using Google search. It is also considered more flexible because it allowed users to enter all the symptoms at the same time regardless of the location of the symptom. It also has better capacity in correcting any misspelled symptoms and accepted the alternative names of the symptom. In addition, it was perceived to be less difficult and less restrictive when it came to finding the symptoms for the given diagnosis. Google search is a tool that all users are familiar with, which could have also contributed to users' preference for Google search.

Based on these results, the following recommendations are proposed to improve the usability of web-based symptoms checking tools:

- Decision tree/flow chart is a good candidate for self-diagnosis tools.
- When using a search tool for the symptom checker, it should provide auto correction of the misspelled symptoms and allow alternative names for the diagnoses or symptoms.
- It should have the option for the users to enter more than one symptom at a time.
- The number of clarification questions should not be too large. Questions related to the same issue could be grouped; e.g. instead of asking several questions to rule out ear infection, the system could ask one question such as "Is there pain, discharge, or other discomfort in your ears?". Users should have the choice to skip these questions if they feel that they don't need to clarify their symptoms or they don't know the answers to these questions.
- In the case of using a body map for the symptom checker, allow users to select more than one part of the body at the same time and then show a list of all the symptoms that are related to these parts.
- When using a body map for the symptom checker, it should make the symptoms that are unrelated to a specific body part on the map, such as skin rash or fever, easier to access and be selected. For example, before showing the body map, ask the user if he/she has a fever or skin rash.
- Make the rating for the most possible conditions more salient to users by using more a visible

representation, such as percentage instead of the small bars.

Our next steps include examining the performance of the users in decision making as regards their condition and the actions they need to take. We will then design a new symptom checking tool that integrates the best practices in existing tools, and evaluate the new system.

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