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Advances in artificial intelligence ophthalmic nursing in China over a decade

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我国近十年眼科护理在人工智能领域的研究进展

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摘要

随着数字时代的不断发展以及跨学科领域的持续合作,人工智能(AI)在医学领域的专业化应用已取得显著进展。眼科对精确度的要求极高,且对智能解决方案的需求旺盛,尤其是在护理方面。因此本研究对国内文献全面回顾,探讨 AI 在眼科护理中的临床实践及现状。采用范围综述框架,相关文献从万方、中国知网(CNKI)、维普、PubMed、Web of Science 等数据库检索,检索时间范围为 2013 年 1 月至 2023 年 12 月。依照纳入和排除标准,对文献进行筛选,并对选定的文章进行数据提取。最终纳入综述的文章共 20 篇。中国在眼科护理中 AI 的发展相对较新,尚未全面展开。护理专业人员需要在新技术和新项目方面持续创新,以有效融入智能医疗的发展。

关键词:人工智能(AI);护理;眼科;综述

Abstract

• With the continuous transformation of the digital era and the ongoing collaboration of interdisciplinary fields, specialized applications of artificial intelligence (AI) have already made significant strides in the field of medicine. Given the precision required in ophthalmology and its high demands for intelligent solutions, particularly in the realm of nursing care, this study aims to explore the clinical practices and current status of AI in ophthalmic nursing based on a comprehensive review of domestic literature. Employing a scoping review framework, the research questions were formulated, and relevant studies were retrieved from Wanfang, the China National Knowledge Infrastructure (CNKI), VIP, PubMed, and Web of Science. The search spanned from January 2013 to December 2023. In accordance with inclusion and exclusion criteria, literature screening was conducted, and data extraction was performed on selected articles. A total of 20 articles were included in the review. The development of AI in ophthalmic nursing in China is relatively recent and not yet comprehensive. Continuous innovation in new technologies and projects is required by nursing professionals to effectively integrate with the advancements in intelligent medical care.

• KEYWORDS: artificial intelligence (AI); nurse; ophthalmic; review
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INTRODUCTION

The developmental history of artificial intelligence (AI) can be traced back to the mid-20th century when the invention of computers and the rise of digital electronic computation provided the conditions for the emergence of AI[1]. However, from the late 1990s to the early 2000s, a period of stagnation known as the "AI winter" occurred due to insufficient computing power and data[2]. The revival of AI took place in the late 1990s with the emergence of machine learning and statistical methods[3]. From the early 2010s to the present, AI has begun to play a role in the field of medical imaging, utilizing deep learning algorithms for disease diagnosis in medical images such as X-rays, CT scans, and MRIs[4]. In the same timeframe, there has been a focus on the development and application of nursing robots, various remote medical technologies, and health monitoring techniques to assist in rehabilitation, monitor patient conditions, and provide social support[5]. In the early 2020s, virtual assistants have started to be used in medical environments to interact with patients, answer questions, and provide basic medical information[6]. In general, the development of AI in nursing has primarily centered around enhancing medical efficiency and improving the patient care experience. As technology continues to advance, AI is poised to bring more innovations

and improvements to nursing in the future[7-10].

In the dynamic intersection of nursing, AI, and ophthalmology, a paradigm shift is underway, characterized by the seamless integration of professional expertise and cutting-edge technology[11]. This review delves into the pragmatic realm of AI in eye care, assessing its impact on clinical precision, diagnostic accuracy, and patient outcomes. Nursing, as the cornerstone of patient-centered care, provides a crucial context for the integration of AI in ophthalmology[12]. The marriage of nursing proficiency with AI technologies holds the potential to enhance efficiency, streamline processes, and elevate the overall quality of eye care services[13]. Within the specialized domain of ophthalmology, the nuanced application of AI-driven tools is reshaping diagnostic methodologies and treatment approaches[14]. This review navigates through the technical intricacies, exploring how AI augments the analysis of ocular data, expedites diagnostics, and facilitates more targeted interventions. With an emphasis on professional terminology, our examination encompasses key facets such as automated screening processes, and data-driven treatment modalities[15]. The precision afforded by AI complements the discerning skills of nursing professionals, collectively contributing to a comprehensive and refined approach to eye care[16]. As we embark on this exploration, the objective is to provide a lucid understanding of the symbiosis between nursing, AI, and ophthalmology. Through an evidence-based lens, this review dissects the practical implications, challenges, and potentials that arise when these disciplines converge in the pursuit of optimal patient outcomes.

DATA AND METHOD

Research Question The specific research questions are: 1) What are the specific application scenarios of AI in ophthalmic nursing; 2) What are the potential application values of AI in ophthalmic nursing; 3) Compared with foreign countries, where do we fall short; 4) What strategies and suggestions are there for the application of AI in ophthalmic nursing.

Literature Selection Criteria Inclusion Criteria: 1) The study subjects were patients in the field of ophthalmology; 2) The research encompassed both AI and ophthalmic nursing; 3) The study design included cross-sectional research, quasi-experimental studies, randomized controlled trials, and mixed-methods research. Exclusion Criteria: 1) The document type was conference proceedings; 2) Literature that could not be obtained in full; 3) Redundant or low-quality literature.

Search Strategy Formulating the retrieval strategy involved specifying a time span from January 2013 to December 2023. The search was conducted using a combination of controlled vocabulary, free terms, Boolean logical operators, and truncated terms, employing Chinese keywords such as "artificial intelligence", "language model", "machine learning", "deep learning", "intelligent healthcare", "nurse", "nursing", "nursing workflow", "nursing education", "nursing research", "clinical nursing" for the retrieval conditions, the retrieval was carried out in CNKI, Wanfang and VIP databases, and a total of 179 retrieval results were obtained. In PubMed and Web of Science databases, the retrieval formula was constructed according to the title, keywords and abstract, TI = ("AI" OR "artificial intelligence" OR "language model" OR "machine learning" OR "deep learning" OR "intelligent healthcare") AND ("nurse" OR "nursing" OR "nursing workflow" OR "nursing education" OR "nursing research" OR "clinical nursing"), then, the literature was searched using a combination of free-text search and keyword search. Ultimately, PubMed retrieved 3 123 articles, while Web of Science retrieved 2 883 articles. To prevent omissions in the paper screening process, considering the wide variety of eye diseases, no specific ophthalmic-related keywords were set. Researchers then re-screened all retrieved articles to select appropriate ones.

Literature Screening and Data Extraction Two researchers independently screened the literature based on inclusion and exclusion criteria. Initially, duplicate documents were removed using NoteExpress literature management software. Subsequently, titles and abstracts were scrutinized for preliminary screening, and full texts of potentially meeting inclusion criteria were further examined. A data extraction table was established for the standardized extraction of information from the ultimately included literature.

RESULTS

Literature Screening Process and Outcomes No literature related to the theme of this study was found in the English literature database. Most of the ophthalmic AI studies were conducted by clinicians or other national researchers, rather than domestic nursing staff. A total of 179 Chinese databases' articles were retrieved, and eventually, 20 articles met the inclusion criteria. The flowchart depicting the literature screening process is illustrated in Figure 1.

Basic Information of Included Literature The publications included in this study spanned from 2013 to 2023, with 6 articles supported by project funding, and 13 originating from Southern China, as detailed in Table 1.

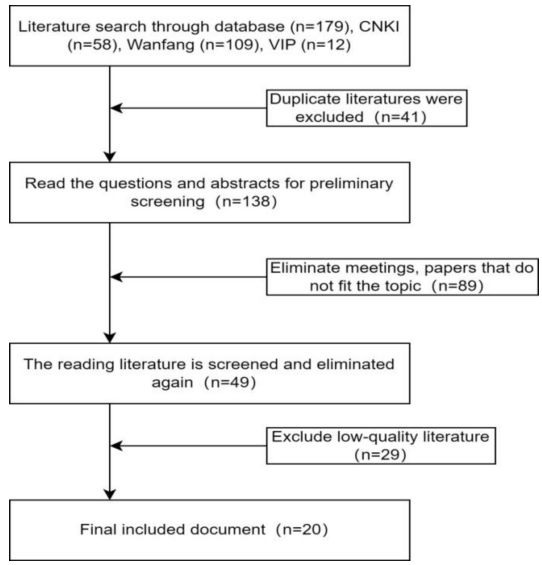

Figure 1 Flow chart of literature screening.

Table 1 Summary of basic information of included literature

First author (Year)	City	Institution	Research technique	Subject	Foundation items
Xie *et al* 2023[17]	Wenzhou	Eye Hospital Affiliated to Wenzhou Medical University	Cross-sectional study	A study on the application of the intelligent nursing cloud platform in the management of ophthalmic day wards	None
Jiang and Tan 2023[18]	Wuhan	Union Hospital Affiliated to Tongji Medical College, Huazhong University of Science and Technology	Experimental study	Effects of intelligent data driven precision teaching in ophthalmic nursing interns	None
Chen *et al* 2023[19]	Hangzhou	The Second Affiliated Hospital of Zhejiang University School of Medicine	Cross-sectional study	Online consultation by ophthalmic patients *via* Internet Plus care service platform and the influencing factor	Zhejiang Province Health Science and Technology Project
Kang *et al* 2023[20]	Shenzhen	Shenzhen Eye Hospital	Experimental study	Application of "Internet Plus" continuing nursing in patients undergoing day surgery in ophthalmology	None
Shen *et al* 2023[21]	Beijing	Beijing Tongren Hospital, Capital Medical University	Experimental study	Application of intelligent mobile health education system in the perioperative period of retinal detachment patients undergoing daytime surgery	None
Shao *et al* 2022[22]	Mudanjiang	The Second Affiliated Hospital of Mudanjiang Medical University	Experimental study	Analysis of the effectiveness of nursing interventions for diabetic retinopathy patients based on an intelligent multidisciplinary information platform	None
Zhang *et al* 2021[23]	Guangzhou	State Key Laboratory of Ophthalmology	Cross-sectional study	Investigation on the demands of artificial intelligence in clinical nursing of ophthalmology	Nursing Research Project of Guangdong Nursing Association
Zhou and Ge 2021[24]	Shanghai	Xinhua Hospital, Shanghai Jiao Tong University Hospital	Review	Status and development of posture nursing after retinal detachment surgery: A literature review	Shanghai Jiao Tong University School of Medicine Science and Technology Fund Research Project
Lin *et al* 2021[25]	Guangzhou	State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Centre, Sun Yat-sen University	Longitudinal study	Application and analysis of artificial intelligence voice system in postoperative follow-up of children with congenital cataract	National Key R&D Program of China and so on
Li *et al* 2020[26]	Hangzhou	Zhejiang Chinese Medical University	Discussion	Discussion on the application of eye-tracking technology in the field of intelligent nursing	Ministry of Education Research Start-up Fund for Returned Overseas Scholars

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Table 1 Summary of basic information of included literature

First author (Year)	City	Institution	Research technique	Subject	Foundation items
Liu *et al* 2019[27]	Shenzhen	Shenzhen Eye Hospital	Cross-sectional study	Development and application of intelligent software for the health management of chronic ophthalmic diseases	None
Li and Wang 2018[28]	Cangzhou	Cangzhou Central Hospital	Experimental study	Application of smartphone-based continuing care in postoperative ophthalmic patients	None
He *et al* 2018[29]	Bengbu	The First Affiliated Hospital of Bengbu Medical College	Experimental study	Application of the WeChat interactive platform in clinical ophthalmic nursing education	None
Wu *et al* 2017[30]	Maoming	Guangdong Institute of Petrochemical Technology	Discussion	The intelligent system of ocular region nursing	None
Yu 2017[31]	Shenyang	The Fourth People's Hospital of Shenyang	Cross-sectional study	Application of intelligent infusion alarm devices in ophthalmic infusions	None
Lin and Mou 2017[32]	Harbin	The First Affiliated Hospital of Harbin Medical University	Qualitative study	Study on the intelligent medicine box in patients with eye disease	National Clinical Key Specialty Construction Project in Nursing
Li *et al* 2017[33]	Wuhan	Ophthalmology Department of Wuhan General Hospital of PLA	Experimental study	Clinical observation of an intelligent periorbital pulse therapy device in the treatment of dry eye syndrome	None
Dai *et al* 2016[34]	Qujing	Ophthalmology Department of the First People's Hospital of Qujing City, Yunnan Province	Experimental study	Application of multimedia scenario mode in ophthalmic health education	None
Liu *et al* 2015[35]	Beijing	Eye ward, the Peking University Third Hospital	Experimental study	Design and application of ophthalmologic peri-operative information systems	None
Wang and Wang 2013[36]	Zhengzhou	School of Nursing, Zhengzhou University	Experimental study	Implementation of the PBL teaching model in ophthalmic clinical nursing education under a network-based environment	None

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Emergence of Artificial Intelligence Trends in the Field of Nursing Through meticulous data analysis of 19 scholarly articles, it is discerned that since 2013, China has embarked on substantial research endeavors in the realm of AI within ophthalmic nursing. The distribution of studies across the years is as follows: 2013 (1 publication), 2014 (0 publications), 2015 (1 publication), 2016 (1 publication), 2017 (4 publications), 2018 (2 publications), 2019 (1 publication), 2020 (1 publication), 2021 (3 publications), 2022 (1 publication), and 2023 (5 publications).

Integration Approaches of Artificial Intelligence and Ophthalmic Nursing Upon perusing these 19 scholarly articles, it becomes apparent that intelligence has found application in various facets of ophthalmology. However, in comparison to its integration into clinical practices, the interdisciplinary application of intelligent nursing remains relatively constrained. Over the past decade in our nation, there have been 3 publications exploring the application of intelligence in ophthalmic nursing education, and 2 delving into the realm of continuous care. The discourse extends to intelligent systems or platforms in 8 publications, investigations into the current state of development and demands in 2 publications, and the exploration of intelligent devices in 3 publications. A detailed breakdown is available in Table 1.

Targets, Methods, and Content of Intelligent Ophthalmic Applications Domestic research indicates that, in 9 publications, the studied subjects are rather broad, encompassing not only patients in ophthalmology but also nursing professionals, without specific granularity. Two publications specifically investigate nursing interns, while others focus on daytime patients, patients after retinal detachment repositioning surgery, patients post-vitrectomy, congenital cataract children, dry eye patients, among others. A detailed breakdown is available in Table 1.

Application Efficacy In evaluating the efficacy of intelligent nursing, the most frequently encountered metrics are satisfaction levels, followed by health literacy rates, psychological assessments, ophthalmic examination scores, and evaluations of teaching effectiveness. Less frequently encountered metrics include fluorescein staining for dry eye patients, tear secretion levels, and tear film rupture time. A detailed breakdown is available in Table 1.

DISCUSSION

This manuscript succinctly delineates the progression of AI in ophthalmic nursing from 2013 to 2023. As the digital era undergoes perpetual transformation and interdisciplinary collaboration becomes more pronounced, the integration of specialized AI into the realm of medicine has long been underway. The application of image diagnostics and information gathering has seamlessly permeated clinical practices, yielding commendable therapeutic outcomes. Given the intricate nature of ophthalmology, there exists a heightened demand for the application of AI, particularly within the domain of nursing[37-38]. Consequently, the authors conducted an exhaustive review of domestic literature spanning the last decade, culminating in a comprehensive synthesis of AI's clinical applications in ophthalmic nursing. This endeavor not only serves as a reflective guide for future nursing practices but also propels the steady advancement of the nursing and healthcare domain.

It is discernible that the trajectory of intelligent ophthalmic nursing exhibits noticeable undulations between 2013 and 2023. This fluctuation is particularly pronounced in 2014, where the count of publications plummeted to zero. Upon scrutinizing a substantial body of literature, it was elucidated that the decline in intelligent nursing outputs during 2014 aligns with existing research findings[39]. In 2017, there was a modest zenith in domestic intelligent ophthalmic nursing, potentially attributed to the ascendance of AI technologies. Clinical ophthalmic nurses recognized the expediency and efficiency with which clinical conundrums could be addressed through intelligent inventions, thus fostering a more extensive application of innovative intelligent solutions[40]. From 2017 to 2020, there was a subsequent downturn in AI ophthalmic nursing, evidenced by a reduction in the number of published papers—a trend incongruent with other research outcomes[39]. This study posits that, commencing in 2017, an increasing cadre of researchers has been engrossed in developing diverse intelligent systems in ophthalmology or crafting clinical intelligent assessment tools. As these AI tools progressively facilitate physicians, ocular nursing professionals may experience a reduction in the inclination and time dedicated to investigating AI ophthalmic nursing, indicative of a burgeoning dependency[41]. Moreover, nursing practitioners may harbor a pervasive psychological gap, perceiving their own research endeavors in AI nursing technologies as decidedly less sophisticated than those invented and pioneered by physicians, potentially diminishing the research impetus among ophthalmic nurses[42].

Commencing in 2020, there was resurgence in domestic AI ophthalmic nursing, reaching its zenith in 2023. This resurgence could be attributed to national policies propelling society to engage and vigorously cultivate intelligent nursing practices[43]. Furthermore, the proliferation of intelligent brands and products has galvanized the initiation of AI ophthalmic nursing within hospital wards[44]. Lastly, in keeping with the global thrust towards the robust development of intelligence, ophthalmic nursing necessitates synchronous alignment with the zeitgeist[45]. However, it is imperative to note that in 2022, there was a lone relevant publication. Upon exploring other nursing disciplines, researchers found a plethora of papers, possibly indicative of a lack of emphasis on research in ophthalmic nursing within comprehensive healthcare institutions[46].

In contrast to physicians, the realm of AI ophthalmic nursing is comparatively circumscribed, necessitating interdisciplinary collaboration in clinical applications[47]. Among the 19 articles retrieved in this study, 6 publications underscore collaborative efforts across diverse disciplines and departments. Notably,

the article titled "Application of the intelligent nursing cloud platform in the management of ophthalmic day wards" exclusively emanated from the Hospital Information Science[17]. Through these instances, it becomes apparent that undertaking independent endeavors in the realm of AI ophthalmic nursing poses considerable challenges for nurses. Within extant research, the majority of papers on AI ophthalmic nursing intricately intertwine with other professional domains.

Within the context of ophthalmic teaching paradigms, discussions traverse intelligent data - driven precision instruction, shifts in teaching methodologies, and the application of the WeChat platform. In the continuum of care, one article pertains to daytime surgical patients[20], and another addresses post - ophthalmic surgical patients[28]. Delving into intelligent systems or platforms, current investigations have explored the "Internet + Nursing Service" platform[19], health management intelligent software systems[27], intelligent nursing cloud platforms[17], intelligent eye care systems[30], and intelligent mobile health education systems[21]. The application of AI in ophthalmic care covers multiple dimensions such as clinical care, health education, chronic disease management, nursing education and intelligent equipment assistance, and is building a patient-centered intelligent nursing service system.

Despite the relatively scant volume of domestic literature on AI ophthalmic nursing in recent years, an examination of research content reveals a commendable comprehensiveness. Given the distinctive nature of ophthalmic surgeries, where certain post - operative cases demand meticulous positional management[48], the consensus on AI ophthalmic nursing positional management remains elusive[49]. Consequently, researchers have conducted surveys to assess the current landscape of AI positional management.

In the clinical domain, for nursing professionals, endeavors that align closely with clinical practice and yield research outcomes more readily often manifest as minor innovations, patents, and the like[50]. Notably, within the purview of Chinese nursing professionals, clinical research on intelligent infusion alarm systems, intelligent drug consolidation boxes, and intelligent periorbital pulse therapy devices has provided insightful benchmarks for inventive nursing papers.

In the realm of research methodologies, domestic literature reveals a prevalence of experimental research approaches, albeit with considerable variance in sample sizes. Among the 19 articles examined, the range of sample sizes spans from 36 cases to 3 818 cases. Two articles employ a cross-sectional research design, with respective sample sizes of 100 and 510 cases. The substantial variability in sample sizes suggests that within the domain of AI ophthalmic nursing, nursing professionals have the latitude to engage in both small-scale and large - scale investigations. This diversity in research approaches augurs well for future endeavors, providing nursing professionals with a spectrum of reference points for sample size considerations.

Qualitative research methods are employed in 2 articles[25,32], complemented by one comprehensive review[24], while the remainder predominantly assumes a discursive nature. The scope of subjects in surveys within the domain of domestic AI ophthalmic nursing is notably extensive. These encompass a diverse array of demographics, including ophthalmic patients[18-19,27-28,31-32,34-36], ophthalmic nursing practitioners[23], nursing interns[18], daytime patients[17,20], patients post - retinal detachment repositioning surgery[24], patients post-vitrectomy[21], congenital cataract children[25], dry eye patients[33], and others. Although the existing scope of study subjects is richly diversified, there is a conspicuous dearth in discussions regarding subspecialized AI nursing within ophthalmology. A more nuanced analysis in these specific domains could potentially furnish a theoretical foundation for the future discourse and advancement of AI ophthalmic nursing[51].

The evaluation outcomes of extant research underscore a prevailing homogeneity in domestic scholarly papers. Predominantly, the most frequently encountered metric is that of satisfaction[21,31,34-36]. However, it is noteworthy that both domestically and internationally, there lacks a sufficiently specific and comprehensive tool for assessing satisfaction. The majority of studies resort to the Likert 5-point scoring system, ranging from "extremely dissatisfied" to "extremely satisfied". Within the context of research-oriented papers, there exists room for substantial refinement. It is hoped that future researchers will pioneer the development of more apt satisfaction metrics.

Subsequently, the spectrum encompasses health literacy[20-21,34], psychological assessments[21,28], ophthalmic examination scores[18,36], and evaluations of teaching effectiveness[18,36]. Conversely, less frequently explored are aspects such as fluorescein staining for dry eye patients, tear secretion dynamics, and tear film rupture time[33]. Perusal of the literature reveals that the integration of AI ophthalmic nursing has ushered in considerable conveniences to clinical practices. Beyond the enhancement of clinical assessment metrics, its profound impact lies in fostering patient rehabilitation and recovery.

AI in the field of ophthalmic care can help nurses improve nursing efficiency and decision support capabilities in clinical work. Literature 1 and 4 point out that AI platforms enhance the execution efficiency of nursing plans and the timeliness of nursing responses in ward management and postoperative patient tracking[17,20]. Literature 6 suggests that through data-driven patient health assessment tools, nurses can identify high - risk individuals early, effectively preventing complications[22]. Literature 5 and 12 show that intelligent mobile systems provide postoperative patients with continuous health education and behavioral guidance, significantly improving postoperative compliance and rehabilitation quality. Especially in chronic disease management scenarios[21,28], Literature 11 achieves real - time interaction feedback mechanisms between patients and nurses through smart

software, establishing a new model of continuous care[21]. However, compared to other countries, China's ophthalmic care AI technology development lags behind. Issues include lagging standardization of AI systems, uneven scales and validation levels of clinical research, and low technical participation from nursing staff. In terms of education and training, Chinese nurses have fewer opportunities to receive AI training compared to European and American countries, and most training is short-term and tool-based, lacking a systematic educational system. This gap further exacerbates the obstacles to practical application. Therefore, in future research, we need to build a collaborative mechanism that integrates multiple disciplines, encouraging the participation of nursing staff, information engineers, ophthalmologists, and others in the development of AI systems; promote the construction of real-world clinical validation systems, establishing a multi-dimensional validation indicator system covering nursing quality, patient outcomes, economic costs, and more; enhance the AI literacy and operational skills of nursing personnel, incorporating basic AI knowledge into the continuing education curriculum for nurses, and improving application capabilities through simulation training, online learning, and case discussions; establish ethical review and data governance systems, perfecting the data management and ethical review processes for nursing AI systems, protecting patient data privacy, clarifying usage boundaries and responsibility allocation, and enhancing public trust; drive the intelligent and personalized development of AI systems, integrating patients' physiological, psychological, and social backgrounds to develop smart platforms with emotion recognition and personalized recommendation functions, thereby enhancing the system's humanistic care capabilities.

CONCLUSION

Presently, the domain of AI ophthalmic nursing stands as a focal point in healthcare research. Within the domestic landscape, the evaluative methods and tools, though belated in development, exhibit commendable efficacy. Given the stringent inclusion criteria employed in this study, there exists the possibility that certain reports concerning the intersection of ophthalmic nursing and AI may not have been encompassed. It is suggested that future comprehensive reviews of AI ophthalmic nursing might consider judiciously relaxing the inclusion criteria, broadening the scope of inquiry to facilitate a more comprehensive discourse on ophthalmic nursing research.

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Authors' contributions: Zhang YL wrote the manuscript and drew figures; Jiang YY designed the study.

REFERENCES

[1] Peng J, Jury EC, Dönnes P, et al. Machine learning techniques for personalised medicine approaches in immune-mediated chronic inflammatory diseases: applications and challenges. Front Pharmacol, 2021,12:720694.
[2] Das A, Mock J, Irani F, et al. Multimodal explainable AI predicts upcoming speech behavior in adults who stutter. Front Neurosci, 2022, 16:912798.
[3] Foster KR, Koprowski R, Skufca JD. Machine learning, medical diagnosis, and biomedical engineering research - commentary. Biomed Eng Online, 2014,13:94.
[4] Rao S, Sharan K, Sukumar S, et al. Systematic review on diagnostic reference levels for computed tomography examinations in radiation therapy planning. Diagnostics (Basel), 2023,13(6):1072.
[5] Doos L, Packer C, Ward D, et al. Past speculations of future health technologies: a description of technologies predicted in 15 forecasting studies published between 1986 and 2010. BMJ Open, 2017,7(7):e016206.
[6] Dhopte A, Bagde H. Smart smile: revolutionizing dentistry with artificial intelligence. Cureus, 2023,15(6):e41227.
[7] Oniani D, Hilsman J, Peng YF, et al. Adopting and expanding ethical principles for generative artificial intelligence from military to healthcare. NPJ Digit Med, 2023,6(1):225.
[8] Li M, Xie HZ, Luo Q, et al. A qualitative study on the humanistic care needs of patients with stroke and their families. J Multidiscip Healthc, 2023,16:717-730.
[9] Park CW, Seo SW, Kang N, et al. Artificial intelligence in health care: current applications and issues. J Korean Med Sci, 2020,35(42):e379.
[10] Chua GP. Oncology nursing in Singapore: how it evolved and what does the future hold. Asia Pac J Oncol Nurs, 2020,7(2):129-133.
[11] Sengupta P, Dutta S. ChatGPT guidance for reproductive specialists: dr. Jekyll or mr. Hyde EXCLI J, 2023,22:911-914.
[12] Kwak Y, Ahn JW, Seo YH. Influence of AI ethics awareness, attitude, anxiety, and self-efficacy on nursing students' behavioral intentions. BMC Nurs, 2022,21(1):267.
[13] Raza A, Ali M, Ehsan MK, et al. Spectrum evaluation in CR-based smart healthcare systems using optimizable tree machine learning approach. Sensors (Basel), 2023,23(17):7456.
[14] Benning L, Peintner A, Peintner L. Advances in and the applicability of machine learning-based screening and early detection approaches for cancer: a primer. Cancers (Basel), 2022,14(3):623.
[15] Sun LQ, Ho H, Ji XJ. Editorial: Advances in imaging of pediatric heart diseases. Front Pediatr, 2023,11:1305566.
[16] Ortega-Lapiedra R, Barrado-Narvión MJ, Bernués-Olivún J. Acquisition of competencies of nurses: improving the performance of the healthcare system. Int J Environ Res Public Health, 2023,20(5):4510.
[17] Xie WL, Zhou WL, Xu H. A study on the application of the intelligent nursing cloud platform in the management of ophthalmic day wards. Computer Knowledge and Technology, 2023,19(15):93-95.
[18] Jiang X, Tan X. Effects of intelligent data driven precision teaching in ophthalmic nursing interns. Chin J Mod Nurs, 2023,29(12):1644-1648.
[19] Chen HL, Dong PF, Qiao DN, et al. Online consultation by ophthalmic patients via Internet Plus care service platform and the influencing factor. Journal of Nursing Science, 2023,38(20):4-7.
[20] Kang JF, Chang H, Tang LL, et al. Application of "Internet Plus" continuing nursing in patients undergoing day surgery in ophthalmology. Modern Nurse, 2023,30(11):139-142.
[21] Shen X, Wang WX, Ma ZF. Application of intelligent mobile health education system in the perioperative period of retinal detachment patients undergoing daytime surgery. Chinese Nursing Research, 2023, 37(12):2239-2243.
[22] Shao DR, Lu LY, Han Y, et al. Analysis of the effectiveness of nursing interventions for diabetic retinopathy patients based on an intelligent multidisciplinary information platform. Electronic Components

and Information Technology, 2022,6(2):173-175,178.
[23] Zhang HR, Fang XM, Zhang Y, et al. Investigation on the demands of artificial intelligence in clinical nursing of ophthalmology. Yan Ke Xue Bao, 2021,36(12):992-997.
[24] Zhou LL, Ge XH. Status and development of posture nursing after retinal detachment surgery: A literature review. Journal of Nursing Continuing Education, 2021, 36(5): 428-431.
[25] Lin ZL, Li Q, Xiang YF, et al. Application and analysis of artificial intelligence voice system in postoperative follow-up of children with congenital cataract. Yan Ke Xue Bao, 2021,36(1):23-29.
[26] Li PY, Wang JQ, Xu XQ, et al. Discussion on the application of eye-tracking technology in the field of intelligent nursing. Journal of Fujian Computer, 2020, 36(11): 98-100.
[27] Liu YQ, Zhang YJ, Chen FX, et al. Development and application of intelligent software for the health management of chronic ophthalmic diseases. Journal of Nursing (China), 2019,26(5):72-74.
[28] Li WY, Wang ZX. Application of smartphone-based continuing care in postoperative ophthalmic patients. Journal of Clinical Nursing, 2018,17(6):44-47.
[29] He PP, Yang HX, Yang M. Application of the WeChat interactive platform in clinical ophthalmic nursing education. Chinese General Practice Nursing, 2018,16(30):3827-3829.
[30] Wu XX, Hu WL, Li WW, et al. The intelligent system of ocular region nursing. Digital Technology and Application, 2017(10):66,68.
[31] Yu HJ. Application of intelligent infusion alarm devices in ophthalmic infusions. Guide of China Medicine, 2017,15(30):293-294.
[32] Lin LL, Mou Y. Study on the intelligent medicine box in patients with eye disease. Journal of Harbin Medical University, 2017,51(03): 281-284.
[33] Li D, Chen YH, Xu C, et al. Clinical observation of an intelligent periorbital pulse therapy device in the treatment of dry eye syndrome. Electronic Journal of Practical Clinical Nursing, 2017,2(7):160,166.
[34] Dai MH, Tang L, Hai P. Application of multimedia scenario mode in ophthalmic health education. Chinese Journal of Practical Nursing, 2016,32(z1):74-75.
[35] Liu J, Hu JP, Liu Z, et al. Design and application of ophthalmologic peri-operative information systems. Chinese Journal of Practical Nursing, 2015(30):2293-2297.
[36] Wang X, Wang CY. Implementation of the PBL teaching model in ophthalmic clinical nursing education under a network - based environment. Health Vocational Education, 2013(18):41-42.
[37] Chen Z, Guan DF, Wang ZF, et al. Microbiota in cancer: molecular mechanisms and therapeutic interventions. Med Comm (2020), 2023,4(6):e417.
[38] Wynne N, Carroll J, Duncan JL. Promises and pitfalls of evaluating photoreceptor - based retinal disease with adaptive optics scanning light ophthalmoscopy (AOSLO). Prog Retin Eye Res, 2021, 83:100920.
[39] Shi JY, Luo JY, Wang XL, et al. Research hotspots and trends of artificial intelligence in nursing at home and abroad. Military Nursing, 2023,40(7):16-19.
[40] Weinert L, Klass M, Schneider G, et al. Exploring stakeholder requirements to enable the research and development of artificial intelligence algorithms in a hospital - based generic infrastructure: protocol for a multistep mixed methods study. JMIR Res Protoc, 2022, 11(12):e42208.
[41] Moreno-Fergusson ME, Guerrero Rueda WJ, Ortiz Basto GA, et al. Analytics and lean health care to address nurse care management challenges for inpatients in emerging economies. J Nurs Scholarsh, 2021, 53(6):803-814.
[42] Brown SA, Yang EH, Branch M, et al. Training and career development in cardio-oncology translational and implementation science. Heart Fail Clin, 2022,18(3):503-514.
[43] Song Y, Qian CF, Pickard S. Age-related digital divide during the COVID-19 pandemic in China. Int J Environ Res Public Health, 2021, 18(21):11285.
[44] Lompo P, Heroes AS, Agbobli E, et al. Growth of gram-negative bacteria in antiseptics, disinfectants and hand hygiene products in two tertiary care hospitals in west Africa - a cross - sectional survey. Pathogens, 2023,12(7):917.
[45] Engels D, Zhou XN. Neglected tropical diseases: an effective global response to local poverty - related disease priorities. Infect Dis Poverty, 2020,9(1):10.
[46] Weber AM, Voos KC, Bakas TM, et al. A clinical - academic partnership to develop a family management intervention for parents of preterm infants. J Clin Nurs, 2022,31(3-4):390-405.
[47] Mousavi Baigi SF, Sarbaz M, Ghaddaripouri K, et al. Attitudes, knowledge, and skills towards artificial intelligence among healthcare students: a systematic review. Health Sci Rep, 2023,6(3):e1138.
[48] Das AV, Chaurasia S, Joseph J, et al. Clinical profile and microbiological trends of therapeutic keratoplasty at a network of tertiary care ophthalmology centers in India. Int Ophthalmol, 2022, 42(5): 1391-1399.
[49] Thomas N, Coleman M, Terry D. Nurses' experience of caring for patients with delirium: systematic review and qualitative evidence synthesis. Nurs Rep, 2021,11(1):164-174.
[50] Mrayyan MT, Abunab HY, Abu Khait A, et al. Competency in nursing practice: a concept analysis. BMJ Open, 2023,13(6):e067352.
[51] Garcia JA, Sanchez GR, Sanchez-Youngman S, et al. RACE AS LIVED EXPERIENCE: the impact of multi - dimensional measures of race/ethnicity on the self-reported health status of latinos. Du Bois Rev, 2015,12(2):349-373.