E-health Concept Development and Maturity in Literature

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Abstract

Background: Electronic technologies, which used in electronic health, electronic commerce, electronic learning, and electronic banking, have wildly invaded our life. E-health is a rapidly evolving concept in many disciplines such as nursing and medicine. Objective: To identify the maturity of e-health as a concept to attain better clarity on its meaning and application. Method: Data search included CINAHL, PubMed Central, Google Scholar, Sage Publications, Scopus, Taylor and Francis, Emerald, and Wiley's databases. The concepts of search were: electronic health, e-health, and e-health concept analysis. 36 cited definitions were found in the literature related to e-health. Morse criteria were utilized by assessing four principles to evaluate the level of maturity of e-health concept: (1) the epistemological (2) logical (3) pragmatical, and (4) linguistical principles. Conclusion: e-health concept is still not mature in all disciplines related to health.

Keywords: e-health; concept maturity

Introduction

The advancement in technology has revolutionized every single aspect of our life. Electronic technologies such as electronic health (e-health), electronic commerce, electronic learning, and electronic banking have wildly invaded our life. E-health is a wide spread concept which has been applied extensively in the recent literature (Rooij & Marsh, 2016; Showell & Nøhr, 2012; Fatehi & Wootton, 2012). It is documented that the first implementation of e-health occurred in 1926 when the Royal Flying Doctor Service was providing medical consultation via Morse code in Australia (Rooij & Marsh, 2016).

Nevertheless, e-health as a contemporary concept has emerged in 1999 (Rooij & Marsh, 2016). Furthermore, the publication in this domain is still growing rapidly (Fatehi & Wootton, 2012). In March 2016, a search for "e-health" on Google yielded 4,300,000 results, and on Scopus the search yielded 37,680 results.

E-health has promised to achieve quality, cost effective, equal and customized health care (Mettler, & Raptis, 2012; Kreps & Neuhauser, 2010). Additionally, e-health, through its tools and applications, has contributed to health promotion, disease prevention and disease treatment. E-health includes a vast array of tools and applications. The applications include, but not limited to, interactive websites, e-mail, telehealth applications, gaming, web portals, voice recognition, and online communities (Kreps & Neuhauser, 2010). Despite extensive use, application, and benefits of e-health; a consensus about the concept definition has not been achieved yet (Showell & Nøhr, 2012; Fatehi & Wootton, 2012). The aim of this paper is to identify the maturity of e-health concept in the literature.

E-health definitions

The meaning of the concept varies by the context, and the institution where it is used (Lewis, 2015). The e-health suffers from numerous challenges in its application, which makes the advancement in e-health lags behind the development in other e-technologies (Jahanbakhsh, Sharifi & Ayat, 2014).A consensus on the definition of e-health is crucial to reduce the confusion about how to use it in many disciplines. A clear definition for e-health has practical implications at both educational and administrative level.

The journal of medical Internet research was launched in 1999 as a first formal and credible forum for the research about e-health (Ahern, 2007). Since 2001, the journal has published a series of articles, which were titled as "what is the e-health." The series aimed to reach a taxonomy and consensus on the definition and the scope of e-health (Ahern, 2007). However, a definition which was proposed in the first article on the series by Eysenbach (2001) is among the most commonly cited definitions until now. Eysenbach, (2001) defined e-health as "an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. E-health is not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve-health care locally, regionally, and worldwide by using information and communication technology" (p.2).Although this definition incorporates related disciplines and fields that might be used, specified the outcomes of e-health regionally, nationally and international; it limited the uses of e-health concept into two branches and missed the stakeholders who can get benefits of e-health. On the other hand,

without clear definition of e-health, it would be difficult to reach an agreement about unified competencies for professionals training (Flaherty, Hoffman-Goetz, & Arocha, 2015).

Additionally, a consensus on a definition in the field of informatics will provide guidance to organizations such as International Medical Informatics Associations (Flaherty, Hoffman-Goetz & Arocha, 2015). Policy and decision makers find it difficult to direct their strategies and to prioritize the investment in e-health based on comparative analysis of the outcomes of various e-health practices (D'Urso, De Giovanni & Spagnoletti, 2013). Thus, defining ataxonomy for classifying e-health projects would enhance the understanding of the general public, policy makers and the funding agencies about their responsibilities and contributions (Flaherty, Hoffman-Goetz & Arocha, 2015; D'Urso, De Giovanni & Spagnoletti, 2013). For evaluating the maturity of e-health as a concept, 36 cited definitions were identified in this comprehensive review as shown in Table 1.

Table1. E-health definitions

Definition	Author
Internet-based health care is the application of information and communications technologies across the whole range of healthcare functions.	(González, Quesada, Urrutia, & Gavidia, 2006)
E-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve-health care locally, regionally, and worldwide by using information and communication technology	(Eysenbach, 2001)
It is the combined use of electronic information and communication technology in the-health sector for clinical, educational, research, and administrative purposes, both at the local site and across wide geographic regions.	(Mukherjee & McGinnis, 2007)
The use of emerging information and communication technology, especially the Internet, to improve or enable-health and healthcare	(Eng, 2001)
"An emerging field of medical informatics, referring to the organization and delivery of health services and information using the Internet and related technologies"	(Car, Black, Anandan, Cresswell, & Pagliari, 2009)
"Combined use of electronic information and communication technology in the-health care sector for clinical, education, research, and administrative purposes.	(Mukherjee & McGinnis, 2007)
E-Health is defined as the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge, and research.	(WHO,2005)
Technology that supports health care providers in the management of chronic diseases and continuing care.	(Hendriks, Walfridsson, Johansson, & Strömberg, 2015)
Healthcare Information and Management Systems Society E-Health Special Interest Group definition: The application of the Internet and other related technologies in the-healthcare industry to improve the access, efficiency, effectiveness, and quality of clinical and business processes utilized by healthcare organizations, practitioners, patients, and consumers to improve the-health status of patients.	(Curran & Curran, 2005)
The convergence of various technologies such as the Internet, computer telephony/interactive voice response, wireless communications, plus direct access to healthcare providers, healthcare management, healthcare education (perhaps via telemedicine) and wellness information	(Deluca & Enmark, 2000)
The transfer of healthcare by electronic means	(Knott & Weller, 2014)
Electronic systems that support health care services such as continuing medical education of physicians, logistics or finance.	(Eland- de Kok, van Os-Medendorp, Vergouwe -Meijer, Bruijnzeel-Koomen, &Ros, 2011)

The electronic collection, management, use, storage and sharing of healthcare information.	(Pearce & Haikerwal,2010)
All-encompassing term for the combined use in the-health sector of electronic information and communication technology (ICT) for clinical, educational, research and administrative purposes, both at the local site and at a distance.	(Mitchell, 1999)
"Includes any transfer of health communication, services, surveillance or treatment through the use of digital means".	(Suggs & Ratzan, 2012)
The use of the Internet for health promotion.	(Fox, Rainie, & Horrigan, 2006)
All information and communication technology applications in direct patient care.	(Pagliari et al., 2005)
Major characteristics of e-health 1. Web information for clinicians; and for patients; 2. Telehealth; 3. Systems for patient centered clinical care; 4. Systems intended for autonomous use by patients and citizens; and 5. Independent use of social networking for health self-help.	(Showell & Nøhr, 2012)
Health in Internet, access to anything related with health with or without quality control.	(Moumtzoglou, 2010)
An all-encompassing term for the combined use of electronic information and communication technology in the health sector. This term refers to that technology used for clinical, educational, research, and administrative purposes, both at the local site and across wide geographic regions. The use of e-health has enhanced networking, facilitated global thinking, and improved health care on local, regional, and national levels.	(Cashen, Dykes, & Gerber, 2004)
is the use of ICT in health products, services and processes combined with organisational change in healthcare systems and new skills, in order to improve health of citizens, efficiency and productivity in healthcare delivery, and the economic and social value of health. eHealth covers the interaction between patients and health-service providers, institution-to-institution transmission of data, or peer-to-peer communication between patients and/or health professionals	European Commission,2012
Health services and information delivered or enhanced through the Internet and related technologies	(Eysenbach, 2001)
E-health and the related technologies as only one component (indeed, an important one) of the whole spectrum of potential solutions in the field of health information systems (Chandra, Sikula, & Paul) to address all aspects of the problem	(Mettler & Raptis, 2012)
Cost-effective and secure use of information and communication technologies in support of health systems, including healthcare related services and monitoring at both the local site and at a distance.	(Benkaouz & Erradi, 2015)
All forms of electronic health care delivered over the Internet, ranging from informational, educational, and commercial "products" to direct services offered by professionals, nonprofessionals, businesses, or consumers themselves".	(Maheu, Whitten, & Allen, 2002)
In the-healthcare domain, the use of information and communication technologies (ICTs) to improve clinical care and administrative decision-making has been referred to as e-health	(Oh, Rizo, Enkin, & Jadad, 2005)
The term e-health refers generally to incorporating information and communications technology (ICT) into healthcare products, services, and processes and into organizational and governmental infrastructures That can improve patient-citizens' health and well-being, increase efficiency and productivity in healthcare delivery, and enhance-healthcare as an economic and social value. Fundamentally, e-health includes myriad elements in the interaction and data exchange among multiple stakeholders in an e-health ecosystem.	(Kovac, 2014).

Provision of health services using digital technology has been termed as e-health	(Slamanig & Stingl, 2008)
E-health necessitates entire restructuring and digitalization of healthcare infrastructure, including production, supply, and management	(Cheong, Shin, & Joeng, 2009)
The use of computer- based technology within a healthcare environment, and includes many applications, varying from electronic health records (EHRs) to specific telemedicine applications, mobile-health, and websites that support patients in self-management.	(Cunningham, Wake, Waller, & Morris, 2014)
E-health has been introduced as an umbrella term, describing the combined use of electronic communication and information technology in the-health sector, and also the use of digital data—transmitted, stored and retrieved electronically—for clinical, educational and administrative purposes, both at the local site and at distance	(Mitchell, 1999)
E-health is a type of telemedicine that, encompasses any "e-thing" in the-healthcare field; that is, any database or encyclopedia containing information pertinent to health, medicine, or pharmacy that is accessible solely via the Internet	(Rosen, 2000)
E-health connotes the convenience, low cost, and ready accessibility of health related information and communication using the Internet and associated technologies such as email and World Wide Web.	(Sinha & Thankachan, 2012)
Services that can facilitate individuals, families and communities to improve their health and well-being through information communication technology	(Peate, 2013).
The application of Internet principles, techniques and technologies to improve healthcare. New way of conducting the business of healthcare enabling stronger and more effective connections among patients, doctors, hospitals, employers, brokers, payers, laboratories, pharmacies, and suppliers	(Beaulieu & Beinlich, 2001)
E-health is the process of providing health care via electronic means, in particular over the Internet. It can include teaching, monitoring (e.g. physiologic data), and interaction with health care providers, as well as interaction with other patients afflicted with the same conditions.	(Pretlow, 2000)

Methods

The concept must be mature in order to be used in nursing discipline, theories, research and practice (Morse, et al., 1996). The mature concept is the concept which is "well defined, has clearly described characteristics, delineated boundaries, and documented preconditions and outcomes" (Morse, et al., 1996, p. 387). Morse criteria were utilized by assessing four principles to evaluate the level of maturity of e-health concept, (1) the epistemological (2) logical (3) pragmatical and (4) linguistical principles (Morse, et al., 1996)

CINAHL, PubMed Central, Google Scholar, Sage Publications, Scopus, Taylor and Francis, Emerald, and Wiley databases were searched using, e-health, e-health concept development, and e-health concept analysis keywords. Electronic health was used as one of the keywords, but most results came up with "electronic health records," and no result about e-health showed up. Search was limited to full-text, published in English articles, and those published between 1999 and 2016.

One way to examine concepts is to start from the structure. The structure of a concept includes its theoretical definition, attributes, boundaries, preconditions, and outcomes. The concept is analysed by asking questions about the concept based on the four analytic principles (the epistemological, logical, pragmatical, and linguistical principles), and the level of concept maturity is determined by the answers for these questions.

Epistemological Principle

In epistemological principle, e-health concept is evaluated by assessing its clarity, if it is well-defined and differentiated from other concepts, and whether literature definitions are consistent (Morse, Hupcey, & Cerdas, 1996). The most commonly cited e-health definitions those which were defined by Mitchell J. (1999), Eysenbach (2001), and the WHO (2011). However, there was no clear consensus on these e-health definitions (Hovenga, Kidd, Garde, & Hullin, 2009; Oh, Rizo, Enkin, &Jadad, 2005; Showell & Nøhr, 2012).In addition, there was disagreement about the comprehensiveness of e-health concept; whether e-health is the umbrella that includes telemedicine or the opposite. Three studies indicated that e-health includes telemedicine (Cunningham, Wake, Waller, & Morris, 2014; Deluca & Enmark, 2000; Olsson &Jarlman, 2004), whereas telemedicine includes e-health in one study (Breen & Zhang, 2008). However, major themes were identified among definitions published in literature, which were-health, technology, stakeholder parties, expected consequences, location, and

application areas.

The first theme was health; it was identified in all definitions reviewed, it was stated verbatim as health (Gustafson & Wyatt, 2004; Moumtzoglou, 2010; WHO, 2011), or used in conjunction with other words, such as health care, health information, health service, health sector, and health systems (Eysenbach, 2001; González, Quesada, Urrutia, & Gavidia, 2006; Mitchell, 1999; Mukherjee & McGinnis, 2007). Wellbeing and wellness were used as synonymous to health in other studies (Deluca &Enmark, 2000; Kovac, 2014; Peate, 2013). Health was used associated with health care services terms, which indicates that e-health does not mean wellbeing or health of people, but rather the services provided.

The second theme was technology; it was stated in all definitions including information and communication technology (Eng, 2001; Eysenbach, 2001; Mitchell, 1999; Mukherjee& McGinnis, 2007; WHO, 2011), Internet (Curran & Curran, 2005; Eng, 2001; Eysenbach, 2001; González et al., 2006; Moumtzoglou, 2010), and/or electronic technology (Knott & Weller, 2014; Mitchell, 1999; Mukherjee & McGinnis, 2007; WHO, 2011). Other terms were used to indicate using technology, such as informatics (Car, Black, Anandan, Cresswell, & Pagliari, 2009), computer (Cashen, Dykes, & Gerber, 2004; Cunningham et al., 2014; Deluca &Enmark, 2000; Kind & Silber, 2004; Kwankam, 2004), digital (Mitchell, 1999; Slamanig & Stingl, 2008; Suggs &Ratzan, 2012), information on webpages (Cunningham et al., 2014; Showell&Nøhr, 2012; Sinha &Thankachan, 2012), network(Cashen et al., 2004; Eysenbach, 2001; Showell & Nøhr, 2012), and mobile or telephony (Cunningham et al., 2014; Deluca &Enmark, 2000).

Stakeholders parties who can benefit from e-health was the third theme, which were-health care professionals, patients or clients, business sector, health care organizations, government and communities (Curran & Curran, 2005; Deluca &Enmark, 2000; Gustafson & Wyatt, 2004; Hendriks, Walfridsson, Johansson, &Strömberg, 2015; Kovac, 2014; Maheu, Whitten, & Allen, 2002; Peate, 2013; Showell & Nøhr, 2012; WHO, 2011).

The fourth theme was expected positive outcomes of e-health, which may include improving health care (Cashen et al., 2004; Curran & Curran, 2005; Eng, 2001; Eysenbach, 2001; Kovac, 2014; WHO, 2011), encouraging health care organizations to be innovative in health care delivery approaches (Cashen et al., 2004; WHO, 2011), making the-health information accessible, effective and efficient and cost effective (Cashen et al., 2004; Curran & Curran, 2005; Deluca & Enmark, 2000; Gustafson & Wyatt, 2004; Kind & Silber, 2004; Kovac, 2014; Kwankam, 2004; Sinha &Thankachan, 2012; WHO, 2011), and helping health care professionals and managers in decision making (Oh et al., 2005).

The fifth theme was the location where e-health can be applied and attain its effects; locally, nationally and internationally (Cashen et al., 2004; Eysenbach, 2001; Mitchell, 1999; Mukherjee & McGinnis, 2007). Since e-health is based on the Internet, any client who can access the Internet will get the benefit from this service, whether from the same countries who offer this information, or other countries.

The last theme was the application fields, as e-health can be applied in clinical practice areas, education, research, administration, health surveillance, health literature, and business (Cashen et al., 2004; Curran & Curran, 2005; Deluca &Enmark, 2000; Maheu et al., 2002; Mitchell, 1999; Mukherjee & McGinnis, 2007; Oh et al., 2005; Showell&Nøhr, 2012; Suggs &Ratzan, 2012; WHO, 2011). After discussing major themes, it is noteworthy to highlight an attractive significant point of view for e-health by Eysenbach (2001), who defined e-health as it is "not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking" (p.2).

Pragmatical principle

This principle is concerned to answer the following questions; is the concept apt and applicable within the context of inquiry? And is the concept properly operationalized?(Morse, et al., 1996). The extensive assessment of available definitions revealed that e-health is used in all aspects of health care delivery(Kovac, 2014), in planning management and providing efficient care(González, Quesada, Urrutia, & Gavidia, 2006; curan & curan, 2005), in monitoring physiological data and lab result(Pretlow, 2000), in consultation, referral and health risk assessment(Baur, Deering, & Hsu, 2000), in improving health and health care nationally, regionally and worldwide (WHO, 2003; Eysenbach, 2001; Mitchell, 1999),and it is useful as information, communication and commerce system (Maheu, Whitten & Allen, 2002). On the other hand, it is found that e-health is not limited tohealth-care professional, but it is used broadly in many disciplines such as information technology, education, administration and management, business, health care industry, insurance, and public health (Cashen, Dykes, & Gerber, 2004;Deluca &Enmark, 2000).

E-health stakeholders are the consumers, patients, administrators, managers, researchers, doctors, hospitals, employers, brokers, pharmacist, nurses, laboratories, suppliers, and buyers (Beaulieu & Beinlich, 2001). Although this broadening in the uses, users and disciplines that get the benefit of e-health, it still not that much consistency and congruency among e-health definition. On the other hand, there is a dispute in all disciplines, question to what scope the intended stakeholders are embracing, using and get value from e-health

(van Eerden, 2015).Many researchers attempt to operationalize e-health, but few who developed tools. The available tools within the context of e-health are measuring the readiness (Van Dyk, 2014). The e-health readiness is defined "the degree to which users, healthcare institutions, and the-healthcare system itself, are prepared to participate and succeed with e-health implementation"(CANARIE, 2002). Most studies used these six tools mirror healthcare providers and/ or administrative perceptions in an inconsistence way of evaluation (Li, Land, Ray, & Chattopadhyaya, 2010). This discrepancy in both usefulness and assessmentis limiting the ability of e-health as a concept to be operationalized, and hinder its maturity (Morse, Hupcey, Penrod, & Mitcham, 2002).Thus e-health from the pragmatic perspective is evaluated as partially mature.

Linguistic principle
Linguistic principle is one of the parameters that were proposed by Morse and his colleagues to evaluate the level of concept maturity. Linguistic principle reflects the consistency and appropriateness of applying the concept in different contexts (Morse, Hupcey, Penrod, & Mitcham, 2002).

However, describing the preconditions and outcomes of the concepts is crucial to link the concept with the context (Morse, Hupcey, & Cerdas, 1996). Preconditions are the conditions that preceded and must precede the concept to develop. Meanwhile, the outcomes are the results or implication that follows the concept utilization (Morse, Hupcey, & Cerdas, 1996).

Preconditions
As shown in Table 2, the analysis of literature has revealed that the concept emerged as a glimmer of hope to solve the various challenges that are facing the health care systems in both developing and developed countries. In the developed countries, the complexity of the health care system and the escalating costs of the health care services of health were among the major drivers (Athanasenas, 2015). While the scarcity of recourses and hard to reach health care services were addressed as preconditions for the emergence of e-health (Jahangirian &Taylor, 2013).

Table 2. The concepts of e-health preconditions

Finding	Reference
Challenge of providing cost effective, high quality, safe and accessible health care services	(D'Urso, De Giovanni, & Spagnoletti, 2013; Meier, Fitzgerald, & Smith, 2013; Mettler & Raptis, 2012; Moghaddasi, Asadi, Hosseini, & Ebnehoseini, 2012)
Healthcare personnel and recourses shortage and maldistribution	(Benkaouz & Erradi, 2015; Mettler & Raptis, 2012)
In the developed countries, highly complex, sophisticated, fragmented, expensive and inefficient health care delivery systems and the resultant discontinuity in healthcare and information flow are major preconditions	(Athanasenas, 2015; Geissbuhler, 2012)
The scarcity of recourses and lack of access to basic health care services were the major drivers and precondition for e health in the developing countries	(ITU, 2008; Jahangirian & Taylor, 2013)
Increased demand on health care services as a results of changing demographics; increased proportion of the population that is aging, the changing lifestyles; in addition to changing the patterns of the disease toward chronic illness	(Gray, Miller, Kuluski, & Cott, 2014; Mettler & Raptis, 2012)
The increased patient's access to health information through the internet and the wide use of smart phones; in addition to the technological advancement, expansion in data digitization and computerization.	(Bashshur, Shannon, Krupinski, & Grigsby, 2011; Geissbuhler, 2012; ITU, 2008; Rooij & Marsh, 2016)
A supportive system with will defined policies , network connectivity ,trained personnel and an internet access	(Da, Ca, Pa, & de Quirós Fa, 2015; Moghaddasi et al., 2012)
Information technology literacy and acceptance	(Mackert, Champlin, Holton, Muñoz, & Damásio, 2014; Moghaddasi et al., 2012; Norman, 2011; Wilkowska & Ziefle, 2012)

Outcomes
As (D'Urso, De Giovanni, &Spagnoletti, 2013) pointed out, the inconsistency in defining e-health and the lack of clear taxonomy of the projects that it encompasses, make it difficult to evaluate its outcomes. From economists' point of view, as a result of the multiplicity of input and products in addition to the complexity in the

production process in e-health, developing an efficiency measures for e-health clinical as well humanistic outcomes constitute a great challenge (Athanasenas, 2015). There is no global consensus about the quantitative as well as qualitative indicators that should be measured to evaluate e-health outcomes (Scott, & Saeed, 2008). Nevertheless, the majority of documented outcomes were at the organizational and provider's level. The outcomes of e-health from the consumers' perspective are lacking (Athanasenas, 2015) (Table3).

Table 3. The concepts of e-health outcomes

Finding	Reference
Improved the quality and security of patient care	(D'Urso et al., 2013; Da et al., 2015)
Reduced the burden on health care systems	(Hendriks et al., 2015)
In the developed countries e health is believed to increase the efficiency and efficacy of health care delivery and lowering the cost of health care services	(Athanasenas, 2015; Benkaouz & Erradi, 2015; Geissbuhler, 2012; Rooij & Marsh, 2016; van Os‐Medendorp et al., 2012)
In developing countries the outcome of implementing e health is extending and expanding the reach of health care services to underserved population	(ITU, 2008; Jahanbakhsh, Sharifi, & Ayat, 2014)
Improved the patient's access to health care and saved the travel cost and practical inconvenience	(Banbury, Roots, & Nancarrow, 2014)
Health care activities that are more patient-centered, patient-owned and patient- controlled	(Geissbuhler, 2012; Mackert, Love, & Whitten, 2008; Moussa, Sherrod, & Choi, 2013; Wilkowska & Ziefle, 2012)
E-health results in "Easing the transitions in health care"	(Geissbuhler, 2012)
Improved surveillance services Fast and reliable communication of information that reduced the errors and improved the continuity of care Issues in relation to the invasion of patients' data privacy and security were the most prominent negative outcomes of e health	(Suzanne Suggs et al., 2015) (Geissbuhler, 2012) (Chandra et al., 2004; Wilkowska & Ziefle, 2012)

Assessment
Overall, the preconditions of e-health at the health care system were adequately described and demonstrated in literature. However, the concept's outcomes, particularly from the patient perspective, were not adequately demonstrated. Across the disciplines, e-health was defined inconsistently. In computer and health sciences, the focus was on using information and communication technology to promote client's health and health care system performance.

The concepts' preconditions were fully described and demonstrated. However, the outcomes are well described but not adequately demonstrated related to the lack of measures that measure its outcomes. According to Morse's criteria (2001), in terms of linguistic principle, the concept is partially mature.

Logical Principle
This principle addresses whether the concept holds its boundaries through theoretical integration with other concepts. Boundaries delineate one concept from another and are identified when all the attributes are no longer present, weak, or replaced by new attributes (Morse, Hupcey, Penrod, & Mitcham, 2002).

Confusion about blurred distinction between concepts is described throughout the literature. E-health is a concept which has been widely used, and a systematic review of the definitions shows that there is an unclear definition of its meaning (Solliet al, 2012).The concept was created in line with other electronic (e-) words and any term or word, such as e-commerce, e-business, and e-solutions. E-health, like many concepts of relatively recent creation, has an evolving definition, which might be clarified if used in a specific field of interest (Meier et al., 2013).

As no single consensus definition is available, there is no clear, common understanding of the boundaries of activities, which might be categorized as e-health (Showell & Nøhr, 2012).Boundaries of any concept are identified by what is and what is not a part of that concept and by determining if the characteristics are presented or not with the neighboring concept (Morse, Hupcey & Cerdas, 1996). The demarcation of the boundaries is evidence on the uniqueness and the maturity of the concept. A well-developed concept has boundaries that are clearly delineated, while those with unclear boundaries and overlap with other concepts are poorly developed (Morse, Hupcey & Cerdas, 1996).

Studies that have discussed the benefits of e-health included different interrelated terms (concepts) used interchangeably with e-health. For instance, but not limited to, an e-mail communication, information and communication technologies (ICTs), information technology, Internet-based surveillance, digital communications as well as telemedicine, and medical health (reported throughout the literature as mHealth). Although the terms' e-health, telemedicine, and mHealthare used interchangeably, differences exist between these terms. It has become more acceptable to refer to e-health as an all-encompassing term that includes the fields of telemedicine and mHealth. The difference between the fields of e-health and telemedicine is clear. Telemedicine involves the use of information technology primarily for the delivery of clinical services. On the other hand, e-health uses technology to provide nonclinical health-care services such as tele-education and tele-training for continuing medical education, practice management, research, and administration. Moreover, telemedicine remains linked to medical professionals, whereas e-health is driven by nonprofessionals, namely patient-consumers. Regarding the mHealth field, it has emerged as a sub segment of e-health. As such, mHealth is a term used in the practice of medicine and public health with support from mobile devices. Although there are some projects that are considered solely within the field of mHealth, there is a strong linkage between mHealth and e-health (Meier, Fitzgerald & Smith, 2013).

In comparing the e-health with mHealth as a relative concept, the characteristics of the e-health move beyond the boundaries that demarcating e-health from another concept like mHealth, the characteristics of eHealth are less well - represented until they are no longer present. The manifestations of the e-health concept emerge with the neighboring concepts as this concept has similar characteristics with other concepts (Morse, et al. 1996).

The body of included scientific literature has been explored to find a distinction between e-health and other relevant concepts, but no clear distinction was found. The concept of e-health holds its boundaries poorly through theoretical integration with other concepts (Solli et al, 2012). There are linkages to the concept of e-health and other concepts, but boundaries are not clarified. Therefore, the logical principle is evaluated to be partially mature.

Discussion

Based on Morse's criteria, an evaluation of e-health as a concept was done and revealed the presence of unclear definition to the concept; this resulted in an obvious main challenge for the development of e-health field (Jahanbakhsh, Sharifi& Ayat, 2014; Oh, Rizo, Enkin&Jadad, 2005). In contrast, others reported that the lack of consensus in e-health definition did not stand in the way of the new innovations in the field of e-health (Showell&Nøhr, 2012). The inconsistency in defining such a widespread concept might contribute to communication problems among those who use it (Lewis, 2015; Oh, Rizo, Enkin&Jadad, 2005). Lack of adherence to terminologies and theoretical basis in e-health field and the absence of a clear-cut in its definition and scope hinder the knowledge development and inquiry in the e-health field (Jiang, Wang, Peng & Zhu, 2015). Furthermore, there were no clear boundaries between e-health and other related concepts such as health informatics, telehealth, telemedicine and m health (Bashshur, Shannon, Krupinski, & Grigsby, 2011). There are various interpretations of how these concepts go with each other (Doarn, et al, 2014). These terms are sometimes used interchangeably (Rooij, & Marsh, 2016; Fatehi& Wootton, 2012). At other times, telehealth and telemedicine are referred to as applications of e-health; in some instances, e-health is subsumed under the umbrella of health informatics. Such confusion and uncertainty undermine the conceptual development of e health and give rise to the question of what does really e-health represents.

Showell and Nøhr (2012) in their review found vagueness in the definition of the concept of e-health in term of process or outcome. A dialogue among the experts and professionals in the field is required to reach a unified definition (Showell&Nøhr, 2012).

Conclusion

New technology invaded every aspect of our life. The emergent of e-health technology make it a must to be used. Furthermore, e-health is defined in disagreement manner among disciplines. In order to define e-health consistently, its characteristics, scope, stakeholders, utility, and outcomes must be considered. This will help nurses and other disciplines in clarifying, applying, operationalizing e-health appropriately, and improving its outcomes.

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