2018

A framework for eHealth readiness of dietitians

Kirsty Maunder  
*University of Wollongong, km932@uowmail.edu.au*

Karen L. Walton  
*University of Wollongong, kwalton@uow.edu.au*

Peter G. Williams  
*University of Canberra, peterw@uow.edu.au*

Maree Ferguson  
*Dietitian Connection, maree_ferguson@health.qld.gov.au*

Eleanor J. Beck  
*University of Wollongong, eleanor@uow.edu.au*

Publication Details

A framework for eHealth readiness of dietitians

Abstract
Aim To develop a framework for assessing the eHealth readiness of dietitians. Methods Using an inductive approach, this research was divided into three stages: 1. a systematic literature review to identify models or frameworks on eHealth readiness; 2. data synthesis to identify eHealth readiness themes and develop a framework; and 3. semi-structured interviews with Australian nutrition informatics experts to gain consensus and validate the framework. Results Two hundred and forty one unique citations were identified, of which twenty four met the research criteria and were included in the review and subsequent synthesis. Common eHealth readiness themes or dimensions were extracted from the literature, and five key dimensions were identified that were relevant to dietitian eHealth readiness: access, standards, attitude, aptitude and advocacy. A framework diagram was designed and discussed during semi-structured interviews with ten nutrition informatics experts to inform the final framework. The result of this research was an inductively developed Framework for eHealth Readiness of Dietitians (FeRD). Discussion The FeRD builds on existing theories and models, and provides a conceptual model for developing eHealth readiness evaluation tools to examine, measure and drive strategies to better prepare dietitian professionals for eHealth.

Keywords
ehealth, framework, readiness, dietitians

Disciplines
Medicine and Health Sciences | Social and Behavioral Sciences

Publication Details

This journal article is available at Research Online: http://ro.uow.edu.au/smhpapers/5450
ABSTRACT

Aim: To develop a framework for assessing the eHealth readiness of dietitians.

Methods: Using an inductive approach, this research was divided into three stages: 1. a systematic literature review to identify models or frameworks on eHealth readiness; 2. data synthesis to identify eHealth readiness themes and develop a framework; and 3. semi-structured interviews with Australian nutrition informatics experts to gain consensus and validate the framework.

Results: Two hundred and forty one unique citations were identified, of which twenty four met the research criteria and were included in the review and subsequent synthesis. Common eHealth readiness themes or dimensions were extracted from the literature, and five key dimensions were identified that were relevant to dietitian eHealth readiness: access, standards, attitude, aptitude and advocacy. A framework diagram was designed and discussed during semi-structured interviews with ten nutrition informatics experts to inform the final framework. The result of this research was an inductively developed Framework for eHealth Readiness of Dietitians (FeRD).

Discussion: The FeRD builds on existing theories and models, and provides a conceptual model for developing eHealth readiness evaluation tools to examine, measure and drive strategies to better prepare dietitian professionals for eHealth.

Key words: eHealth readiness, framework, dietitian, nutrition informatics, health information technology.

1. Introduction

Hospitals and healthcare providers are challenged by the need to increase care delivery without increasing resource consumption, due to the ageing population and corresponding rise in chronic diseases [1, 2]. eHealth refers to electronic processes and communications that support or enable healthcare practices [3]. The use of eHealth is rapidly increasing, and is now widely accepted as integral in supporting and sustaining the challenge of healthcare delivery, patient safety, efficiency, clinical decision-making, curtailing increasing healthcare costs, supporting research and ultimately enhancing patient care [4-9]. The potential of eHealth goes beyond supporting the burdened healthcare system; it can also contribute to health-related behaviour modification, and improve accessibility of healthcare to rural and remote populations [10].
In parallel with the increasing use of electronic health records (EHR), telemedicine, clinical information systems and other software solutions, there is increasing research into technology acceptance and adoption. However, technology acceptance research within healthcare is only just starting to extend beyond nursing and medical practitioners [11, 12]. In addition, in order to ensure the success of eHealth initiatives, readiness is more comprehensive than individual acceptance and willingness to use technologies, the solutions must also meet the needs of the healthcare practitioner, and implementations need to occur with engagement and communication amongst key stakeholders. Solutions must enable, support and enhance practice, and incorporate standards and processes required for the specific healthcare practitioner. Whilst models to identify, predict and manage user acceptance of technology will facilitate implementation efforts [11, 12], without the right solution or clinical leadership for example, the end result may not achieve the proposed benefits or may fail and, at worst, may increase the risk of adverse events [13-18]. Whilst failure rates are not well documented in the literature, figures suggest one-fifth to one quarter are a total failure, one-third to three-fifths are partial failure, and only a minority are a success [19].

eHealth readiness refers to the preparedness of healthcare organisations, societies, or healthcare workers, for the expected change caused by plans associated with a health information technology (HIT) solution [20, 21]. The prior assessment of readiness for a healthcare innovation, and the readiness for change, has been demonstrated to reduce the risk of failure after the introduction of a HIT solution [22-24]. In order to analyse eHealth readiness and identify areas for improvement, a standardised framework for assessment is required. Several such tools have been developed within areas such as e-business, e-commerce and e-government [25], but appear to be in their infancy within healthcare.

The integration of eHealth has initially focused on medical practitioners and nurses, but will inevitably impact on the practice of the allied health professionals. Dietitians are allied health professionals who play a critical role in the delivery of healthcare across a variety of practice areas. The development of eHealth systems which do not support dietetic standards and processes to maximise efficiencies and assist in delivery of patient care, could adversely affect patient care quality and safety [4, 6, 7]. The aim of this research was to
develop a framework for the analysis and identification of areas for professional improvement in relation to dietitian eHealth readiness, to enable the benefits of eHealth to be realised.

2. Methodology

Using an inductive approach this research was divided into three stages, reported below: systematic literature review (SLR), data synthesis to identify eHealth readiness themes and develop a framework; and semi-structured interviews with Australian nutrition informatics experts to gain consensus and validate the framework.

2.1 Systematic literature review

The SLR aimed to identify literature on eHealth readiness themes or models, designed specifically for health professionals. The search protocol was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement [26] and reported using a narrative synthesis. Searches were conducted in Scopus, CINAHL, Medline, Cochrane and Web of Science databases for peer-reviewed scholarly articles published from the earliest date until December 2016 (when the search was being performed). These databases were selected due to their relevance for journals in the field of health informatics. Search terms were determined through searching the literature, a Medical Subject Headings (MeSH) on Demand search and a Google search, and pilot tested to check that appropriate papers were being identified. The final search terms related to 1. healthcare and Information Technology (‘eHealth’, ‘health informatics’, ‘medical informatics’, ‘Health Information Technology’, ‘health information systems’, and ‘hospital information systems’) and 2. readiness (‘readiness’ or ‘preparedness’). The full details of the electronic search strategies can be found in the Supplementary File 1. Additional articles were identified for inclusion through reference harvesting of relevant papers and a key author search based on these reference lists. A Google search was also conducted to identify additional non-journal publications (grey literature) on eHealth readiness frameworks.

After the removal of duplicates, titles and abstracts were screened to exclude articles which did not meet the inclusion criteria: English language articles; full-text; and including a model, framework or identified themes of eHealth readiness. The remaining articles were
assessed to identify unique empirical research specifically identifying a model, framework or themes for assessing eHealth readiness. Due to the paucity of articles with a focus on health professionals, those with a broader country/region or organisational focus were included for synthesis, as were those focusing on a specific eHealth field (such as telehealth), even if they did not specify or label a model, framework or themes. The broad topics still provided relevant insight into the potential readiness dimensions that could apply to health professionals for eHealth. Articles focused solely on patients or consumers were excluded.

All included articles were reviewed and key data extracted to a summary table for further analysis. The summary table included the authors, year and country of the study, model or framework name and description, study design, readiness dimensions or themes, and setting or target group and application.

2.2 Data synthesis and framework development
Following the data analysis phase of the literature review, the articles were reviewed for eHealth readiness themes applicable to dietitians. Key sentences and descriptions of the themes were recorded. Themes were categorised into related groups to form the framework dimensions, and the descriptions reviewed and summarised to form the framework dimension descriptions. The themes, groupings and dimensions were reviewed and refined to achieve the draft framework table.

eHealth readiness dimensions were extracted and overlapped around a central goal of eHealth readiness of dietitians, and a draft framework diagram created. The dimension descriptions were abbreviated and included in the diagram.

2.3 Interviews and framework validation
Semi-structured interviews with nutrition informatics experts were employed to identify perceived attributes of eHealth readiness of dietitians and to develop consensus and validate the framework. A combination of purposive and snowball sampling techniques were used to select participants with an expertise in the field of nutrition informatics and to ensure representation across a variety of dietetic practice areas. The selection of expert participants was based on four main criteria: their experience with an eHealth implementation; research
and publication on eHealth solutions for dietitians; role at a national level as an advocate for eHealth for dietitians; or Certified Health Informatician Australasia (CHIA) credentials. A total of ten Australian nutrition informatics experts were interviewed. The [removed for blind peer review] Human Research Ethics Committee granted Ethics approval (HE16/202).

The interviews consisted of four key questions. Firstly, participants were asked what attributes they considered reflective of a profession’s readiness for eHealth (Question 1). They were then shown the draft framework diagram and asked Question 2: Do you feel this framework covers all of the dimensions of allied health eHealth readiness?; Question 3: Do you feel the dimension names and definitions are suitable?; and Question 4: Do you have any other suggestions?

The primary research conducted the audio-taped face-to-face or over the phone with participants. The same researcher transcribed the interviews verbatim. A thematic analysis approach [27] was applied to Question 1 (attributes of eHealth readiness) whereby the text was labelled as an open code and then once the transcript was coded, all codes were grouped into categories to form the key themes within Microsoft Excel 2010. Key sentences and descriptions of the themes were also recorded. The researcher then compared the identified themes to those identified in the literature to determine overlap and differences, and update the framework table and diagram based on the literature and interviews. Responses to Question 2 formed part of the validation process, with responses being recorded as the percentage of consensus against each dimension. To achieve the final framework, Questions 3-4 responses were recorded and incorporated into the review, and refinement of the dimension names and definitions.

3. Results

3.1 Systematic literature review

Four hundred and eleven articles were identified, and after the removal of duplicates, 241 articles were reviewed. Two hundred and twenty one articles were excluded based on title or abstract, as they did not relate to a model, framework or identifying themes of eHealth readiness. The setting (whether it was a specific country/countries or region/s or organisation type, such as primary care, rural or remote settings or public or private...
practise) and the application (whether it was eHealth in general or specific applications, such as telehealth or telemedicine), were not limited within the search. Many of the research studies identified in the search related to a specific eHealth intervention or innovation for the management of disaster, emergency or bioterrorism readiness or consumer or community interest in eHealth, and consequently were excluded. An additional 16 articles were found via hand searching reference lists and a Google search. Thirty-six full text articles were assessed; twelve articles were excluded, leaving 24 articles for the data synthesis (Figure 1). The articles were excluded for the following reasons: articles that utilised an already published eHealth readiness framework (n=4); or did not report on a framework or assessment model (n=8). There were 15 unique authors that contributed to the final 24 articles. Twenty-one articles were peer-reviewed, and three identified during the Google search, which were included due to their relevance to the topic. Of these three articles, the Australian government published two [28, 29] and Cisco and the Region of Southern Denmark jointly published the third (Pederson et al, 2013) [30].

3.1.1 Study characteristics

Results of the literature review analysis (Table 1) revealed the studies were conducted across a variety of countries, including United States of America (USA) (6), Australia (5), Canada (5), Pakistan (2), Europe (1), Iran (1), Italy (1), Lebanon (1), South Africa (1) and United Kingdom (1). The setting or target of each study differed, with most being healthcare organisations (15), followed by health practitioners (primarily physicians and nurses) (4), rural communities (3), primary care (1) and country/region (1). The health-based application also differed in each study, with the majority focused on eHealth (15), followed by telehealth (6), EHR (2) and health information exchange (1).

Of the four articles that included data on health practitioners, only one study specifically targeted allied health professionals and eHealth readiness, published in an Australian government report in 2011 [28]. Two studies were conducted in the rural healthcare setting and targeted a variety of levels, including medical practitioners, patients, administration staff and the organisation, with a specific focus on telehealth [31, 32].
3.1.2 Data analysis

Of the 24 studies included for synthesis, ten utilised a readiness framework to analyse the data, and 13 developed a framework or identified themes for the analysis of readiness. One Australian government report on allied health eHealth readiness identified the importance of clinical engagement in eHealth, and investigated three dimensions of readiness: infrastructure, attitude and aptitude [28]. Whilst the theories and models identified in this literature review focus on a variety of different settings or targets and applications, the commonality is that they seek to determine the factors that contribute to eHealth readiness and how this assessment process can be modelled and predicted using theoretical and empirical approaches. All of the models were analysed to identify factors that may contribute to eHealth readiness within dietitians, as the focus of this research.

3.2 Data synthesis and framework development

Common eHealth readiness themes or dimensions were identified across the articles, and all that were relevant to dietitians were tabled with a brief description, and the supporting literature referenced (Table 2). The key relevant dimensions extracted for the literature included access, standards, attitude, aptitude and advocacy. Due to the setting, target group and application in focus, none of the identified articles referenced all five dimensions. The majority of authors (7) referenced two dimensions, with four authors referencing three dimensions, and two more referencing four of the five dimensions.

Of the fifteen contributing authors, thirteen identified access in some form, reporting on information technology infrastructure, architecture, structural and/or resource readiness [2, 24, 25, 28, 30, 32-42]. One author only identified funding as a core readiness requirement [43], whilst another highlighted funding, but within the theme of structural readiness [44]. HIT infrastructure and funding is fundamental to any eHealth project, and could be considered the first step in preparing for any HIT project. The dimension is more clearly described as: access to the required information technology infrastructure (including hardware, software/apps and networks) and funding.

Eight of the contributing authors referenced Authority/Standards and referred to in a variety of terms, such as data and standards, processes, policies, protocols, procedures, regulations and interoperability [2, 23, 25, 30, 33, 36-38, 41, 43]. Consequently, the description was
developed to encompass all of these components: documented terminology and process standards to support practice and processes of the practitioner.

Eleven of the authors referenced *Attitude*, and it was the dimension with the greatest variety of descriptions, all listed in Table 2 [24, 25, 28, 31-33, 35, 37-40, 42, 45]. This dimension is complex as it encompasses several individual traits in relation to HIT, and therefore was described as: awareness of the need to change; knowledge of the benefits of eHealth; and willingness to utilise eHealth solutions.

*Attitude* is more easily defined as the: ability to utilise eHealth solutions. Six of the authors referenced this dimension, including terms such as aptitude, knowledge, education, capacity and competence [28, 30, 32, 33, 37, 38, 40, 45]. This was described as the: ability to utilise eHealth solutions.

Eight of the authors referred to the topics of ownership, leadership and collaboration, which were incorporated into the dimension of *Advocacy* [28, 30, 31, 40, 41, 43, 45]. Whilst often not referenced, the discussion of advocacy is compelling, and is probably the key dimension in eHealth readiness that is often overlooked. Ingebrigtsen et al.[1] conducted a SLR providing evidence that clinical leaders can have a positive impact on the success of HIT adoption in healthcare organisations, supporting the importance of including this as a dimension. Consequently, this dimension was listed last in the table, representing an advanced stage of preparing for a successful eHealth system implementation: capacity for leadership and ownership of eHealth initiatives.

Based on the initial themes and descriptions developed from the literature review, a draft framework diagram was created and abbreviated to FeRD (Framework for eHealth Readiness of Dietitians).

3.4 Interviews and framework validation

The practice areas of the ten interview participants included hospital (including management, clinical and foodservices) (4), research and education (2), private industry (2), government (1), and private practice/business (1). Many of the participants represented
multiple practice areas, however for the purpose of this summary, only the primary practice area was noted.

The analysis of the interviews identified the same five themes as the literature review. The results of the interviews were summarised in a table based on their responses to each of the four questions, along with the percentage of authors from the literature review that identified each dimension, to allow a comparison (Table 3). Similarly to the authors included in the literature review, none of the nutrition informatics experts identified all five dimensions of eHealth readiness.

Once interviewees were shown the framework however, all agreed on the included dimensions and identified their relevance and importance. All provided positive feedback about the framework and highlighted the usefulness of this tool for the profession. Three interviewees discussed the use of the tool to prepare dietitians and related staff for eHealth projects within their organisation. In addition, two interviewees suggested the potential applicability to other allied health professionals.

One interviewee suggested to include ‘experience’ as part of aptitude. However, this was rejected, as this framework is about guiding the preparation of the profession for eHealth readiness. Inclusion of experience would suggest dietitians who have not had eHealth experience are unable to be considered ready. All the other dimension description suggestions were incorporated into the final framework (Figure 2).

A number of participants identified external factors that can influence dietitians in some of these dimensions, such as professional associations, political climate and education. However, the focus of this research was specifically on the professional group eHealth readiness dimensions, and consequently these external factors were also not included. Future investigations would ideally to identify strategies to strengthen the capacity of each of these dimensions.

4. Discussion

There is a paucity of literature on eHealth readiness, and no frameworks were identified for assessing and reporting on the eHealth readiness of allied health professionals (including
dietitians). Consequently, a SLR and interviews were conducted to inform the development of a framework for investigating the eHealth readiness of dietitians, which was abbreviated to FeRD. The FeRD uniquely identifies all relevant dimensions through an inductive approach, having selected all of the key themes from a variety of authors and experts, who listed areas of which they felt important, within the context of their focus setting or their experience. The findings of this study led to the development and validation of the first framework for eHealth readiness assessment for dietitians.

The results of the SLR and the interview responses highlight the complexity of eHealth readiness, specifically how different experiences and exposures to eHealth create different levels of knowledge and ideas with regard to what may be important for determining eHealth readiness. No single study (publication) or nutrition informatics expert interview respondent identified all the key dimensions. Whilst the most frequently reported dimension in the literature was access (87%), conversely the nutrition informatics experts reported this the least (10%). Nutrition informatics experts may not have identified access as important, as Australian dietitians report high levels of access to technology in the workplace, [46] and consequently it may be presumed that dietitians take it for granted [47]. Interviewees were uniformly supportive of the proposed dimensions, once these were revealed during their interview. The results emphasise the importance of having a framework for guiding the profession to identify all essential dimensions, and not leave out any based on assumptions or experience, as every eHealth readiness assessment will be unique.

The FeRD will enable the assessment of readiness of dietitians at all levels, from single facilities or areas, to organisations, and even at the state or national level. It is anticipated that this framework will be part of the preparation for the implementation of any eHealth solution for dietitians. Our previous research has included a national eHealth readiness survey of Australian dietitians [47]. Future iterations of this work will be analysed using the FeRD, which is an example of how this framework can be applied to the profession at a national level. Using the FeRD to either develop assessment tools (such as a questionnaire) or review existing tools to ensure they asses all eHealth readiness dimensions, will enable the development of targeted improvement strategies for the profession.
An example of how the framework can be utilised at a facility or organisational level, is for the preparation of dietitians for the implementation of a nutrition-related eHealth solution. A specific case would be the implementation of a hospital patient electronic meal ordering solution for food and nutrition services which requires significant preparation and eHealth readiness of the end users (including dietitians). The ordering system requires institutional review, but individuals also require preparation. The FeRD provides a comprehensive methodology essential for identifying all relevant project requirements, and assists in developing preparation activities (such as education and in-services) to ensure increased success of the eHealth solution. As identified in the interviews reported here, dietitian readiness has multiple dimensions but some are potentially overlooked without application of a framework.

This study was limited to the design and initial validation of the framework for dietitians. Future studies utilising the FeRD for processes such as a hospital patient electronic meal ordering solution implementation, will strengthen the validation of this framework. Future research could investigate the applicability of the FeRD to other allied health professionals, such as physiotherapists and occupational therapists.

The FeRD offers a comprehensive platform for the analysis and identification of areas for professional improvement to enable the benefits of eHealth to be realised and for the prevention of innovation failure. It provides a conceptual model for developing eHealth readiness evaluation tools to measure, examine and drive strategies to better prepare dietitians for eHealth. It may also prove relevant and useful to assess the eHealth readiness of other allied health professions. This framework builds on existing theories and models of eHealth readiness and incorporates expert opinions, and consequently covers a comprehensive range of dimensions, including access, standards, attitude, aptitude and advocacy. The evaluation of dietitian readiness for eHealth should not be limited to acceptance and adoption of eHealth, but should cover all of the dimensions identified in this framework.

Acknowledgements

This research has been conducted with the support of the Australian Government Research Training Program Scholarship. The authors would like to thank Australian nutrition
informatics experts who supported this research through their participation in the interviews to validate the framework.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Conflict of Interest**

[Removed for blind peer review]

**Authorship**

[Removed for blind peer review]

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

5. **References**


Figure 1: PRISMA flow chart for selection of studies on eHealth readiness.

Identification

CINAHL (n=77)  Medline (n=123)  Scopus (n=47)  Web of Science (n=164)

Duplicate citations removed (n=170)

Total citations with duplicates removed (n=241)

Additional citations (hand searching reference lists and Google search) (n=16)
- Peer-reviewed journal articles (n=13)
- Grey literature (n=3)

Unique citations screened (n=257)

Citations excluded (based on title or abstract) or abstract only (n=221)

Full-text articles assessed (n=36)

Full-text articles excluded (n=12)
Key reason for exclusion:
- Utilised an already published eHealth readiness framework (n=4)
- Did not report on themes, a framework or an assessment model (n=8)

Studies included for the data synthesis (n=24)
Figure 2: Framework for eHealth readiness of dietitians (FeRD).

Alternative coloured Figure 2:

Figure 2: Framework for eHealth readiness of dietitians (FeRD).
<table>
<thead>
<tr>
<th>Author (Country)</th>
<th>Publication/s (Year)</th>
<th>Setting / Application</th>
<th>Framework</th>
<th>Readiness dimensions / themes</th>
<th>Study type / assessment tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jennett et al [22]</td>
<td>The essence of</td>
<td>Rural</td>
<td>Identified themes that can be used to</td>
<td>Types (4):</td>
<td>Semi-structured</td>
</tr>
<tr>
<td>Study</td>
<td>Type/Scope</td>
<td>Findings/Methods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Factors contributing to failure: 1. Inadequate needs assessment and lack of buy-in 2. Lack of staff preparation 3. Resistance to change |
Semi-structured interviews and analysed using an iterative qualitative approach. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Country/Region</th>
<th>Research Question</th>
<th>Methods/Findings</th>
<th>Main Categories/Topics</th>
<th>Additional Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authors</td>
<td>Study Title</td>
<td>Institution/Field</td>
<td>Methodology</td>
<td>Key Findings</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Government</td>
<td>The eHealth readiness of Australia’s medical specialists. (2011)</td>
<td>Health practitioners / eHealth</td>
<td>Classes of variables were identified and tested to develop a research model to identify variables associated with clinicians’ perceptions of organisational readiness. The variables were based on Holt et al’s ‘Readiness for organisational change’ to relate directly to healthcare.</td>
<td>Classes of variables (4): 1. Attributes of the change 2. Leadership support 3. Internal context 4. Attributes of the change targets</td>
<td>Literature review and interviews.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Method</th>
<th>Framework/Conceptual Model</th>
<th>Sections/Constructs/Components</th>
<th>Literature Review/Questionnaire</th>
<th>Development</th>
</tr>
</thead>
</table>
Table 2: Development of the dietitian eHealth readiness framework

<table>
<thead>
<tr>
<th>Proposed readiness dimension</th>
<th>Detailed description</th>
<th>Supporting readiness dimensions from the literature that apply to a health practitioner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td>Access to the required information technology infrastructure (including hardware, software/apps and networks) and funding.</td>
<td>Technological[^{21, 23-25, 33-39}], technological infrastructural[^{40, 41}], Access to computers at work[^{39, 42}], Appropriateness (of applications within their context)[^{42}], ICT architecture/infrastructure[^{2, 30}], infrastructural[^{28, 29}], Resources[^{24, 33, 35, 37, 38, 41, 43}], Structural readiness[^{22, 32, 44}], Funding[^{44, 45}]</td>
</tr>
<tr>
<td><strong>Authority/Standards</strong></td>
<td>Documented terminology and process standards to support the practice and processes of the practitioner.</td>
<td>Processes[^{33, 37, 38}], Data and standards[^{45}], Standardisation policies, protocols and procedures[^{2, 41}], policy[^{21, 23, 25}], Policies and regulations[^{40}], Standards and interoperability[^{30}]</td>
</tr>
<tr>
<td><strong>Attitude</strong></td>
<td>Awareness of the need to change; knowledge of the benefits of eHealth; and willingness to utilise eHealth solutions.</td>
<td>Turf (perception of eHealth as a threat to competency or autonomy); efficacy; practice context; apprehension; and time to learn[^{31}], Core[^{21-23, 25, 32, 39, 44}], motivational[^{24, 35}], need-change readiness[^{36}] (the realisation of needs and expressed dissatisfaction with the present situation and conditions), vision clarity (the sense that change is needed)[^{46}], personally beneficial[^{42}], Engagement[^{24, 32, 35, 36, 39, 44}], Attitudinal[^{28, 29}], Awareness and education[^{23, 32, 44}], Perceived need to improve practice[^{22}], Efficacy[^{31}], projection of benefits[^{32}], aware of benefits[^{43}], change appropriateness[^{32}], assessment of risk[^{32}], Self-efficacy[^{46}], Practice context[^{22, 31}], Apprehension[^{31}], Time to learn[^{31}], Values and goals[^{33, 37, 38}]</td>
</tr>
<tr>
<td><strong>Aptitude</strong></td>
<td>Ability to utilise eHealth solutions.</td>
<td>Knowledge[^{33, 37, 38}], Computer literacy[^{42}], Change efficacy[^{42, 46}], Staffing and skills[^{33, 37, 38}], Aptitudinal[^{28, 29}], Awareness and education[^{32, 44}], preparing staff[^{23}], Capacity and competence[^{30}]</td>
</tr>
<tr>
<td><strong>Advocacy</strong></td>
<td>Capacity for leadership and ownership of eHealth initiatives.</td>
<td>Ownership[^{31}], Leadership[^{22, 23, 28, 34, 41}], Leadership and collaboration[^{30}], Management support[^{41, 42}], Presence of a project champion[^{46}]</td>
</tr>
</tbody>
</table>
Table 3: eHealth readiness framework dimensions validation findings.

<table>
<thead>
<tr>
<th>Proposed readiness dimension</th>
<th>Framework short description</th>
<th>Literature review dimensions identified (n=15)</th>
<th>Dimensions identified in interviews (Q1) (prior to seeing the framework)</th>
<th>Dimensions consensus in interviews (Q2) (after seeing the framework)</th>
<th>Dimension names and descriptions from interviews (Q3 &amp; Q4) (after seeing the framework)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Access to IT infrastructure and funding.</td>
<td>87% (n=13)</td>
<td>10% (n=1)</td>
<td>100% (n=10)</td>
<td>Add 'suitable eHealth solutions' (n=1).</td>
</tr>
<tr>
<td>Authority / Standards</td>
<td>Terminology and process standards.</td>
<td>53% (n=8)</td>
<td>30% (n=3)</td>
<td>100% (n=10)</td>
<td>Preferred ‘Standards’ over ‘Authority’ (n=10).</td>
</tr>
<tr>
<td>Attitude</td>
<td>Knowledge of the benefits of eHealth and willingness to utilise eHealth solutions.</td>
<td>71% (n=10)</td>
<td>80% (n=8)</td>
<td>100% (n=10)</td>
<td>Add ‘awareness of what eHealth is’ (n=2). Add ‘awareness of the need to change’ (level of frustration with existing solutions) (n=2).</td>
</tr>
<tr>
<td>Aptitude</td>
<td>Ability to utilise eHealth solutions.</td>
<td>43% (n=6)</td>
<td>70% (n=7)</td>
<td>100% (n=10)</td>
<td>Add ‘experience’ (n=1).</td>
</tr>
<tr>
<td>Advocacy</td>
<td>Capacity to lead eHealth initiatives.</td>
<td>53% (n=8)</td>
<td>50% (n=5)</td>
<td>100% (n=10)</td>
<td>Add ‘communicate requirements’ (n=1). Add ‘capacity to support’ (n=1). Add ‘engage stakeholders’ (n=1).</td>
</tr>
</tbody>
</table>