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Care models for individuals with chronic multimorbidity: lessons for low- and middle-income countries

Aklilu Endalamaw[1,2*], Anteneh Zewdie[3], Eskinder Wolka[3] and Yibeltal Assefa[1]

Abstract

Background Patients with multiple long-term conditions requires understanding the existing care models to address their complex and multifaceted health needs. However, current literature lacks a comprehensive overview of the essential components, impacts, challenges, and facilitators of these care models, prompting this scoping review.

Methods A scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-analysis Extension for Scoping Reviews guideline. Our search encompassed articles from PubMed, Web of Science, EMBASE, SCOPUS, and Google Scholar. The World Health Organization's health system framework was utilized to synthesis the findings. This framework comprises six building blocks (service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership/governance) and eight key characteristics of good service delivery models (access, coverage, quality, safety, improved health, responsiveness, social and financial risk protection, and improved efficiency). Findings were synthesized qualitatively to identify components, impacts, barriers, and facilitators of care models.

Results A care model represents various collective interventions in the healthcare delivery aimed at achieving desired outcomes. The names of these care models are derived from core activities or major responsibilities, involved healthcare teams, diseases conditions, eligible clients, purposes, and care settings. Notable care models include the Integrated, Collaborative, Integrated-Collaborative, Guided, Nurse-led, Geriatric, and Chronic care models, as well as All-inclusive Care Model for the Elderly, IMPACT clinic, and Geriatric Patient-Aligned Care Teams (GeriPACT). Other care models (include Care Management Plus, Value Stream Mapping, Preventive Home Visits, Transition Care, Self-Management, and Care Coordination) have supplemented the main ones. Care models improved quality of care (such as access, patient-centeredness, timeliness, safety, efficiency), cost of care, and quality of life for patients that were facilitated by presence of shared mission, system and function integration, availability of resources, and supportive tools.

Conclusions Care models were implemented for the purpose of enhancing quality of care, health outcomes, cost efficiency, and patient satisfaction by considering careful recruitment of eligible clients, appropriate selection of service delivery settings, and robust organizational arrangements involving leadership roles, healthcare teams,

*Correspondence:
Aklilu Endalamaw
yaklilu12@gmail.com

Full list of author information is available at the end of the article

financial support, and health information systems. The distinct team compositions and their roles in service provision processes differentiate care models.

Keywords Multimorbidity, Care models, Review

Background

Multimorbidity refers to the coexistence of multiple diseases conditions, including chronic diseases, biopsychosocial factors, or some risk factor [1, 2]. In 2023, it was estimated that 37.2% of the adult population worldwide experienced multimorbidity [3]. Notably, this percentage surpasses 50% when considering adults aged 65 years and older [3]. The burden of multimorbidity varies across geographical regions. South America had the highest prevalence of multimorbidity at 45.7%, followed by North America (43.1%), Europe (39.2%), Asia (35%), and Africa (28.2%) [4]. The prevalence of multimorbidity also varies across populations. For instance, it was 25.4% among Chinese adults [4] while it ranged from 27 to 74% among elderly Nigerians [5]. This burden has significantly varied based on age, gender, socioeconomic status, and health status [5–13]. To illustrate, according to a meta-analysis of primary studies from 2000 to 2021, 39.4% of adult females were diagnosed for multimorbidity compared to 32.8% of adult males [3]. There is a non-negligible prevalence of multimorbidity, ranging from 1.2 to 24.8%, among children under five years old in Sub-Saharan African countries [14]. In this continent, the prevalence of multimorbidity escalates with age, from 3.3% for those aged 18–29 years to 40.2% for those aged ≥ 80 years [4].

Multimorbidity poses significant challenges to the global health and wellbeing [15]. For individuals, it results in a host of adverse outcomes, including poor quality of life, increased loneliness, frequent hospital admissions, fragmented care, disability or daily activities impairment, polypharmacy, poor treatment adherence, and higher probability of mortality. It also places a substantial burden on health care services, affecting both costs and drug utilization [9, 16–18], and results in undesired health consequences [19], which are exacerbated when there is poor service integration, a lack of person-centred care, and limited healthcare professionals' skills [20]. Moreover, the way health system is structured, and functions contributes to leaving behind clients with two or more conditions. In most situations, health professionals specialize vertically, resulting in specific areas of expertise and missed management of comorbid cases [21]. Vertical budgets and programs, along with disease-specific short-term training, medicine, and supplies, focus on addressing single diseases [22]. The challenges arose from disease specific treatment are also identified by the sixty-ninth World Health Assembly [23]. For these reasons, it is essential to reshape medical training, shifts in global governance and funding, and actualize care for whole persons. Furthermore, individuals with multimorbidity often experience a lack of holistic care and insufficient guidance from healthcare providers [21].

Individuals with multimorbidity require maintaining social connections, accessing individualized care, and receiving support [24] through convenient access to providers (telephone, internet or in person), clear communication of individualized care plans, and continuity of relationships. Additionally, they value providers who actively listen, acknowledge unique and fluctuating needs, and exhibit a caring attitude [25]. Addressing all these needs and alleviating the burden of multimorbidity call for care models that facilitate integration, linkage and collaboration [8]. The World Health Organization (WHO) emphasizes the importance of people-centered integrated health services [23].

Reviewing the existing models of care is essential to address the multifaceted effects of multimorbidity effectively. However, current literature lacks a comprehensive overview of the essential components, impacts, challenges, and facilitators of these care models. The objective of this scoping review was to assesses multimorbidity care models, examining their components, impact, and implementation challenges and facilitators. By exploring different care models and their unique features, we can adapt and utilize them effectively in diverse contexts and countries.

Methods

Protocol and registration

A systematic search was conducted to identify literature on the Care models related to multimorbidity. A scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-analysis Extension for Scoping Reviews guideline (PRISMA-ScR) [26]. Although PRISMA-ScR was utilized as a reporting tool, Arksey and O'Malley's scoping review framework was considered from conception to evidence synthesis. The process included developing the research question, identifying relevant articles, conducting study selection, collating and summarizing data, and reporting the results. Consultations were also addressed during the weekly team meetings [27].

Eligibility criteria

Any article on care models for chronic multimorbidity was included. Articles published in English on care models for multimorbidity and/or its elements, outcome, barriers or challenges, and facilitators or strategies were

included. Articles were not excluded due to the date of publication, study design, and study settings. Reviews were excluded after checking the included articles in those reviews. If the included articles in a review article were parts of the current review, that review were excluded prevent duplication of findings from the same articles. However, few reviews were included when the objectives and main findings of the previous review were synthesised from various sources, and its included articles are not included in our review.

Information sources

Articles were searched in PubMed, Web of Science, EMBASE, and SCOPUS. Articles were also searched in Google Scholar. The reference lists of eligible articles were reviewed for full-text review to find relevant articles. The most recent search date in databases was 12 February 2024.

Search

Lists of key words or search terms and/or phrases were identified based on three key domains: "Care model", "Multimorbidity", and "Chronic". Search strategies were developed in lined with each database's requirements. The search strategy was built using Boolean Operators: AND, OR, quotation marks "", parentheses (), and asterisks*. The search strategy for each database is presented in the supplementary file (Supplementary file 1: Search strategy).

Selection of sources of evidence

AE conducted a search and collected available articles. All available articles were exported into EndNote 20 for duplication removal and reference managers. Then, AE automatically removed duplicates using the "Find Duplicates" command in EndNote 20. Next, AE screened articles by title and abstract to identify eligible articles for full-text review. AE weekly reported each step and the activities to the team. Then, team members provided comments on the reported activities and discussed the way forward for the next stages. AE and YA conducted a preliminary overview of samples of articles for full-text review. Finally, AE assessed eligibility for full-text review, and it was approved by YA.

Data items and charting process

The team prepared and evaluated the data extraction format. The format emphasised the following aspects: types of care models, health care setting, country, definition of care models, multimorbid diseases, elements or components of care models, impacts or outcomes of care models, barriers or challenges of care models, and facilitators or strategies of care models. AE charted data from the included sources of evidence in duplicates. Any discrepancies were checked with YA. When discrepancies were found, AE and YA reviewed the extracted data alongside the sources and made necessary corrections.

Synthesis of results

Data synthesis was done based on the objectives. Similar or unique findings were gathered and was provided qualitative meanings in relation to the meaning of care models for individuals with multimorbidity and its elements, outcomes, barriers, and facilitators. The WHO health system framework was used to synthesise findings on elements, outcomes, barriers, and facilitators of care models. This framework has six system building blocks and eight overall goals/outcomes. The system building blocks are service delivery, health workforce, information, medical products, vaccines & technologies, financing, and leadership/governance, which guided us in framing elements, barriers, and facilitators of care models. Community engagement and multisectoral policy and action were also considered in the data extraction and synthesis. These dimensions were included because primary health care encompasses community engagement and multisectoral action as one of its aspects. The overall goals/outcomes include access, coverage, quality, safety, improved health (level and equity), responsiveness, social and financial risk protection, and improved efficiency. We used these goals/outcomes to synthesise the outcomes or impacts of care models [28]. Additionally, we considered outcomes beyond health system frameworks.

Results

Selection of sources of evidence

A total of 3,830 articles were collected from databases (PubMed=555, Web of Science=637, EMBASE=908, and SCOPUS=1,682) and Google Scholar (n=48). Of these, 1,322 articles were excluded due to duplicates. After title and abstract screening, 137 articles were eligible for full text. Finally, 54 articles fulfilled the eligibility criteria for data extraction (Fig. 1).

Models of care for patients with multiple chronic health conditions

A care model represents collective interventions in the healthcare delivery process aimed at achieving desired outcomes, named based on core activities or responsibilities, involving healthcare teams, disease conditions, eligible clients, purposes, and services settings. Examples include, Integrated, Collaborative, Integrated-Collaborative, Guided, and NCMs. Geriatric Care, All-inclusive Care Model for the Elderly, and Geriatric Patient-Aligned Care (GeriPACT) Teams (based on eligible clients), the IMPACT clinic (based on the role of health workers and eligible patients). Chronic Care Model (based on disease conditions), and Care Management Plus, Value Stream

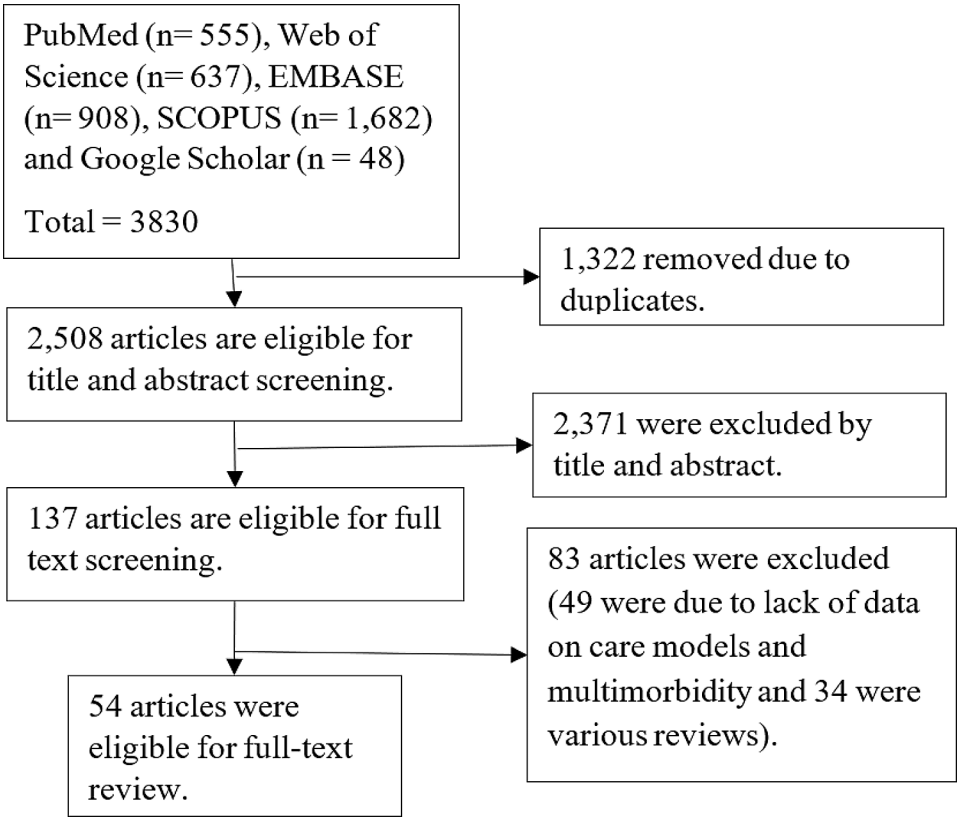

Fig. 1 Article selection process

Mapping, Preventive Home Visits, and Transition Care (based on the types of services provided).

Meaningful care models are developed through collective understanding of contexts (such as identifying eligible clients and selecting healthcare settings), organizing healthcare team, and providing health services. Additionally, they involve accessing community resources, arranging financial issues, utilizing health information systems, and setting measurable outcomes [29, 30].

Types of care models

Integrated Model of Care (IMC) [31–51] The IMC has been implemented across Europe, Spain, Italy, Canada, the United States, Australia, China, and Taiwan, with related initiatives like Canada's PRISMA program. This model operates in various settings, including hospitals, community geriatric units, chronic disease clinics, and nursing homes. Essential components of the IMC include organizational arrangements, patient recruitment, multidisciplinary team collaboration, comprehensive service delivery, financial management, and the use of information communication technology-based platforms like e-health records. Specifically, teams comprise case managers, physicians, specialists, pharmacists, geriatric practitioners, general practitioners, social workers, psychologists, project managers, and occupational therapists. Service delivery involves assessments, care planning, management, follow-ups, medication reviews, care coordination, patient empowerment, self-management, and effective communication.

The impacts of the IMC are significant, leading to improved quality of care, better health outcomes, cost efficiency, and enhanced patient satisfaction. However, challenges include resource allocation, team coordination and communication, service integration, technological barriers, and policy and regulatory hurdles. Facilitators for successful implementation include strong leadership and governance, supportive policies, continuous professional training, access to community and social resources, adequate financial support, and effective use of health information systems and digital tools. These elements underscore the comprehensive nature of the IMC and highlight the coordinated efforts needed to meet the complex healthcare needs of patients with multiple long-term conditions.

Collaborative care model (CCM) [52–60] The CCM has been studied in various settings, including a safety net clinic for low-income Hispanic patients, primary care clinics in the USA, general practices in Australia, and Northwest England. It involves selectively engaging healthcare professionals based on their roles and contributions. For

instance, social workers, psychiatrists, and primary care physicians (PCPs) are involved in managing depression and diabetes. In these cases, bilingual social work specialists and PCPs deliver problem-solving therapy and prescribe antidepressants, respectively. While social workers and PCPs play primary roles, they receive supervision from higher-level professionals, with psychiatrists providing telephone consultations for medication management. In managing diabetes and coronary heart disease, practice nurses and psychological practitioners deliver case management and low-intensity psychological treatment.

Essential components of the CCM include a well-trained health workforce, a multidisciplinary team, case management, comprehensive assessments, care planning, drug prescriptions, problem-solving therapy, and psychological therapy. It emphasizes client support, including self-care with pharmacotherapy, guideline-based drug preferences, motivational coaching, self-monitoring materials, and follow-up activities. Monthly telephone follow-ups, bi-weekly visits, outreach visits, and weekly case review meetings are integral to this model. The impacts of the model include improved patient care coordination and treatment outcomes. However, challenges such as ensuring adequate training, maintaining effective collaboration among diverse professionals, and managing communication barriers must be addressed. Facilitators for this model include strong leadership, continuous professional training, and supportive policies to ensure effective implementation. CCM improved quality of care (client satisfaction, recovery), increased recipient of treatment, reduced costs of care, and improved quality of life. In contrast, this care model was not effective on pain management among individuals with depression and musculoskeletal problems, as well as in improving depression among individuals with diabetes or cardiovascular diseases.

Integrated-collaborative care model (ICCM) [61] The ICCM evaluated in general practices in northwestern England, aims to address the needs of individuals dealing with depression and chronic conditions like diabetes or cardiovascular disease. This model operates through two distinct intervention phases. Initially, collaborative care is provided by psychological practitioners, focusing on psychological well-being and symptom management. Subsequently, care is integrated jointly with the practice nurse, emphasizing comprehensive patient assessment, care plan development, and various symptom management techniques such as behavioral activation and cognitive restructuring. Key components also include training for psychological practitioners, collaborative care meetings involving patients, practitioners, nurses, and general practitioners for medication management, as well as rigorous monitoring and supervision by experienced psychological therapists on a weekly basis.

The model underscores the importance of follow-up care, with weekly follow-ups for clients facing more complex issues and monthly follow-ups for others. Implementations typically occur within general practice clinics or psychological therapy centers, ensuring accessibility and consistency in the treatment environment. While the Integrated CCM has shown positive impacts on patient outcomes, challenges include ensuring adequate training for practitioners, fostering effective collaboration among team members, and managing the coordination of care across different settings. Facilitators for successful implementation encompass robust training programs, effective communication strategies, supportive leadership, and patient engagement. These elements are crucial for optimizing care delivery and addressing the multifaceted needs of individuals with depression and long-term physical conditions within the Integrated CCM framework. IMC improve quality of care (client satisfaction and recovery), accessibility (increased patient's clinical visits), patient-centredness communication between levels of care, safety (reduce medication errors and facilitate home death), efficiency (shorten hospitalization and reduced unnecessary services uses), quality of life, and foster self-management. However, this model did not yield in significant differences in quality of life, self-efficacy, disability, and social support.

Guided care mode (GCM) [62–64] The GCM, implemented in primary care offices in the USA, comprises several essential components aimed at improving patient care. These elements, viewed as guiding principles, include meticulous planning, comprehensive training for healthcare providers, and thorough patient assessment primarily conducted by nurses. Collaboration among interdisciplinary team members, including nurses, physicians, patients, and caregivers, is emphasized to ensure holistic care delivery. Central to the model is the development of personalized care plans tailored to each patient's needs, alongside disease or case management services provided by the healthcare team. Regular follow-up, monitoring, and evaluation are integral to track patient progress and adjust care plans accordingly. Additionally, the model emphasizes support for patient self-management, encompassing lifestyle modifications, as well as coordination of care among healthcare professionals and seamless transitions between care settings. Adequate allocation of resources is also highlighted to ensure the effective implementation of the model.

The GCM has significant impacts on patient outcomes, including improved quality of care, enhanced patient satisfaction, and better health outcomes. However, challenges exist, such as ensuring sufficient training for

healthcare providers, fostering effective collaboration among team members, and managing the coordination of care across various healthcare settings. Facilitators for successful implementation include robust planning processes, comprehensive training programs, effective communication strategies, and access to adequate resources. Additionally, supportive policies and leadership, alongside patient and caregiver engagement, are crucial for overcoming challenges and optimizing the delivery of care within the GCM framework. GCM increased quality of care and acceptability of services.

Nurse-led care model (NCM) [65–67] This model was developed with a multidisciplinary team in Australia to support continuity of care at the primary-secondary interface for people with multimorbidity. NCM, led by nursing professionals, was also evaluated in Japan, the USA, Canada, UK, Australia, Netherlands, New Zealand, and Slovenia. Elements were coordination, governance, communication, culture, health assessment, develop care process or care plan (e.g., self-management action plan), collaboration (patient and care provider), clinical best practice and interventions (psychological support), evaluation & improvement, and systems, processes and resources. Multidisciplinary involvement was also emphasised in this care model i.e., coordinated multidisciplinary intervention. NCM was acceptable to physician, patients, and caregivers and transferrable to other health care settings.

Chronic model of care (CMC) It was implemented for multiple chronic conditions in primary care and promoting effective advance care for elders in the USA. The first step in adopting CMC is healthcare organization, involving leadership, incentives, resources, support, and area agency. Number of clinics, number of physicians, number of physicians per clinic, types of specialities, years of physician's experiences, productivity per month, payer by clinic, intermountain health plan are part of the organization. Care delivery redesign is the second major element that includes care management encounters, face to face visits, telephone calls, coordination, and care conferences. Self -management support includes education sessions and motivation of patient. Electronic accesses and connection to external programs are involved as part of connection to community. Using protocols was part of support for evidence-based practice. Monthly information system usage used for access, best practice support, and communication by participating care managers and physicians [68]. The Promoting Effective Advance Care for Elders (PEACE) [69] model, which was evaluated in the USA, utilised CMC's interventions.

Several care models have been explored but are not frequently investigated. The Geriatric Care model, developed in the Netherlands, focuses on enhancing the health conditions of the elderly [70]. The Geriatric Care model did not effectively improve quality of life, functional limitations, self-rated health, psychological wellbeing, social functioning, or reduce hospitalizations [70]. In the USA, the All-inclusive Care for the Elderly (PACE) model [71], Care Coordination [60], and Care management Plus [72] were evaluated .The IMPACT clinic [73] and Value stream mapping [74] in Canada represents an innovative model of interprofessional primary care for community-dwelling seniors and patient waiting time enhancement model, respectively. The Preventive Home Visit in Japan involves the assessment of locomotion, daily activities, social contacts or relationships with other people, health conditions, and signs of abuse by community health nurses, care managers, or social workers [75]. Lastly, Transitional Care conducted in Chile involves a transition nurse who establishes a transition office, communicates via email, identifies patients, and reviewing clinical records [76]. The overview of common care models with their essential components, impacts, challenges, and facilitators are presented in Table 1.

Discussion

This review maps the available care models and their elements, impact, implementation barriers and facilitators. All available care models were from high-income countries (the USA, Netherlands, Canada, Australia, England, Japan, and Chile), and an upper-middle-income country (China). The discussion focuses on which and how the applicability and adaptability of care model are likely in the low-income country's contexts.

The available care models have been implemented across various settings, from home to hospital levels. In high-income countries, home care is feasible due to the large elderly population and consistent support from the governments, such as Medicare [71]. For instance, in Australia, 4.2 million (16%) of the population are aged 65 years and above as of June 2020 [77]. Additionally, proactive healthcare services, such as eligibility assessments conducted at homes of elderly individuals by interdisciplinary teams that include geriatric experts, have been established in high-income countries but are largely absent in low-income countries. Notably, models like the All-inclusive Care for the Elderly [71], the 'Geriatric Care model' [70], and the IMPACT clinic [73] are specifically designed for community-dwelling seniors or elderly individuals in high-income countries.

However, assessing eligibility for elderly care and identifying health issues at homes of elderly individuals before they seek care at health institutions can be resource-intensive, particularly in the absence of financial support from the government or other sources. In high-income countries, such as Australia, the government provides

Table 1 Care models, essential elements, impacts, challenges, and facilitators

Care model	Essential components	Impacts	Challenges	Facilitators
Integrated Model of Care (IMC)	- Organizational arrangements - Patient recruitment - Multidisciplinary team collaboration - Comprehensive service delivery - Financial management -self-management- Use of ICT-based platforms	- Improved quality of care (client satisfaction)- better health outcomes (recovery and survival) – efficiency-Enhanced patient satisfaction-accessibility-safety-quality of life	- Resource allocation - Team coordination and communication - Service integration - Technological barriers - Policy and regulatory hurdles	- Strong leadership and governance - Supportive policies - Continuous professional training - Access to community and social resources - Adequate financial support - Effective use of health information systems and digital tools
Collaborative Care Model (CCM)	- Well-trained health workforce - Multidisciplinary team - Case management - Comprehensive assessments - Care planning - Drug prescriptions - Problem-solving therapy - Psychological therapy-follow-up-technology-self-management	- Improved patient care coordination and treatment outcomes-quality of care-treatment outcome-cost effective- quality of life	- Ensuring adequate training - Maintaining effective collaboration - Managing communication barriers	- Strong leadership - Continuous professional training - Supportive policies
Integrated-Collaborative Care Model (ICCM)	- Comprehensive patient assessment - Care plan development - Symptom management techniques - Training for practitioners - Collaborative care meetings - Rigorous monitoring and supervision	- Positive impacts on patient outcomes - Accessibility and consistency in treatment environment	- Ensuring adequate training - Fostering effective collaboration - Managing coordination of care - Challenges in follow-up care	- Robust training programs - Effective communication strategies - Supportive leadership - Patient engagement
Guided-Care Model (GCM)	- Meticulous planning - Comprehensive training for healthcare providers - Thorough patient assessment - Collaboration among interdisciplinary team -health assessment- Personalized care plans -Guide care- regular follow-up- self-management	- Improved quality of care – acceptability of services	- Ensuring sufficient training - Fostering effective collaboration - Managing coordination of care	- Robust planning processes - Comprehensive training programs - Effective communication strategies - Access to adequate resources
Nurse-led Care Model (NCM)	- Governance - Coordination - Multidisciplinary team led by nurses - Health assessment - Care planning - Case management - Follow-up (evaluation)- self-management	- Continuity of care - Enhanced patient satisfaction	- Effective coordination among team members - Fostering a supportive culture - Overcoming resource constraints	- Clear governance structures - Robust communication channels - Supportive leadership - Ongoing evaluation
Chronic Care Model (CCM)	- Leadership - Collaboration - Organizational structures - Multidisciplinary members - Service provision - Incentives – Resources – technology- self-management	- Improved management of chronic conditions - Effective advance care planning for elders	- Strong leadership and adequate resources - Effective coordination among interdisciplinary teams - Overcoming reimbursement mechanisms	- Supportive organizational cultures - Incentivization strategies - Capacity-building initiatives - Integration of technology

subsidised aged care services, including residential care and home care, while also regulating the aged care sector [78]. Furthermore, the availability of well-established residences for aged care and retirement communities may be conducive to implementing multidisciplinary, elderly-focused care models [79]. Hence, such care models could be adopted in other high-income countries due to their effectiveness in reducing institution-based service utilization [71], adaptability, acceptability, and feasibility [73].

In contrast, in low-income countries, despite the presence of a non-negligible number of elderly populations (for instance, in Ethiopia, 3.0% of the population is aged 65 years and above in 2022 [80]), there was no system specifically designed for the elderly populations, no dedicated geriatric specialists, and no established financial support schemes. Instead, individuals with multimorbidity, regardless of their age and other constraints, regularly seek care in primary care settings with or without appointments. These visits occur either as frequent follow-ups or new health concerns, aligning with their specific needs in low-income countries [81]. As a result, an elderly-focused approach to care models is less likely to be effectively implemented in low-income countries. These countries require political and policy initiatives to develop strategies that address the needs of their growing aged populations.

In most care models, effective leadership, financial support, health information technologies, health workforce teams, and service delivery perspectives were essential, in addition to considering the population and overall country context. The WHO's framework for integrated, people centred care supports the current findings, as that framework was developed to be adapted and implemented in low- or high-income countries [23]. Community engagement, governance, reorientation of the model of care, services coordination within and across sectors, and creation of an enabling environment [23]. Aligning with this WHO's framework, selecting and adapting appropriate care models is crucial for managing chronic diseases in low-income countries. Taking Ethiopia as an example, Ethiopia has developed a national strategy to address chronic diseases [82]. Similar to people-centred care [23], strategies such as strengthening national health policy and chronic diseases governance, promoting multisectoral coordination, enhancing integrated health service delivery, developing multidisciplinary team, and improving infrastructure are included in chronic disease management strategic document [82].

The implementation of various care models critically depends on how teams are built, and roles and responsibilities are allocated. This underscores the importance of understanding how multidisciplinary teams interact to provide services for individuals with multimorbidity. When implementing care models, teams may take one or more approaches: collaborative efforts towards a common goal (interdisciplinary team) or independently work within their respective disciplines to create tailored plans to their expertise (multidisciplinary team) [83]. The Integrated, Collaborative, Guided, Nurse-led, Geriatric, PACE, and IMPACT Care models require two or more healthcare professionals. The difference lies in which specific field of study the team members come from and how they interact in delivering the services. Team composition with clearly defined roles and responsibilities may depend on the types of care, diseases nature, and level of health care (home care, primary care, secondary care, or tertiary care) that aimed at ensuring effective care delivery. For the GCM [62–64], only nurses and physicians were team members. In contrast, NCMs included nurses with different education levels, such as nurse practitioners, clinical nurse specialist, and advanced nurse specialists [65–67]. In this model, the nurses took on leadership roles [66]. Ideally, involving professionals from only two disciplines (nurses and physicians) can be cost effective and feasible, especially in the absence of other professionals. However, this approach may require extensive training or task-shifting for the team to address the comprehensive needs of clients with multiple conditions. Nurses could replace physician if they received appropriate training [84].

Collaboration of healthcare teams is crucial in all care models though there is some confusion regarding integration. For instance, the IMC and CCM often emphasize collaboration, which can cause confusion. Both models of care require effective leadership, multidisciplinary teams, financial support, and client and caregiver engagement. While integration necessitates collaboration, the reverse is not true: collaboration does not require integration as a precondition [85]. In the IMC, shared decision between teams may be required at certain intersection points. For instance, in an IMC within ambulatory care setting of a hospital in Taiwan [36], the case manager and pharmacist independently conduct comprehensive assessments and medication review, respectively, as the initial step. Next, they cooperate and jointly make recommendations. The physician then reconciles team's decision and provides recommendation based on teams' input and the client's preferences. Finally, the case manager takes responsibility for follow-up care. Comparably in another study, IMC has passed some steps: intake screen by physician, care coordination screen by occupational therapists, orientation about care delivery process by nurse, multidisciplinary care appointment by multidisciplinary team, integrated care phase by team, transition phase by occupational therapist, and discharge phase by physician [39]. In contrast, the CCM requires teams work collaboratively, aligned with their expertise, towards common interests. For instance, bilingual graduate social work

diabetes depression clinical specialists (DDCSs) and PCPs independently perform their roles. Meanwhile, psychiatrists supervised DDCSs and PCPs via telephone in a weekly basis [53]. Similarly, in another CCM, nurses develop care plans, follow-up clients, and provide self-care training for patients, while PCP prescribes drugs. Nurses in this model are supervised by psychiatrists, PCPs, and psychologists [54]. These implies that implementation of care models is varied and need careful understanding despite having many identical elements.

As for the implication of the review findings, care models for multimorbidity were rarely implemented and evaluated in low-income countries. However, considering the WHO's integrated, people-centred care approach [23] and the national health plans in low-income countries (e.g., Ethiopia) [82], when we see the implications of each care model, the IMC emerges as the most suitable choice. For instance, in Ethiopia, it holds a prominent position at the Ministry of Health level, and some health facilities have already initiated integrated care for non-communicable diseases at the primary health care level. These initiatives involve practices such as task shifting, task sharing, and improving referral networks. Additionally, families are actively engaged, health care settings are reoriented and multidisciplinary teams—including general practitioners, nurses, and pharmacists—are established [81, 82]. This alignment with leadership support and the availability of functional clinics positions the IMC favourably for evaluating its implementation. Notably, challenges related to building interdisciplinary team, financial system integration (including funds, incentives, and health insurance), and resource allocation [41] may be unlikely to hinder its adoption in Ethiopia, given the national strategic plan's endorsement.

However, the evaluation of the implementation process that requires strategical and operational plans is critical to understand the forms of integration. Integration could be organisational, professional, cultural, or technological at macro-, meso- and micro level for a whole population group or specific client group [86]. Additionally, it requires attention on how integrated care delivery is organised and provided. Horizontal integration aims to provide comprehensive services for clients by multidisciplinary team, and vertical integration focuses on improving referrals between different hierarchical care levels [87]. It is also necessitates to clearly demonstrate how care co-ordination and fully integrated teams are functions [86]. Furthermore, effective interventions may be introduced into the existing IMC. For instance, Care Coordination was initiated in the exiting IMC. There was a subspeciality-trained nurse led care coordination for patients with complex health profiles in inpatient and outpatient settings in an already available integrated health care system involving care coordinators (all nurses), social workers, and administrative support person [60].

Limitation

Articles conducted and published in English were included. However, there may be other studies conducted in languages other than English. The search strategy did not incorporate database-specific indexed terms (e.g., MeSH terms for PubMed), which is another limitation because it may result in missing relevant articles indexed under these terms. Search for articles and title screening were conducted by a sole author, even though each activity were discussed during the weekly meeting.

Conclusions

The review and analysis of various care models reveals a comprehensive approach to improving healthcare delivery across diverse settings. Each model, whether integrated, collaborative, nurse-led, or specific to chronic and geriatric care, demonstrates significant potential for enhancing quality of care, health outcomes, cost efficiency, and patient satisfaction. The success of these models hinges on addressing common challenges such as resource allocation, team coordination, and technological barriers. Key facilitators like strong leadership, supportive policies, continuous professional training, and robust communication strategies are crucial for overcoming these challenges and ensuring effective implementation. As healthcare systems worldwide continue to evolve, these models offer valuable insights and frameworks that can be adapted and scaled to meet the unique needs of different populations, ultimately leading to more integrated, efficient, and patient-centred care.

Abbreviations

CCM	Collaborative Care Model
CMC	Chronic Model of Care
DDCSs	Diabetes Depression Clinical Specialists
GCM	Guided Care Mode
GeriPACT	Geriatric Patient-Aligned Care Teams
ICCM	Integrated-Collaborative Care Model
ICM	Integrated Model of Care
NCM	Nurse-led Care Model
PACE	The All-inclusive Care for the Elderly
PCPs	Primary Care Physicians
PEACE	Promoting Effective Advance Care for Elders
PRISMA-ScR	Preferred Reporting Items for Systematic Review and Meta-analysis Extension for Scoping Reviews guideline
USA	United States of America
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1

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Author contributions
YA and AE conceptualised the project. AE extracted data, write the first draft and subsequent revision. YA supervised the whole research process, checked extracted data and edit the manuscript. AZ and EW revised the manuscript. All the authors approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable because the review was dependent on secondary resources from published articles and did not collect data from human participants.

Competing interests
The authors declare no competing interests.

Consent for publication
Not applicable.

Author details
[1]School of Public Health, The University of Queensland, Brisbane, Australia
[2]College of Medicine and Health Sciences, Bahir Dar University, Bahir Dar, Ethiopia
[3]International Institute for Primary Health Care in Ethiopia, Addis Ababa, Ethiopia

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