

## What Is eHealth (3): A Systematic Review of Published Definitions

Hans Oh<sup>1,2</sup>, BSc; Carlos Rizo<sup>1,2</sup>, MD; Murray Enkin<sup>1</sup>, MD; Alejandro Jadad<sup>1,2</sup>, MD, DPhil

<sup>1</sup>Centre for Global eHealth Innovation, University Health Network, Toronto ON, Canada

<sup>2</sup>Department of Health Policy Management and Evaluation, University of Toronto, Toronto ON, Canada

### Corresponding Author:

Alejandro Jadad, MD, DPhil

Centre for Global eHealth Innovation

University Health Network

R Fraser Elliott Building, 4th Floor

190 Elizabeth Street

Toronto, ON M5G 2C4

Canada

Phone: +1 416 340 4800 ext 6903

Fax: +1 416 340 3595

Email: [ajadad \[at\] uhnres.utoronto.ca](mailto:ajadad@uhnres.utoronto.ca)

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### ABSTRACT

**Context:** The term eHealth is widely used by many individuals, academic institutions, professional bodies, and funding organizations. It has become an accepted neologism despite the lack of an agreed-upon clear or precise definition. We believe that communication among the many individuals and organizations that use the term could be improved by comprehensive data about the range of meanings encompassed by the term.

**Objective:** To report the results of a systematic review of published, suggested, or proposed definitions of eHealth.

**Data Sources:** Using the search query string “eHealth” OR “e-Health” OR “electronic health”, we searched the following databases: Medline and Premedline (1966-June 2004), EMBASE (1980-May 2004), International Pharmaceutical Abstracts (1970-May 2004), Web of Science (all years), Information Sciences Abstracts (1966-May 2004), Library Information Sciences Abstracts (1969-May 2004), and Wilson Business Abstracts (1982-March 2004). In addition, we searched dictionaries and an Internet search engine.

**Study Selection:** We included any source published in either print format or on the Internet, available in English, and containing text that defines or attempts to define eHealth in explicit terms. Two of us independently reviewed titles and abstracts of citations identified in the bibliographic databases and Internet search, reaching consensus on relevance by discussion.

**Data Extraction:** We retrieved relevant reports, articles, references, letters, and websites containing definitions of eHealth. Two of us qualitatively analyzed the definitions and coded them for content, emerging themes, patterns, and novel ideas.

**Data Synthesis:** The 51 unique definitions that we retrieved showed a wide range of themes, but no clear consensus about the meaning of the term eHealth. We identified 2 universal themes (health and technology) and 6 less general (commerce, activities, stakeholders, outcomes, place, and perspectives).

**Conclusions:** The widespread use of the term eHealth suggests that it is an important concept, and that there is a tacit understanding of its meaning. This compendium of proposed definitions may improve communication among the many individuals and organizations that use the term.

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## KEYWORDS

eHealth; Internet; medical informatics; systematic review; information services; telemedicine

## Introduction

During the 1990s, as the Internet exploded into public consciousness, a number of e-terms began to appear and proliferate. The terms were useful: email brought new possibilities for people to communicate rapidly and share experiences; e-commerce proposed new ways to conduct business and financial transactions through the Internet. The introduction of *eHealth* represented the promise of information and communication technologies to improve health and the health care system [1]. It too has become an indispensable term.

As with most neologisms, the precise meaning of eHealth varied with the context in which the term was used. Nevertheless, it has been fairly well understood, and is now widely used by many academic institutions, professional bodies, and funding organizations. We recognized the impossibility of finding a universally acceptable, universally applicable formal definition, yet felt that a clearer understanding of the term could be achieved by reviewing the range of proposed meanings. What is this thing called eHealth? Two previous articles in this journal have dealt with the question of how eHealth can be or should be defined [2,3]. The aim of this paper is to systematically search the literature for definitions, which have been published to date, in an attempt to answer this unanswerable question and to determine the contexts or settings in which the term has been used.

To the best of our knowledge, no such search has previously been carried out or published. We believe that a better understanding of the meaning and perspectives of eHealth could improve communication among the many individuals and organizations that use the term. For this reason, we collected, examined, and qualitatively analyzed the published proposed definitions of the term eHealth.

## Methods

## Systematic Review

We first conducted a systematic review of the peer-reviewed literature to capture as many definitions of eHealth as possible. Our inclusion criteria required that a source be published in either print format or on the Internet, be available in English, and contain text that defines or attempts to define eHealth in explicit terms.

We searched the following electronic databases: Medline and Premedline (1966-June 2004), EMBASE (1980-May 2004), International Pharmaceutical Abstracts (1970-May 2004), Web of Science (all years), Information Sciences Abstracts (1966-May 2004), Library Information Sciences Abstracts (1969-May 2004), Wilson Business Abstracts (1982-March 2004).

For each database, we used the search query string “*eHealth*” OR “*e-Health*” OR “*electronic health*”. In addition, we then searched dictionaries [4,5] and the Google web search engine (June 2004) which ranks retrieval by importance and relevance [6]. Because the search of Google resulted in an overwhelming number of hits, we reviewed only the first 400 results. We also refined our search by including the additional term *definition* and again reviewed the first 400 hits. We then conducted a further search using the search query string “*what is eHealth*” OR “*what is e-Health*”, reviewing all 358 results. We conducted our searches between February 1, 2004, and June 30, 2004. A summary of our search strategy and results is presented in [Tables 1](#) and [2](#).

Two of us (HO, CR) independently reviewed titles and abstracts of citations identified in the bibliographic databases. By viewing summaries and websites of the Internet search, we reached consensus on relevance by discussion. We retrieved the relevant reports, articles, references, letters, and websites. We also manually searched the reference lists of the articles reviewed for additional relevant sources. From the hard or electronic copy of each report, we obtained the following data: author name, publication year, source, and definition (listed in [Table 3](#)). We identified and excluded duplicate definitions.

## Qualitative Analysis

Upon collection, we analyzed all the definitions and coded for content, emerging themes, patterns, and novel ideas. We used the constant comparative method described by Strauss and Corbin [7] involving open coding, axial coding, and selective coding. The constant comparative method is an iterative process of analyzing qualitative data (ie, text). Units of text (ie, words, phrases, sentences, or paragraphs) are labeled, compared, and grouped until no new categories emerge. Two of us (HO, CR) independently coded the definitions and compared results for consistency and reliability using a commercially available qualitative analytical software package (QSR NVivo v2.0).

## Results

### Systematic Review

In total, we scanned 1209 abstracts and reviewed 430 citations from the bibliographic databases. From these we collected 10 different definitions for the term eHealth ([Table 1](#)). From the Google search, we reviewed 1158 sites and identified 41 additional unique definitions ([Table 2](#)).

The definitions that we found were as short as 3 words [8] or as long as 74 words [9] ([Table 3](#)). We identified 2 universal themes (health and technology) and 6 less generally mentioned themes (commerce, activities, stakeholders, outcomes, place and perspectives) ([Table 4](#)).

**Table 1.** Summary of database searches

[\[view this table\]](#)

**Table 2.** Summary of Google searches

[\[view this table\]](#)

**Table 3.** Definitions (verbatim quotations) of eHealth presented in chronological order

[\[view this table\]](#)

**Table 4.** Themes found in definitions of eHealth

[\[view this table\]](#)

## Qualitative Analysis

Not surprisingly, all the definitions included the theme of health. The word *health* per se was used in almost all 51 definitions collected (only two did not include it) [8,10]. Most commonly, the word *health* was used in relation to health services delivery (eg, health care [3,11-38], health system [39-41], health sector [16,22,42-44] or health industry [9,45-47]) which suggests that eHealth may refer more to services and systems rather than to the health of people. Wellness as a

concept was used only 5 times (namely, wellness [3], public health [26], health and wellness [48], health and well-being [49], and health promotion [13]).

All the definitions also referred to technology, either explicitly or implicitly. The word *Internet* was explicitly mentioned in 27 of the 51 definitions [3, 9, 11, 13, 14, 16-18, 20-24, 26-29, 31, 34, 38, 40, 45-47, 49-51]; 4 of them used *Internet* as an adjective (Internet-related [13], Internet technologies [27, 51], or Internet principles [27]) rather than as a noun. Some authors listed specific technologies such as interactive television [23], personal digital assistants [23], CD-ROMs/DVD [23] or Internet telephony [16]. Others referred to technology in more general terms (eg, new media [52], information and communication technologies [19, 20, 22, 24, 30, 32, 33, 35, 36, 39, 41-44, 48, 53, 54], and Internet-related technologies [3,11,18,26,27,34]). Only 1 definition [38] used the term *integration*.

In 11 definitions, [3,12,21,27,28,37,43,45-47,55] eHealth was referred to in terms of commerce, suggesting that eHealth is “health care’s component of business over the Internet” [45], the “application of e-commerce to health care and pharmaceuticals” [12], or as “new business models using technology” [37]. Others associated eHealth with activities such as managing [22], educating [39], arranging [22], connecting [39], obtaining [34], providing [33], redefining [28], supporting [33], using [42], assisting [37] and accessing [51]. The stakeholders most often mentioned were health care providers (doctors [27,36], health care providers [16,37], health care professionals [34,39], health workers [51], managers [39], and caregivers [40]). The public is mentioned as public [51], patients [17,25,27,34,39,53], consumers [14,21,25,39], non-professionals [14,21,46], and citizens [53]. Governments [39], employers [27], and payers [27] are also listed as potentially benefiting from eHealth.

While most of the definitions concentrated on the process of care, about one quarter of them focused on the outcomes to be expected. These definitions mentioned improving and increasing the cost-effectiveness of health care [9] and making processes more efficient [14,25,26]. Others suggested that eHealth could solve problems related to access to care, cost, quality, and portability of health care services [9].

While the actual word *place* was not used in any of the definitions, some authors referred to the concepts of distance, geography, and location. One definition describes the impact of eHealth as local, regional, and worldwide [3]. Another describes eHealth as taking place both at the local site and at a distance [42]. A third suggests that distance and place no longer remain barriers, as eHealth is “to provide and support health care wherever the participants are located” [33].

Finally, other definitions suggest that eHealth represents a new perspective on health care. One author describes eHealth as a “state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking” [3]. Another source describes eHealth as a “consumer-centered model of health where stakeholders collaborate” [22].

The term eHealth encompasses a set of disparate concepts, including health, technology, and commerce. The 51 unique published definitions that we found included these concepts with varying degrees of emphasis. All specifically mentioned health and the technology involved. Many noted the varying stakeholders, the attitudes encompassed, the role of place and distance, and the real or potential benefits to be expected from eHealth.

Health, as used in these definitions, usually referred explicitly to health care as a process, rather than to health as an outcome. This is as expected; there is no consensus on the meaning of the word *health* per se, the definitions of which range from a narrowly construed “converse of disease or infirmity or when disease or infirmity is absent” [56] to the all-encompassing World Health Organization's “health is a state of complete physical, mental, and social well being and not just the absence of disease or infirmity” [57].

In the definitions of eHealth we found, technology was viewed both as a tool to enable a process/function/service and as the embodiment of eHealth itself (eg, a health website on the Internet). We were pleased to note that technology was portrayed as a means to expand, to assist, or to enhance human activities, rather than as a substitute for them. Surprisingly few of the published definitions referred explicitly to the commercial aspects of eHealth (Table 4).

The overwhelming understanding of eHealth reflects an attitude of optimism. All definitions had positive connotations and included terms such as benefits [9], improvement [3,20,23,26,27], enhancing [34,35,48], efficiency [3,25], and enabling [20,23,25,27,36]. One definition suggests that eHealth allows patients and professionals to “do the previously impossible” [14]. None of the published definitions suggests that eHealth may have any adverse, negative, harmful, or disadvantageous effects.

In this review, we do not report the frequency with which certain definitions were used by others, or the impact of each definition. The most commonly cited definition on the Internet is Eysenbach's [3] which was adopted or referred to by at least 87 websites on the Internet. Mitchell's definition [42] was used by a handful of others. There were many variations on the definition that characterizes eHealth as the “use of information technology in the delivery of health care” [19]. Most definitions implied that theirs was “the” definition.

In a perfectly logical language, as envisioned by Ludwig Wittgenstein in his early years [58], each word would have a specific and clear meaning. The philosopher himself recognized that such an idealized language could not be achieved in real life; he concluded his classic book, *Tractatus Logico-Philosophicus*, with “My propositions serve as elucidations in the following way: anyone who understands me eventually recognizes them as nonsensical, when he has used them—as steps—to climb up beyond them. (He must, so to speak, throw away the ladder after he has climbed up it.)” [58]. In his later work, *Philosophical Investigations* [59], Wittgenstein compares words in a language to tools in a toolbox, saying that their functions are varied according to the needs of the speaker much like the tools in a toolbox are varied according to the needs of the repairman. Their functional differences are what make them practical, and in the case of words this difference is usage. The way in which a word is used is what makes it useful in the language; a particular usage of a word gives the word its special authority in that situation [60]. For this reason we have not yielded to the temptation (nor do we have the chutzpah) to

attempt another “better” definition of eHealth. The widespread use of the term suggests that eHealth is an important concept, and the term is a useful “tool” to express that concept. It is generally understood despite the lack of a precise definition. The variations among the proposed definitions reflect the various perspectives, settings and contexts in which *eHealth* is used; they round and enhance our understanding of the concept.

In this systematic review and qualitative analysis of the definitions, we have completed only a first step in research on the evolving meaning of eHealth. It is an essential first step because it tells us how the current literature defines the term. We hope, and believe, that this compilation of existing definitions can be a useful resource to facilitate communication, discussion, and stimulate further research.

Questions remain about how the differing concepts and understandings of the term eHealth affect different stakeholders. What do people expect from eHealth? Do patients want eHealth? Do health care providers want eHealth? How does eHealth change the relationships, understandings, and interactions within the health care system? Time, patience, and further research will provide at least provisional answers to these questions, and to the myriad of questions still unasked.

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## **Authors' Contributions**

HO and CR conducted the search, extracted the data, and analyzed the content. All the authors participated in designing the search strategy, reviewing results, and preparing the final manuscript.

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## **Conflicts of Interest**

None declared.

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