The Role Of Health Education Technology In Preventing Chronic Diseases: A Systematic Review

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Abstract

Background: Health technology, including wearable fitness trackers, MRI equipment, and telehealth systems, improves medical treatment, accessibility, and efficiency. This systematic review explores technologies promoting health education for chronic diseases.

Method: A thorough search of databases, including Scopus, PsycINFO, and Web of Science, was conducted to categorize relevant research published between 2019 and 2023. The inclusion criteria was for this, studies on health education technology in preventing chronic diseases conducted in the healthcare setting, published in peer-reviewed journals, conference proceedings, or English-written reports. The selected studies must also offer helpful information on team dynamics and employ recognized measurement scales. Following an initial

screening and quality evaluation, fifteen studies were included in the synthesis. Results: The study database was searched through electronic databases, identifying 426 records. Fifteen unique papers were assessed for eligibility based on titles and abstracts. After initial screening, 15 studies were selected for full-text assessment. After an independent review, 15 studies met the criteria and were included in the systematic review. The selected studies were conducted between 2019 and 2023 and varied in design. The PRISMA flowchart illustrates the selection process. Quality evaluation involves peer-reviewed journals, overall assessment, and quality management. The result suggested themes of health technology education for preventing various diseases such as cancer, cardiovascular diseases, TB, arthritis, and neurological diseases.

Conclusion: A systematic review suggests that health education technology can prevent chronic diseases like cancer, TB, arthritis, lung and neurological disorders, and lung illness. However, resource limitations and fewer neutral results may suggest bias in favour of promising technology. Healthcare technology education is recommended, with free programs for healthcare professionals.

Keywords: Health Education technology, Preventing Chronic Diseases, A Systematic Review

Introduction

The term "health technology" encompasses a wide range of instruments, apparatuses, and inventions intended to improve the provision and calibre of medical treatment. These technologies have many uses, from wearable fitness trackers and MRI equipment for medical purposes to telehealth and telemedicine systems that enable remote consultations. Patient treatment and data management are streamlined by health information technology, including electronic health records and applications (Amano et al., 2023). Alruwaili et al.'s 2023 study examined the integration of technology and innovation in community health nursing practice in Saudi Arabia. The review covers various aspects, including technological tools and innovative techniques, providing insights into the current landscape of community health nursing. (Alqarni et al., 2023)

Robotics and artificial intelligence are advancing in surgery, diagnostics, and data analysis, and 3D printing helps create personalized medical solutions. Health sensors and wearables monitor and gather vital health data, while genomic medicine uses genetic information to provide individualized therapies. Combining these technologies will make healthcare delivery more accessible, efficient, and better for patients. The ever-changing and dynamic character of health technology underscores

its vital role in shaping the future of healthcare. (Al-Kubaisi et al., 2022; Al-Kubaisi et al., 2023; Alruwaili et al., 2023; Matmi et al., 2023)

The COVID-19 pandemic has increased demand for fast, practical solutions to manage and treat viral infections. Telemedicine and other e-health technologies could alleviate pressure on the healthcare system. However, due to lacking regulations and recommendations, stakeholders need help validating and approving digital health technologies, necessitating proper scientific research (Senbekov et al., 2020). Furthermore, Digital Health Education Collaboration revealed that virtual patient simulations significantly enhance learning outcomes in knowledge acquisition, clinical skills development, and overall learner satisfaction (Kononowicz et al., 2019). Another study finding contributes valuable information to the ongoing discourse on improving public health education and practice in the region, addressing the perspectives of key players within the field (Alaklabi et al., 2023).

Technology within healthcare helps the physicians and nursing staff to prevent chronic disease. It also helps reduce the workload from the professional and provides and makes them compassionate toward the work. Azizoddin et al. (2021) used mobile health technology to improve patient education and self-management for advanced cancer pain. A multidisciplinary approach involved healthcare professionals and technology experts. Real-time monitoring and personalized interventions improved patient engagement, highlighting the potential of technology-enhanced cancer care. A study conducted examining the use of eHealth in individuals with chronic diseases to investigate the influence of sociodemographic factors on its utilization. Published in the International Journal of Environmental Research and Public Health, the research explored the impact of various sociodemographic variables on adopting eHealth technologies for managing chronic conditions. The findings, revealing a significant interplay between sociodemographic characteristics and eHealth engagement, contribute valuable insights into the nuanced dynamics shaping the use of technology in chronic disease management (Reiners et al., 2019).

The integrative review by Sá et al. (2019) explores technologies fostering health education for the elderly community, synthesizing existing literature and offering a comprehensive overview of the role of technology in enhancing health education for older people. The authors examine various technological interventions and their impact on promoting health awareness among older populations. It also found valuable insights for healthcare practitioners and policymakers seeking effective strategies to leverage technology for health education initiatives targeted at older people. This review underscores the potential of technology as a facilitator for improving health outcomes and promoting wellbeing in elderly communities. A research by Refai et al. (2022) showed

the link between electronic cigarette smoking and asthma, focusing on the influence of mental health. The review provided a comprehensive understanding of the intricate relationship between electronic cigarette use, asthma, and mental health, offering insights into potential impacts on respiratory health and psychological wellbeing.

The effect of pre-and post-health education on knowledge levels and self-efficacy in pregnant women with urinary tract infections was investigated in a research published in HIV Nursing. The study's findings highlight the value of specifically tailored education for expectant mothers and showed improved knowledge and self-efficacy following health education sessions. The results provide crucial new information on treating and avoiding urinary tract infections for medical professionals (Yakout et al., 2023). However, health technology education is vital for the nursing staff to deal with that technology effectively. It provides insights into the necessary skills and knowledge for nurses to adapt and succeed in this transformative medical era (Oraibi et al., 2022). Moreover, a bibliometric study of digital technology in cardiology offers a thorough summary of the trends, patterns, and developments in the discipline and essential insights into the academic environment (Yeung et al., 2020).

However, using artificial intelligence (AI) in biomedicine, healthcare, and medical education is another exciting and quickly expanding field. AI has the potential to enhance the functionality and performance of diagnostic systems greatly. Additionally, it may aid in optimizing treatment plans, raising therapeutic efficacy, improving patient satisfaction, and saving expenses (He et al.,2019). Clinical research and biological experimentation may be carried out more easily with the help of AI. AI is also essential in fields that need manual work and automation. Even with recent advancements, AI still needs to be ableompletely replace people in the biomedical and healthcare fields (Angus, 2020).

Methods

Research Objective

The research objective is to explore the role of health education technology in preventing chronic diseases.

Research Question

1. How does health education technology have an impact on preventing chronic disease?
2. What are the different types of health technology education for preventing chronic disease?

Literature Search Strategy

A comprehensive search strategy was developed to identify relevant studies. Databases such as Scopus, PsycINFO and Web of Science were searched using a combination of keywords related to “Health Education”, “Health Technology Education", and "Role of Health Technology Education on prevention of chronic disease.”

Table 1 Syntax Search

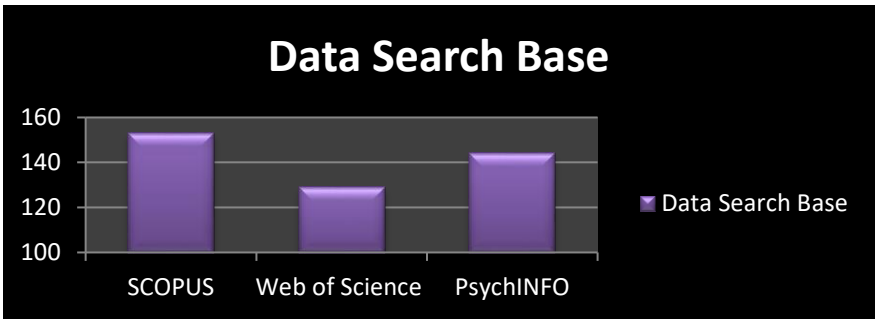
Syntax 1	“Health Technology Education” and “Prevention the Chronic Disease”
Syntax 2	“Role of Health Technology Education on Prevention the Chronic Disease.”

Table 2 Statistics from the Data Base

No	Database	Syntax	Year	No of Researches
1	Scopus	Syntax 1	2018 - 2023	86
		Syntax 2		67
2	Web of Science	Syntax 1		75
		Syntax 2		54
3	PsycINFO	Syntax 1		89
		Syntax 2		55

The study utilized Scopus, Web of Science, and PsycINFO databases to identify relevant research publications from 2018-2023. The most significant articles were found in Scopus 153, PsycINFO 144 and Web of Science 129, demonstrating thoroughness in the scientific search. The total research searched as 426.

Figure 1



Graphic representation of search database according to different search engines

Inclusion and Exclusion Criteria

The review included studies about the role of health education technology in preventing chronic diseases conducted in the healthcare setting, published in peer-reviewed journals, conference proceedings, or English-written reports. They were excluded if they did not meet the criteria or were duplicates.

Quality Assessment

The quality and methodological rigour of the included studies were assessed using appropriate tools, such as the Joanna Briggs Institute Critical Appraisal Checklist for various study designs. The assessment considered study design, sample size, data collection methods, and potential biases. Studies were excluded based on quality assessment, but the findings were interpreted in light of their methodological strengths and limitations.

Table 3 Assessment of the literature quality matrix

Sr #	Author	Are the selection of studies described appropriately	Has the literature covered all relevant studies	Does the method section describe?	Were findings clearly described?	Quality rating
1	Ye, J.	Yes	Yes	Yes	Yes	Good
2	Smith et al.	Yes	Yes	Yes	Yes	Good
3	Awad et al.	Yes	Yes	Yes	Yes	Good
4	Pashayan et al.	Yes	No	Yes	Yes	Good
5	Solomon et al.	Yes	Yes	Yes	Yes	Good
6	Searcy et al.	Yes	Yes	Yes	Yes	Good
7	Choi et al.	Yes	Yes	Yes	Yes	Good
8	Schorr et al.	Yes	Yes	Yes	Yes	Good
9	Busnatu et al.	Yes	Yes	Yes	Yes	Good
10	Buss et al.	Yes	Yes	Yes	Yes	Good
11	Gray et al.	Yes	Yes	Yes	Yes	Good
12	Lee et al.	Yes	Yes	Yes	Yes	Good
13	Thiong'o et al.	Yes	Yes	Yes	Yes	Good
14	Dasgupta	Yes	Yes	Yes	Yes	Good
15	Guo et al.	Yes	Yes	Yes	Yes	Good

The systematic review of studies provided clear descriptions, methods, selection processes, literature coverage, and clear conclusions, resulting in a "Good" rating for their quality.

Study Selection

Two independent reviewers screened retrieved studies for eligibility, then reviewed full-text articles against inclusion and exclusion criteria, with disagreements resolved through discussion or consultation with a third reviewer.

Table 4 Selected Studies for SR (Systematic Review

No	Author	Research	Year
1	Ye, J.	The role of health technology and informatics in a global public health emergency: Practices and implications from the COVID-19 pandemic.	2020
2	Smith et al.	New technologies, new disparities: The intersection of electronic health and digital health literacy.	2019
3	Awad et al.	Connected healthcare: Improving patient care using digital health technologies	2021
4	Pashayan et al.	Personalized early detection and prevention of breast cancer: ENVISION consensus statement	2020
5	Solomon et al.	Digital health technologies: Opportunities and challenges in rheumatology	2020
6	Searcy et al.	Mobile health technologies for older adults with cardiovascular disease: Current evidence and future directions.	2019
7	Choi et al.	A systematic review of mobile health technologies to support self-management of concurrent diabetes and hypertension.	2020
8	Schorr et al.	Harnessing mobile health technology for secondary cardiovascular disease prevention in older adults: A scientific statement from the American Heart Association.	2021
9	Busnatu et al.	The role of mHealth technology in the secondary prevention of cardiovascular disease	2019
10	Buss et al.	Primary prevention of cardiovascular disease and type 2 diabetes mellitus using mobile health technology: Systematic literature review.	2020
11	Gray et al.	Digital health technology in the prevention of heart failure and coronary artery disease	2022
12	Lee et al.	Use of digital technology to enhance tuberculosis control: Scoping review	2020
13	Thiong'o et al.	Digital twin technology: The future of predicting neurological complications of pediatric cancers and their treatment	2022
14	Dasgupta	Microbial Technology for Neurological Disorders	2023
15	Guo et al.	Mobile health technology to improve care for patients with atrial fibrillation.	2020

Result

Study Database

A systematic search of electronic databases identified 426 records. After removing duplicates, 15 unique papers were assessed for eligibility based on titles and abstracts.

Title and Abstract Screening

During the initial screening, the reviewer assessed the titles and abstracts of the identified records. Following this process, 15 studies were selected for full-text assessment. Disagreements between the reviewers were resolved through discussion and consensus.

Full-Text Assessment

The full texts of the 15 selected studies were obtained and independently reviewed against the inclusion and exclusion criteria by two reviewers. Following the full-text assessment, 15 studies met the criteria and were included in the systematic review.

Study Characteristics

The selected studies were conducted between 2019-2023 and varied in design, with 1 being systematic research 6, narrative research 4, randomized control 1, scoping 1, scientific research 1, LR 1 and experimental research 1.

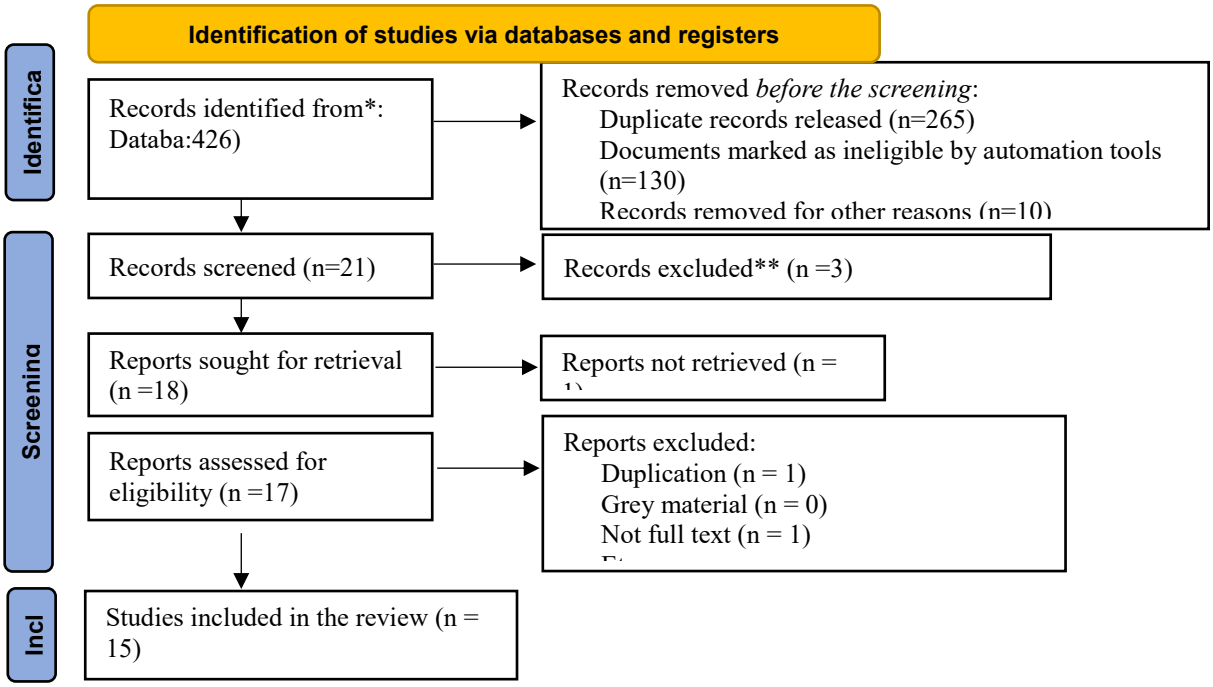
PRISMA Flowchart

The study selection process is illustrated in the PRISMA flowchart (Table 4). It visually represents the number of records at each stage of the selection process, from the initial database search to the final inclusion in the systematic review.

Identification of studies via databases and registers

Quality evaluation is a systematic process that involves assessing study quality using data from peer-reviewed journals, overall assessment, and quality management, providing valuable information on research techniques and pressure application.

Table 5 Identification of Studies via Database



Data Extraction

A standardized data extraction form was developed and pilot-tested. Two reviewers independently extracted relevant data from the selected studies, including study characteristics (authors, publication year), participants' characteristics, key findings, and other relevant information—any discrepancies resolved through consensus.

Table 6 Research Matrix

Author, Year	Aim of study	Methodology	Sample	Setting	Result
Ye, J. (2020)	Role of health technology and informatics in a global public health emergency	Literature Review	Not specified	China	Examines practices and implications of the COVID-19 pandemic
Smith, B., & Magnani, J. W. (2019)	The intersection of electronic health and digital health literacy	Narrative Review	N/A	University of Pittsburgh Medical Center, Pittsburgh,	Discusses disparities at the intersection of electronic health and digital health literacy
Awad, A., et al. (2021)	Connected healthcare using digital health technologies	Narrative Review	N/A		Highlights improvements in patient care through digital health technologies
Pashayan, N., et al. (2020)	Personalized early detection and prevention of breast cancer	Narrative Review	N/A	Department of Applied Health Research, Institute of Epidemiology and Healthcare, University College London, London, UK	Proposes ENVISION consensus statement for personalized breast cancer prevention
Solomon, D. H., & Rudin, R. S. (2020)	Opportunities and challenges of digital health technologies in rheumatology	Systematic Review	Not specified	Not specified	Explores opportunities and challenges in integrating digital health technologies in rheumatology
Searcy, R. P., et al. (2019)	Mobile health technologies for older adults with cardiovascular disease	Systematic review	Older adults with cardiovascular disease	University of North Carolina School of Medicine	Reviews current evidence and suggests future directions for mobile health technologies in older adults with cardiovascular disease
Choi, W., et al. (2020)	Mobile health technologies for concurrent diabetes and hypertension self-management	Systematic review	11 studies	USA	Provides a systematic review of mobile health technologies supporting self-management of diabetes and hypertension

Schorr, E. N., et al. (2021)	Harnessing mobile health technology for secondary cardiovascular disease prevention in older adults	Scientific statement	26 Studies	N/A	Offers a scientific statement from the American Heart Association on using mobile health technology for secondary cardiovascular disease prevention in older adults
Busnatu, S. S., et al. (2019)	Role of mHealth technology in secondary prevention of cardiovascular disease	Experimental research	71	Europe	Discusses the role of mHealth technology in the secondary prevention of cardiovascular disease
Buss, V. H., et al. (2020)	Primary prevention of cardiovascular disease and type 2 diabetes using mobile health technology	Systematic review	941 studies	N/A	prevention of cardiovascular disease and type 2 diabetes using mobile health technology is effective
Gray, R., et al. (2022)	Digital health technology in the prevention of heart failure and coronary artery disease	A systematic review of Randomize controlled design	6.5 billion people	N/A	digital health technology is helpful in preventing heart failure and coronary artery disease
Lee, Y., et al. (2020)	Use of digital technology to enhance tuberculosis control	Scoping review	145 Studies	N/A	Conducts a scoping review on the use of digital technology to enhance tuberculosis control
Thiong'o, G. M., & Rutka, J. T. (2022)	Digital twin technology in predicting neurological complications of pediatric cancers	Narrative studies	N/A	Canada	Discusses the future of predicting neurological complications using digital twin technology Dasgupta, A. (2023) Microbial Technology for Neurological Disorders Not specified Not specified Not specified.

Dasgupta, A. (2023)	Microbial Technology for Neurological Disorders	Narrative studies	N/A	N/A	Discussion on microbial technology is effective in preventing neurological disorders
Guo, Y. et al. (2020)	Mobile health technology to improve care for patients with atrial fibrillation	Cluster Randomized	1646 participants	China	Improved care for patients and Explores the use of mobile health technology to improve care for patients with atrial fibrillation.

Data Synthesis

The synthesized findings were presented through a narrative synthesis approach, exploring the role of health education technology in preventing chronic diseases. Quantitative results, if available and comparable, may be pooled for meta-analysis. Heterogeneity among studies was assessed using appropriate methods.

Table 7 The following sub-themes have been observed among the studies, including in the systematic review.

Themes	Sub-themes
1	Health Technology Education for Cancer Prevention
2	Health Technology Education for Cardiovascular Prevention
3	Health Technology Education for TB Prevention
4	Health Technology Education for Arthritis Prevention
5	Health Technology Education for Neurological Disease Prevention

Discussion

Health technology education is effective in preventing diseases. The breast cancer is increasing due to a lack of prevention programs. Focused on breast cancer, the research presents the ENVISION consensus statement, advocating for personalized early detection and prevention. It underscores the need for a tailored approach based on individual risk factors in the fight against breast cancer (Pashayan et al., 2020).

Cardiovascular disease is prevalent among any age group. The rate of cardiovascular diagnoses has increased. To prevent cardiovascular disease hea, lth technology is very effective in early diagnosis. Investigating mobile health technologies for older adults with cardiovascular disease, this study reviews current evidence and future directions. It assesses the potential benefits and challenges of implementing these technologies in managing cardiovascular health in older people (Searcy et al., 2019). This research discusses using mobile health technology for secondary cardiovascular disease prevention in

older adults. It presents a scientific statement from the American Heart Association, emphasizing the potential of harnessing digital health for improved cardiovascular outcomes in older people (Schorr et al., 2021). Also, regarding the role of mHealth technology in the secondary prevention of cardiovascular disease, this study explores the current evidence. It discusses the potential impact of digital solutions on preventing cardiovascular events (Busnatu et al., 2019). Centred on digital health technology, this study explores its role in preventing heart failure and coronary artery disease. It specifically discusses how these technologies can be leveraged to improve outcomes and prevent the development of these cardiovascular conditions (Gray et al., 2022).

Diabetic is also linked to cardiovascular disease. Conducting a systematic review, this research evaluates mobile health technologies supporting self-management of concurrent diabetes and hypertension. The study provides insights into the effectiveness of these technologies in empowering individuals to manage both conditions simultaneously (Choi et al., 2020). This systematic review examines the use of mobile health technology for the primary prevention of cardiovascular disease and type 2 diabetes mellitus. The research assesses the existing literature to understand the effectiveness of these technologies in preventing these chronic conditions (Buss et al., 2020).

A study investigated the use of digital technology to enhance tuberculosis control; this scoping review explores various applications of digital solutions in the fight against tuberculosis. It provides insights into how technology can contribute to more effective tuberculosis control strategies (Lee et al., 2020).

This research delves into digital twin technology's potential in predicting neurological complications of pediatric cancers and their treatment. It explores how digital twins can contribute to personalized and predictive approaches in managing neurological issues associated with pediatric cancer **(**Thiong'o & Rutka,2022). Dasgupta (2023) has focused on microbial technology for neurological disorders. It specifically discusses the application of microbial technology in understanding and potentially treating neurological disorders.

A systematic review also explores the health education technology and prevention of other diseases such as arthritis and lungs. The result suggested the use of mobile health technology to improve care for patients with atrial fibrillation. The study discusses how digital solutions can enhance the management of atrial fibrillation, ultimately improving patient outcomes (Guo et al., 2020). Addressing rheumatology explores opportunities and challenges associated with digital health technologies. These technologies' impact on rheumatologicpractices and patient care is very effective (Solomon & Rudin, 2020). Another focuses

on the crucial role of health technology and informatics during global public health emergencies, using the COVID-19 pandemic as a case study. It explores practices and implications, highlighting the integration of digital solutions in managing such crises effectively (Ye, 2020).

Limitation & Implications

This systematic review, which is based on published studies, can leave out unreported or grey information about the role of health education technology in preventing chronic disease. However, the risk of publication bias was deemed high as only published studies were included, potentially removing unreported or grey material. The review followed methodology norms, but resource limitations prevented it from organizing all relevant technologies. The review produced fewer neutral or negative results, potentially indicating a bias favouring promising technology.

Recommendations

Future studies could use unpublished information and research from government-run and nonprofit groups and engage subject-matter experts to reduce this limitation. It is suggested that healthcare technology education for preventing chronic diseases such as cancer, TB, arthritis and cardiovascular diseases. The technology prevents the individual from any severe stage of illness or developing any diseases. It is recommended to provide free technological education programs for people to assess themselves yearly. Also, training programs should be given to healthcare professionals who need knowledge about health technology.

What does this article add to existing literature?

This systematic review gathered the research which explores and examine**s** the role of health education technology in preventing chronic disease. It also describes the conditions, what type of technology is used, and what is practical or helpful in preventing chronic diseases. It discusses chronic diseases concerning health technology, such as cancer, TB, arthritis, lung and neurological disorders, and lung illness in this systematic review.

Conclusion

Based on a systematic review, it is concluded that the role of health education technology in preventing chronic disease. It has discussed chronic diseases concerning health technology, such as cancer, TB, arthritis, lung, neurological disorders and lung illnesses. Based on published studies, the systematic review of health education technology's role in preventing chronic disease may exclude unreported or grey information. However, resource limitations and fewer neutral results may indicate bias in favour of promising technology. Healthcare technology education is recommended to prevent chronic diseases like cancer, TB, arthritis, and cardiovascular diseases. Free educational programs should

be provided for self-assessment and training for healthcare professionals needing more knowledge about health technology. This will prevent severe illness and disease development.

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