



INTERNET AS A SOURCE FOR CHILDHOOD IMMUNIZATION INFORMATION

Vaccine hesitancy from nursing perspective

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<p>Abstract:</p> <p>This literature review aims to investigate the impact of Internet information on childhood vaccines decision among parents, and healthcare professionals' roles in countering vaccine hesitancy sentiment. Two research questions are: 'What challenges are hindering parents from obtaining sufficient information online regarding childhood immunization?' and 'What are the recommendations for healthcare providers to counteract such phenomenon?'</p> <p>The study uses two theoretical frameworks to shed light on the findings: the 3Cs model of vaccine hesitancy by SAGE Working Group (2015) and the Health Belief Model by Rosenstock, Strecher & Becker (1988). Through data collecting process, 11 articles were selected and analyzed using inductive qualitative content analysis by Elo & Kyngäs (2007).</p> <p>Findings show that knowledge barriers, lack of trust and vulnerability towards misinformation are most common challenges for parents who are making vaccine decisions; while lack of time/resources is the factor preventing healthcare professionals from guiding parents. These challenges can be tackled by online and offline interventions, like implementing crowd-based networks, increasing transparency, developing information, providing decision aids, understanding users' behaviors and using therapeutic communication.</p> <p>It is difficult to eliminate immunization misinformation and anti-vaccination sentiment from the Internet. However, the author believes by improving nurses' awareness of the phenomenon and applying interventions into practice, we can productively increase vaccine acceptance.</p>	
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List of abbreviations

CDC	Centers for Diseases Control and Prevention
CCC	Copenhagen Consensus Center
WHO	World health organization
HCPs	Healthcare providers
HCs	Health consumers
EU	European Union
HBM	Health Belief Model
MMR	Measles, Mumps and Rubella
DPT	Dissatisfied Parents Together

FOREWORD

My deepest gratitude goes to all the teachers from the Department of Health and Welfare of Arcada for their support and guidance during my studies. I greatly appreciate Pamela Gray for her quality instructions of thesis writing and encouraging this topic. I would like to thank my tutor teacher, Denise Villikka, for her exquisite nursing skills and motivation.

My thesis could not have completed without constant emotional support from my family, friends and especially my comrade Eeko who showed me how to transform negative energy into productivity.

1 INTRODUCTION

Vaccination is generally deemed to be one of the greatest public health achievements of this century (CDC, 2011). Vaccination is one of the most cost-effective ways for improving general health (CCC, 2008). An effective and sustained vaccine coverage protects not only vaccinated individuals, but also helps people who cannot receive vaccines via herd immunity (Fine et al., 2011).

In December 2017, question about impact of anti-vaccine movement on public health was raised to European Parliament for investigation (European Parliament, 2017). An international study by Ipsos MORI in 2017 reported that nearly half of population in many countries believe that vaccines are linked to autism. The vaccine hesitancy phenomenon is currently threatening the effectiveness of immunization in many countries around the world, resulting in the outbreak of preventable diseases (Smith et al., 2011). Various studies have found the connection between vaccine delay or refusal with unfavorable information on the media (Dannetun et al., 2005; Mason et al., 2000). Another study reported that media has an impact on vaccine decision, such as countries where anti-vaccination movement occurs more often had higher rates of pertussis, compared to countries with fewer reports of anti-vaccination movement (Gangarosa, 1998).

As frontline healthcare professionals, nurses encounter firsthand health consumers' concerns and hesitation based on immunization information they have found from the Internet. Therefore, it is necessary to examine what are the factors that preventing health consumers from obtaining accurate information and how to counteract parental vaccine hesitation in practice.

The thesis comprises of 8 chapters. After introducing the motivation and topic of the thesis, the author presents the background information needed to understand the context. Two theoretical frameworks were chosen and used simultaneously for literature analysis. Chapter 4 represents the aim and scope of the thesis, as well as two research questions. The data collecting, analysis process and methodology is demonstrated in chapter 5. Findings from selected articles are presented and discussed in light of chosen theoretical frameworks through chapters 6 and 7. Chapter 8 consists of self-reflections of this study

and suggestions on how it could be further developed. References and Appendixes are found at the end of the thesis.

2 BACKGROUND

In this chapter, the author presents definition of ‘vaccine hesitancy’, the context and characteristics of current Internet technologies and how they affect health information. The author also gives a brief explanation on anti-vaccination sentiment and its background.

2.1 Vaccine hesitancy

In this section, the definition of vaccine hesitancy will be introduced to provide a clear understanding of the subject.

The most popular definition of ‘vaccine hesitancy’ was proposed by WHO Strategic Advisory Group of Experts (SAGE) Working Group in 2012 while conducting a behavioral model for vaccine acceptance. In 2014, a comparison between two terms “vaccine hesitancy” and “vaccination hesitancy” was also discussed. The difference was the latter term refers to a wider range of elements, such as immunization services, fear of needles and knowledge about preventable illnesses, not just to the vaccine itself (MacDonald, 2015). However, the SAGE Working Group decided to select the term “vaccine hesitancy” with an extensive definition as following:

‘Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence.’

(MacDonald, 2015)

To describe the phenomenon, SAGE Working Group has proposed a continuum between a full vaccine acceptance and complete refusal of all vaccines. Those who are unsure or hesitant towards vaccines belong in between the two extremes. Other researchers have agreed with the continuum of vaccine hesitancy that SAGE Working Group suggested (Bedford et al, 2018). Other studies reported that vaccine hesitant individuals manifest different degrees of indecision towards vaccines (Larson et al., 2014), parental attitudes towards vaccine belong to a “spectrum” (Leask et al., 2012)

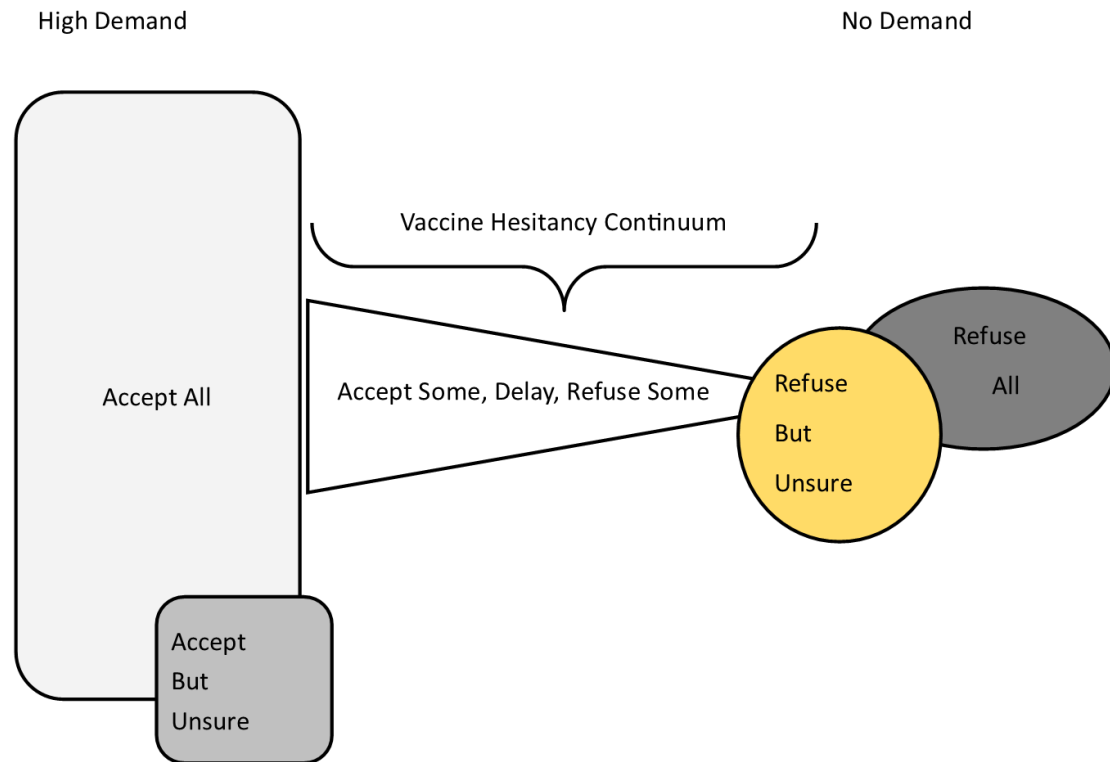


Figure 1: The continuum of vaccine hesitancy (MacDonald, 2015)

2.2 Internet, Web 2.0 and user behavior

In this century, we have been witnessing a rapid change in how humans create, consume and share information with the so called "Web 2.0" (O'Reilly, 2005).

Before the Internet, producing, spreading and changing information bound in books, broadcast media and journals was more limited by publishing houses, media companies and other gatekeepers. The Internet made it cheap for everyone to produce content and distribute it digitally across the globe. Anyone with access could open a website targeting any global niche and find likeminded audience, given that one would know how websites were written and web servers established. Soon after, services cutting the cost of broadcasting even further emerged. What we know as Web 2.0 started when websites started providing user-friendly tools for anyone to produce and distribute any content on the Internet, cutting the need for technical expertise of running a working website. Instead of individual blogs, we started seeing blogging platforms like Blogger or Wordpress, where

anyone could start an online journal and link it to a greater community of bloggers. Instead of needing to operate a video content website, one could just upload any film one has made to Youtube. Instead of personal websites, we started seeing social media platforms connecting our individual profiles to each other.

The ranking algorithms of popular search engines influences what and how the users receive the content they are searching for. Websites that appear on the first results page on Google are not always the most accurate sites, but rather the sites that give the most popular answers to the question user is asking. According to the founders of Google, their PageRank method for rating Webpages is based on “measuring the human interest and attention devoted to them” (Page et al., 1998). In other words, Google’s PageRank method does not necessarily measure Web page by reliability or trustworthiness.

Internet search engines and social media have become our prime tools for acquiring and learning new information and health related information is no exception. Therefore, the quality of information presented online becomes an important question.

2.3 Health Information on the Internet

A national survey from Pew Research Center’s Internet & American Life Project (Fox, 2011) found that “doctors, nurses, and other health professionals continue to be the first choice for most people with health concerns, but online resources, including advice from peers, are a significant source of health information in the U.S”. In this study, data showed that 59% of all adults have looked online for health information. Similarly, the report also found that 25% of adults have read other people’s commentary or experience about health on online groups or blog; and that 19% of adults have watched a video about health from the Internet. The social media plays a strong role in Internet usage, since 21% of adults participate in online conversation with others who experience the same medical needs for information or support.

The use of information and communication technologies in healthcare is commonly called and researched as “e-health.” It was first mentioned on Journal of Medical Internet

Research as an “intersection of medical informatics, public health and business” (Eysenbach, 2001). E-health emerged when Internet and advanced technologies facilitate health services and information.

The author uses this context of e-health in our study to illuminate the various online sources of health information used by patients and healthcare professionals. In thesis this domain is mainly referred as “online health information.”

2.4 Anti-vaccination community

The anti-vaccination movement has been recognized since the very beginning of vaccinology. It began after the 1853 Vaccination Act for compulsory vaccination had been applied in Europe (Durbach, 2000). The community has been evolving through time until the modern day and is unlikely to be vanquished. They have managed to create several noticeable impacts on healthcare users’ behavior. For example, in United States 1982, thousands of parents were convinced to detain pertussis vaccines by a television documentary named “DPT: Vaccine Roulette”. The effects of this documentary were dramatized by media, which urged parents with children who were injured by vaccines to proceed lawsuits. Despite that vaccine’s manufacturers had doubled their prices, the damage claims still exceeded sale thirty folds. Many pharmaceutical companies stopped making vaccines. This incident led to the formation of a law protecting pharmaceutical companies which manufacture vaccines, while compensating those allegedly harmed by vaccines. This act, National Childhood Vaccine Injury Act, which was passed by US Congress in 1986, contained Vaccine Injury Compensation Program (VICP) (Wolfe, 2002; Offit, 2011).

Another remarkable anti-vaccination story was Andrew Wakefield’s widely read 1998 study on the Lancet. Wakefield implied in this study and in a press conference the connection between MMR vaccine and autism. On 2010, The Lancet formally retracted Wakefield’s 1998 paper, due to its false claims and unethical conduct. However, the study has been still used by the anti-vaccination community to promote their agenda, and Wakefield still receives support from those who distrust vaccines. (Wakefield et al., 1998)

Before the era of online social media, anti-vaccination movement manifested through print media. Leask & Chapman (1998) have conducted an analysis on 2440 articles about vaccination on newspapers from 1993 to 1997. From 115 articles narrated anti-vaccination proclamation, the researchers have identified eight subtexts that most frequently occurred:

1. Cover-up, if it stated or implied that information about immunisation was being wilfully distorted, suppressed or otherwise withheld from the public.
2. Excavation of the 'facts', if it referred to allegedly reliable information about immunisation that ran counter to generally accepted wisdom about the benefits, safety and efficacy of vaccines.
3. Included here were accounts of 'experts' who disagreed with the orthodoxy on vaccines.
4. Unholy alliance for profit, if it stated or implied that the promotion of vaccines was motivated by monetary gain; and that doctors, pharmaceutical companies, researchers and public health bureaucrats were colluding in this regard.
5. Towards totalitarianism, if it stated or implied that regulation of the administration of vaccines involved a threat to civil liberties and was an excessive exertion of governmental control.
6. Us and them, if anti-immunisationists positioned themselves as caring and concerned friends or allies of parents, together pitted against the collusive interests of uncaring doctors and government. Included here were instances when a parent or advocate against vaccination gave a personal account of a child who had allegedly suffered badly from immunisation.
7. Poisons, if it stated or implied that vaccines are toxic and poisonous or that their contents are made from undesirable products.
8. Vaccines as the cause of idiopathic ills, if it was suggested that vaccines were the cause of diseases or behavioural problems of unknown or uncertain origin.
9. Back to nature, if it implied that 'natural' methods of preventing diseases are more desirable than the 'artificial' method of vaccination.

(Leask & Chapman, 1998)

Today anti-vaccination sentiment is spread in various social communities offline and on the Internet. Social media and easily accessible websites form global communities where sentiments and healthcare experiences are shared. It is worthwhile to mention the most common tactics used by the anti-vaccination movement.

Skewing the science: Denigrating and rejecting science that fails to support anti-vaccine positions; endorsing poorly-conducted studies that promote anti-vaccine agendas.

Shifting hypotheses: Continually proposing new theories for vaccines causing harm; moving targets when evidence fails to support such ideas.

Censorship: Suppressing dissenting opinions; shutting down critics.

Attacking the opposition: Attacking critics, via both personal insults and filing legal actions.

(Kata, 2012)

By identifying these tactics by the anti-vaccination community, healthcare providers can acknowledge what kind of misinformation health consumers may encounter every time they look for immunization information online.

2.5 Role of nurses in promoting vaccine acceptance

Nurses are front-line professionals who are more likely to encounter concerns and questions regarding information and misinformation from parents. It is essential to keep up-to-date with ongoing trends and arguments about childhood immunization. This makes nurses ready to provide adequate information to parents when needed.

Studies have suggested that nurses are more likely to succeed in establishing trust with health consumers, for they perceive nurses to have same socioeconomic status. Health consumers may find themselves personally closer to nurses, compared to other medical professionals such as physicians or researchers, as nurses are less involved through financial ties with pharmaceutical companies (Hoekstra & Margolis, 2016).

Nurses' role in improving childhood immunization acceptance should be given more attention. In most practices, nurses act as vaccine administer to children, educator and counselor to parents. This creates unique opportunities for nurses to utilize, as well as responsibility to carry. Nurses' important roles require them to acquire complete skill of researching, analyzing and using data. Moreover, it is crucial for nurses to expect health consumers' Internet use and to navigate them to reliable, accurate information sources (Scott et al., 2008).

3 THEORETICAL FRAMEWORK

There are two models chosen for this study. The “Vaccine Hesitancy Model” identifies the factors of vaccine-hesitant behaviors for a better understanding of individual occurrences. The “Health Belief Model” acts as theoretical framework for developing interventions, as well as for interpreting the results in the Findings-chapter. Both models can be employed simultaneously to shed light on the complex issue of this paper.

3.1 Vaccine Hesitancy Model

A model was developed to examine the complexity of vaccine hesitancy, called “3Cs” model. In this model, three featured main categories in vaccine hesitancy were confidence, complacency and convenience. Figure 2 below illustrates 3Cs model.

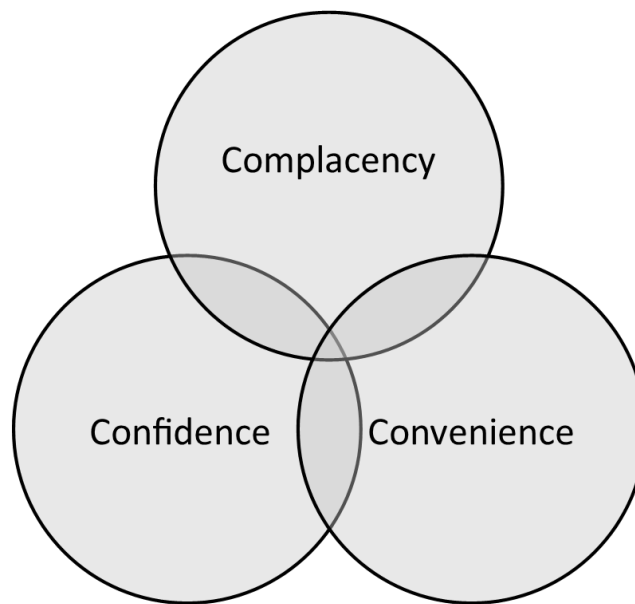


Figure 2: "Three Cs" model of vaccine hesitancy (MacDonald, 2015)

Confidence refers to “trust in (i) the effectiveness and safety of vaccines; (ii) the system that delivers them, including the reliability and competence of the health services and health professionals and (iii) the motivations of policy-makers who decide on the needed vaccines”.

Complacency occurs when “perceived risks of vaccine-preventable diseases are low, and vaccination is not deemed a necessary preventive action” (MacDonald, 2015). Effective immunization programs may practically eliminate previously common epidemics and distance people who have no first-hand experience from their frightening effects.

Convenience may be deemed as most significant factor as it includes “physical availability, affordability and willingness-to-pay, geographical accessibility, ability to understand (language and health literacy) and appeal of immunization services affect uptake” (MacDonald, 2015).

3.2 Health Belief Model

The theoretical framework of choice for this paper was “Health Belief Model” (HBM) (Rosenstock, Strecher & Becker), one of the first theories of health behavior. It is a psychological model focusing on the attitude and beliefs to explain and predict health consumers’ health behavior. The HBM can be utilized into health promotion under nursing’s perspective. The fact that HBM was originally developed to examine the barriers to polio vaccination for parents makes it naturally useful in this topic.

The HBM comprises of six main dimensions that impact on individual’s decision regarding to health. The authors of HBM suggested that people are willing to take action if they:

Believe they are susceptible to the condition (perceived susceptibility)

Believe the condition has serious consequences (perceived severity)

Believe taking action would reduce their susceptibility to the condition or its severity (perceived benefits)

Believe costs of taking action (perceived barriers) are outweighed by the benefits

Are exposed to factors that prompt action (e.g., a television ad or a reminder from one’s physician to get a mammogram) (cue to action)

Are confident in their ability to successfully perform an action (self-efficacy)

(Theory at a Glance: A Guide for Health Promotion Practice, 1997)

The HBM has been demonstrated by the following conceptual framework (Figure 2).

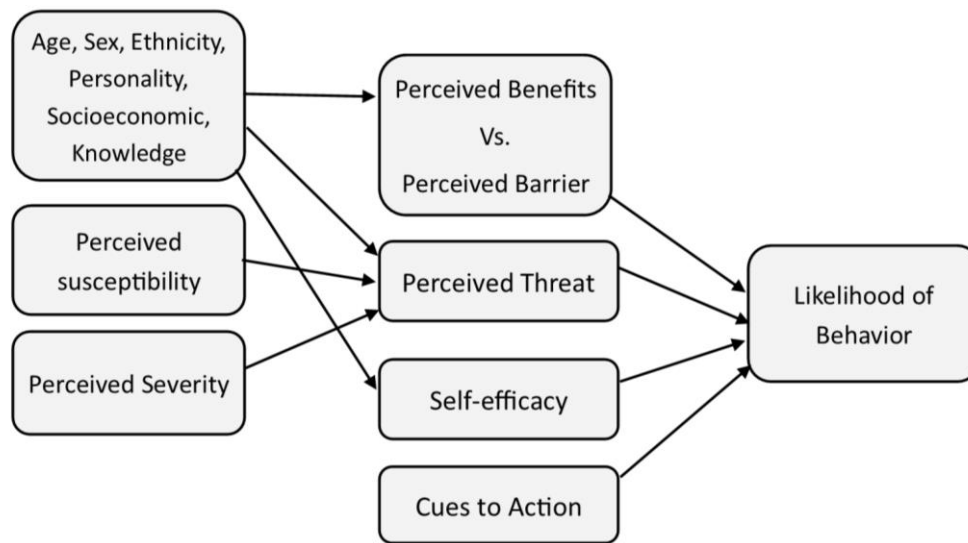


Figure 3: Health Belief Model (Rosenstock et al, 1988)

Health Belief Model has been widely recognized, well-tested and applied as a nursing tool, especially in issues about preventive healthcare practice. The framework offers a flexible, adaptable and applicable tool to different health behaviors. A review of 46 studies with diverse population and settings of HBM indicated strong empirical evidence for each dimension of the model (Janz & Becker, 1984).

3.3 The correlation between two models

It is fundamental to note that prime motivation of HBM is taking positive health actions to avoid negative health consequences. Firstly, healthcare providers need to increase health consumers' perceived susceptibility and perceived severity through proper education. In childhood vaccine acceptance context, this can be referred to intervention for 'complacency' of 3Cs model. When parents nowadays do not have firsthand experience of how lethally dangerous vaccine-preventable diseases are, they are more likely to overlook vaccine necessity. The information about prevalence and consequences of these diseases need to be reminded.

Secondly, to engage a positive health behavior, healthcare providers need to aid parents in analyzing cost and benefits of vaccination (i.e., increasing perceived benefits and decreasing perceived barriers). This is relevant to the ‘confidence’ of 3Cs model, when parents need to analyze between vaccine benefits and side effects; or to increase trust in scientific evidence; or decrease doubts in policy makers and/or healthcare system.

Thirdly, when implementing “cues to action” and boosting “self-efficacy”, healthcare providers may need to consider parents’ capabilities, accessibility and interest towards vaccination services. This step fairly relates to ‘convenience’ factor of 3Cs model. By acknowledging parents’ convenience factor, healthcare providers will be able to tailor effective how-to information, guidance and positive enforcement.

4 AIM AND RESEARCH QUESTIONS

This thesis explores and raises critical awareness of the association between the use of online health information and parental decisions when it comes to vaccination. Moreover, the thesis explores nurses' role and approaches to counteract such phenomenon.

This thesis is motivated by the research question:

- What challenges are hindering parents from obtaining sufficient information online to decide on childhood immunization?
- What are the recommendations for healthcare providers to counteract such phenomenon?

4.1 Audience and scope

The writer hopes this paper will be practically useful for healthcare practitioners when it comes to understand the health consumers' usage behavior regarding immunization information from the Internet and for countering it with more accurate and useful information.

This paper focus on childhood immunization, therefore targeted health consumers are mostly perinatal parents. Healthcare providers who work at public healthcare settings, pediatric care, school setting and family centered care would find this paper useful.

5 METHODOLOGY

In a qualitative research, methodology indicates the “theoretical assumptions underpinning the choice of methods and processes” (Taylor and Francis, 2013, p.188). This section presents explanation of how the data were collected and analyzed, as well as a list of articles that were used for the study.

5.1 Literature review

According to Aveyard (2014), a literature review is “the comprehensive study and interpretation of literature that relates to a particular topic”. When conducting a literature review, the author defines research questions then attempts to answer them during a process of searching and analyzing relevant literature. Each article can be seen as a piece of jigsaw that helps to complete a puzzle. To healthcare professionals, being up to date with latest information and research is required. However, with the enormous amount of developments in the realm, to assimilate all the research in any topic seems impossible. That is why literature reviews are important and useful since they summarize the available literature in the field.

5.2 Data collection

Data are the selection of information obtained from using certain methods to gather, according to the nature and amount of information. There are two research questions in the paper. Although the searching was carried out thoroughly and systematically, it could not avoid language bias, for it was limited to only English.

The data collecting process included three phases: identification, screening and eligibility.

5.2.1 Identification phase

Arcada’s Nelli Portal allows us to access several databases simultaneously related to nursing, making the search process faster and easier. The searching process was conducted through Academic Search Elite (EBSCO), Cinahl (EBSCO), Cochrane Library, PubMed, Sage, and ScienceDirect. The main search terms used were:

- Vaccine hesitancy AND Internet
- Vaccine hesitancy AND nursing
- Vaccine acceptance AND intervention
- Childhood vaccine AND Internet AND parents

To set boundaries for the collected data, filters were applied during the searches process. Filters set for identification phase were: peer-reviewed, primary research articles, English language and free access through Arcada's Nelli portal. The search was also limited to 5 recent years, since new healthcare knowledge is constantly being produced. Moreover, the Internet and its technologies has been advancing steadily. Thus, the newer the information, the better and more applicable the study is. Articles that are not in English, secondary research, published before 2013 and not related to healthcare were eliminated.

The filter options can vary from database to database. Therefore, sometimes the author had to apply different filters to produce more specified and refined results. For example, during the search on ScienceDirect database, when using the search terms "vaccine hesitancy" AND "Internet" with "2013 to present" timeframe and "research articles" type, the search at first yielded to 90 hits. The author then limited these search terms for "Title, abstract or keywords" and received 12 hits. Similarly, on ScienceDirect, when using the search terms "childhood vaccine" AND "Internet" AND "parents", the result first yielded 79 hits. The author confined the search with "childhood vaccine" in "Title, abstract or keywords" and received 15 hits. Utilizing filter system can help achieving more accurate results and saving more time for the screening phase.

There were 172 articles identified after this phase. All duplicates were eliminated, leaving 165 articles for screening phase.

5.2.2 Screening phase

In screening phase, the author studied all titles and abstracts of 165 articles to select eligible articles for further scrutiny. Chosen articles need to contain at least 2 searched keywords in the abstract. These articles were also narrowed down as per relevance to the subject, which focus on parent's perception on childhood vaccination. Therefore, studies

about adolescents' perception on vaccination, studies on adults' vaccination, studies not related to healthcare providers were eliminated. 33 eligible articles were shortlisted for the third phase.

Details of the searching process of the first two phases, including search engines, keywords, applied filters and corresponding results of each search is demonstrated in Appendix 1 – Table 3.

5.2.3 Eligibility phase

During the eligibility phase, 33 articles were read thoroughly under inclusion and exclusion criteria. Articles which did not hold up to the inclusion criteria were disqualified. The total amount of eliminated articles were 22, leaving 11 articles chosen to answer the research questions.

The inclusion criteria included:

1. The article needs to significantly answer at least one research question.
2. How relevant the article is to the mentioned research questions.
3. To what extent the article can be applicable and interpretable to nursing practice.

Figure 2 shows the data collection process through three phases.

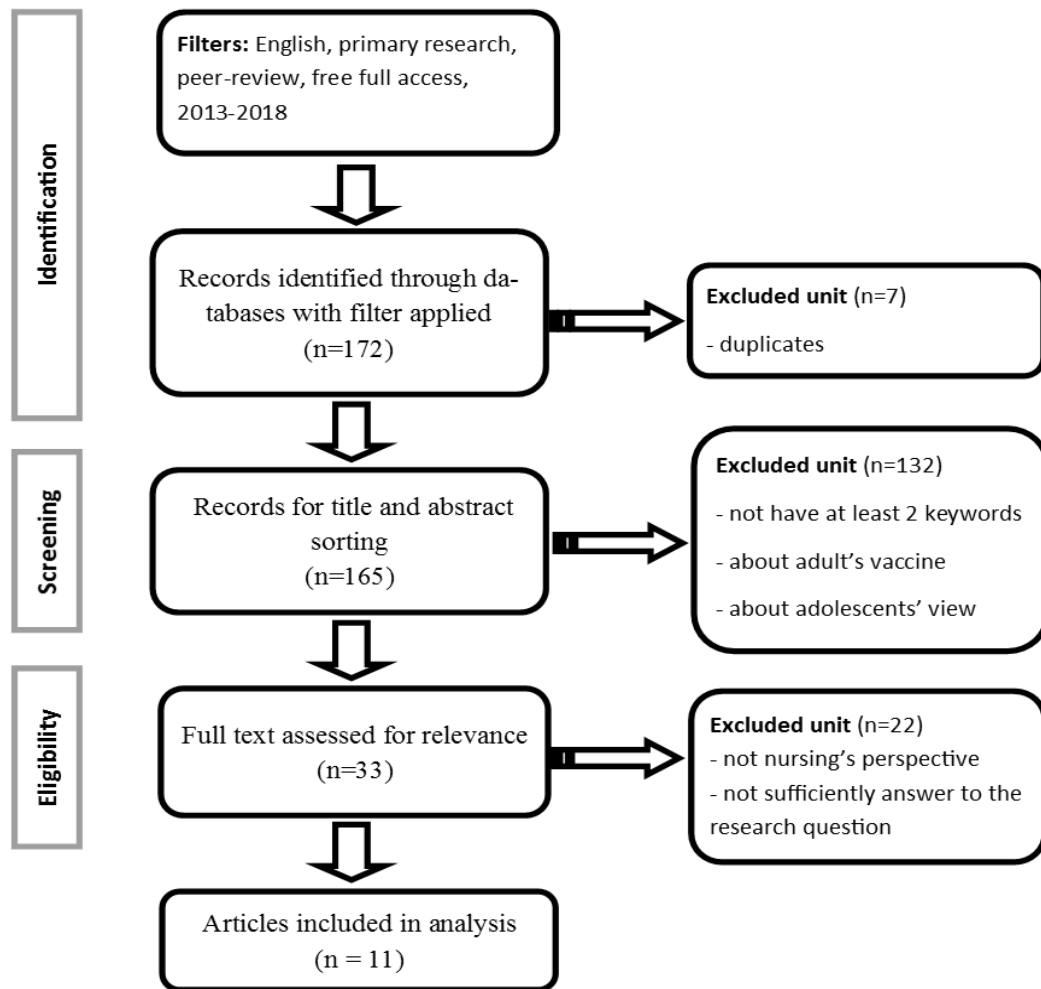


Figure 4: Data collection flowchart

5.2.4 List of chosen articles:

1. Getman, R., Helmi, M., Roberts, H., Yasane, A., Cutler, D., Seymour, B. (2017). Vaccine Hesitancy and Online Information: The influence of Digital Networks. *Health Education & Behavior* 1-8.
2. Wiley, K.R., Steffens, M., Berry, N., Leask, J. (2017). An audit of the quality of online immunization information available to Australian parents. *BMC Public Health* (2017) 17:76.
3. Dubé, E., Gagnon, D. et al. (2016). Understanding Vaccine Hesitancy in Canada: Results of a Consultation Study by the Canadian Immunization Research Network. *PLoS ONE* 11 (6): e0156118.

4. Ruiz, J.B., Bell, R.A. (2014). Understanding vaccination resistance: Vaccine search term selection bias and the valence of retrieved information. *Vaccine* 32 (2014) 5776 – 5780.
5. Williams S.E., Rothman, R.L. et al. (2013). A Randomized Trial to Increase Acceptance of Childhood Vaccines by Vaccine-Hesitant Parents: A Pilot Study. *Academic Pediatrics*. Volume 13, Number 5, Sept – Oct 2013.
6. Lenmann B.A., Melker, H.E., Timmermans, R.M., Mollema, L. (2017). Informed decision making in the context of childhood immunization. *Patient Education and Counseling* 100 (2017) 2339 – 2345.
7. Berry, N.J., Danchin, M., Trevena, L., Witterman, H.O. et al. (2018). Sharing knowledge about immunisation (SKAI): An exploration of parents' communication needs to inform development of a clinical communication support intervention. *Vaccine* 36 (2018) 6580–6490.
8. Shoup, J.A., Wagner, N.M., Kraus, C.R. et al. (2015). Development of an Interactive Social Media Tool for Parents With Concerns About Vaccines. *Health Education & Behavior*, Vol 42(3) 302-312.
9. Lieu, T.A., Zikmund-Fisher, B.J., Chou, C., Ray, T., Wittenberg, E. (2017). Parents' Perspectives on How to Improve the Childhood Vaccination Process. *Clinical Pediatrics* 2017, Vol 56(3) 238-246.
10. Danchin, M.H., Costa-Pinto, J., Attwell, K., Willaby, H et al. (2017). Vaccine decision-making begins in pregnancy: Correlation between vaccine concerns, intentions and maternal vaccination with subsequent childhood vaccine uptake. *Vaccine* 36 (2018) 6473-6479.
11. Glanz, J.M., Wagner N.M., Narwaney, K. J., Kraus, C., Shoup, J.A. et al. (2017). Web-based social Media Intervention to increase Vaccine Acceptance: A randomized Controlled Trial. *Pediatrics*, 2017; 140 (6):e2071117.

5.3 Data analysis

There are various methods used to analyze text data, namely ethnography, grounded theory, phenomenology, history research and qualitative content analysis. Usually the researchers need to choose methods and processes that are appropriate for gathering and

analyzing the needed data. The methodology of choice for this thesis was qualitative inductive approach and content analysis. It means analyzing the data and forming the categories that help answer the topic questions. Downe-Wamboldt (1992) stated that the main purpose of content analysis is “to enhance the inferential quality of the results by relating the categories to the context or environment that produced the data”. Hsieh has defined qualitative content analysis as a ‘research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns’. (Hsieh, 2005)

According to Bernard (2011, p.7), inductive method involves “the search for pattern from observation and the development of explanations – theories – for those patterns through series of hypotheses”. Usually patterns, similarities and regularities in premises need to be observed to achieve conclusions. Because of the novelty of this topic and everchanging nature of Internet itself, quite few studies addressing the Internet’s effects on childhood immunization and its interventions have been done before. No hypotheses were specifically found at the beginning of the research. This created an opportunity for the author to thoroughly observe, explore and conceptualize the phenomenon.

The author applied the qualitative content analysis approach suggested by Elo & Kyngäs for the analysis process, because it directly relates to nursing research. Elo & Kyngäs (2007) proposed three main phases for both inductive and deductive approaches: preparation, organizing and reporting.

During the preparation phase, the researcher selects a theme or a word to be the unit of analysis. Unit of analysis may be equivalent to “a letter, word, sentence, portion of pages or words, the number of participants in discussion or the time used for discussion” (Elo & Kyngäs, 2007). It is important to decide on whether the manifest content or the latent content should be analyzed. While the manifest content represents the obvious meaning of a text, whereas the latent content refers to underlying meaning that needs to be interpreted from a text (Graneheim & Lundman, 2004). After deciding on analysis level, the researcher needs to familiarize him or herself with the data by asking the following questions while reading: “Who is telling? Where is this happening? When did it happen? What is happening? Why?” (Elo & Kyngäs, 2007). In the organizing phase, the researcher

would perform open coding by creating headings to describe all aspects from the content. The codes are then grouped into a list of categories and eventually a theme to describe the phenomenon as a whole. Finally, during the reporting phase, it is fundamental that the researcher describes a link between the results and the data.

As mentioned above, the selected data is analyzed in inductive approach. The author made notes and defined the labeling codes on the articles while carefully reading them. These codes were then listed and categorized into the same group with other relevant codes. After that, the categories were emerged into a sub-theme and theme. Table 1 in the Findings chapter illustrates the categories and sub-theme founded from the analysis process.

5.4 Ethical consideration

In order to protect research participants, various codes of ethics have been developed throughout the history of nursing research. According to Polit & Beck (2013), there are three fundamental ethical principles on which standards of ethical conducts in research are based on: beneficence, respect for human dignity, and justice. Beneficence refers to the duty of minimizing harm and maximizing benefits in research. Researchers are obliged to avoid and prevent unnecessary harm or discomfort that happen to participants during their studies. Moreover, the relationship between researchers and participants should be established on trust and transparency to avoid exploitation. The second ethical principle, respect for human dignity, refers to “both the right to self-determination and the right to full disclosure” (Polit & Beck, 2013). Therefore, participants have the right to voluntarily participate or withdraw from the study. The third ethical principle called justice, which concerns participants’ right to fair treatment and the right to full privacy (Polit & Beck, 2013).

Since this thesis is a literature review, the most significant ethical consideration that writer should concentrate on is respect for intellectual property. The thesis was conducted by collecting, reviewing and analyzing available literatures to answer the research question. No human or animal was chosen to be study subject for this study. Hence, the ethical approval for this study was not necessary. However, the writer should carry the obligation of giving full credits to original authors using appropriate reference.

6 FINDINGS

In this chapter, the research results are revealed to answer the question of the thesis, which are (i) current challenges regarding Internet information about childhood immunization, and (ii) recommendations for healthcare providers to counteract such phenomenon.

To present the findings in a clear and comprehensive structure, two main subthemes - “Challenges” and “Recommendations” - have been defined to answer the questions. Different categories were grouped from various codes derived from the articles. Table below demonstrates all minor and major categories of the findings and the number of articles that belong to them. An in-depth description as well as main findings of each articles can be found in Appendix 2 Table 4.

Table 1: Minor and major categories of the findings

Unit of analysis	Codes	Categories	Sub theme	Theme
1, 2, 3, 4, 6, 7	Knowledge barriers	Challenge faced by health consumers	Challenges	How Internet impacts childhood vaccine attitude in parents and interventions
7, 9, 11	Lack of trust			
1, 2, 4	Vulnerability towards misinformation			
3, 5, 7, 9	Lack of time/ resources	Challenge faced by HCPs		
1, 2, 3, 8, 10, 11	Crowd-based Network intervention	Online intervention	Recommendations	
1, 3, 7, 8, 9, 10	Transparency			
5, 7, 8, 10	Information development			
4, 6, 7	Decision aid & education	Offline intervention		
3, 4, 10	Behavior Understanding			
2, 3, 8, 10, 11	Therapeutic communication			

6.1 Challenges

6.1.1 Challenges for health consumers

Knowledge barriers: The lack of knowledge or difficulties in obtaining sufficient information about childhood vaccination is the most notable finding from the articles. A study (2) about quality of online immunization information on 186 pages from 115 website shows that, many sites lack information of depth. Even when details were given, general viewers cannot access the information without subscription of payment (1, 2). Another study (3) that interviewed professionals involving in vaccination research and administration, reports that, the “diffusion of negative information on vaccination in Internet” was ranked highest among the main causes of vaccine hesitancy, followed by lack of knowledge of vaccination. Study (4) found that websites yielded by positive search terms countered less vaccine myths than the websites returned from neutral or negative search terms. Study (7) reports on the need of more information about vaccination, such as vaccine safety and side effects, stated by parents who participated in these studies. Only 50% of pregnant women involved in study (10) “strongly agreed” that they have sufficient knowledge to make a decision about vaccination. Study (6) investigating on decision making process of vaccine acceptors, partial acceptors and decliners found that, vaccine decliners manifest the least knowledge compared to the other two groups. The study also reported that, out of 1615 parents who took part in the test, only 21% can be classified as “making an informed decision”.

Lack of trust: Trust is an important factor that influences the attitude of parents about childhood vaccination. It can refer to trust in vaccine safety, trust in the healthcare system and trust in healthcare providers. Healthcare professionals who participated in study (3) expressed that, mistrust in “pharmaceutical industry”, “conventional medicine” and “medical establishment” is one of the notable causes for vaccine hesitancy. Parents expressed that they need more transparency when obtaining vaccine information, such as the balance between side effects and benefits of vaccine (7). Parents may avoid reading the information, but for them this accessibility appear to “demonstrate transparency, establishing credibility and building trust” (9).

Vulnerability towards misinformation: It was reported that the Internet usage or information seeking behavior of health consumers can lead them to misinformation. Study (1) found that the hierarchical mode of scientific authority is being exploited by the vaccine-hesitant community to implement their narratives. Study (2) indicates that searches for immunization information can be influenced if users do not clear their cookies and history regularly. Study (4) shows that, a person using negative search terms (e.g. “vaccine risks”) would encounter 3,6 times more vaccine myths than a person who uses neutral terms (e.g. ”vaccine”), and 4,8 times more vaccine myths than a person who uses positive terms (”vaccine benefits”). Even when searching for benefits of vaccines, a person can still encounter misinformation about vaccine safety and effectiveness (4).

6.1.2 Challenges for healthcare providers

Lack of time and resources: Experts expressed that it takes much more time for healthcare providers to explain and/or encourage hesitant parents during time-limited visit (3, 5). Vaccine hesitancy also tends to affect productivity of healthcare workers (3). Parents also expressed the need to have information regarding vaccination before the clinic visit, as well as time to reflect on them (7, 9)

6.2 Recommendations

6.2.1 Online interventions

Crowd-based network development: Studies have pressed the need for crowd-based network, with interactive functions, where users decide the information type (1, 2, 3, 10). A few studies showed improvement on vaccine acceptance with interactive social media network, where parents interact directly with research team and/or other parents (8, 11).

Information development: Studies showed the need for information to be tailored according to different targets, with comprehensible and reassuring content (7, 11). Study (5) showed an intervention including 8-minutes video about vaccine concerns, an educational handout about common vaccine concerns, and a written instruction on how to find reliable medical information on the Internet. The outcome shows modest but significant

improvement in parental attitude towards vaccination. Participants in study (8) addressed the need for all interactive forums about vaccination to be monitored by professionals.

Transparency of information: There was apparent needs for balanced information about side effects as well as benefits of childhood vaccine (7, 8, 9, 10). Parents were also determined to know the sources of research funding, citations and hyperlinks for all available information (3, 8, 11). Even though some parents may avoid reading the detailed information, the accessibility itself was still deemed as transparency (7). Study (1) reported that, due to its nature as a crowd-base network, Wikipedia appears to be more transparent to viewer and thus less likely to be misused by the vaccine-hesitant community to push their agenda.

6.2.2 Offline interventions

Education and decision aids: Study (6) suggested the need of addressing different aspects of an informed decision, as well as to assess what kind and how much information parents need and want in order to make an informed decision. Study (7) reported that many parents seek for “everyday implications” to inform their decision, instead of complicated “numerical information about risks and benefits”.

Behavior understanding: Experts called for more efforts in measuring and assessing vaccine hesitancy and how it influences vaccination behavior, as well as the need for better definition the concept of vaccine hesitancy (3). Study (4) indicated that the sponsors of vaccination information websites should not take for granted the need for vaccination and thus miss the opportunity to inoculate their visitors from misinformation they might come across. Similarly, In the study (10), many mothers reported that HCPs just assumed that they would vaccinate “without making explicit recommendations”. Professionals should always bear in mind that health consumers will continually seek online information for vaccination (4).

Therapeutic communication: Communication from HCPs is essential to guide parents how to make an unbiased search (2), and to lead them to credible sources for vaccine

information (4). Experts recommended that it's important to listen without being judgmental, to disclose information about vaccine risks, and to correct misinformation (3). Study (8) suggested that healthcare providers can improve trust from health consumers by disclosing both benefits and risks of childhood vaccine, listening to parents' concerns, providing individualized answers with comprehensible information. Study (11) reported that even when the social media intervention tool has a discussion forum, participants still preferred to communicate with the research team than with other participants.

7 DISCUSSION

Findings from study (3) addressed the need for a common definition on ‘vaccine hesitancy’ among healthcare professionals. Current definition from WHO focuses on binary health outcomes (i.e., vaccinate or not vaccinate), which can be difficult when putting into practice. In fact, the definition from WHO has been criticized for lack of consideration for attitudes of beliefs. Those who are “uncertain but very interested and committed in vaccination issues are prone to information seeking and long and balanced decision-making”, and to those who have “no definite opinion, little knowledge and little interest about vaccination issues and who randomly forget or delay some vaccines” could both fall into ‘vaccine hesitant’ classification. However, those two groups manifest completely different attitudes and behaviors (Peretti-Watel et al., 2015).

The findings from this paper convey different correlations between Internet information and attitude towards childhood vaccination of parents. These studies confirm Internet as a popular source for parents to seek information and to make decision on childhood immunization. It was consistent with previous studies about this phenomenon (Kata, 2012; LaVail & Keney, 2012; Witterman & Zikmund-Fisher, 2012). Study (6) observed that vaccine decliners gained the same amount of information from the authorities as acceptors, which means that they made their decision based on information from elsewhere. Even though health consumers still perceived healthcare providers as their fundamental sources of information (5, 10, 11), the change in information seeking behavior is making a shift of power in the relationship between healthcare providers and health consumers. The access to information stimulates the rise of informed health consumers. Health consumers have become “a partner and decision-maker” in “shared decision making” of their own health treatment plan (Ratzan, 2010). Therefore, it is crucial that healthcare providers acknowledge consumers’ usage behavior of health information in order to guide the decision-making process.

As mentioned in background chapter, anti-vaccination movement has been facilitated by Web 2.0 and evolving continuously. Misinformation repeated through different channels are constantly spreading fear and uncertainty among readers. Vaccine-hesitant communities are still growing vigorously in the presence of overwhelmingly dominance of pro-

vaccine content. The fact that most popular social media platforms (e.g Facebook, Youtube) apply the popularity algorithm to cater their users individualized and consistent content, creates an echo chamber effect (Facebook Data Policy, 2018, Quattrociochi, 2016). Echo chamber is known as “a result of selective exposure and ideological segregation” (Barberá et al, 2015), as well as an exercise of confirmation bias. Study shows that the more engaged a user is within an echo chamber, the more likely that user will connect with like-minded individuals (Quattrociochi, 2016). The echo chamber effect sustains well-segregated communities of either in favor or against vaccination. This may explain why efforts to provide accurate, scientific immunization information cannot penetrate vaccine-hesitant groups, as reported by study (1). Similarly, individual search results can vary greatly by the information retrieval habits of Internet users or local legislative requirements. Search results are affected by personal search history and monitored Internet usage activities, as indicated by study (2). Thus, healthcare providers are recommended to become familiar with network behavior pattern and the content regarding childhood immunization (Schmidt et al, 2018). By acknowledging the ongoing vaccination myths and trends, frontline healthcare providers such as nurses can effectively address parents’ concerns. These findings also suggested that healthcare providers’ competency in Internet health information can play a crucial part in health consumer education and assistance.

To combat the inflation of vaccine-hesitant community, health researchers and policy makers need to implement different strategies other than correcting online misinformation. Findings showed that current content organizers for vaccination information websites have been underestimating the needs and concerns of their readers (1, 4, 7, 8, 10). The importance of vaccines in preventing infectious diseases and necessity of herd immunity need to be constantly addressed to the public. However, it is worth to mention, studies have found that reading scientific information about vaccines and risks of vaccine-preventable diseases did not improve parents’ intention to vaccinate (Nyhan et al., 2014). Similarly, self-affirmation exercise, while being effective in other fields of health messaging, showed to be counterproductive in increasing the intention to vaccinate for parents with initially negative attitudes towards vaccines (Reavis et al, 2017). This once again emphasizes that vaccine hesitancy issue needs to be analyzed and tackled with holistic approaches.

To address vaccine hesitancy sentiment in Europe, in January of 2018, the Commission has organized a High-Level Expert Group (HLEG) to tackle the problem of online misinformation. The group includes 39 members who are experts from civil society, various news organizations and social media platforms. The mission of the group is to formulate tactics and recommendations to deal with fake news on an EU-level (European Commission, 2018). Moreover, in 2018, a Member States led project on vaccination was co-funded by EU Health program. This project aims to provide in-service training program for health professionals, social and online media monitoring and addressing vaccine hesitancy phenomenon on media (European Parliament, 2018).

7.1 Findings through theoretical frameworks

As analyzed in Theoretical Framework chapter, two chosen frameworks (i.e., 3Cs model and Health Belief Model) can be used simultaneously to shed light on findings.

The 3Cs model provides a comprehending format to identify determinants made up for a complex issue like vaccine hesitancy. Through the three elements ‘confidence’, ‘complacency’ and ‘convenience’, healthcare providers will be able to understand how parents form their vaccine-hesitant attitude and behavior. Even though this thesis only focuses on Internet information and its impact on parents’ vaccine decision, it is evident that 3Cs model supports the findings about challenges faced by health consumers and healthcare providers. Furthermore, 3Cs model reinforces the intervention strategies when applying with Health Belief Model. Health Belief Model has been effectively used in various studies investigating vaccine acceptance from different aspects.

In this section, findings from previous chapter will be applied into Health Belief Model theoretical framework to gain an applicable interpretation for interventions. Details of how the findings can be applied into Health Belief Model framework is demonstrated by Table 2.

Table 2: Applying Health Belief Model into interpreting findings

Concept	Definition	Examples	Finding codes
Perceived susceptibility	Individual's assessment of their chance of getting a condition	Parents acknowledge that infants and children can get infected by incurable viral diseases.	<u>-Information development</u>
Perceived severity	Individual's evaluation on how serious the condition is	Parents acknowledge the danger of these diseases (brain damage, death, paralysis, etc.)	<u>-Information development</u> <u>-Decision aid and education</u>
Perceived benefits	Individual's belief that the advised behavior can improve their condition	Parents believe that vaccinating their children fully and timely will protect their children from these diseases.	<u>-Information development</u> <u>-Therapeutic communication</u> <u>-Transparency</u>
Perceived barriers	Individual's judgment about actual and psychological cost of the advised behavior	Parents identify their personal barriers (i.e., uncertain of vaccine safety) and explore ways to reduce barriers (discuss with HCPs, study in-depth information)	<u>-Knowledge barriers</u> <u>-Lack of trust</u> <u>-Lack of time/ resources</u> <u>-Transparency</u>
Cue to action	Factors that activate the process to forming the advised behavior	Parents receive reminder cues for actions (encouragement from online interactive groups; reminder from mainstream media)	<u>-Crowd-based network intervention</u> <u>-Information development</u> <u>-Behavior Understanding</u>
Self-efficacy	Confidence in one's ability to achieve the action	HCPs help parents gain confidence in vaccination and how to obtain sufficient, credible information for themselves.	<u>-Behavior Understanding</u> <u>-Therapeutic Communication</u>

8 CONCLUSION

It is apparent that Internet has become a significant source for childhood immunization information. Through this investigation, the author explored how Internet impacts childhood vaccine attitudes in parents, as well as online and offline interventions for it. The findings from 11 chosen articles have answered two research questions, and the discussion interprets the findings in light of chosen theoretical frameworks.

Factors regarding Internet that prevent parents from having sufficient knowledge about childhood information are knowledge barriers, lack of trust and vulnerability towards misinformation. Online interventions that were identified are utilizing of a crowd-based network, improving transparency and information development. Offline interventions include decision aid and education, behavior understanding and therapeutic communication. Online interventions may be more suitable for website organizers and policy makers, while offline interventions are practical and applicable for frontline healthcare providers, especially nurses. More studies are needed to investigate the influence of Internet health information on nursing practice in different settings.

8.1 Strength, limitations and recommendations

This thesis is multidisciplinary work on a contemporary topic. Internet misinformation issues are being studied in other contexts than healthcare information. For instance, Internet misinformation and its prevalence has been identified as a tool for political influencing or cybercrimes. Studies we analyzed in healthcare context fit with the patterns witnessed elsewhere where the misinformation issues are rampant. The studies analyzed are very current and illuminate today's vaccine hesitancy sentiment landscape and anti-vaccine movement. The author hopes this study manages to provide accurate and useful information for our target audience.

This thesis is not a study without limitations. The studies used for this thesis mainly focus in challenges and interventions in developed, Western countries. It may not be as realistic and applicable when implementing for developing countries or countries in other areas of the world due to differences in culture, beliefs, level of literacy and social factors.

Even though the author narrowed the timeframe for data collecting to 5 most recent years, it is necessary to mention that Internet information trends are advancing rapidly. Some of the studies may be even outdated compared to current Internet technologies. The author recommends that studies in the future take into account the technologies so that interventions can be up-to-date and quickly applied into practice.

Furthermore, as mentioned before, the scope of this paper focused on childhood immunization with the targeted health consumers being perinatal parents. Therefore, studies about immunization in adolescents and adults are not investigated in this paper. Further studies on Internet information regarding adolescents' and adults' immunization should be conducted to examine attitudinal and behavioral patterns of this issue.

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APPENDICES

Appendix 1

Table 3: Details of data retrieval process

Database	Search terms	Limitations	1st phase	2nd phase
Academic Search Elite	“Vaccine hesitancy” AND “Internet”	Peer-reviewed Full text 2013 – present	3	2
	“Vaccine hesitancy” AND “nursing”		4	2
	“Vaccine acceptance” AND “intervention”		2	1
	“childhood vaccine” AND “Internet” AND “parents”		0	0
Sage	“Vaccine hesitancy” AND “Internet”	Research article Full access 2013 – present	15	5
	“Vaccine hesitancy” AND “nursing”		12	2
	“Vaccine acceptance” AND “intervention”		28	3
	“childhood vaccine” AND “Internet” AND “parents”		5	1
CINAHL	“Vaccine hesitancy” AND “Internet”	Linked Full Text	1	0
	“Vaccine hesitancy” AND “nursing”	2013 – present	2	1

	“Vaccine acceptance” AND intervention		1	0
	“childhood vaccine” AND “Internet” AND “parents”		1	1
PubMed	“Vaccine hesitancy” AND “Internet”	Free full text Journal articles 2013 – present	11	3
	“Vaccine hesitancy” AND “nursing”		11	3
	“Vaccine acceptance” AND “intervention”		10	1
	“childhood vaccine” AND “Internet” AND “parents”		0	0
ScienceDirect	“Vaccine hesitancy” AND “Internet”	Title, abstract, keywords Research articles 2013 – present	12	3
	“Vaccine hesitancy” AND “nursing”	Research articles 2013 – present	33	5
	“Vaccine acceptance” AND “intervention”	Title, abstract, keywords Research articles 2013 – present	16	4

	(Title, abstract, keywords: “childhood vaccine”) AND “Internet” AND “parents”	Research articles 2013 – present	5	3
Total of articles after each phase			172 (after deduplication n= 165)	40
Articles for eligibility phase				33

Appendix 2

Table 4: Formulation of major and minor categories during content analysis of chosen articles

Article number	Categorized condensed meaning units Categories names are in bold characters
1	<p>The study analyzed childhood vaccination information in 28122 publications from 4817 sources.</p> <p><u>Knowledge barriers:</u> A hyperlink map shows that content from pro-vaccine (Sciencesblogs, Sciencebasedmedicine.org), health and science sites (ScienceDirect, Chemport, CDC.gov) and mainstream media (NBC News, MSNBC, LiveScience) only rarely interact with the vaccine hesitant community. Peer-reviewed, academic papers are too technical to general public, plus the viewers usually cannot access those without subscription.</p> <p><u>Vulnerability towards misinformation:</u> The hierarchical mode of scientific authority is being exploited by the vaccine-hesitant community to enforce their narratives.</p> <p><u>Crow-based network intervention:</u> The study shows that Wikipedia is an example of utilizing crowd-base authority to providing high-level context, easy-to-access content.</p> <p><u>Transparency:</u> Due to its nature as a crowd-base network, Wikipedia is more transparent to its viewer. Thus, Wikipedia is less likely to be misused by the vaccine-hesitant community than other pro-vaccine sources.</p>

2	<p>The study inspects the quality of immunization content from 186 pages from 115 websites.</p> <p><u>Knowledge barriers</u>: Many sites lack information of depth. Even when details were given, general viewers cannot access the information without subscription of payment.</p> <p><u>Vulnerability towards misinformation</u>: Searches for immunization information can be influenced if users do not clear their cookies and history regularly. Google's Personalized Search function and auto-complete function may return the results biased by user's search history, what searches user has previously made</p> <p><u>Crow-based Network interventions</u>: Immunization information need to be applied into an interactive platform, where users decide the information type.</p> <p><u>Information development</u>: Parents require more information. The current information to them is "either too basic, or too technical, with little readily available between the two extremes".</p> <p><u>Therapeutic communication</u>: Communication is essential to guide parents how to make an unbiased search, e.g. to clear browser history and not to use suggested terms from search engines.</p>
3	<p>The study interviewed healthcare professionals, researchers, policy makers and vaccine administrator about vaccine hesitancy definition, scope and causes.</p> <p><u>Knowledge barriers</u> and <u>Vulnerability towards misinformation</u>: Regarding the vaccine hesitancy causes, the survey reported that the "diffusion of negative information on vaccination in Internet" was ranked highest among the main causes of vaccine hesitancy, followed by lack of knowledge of vaccination.</p> <p><u>Lack of trust</u>: "mistrust in the pharmaceutical industry" and "lack of confidence in vaccine safety" were also mentioned as the third most notable cause for vaccine hesitancy.</p> <p><u>Lack of time/resources</u>: It takes much more time for healthcare providers to explain and/or encourage hesitant parents.</p> <p><u>Crowd-based network intervention</u>: Social media as a source of online health information needs to be developed to respond to parents' needs and interests.</p> <p><u>Transparency</u>: The link between source of research funding and trust or mistrust requires more investigation.</p>

	<p><u>Behavior understanding</u>: Experts called for more efforts in measuring and assessing vaccine hesitancy and how it influences vaccination behavior, as well as the need for better definition the concept of vaccine hesitancy.</p> <p><u>Therapeutic communication</u>: Experts reported that it's important to listen without being judgmental, to disclose information about vaccine risks, and to correct misinformation.</p>
4	<p>The study analyzed first results page from Google search using positive, negative and neutral vaccination related terms.</p> <p><u>Vulnerability towards misinformation</u>: The searching behavior can dramatically affect the results. A person using negative search terms (e.g. "vaccine risks") would encounter 3,6 times more vaccine myths than a person who uses neutral terms (e.g. "vaccine"), and 4,8 times more vaccine myths than a person who uses positive terms ("vaccine benefits").</p> <p><u>Knowledge barriers</u>: Study found that websites yielded by positive search terms did not discourage vaccination, but "only rarely encouraged it", and they countered less vaccine myths than the websites returned from neutral or negative search terms.</p> <p><u>Behavior understanding</u>: The sponsors of vaccination information websites should not take for granted the need for vaccination and thus miss the opportunity to inoculate their visitors from misinformation they might come across.</p> <p><u>Education aid and education</u>: Healthcare provider should provide guidance for health consumers and lead them to credible sources.</p>
5	<p>The randomized trial study evaluated an educational intervention to improve parental attitudes and vaccine uptake.</p> <p><u>Lack of time/ resources</u>: It is challenging to provide information for many complex issues during time-limited well-child visit.</p> <p><u>Information development</u>: The intervention includes 3 units: 8-minuts video addressed most common concerns of vaccine-hesitant parents; an educational handout about common vaccine concerns, a written instruction on how to find reliable medical information on the Internet. The outcome shows modest but significant improvement in parental attitude towards vaccination.</p>

6	<p>The study investigated informed decision making about childhood immunization by measuring knowledge, deliberation and value-consistency.</p> <p><u>Knowledge barriers</u>: Among identified vaccine acceptors, partial acceptors and decliners, vaccine decliners manifest the least knowledge compare to the other two groups. Partial acceptors and decliners also tend to have inaccurate knowledge regarding the necessity of vaccination and vaccine side effects.</p> <p><u>Lack of trust</u>: Parents who refused vaccines for their children showed insufficient knowledge due to the mistrust in the current information provided by the authorities. Partial acceptors showed ambivalent attitude during the study that might relate to the discomfort when a decision has to be made.</p> <p><u>Decision aid and education</u>: Study suggested the need of addressing different aspects of an informed decision, as well as to assess what kind and how much information parents need and want in order to make an informed decision.</p>
7	<p>The study developed a communication tool to improve primary healthcare providers' communication with vaccine-hesitant parents.</p> <p><u>Knowledge barriers</u>: Parents expressed the need for more access to information about childhood vaccination.</p> <p><u>Lack of time/ resources</u>: Parents need to have the information in advance and time to reflect on them.</p> <p><u>Transparency</u>: Parents expressed that they need transparency when obtaining vaccine information, such as the balance between side effects and benefits of vaccine.</p> <p><u>Information development</u>: A series of fact sheets addressing five most common concerns amongst Australian parents were presented. They were found to be helpful and reassuring to many parents. During the demonstration of graphic and numeric data, parents showed little to no interest.</p> <p><u>Decision aid and education</u>: Many parents seek for "everyday implications" to inform their decision, instead of complicated "numerical information about risks and benefits".</p>

8	<p>The study main goal was to establish trust and credibility through an interactive social media tool.</p> <p><u>Lack of trust</u>: 60% of parents who accept or delay vaccines stated that they would trust information from the tool, whereas only 36% of parents who decline all vaccines reported that they would do so.</p> <p><u>Crowd-based Network intervention</u>: The tool includes multimedia content posted on the blog and an online chat room for direct communication between parents and research team. The blog's content is developed by research staffs</p> <p><u>Transparency</u>: Parents were determined to obtain information about vaccine risks as well as benefits. Parents also requested the display of sources of funding and citations for all information.</p> <p><u>Information development</u>: All interactive forums should be monitored by professionals</p> <p><u>Therapeutic communication</u>: Healthcare providers can improve trust from health consumers by disclosing both benefits and risks of childhood vaccine, listening to parents' concerns, providing individualized answers with comprehensible information.</p>
9	<p>The survey explored opinions on how to improve childhood vaccination process from 1222 participants.</p> <p><u>Lack of time/resources</u>: Parents stated that having information before clinic visits as the most important factor to improve vaccination process.</p> <p><u>Transparency</u>: Parents expressed the need for information about side effects of childhood vaccines.</p>
10	<p>The study surveyed pregnant women on vaccine concerns and investigated their vaccine decision making process.</p> <p><u>Knowledge barriers</u>: 50% of participants "strongly agreed" and 32% of participants "moderately agreed" that they have sufficient knowledge in order to make a decision.</p> <p><u>Lack of trust</u>: Participants concerns about vaccine safety aspects.</p>

	<p><u>Transparency</u>: Many mothers wanted additional information on vaccines' risks and benefits</p> <p><u>Crowd-based network intervention</u>: Study indicates that "a maternal and childhood immunization platform" needs to be developed.</p> <p><u>Behavior understanding</u>: Many mothers reported that they had to actively raise their concerns about childhood vaccination, because HCPs just assumed that they would vaccinate "without making explicit recommendations".</p>
11	<p>The study investigated the influence of a web-based social media intervention on vaccine acceptance.</p> <p><u>Crowd-based network intervention</u>: Besides the information about vaccination, the tool includes other social media functions: a blog, discussion forum, chat room and "Ask a question" portal. Participates involved in social media intervention showed to be more likely to vaccinate their children on time, compared to parents that only took part in usual care.</p> <p><u>Information development</u>: The information provided on this website was compact and easy-to-understand.</p> <p><u>Transparency</u>: The information was carefully referenced and hyperlinked to maintain proper transparency.</p> <p><u>Therapeutic communication</u>: The study showed that even though the social media tool has a discussion forum, participants still preferred to communicate with the research team.</p>