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Use of Technology in Coordinating Care Among Pharmacists, Physiotherapists, and Operations Managers

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Abstract

Background: The aging global population poses significant challenges to healthcare systems, particularly in meeting the complex needs of older adults. The World Health Organization predicts a healthcare professional shortage, emphasizing the need for integrated care models that enhance service delivery for seniors. Information and Communication Technology (ICT) is vital in coordinating care among healthcare professionals, including pharmacists, physiotherapists, and operations managers, to improve health outcomes for older adults.

Methods: This study employs a scoping review approach, analyzing 36 ICT-based integrated care practice models sourced from nine databases, including PubMed and Scopus, alongside targeted journals. The review focuses on understanding practice models, early impacts, facilitators, and barriers to integrating ICT in care for older adults.

Results: The findings reveal that successful integrated care models utilize various ICT tools, such as electronic health records and digital communication platforms, to facilitate collaboration among multidisciplinary teams. However, barriers such as inadequate infrastructure, workforce shortages, and varying levels of IT proficiency among older adults hinder effective implementation. Notably, training for healthcare professionals significantly enhances care coordination and patient engagement.

Conclusion: The integration of ICT in care models for older adults is essential for improving health outcomes and addressing the multifaceted needs of this demographic. However, overcoming existing barriers requires targeted training, investment in infrastructure, and policy support to foster a sustainable integrated care environment.

Keywords: Integrated Care, Information and Communication Technology, Aging Population, Healthcare Professionals, Multidisciplinary Teams

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1. Introduction

The global population is aging in a progressively severe manner. In 2019, the worldwide population aged 65 and above reached 703 million and is projected to surpass 1.5 billion by 2050. Additionally, the population aged 80 and above is anticipated to rise from 143 million in 2019 to 426 million in 2050, with over 50% residing in East and Southeast Asia. The rapid rise in the percentage of the senior population has exerted significant financial strain on the national aged care providing system [1]. Furthermore, as older persons advance in age, they face heightened risks of physical and mental deterioration, characterized by a rising incidence of mobility loss, cognitive decline, auditory impairment, visual impairment, and increasingly intricate health and social care requirements [2]. The World Health Organization (WHO) predicts a global deficit of 18 million healthcare professionals by 2030, especially in Africa and Southeast Asia, presenting the challenge of reconciling the demand for services for the elderly with the urgent necessity to establish accessible avenues for integrating medical and social resources to proactively tackle societal aging [3].

The United Nations Decade of Healthy Ageing (2020–2030) explicitly designates the advancement of integrated care as a key area of activity to guarantee that older individuals get equitable access to excellent fundamental health services [4]. Integrated care denotes the systematic management and delivery of services aimed at offering individuals continuous health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation guidance, and palliative care throughout their lifespan. It seeks to coordinate care across various levels and settings, both within and beyond the healthcare sector, with the objective of enhancing the inadequate and inefficient provision of services for the elderly, thereby addressing their increasingly complex healthcare requirements [5,6]. The effective utilization of ICT serves as the 'lubricant' and 'glue' of integrated care systems, enhancing information access and flow, improving work efficiency, facilitating care integration and management processes, addressing COVID-19-related issues and social isolation, and is recognized as a crucial enabler of integrated care delivery and primary health care coordination [7].

The World Health Organization has established the Integrated Person-Centered Health care (IPCHS) framework and the Integrated Care for Older Adults (ICOPE) initiative, together with the ICOPE Handbook application, to advance integrated person-centered care via digital technology [8]. Nonetheless, the majority of integrated care programs for frail elderly individuals do not adhere to all WHO-IPCHS guidelines, resulting in clinical practice that is hindered by insufficient resources and support, inadequate coordination and interprofessional cooperation, and substandard person-centered care [9]. The integration of ICT in community-based geriatric care has been sluggish, and its application in integrated care for older adults frequently falls short due to issues related to policy, funding, and infrastructure, resulting in variability in clinical practice outcomes [10]. Furthermore, existing research fails to offer a comprehensive assessment of the current status of ICT-based integrated care for older adults. This study seeks to address the evidence gap by conducting a comprehensive analysis and synthesis of practice models, initial effects, potential barriers, and facilitators of ICT-based integrated care for older adults through a scoping review approach, while also identifying applicable policy opportunities and lessons.

This research aimed to synthesize the existing information about practice models, early impacts, facilitators, and barriers of ICT-based integrated care for older individuals.

2. Methods

We examined nine databases: Pubmed, Web of Science, EBSCO, Scopus, MEDLINE, EMBASE, CINAHL, Cochrane Library, and Joanna Briggs Institute, along with three specialized journals: International Journal of Integrated Care, Journal of Integrated Care, and International Journal of Care Coordination.

3. Members of a Multidisciplinary Team

Thirty-six ICT-based integrated care practice models were implemented via the establishment of multidisciplinary teams primarily comprising clinicians, practice nurses, general practitioners, primary care physicians, community nurses, and social workers, with supplementary studies involving

physiotherapists (38.9%), occupational therapists (27.8%), mental health practitioners (19.4%), pharmacists (27.8%), and other healthcare professionals. Fourteen practice models included a "case manager" function, mostly occupied by nurses, community nurses, social workers, or volunteers [11-32]. Case managers in integrated care practice have varied responsibilities based on different scenarios; however, their primary duties include managing cases both in and out of hospitals, assessing and monitoring the health and needs of older adults, organizing and coordinating care services, regularly evaluating care plans, arranging multidisciplinary meetings, and providing informational support. In the transition from hospital to home or primary care/nursing facility, the multidisciplinary team comprises C-TraC nurses, Link nurses, nurse coordinators, discharge nurses, GRACE support teams, among others, to facilitate and provide post-discharge assistance [11,33-36]. Soto-Gordoa et al. [37] established liaison nurses in hospitals to coordinate treatment among various experts throughout patient hospitalization. Weiss et al. [38] enlisted bilingual and bicultural social workers to address the needs of elderly individuals with cognitive impairment. Furthermore, to ensure the execution of integrated care using ICT, 16 (44.4%) practice models expressly included specialized training for members of the multidisciplinary team, with training durations varying from 2 days to 2 months [39-41]. In the Embrace model of integrated care, training for team members was scheduled during the pre- and mid-program phases to ensure adherence to the Embrace principles and methodologies [19,42,43]. Training for multifunctional team members encompasses several modalities, including online, offline, and theoretical plus practical components. C-TraC nurses were mandated to complete a 1-week apprenticeship with the C-TraC implementation team, alongside a 4-week intensive training program [44,45].

4. Information and Communication Technology

The CareWell research team identified 12 ICT tools that facilitate integrated care: electronic prescriptions, clinician-patient messaging, electronic health records, interconsultation, call centers, virtual conferences, personal health folders, nurse information systems, educational platforms, collaborative platforms, telemonitoring, and multichannel centers [37]. In this study, we categorized the ICT support for the 36 integrated care practice models into ten distinct categories: digital communications (61.1%), electronic health record (33.3%), clinician and patient information system (33.3%), electronic medical record (16.7%), electronic assessment tool (13.9%), wearable monitoring device and sensor (8.3%), personal health folder (5.6%), digital educational material (5.6%), electronic prescription (2.8%), and social robot (2.8%). Information and Communication Technology (ICT) facilitates seamless access to continuous monitoring, evaluation, management, and dissemination of patient health information, enhances communication and coordination among multidisciplinary team members, and supports the recording and assessment of plan efficacy. Moreover, ICT significantly contributes to decision support, as the Embrace Integrated Care Project team incorporates worldwide functional, disability, and health categorization resources together with official recommendations into clinical information systems to enhance decision-making.

The CareWell Primary Care Project has established multidisciplinary practice guidelines for medical, nursing, and social support pertaining to eight prevalent geriatric syndromes, as well as advance care planning guidelines, which are integrated into the Health and Wellbeing Information Portal to serve as job aids and facilitate constructive discussions between frail older adults and general practitioners [46-48]. The World Health Organization intentionally developed the ICOPE Handbook application to create interventions and care plans derived on intrinsic capacity assessment findings, facilitating the use of ICOPE in community and primary care environments [45].

5. Barriers and Enablers of ICT-Driven Integrated Care Practice

Information and Communication Technology (ICT) is pivotal in all facets of integrated care, including community resources and policies, health systems, delivery systems, self-management assistance, decision support, and clinical information systems; yet, several problems continue to impede the use of eHealth technology. Six studies identified barriers to the implementation of ICT-based integrated care [20,23,34-37], categorized into four themes: demand-side factors (fear and lack of confidence in utilizing IT,

insufficient patient skills, distrust in the accuracy of smart monitoring devices), supply-side factors (insufficient provider skills, resistance to innovative IT applications, inadequate human resources), technical factors (deficient ICT infrastructure, poor compatibility among eHealth tools, insufficient ICT technical support, complexity in the use of devices and applications, privacy and security concerns), and systemic factors (inadequate legislative framework, insufficient funding, uncertainty regarding cost-effectiveness). Kastner [13], Vestjens [15], and Valaitis [49] identified essential factors for ensuring the sustainable dissemination of ICT-supported integrated care models, including sufficient human resources, multidisciplinary team engagement, training and ongoing communication, continuous evaluation and feedback, the establishment of procedures and/or protocols to enhance team processes, sustainable infrastructure, facilitated ICT systems, clinical leadership participation, and organized funding. The World Health Organization cited the active engagement of older individuals, the training of practitioners, and the digital integration of health information as significant facilitators in its study on ICOPE Practice [50].

6. Discussion

The ICT-based integrated care model encompasses essential components such as a single entry point, comprehensive geriatric assessment, personalized care planning, multidisciplinary case conferences, coordinated care, case management, and patient empowerment. This framework aims to deliver necessary services for older adults, with preliminary evidence indicating improvements in physical and mental health, quality of care, resource conservation, and enhanced utilization of primary care and community resources. However, there exists variability in practice outcomes, with numerous influencing factors present at the demand-side, supply-side, technology, and system levels.

he primary objectives of ICT-based integrated care services at the demand-side level are frail older individuals (30.6%), older adults with physical or cognitive impairments (16.7%), and older adults with multiple morbidities (13.9%). The rising incidence of frailty with advancing age, the resulting decline in physical, cognitive, social, and psychological conditions, the escalating complexity of health and social care requirements, and research indicating that multiple morbidities correlate with heightened unmet needs, increased healthcare utilization, and diminished perceived health status and quality of life, underscore a stronger preference for integrated care services involving multiple providers. Senior patients have articulated a preference for accessible, efficient, and coordinated treatment that aligns with their needs and preferences, while also considering their rights and safety [51]. Islam et al. [52] developed a "Holistic Continuum of Patient Care" approach tailored for frail elderly patients to provide integrated care, addressing the challenge of various morbidities.

Nevertheless, the ICT-based integrated care was impeded by older individuals' apprehension, lack of confidence, and insufficient abilities in using information technology (IT). This may be associated with the differing levels of 'technophobia' in older persons, leading to reduced use and acceptance of ICT, which is indirectly affected by cognitive closure, hence diminishing e-health preparedness in this demographic. This indicates that academics may later create training programs and 'age-friendly' information platforms to improve the adoption of information technology among older persons, informed by the factors contributing to their 'technophobia'. Moreover, the lack of confidence in the precision of smart monitoring devices among older persons serves as a barrier to participation. Nevertheless, the extensive implementation of information technology in healthcare has revealed that Internet of Things (IoT) technologies, including sensors and wearable devices, serve as a more appropriate means for health monitoring and thorough geriatric assessment, thereby enhancing the efficiency of data collection and dissemination, as well as the prospective advantages of telemonitoring in mitigating disease progression and hospitalization among elderly individuals with chronic conditions. The Government may spearhead the installation of intelligent monitoring devices in primary care institutions, offering complimentary application experiences for senior citizens and fostering application use via trust-building initiatives.

The multidisciplinary team, mostly composed of health professionals, primary care workers, and social workers, serves as a crucial internal catalyst for integrated care at the supply-side level. The participation of multidisciplinary members addresses the intricate care requirements of older adults, and

the establishment of regular multidisciplinary meetings aids in delineating the roles of members, coordinating care services, and enhancing support for patients and their families, with general practitioners playing a crucial role in the effective provision of care for older adults [53]. Moreover, general practitioners and case managers are often seen as a single access point to integrated care. A singular point of entry streamlines the referral process for older adults to suitable social and primary care facilities, which is crucial for service integration and the standardization of needs assessment procedures. This unified entry system guarantees an adequate patient volume for financial viability and operational efficiency, thereby ensuring that social resources align with medical requirements. Researchers are advised to enlist multidisciplinary individuals to create a service team, using the findings from a thorough evaluation of older persons as a framework, while maximizing the general practitioner as a single access point.

The deficiency of human resources for services, the inadequacy of providers' abilities, and the reluctance to novel IT applications are significant challenges that impede the deployment of ICT-based integrated care. In 2018, a global deficit of approximately 6 million nursing professionals was identified, with an anticipated shortfall of 5.7 million nurses persisting into 2030, a situation exacerbated by the COVID-19 pandemic, which significantly disrupted the equilibrium between supply and demand for integrated care services [54]. The IT use behavior of multidisciplinary team members, as ICT users, directly influences the intended implementation and quality of integrated care. Hector et al. [55] shown that health care assistants see ICT as unhelpful, time-consuming to implement, difficult, or augmenting their workload, all of which led to reluctance among service providers towards ICT use. This indicates that clinical managers have to optimize the operation of ICT platforms and provide specialized training on ICT applications to enhance nurses' attitudes and skills in using IT. Healthcare experts deemed that enhancing knowledge of e-health expertise via the introduction of pertinent IT solutions and medical technology is the most effective training program to augment their IT abilities [56].

Information and communication technologies frequently employed in integrated care models comprised digital communication (61.1%), electronic health records (33.3%), and clinician and patient information systems (33.3%), paralleling the findings of Melchiorre et al [57], who examined the utilization of e-health tools in European integrated care initiatives for older adults with multiple comorbidities. Digital communication enables prompt interaction among multidisciplinary teams and patients, electronic health records facilitate the collection and dissemination of patient information, and information systems offer portals for team members and patients to empower patients and encourage their active involvement in the execution of integrated care [58]. Electronic prescriptions (2.8%) and social robots (2.8%) were utilized infrequently, potentially due to the lower issuance and transmission of ICT-based prescriptions in integrated care services, alongside the fact that pharmacists constitute only 27.8% of the multidisciplinary team members. This, coupled with cost control measures in healthcare, has adversely affected the adoption of e-prescribing and artificial intelligence bots. Both elderly patients and their informal caregivers highly valued robotic-assisted and non-robotic-assisted technologies as a care route [59]. Moreover, electronic prescriptions may diminish medication mistakes and adverse drug responses, enhance prescription safety, and pharmacists are amenable to engaging in electronic prescription systems [60,61]. This indicates that researchers may include e-prescribing services into integrated care and even provide spiritual consolation services with robots.

At the technical level, insufficient ICT infrastructure, restricted functionality, convoluted technology use procedures, poor interoperability across e-health technologies, and privacy/security concerns hinder the deployment of integrated care. Martono et al. [62] discovered that inadequate ICT system quality and information quality diminish users' perceived utility and perceived ease of use. According to the technology acceptance model research, perceived utility and simplicity of use influence users' behavioral intentions. Moreover, collaborative treatment across multidisciplinary teams necessitates the exchange of patient data, with privacy and security concerns being the primary obstacles to data transmission. The research indicated that consumers' perceived privacy and security influence their readiness to persist in adopting ICT [63]. Ogal et al. [64] recognized interoperability and compatibility of ICT systems, along with privacy concerns, as significant obstacles to the sharing of healthcare information, which might hinder effective

communication and coordination across multidisciplinary teams and diminish stakeholder trust and user involvement. User involvement influences perceived utility, perceived ease of use, and behavioral intentions [65]. This indicates that researchers may develop comprehensive, easy, and interoperable platforms for integrated care services, grounded on the technological functional needs of both the supply and demand sides of the service.

At the systemic level, obstacles to the implementation of ICT-based integrated care persist, including inadequate legal frameworks, insufficient money, and ambiguity over cost-effectiveness. Since 2010, England has implemented a series of policies aimed at promoting the integration of health and social care; however, the accumulation of various policy initiatives has hindered the development of cohesive relationships, and the persistent underfunding of social care has resulted in considerable workforce challenges. Furthermore, insufficient financial backing and poor cost-effectiveness may deter the distribution of resources to people, hospitals, and departments, so undermining the motivation for care integration [56]. The German Federal Government has initiated the Healthcare Innovation Fund, allocating €200 million annually from 2020 to 2024 to promote the advancement and dissemination of integrated healthcare and to encourage pertinent insurance companies to foster the creation of new integrated care models. Policies implemented by the federal and state governments have commenced health financing to provide financial assistance for social care [67]. Stokes et al. [68] facilitated more cohesive activities by consolidating health and social care financing. This study identified four practice models that yielded no net monetary benefit and diminished incentives for multidisciplinary team members, older adults, and their caregivers to engage in integrated care. This may be attributed to the increased labor costs associated with recruiting multidisciplinary team members, while short-term interventions fail to enhance health outcomes for frail or chronically ill older adults. Furthermore, the premature application of the intervention's rigorous practices may lead to heightened utilization of services and informal care among older adults, thereby indirectly escalating intervention costs. This indicates that governments need to spearhead the encouragement of diverse funding sources to provide suitable services by aligning supply with demand, therefore minimizing intervention costs and safeguarding economic advantages.

7. Conclusions

The ICT-based integrated care model employed digital communication, electronic health records, and clinician and patient information systems to establish multidisciplinary teams that deliver diverse services through the vertical and horizontal integration of health and social care institutions. This model amalgamated seven fundamental components: a single-entry point, comprehensive geriatric assessment, personalized care planning, multidisciplinary case conferences, coordinated care, case management, and patient empowerment, addressing the needs of both service providers and recipients to a certain degree. Nonetheless, variability persists in their practice impacts, and the team will do an additional systematic review to evaluate the real impact of ICT-based integrated care implementation by a meticulous quality assessment of the literature and synthesis of findings. Furthermore, a limited number of studies examined the obstacles and enablers of ICT-based integrated care implementation, and the aggregated evidence may lack persuasiveness; researchers might employ qualitative methods to elucidate the existing local practices and critical factors that promote the effective implementation of ICT-based integrated care prior to formal intervention.

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استخدام التكنولوجيا في تنسيق الرعاية بين الصيادلة وأخصائيي العلاج الطبيعي ومديري العمليات

الملخص

الخلفية :يمثل التقدم في عمر السكان العالمي تحديات كبيرة لأنظمة الرعاية الصحية، خاصة في تلبية الاحتياجات المعقدة لكبار السن. تتوقع منظمة الصحة العالمية نقصًا في المهنيين الصحيين، مما يؤكد الحاجة إلى نماذج رعاية متكاملة تعزز تقديم الخدمات لكبار السن. تلعب تكنولوجيا المعلومات والاتصالات (ICT) دورًا حيويًا في تنسيق الرعاية بين المهنيين الصحيين، بما في ذلك الصيادلة وأخصائيي العلاج الطبيعي ومديري العمليات، لتحسين النتائج الصحية لهذه الفئة.

الطرق :اعتمدت هذه الدراسة على نهج مراجعة استكشافية، حيث تم تحليل 36 نموذجًا لممارسات الرعاية المتكاملة القائمة على تكنولوجيا المعلومات والاتصالات، تم الحصول عليها من تسع قواعد بيانات، بما في ذلك PubMed وScopus، بالإضافة إلى مجلات متخصصة. ركزت المراجعة على فهم نماذج الممارسات، والتأثيرات المبكرة، والعوامل الميسرة، والعوائق أمام دمج تكنولوجيا المعلومات والاتصالات في رعاية كبار السن.

النتائج :أظهرت النتائج أن نماذج الرعاية المتكاملة الناجحة تستخدم أدوات متنوعة من تكنولوجيا المعلومات والاتصالات، مثل السجلات الصحية الإلكترونية ومنصات الاتصال الرقمية، لتسهيل التعاون بين الفرق متعددة التخصصات. ومع ذلك، تعيق التنفيذ الفعال عوائق مثل البنية التحتية غير الكافية، ونقص القوى العاملة، وتفاوت مستويات الكفاءة في استخدام التكنولوجيا بين كبار السن. ومن الجدير بالذكر أن تدريب المهنيين الصحيين يعزز بشكل كبير تنسيق الرعاية ومشاركة المرضى.

الاستنتاج :يُعد دمج تكنولوجيا المعلومات والاتصالات في نماذج الرعاية لكبار السن أمرًا ضروريًا لتحسين النتائج الصحية ومعالجة الاحتياجات المتعددة الأوجه لهذه الفئة. ومع ذلك، يتطلب التغلب على العوائق الحالية استثمارات موجهة في التدريب والبنية التحتية، ودعم السياسات لخلق بيئة رعاية متكاملة ومستدامة.

الكلمات المفتاحية :الرعاية المتكاملة، تكنولوجيا المعلومات والاتصالات، السكان المسنون، المهنيون الصحيون، الفرق متعددة التخصصات.