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Multimorbid heart failure (HF) and cardiorenal metabolic (CaReMe) syndrome, exploring integrated models of care: A scoping review

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Abstract

Background: Heart failure (HF) remains a global cause of morbidity and mortality and is increasingly complex to manage due to high prevalence of multimorbidity and coexisting cardiorenal and metabolic (CaReMe) syndrome. Individualised care through integrated service models can improve quality and maximise patient outcomes. This scoping review identifies and synthesises models of integrated care for multimorbid HF and CaReMe syndrome, analysing organisation, implementation, and reported outcome measures. **Methods:** A systematic search was conducted in MEDLINE, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), COCHRANE library, and grey literature. Eligible studies included primary research published between 2014 and 2025 describing integrated, multispecialty, or multidisciplinary team (MDT) models of care for adults with multimorbid HF and CaReMe disease. The search followed PRISMA-ScR reporting standards and studies reviewed using standardised tools informed by Joanna Briggs Institute (JBI) and Cochrane Collaborations Tool methodologies. **Results:** Five studies were identified from upper-middle and high-income countries that incorporated MDT integrated care models. Models were mapped to the Effective Practice and Organisation of Care (EPOC) framework explaining key components of integrated care. Positive outcomes included reduced hospitalisations, improved treatment adherence, enhanced collaborative processes, and patient engagement. Limited governance structures, variable outcome measures, gaps in financial and technological evaluations were also identified. **Conclusion:** Integrated care models for multimorbid HF and CaReMe syndrome demonstrate potential to enhance care coordination and quality of life. Evidence gaps persist regarding practical implementation, economic viability, and flexibility across healthcare settings. Future research should prioritise patient co-design, standardised outcomes, and shared decision-making frameworks.

Keywords

heart failure, multimorbidity, cardiorenal and metabolic syndrome, integrated care models, multidisciplinary team

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1. Introduction

Cardiovascular disease (CVD) is a dominant burden of ill health with approximately 523 million cases and 17.3 million deaths documented globally in 2019[1,2] projected to rise to 35.6 million deaths by 2050.[3] Heart failure (HF) is one of the most prevalent forms of CVD affecting 64 million people worldwide,[4] whilst the overall global prevalence of multimorbidity is calculated at 37.2%.[5] The complexity of HF management is increasing due to its coexistence with two or more chronic health conditions, widely referred to as multimorbidity, shifting from the exception to the norm.[6–9] A common occurrence in multimorbid HF is cardio renal metabolic (CaReMe) syndrome, a collection of interactive cardiovascular, renal, and metabolic co-morbidities,[10,11] which impact disease severity, response to treatment and HF outcomes.[12–17] HF frequently occurs with this cluster of conditions and may represent both a consequence and a driver of CaReMe disease processes.[10] Therefore, this review considers HF and CaReMe syndrome as overlapping clinical entities rather than separate conditions. The predisposition to multimorbidity in HF is mirrored by its rising incidence and mortality rates, with epidemiology indicating adverse individual, societal and economic impact.[18]

Models of care outline how services are organised and delivered, clarifying care processes, provider roles, and co-ordination. Understanding functioning models for individuals with multimorbid HF and CaReMe syndrome is essential to guide change from disease focus systems to person-centred integrated approaches,[19] when combined with health professional support and patient behaviour modifications. These models may enhance care delivery, reduce health disparities, optimise treatments and promote equitable, reproducible care.[20–22]

2. Background

Integrated patient care is defined as the continuous delivery of coordinated services that bring together support systems to meet patient needs, optimise wellbeing, and promote shared decision-making (SDM) between patients and healthcare providers.[23–25] In the UK, place-based partnerships encourage collaborative, patient-centred care.[26–29] In the US, rising chronic disease prevalence, healthcare costs, and fragmented care have driven policies that incentivise integration of health and social care.[3,30,31] Globally, the WHO framework[32] supports a life-course approach, shifting from siloed healthcare to integrated, disease-based service delivery tailored to individual values and contexts. Evidence indicates that coordinated models of integrated care can improve care for patients and caregivers, enhancing quality of life and reducing care burden.[33,34] These and are promoted by advisory groups and international guidelines emphasising SDM.[13,35,36]

Despite these advances, defining and measuring integrated care remains challenging due to the lack of standardised tools and the complexity of stakeholders involved.[37–39] For individuals with multimorbid HF and CaReMe syndrome, integrated models support management of complex interventions, preventative strategies, and holistic care.[18,40] The ICARE4EU consortium highlighted that fragmented single-disease systems hinder care for patients with multimorbidity, advocating stepwise, patient-centred reforms.[40] Multimorbid HF and CaReMe treatments aim to reduce hospitalisations and cardiovascular mortality.[41] Integrated multispecialty cardio-renal care offers cost-effective, holistic management that improves decision-making and lowers all-cause hospitalisations.[42,43] Therefore, integrated care models may safeguard against isolated working to benefit patient care. A scoping review was therefore undertaken to identify and synthesise evidence on existing integrated care models for this population.

Within this review, integrated care refers to coordinated service delivery across organisational and professional boundaries. Multispecialty and MDT models are therefore considered operational strategies through which integrated care can be implemented in practice, enabling collaboration between CaReMe specialists and allied health professionals (AHPs).

3. Aims

The primary focus of the review was to identify integrated models of care for patients living with multimorbid HF and CaReMe syndrome. It identified models adopting multispeciality and MDT approaches. The second focus was to synthesise literature to establish current evidence base for models of care delivered for patients with multimorbid HF and CaReMe.

4. Design

A review was conducted to synthesise quantitative outcomes such as hospitalisations, mortality, and adherence. The review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,[44] which are suitable for mapping a wide breadth of evidence, identifying gaps[45–47] to inform the practical refinement of integrated care models.[48]

5. Method

A systematic scoping review was conducted to comprehensively identify, evaluate, and synthesise literature on integrated care models for adults with multimorbid HF and CaReMe syndrome.

Various review typologies were analysed using the Search, Appraisal, Synthesis, and Analysis (SALSA) framework.[48] The search was constrained by a specific timescale. A rigorous systematic process was applied to ensure transparency (44). The review aimed to characterise the quantity and quality of the literature and critically appraise key features contributing to the evidence base.

5.1. Search strategy

Electronic databases and grey literature were searched. Online databases included MEDLINE, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), COCHRANE library, and sources of unpublished studies clinical trials.gov, WHO International Clinical Trials Registry Platform (ICTRP), and Google Scholar. Optimising a combination of databases which have a broad focus whilst considering the specialised subject area is recommended as a minimum requirement in systematic reviews.[49,50] Free text key terms and Medical Subject Heading (MeSH) appropriate to each database were used and reference lists of included papers were hand searched, see Table 1. The search was he search was initially restricted to a 10-year period from 2014-2024 and then updated in 2025.

5.2. Selection criteria

The rationale for the selected search terms was important. CaReMe sits within a complex landscape of multimorbidity, with individuals commonly presenting with chronic conditions spanning multiple systems.[10,51] Terms linked to CaReMe diseases were used due to their high prevalence, interdependence, and relevance to coordinated multispeciality care. A search strategy covering all co-morbidities was considered impractical and risked diluting the study's focus. Some conditions co-exist more frequently than by chance, targeting these clusters can support more efficient healthcare strategies.[52] Anchoring the search strategy and conceptual model around HF, CaReMe disease, and the term multimorbidity was clinically and practically justified because CaReMe conditions are pathologically and clinically linked[41,51,53]. A model of care was defined as a structured approach to healthcare delivery outlining professional roles, care coordination processes, and organisational arrangements supporting integrated management of HF and CaReMe conditions.

Focussing on HF and CaReMe syndrome aimed to produce a greater analytical depth of understanding which was favourable over broader multimorbid conditions, with less clinical relevance. Rather than specifying individual co-existing conditions, the term multimorbidity with HF was adopted to balance generalisability and feasibility, thereby supporting implementation within existing healthcare infrastructure.[54,55] This decision supports realistic, scalable care models, and the broader search did not add findings beyond the focused search.

A Population Intervention Outcome (PIO) framework was implemented to guide the search, a variant of the Population, Intervention, Comparison and Outcome (PICO) framework[56]. It helped to identify patient areas of concern, guide selection of key search terms, clarify the problem, extract results, and outcomes.[57,58] The search strategy was developed collaboratively by the research team with consultation from an experienced academic librarian to ensure appropriate use of MeSH terms and engine specific indexing.

Table 1. Search strategy.

Population
"Heart failure" OR "Cardiovascular disease" OR "Renal failure" OR "Chronic Kidney disease" OR "Metabolic disease" OR "Metabolic syndrome" OR "Diabet*" OR "Diabetes mellitus" OR "Multimorbidity" OR "Cardio renal metabolic syndrome" OR "Cardio renal syndrome" OR "Vascular disease."
Intervention
"Multidisciplinary" OR "Multispeciality" OR "Interdisciplinary" OR "Team" OR "Integrated" OR "Multiprofessional" OR "Collaborative" OR "Coordination"
Outcome
"Model" OR "Care model" OR "Cardio-Renal-Metabolic Care Model" *OR "Kaiser Permanente* model" OR "Vanguard Care Model" OR "Integrated care"

5.3. Inclusion and exclusion criteria

Articles were screened for suitability; full text reviewed for eligibility using inclusion and exclusion criteria outline in Table 2.

5.4. Screening

A total of 8292 references were identified from the databases and imported for screening. 2225 duplicates were identified and removed using Rayyan software. The remaining 6067 studies were divided by authorship A-Z and screened by six authors working independently in pairs (J.L, I.J, L.M, K.H, J.H and C.V.M). Authors screened each title initially excluding 5615 articles. The same team screened abstracts resulting in the exclusion of a 431 studies which did not meet the criteria. All reviewers were aware of the search eligibility criteria to reduce the risk of missing relevant papers.[59,60] A bespoke data extraction tool was developed, piloted, and refined for this purpose. Disagreements between reviewers were resolved through discussion with a third reviewer from the research team (IJ). A total of twenty-one full text papers were reviewed for eligibility. Seventeen articles were then excluded for the following reasons, n = 6 papers did not focus on HF and multimorbid conditions, n=1 did not focus on a model of care delivery, n= 1 focused on mathematical modelling with no relevance to the types of model being reviewed, n = 9 were not primary data collection studies these comprised literature review articles, protocols and a commentary piece. Review articles and protocols were excluded to ensure the synthesis focused on primary evidence describing implemented models of care. Protocols were not included as they do not report outcomes. While review articles were informative and considered in the discussion, they were excluded from the synthesis as they do not contribute primary data to the evidence base on future models of care. A hand search of the reference lists of these twenty-one articles identified one additional eligible paper.

Five studies were selected for data extraction. The identification of only five eligible studies despite screening over 8,000 records highlights the limited empirical evidence currently available describing integrated care models specific to multimorbid HF and CaReMe populations (Table 3).

5.5. Quality appraisal

Reviewers followed a structured approach to data extraction to ensure methodological transparency and consistency[61]. A bespoke dat extraction tool was developed, piloted, and refined, informed by Joanna Briggs Institute (JBI) and Cochrane Collaboration guidance (2011), to systematically capture study characteristics and methodological features.[61–63] Data extraction was conducted by the primary author (JL) using this standardised framework.

Study quality and potential bias were considered during data charting and interpretation; however, a formal risk of bias or quality appraisal using validated tools (e.g., CASP or JBI checklists) was not undertaken. This is consistent with scoping review methodology,[44,57] which focuses on mapping the breadth of evidence rather than excluding studies based on quality. Instead, study characteristics, strengths, and limitations were summarised to support interpretation.

Bias, defined as systematic deviation from the truth due to study design, conduct, or reporting, was considered narratively in line with Büttner et al.[60] Reviewers adhered to eligibility criteria to minimise the risk of missing relevant studies.[64,65] The absence of formal quality assessment is a limitation, and findings should be interpreted with caution.

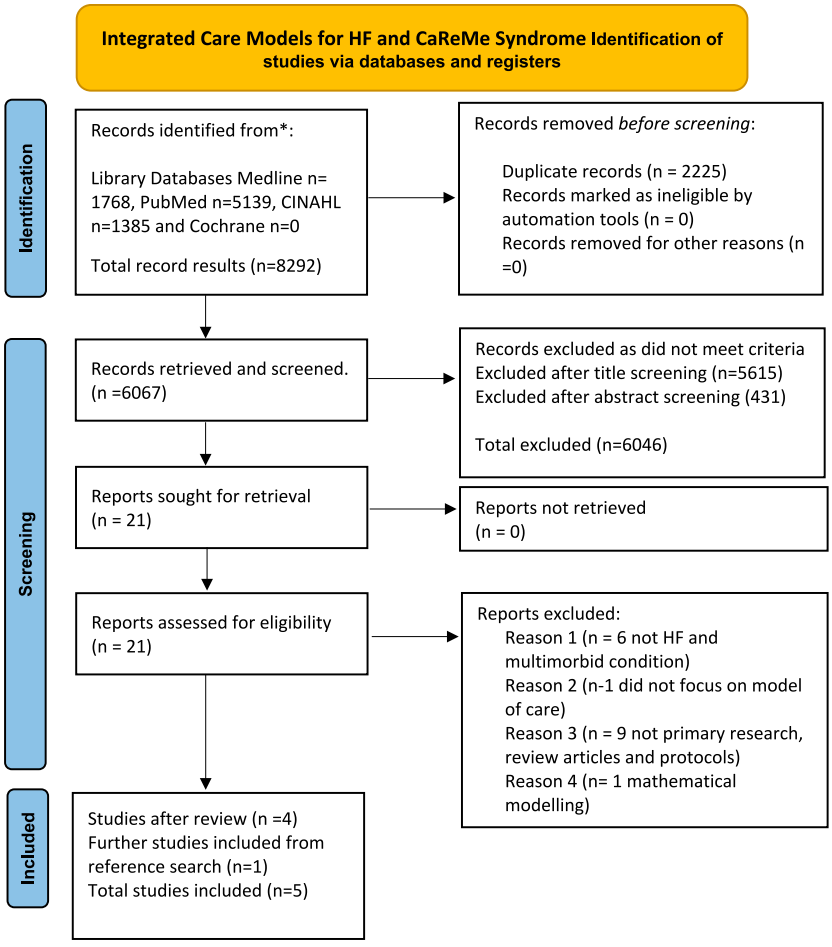
5.6. Data analysis

Papers were analysed for shared characteristics and common elements through iterative discussion with the lead researcher (IJ). Analysis beyond a standard scoping review was needed to understand how models of care function in practice, as scoping

Table 2. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Studies published in the English language	
Publications dated between 2014 and 2024	
Primary research studies (involving primary data collection)	
Studies describing integrated, multispecialty, or multidisciplinary (MDT) models of care for adults with heart failure (HF) and multimorbidity, including cardiorenal and metabolic disease	Studies describing models of care focused on a single condition only

Table 3. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only.



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

reviews provide a broad overview but not detailed component or contextual insights. Given that models of care comprise multiple interconnected elements, the Effective Practice and Organisation of Care (EPOC) taxonomy[66,67] guided the analysis. The EPOC framework categorises health system interventions into the four domains of delivery, financial, governance, and implementation arrangements, further subdivided to describe mechanisms of action. A bespoke data extraction tool (Table S1) was developed, and included studies were mapped to relevant EPOC domains (Table 4), enabling systematic classification and comparison across domains, categories, and subcategories.

6. Findings

6.1. Characteristics of included studies

Five studies were included in the review[43,68–71] these originated in the UK (n=1), the United States of America (n=1), Australia (n=2), and Iran (n=1). Of the five studies, two were randomised controlled trials (RCTs),[68,71] the remainder were retrospective cohort studies.[43,69,70] In the non-RCT studies[43,68,69] the main methodological constraints included variability in

Table 4. Study characteristics mapped to EPOC domains.

Study	Delivery arrangements	Financial arrangements	Governance arrangements	Implementation Strategies
Essa et al.[43]	Multispecialty MDT care, shared care pathways, coordinated comorbidity management, virtual MDT meetings.	Not reported but cost savings of the service highlighted.	Accountability across specialities agreed, protocols for HF and comorbidities followed.	Consensus processes, treatment optimisation, deprescribing
Ghobadi et al.[68]	Nurse-led MDT, disease management, self-management support	Not reported	Clinical accountability for MDT prescribing	Educational sessions, medications review and optimisation, audit, and feedback
Ho et al.[69]	MDT ambulatory service, shared care, quality and safety systems	Not reported	Accountability for evidence-based prescribing	Audit and feedback, senior clinicians leading
Mulligan et al.[70]	Cardio-geriatric MDT, inpatient shared care, role expansion, transitional care.	Not reported, descriptions of health resources.	Governance for multi and cross-specialty working	Joint ward rounds, educational meetings, consensus and agreement processes used.
Rollman et al.[71]	Blended collaborative care (BCC), nurse care managers, continuity across settings, telephone follow-up, and electronic health records use.	Not reported	Shared accountability across mental and physical health services.	Tailored interventions, patient goal setting, aims for continuous quality improvement

study design, single-centre recruitment, and a limited generalisability of findings. Nevertheless, consistently high retention rates across all included studies added to internal validity, essential for reaching meaningful and valid conclusions from research studies.[72]

Study populations in addition to HF included specialities of cardio-geriatric medicine[70] mental health, specifically comorbid depression and mental distress.[71] They included prevalent multimorbid conditions such as diabetes, renal impairment, and frailty.[43,69,70] Ghobadi et al.[68] highlighted the complex nature of multimorbid HF, identifying myocardial infarction, hypertension, peptic ulcer, and depression as the most frequent comorbidities in both groups studied. Reinforcing the breadth and impact of coexisting conditions. Studies recruited elderly patients, with mean or median ages ranging from 68 to 81 years[43,68–71] female participants were underrepresented. Most study participants were diagnosed with HF with reduced ejection fraction (HFrEF)[68,71,72] although HF with preserved ejection fraction (HFpEF) was also reported by Essa et al.,[43] with no HF subtypes.[70]

6.2. Delivery arrangements

6.2.1. Multidisciplinary team composition

Health professionals in the studies included cardiologists (n=5), Nephrologists (n=1), Acute medics (n=1) diabetologist (n=1) nurses (n=5), geriatricians (n=1), General practitioners (n=1), Psychiatrists (n=1), Allied Health Professionals (AHPs) (n=3) and mental health specialists (n=1).

6.2.2. Interventions

Interventions assessed in all models include management of comorbidities, optimisation of medications and adherence, symptom control, and health education. Other interventions considered mental health management,[68,71] comprehensive geriatric assessments (CGA)[70] patient self-management[68] and the environment of service delivery.[71]

6.2.3. Care setting and coordination

Care was coordinated and delivered across multiple providers mostly taking place in hospital-based settings[43,69–71] and primary care collaborating with hospital specialists.[68] Recruitment occurred in hospital and inpatient settings where initial interventions were delivered. Essa et al.[43] established multispecialty MDT meetings for multimorbid HF patients ensuring integrated and timely management. Ghobadi et al.[68] focused on MDT initiated symptom management and medication

concordance as part of integrated delivery. Ho et al.[69] examined enhanced guideline adherence through coordinated care between generalists, cardiologists, and AHPs. Rollman et al.[71] amalgamated physical and mental health service providers, offering a distinctive collaborative care model.

6.2.4. Tools and technology

Validated decision-support and assessment tools underpinned many interventions in the studies to enable structured care planning and measure outcomes. These included the Mental Health Related Quality of Life (mHRQOL) tool, PHQ-9, Hospital Anxiety and Depression Scale,[71] the Edmonton Symptom Assessment Scale (ESAS), and Morisky Medication Adherence Scale (MMAS).[68] Clinical management tools tracked HF interventions including advanced management (device therapy, transplant referrals), integrated palliative care referrals, and polypharmacy reviews.[43] Ho et al.[69] focused on compliance in CaReMe disease aligning to national guidelines. Care planning and SDM were supported by structured tools such as disease management templates[68] and blended care algorithms.[71] MDTs used joint care checklists and shared documentation systems to promote group responsibility for patient outcomes.[43,69,70]

Positive outcomes were observed across multiple domains, including reductions in hospitalisations, improved adherence, and enhanced process measures. Essa et al.[43] reported a decrease from 1.1 ± 0.4 to 0.6 ± 0.1 admissions per patient ($p < 0.001$), saving 1,586 hospital bed-days. In contrast, Mulligan et al.[70] observed a longer median length of stay (4 vs 4 days, $p = 0.04$) with overall hospital use remaining similar, concluding that intensified collaborative management did not reduce readmissions or mortality but still championed the value of collaborative care. Ghobadi et al.[68] measured outcomes at three intervals over 8 weeks and found patients in the MDT management program (MMP) showed marked improvements in medication adherence (MMAS: 43.3, 24.0, 18.4; interaction $p < 0.001$). Identifying substantial reductions in total symptom burden (ESAS: 6.03, 5.00, 4.27; interaction $p < 0.001$). In contrast, the usual care (UC) group demonstrated worsening adherence (43.3, 50.0, 50.8) and increased symptom burden (5.71, 6.20, 6.27), emphasising the effectiveness of the MMP. Ho et al.[69] demonstrated improved prescriber compliance, with 93–98% of eligible patients receiving recommended Renin–Angiotensin System (RAS) antagonists, beta-blockers, anti-platelets, yet no statistical assessment was undertaken. Compliance with non-pharmacological interventions was lower, exercise 36%; and significantly associated with patient and carer factors ($p < 0.001$). Adherence to ophthalmology/podiatry review recommendations was 0% with significant differences between compliant and non-compliant groups ($p = 0.022$).

Mortality and readmission findings were more variable. Mulligan et al.[70] found no significant differences in 30-day or 365-day all-cause readmissions between historical controls and the MDT group (21.7%vs 25.6%, $p = 0.33$; 68.1% vs 68.0%, $p = 1.00$). There was a trend toward fewer HF-specific readmissions (14.7%, vs 9.2% $p = 0.07$), increased referrals to subacute rehabilitation (7% vs 14%, p=0.01) and 6-month echocardiograms (40% vs 86%, p=0.0). Rollman et al.[71] found that blended collaborative care (BCC) produced greater improvements in depressive symptoms than UC (effect size = 0.47) enhancing usual care, (PROMIS-Depression effect size 0.47; 95% CI, 0.28 to 0.67) and UC participants (0.24; 95% CI, 0.07 to 0.41). BCC also improved mental health related quality of life (+4.47 SF-12 MCS points; $p = .002$) with similar benefits across sexes. BCC did not significantly affect physical function, HF pharmacotherapy use, hospital admissions, or mortality over 12 months. Ghobadi et al.[68] and Ho et al.[69] primarily focused on symptom burden, adherence, and guideline concordance without reporting readmissions or mortality. Collectively, MDT and integrated approaches demonstrated reliable processes and patient centred improvements, despite inconsistent effects on mortality and readmission rates. These results need to be considered within the context of a retrospective study design, which can be less accurate and prone to bias.[73,74]

Information Technology (IT) was prevalent in studies, facilitating data measurement and communication, illustrating an emerging trend. Essa et al.[43] measured all-cause hospitalisations and outpatient clinic attendances through hospital electronic health records (EHRs) and organisational data. Mulligan et al.[70] accessed patient archives and information systems to assess participant length of stay, readmissions, and mortality. Rollman et al.[71] adopted stepped care protocols supported by electronic decision support and communication systems connecting psychiatrists, cardiologists, and nurse managers. They incorporated essential telephone contacts as part of interventions, emphasising the value of IT and digital tools integration. Whilst this improved coordination, no studies directly evaluated its impact on clinical outcomes.

6.3. Governance arrangements

Governance arrangements were identified through explicit descriptions of leadership structures, professional roles, prescribing responsibilities, and organisational collaboration reported within the included studies.

6.3.1. Regulatory and accountability structures

Regulatory requirements, accountability, professional roles, and leadership structures were all evidenced at some level. Studies implied cross-institutional collaboration and shared accountability for care[43,70] including prescribing

responsibilities.[69] They did not offer formal descriptions of governance mechanisms such as accreditation, qualifications, or professional regulatory oversight.

6.3.2 Workforce and role expansion

MDT working expanded workforce roles, utilising nurses as care managers, advancing beyond traditional scope of practice.[71] Essa et al.[43] described integration of multiple specialist disciplines into MDT decision-making forums, enabling redistribution of clinical tasks across the workforce. Although mechanisms for patients SDM were less clearly articulated. Ghobadi et al.[68] highlighted the incorporation of patient self-management within MDT structures as a means of promoting adherence and symptom monitoring, thereby supporting patient autonomy.

Governance and workforce arrangements underpinned how care delivery was organised and sustained, while also exposing ongoing challenges related to accountability, leadership, and the formal integration of patient engagement within MDT frameworks.

6.4. Financial arrangements

6.4.1. Economic analysis

Financial arrangements and cost savings were not consistently addressed but were reported by Essa et al.[43] providing an economic analysis of the impact of the virtual multispecialty MDT. Their analysis demonstrated that the virtual multispecialty MDT model reduced hospitalisations (1.1 to 0.6 per patient, $p < 0.001$) and outpatient clinic attendances (481–534 fewer appointments), equating to cost savings of £664,550. Consequently, the virtual CaReMe MDT service model demonstrated both patient-centred and financially sustainable care. In contrast, Mulligan et al.[70] reported descriptions of health resource use but lacked a cost analysis. They observed lower HF-specific admissions at 30 days but no change in mortality or readmissions, which could indicate a ceiling of care effect due to its complex elderly cohort. The findings mutually indicate that while financial evaluations were limited, MDT and integrated care models have the potential to generate efficiency savings by reducing hospital expenditure.

6.5. Implementation

Implementation strategies to support decision-making processes, included ward rounds and structured MDT meetings. Educational initiatives targeting both patients and professionals were utilised, alongside audit and feedback mechanisms to support practice change. SDM was enacted through collaborative discussions focused on condition optimisation and treatment planning.[43,70] In addition, educational interventions were designed to inform prescribing decisions and improve medication adherence.[68,69]

Tailored, patient-centred interventions such as goal setting and self-management support were embedded within nurse-led models to enable continuous quality improvement and sustained implementation.[71] Across studies, nurses played a central role in coordinating and leading implementation activities, transforming expanded workforce roles into practical integrated care delivery.[68–72]

7. Discussion

Multimorbid HF and CaReMe continue to rise globally.[5,75] Despite a limited evidence base, studies show inconsistent reporting of effectiveness, with diverse interventions and outcomes.[76,77] This discussion applies the EPOC taxonomy, to examine integrated MDT models, highlighting strengths, limitations, and gaps in current management.

HF is classified by left ventricular ejection fraction (LVEF) into HFrEF (≤40%), HFmrEF (41–49%), and HFpEF (≥50%),[78,79] alongside staging from A (at risk) to D (advanced disease) which guides risk stratification and treatment[80]. However, the predominance of HFrEF populations in studies limits applicability to HFpEF, where pathophysiology and multimorbidity differ, highlighting the need for greater HFpEF representation in future research.

All included studies were conducted in middle- and high-income, predominantly Western settings, limiting generalisability to lower-resource contexts where healthcare infrastructure, workforce, specialist access, and financing differ[81,82]. High-risk, ethnically, and culturally diverse populations remain underrepresented. Some differences between studies are necessary because care models need to be adapted to different healthcare settings. However, some variation remains unexplained, highlighting the need for greater harmonisation and more transparent approaches to assessing contextual applicability in evidence synthesis[83]. Similarly, the underrepresentation of women reflects a broader gap in cardiovascular research and may limit understanding of sex-specific responses to integrated HF care.[84] Furthermore, while

observational studies provide valuable real-world insights, their susceptibility to bias means findings should be interpreted cautiously alongside randomised controlled trial evidence.

Despite variation in study design, MDTs generally comprised of cardiologists, nurses, AHPs, geriatricians, and mental health specialists. There were opportunities for nurses, acting in care coordinator or manager roles, which emerged as a feature of integrated practice. Variability in workforce arrangements may explain inconsistencies in patient engagement and reported outcomes. Recruitment during inpatient admissions and care delivery centred around specialist hospital settings, suggesting a reactive rather than preventative model of care. This may limit transferability to multimorbid HF and CaReMe populations managed in community settings were complexity challenges standardised care pathways.[9]

IT primarily acted as an enabler of care delivery, supporting MDT communications, care coordination, and outcome measurement. However, it was not examined as an independent intervention and was unevenly integrated across EPOC domains. This limited exploration of IT within integrated care models may have restricted its potential to enhance patient empowerment and SDM for HF and CaReMe patients, despite the rapid expansion of telehealth and virtual care approaches[85–87].

Governance arrangements were variably reported and often underdeveloped. Lack of robust consistent data highlights the need to standardise measurement tools and patient outcomes, offering future research opportunities which capture both objective and subjective aspects of care. This has previously been recognised by Lawson et al.,[88] who reviewed processes for developing a Core Outcome Set (COS) to recognise HF-specific and generalised symptoms associated with multimorbidity such as CaReMe syndrome. A COS not only helps to improve the quality of evidence base on subjects worldwide[89] but has the potential for practice integration to detect clinical deterioration early and prevent hospital admissions.[88] The absence of a COS further emphasises the need for a quality improvement framework linking interventions to patient outcomes. Variation in governance structures and inconsistent outcome measurements may have contributed to differences in results reporting across studies, indicating a lack of oversight and shared direction in multimorbid HF and CaReMe research.

There was limited exploration of financial arrangements in the literature, with only one study reporting a formal economic evaluation. This could suggest insufficient investment into integrated care models and explain inconsistencies in its wider implementation. In the context of finite healthcare resources, the scarcity of economic evaluation signals the importance of demonstrating cost-effectiveness to justify investment in integrated care models.[90]

Implementation strategies also revealed gaps in relation to patient and family involvement. Although SDM was central to integrated care, how the MDT, patients, and carers collaborated was often unclear. Many studies prioritised pharmacological optimisation with a limited focus on self-management, often considered the holy grail of long-term conditions[91,92]. Instead, they implied a predominantly medical model of care, featuring less of an emphasis on behavioural, lifestyle, or preventative interventions. Person-centred care is central to integrated health systems, emphasising tailored interventions to individual needs, preferences, and social context.[93,94] While SDM and self-management support were described, evaluation of person-centred outcomes was limited. Person-centred outcomes refer to patient-reported measures reflecting the experience and impact of care, including patient experience, health-related quality of life, and engagement in care planning. Future integrated HF and CaReMe models should incorporate validated measures of these outcomes to better capture care effectiveness from the patient perspective.

Although organisational culture was not explicitly measured, reported practices suggest a shift towards more collaborative and integrated working, with inconsistent embedding of patient empowerment. Nurses played a leading role in coordinating care, bridging service delivery, governance, and quality improvement, and are well positioned to lead integrated models that prioritise continuity and patient-centred care.[95,96]

The international evidence highlights the influence of contextual and systemic factors on multimorbidity management. Application of the EPOC taxonomy[67] identified gaps across governance, financing, implementation, and care pathways, indicating that integrated HF and CaReMe care remains fragmented and unevenly developed. Greater alignment across EPOC domains that reflects a more consistent and coordinated development of organisational, financial, clinical, and implementation components within integrated care models is needed. Improved reporting of governance, patient involvement, digital integration, and funding will support more equitable and effective care. Meaningful patient and public involvement are also essential to co-produce services and ensure interventions reflect patient priorities.[97–99]

8. Limitations of search

The limitations of this scoping review should be considered. A broader definition of multimorbidity may have expanded the search; however, multimorbid HF and CaReMe syndrome warrant specific recognition due to their shared comorbidities. Only studies published in English were included and therefore relevant studies in other languages may have been missed. However, the transferability to multimorbid HF, CaReMe syndrome and targeted implementation strategies within the speciality meant that widening the review of papers could have diluted the usefulness of the evidence found in this population.

Aligning to scoping review methodology, formal risk of bias assessment was not undertaken, therefore findings should be interpreted cautiously as the methodological quality of included studies may vary.

9. Conclusion

This scoping review highlights the complexity of integrated care delivery in multimorbid HF and CaReMe populations and stresses the importance of MDT models in improving care coordination and health outcomes. Evidence suggests integrated models have potential to improve SDM and support sustainability for health care systems. It identified research gaps relating to financial benefits, implementation strategies, IT evaluation, and underdeveloped governance and accountability structures, indicating the need for clearer frameworks. Future research studies should aim to include both nurses and patients in co-production, standardising outcome measures, and exploration of implementation across diverse healthcare contexts.

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Ethical considerations

This study was a scoping review of published literature. Ethical approval was not required as no human participants, patient data, or identifiable personal data were involved.

Consent to participate

Not applicable. This study did not involve human participants.

Consent for publication

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