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O. Sobolieva-Tereshchenko,

PhD in Economics, Researcher,

Interdisciplinary Research Team on Internet and Society,

Faculty of Social Studies, Masaryk University, Brno, Czech Republic

ORCID ID: https://orcid.org/0000-0002-1086-1192

IMPLEMENTATION eHEALTH LITERACY INSTRUMENTS IN E-GOVERNMENT. MEASUREMENTS AND TRENDS

О. А. Соболєва-Терещенко,

к. е. н., науковий співробітник,

Міждисциплінарна Дослідницька Група Інтернету та Суспільства,

Факультет соціальних наук Університету імені Масарика, Брно, Чехія

ВПРОВАДЖЕННЯ ІНСТРУМЕНТІВ ГРАМОТНОСТІ В ГАЛУЗІ Е-ЗДОРОВ'Я В ЕЛЕКТРОННОМУ УРЯДУВАННІ. ВИМІРЮВАННЯ ТА ТЕНДЕНЦІЇ

The article examines the essence, measurement, and trends of eHealth literacy in the context of the introduction of digital technologies in public administration. The existing eHealth Literacy measurements from 2006 to 2022 were researched and revealed few eHealth Literacy instruments, that can be considered a prelude to the implementation in E-Government. The scoping review of available eHealth literacy instruments and an assessment of their measurement based on 1699 potential studies identified by Web of Science, PubMed, Scopus during 17 years was presented. A qualitative selection of articles in a systematic review of the literature using PRISMA and a qualitative analysis of studies and measurement instruments identified 15 articles with original eHealth literacy tools of high to good quality. The scoping review of the eHealth literacy measurements identified key skills for digital health implementation: basic computer skills, information researching skills, navigation skills, information understanding skills, information assessment skills, information confidence skills, health self-management skills, use of information for skills decision making, health information protection skills, communication skills. In the future, studies will be required for comprehensive and in-depth exploration of measurement instruments of eHealth Literacy in sphere unification and standardization eHealth Literacy Instruments and eHealth Literacy skills. Identifying eHealth literacy levels in general or specific clinical populations can guide strategies to digitally deliver tailored orientation and to develop interventions to improve eHealth literacy skills. The eHealth Literacy Scale (eHEALS), European Health Literacy Questionnaire (HLS-EU-Q16), eHealth Literacy Scale in Web 3.0 contest (eHLS-Web 3.0) were defined as the most important instruments for implementation in E-Government. The possibilities of introducing electronic literacy in the field of health care at the individual and state levels are determined, as well as the need to improve certain norms of Ukrainian legislation on health care.

У статті досліджено сутність, систему вимірювання та тенденції електронної грамотності в галузі охорони здоров'я в контексті впровадження цифрових технологій в державне управління. В рамках дослідження існуючої системи вимірювання електронної грамотності в галузі охорони здоров'я з 2006 по 2022 роки було опрацьовано 1699 статей та виявлено декілька інструментів електронної грамотності в галузі охорони здоров'я, які можна вважати прелюдією до впровадження в електронному урядуванні. Також, було представлено огляд наявних інструментів електронної грамотності охорони здоров'я та оцінку їх вимірювання на основі 1699 потенційних досліджень, опублікованих в науково-метричних базах Web of Science, PubMed, Scopus протягом 17 років. Якісний відбір статей у систематичному огляді літератури з використанням PRISMA та якісний аналіз досліджень і інструментів вимірювання виявили 15 статей з оригінальними інструментами грамотності електронної охорони здоров'я високої та хорошої якості. Огляд вимірювань електронної грамотності в галузі охорони здоров'я визначив ключові навички для впровадження цифрової охорони здоров'я, а саме: базові навички роботи з комп'ютером, компетенції щодо пошуку інформації, навички навігації в Інтернет-просторі, навички розуміння інформації в Інтернеті, навички загальної оцінки інформації в Інтернеті, компетенції щодо критичного оцінювання надійності та достовірності інформації в Інтернеті, навички самоконтролю здоров'я, компетенції щодо використання знайденої інформації для прийняття рішень, навички захисту особистої та персональної інформації про здоров'я, комунікативні навички. Майбутні дослідження слід зосередити на всебічному та поглибленому вивченні умов та можливостей уніфікації та стандартизації інструментів

грамотності електронної охорони здоров'я та навичок грамотності електронної охорони здоров'я.

Три інструменти: eHEALS, HLS-EU-Q, eHLS-Web 3.0 було визначено, як найбільш прийнятні в контексті впровадження цифрових технологій в державне управління, внаслідок широти та терміну апробації перших двох та якості розробки третього. Означено можливості запровадження електронної грамотності у сфері охорони здоров'я на індивідуальному та державному рівнях, а також необхідність удосконалення окремих норм законодавства України щодо охорони здоров'я населення.

Keywords: *public administration, health care; government policy, public health, eHealth literacy, digital literacy*

Ключові слова: *державне управління, охорона здоров'я; державна політика, громадське здоров'я, електрона грамотність охорони здоров'я, цифрова грамотність*

Target setting. The Association Agreement between Ukraine and the EU in the Ministry of Health of Ukraine and the EU4Health program provide for priority international initiatives and cooperation in the field of health care, the development and implementation of EU legislation in the field of health care, and integration between the national health care systems of the participating countries.

The World Health Organization (WHO) has defined health literacy as the cognitive and social skills that determine people's motivation and ability to access, understand and use information to promote and maintain optimal health [1]. Later, the WHO Regional Office for Europe defined that Health literacy is related to literacy and involves people having the knowledge, motivation, and competence to access, understand, evaluate and apply health information in order to make

judgments and make decisions. in everyday life. health care, disease prevention and health promotion to maintain or improve the quality of life throughout life [2].

A complex and multifaceted range of problems the implementation of the state's economic policy under the conditions of globalization [3] also includes the implementation of a unified system for assessing digital literacy in the field of health care, which would allow comprehensive assessment of the level of eHealth literacy, increase macroeconomic indicators and reduce state healthcare costs.

The eHealth literacy has a vital impact on public health through access to and use of health services. Essentially, eHealth literacy plays a role in improving health outcomes both at the individual level (reducing health inequalities) and at the societal level (continuous development of health policy). Thus, measuring eHealth literacy is fundamental and requires appropriate action at the government level.

In a review of the literature from 2006 to 2022, the 15 eHealth literacy instruments were identified. The existence of many different versions of such instruments demonstrates a growing trend in measuring eHealth literacy related to the increasing use of the Internet and social media. This becomes too relevant in the period digital public administration.

However, none of the previous reviews assess instruments comprehensively. Thus, to provide insight into the literature, we performed a bibliometric analysis to comprehensively review all existing eHealth literacy instruments.

Analysis of research and publications. The measurement of eHealth literacy was covered in the studies of scientists of various economic schools and eras during 2006-2022. The first eHealth Literacy Scale (eHEALS) was developed by Cameron D. Norman and Harvey A. Skinner in 2006. This eHealth Literacy

Scale has been translated into many languages and has been in use for over 17 years. During this period, the introduction of information technology contributed to the development of the scale, tools, instruments of eHealth Literacy [4].

Some of the eHealth literacy instruments were developed to assess the literacy of the population in context of scientific research [4,17] some for the needs of medical practitioners [14,16], and some for the needs of public administration [5]. However, all of them are segmental and do not provide a common picture for making managerial decisions aimed at improving the general level of public health and reducing health care costs.

Paying tribute to the results of foreign scientists [4-18] in the field of eHealth literacy, which is understood as the spread of new skills in healthcare digital system, has a research character, but many not practical used in public administration.

It should be recognized that today the problem of introducing eHealth literacy into the process of E-Government for the purpose of unification and systematization remains open.

The purpose of the article is to provide a scoping review of the most appropriate measurement for implementing eHealth literacy instruments in the digital government system in order to evaluate, unify and standardize health information.

This study aimed to review the existing measurements of eHealth literacy to summarize the current knowledge on the development of the main existing eHealth literacy indicators to understand their evolution and their possible implementation in the E-Government health system.

Question 1: What are the main current indicators of eHealth literacy?

Question 2: What are the trends in eHealth literacy rates in 2006–2022?

We thought this might help synthesize evidence and provide a platform for investigators with similar interests to easily select, apply, or appraise an instrument when needed.

Presentation of the main research material. A scoping review was performed following the principles of PRISMA. Articles were identified by searching three databases: Web of Science, PubMed, Scopus. The databases were searched from 2006 to 2022. The selected keywords include words ‘eHEALS’, ‘eHealth literacy measurement’, ‘e-Health literacy measurement’, ‘electronic Health literacy measurement’. Basic inclusion criteria consisted of original articles, which had original and validation eHealth literacy instruments.

Our comprehensive systematic review framework is based on studies of all scales, tools, questionnaires, and instruments of eHealth literacy since the publication of eHEALS. We searched three main databases in biomedical information for published articles on the measurement properties of instruments measuring eHealth literacy and showed eligible articles using a standard set of selection criteria.

We selected eligible articles based on 3 main criteria: (1) availability of English full-text or Open Access article, (2) measuring eHealth literacy instruments as defined in the scoping review framework (3) use of a valuational and useful measuring instruments. Our study focused on finding measuring instruments of eHealth literacy (scales, toolkit, instruments, questionnaire).

Exclusion criteria were: (1) Reviews, books, letters to the editor, and abstracts of speeches (2) lack of a valuational and useful measuring instruments.

The initial search yielded 1699 articles, including 551 articles of Web of Science, 611 articles of PubMed, 537 articles of Scopus. The literature search results were reviewed, and duplicate results were excluded (1151), leaving 548 articles.

According to the inclusion and exclusion criteria of the study, was scrutinized the titles and abstracts of the articles, leaving 47 articles. Thirty-two articles on the use of computer technology for testing health literacy were then excluded, and 15 articles on eHealth literacy measurement were presented. All 15 papers showed a good level of reliability measurement. The study flow diagram of the study selection process is present Figure 1.

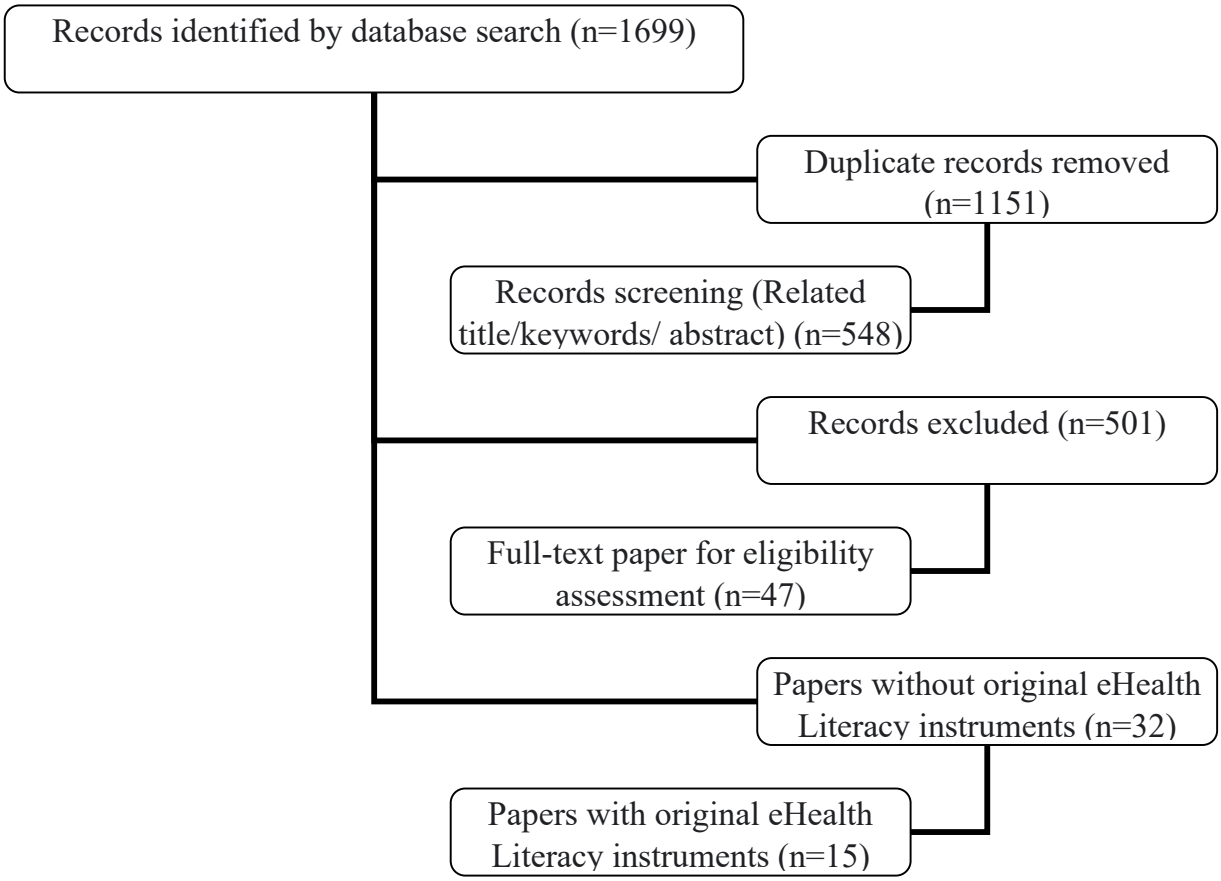

Figure 1. Flow diagram of the study selection process

In summary, we identified 15 eHealth literacy instruments (Table 1) that were rated as high quality based on the presence of important metrics such as

domain representation, sample size, level of internal consistency scores, and description of the eHealth literacy skills set [4-18].

Table 1. Review papers on eHealth literacy instruments 2006-2022

#	Name of Health Literacy Instrument	Year	Authors	Country	Sample	Number of items
1	eHealth Literacy Scale (eHEALS)	2006	Norman CD, Skinner HA	Canada	664 adolescents (age 13-21)	8 items
2	European Health Literacy Questionnaire (HLS-EU-Q16)	2009-2012	European Health Literacy project	EU	8 EU countries (n = 1000 per country, n = 8000 total sample).	16 items
3	Patient Readiness to Engage in Health Internet Technology (PRE-HIT)	2014	Koopman R.J et al	USA	200 patients with chronic conditions (age 18+)	28 items
4	e-Health Impact Questionnaire (eHIQ)	2015	Laura Kelly et al	UK	117 participants in Stage 1 + 102 in Stage 2 (age 18+)	37 items
5	electronic Health Literacy Scale (e-HLS)	2016	Seçkin G et al	USA	50,000 residents (age 18+)	19 items
6	Digital Health Literacy Instrument (DHLI)	2017	van der Vaart R et al	Netherlands	200 respondents at T1 (age 18-84) + 67 respondents at T2 (age 18-65)	28 items
7	Digital Health Literacy Assessment Tool (DHLAT)	2017	Beth St. Jean et al	USA	19 participants (age 12–15)	13 items
8	Extended eHealth literacy scale (eHEALS-E)	2017	Petrič G et al	Slovenia	644 users (mean=38.9 years)	20 items
9	eHealth Literacy Assessment Toolkit (eHLA)	2018	Karnoe A et al	Denmark	475 respondents (age 18 - 60 +)	44 items
10	eHealth Literacy Questionnaire (eHLQ)	2018	Kayser, L et al	Denmark	475 individuals (age 16 - 74)	35 items

Continuation of table 1.

#	Name of Health Literacy Instrument	Year	Authors	Country	Sample	Number of items
11	Transactional eHealth Literacy Instrument (TeHLI)	2019	Paige, S. R. et al	USA	5 experts and 25 end-users 283 participants (age 64.34 years ± 10.4 years)	18 items
12	Digital health literacy assessment (DHLA)	2020	Liu P et al	Taiwan	350 participants (age 20+)	10 items
13	eHealth Literacy Scale in Web 3.0 contest (eHLS-Web 3.0)	2021	Liu H et al	China	1421 students in study 1 (age 20.5 years ± 1.4) and 8 health experts (age 38.3 ± 5.9) + 741 students in study 2 (age 21.3 years ± 1.4)	24 items
14	eHealthy Diet Literacy Questionnaire (e-HDLQ)	2021	Van Duong, T et al	Taiwan	1342 adults (age 18 +)	11 items
15	Revised German eHealth Literacy Scale (GR-eHEALS)	2022	Marsall M et al	Germany	470 people aged 23 - 72 years	16 items

In the thematic evolution of the eHealth literacy measurement, three stages of development were identified in the context of domains and skills, with measures of internal consistency by Cronbach-alpha coefficient (Cronbach's Alpha (α)) (Table 2).

Table 2. Stages of eHealth literacy development 2006-2022

Stages	Characteristics	Name	α
1. Formation	Presentation of the concept of eHealth literacy "Lily Model" and the formation of eHEALS - the first scale of eHealth literacy (eHL) for health practitioners.	eHEALS	0.88
	Development of the HLS-EU Conceptual Model of Health Literacy by the European Health Literacy Consortium, the emergence of a European Health Literacy Questionnaire (HL), which aims to bring together the views of medicine and public health on the HL of people in 8 EU countries.	HLS-EU-Q16	0.81
2. Expansion	The eHEALS was translated from English into other languages and approbation in other countries.	PRE-HIT	0.57 -0.87
	The various of the HLS-EU-Q as versions HLS-EU-Q47, HLS-EU-Q16, HLS-EU-Q6 approbation in other countries and mixed with other scales of eHL, digital HL and HL.	eHIQ	0.77- 0.92
	Formation of new electronic, digital, eHEALS literacy scales, questionnaires, instruments, and tools that deeply study basic computer skills, Internet navigation / orientation skills, health information privacy protection skills, communication skills and health information assessment skills.	e-HLS	0.93
		DHLI	0.57 - 0.88
		DHLAT	not
		eHEALS-E	0.52 -0.81
		eHLA	0.59 -0.94
		eHLQ	0.77-0.86
3. Upgrade	Operational skills / basic computer and IT skills / ability to access the Internet with the rapid development of IT and remote working and living in the context of COVID-19 is transforming into navigation skills and online health information seeking (ONIS) skills.	TeHLI	0.87- 0.92
	During the COVID-19 period, health information assessment skills have taken on an emphasis on health information trust skills.	DHLA	0.84 -0.89.
	Increase mixed with other scales of eHL, digital HL and HL.	eHLS-Web 3.0	0.976
	Increase of used scales mixed with other scales of eHL, digital HL and HL.	e-HDLQ	0.64
		GR-eHEALS	0.83-0.92

The detailed study of the content and changes of eHealth skills in a selected eHealth literacy instruments made it possible to find three stages in the development of eHealth Literacy measurements: formation during 2006-2014, extension during 2014-2017, improvement during 2018-2022.

This systematic review of the literature covered seventeen years of bibliometrics. This review extracted and reported a range of health literacy instruments and may be helpful for business, public administration, and international organizations in area healthcare. In addition, the current study might help investigators, and decision makers, who wish to use an instrument for measuring eHealth literacy in E-Government.

Despite a significant number of measurements for assessing eHealth literacy, the availability of unique international instruments for measuring eHealth literacy is currently one of the concerns of public health professionals. This study showed that the most widely used instruments internationally are HLS-EU-Q 16 and eHEALS. Given the wide range of applications of these measurements, they can be considered a prelude to the development of an international instrument for measuring eHealth literacy. The eHLS Web 3.0. which has the highest internal consistency of all selected eHealth literacy instruments, could potentially be used by healthcare providers to assess eHealth literacy.

Given the quality of this instrument, and the number and diversity of study participants, it could be the basis for introducing eHealth literacy into E-Government. It seems that we need a core eHealth literacy instrument that considers the needs of consumers and providers of health services and the need for their regulation at the national and international levels.

Limitations. The main criterion in extracting information was the availability of full-text papers. Otherwise, such studies were removed from the review. In addition, we only reviewed papers that included the words ‘eHEALS’, ‘eHealth literacy measurement’, ‘e-Health literacy measurement, ‘electronic Health literacy measurement’ in the title, abstracts, or keywords. Thus, there is a risk of missing papers that did not use these words.

Conclusion. This review found that there are more than enough instruments to measure health literacy. In addition, we found that several instruments underestimated psychometric properties. However, the evidence suggests that well-designed instruments and adequate screening measures can be useful if appropriately selected based on the objectives of this study.

Perhaps such appointed institutions as The National Health Service of Ukraine (NHSU) and Minister of Health should take responsibility and provide clear guidelines for measuring health literacy as appropriate in process implementation of eHealth literacy instruments in E-Government.

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