Research in Health Science
ISSN 2470-6205 (Print) ISSN 2470-6213 (Online)
Vol. 10, No. 1, 2025
www.scholink.org/ojs/index.php/rhs

Original Paper

Research Progress on E-health Literacy in Patients with Chronic Obstructive Pulmonary Disease

Zheng Wang[1], Yilin Wang[2], Haoyuan Guo[3], Shuang Chen[4], Yanling Li[5*] & Kaihang Li[6*]

[1] School of Nursing, Hebei University, Baoding 071000, China

[2] School of Basic Medicine, Shandong University, Jinan 250000, China

[3] School of Anesthesiology, Hebei University, Baoding 071000, China

[4] Department of Intensive Care Medicine, Affiliated Hospital of Hebei University, Baoding 071000, China

[5*] Department of Nursing, Affiliated Hospital of Hebei University, Baoding 071000, China

[6*] Department of Nursing, Affiliated Hospital of Hebei Mental Health Center, Baoding 071000, China

Corresponding author: Yanling Li, E-mail: xsliyanling@163.com; Kaihang Li, E-mail: 2412888645@qq.com

Received: December 12, 2024 Accepted: January 7, 2025 Online Published: January 13, 2025

doi:10.22158/rhs.v10n1p1 URL: http://dx.doi.org/10.22158/rhs.v10n1p1

Abstract

The development and theoretical model of the concept of e-health literacy, the current status of e-health literacy in patients with chronic obstructive pulmonary disease (COPD), the influencing factors and interventions are reviewed, with a view to providing references for studies related to e-health literacy in COPD patients.

Keywords

chronic obstructive pulmonary disease, e-health literacy, influencing factors, review

1. Introduction

Chronic obstructive pulmonary disease (chronic obstructive pulmonary disease, COPD) referred to as chronic obstructive pulmonary disease (COPD), is a common chronic disease which is mainly characterized by persistent airflow limitation of the airways[1], with a high prevalence, high disability, high morbidity and mortality and high burden of disease, chronic obstructive pulmonary disease has become one of the three major causes of human death[2]. The focus of COPD management is on prevention and control, and the key to successful prevention and control lies in whether the patient is able to perform good self-management[3], but due to the lack of healthcare manpower, insufficient

healthcare services, and personal factors of the patient in China, which leads to poor patient self-management[4-5], and with the development of the "Internet + healthcare", this type of web-based e-health counseling has become one of the three major causes of human deathscauses, this type of web-based e-health counseling has become the main method preferred by most people[6]. However, the huge amount of information on the Internet and its varying quality are also important reasons for the confusion of most people. Some patients sub indicated that it is still difficult to access evidence-based health information about their condition on the Internet, which leads to the lack of patients' ability to obtain solutions to their problems from electronic resources, i.e., low e-health literacy[7]. Therefore, this study reviewed the concept of e-health literacy, assessment tools, current status of research, and influencing factors, with the aim of providing a reference for studies related to e-health literacy in COPD patients in China.

2. Concept of eHealth Literacy

The concept of e-health literacy was initially proposed by Norman[8] scholars, who defined it as an individual's ability to use electronic resources to search for, discover, understand, and evaluate health information, and to apply the information obtained to solve health problems. Together, these skills form a complete framework for e-health literacy and provide an important reference for subsequent research and practice. e-health literacy is addressed from another perspective by Neter scholars[9], who define it as people's ability to use emerging information and communication technologies to enhance or reach their personal health and healthcare goals. On the other hand, Gilstad scholars[10]emphasize that e-health literacy involves identifying and defining health problems, communicating in multicultural and social contexts, finding, understanding, evaluating, and applying e-health information and health technologies, as well as critically applying this knowledge to solve health problems. Paige[11] adopted Walker and Avant's conceptual analysis approach to defining e-health literacy, and the scholar suggests that e-health literacy e-health literacy encompasses fourkey skill sets: (1) functional (orientation and comprehension); (2) communicative (exchange); (3) critical (evaluation); and (4) transformational (application). Although definitions of eHealth literacy continue to evolve, the definition originally proposed by Norman scholars is still widely used and provides a solid foundation for research.

3. eHealth Literacy Theoretical Model

3.1 Lily Model

Lily Model[8] (Lily Model) is a theoretical framework constructed by Norman and Skinner to further parse the connotations of the concept of eHealth literacy after it was proposed. The model breaks down e-health literacy in detail into six core components: traditional literacy, health literacy, scientific literacy, information literacy, media literacy, and computer literacy, which are intertwined and interact with each other, and together constitute an individual's adaptive capacity in the e-health environment. E-health literacy requires more than mastery of computer skills; it requires a combination of multiple core

literacies. The model helps guide the education and training of eHealth literacy. Through targeted education and training for different types of literacies, the level of eHealth literacy of individuals can be improved so that they can better utilize eHealth resources to maintain their own health.

3.2 Comprehensive Model of eHealth Literacy

With the continuous deepening of research, some scholars[10] believe that the Lily model can not fully meet the current context of e-health, which ignores individual differences, therefore, Gilstad scholars added external influences on the basis of the Lily model, arguing that it should also take into account the influence of factors such as health cognition, cultural and social backgrounds, and specific health conditions on an individual's e-health literacy, i.e., an individual's understanding of and attitude towards health issues, cultural background, education level, social status, and individual health conditions all influence how and how well individuals utilize e-health. The Comprehensive Model of eHealth Literacy (CML) has important application value in the measurement, assessment and enhancement of eHealth literacy, and is a more comprehensive and nuanced framework that can help to understand and assess individuals' eHealth literacy levels in greater depth and provide guidance for the development of effective enhancement strategies.

3.3 Interactive Model of eHealth Literacy

In 2018, Paige et al.[11] constructed an interactive model of eHealth literacy (TMeHL) based on the communicative transaction model, which is the broadest theoretical model covering the concept of eHealth literacy, and which posits that eHealth literacy is a hierarchical, intrinsic set of individual skills that mediates the interaction between environmental factors and patient engagement in healthcare. More specifically, an individual's e-health literacy counteracts the negative effects of social and related environmentally generated disruptive factors. TMeHL consists of three literacies: basic literacy, health literacy, and technological literacy. Health literacy and technological literacy constitute a hierarchical structure of eHealth literacy, from low to high: functional eHealth literacy (operant behaviors: orientation and comprehension), interactive eHealth literacy (operant behaviors: communication), critical eHealth literacy (operant behaviors: evaluation), and applied eHealth literacy (operant behaviors: application).

4. Current Status of Research on e-health Literacy for COPD

Chang Ruijing[12] scholars conducted a survey of patients with stable stage of chronic obstructive pulmonary disease in remote areas of southern Xinjiang, and the results of the study showed that the e-health literacy scores of patients with chronic obstructive pulmonary disease were at a moderately low level, and the considerations may be related to the patients' medical conditions, individual factors, and family environments. Wang Ji et al.[13] showed that the average e-health literacy) score of 120 adult COPD patients was (3.63 ± 0.71), which was consistent with the findings of Chang Ruijing scholars. Wahl[14] measured the e-health literacy level of 158 COPD patients, and the results showed that the e-health literacy of COPD patients was at a moderate level. Stellefson[15] investigated 270 COPD

patients, and the results of the study reported that the patients were at a moderate level of e-health literacy, but the patients were less confident in their ability to distinguish between high-quality and low-quality online health information sources. Taken together, national and international studies have shown that e-health literacy among COPD (chronic obstructive pulmonary disease) patients is generally low, and that patients with chronic obstructive pulmonary disease are less confident in their ability to use digital technology and adapt to new forms of health information dissemination.

5. eHealth Literacy Research Tools

5.1 eHEALS: eHealth Literacy Scale

The scale was developed by Norman scholars[8] in 2006 and consists of 8 entries on a 5-point Likert scale, where higher scores are associated with higher levels of eHealth literacy. The reliability of the scale was tested using internal consistency item analysis and retest reliability estimates, and the results showed that the scale demonstrated moderate stability. The scale is currently used in a wide range of groups and has been discontinued for use in other groups such as students, the elderly, etc. However, the scale is based on the e-health literacy scale in the Web 1.0 environment, and is unable to measure the social and interactive nature of Web 2.0.

5.2 Electronic Health Literacy Questionnaire (eHLQ)

The questionnaire[16] contains a total of 35 entries in 7 dimensions, covering a total of 7 dimensions of using technology to process health information, understanding of health concepts and language, ability to actively participate in digital services, feeling safe and in control, motivated to participate in digital services, access to effective digital services, and, digital services appropriate to the needs of the individual, which was validated to be a good fit for the scale. The e-Health Literacy Questionnaire is a multidimensional instrument with robust properties based on a well-defined a priori eHLF framework.

5.3 The Digital Health Literacy Instrument (DHLI)

Developed by Van Der Vaart[17] and others, this tool consists of a self-report scale with 21 entries and seven performance-based tasks, which use self-report to assess actual competence. The instrument measures a range of Health 1.0 (information gathering) and Health 2.0 skills (online interaction) and measures Internet use skills in a self-assessment manner, but is not a direct objective measure of operational skills.

5.4 Electronic Health Literacy Scale (e-HLS)

Developed by Seçkin[18] scholars in 2016, the scale is based on a review of literature related to health literacy and contains 3 dimensions and 19 entries related to behavior, trust, and communication. The scale is based on a 5-point Likert scale with a Cronbach's alpha coefficient of 0.93.The scale is suitable for use among adults and older adults.

5.5 Interactive Electronic Health Literacy Tool

Paige[11] developed the TeHLI based on the eHealth Literacy Interaction Model, which consists of 4 subscales and 18 entries involving 4 dimensions, namely, functional, communicative, critical, and

transformative, and adequately measures the characteristics of e-interaction in the Web 2.0 environment.

5.6 eHLS-Web3.0 EHL Scale (eHLS)

The scale[19] consists of 3 dimensions and 24 items, including acquisition (8 items), validation (6 items), and application (10 items). The scale has good internal consistency reliability and retest reliability, and has been proved to be a reliable tool for assessing Chinese college students' e-health literacy in the Web 3.0 environment. The tool measures not only search skills and communication skills, but also individuals' skills in constructing health datasets, self-tracking, and protecting privacy.

6. Factors Influencing e-health Literacy in Patients with COPD

6.1 Age

Age is one of the key factors governing e-health literacy in patients with chronic obstructive pulmonary disease (COPD). Xu Qian's findings[20] showed that e-health literacy scores were higher among COPD patients aged 60 to 69 years old, and with the increase of age, patients' e-health literacy showed a decreasing trend, i.e., the older the age, the lower the level of e-health literacy. This finding is consistent with the findings of Tennant scholars[21] that the younger the age of the patients, the higher the level of e-health literacy. This difference may be attributed to the fact that older people have difficulty in assessing the application of e-health information in research as their physiological functions gradually diminish with age, and their ability to accept and learn new things decreases[11].

6.2 Gender

At present, the influence of gender on e-health literacy has not yet formed a unified conclusion. Some studies have shown[22] that women have higher levels of e-health literacy than men. However, it has also been shown in several studies[14] that there is no significant association between gender and eHealth literacy level. Future studies may further delve into the specific impact of gender factors on patients' eHealth literacy in order to obtain more accurate and comprehensive conclusions.

6.3 Educational Level

The higher the literacy level of COPD patients the higher their e-health literacy scores[20], which may be related to the fact that older adults with high literacy levels are more inclined to seek e-health information on the Internet, and have a stronger awareness of health information resources[23]. Foreign scholars Stellefson[15] and other research results are the same as above, the COPD patients with high literacy level have good comprehension ability, and at the same time, they will actively seek online health resources, so their e-health literacy level is higher.

6.4 Disease Severity

According to the results of a study[24], e-health literacy in COPD patients is affected by the severity of the patient's disease; the more severe the patient's disease, the higher the level of e-health literacy, and e-health literacy was positively correlated with lung-specific HRQoL. This may be related to the fact that patients with severe disease have a greater need for knowledge about their disease, and that

patients access the internet through frequent visits to find information about self-management of their relevant disease.

6.5 Self-efficacy

It has been shown[15] that the higher the self-efficacy of patients, the higher their level of e-health literacy. In addition, self-efficacy in COPD patients is associated with being able to differentiate between high-quality and low-quality resources. COPD patients with higher self-efficacy are more aware of where to find useful resources and how to use health information on the Internet to make health decisions for self-management.

6.6 Technophobia

Jiang[25] showed that technophobia is a predictor of e-health literacy and that technophobia is negatively correlated with the level of e-health literacy. COPD patients with technophobia may show behaviors such as refusing to escape or develop some negative physical or emotional problems when facing e-health technology, which in turn affects their e-health literacy level.

6.7 Social Support

Social support plays a key role in improving disease management and e-health literacy in patients with chronic obstructive pulmonary disease (COPD), and social support is crucial for patients with COPD to maintain good health and COPD prognosis, and social support can enhance patients' self-efficacy, which can promote patients' transformation of e-health information into health behaviors, and improve the level of patients' e-health literacy[15].

6.8 Disease-related Knowledge and Computer Literacy

COPD patients with higher levels of disease knowledge can enhance their e-health literacy levels[13], the reason for which may be related to the gradual increase in the patient's knowledge and understanding of the disease, which contributes to their self-efficacy and changes in behavior related to the disease state, similar results were found by Stellefson scholars[15], who argued that a richer level of COPD-related knowledge predicts a higher level of ehealth literacy, with COPD patients having greater disease knowledge and greater awareness of health resources available on the Internet. Studies have shown a positive correlation between a patient's level of computer literacy and their level of e-health literacy[8], the more computer literate a patient is, the correspondingly higher their e-health literacy is. This emphasizes the importance of mastering digital technology to enhance e-health literacy.

7. Status of e-health Literacy Intervention for Patients with COPD

At present, the field of e-health literacy intervention for patients with chronic obstructive pulmonary disease (COPD) is still in the exploratory stage, and there are fewer studies on e-health literacy intervention for patients with COPD. The following is the current status of e-health literacy intervention for patients with chronic diseases, with a view to providing e-health literacy levels for patients with chronic obstructive pulmonary disease (COPD).

7.1 eHealth Literacy Training

E-health literacy training has been shown to have a significant effect on e-health literacy enhancement. Nahm scholars[26] recruited 272 patients with chronic diseases and conducted a 3-week theory-based portal e-learning program (T-PeP) for older adults with chronic diseases to help patients learn to use the portal and improve their self-management skills. The T-PeP mainly consisted of portal information, functions, and relevant evolution videos, and patients can use the program to access their electronic health records and communicate with providers. Through this e-health literacy training, the results showed that patients' health decision-making skills, doctor-patient communication skills, and e-health literacy were positively improved. Sun Ju Chang [27] utilized an intervention mapping approach with the information-motivation-behavioral skills model as a conceptual framework to develop an e-health literacy education program and recruited 11 older adults for a pilot study. This pilot study demonstrated that this e-education program was an effective method to improve e-health literacy among older adults, and that patients' internet knowledge, attitudes toward internet-based health information, level of understanding of internet-based health information, and patients' e-health literacy were significantly improved. Through e-health literacy training, patients with chronic diseases can learn how to effectively access, understand and apply e-health information, and improve their ability to utilize e-health.

7.2 Social Support Intervention

Some studies have shown that e-health literacy and social support have a chain-mediated role in older patients with chronic diseases, which suggests that social support interventions play an important role in enhancing patients' e-health literacy and improving patients' health status [28]. Scholars from Anna[29] developed a digital network website for patients with chronic lung disease and recruited patients with chronic lung disease to take part in this study and conducted personal and focus group surveys on the health care workers and patients who took part in this study, workers and patients in personal and focus interviews. Collaboration between the multidisciplinary team and patients created new knowledge and understanding about the daily lives of patients with COPD and improved patients' ability to utilize e-health information. Nahm scholars[26] conducted a portal e-learning program for patients with chronic diseases with the addition of a forum and encouraged active participation in the exchange of information, and the results of the study showed that this study improved patient information management and effectiveness, and not only helped patients to better manage information, but also helped patients to better manage their health efficacy, which not only helped patients to better manage information, but also enhanced their support and care from family, friends, and society at the material-economic and emotional levels. Thus, the patients' ability to access and utilize digital resources was further facilitated, thus improving their e-health literacy. In addition, an online courses (MOOCs) program developed by an academic[30] within the framework of the European project IC-Health has achieved significant results. Through the form of focus group sessions, participants discussed their experiences and needs of Internet use together, encouraging and supporting each other.

This form of interaction not only enhanced the social connection among participants, but also improved their eHealth literacy.

7.3 Comprehensive Intervention Program

Yu Jingli[32] scholars constructed an e-health literacy intervention program for young and middle-aged stroke patients and verified its effectiveness, with its intervention content focusing on the four aspects of orientation comprehension, communication, assessment and application, and the results of the study showed that the e-health literacy intervention program for young and middle-aged stroke patients based on the TMeHL model can effectively improve the level of e-health literacy of the patients. Hu Yufan[33] scholars constructed an e-health literacy intervention program for stroke patients based on the information ecology theory through quantitative research, literature research method, etc. Combined with the patients' own characteristics and needs, they assessed the intervention effect using the e-health literacy scale, the health information searching behavioral scale, the information self-efficacy scale, and the test questions of health information judging ability, and verified the feasibility of the intervention program. The results of the study showed that the intervention program could effectively improve the e-health literacy of stroke patients. Xu Liangmei scholars carried out the construction and implementation of an intervention program for the online health information identification ability of lupus erythematosus patients, and the results of the study showed that the program had a certain degree of feasibility and effectiveness[34].

8. Summary and Outlook

E-health literacy in patients with chronic lung resistance is generally low, and its influencing factors include demographic factors, psychological factors, disease factors, family and social support, information and media support, as well as disease-related knowledge and computer literacy, etc. Enhancing the e-health literacy of patients with chronic lung resistance can improve the ability of patients to self-manage their health, improve their health outcomes, and improve the quality of life of patients with COPD. At present, e-health literacy intervention for patients with chronic obstructive pulmonary disease (COPD) is still in the exploratory stage, mostly based on descriptive studies, and there is a lack of in-depth intervention studies, and the vast majority of intervention studies lack clear theoretical guidance, resulting in a lack of science in the intervention program[31], so future research needs to be based on the relevant theories, and continue to optimize the assessment tools for e-health literacy, improve the research design, and under the guidance of the theoretical framework, constructing developing and validating an interventional study of e-health literacy in patients with chronic lung resistance, in order to improve the ability of patients with chronic lung resistance to use electronic tools for disease self-management.

References

[1] Chronic Obstructive Pulmonary Disease Group of the Respiratory Disease Branch of the Chinese Medical Association, Chronic Obstructive Pulmonary Disease Working Committee of the Respiratory Physicians Branch of the Chinese Medical Association. Guidelines for the diagnosis and treatment of chronic obstructive pulmonary disease (2021 revised edition). *Chinese Journal of Tuberculosis and Respiratory*, 2021, *44*(3), 170-205.

[2] Chronic Obstructive Pulmonary Disease Group of the Respiratory Disease Branch of the Chinese Medical Association. Chronic Obstructive Pulmonary Disease Diagnosis and Treatment Guidelines (2013 Revision). *Chinese Journal of Frontiers of Medicine: Electronic Edition*, *2014*(2), 67-80.

[3] Fan Tengyang, Ke Di, & Wu Yingqiang. Effects of Knowing, Believing and Doing Model Intervention on Self-Management Behavior of Elderly Hypertensive Patients. *Chinese Community Physician*, *2021*(2), 28-29.

[4] Marklund, S., Tistad, M., Lundell, S., et al. Experiences and Factors Affecting Usage of an eHealth Tool for Self-Management Among People With Chronic Obstructive Pulmonary Disease: Qualitative Study. *J Med Internet Res.* 2021 Apr 30, *23*(4), e25672. https://doi.org/10.2196/25672

[5] Wang Yujiao, & Wang Wenjie. Research progress on self-management ability of patients with chronic obstructive pulmonary disease in the stabilized phase. *Evidence-Based Nursing*, 2023, *9*(20), 3694-3699.

[6] Shiferaw, K. B., Tilahun, B. C., Endehabtu, B. F., et al. E-health literacy and associated factors among chronic patients in a low-income country: a cross-sectional survey. *BMC Med Inform Decis Mak.* 2020 Aug 6, *20*(1), 18. https://doi.org/10.1186/s12911-020-01202-1

[7] Stellefson, M. L., Shuster, J. J., Chaney, B. H., et al. Web-based Health Information Seeking and eHealth Literacy among Patients Living with Chronic Obstructive Pulmonary Disease (COPD). *Health Commun.* 2018, *33*(12), 1410-1424. https://doi.org/10.1080/10410236.2017.1353868

[8] Norman, C. D., & Skinner, H. A. eHEALS: The eHealth Literacy Scale. *Journal of medical Internet research*, 2006, *8*(4), e507. https://doi.org/10.2196/jmir.8.4.e27

[9] Neter, B. E. eHealth literacy: extending the digital divide to the realm of health information. *Journal of Medical Internet Research*, 2012, *14*(1), e19. https://doi.org/10.2196/jmir.1619

[10] Gilstad, H. Toward a comprehensive model of eHealth literacy. Proceedings of the 2nd European Workshop on Practical Aspects of Health Informatics. Trondheim Norway: Norwegian University of Science and Technology, 2014:1.

[11] Paige, S. R., Stellefson, M., Krieger, J. L., et al. Proposing a Transactional Model of eHealth Literacy: Concept Analysis. *J Med Internet Res.* 2018 Oct 2, *20*(10), e10175. https://doi.org/10.2196/10175

[12] Chang Ruijing, Wang Changzhu, & Kuliganati Patikhan. Relationship between self-management ability and e-health literacy among patients with stable COPD in remote areas of southern

Xinjiang. *Occupation and Health*, 2021, *37*(15), 2060-2068.

[13] Wang Ji, & Wang Chunyan. Analysis of the correlation between health literacy, e-health literacy and disease knowledge and quality of life in patients with chronic obstructive pulmonary disease. *Journal of Bengbu Medical College*, 2022, *47*(09), 1210-1213.

[14] Wahl, A. K., Osborne, R. H., Larsen, M. H., et al. Exploring health literacy needs in Chronic obstructive pulmonary disease (COPD), Associations between demographic, clinical variables, psychological well-being and health literacy. *Heart Lung.* 2021 May-Jun, *50*(3), 417-424. https://doi.org/10.1016/j.hrtlng.2021.02.007

[15] Stellefson, M. L., Shuster, J. J., Chaney, B. H., et al. Web-based Health Information Seeking and eHealth Literacy among Patients Living with Chronic Obstructive Pulmonary Disease (COPD). *Health Commun.* 2018 Dec, *33*(12), 1410-1424. https://doi.org/10.1080/10410236.2017.1353868

[16] Kayser, L., Karnoe, A., Furstrand, D., Batterham, R., Christensen, K. B., Elsworth, G., Osborne, R. H. A Multidimensional Tool Based on the eHealth Literacy Framework: Development and Initial Validity Testing of the eHealth Literacy Questionnaire (eHLQ). *J Med Internet Res.* 2018 Feb 12, *20*(2), e36. https://doi.org/10.2196/jmir.8371

[17] van der Vaart, R., & Drossaert, C. Development of the Digital Health Literacy Instrument: Measuring a Broad Spectrum of Health 1.0 and Health 2.0 Skills. *J Med Internet Res.* 2017 Jan 24, *19*(1), e27. https://doi.org/10.2196/jmir.6709

[18] Seçkin, G., Yeatts, D., Hughes, S., et al. Being an informed consumer of health information and assessment of electronic health literacy in a national sample of internet users: validity and reliability of the e-HLS instrument. *J Med Internet Res*, 2016, *18*(7), e161. https://doi.org/10.2196/jmir.5496

[19] Liu, H. X., Chow, B. C., Liang, W., Hassel, H., & Huang, Y. W. Measuring a Broad Spectrum of eHealth Skills in the Web 3.0 Context Using an eHealth Literacy Scale: Development and Validation Study. *J Med Internet Res.* 2021 Sep 23, *23*(9), e31627. https://doi.org/10.2196/31627

[20] Xu Qian, Liu Chunbo, Chen Chong, et al. Analysis of e-health literacy level and its influencing factors in elderly COPD patients. *Zhejiang Clinical Medicine*, 2024, *26*(04), 547-549.

[21] Tennant, B., Stellefson, M., Dodd, V., et al. eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults. *J Med Internet Res.* 2015 Mar 17, *17*(3), e70. https://doi.org/10.2196/jmir.3992

[22] Lee, J., & Tak, S. H. Factors associated with eHealth literacy focusing on digital literacy components: A cross-sectional study of middle-aged adults in South Korea. *Digit Health.* 2022, *8*, 20552076221102765. https://doi.org/10.1177/20552076221102765

[23] Liu, S. Q., Zhao, H. Y., Fu, J. J., et al. Current status and influencing factors of digital health literacy among community-dwelling older adults in Southwest China: A cross-sectional study. *BMC Public Health*, 2022, *22*(1), 996. https://doi.org/10.1186/s12889-022-13378-4

[24] Martinez, C. H., St Jean, B. L., Plauschinat, C. A., et al. Internet access and use by COPD patients

in the national Emphysema/COPD association survey. *BMC Pulmonary Medicine*, 2014, *14*(1), 66. https://doi.org/10.1186/1471-2466-14-66

[25] Jiang, Y., Gao, J., Sun, P., Nan, J., Zou, X., Sun, M., & Song, X. Factors Associated with the e-Health Literacy Among Older Adults with Chronic Obstructive Pulmonary Disease: A Cross-Sectional Study. *Telemed J E Health.* 2024, *30*(4), e1138-e1147. https://doi.org/10.1089/tmj.2023.0394

[26] Nahm, E. S., Zhu, S., Bellantoni, M., Keldsen, L., Russomanno, V., Rietschel, M., Majid, T., Son, H., & Smith, L. The Effects of a Theory-Based Patient Portal e-Learning Program for Older Adults with Chronic Illnesses. *Telemed J E Health.* 2019, *25*(10), 940-951. https://doi.org/10.1089/tmj.2018.0184

[27] Chang, S. J., Yang, E., Lee, K. E., & Ryu, H. Internet health information education for older adults: A pilot study. *Geriatr Nurs.* 2021 Mar-Apr, *42*(2), 533-539. https://doi.org/10.1016/j.gerinurse.2020.10.002

[28] Liu Zhiping, Wang Lirong, Lou Chenyan, et al. Mediating role of e-health literacy and social support between depression and quality of life in elderly patients with chronic diseases. *Journal of Nursing*, 2023, *38*(22), 93-96.

[29] Kjellsdotter, A., Andersson, S., & Berglund, M. Together for the Future - Development of a Digital Website to Support Chronic Obstructive Pulmonary Disease Self-Management: A Qualitative Study. *J Multidiscip Healthc.* 2021, 14, 757-766. https://doi.org/10.2147/JMDH.S302013

[30] Littenbe Rg-Tobia Sj, Reichj. Evaluating access, quality, and equity in online learning: A case study of a MOOC-based Blended professional degree program. *The Internet and Higher Education*, 2020, 100759. https://doi.org/10.1016/j.iheduc.2020.100759

[31] Hao Chenlu, & Hu Ming. Progress of e-health literacy research in elderly patients with chronic diseases. *Nursing Research*, 2023, *37*(03), 506-510.

[32] Yu Jingli. Construction and effect evaluation of e-health literacy intervention program for young and middle-aged stroke patients. Henan University of Science and Technology, 2023.

[33] Hu Yufan. Construction and empirical study of e-health literacy intervention program for elderly chronic disease patients. Nanjing University of Traditional Chinese Medicine, 2024.

[34] Xu Liangmei. Construction of an intervention program for online health information identification ability of patients with systemic lupus erythematosus. Anhui Medical University, 2021.