

# Can the WebMD self-diagnosis tool be used to affect care-seeking behavior related to visiting a general practitioner?

Using self-diagnosis to reduce unnecessary visitations to general practitioners with the goal of making more efficient usage of available resources.

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## Executive Summary

In 2021 the Dutch association for general practitioners (Landelijke huisartsen vereniging/LHV) published a survey detailing the degree of work pressure experienced by general practitioners. From this survey, we can conclude that 69% of general practitioners experience unreasonably high levels of pressure and that because of this pressure 64% of general practitioners are unable to do tasks necessary for running their clinic. (LVH, 2021). This pressure will only become worse due to demographic ageing as such we are required to reevaluate how we use our available resources. Knowing that research has shown that at least 29% of general practitioner visits are deemed unnecessary (Neprofarm, 2010) I propose to try and lower this percentage through symptom checker usage. As such the question I seek to answer through this research is ‘Can the WebMD self-diagnosis tool be used to affect care-seeking behavior related to visiting a general practitioner.’. With the goal of ‘reducing unnecessary visitations to general practitioners by making more efficient usage of available resources.’

This study used a qualitative two-phase approach where in the first phase content analysis is performed during a literature review. This is done to find answer to sub-question one through four and concepts and keywords to be used in the coding phase of the interviews. In the second phase interviews were conducted and then analyzed according to a thematic approach where a coding scheme was used which was created through a mix of inductive and deductive coding.

The result chapter serves as a way of presenting the results obtained through the coding of the interviews and ends with a conclusion which provides answer to sub-question five.

In the conclusion we read that the WebMD symptom checker influences care-seeking behavior. Although the measured effect mostly serves as an increase in care-seeking behavior

this effect however does occur in instances where care was necessary leading to patients making better decision for their personal health. A small level of reduction was also measured in several patients. It is however clear that the symptom checker has a measurable effect on care-seeking behavior.

The study used a pre-decided search strategy for searching out articles and carefully evaluated and compared articles which showed conflicting results. It is however possible that some sense of bias crept into this because the eventual decision was not made by an expert on the subject matter. Future studies on the reduction of care-seeking behavior could benefit from a broader list relatively harmless diseases that lead to unnecessary care-seeking behavior as the current mix of diseases mostly measure increases.

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## 1 Introduction

In 2021 the Dutch association for general practitioners (Landelijke huisartsen vereniging/LHV) published a survey detailing the degree of work pressure experienced by general practitioners. From this survey, we can conclude that 69% of general practitioners experience unreasonably high levels of pressure and that because of this pressure 64% of general practitioners are unable to do tasks necessary for running their clinic. (LVH, 2021).

One of the top reasons for this is related to the concept of ageing meaning that demographically speaking the Dutch population is becoming older.

Within the field of general practitioners this can be seen due to that 49.6% of general practitioners are between 50-65 years old meaning they will soon leave the work force and there are not enough young people coming into the field to replace them. Another problem within the general practitioner field is that the elderly general practitioner group averages a 60-hour work week (CBS, 2022; LVH, 2021). While the trend among younger general practitioners is to work less, which can be seen in that those replacing the elderly general practitioners work on average 16 hours less (LVH, 2021). Which in short means that there are less general practitioner hours available resource wise.

Within the non-general practitioner part of the population the issue of ageing can also be seen, and more specifically 'double ageing' which means that there is an increasing group of elderly people within a demographic and that these people on average live longer than their predecessors. Compared to younger generations older generations have a higher degree of chronic diseases and multimorbidity which in turn leads to a higher care need and increasing expenses (Schäfer et al., 2016).

Based on these two reasons we can conclude that the demand for care is increasing while the number of resources (General practitioner hours available) is decreasing. Based on

the introduction one could argue that we could tell the younger generations to start working more, but this is not a reasonable demand and might force more general practitioners out of the field.

This study researches a different option, which is to reevaluate how we use the resources available to use. Research has shown that at least 29% of general practitioner visits are deemed unnecessary (Neprofarm, 2010) through this study the aim is to find out whether symptom checker usage could help in reducing this unnecessary percentage by helping patients properly assess their care-needs on their own. Institutions such as the National Health Service (NHS) in the United Kingdom and the Australian government have already taken steps in implementing symptom checkers in their health care systems (NHS, n.d; Healthdirect Symptom Checker | Healthdirect, 2020).

Through this study the WebMD symptom checker will be used as a tool for influencing care-seeking behavior of a patient with the goal of reducing unnecessary visits. Therefore, the main research question is formulated as:

*“Can the WebMD self-diagnosis tool be used to affect care-seeking behavior related to visiting a general practitioner?”.*

In order to help answer this main question four sub-questions will be discussed and answered through the theory section and a fifth question will be answered based on a series of interviews. These five sub-questions can be seen below with the reasoning for each attached to it:

**Research question 1:** What percentage of general practitioner visits are deemed unnecessary and what symptoms most often lead to an unnecessary visit?

The aim of this question is to show the scope of the problem and will tell us if there are any dominant symptoms leading to people unnecessarily seeking out general practitioner advice.

Knowing the type of symptoms can help us assess whether the WebMD symptom checker is the right tool in the future.

**Research question 2:** What factors influence patient's information seeking behavior?

In order to change care seeking behavior we first need patients to find and use the tool. As such we are also interested in knowing what factors influence information seeking behavior. This sub-question will supply us our first set of factors of interest for the interview phase – specifically related to seeking out health information.

**Research question 3:** What factors influence a patient's care-seeking behavior?

Through sub-question two we know what factors lead patients to using the symptom checker tool, this question then specifically focuses on the general practitioner visitation side of the research question. This sub-question will supply us with our second set of factors of interest for the interview phase – specifically related to seeking out a general practitioner.

**Research question 4:** How useful is the WebMD symptom checker for self-diagnosis?

The aim of this sub-question is to focus on the usability of the WebMD symptom checker in the fields of accuracy, reliability and ease-of-use, it serves as background information to explain the limitations of the symptom checker for our purpose.

**Research question 5:** Does the WebMD symptom checker affect a patient's care seeking behavior with regards to visiting a general practitioner?

This question will be answered through the interview phase of this research, through said interviews we wish to find out whether the symptom checker can have a significant effect on the likelihood of visiting a general practitioner or focusing on for example self-care

The remainder of this study will follow the following structure. Chapter two will present a literature review providing the theoretical background, define concepts and explain frameworks. Chapter three will be used to discuss the methodology of this study. Chapter



four will present the results of the data analysis performed on the interviews. In chapter five a conclusion will be formulated which will be put to discussion in the sixth and final chapter

## **2 Literature review**

### **2.1 Introduction**

As previously discussed, this study aims to find out whether the WebMD symptom checker can be used to influence a patient's care-seeking behavior when it comes to visiting a general practitioner. Eventually we wish to find out whether said tool can be used to lower a person's likelihood of visiting a general practitioner when it is not medically necessary.

There are many different symptom checkers, and their effectiveness and accuracy are a controversial topic, studies show them to be lacking in triage, diagnosis and promoted risk-averse behavior which in turn led to people being encouraged to seek care where self-help is reasonable (Semigran et al. 2015). While other studies show promising results with for example Li & Salah (2017) showing a high degree of accuracy with ear, nose and throat related symptoms. With more countries slowly developing and implementing their own systems such as the UK and the Australian government (NHS, n.d; Healthdirect Symptom Checker | Healthdirect, 2020) the trend seems to show symptom checkers becoming more accurate and more widely used in the future. Empirical evidence on how patients use these tools and more specifically how they would affect care-seeking behavior is lacking (Winn et al. 2019).

The structure of the remained of this chapter will be the following: First the three core concepts in this research will be defined with them being: the WebMD symptom checker, information seeking-behavior and care-seeking behavior. Then the search strategy for the remained of the literature review will be defined. Next topics related to the sub-questions will be given an in-depth explanation. Based on the last chapter sub-question one through four will be answered.

## **2.2 Core concepts**

### **2.2.1 WebMD symptom checker**

WebMD is an American corporation that publishes information online with regards to health issues, medication and offers a symptom checker which patients can use for a self-diagnosis and in order to find more information related to their ailments (WebMD, 2017). The WebMD website offers two versions of this symptom checker, where the main difference lies in the way patients can input their symptoms. The first version is the 'body map' version which makes use of a visual representation of the male or female body, on this visualization patients can click body parts to show a list of common symptoms for that area. Li & Salah (2017) showed that 70% of patients were unable to find the correct diagnosis through the body map version, users described their experience as being tedious, inaccurate, and not user-friendly.

The second version, which is of the 'textual input' type where a user can describe their symptoms by typing these into an input box shows more promising results. With studies showing in general promising results for textual input versions (Miller et al., 2020; Li & Salah., 2017; Aboueid, 2021). More specifically speaking research from Farmer et al. (2011) found that for 73% of search queries using the textual version for ear, nose and throat related symptoms the correct diagnosis was found showing a high degree of accuracy.

Hence the WebMD symptom checker was picked for its popularity, its relative accuracy and because the author is familiar with this tool.

### **2.2.2 Health care-seeking behavior**

Factors influencing health care-seeking behavior will be discussed further in this chapter first we need to define what we understand as health care-seeking behavior.

Health seeking or health care seeking behavior is defined as any action undertaken by individuals who perceive themselves to have a health problem with the goal of finding appropriate remedy (Olenja, 2003). Two theoretical frameworks are of interest this concept, the first being the framework designed by Campbell and Roland (1996) which is based on the health belief model and focuses on a mix of physical, psychological and social factors influencing a patients decision making process. This framework is however lacking when it comes to the impact of technology as such the model proposed by Aboueid (2021) in her research on understanding university students' behavioral intention of using AI-enabled symptom checkers for self-triage and diagnosis built on the baseline model of Venkatesh et al. (2012) will also be used. The factors of interest will be discussed further in chapters 2.6 and 2.7.

### **2.2.3 Online Health information-seeking behavior**

By looking at the model of Campbell and Roland (1996) in chapter 2.6 on page 16 we can see that information-seeking behavior is a factor in care-seeking behavior. Information-seeking behavior is however a highly important factor in this research as we perceive the symptom checker as providing more information. As such it is necessary to further discuss the concept. Information seeking behavior refers to how humans perceive their need for, pursuit for and use of information (Case and Given, 2016). Later we will look at how self-perceived factors in care seeking behaviour can be altered through appropriate information-seeking behavior. When speaking about information-seeking behavior in this research we specifically refer to online health-information seeking behavior through the internet. Factors of interest will be discussed in chapter 2.6

### 2.3 Search strategy

Search strategy is subject to change between chapters as some questions benefit from a limited scope as to not make the results too big while others benefit from a broader scope due to theories from different time periods or different nations being relatively applicable to other similar nations. The table below shows per chapter of the literature review which keywords were used in searching, which resources were used, if there were time-based limitations and if a specific country was focused in order to obtain information. Chapter 2.1 and 2.2 will not make an appearance in this table as their search strategy was depended on the subsequent chapters referring to the topic.

Chapter	Keywords	Resource	Time limitations	Country limitations
2.4	'Onnodig huisartsenbezoek', 'Medisch Onnodig huisartsenbezoek', 'wat is Onnodig huisartsenbezoek', 'Factoren in onnodig huisartsenbezoek', 'Zelfzorg', 'Unnecessary healthcare', 'Factors leading to unnecessary healthcare', 'symptoms leading to unnecessary healthcare'	Google scholar and nivel publicaties	No	Statistics = NL Other = No limits
2.5	'Information seeking behavior', 'searching health information online', 'Dr google', 'Health information seeking behavior', 'Factors affecting information seeking behavior'	Google scholar, Nivel publicaties and CBS	No	Statistics = NL Other = No limits
2.6	'Care seeking behavior', 'Care seeking behavior general practitioners', 'Health belief model', 'perceived factors in care seeking behavior'	Google scholar	No	No limits
2.7	'Symptom checker usage', 'changing care-seeking behavior using symptom checkers', 'AI based symptom checkers', 'WebMD symptom checker'.	Google scholar	No	No Limits
2.8	'Symptom checkers', 'AI-based symptom checkers', 'Symptom checker accuracy', 'Symptom checker reliability', 'Comparing symptom checkers'.	Google scholar	>2010	No limits

## 2.4 Unnecessary healthcare at the general practitioner level

In this chapter the focus will lie on the report ‘Niet te veel en niet te weinig | De balans tussen nodige en onnodige zorg in de huisartsenpraktijk’ (Not too much en not too little | The balance between necessary and unnecessary care at general practitioners) conducted by the Dutch institute for research of Healthcare (Nivel) Located in the Netherlands. In this research Vervloet et al. (2015) mentions five forms of unnecessary care: over diagnostics, unnecessary medicine use, unnecessary treatment, unnecessary referrals and unnecessary care in the last phases of life. Through a survey conducted among Dutch general practitioners it was found that 57% of general practitioners believe too much care is conducted (Vervloet et al., 2015). More specifically 91% of general practitioners believe too many diagnostics take place and 79% believe too many unnecessary medical treatments are conducted. Vervloet et al. (2015) suggest four main factors for unnecessary care: High expectations of the healthcare system with the believe that everything can be solved by just running some tests. Secondly insecurity among patients where patients want an explanation for their symptoms in order to ease their stress, where general practitioners are inclined to allow these tests in order to ease the stress of their patients. Thirdly a high fear among general practitioners to be wrong about their diagnostics leading them to do extra tests just to be sure in order to protect themselves against lawsuits. Fourth comes the concept of ‘medicalisering’ which comes from the idea that an increasing number of factors are connected to well-being and being brought into the medical domain (Illich, 1982). Based on Vervloet et al. (2015) work one can conclude that there is reason to believe that unnecessary care is taking place at a significant amount. This would support the findings by Nprofarm (2010) who found that 29% of health care is unnecessary and can be solved through rest or self-care. They Found that most unnecessary visits consisted of visits related to pain, colds and coughing symptoms. Every unnecessary test or appointment leads to another bit of necessary care being delayed which has major health

outcomes in the long run. In addition, every form of unnecessary care financially affects the system.

In short, the main factors for unnecessary care according to Vervloet et al. (2015) are: High expectations of the health-care system, patient insecurity, general practitioner insecurity and medicalization. From this list we take high expectations of the health-care system and patient insecurity for the coding scheme in analyzing the interviews, as these factors seem to be affected by knowledge.

## **2.5 Factors influencing information seeking behavior**

With the rise of the internet, it has become common practice for people to google their symptoms before contacting a doctor. CBS (2021) shows that 72% of Dutch citizens aged 12 and older have at some point used the internet to seek out health information. The main factors causing people to seek out health information online are the easy access of information online, an increased level of self-awareness about personal health where people want to be more in control of their own health and a possible lack of access to health services due to waiting lists, financial reasons and distance (Bhandari et al., 2014; Amante et al., 2015; Cole, 2016).

The internet however is not a perfect medium for seeking out health information, especially for people with a low sense health literacy which is the degree to which individuals have the capacity to obtain, process, understand basic health information and services needed to make appropriate health decisions (Logan, 2012).

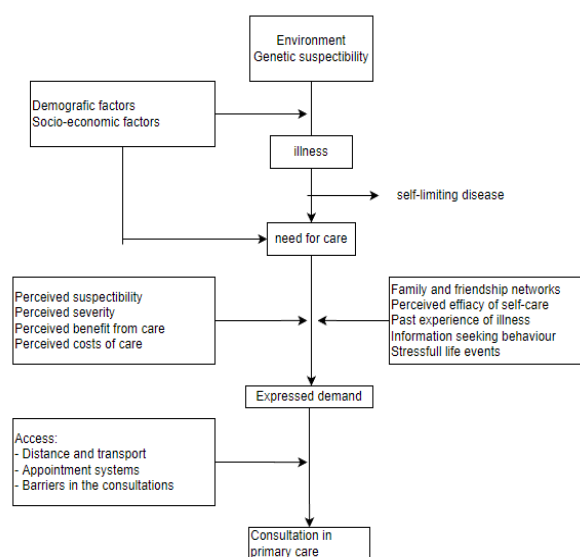
Health literacy is mainly affected by ethnic background, age and educational level (Paasche-Orlow et al., 2005). In the Netherlands 36.4% of citizens aged 18 and older have a limited to bad sense of health literacy (*Health literacy in Nederland. | Nivel, 2018*) which in turn means that these people make more use of the health care system, have a hard time navigating the health system, have a harder time dealing with diseases and in general have lower health

expectancy (*Ruim één op de drie Nederlanders heeft lage gezondheidsvaardigheden* | Nivel, 2018). There also seems to be a correlation between seeking out health information online and cyberchondria (McMullan et al., 2019) which involves the escalation of health concerns due to googling one's own symptom. This effect seems to occur with both google and health applications (Jungmann et al., 2020).

Online health information can be a positive contributing factor in helping patients make educated decisions about their personal health and inform them about what they themselves can do to improve their health. It is however important to ensure it stays understandable for all ages and educational backgrounds.

## 2.6 Factors influencing care-seeking behavior

Healthcare seeking-behavior is defined as any action undertaken by individuals who perceive themselves to have a health problem with the goal of finding appropriate remedy (Olenja, 2003). The theoretical framework 'factors influencing the demand for primary care' designed by Campbell and Roland (1996) which can be seen at Figure 1 is of main interest to us.



**Figure 1:** Factors influencing the demand for primary care. (S. Campbell & Roland, 1996)

The framework developed by Campbell & Roland (1996) shows that the decision to consult a general practitioner is based on a complex mix of psychological, physical and social factors individuals go through several specific steps before eventually ending up at the doctors office. In this theory section we will take a brief look at the overall framework and then focus on the factors of interest to online symptom checker usage in influencing the demand for primary care.

Starting at the 'illness' label which is affected by environmental factors, genetic susceptibility, demographic and socio-economic factors. Moving down from illness we arrive at either a need for care or self-limiting diseases, self-limiting diseases entails that a person based on his/her knowledge of his/her symptoms made the decision to rest/enact self-care measures in order to let the disease pass on its own. Need for care is also affected by demographic and socio-economic factors. The RGCP (As cited in Campbell and Roland, 1996) showed that gender, age, ethnicity, employment status and housing status are influential factors in determining whether a patient will move to a need for care.

Before reaching an expressed demand need for care is affected by Family and friendship networks, perceived efficacy of self-care, past experiences of illness, information seeking behavior and stressful life events on the rights side. On the left side the model shows perceived susceptibility, severity, benefit from care and costs of care as coined through the Health Belief Model (Becker and Maiman,1975 as cited by Campbell and Roland, 1996). Finally expressed demand is affected by access factors such as distance and transport, appointments systems and barriers in the consultation before finally progressing to a consultation in primary care.

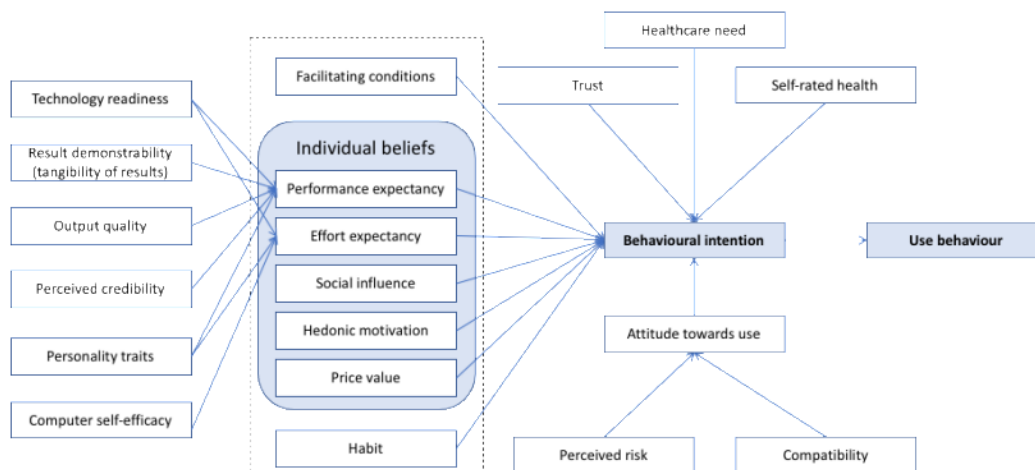
The main factors of interest to us here are the self-perceived factors, perceived factors are mainly affected by knowledge and experiences meaning that we should theoretically be



able to affect them through providing more knowledge/ information. We wish to find out whether the symptom checkers affect can be strong enough as to affect those self-perceived factors.

## 2.7 Factors determining Symptom checker usage

In her research on the use of artificially intelligent symptom checkers by university students Aboueid (2021) proposed a model for factors to consider in explaining university students' behavioral intention of Using AI-enabled symptom checkers for Self-Triage and Self-Diagnosis.



**Figure 2:** Proposed model for understanding university students' behavioral intention of using AI-enabled symptom checkers for self-triage and self-diagnosis (Aboueid, 2021)

The model shown in Figure 2 is built upon the unified theory of acceptance and use of technology model designed by Venkatesh et al. (2016) which consists of four key factors: Performance expectancy, effort expectancy, social influence and facilitating conditions. And four influential moderators age, gender, experience, and voluntariness which are related to predicting the likelihood of a technology being used. Later on hedonic motivation, price value and habit were added - these are however aimed at a consumer context and will not be used further. The factors mentioned are surrounded by a dotted box which has the purpose of showing the factors which came from the original baseline model. This model is able to

explain 70% of the variance in behavioral intention (Venkatesh et al., 2012) , which is the most common indicator of acceptance (Venkatesh et al., 2016). Intention is a strong predictor of actual behavior (Venkatesh et al., 2003). According to the work by Aboueid (2021) the strongest factors are result demonstrability, output quality, perceived credibility, facilitating conditions, trust and healthcare need. Where facilitating conditions might require extra attention, said condition refers to the degree to which an individual believes that an organizational and technical infrastructure exists to support the system (Venkatesh et al., 2003)

## **2.8 WebMD symptom checker**

As previously stated for the purpose of this research the ‘textual input’ version of the WebMD symptom checker was used. The aim of this research is to use said symptom checker to influence a patient’s care-seeking behavior when it comes to visiting a general practitioner. The accuracy of symptom checkers appears to be controversial as research by Semigran et al. (2015) showed them to be lacking in triage, diagnosis and promoted risk-averse behavior. While at the same time other studies show promising positive results in relation to symptom checkers such as the WebMD symptom checker (Miller et al., 2020; Li & Salah., 2017; Aboueid, 2021; Farmer et al., 2011).

This controversy seems to stem from the fact that as complexity of symptoms increases the accuracy of diagnosis becomes lower while at the same time advice becomes more risk averse to make up for this lowered accuracy (Ceney et al., 2021; Semigran et al., 2015). Meaning that if the symptom checker is unsure, it rather tells you to go to the doctor than have the chance for an untreated medical condition to become more serious. When it comes to less complex symptoms such as issues related to the ear, nose and throat the WebMD symptom checker shows an accuracy of 73% (Farmer et al., 2011) a statistic which will be further discussed in chapter 2.9.4.

With more countries slowly developing and implementing their own systems such as the UK and the Australian government (NHS, n.d; Healthdirect Symptom Checker | Healthdirect, 2020) the trend seems to show symptom checkers becoming more accurate and more widely used in the future. Empirical evidence on how patients use these tools and more specifically how they would affect care-seeking behavior is lacking (Winn et al. 2019).

## **2.9 Conclusion**

Here an answer will be given to sub-question one through four. Factors obtained through these answers will then be used in the coding scheme used for sub-question five.

### **2.9.1 What percentage of general practitioner visits are deemed unnecessary and what symptoms most often lead to an unnecessary visit?**

As stated in chapter 2.4 the percentage of general practitioner visits deemed unnecessary by clinical standards lies at 29% according to Nephrofarm (2010) most of these visits are related to pain, cold and coughing symptoms which will resolve themselves overtime. These findings are supported by Vervloet et al. (2015) who found that 91% of general practitioners believe too many diagnostics take place and 79% believe too many unnecessary diagnostics are conducted. If such an amount of doctor's experience unnecessary practices the 29% statistic might even be on the low side. The main reasons of interest to us are: High expectation of the healthcare system and health insecurity as these are factors, we might be able to affect through symptom checker usage.

### **2.9.2 What factors influence patient's information seeking behavior?**

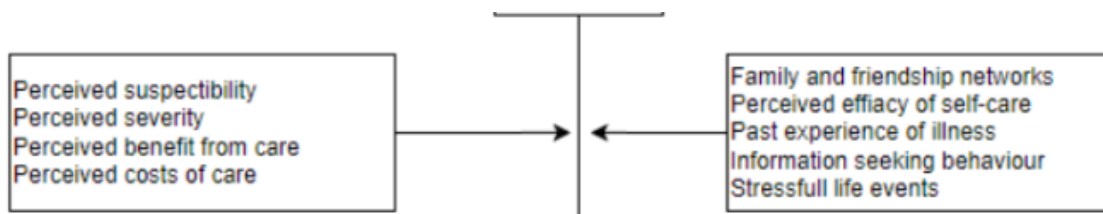
The main factors causing someone to seek out health information online are the easy access of information online, an increased level of self-awareness on personal health with the effect that people want to be in control and a possible lack of access to health services due to waiting lists, financial reasons and distance (Bhandari et al., 2014; Amante et al., 2015; Cole, 2016). When promoting information seeking behavior it is important to account for health literacy and cyberchondria.

If we ensure that information is clear and understandable to various ages, ethnic backgrounds and educational levels we can achieve a population that makes more educated decisions about health and improve self-care.

The previous text was focused on general information seeking behavior, in the case of this research we are also interested in how people will move to use a symptom checker in order to obtain more health information. As such the work by Aboueid (2021) is also of importance, she demonstrated that the strongest factors for symptom checker usage and subsequently doing something with that advice is affected by result demonstrability, output quality, perceived credibility, facilitating conditions, trust and healthcare need. Where facilitating conditions might require extra attention, said condition refers to the degree to which an individual believes that an organizational and technical infrastructure exists to support the system (Venkatesh et al., 2003).

### 2.9.3 What factors influence a patient's care-seeking behavior

The health belief model supplies us with various factors influencing the likelihood of seeking out care. However, in the context of this research we are mainly interested in the factors that we can influence using our symptom checker tool. Which leads to the main factors of interest being the self-perceived factors, as the name says it these are factors based on our personal knowledge and experiences which in turn means that we could change these through new knowledge and experiences. Figure 3 offers a focused view of these factors for us to focus on.



*Figure 3: Factors influencing the demand for primary care. (S. Campbell & Roland, 1996)*

The factors Perceived susceptibility, severity, benefit from care, costs of care and efficacy of self-care deserve extra attention during the interview phase of this research.

### 2.9.4 How useful is the WebMD symptom checker for self-diagnosis?

As previously stated, literature shows that as complexity of symptoms increases the level of accuracy lowers and the WebMD symptom checker becomes more risk averse (Ceney et al., 2021; Semigran et al., 2015). Whether this is a problem is however debatable for the purpose of this study. From Noprofarm (2010) we know that 29% of general practitioner visits are unnecessary and that most of these visits are related to pain, cold and coughing symptoms. Knowing that most unnecessary visits are related to simple pain, cold and coughing related symptoms which shows overlapping symptoms as to what the WebMD symptom checker is accurate with, as farmer et al (2011) showed 73% accuracy for ear, nose and throat related symptoms leading to a correct diagnosis.

Hence the focus of the WebMD symptom checker usage should lie with reducing unnecessary visits of patients with less complex symptoms such as ear, nose and throat type symptoms. By providing users with better knowledge this could keep people from visiting their general practitioner unnecessarily. While at the same time not causing unnecessary dangers for patients with more complex/urgent symptoms as the system then automatically becomes more risk averse.

### **3 Methodology**

#### **3.1 Research aim**

The aim of this study is to research the possible effect the usage of the WebMD symptom checker has on care-seeking behavior in relation to visiting a general practitioner. This is done by performing a qualitative study split into two components. With the first being the literature review phase which is used to define concepts of importance, clarify existing model/theories on the topic and to define keywords which can be used during the coding of the interviews. In the second phase of the study interviews were conducted which were then thematically analyzed based on the six-phase plan by Nel Verhoeven (2020).

#### **3.2 Framework Selection**

In order to help answer the main research question and sub-question two theoretical frameworks are of interest. The main framework is that by Campbell and Roland (1996) which is based on the health belief model and shows the physical, psychological and social factors influencing whether a patient moves forward to consult primary care/go to the general practitioner. Through this model several self-perceived factors of interest are obtained in combination with the concept of 'information seeking behavior' both of which were used in a coding scheme for the interview phase of the research.

The symptom checker in this research is seen as a form of information seeking behavior. This however requires is to define factors influencing information seeking-behavior and the factors influencing the likelihood of someone using a symptom checker and how said tool might affect their behavior. For this purpose, the framework designed by aboueid (2021) in her study on 'University students' behavioral intention of using AI-enabled symptom checkers for self-triage and diagnoses was used, said model is based on a baseline model by Venkatesh et al. (2012) which has a high degree of accuracy in determining the behavioral intention related to technology or in this case symptom checker usage. Through the research

on information seeking behavior and the framework by Aboueid several factors were obtained which were also added to the coding scheme.

### **3.3 Data collection method**

#### **3.3.1 Literature Phase**

For this phase literature was collected according to a pre-defined search strategy which can be found in chapter 2.3. For collecting information on general theories and models no limitations were set on age or nationality of the study. In order to limit the scope of the research when looking for statistics about population behavior the focus was on Dutch Data from CBS and Nivel.

For WebMD related information only studies from after 2010 were picked, this because symptom checkers such as the WebMD symptom checker are rapidly improving and using dated data can skew our perception of accuracy.

#### **3.3.2 Interview Phase**

As can be seen through the research there is not specific group of people that are of interest to us, as such the decision was made to create a heterogenous diverse group of respondents. To pick these respondents the following three criteria were selected:

1. 50-50 Gender division
2. Mix of Educational levels
3. Mix of ages with at least 1/5 respondents being 60+

The 1/5 in criteria three has no specific reasoning behind it, this number was mostly picked to ensure there would be some level of elderly representation within the respondent population.

The number of respondents to select would initially be based on saturation but was soon capped at ten in order to keep the work-load manageable in addition to this saturation was also almost reached at ten respondents as barely any new information was being added.

Respondents were found by looking through the writers personal network, in order to create



a mixed-group students, people from the local gym, contacts at the municipality of Apeldoorn and family members were asked.

Within these ten selected respondents we can find a 50-50 gender division, a wide mix of educational backgrounds, a mix of ages with at least two respondents being 60+ as such the criteria have been met.

### **3.4 Data analysis**

#### **3.4.2 Literature phase**

During the literature phase of this research articles were selected based on the previously mentioned search strategy. Through this search strategy a plethora of theoretical resources were found who were then further analyzed based on their abstract and result section leading to some articles being dropped.

Eventually content analysis was performed on the remaining literature which entailed checking for overlap and differences, when differences in theories occurred further research on the topic was conducted after which a decision would be made on which theory to use in the final document.

After making the final decisions on which literature to use, said literature was used to answer sub-questions one through four. In addition to that deductive coding was used to formulate initial codes and themes for the coding scheme to be used in the interview phase which would be used to answer sub-question five said coding scheme can be found in appendix 2.

The coding scheme is split into seven themes with the following meaning and codes added to it based on the literature phase:

<b>Codes</b>	<b>Themes</b>	<b>Explanation</b>
Self-control Self-limiting behavior	Self-care	Self-care entails that someone would first try to deal with the symptoms on his/her own.
Patient insecurity Fear of the unknown Health insecurity	Lack of knowledge	Factors contributing to a patient believing his/her knowledge is lacking to make the right decision on his/her own.
Expert opinion leading High system expectation	Expert trust	Factors contributing to a patient always preferring an expert opinion over their own knowledge. Wants to be sure
Risk assessment	Risk assessment	The process of deciding action is the most logical based on knowledge and risks
System distrust Expert distrust	Expert distrust	A disbelief in the system or expert opinion
Output quality Cost vs benefit	Care assessment	Assessing whether care is necessary based on the risk vs reward.

Above shows the codes and themes added through the literature phase, in the next chapter the codes from the interview phase will be added to it.

### 3.4.3 Interview phase

For the interview phase of this study ten people were interviewed who were picked based on the criteria found in chapter 3.3.2. Said interviews can be found in the separate data document called ‘Transcripts’. While analyzing the document through thematic analysis inductive coding was performed to add to the coding scheme created through deductive coding during the literature phase of the study, this to add more codes which fit with the pre-determined themes. Based on the inductive coding the following codes were added to the coding scheme, these additions are underlined for clarity. Where knowledgeable was an addition that occurred quite often during the interviews and did not fit within the existing themes, other codes are codes that were often mentioned but are differently worded from existing codes.

<b>Codes</b>	<b>Themes</b>	<b>Explanation</b>
<u>Knowledge</u> <u>Self-confidence</u>	<u>Knowledgeable</u>	<u>Personal knowledge affecting decision making</u>
Self-control Self-limiting behavior <u>Wait it out</u>	Self-care	Self-care entails that someone would first try to deal with the symptoms on his/her own.
Patient insecurity Fear of the unknown Health insecurity <u>Overconfidence</u>	Lack of knowledge	Factors contributing to a patient believing his/her knowledge is lacking to make the right decision on his/her own.
Expert opinion leading High system expectation	Expert trust	Factors contributing to a patient always preferring an expert opinion over their own knowledge. Wants to be sure
Risk assessment Affected by more knowledge Change my plan	Risk assessment	The process of deciding action is the most logical based on knowledge and risks
System distrust Expert distrust	Expert distrust	A disbelief in the system or expert opinion
Output quality Cost vs benefit	Care assessment	Assessing whether care is necessary based on the risk vs reward.

### **3.5 Research questions**

Finding answer to the main question formulated as ‘Can the WebMD self-diagnosis tool be used to affect care-seeking behavior related to visiting a general practitioner?’ with the pre-formulated goal of reducing unnecessary general practitioner visits, requires several factors to come together. As such five sub-questions were formulated with the goal of bringing theory, models and interview data together to form a conclusion, said questions can be found in chapter 1 on page 8 and 9.

### **3.6 Validity and reliability**

Proper reliability requires is to ensure measurements are done in a uniform way every time.

For the theory section a pre-determined search strategy was used and when overlap occurred or there were differences these theories were carefully compared and re-evaluated. Still, it could be possible for bias to seep in when making the eventual decision. Interviews wise a consistent style of interviewing was used with no differences between session.

For coding an initial basic scheme was created based on the theory which was made more extensive after taking a more in-depth approach towards analyzing the interviews. Interviews were scanned several times initially in order to help shape the coding scheme after which coding was done in a single session with no further changes being made to the scheme, this to ensure coding remained uniform throughout the analysis.

Validity entails that data measure what it is supposed to measure. Due to the consistent use of well-studied medical literature this can be applied to the literature section. Although in the case of the interviews some approaches in type of questioning may have not been ideal and as such did not lead to the expected answers.

Based on this knowledge it can be said that the literature review is both reliable and valid for the purpose of this study, data is based on scientific findings and a pre-determined search strategy. In the case of the interviews it can be said that they were conducted in a reliable fashion the goal of the interview questions is to measure whether care-seeking behavior changes based on the use of the WebMD symptom checker. The current two-round style of questioning serves as a valid method as it allows a comparison between questions allowing whether a change occurs.

## 4 Results

### 4.1 Introduction

Chapter four will be used to present the analyses of the interviews, this will be done on a case-by-case bases where each round will be briefly discussed, significant effects and differences will be briefly discussed. Once we have gone through all the cases the three open-ended questions posed in the interview will be discussed. Finally, a conclusion will be given which serves as an answer to sub-question five.

### 4.2 Evaluation of the interview cases

As mentioned in the introduction this chapter will first follow a case-by-case approach and then discuss the open-ended questions separately

#### 4.2.1 Case one harmless common cold

Case one presented patients with symptoms that appear in someone having the common cold. Over the course of round one the most prominent themes were: Knowledgeable with eight appearances, self-care with fourteen appearances and risk assessment with eight appearances. This shows that in this relatively simple set of symptoms patients had adequate initial knowledge to make a risk assessment and act accordingly.

By introducing the WebMD symptom checker in round two, four patients changed risk assessment based on newfound knowledge with the theme risk assessment appearing thirteen times. With their new-found knowledge patients were able to better asses their own health leading to four more patients doing a self-test in order to strike out the possibility of having a corona infection. The extra information provided through the WebMD symptom checker did not affect a patient's likelihood of visiting a general practitioner. It did however lead to an increase in self-care noticeable through the self-care theme appearing twenty-four times in round two.

#### **4.2.2 Case two harmful kidney infection**

Case two presented patients with symptoms that appear in someone having a kidney infection, which is a harmful disease requiring immediate medical attention. Over the course of round one the most prominent themes were Risk assessment with eight appearances, Self-care with nine appearances and knowledgeable with seven appearances. Most noticeable in this case is that five patients show a certain sense of confidence related to the symptoms leading to them assuming their ailment is either harmless or period related. The other five either make the decision to immediately visit a doctor or to contact a doctor for expert advice.

By introducing the WebMD symptom checker in round two there is a shift in what themes are prominent or the extent of their prominence with risk assessment jumping to seventeen appearances and lack of knowledge jumping to eight. Especially the risk assessment theme here warrants extra attention, due to the addition of knowledge and the possibility of having a harmful disease five patients reassess their previous decision to not visit a general practitioner or to first ask for expert advice and instead switch to an immediate visit. This shows that the extra information provided by the symptom checker leads to five patients changing their care-seeking behavior.

#### **4.2.3 Case three harmful acute cholecystitis**

Case three presented patients with symptoms that appear in someone having acute cholecystitis, a disease which is harmful and requires immediate medical assistance over the course of the first round the most prominent themes were knowledgeable with seven appearances and risk assessment with eight appearances. With this more complex mix of dangerous symptoms, we see that patients make the risk assessment based on their knowledge to immediately contact their doctor. In round one seven out of ten patients make the right decision to immediately seek out a doctor.

In round two the most prominent themes are lack of knowledge with six appearances and risk assessment with thirteen appearances. Lack of knowledge here mostly takes shape through the code 'fear of the unknown' which occurs through people seeing a long list of possible diseases they are unfamiliar with which causes them to reassess their risk and increase their urgency. When presented with more knowledge one patient who previously did not want to visit a doctor makes the decision to visit. After all, this patient however also pointed out that he would have visited his doctor anyway if the symptoms had persisted for longer.

#### **4.2.4 Case four harmless stomach flu**

Case four presented patients with the harmless symptoms of a stomach flu, a disease which rarely requires medical assistance. The most prominent themes here were self-care with ten appearances and knowledgeable with seven appearances. Based on their knowledge patients knew these symptoms were harmless and could be solved through self-care leading to nine patients not visiting their doctor. One patient however triggers the theme lack of knowledge twice which takes shape in the decision to visit the doctor due to being insecure about the symptoms.

In round two the most prominent themes were knowledgeable with six appearances, self-care with six appearances and risk assessment with five appearances. Here most patients remain with their initial answer sparking to very short answers. Interesting however is the patient in the previous round who based on the addition of more knowledge no longer wishes to visit their general practitioner.



#### 4.2.5 Open-ended questions

Three open-ended questions were posed to the patients after the case-based interviews were concluded.

Question one asked patients about how important knowledge was for their decision making, here seven patients mentioned that for them their own knowledge or lack of knowledge is the deciding factor in whether to make an appointment. In most cases their knowledge or lack of allows them to make the right decision in doctor visits. Two patients pointed out how they prefer expert opinion over their own knowledge both in complex diseases but also with simple diseases and one patient assumes everything will pass on it's own.

Question two asked patients what other factors are in their opinion important in deciding whether they would visit a general practitioner. Here the elderly patients all mentioned age leading to them being more unsure and greatly affecting their likelihood of visiting a doctor. It is also noticeable how upbringing is often brought up as patients point out that how your parents used to deal with diseases is influential on how you deal with it in later years.

Question three explicitly asked patients about the effect the WebMD symptom checker has on their decision-making process. Here four out of ten patients mentioned how it could help in changing their decision whether to visit a doctor, three out of ten patients said it could be helpful but for now they would rather trust their doctor and three patients said the symptom checker had no effect on their decision-making.

### **4.3 Conclusion – Does the WebMD symptom checker affect a patient’s care seeking behavior with regards to visiting a general practitioner?**

First a summary of the previous information obtained through chapter four will be provided, this to give us a quick and clear overview of what we know now.

In case one we saw how the addition of more information lead to patients increasing their degree of self-care by doing a corona self-test after finding out one of their symptoms occurs in that disease. There was however no significant effect on care-seeking behavior. In case two a significant effect in care-seeking behavior occurs with five patients reassessing their care-seeking behavior upon being presented with more information. In case three no significant effect of the WebMD symptom checker was measured, as patients based on initial information already decided to visit the doctor which did not change after receiving more knowledge. In case four one patient reassess their decision to visit a general practitioner based on new knowledge leading to a change in her care-seeking behavior

Moving on to the open-ended questions we learned how knowledge is the decision-making factor in a majority of our patients on whether they would visit a general practitioner, some other factors relate to age and upbringing. Finally, patients were asked whether the WebMD symptom checker affects their care-seeking behavior. Here four patients pointed out it did have some effect. Three patients pointed out how it could be helpful, but they would rather trust their doctor, coincidentally these were also the three patients mentioning age as an important decision-making factor. Leading to me assuming their due to their age they put less trust in digital tools such as this due to being unfamiliar with technology. Lastly three patients saw no use in the WebMD symptom checker.

Now to circle back to sub-question five, based on the analyses of the various cases and answers to the open-ended questions there is a measurable effect on care-seeking behavior where the addition of extra knowledge provided through the WebMD symptom checker appears to be a significant factor. An even more significant effect could occur by focusing

more on the credibility among elderly citizens. In this analysis we however mostly see increases in care-seeking behavior among patients who would initially do nothing when presented with harmful symptoms. A small sample of patients shows a decrease in unnecessary visits when their care-seeking behavior is affected by the symptom checker.

## 5. Conclusion

The question posed at the start of this study was ‘Can the WebMD self-diagnosis tool be used to affect care-seeking behavior in relation to visiting a general practitioner’ where the explicit goal was to ‘use self-diagnosis to reduce unnecessary visitations to general practitioners with the goal of making more efficient usage of available resources.

We wish to introduce the WebMD self-diagnosis tool as a possible intervention before visiting a general practitioner as such we need to be aware of the steps taken before someone moves from a suspected illness to a consultation at a primary care facility. For this we used the ‘factors influencing the demand for primary care’ model by Campbell and Roland (1996) which gives us various factors of importance in affecting that process.

The main factors of interest to us are however the perceived factors and the information seeking behavior factors. The first can be changed through proper information seeking behavior. Now that we know that information seeking is of importance, we also need to account for the factors important to this concept, and mainly those related to using a symptom checker. We now know that important factors in for this research in relation to seeking health information are easy access and a need to be in control of one’s own health. Additional factors stem from aboueid (2021) model on understanding behavioral intention of using AI-enabled symptom checkers for self-triage and self-diagnosis. Which supplies us with result demonstrability, output quality, perceived credibility, facilitating conditions, trust and healthcare need (Aboueid, 2021).

In short, in order to affect care-seeking behavior through the WebMD symptom checker one needs to focus on patients’ information seeking behavior. By focusing on the need to be in control of one is one health, promoting seeking out information one could subsequently be led to the WebMD symptom checker who has been showing promising results telling us that symptom checker might be beneficial to the health-care system (Miller et al., 2020; Li &

Salah., 2017; Aboueid, 2021). Where we do need to account for the fact that the more complex the symptoms become, the more risk averse the checker gets, but with simple symptoms the accuracy is overall very good.

Finally, by considering the information obtained during the analysis of the interviews one can conclude that the symptom checker does influence care-seeking behavior this by providing patients with more knowledge which affects their risk assessment which in turn affects care-seeking behavior. It is important to note however that over the course of the analysis we mostly measured an increased in general practitioner visit due to patients reassessing the danger of their symptoms – this however occurs in diseases which were harmful to begin with, meaning patients are nudged towards making a better decision for their personal health. A small number of patients showed a reduction in care-seeking behavior based on the knowledge provided to them via the WebMD symptom checker these instances occur in cases where an initial visit was unnecessary.

In short, the WebMD symptom checker has an effect on care-seeking behavior, but whether it's role in reducing unnecessary visits is significant enough for it to be implemented remains unclear.

## 6. Discussion

Theory wise this study can be affected by a minor bias in the selection of articles, as mentioned in the methodology section content analysis was performed on articles checking for overlap and differences, when differences in theories occurred further research was conducted and eventually a decision would be made. This final decision was based on personal judgement and knowing the writer of this study is not an expert in the medical or behavioral field this could have led in some cases to the wrong article being picked.

These articles were then used to create the initial coding scheme, as such this bias effect might have seeped through to the interviews.

Interviews wise a mixed group of respondents were used which were found in the writer's own network, criteria were formulated at the start to determine the make-up of this group. This mixed group of course also affected the answers to the interviews as there is a clear observable difference between younger and elderly people, for the sake of uniformity it could be argued that a more homogenous group would have been more ideal. The aim of this study is not to research a specific group but due to the heterogenous nature of the group automatically a certain degree of comparison between patients occurs.

Furthermore, on the interviews the goal of this study was to find out whether a reduction in care-seeking behavior could be measured, although changes in care-seeking behavior were observed the questions in the end seem less ideal for measuring reduction. For this purpose the study might benefit for an increase in case examples of harmless diseases which often lead to unnecessary visits, this to check whether a reduction can be measured through the usage of the WebMD symptom checker.

Finally, an issue of importance in relation to the analyses of the interview data lies with problems in the usage of atlas.ti, the program ended up being too difficult to work with due to

crashes and other problems. As such the decision was made to do a thematic analysis by hand based on the six-step plan mentioned in the methodology section.

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## Appendix 1 - Interview script

### Introduction

1. T: “Thank you for wanting to participate in this interview, the goal of my research is to find out whether a self-diagnosis tool like the WebMD symptom checker can be utilized to influence a patient's behavior with regards to them visiting their general practitioner. I will first give a short introduction on how this interview will look and then we will get started” → give an overview.
2. T: → Write down the person's name, age, sex and educational background for future referencing.
3. T: “To get started I'm going to present you with several cases. These cases consist of a list of symptoms and after naming them I'm going to be asking you several questions.

### Test cases

#### 4. Case 1: Harmless Common cold

- a. Symptoms:
  - i. Runny nose
  - ii. Sore throat
  - iii. Coughing
  - iv. Can't taste food
  - v. Sneezing
- b. If you had these symptoms, what would you do right now?
- c. Would you visit your general practitioner if you had these symptoms?
  - i. If yes: How did you come to the conclusion that these symptoms require you to visit a general practitioner?
  - ii. If no: How did you come to the conclusion that these symptoms did not require a visit to a general practitioner?

#### 5. Case 2: Harmful: Kidney infection

- a. Symptoms

- i. Lower back pain
  - ii. Frequent urination
  - iii. Blood in urine
  - iv. Fever
  - v. Nausea
- b. If you had these symptoms, what would you do right now?
- c. Would you visit your general practitioner if you had these symptoms?
- i. If yes: How did you come to the conclusion that these symptoms require you to visit a general practitioner?
  - ii. If no: How did you come to the conclusion that these symptoms did not require a visit to a general practitioner?

**6. Case 3: Harmful: Acute Cholecystitis**

- a. Symptoms:
- i. Upper abdominal pain
  - ii. Stomach pain which radiates to your back or side
  - iii. Jaundice//yellow skin
  - iv. Dark Urine
  - v. Nausea
- b. If you had these symptoms, what would you do right now?
- c. Would you visit your general practitioner if you had these symptoms?
- i. If yes: How did you come to the conclusion that these symptoms require you to visit a general practitioner?
  - ii. If no: How did you come to the conclusion that these symptoms did not require a visit to a general practitioner?

**7. Case 4: Harmless: Viral Gastroenteritis - Stomach flu**

- a. Symptoms:
  - i. Abdominal pain
  - ii. Abdominal cramping
  - iii. Diarrhea
  - iv. Feeling weak
  - v. Vomiting
- b. If you had these symptoms, what would you do right now?
- c. Would you visit your general practitioner if you had these symptoms?
  - i. If yes: How did you conclude that these symptoms require you to visit a general practitioner?
  - ii. If no: How did you conclude that these symptoms did not require a visit to a general practitioner?

**Introduction to the WebMD section**

8. T: That leads to us concluding the first section of the interview, as I mentioned in the introduction my research focuses on the WebMD symptom checker, as such we will now go through the same symptoms again. This time however you will have access to a laptop with the webm symptom checker. I want you to type in the symptoms after which I will ask the same questions again.

**9. Case 1: Harmless Common cold**

- a. Symptoms:
  - i. Runny nose
  - ii. Sore throat
  - iii. Coughing
  - iv. Can't taste food
  - v. Sneezing
- b. Which options for diseases are displayed to you now?

- c. What disease do you think these symptoms connect to?
- d. With your current level of knowledge would you visit a general practitioner?
  - i. Yes: Why?
  - ii. No: Why?

#### **10. Case 2: Harmful: Kidney infection**

- a. Symptoms
  - i. Lower back pain
  - ii. Frequent urination
  - iii. Blood in urine
  - iv. Fever
  - v. Nausea
- b. Which options for diseases are displayed to you now?
- c. What disease do you think these symptoms connect to?
- d. With your current level of knowledge would you visit a general practitioner?
  - i. Yes: Why?
  - ii. No: Why?

#### **11. Case 3: Harmful: Acute Cholecystitis**

- a. Symptoms:
  - i. Upper abdominal pain
  - ii. Stomach pain which radiates to your back or side
  - iii. Jaundice//yellow skin
  - iv. Dark Urine
  - v. Nausea
- b. Which options for diseases are displayed to you now?
- c. What disease do you think these symptoms connect to?
- d. With your current level of knowledge would you visit a general practitioner?
  - i. Yes: Why?
  - ii. No: Why?



**12. Case 4: Harmless: Viral Gastroenteritis - Stomach flu**

- a. Symptoms:
  - i. Abdominal pain
  - ii. Abdominal cramping
  - iii. Diarrhea
  - iv. Feeling weak
  - v. Vomiting
- b. Which options for diseases are displayed to you now?
- c. What disease do you think these symptoms connect to?
- d. With your current level of knowledge would you visit a general practitioner?
  - i. Yes: Why?
  - ii. No: Why?

**Finishing**

13. That concludes the cases section of this interview. Now before we finish, I have two more questions.
  - a. How do you think knowledge in general affects your decision-making process with regards to visiting a doctor?
  - b. Are there any other factors which influence your decision making with regards to visiting a doctor?
  - c. Does the WebMD symptom checker affect your likelihood of seeking out medical help.
14. Thank you for participating, this concludes our interview.

## Appendix 2 – Coding scheme

To answer sub-question five ‘Does the WebMD symptom checker change patients’ attitude towards visiting their general practitioner’ a coding scheme was created with a combination of deductive and inductive coding.

<b>Code</b>	<b>Theme</b>	<b>Interview question</b>
- Self-confidence - Knowledge	Knowledgeable	Used in the case analysis
- Self-control - Self-limiting behavior - Wait it out	Self-care	Used in the case analysis
- Patient insecurity - Overconfidence - Fear of the unknown - Health insecurity	Lack of knowledge	Used in the case analysis
- Expert opinion leading - High expectations of the system	Expert trust	Used in the case analysis
- Risk assessment - Affected by more knowledge - Change my plan	Risk assessment/behavioral change	Used in the case analysis
- System distrust	Expert distrust	Used in the case analysis
- Output quality - Cost Vs benefit	Care assessment	Used in the case analysis