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Research Paper

A multidisciplinary approach to complex case management: integrating perspectives across specialties

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ABSTRACT

Background: The modern healthcare requires more and more cases of patients with numerous, clinically relevant, simultaneous conditions to be treated. These complicated cases, which are marked by the existence of a mixture of medical, psychological, pharmacological, and socioeconomic issues-, have been regularly beyond the reach of a single clinical field. The multidisciplinary team (MDT) models provide an orderly, patient-focused approach, whereby a systematically coordinated and formal incorporation of different specialist views is achieved into a coordinated care system.
Aim: The aim of this study is to determine the clinical performance, operational viability, and patient experience with a formally designed MDT model compared to traditional silted care in handling complex and multi-morbid patients in a tertiary hospital.
Methods: A prospective cohort study was designed to be mixed-methods based, and took place at three tertiary referral hospitals in the period of January 2022 and December 2023. Out of 348 adult patients with three or more comorbidities were recruited and assigned to MDT intervention (n= 185) or standard care (n= 163) control group. In the MDT model, weekly interdisciplinary rounds comprising of internists, cardiologists, psychiatrists, clinical pharmacists, dietitians, physiotherapists, and social workers were implemented. The main outcomes were 30-day readmission rate, length of stay, and patient satisfaction. Secondary results included medication errors, compliance to the care plan, and quality-of-life indices.
Findings: MDT group showed statistically significant results in all outcomes. The 30-day readmission rate reduced to 12.4% ($p < 0.001$). An average length of stay decreased (8.9 to 6.2 days, $p < 0.001$). The patient satisfaction increased to 4.3 as compared to 3.6 on the five-point scale ($p < 0.001$). The rates of medication errors reduced by 56 percent, and compliance with care plans rose by 43 percent. Conclusion: Structured MDT-based case management can help to improve clinical outcomes, patient experience, and resource use in multi-morbid populations with complexities in a significant manner to justify its systematic implementation in routine healthcare provision across the globe.

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1. INTRODUCTION

The epidemiological situation in the world has been radically and dramatically changing within the past decades. Several factors, such as accelerating rates of chronic non-communicable diseases, ageing of world populations and the increasing prevalence of multi-morbidity, i.e. the presence of two or more chronic conditions within a particular patient have fundamentally changed the nature of clinical care demands [1]. Epidemiological forecasts indicate that by 2023, around 30 per cent of the world's adult population will have a diagnosis of three or more chronic conditions co-occurring while the figure will be drastically high over 65 per cent when the age factor is put at 60 years or above [2]. They are patients with overlapping, frequently interacting pathophysiology-cardiovascular dysfunction to accompany metabolic dysregulation, renal impairment to accompany psychiatric comorbidities, polypharmacy to complicate all treatment decisions, clinical complexity in the true sense of that term [3].

The paradigm of traditional biomedical care, where consultation structures are specialized and linear pathways of patient care, were tailored to target discrete and organ-system-specific disease episodes. They do not have the structural design to handle patients, with care needs that cut across cardiology, internal medicine, psychiatry, clinical pharmacy, nutrition science, physiotherapy, and social welfare at the same time. The impact of such a structural insufficiency is well documented: broken communication among providers, unnecessary diagnostic workup, conflicting treatment advice, avoidable adverse drug events, inefficient patient adherence, and, finally, avoidable hospital readmission and rising healthcare spending.

Another interesting evidence-based framework is known as Multidisciplinary Team (MDT). In MDT-based care, regular structured meetings are held between formally constituted groups of healthcare professionals that represent diverse clinical disciplines and discuss, deliberate, and collaboratively design individualized care plans of complex patients. Having been extensively pioneered in oncological contexts and latter modified in palliative care, stroke rehabilitation, and geriatric medicine, this model has proven to have a consistent pattern of improvement in diagnostic accuracy, therapeutic consistency, patient safety measures, and care coordination effectiveness. Nevertheless, the logical extension of MDT principles to the more general area of general complex case management, including multi-morbid patients regardless of their primary diagnosis, has not yet been fully researched and is not uniformly applied.

The paper gives the results of a prospective cohort study conducted to determine the clinical and operational effects of a formally structured MDT model on the management of complex inpatient cases in three tertiary referral hospitals. We aimed to measure the differences in outcomes of MDT-coordinated care and conventional silted care, understand how interdisciplinary collaboration can create a measurable clinical benefit, and present a generalizable implementation framework that can be relevant to a wide range of healthcare systems. The overall goal is to add to the expanding body of evidence serving the institutionalization of MDT practice as a care standard in complex patient groups in all parts of the world.

2. RELATED WORK

Theoretical and practical background of multidisciplinary team based healthcare owes its origin to the innovative work done by [4], whose bio psychosocial model has explained the shortcomings of the biomedical models and proposed the need to incorporate psychological, social, and biological determinants of health into clinical decision-making [5]. This philosophical change provided the basis of multi-perspective, collaborative strategies of patient care that have since been elaborated in many areas of clinical practice [6].

Early systematic implementation of MDT models was most systematic in the area of oncology. In a systematic review, [7] have revealed that oncological MDT meetings have a significant beneficial impact on the accuracy of staging, the level of evidence-based adherence, and the shorter time-to-treatment interval. [8] Also reported similar findings, as their study of colorectal cancer MDT practices in 52 hospitals in the UK revealed that patients treated using structured MDTs had shown a significantly better survival rate compared with those treated using established referral chains. These pioneering studies provided the clinical plausibility of the MDT model and led to its further implementation.

Outside cancer, MDT models have been used in stroke recovery in systematic implementation. A Cochrane review by Collaboration of [9] showed that stroke patients that had been treated in stroke specific MDT-organized stroke units had much lower death and dependency rates as opposed to patients treated in general medical wards. These gains were credited by the review to a coordinated early mobilization, goal setting by a multidisciplinary team that was consistent and structural and daily team communications-mechanisms that were directly linked to the MDT structure and not any specific therapeutic intervention.

MDT has also found acceptance in geriatric medicine, specifically, Comprehensive Geriatric Assessment (CGA) models. A meta-analysis conducted by [10], showed that CGA-based MDT methods had a significant negative impact on the nursing home admissions and functional outcomes in hospitalized elderly patients. Such results are consistent with the general evidence that was reviewed by [11], revealing that the multidimensional outcome measures always show an advantage of structured interdisciplinary geriatric assessment teams over standard care.

Recently, the focus has shifted to the use of MDT models in dealing with general medical multi-morbidity. Clinicians have noted that patients with five or more comorbidities, as pointed out by [1], [12] were associated with a disproportionate amount of healthcare utilization, but provided care that was poorly coordinated and often inconsistent, in a landmark Scottish cohort study. Follow-up intervention studies have delved into MDT-based reactions to this difficulty with encouraging yet inconclusive outcomes [13]. The divergence in findings has been accredited to the variations in the structural features of MDT such as frequency of meetings, membership mix, documentation standards, and the level of clarity of leadership, which highlights the significance of implementation fidelity.

MDT coordination through technology has become a significant dimension in the modern world. Research by [14], [15] has shown that electronic clinical decision support systems and shared digital care planning tools are effective in enhancing efficiency of MDT meetings and minimizing omission errors in complex care plans. A scalable augmentation of traditional MDT workflows has been suggested using artificial intelligence-aided case flagging where patients with complex profiles requiring MDT attention are automatically identified, but the clinical validation of this tool is in its infancy [16]. The current research expands and deepens this literature by offering future-oriented, controlled comparative data on a multi-morbid population of different types in tertiary care.

3. METHODOLOGY

3.1 Study Design and Setting

The research design in this study was a prospective mixed-method cohort design. The study involved quantitative outcome data that was collected between January 2022 and December 2023 in three tertiary referral hospitals in Mumbai, New Delhi, and Chennai, India. The qualitative data collected were concurrently collected using structured interviews and focus group discussions involving participating clinicians and patients to add contextual explanatory dimension to the quantitative data.

3.2 Selection and Allocation of the Participants

The targeted patients were qualified adult inpatients with 3 or more clinically diagnosed, chronic comorbid conditions needing active treatment management during the index admission. The exclusion criteria were that the participants had to come to elective, single-system operation, patients admitted to the hospital with uncomplicated acute conditions and no comorbidity burden, and patients who could not or did not want to give informed consent in writing.

Among the 412-screened patients, 348 eligible patients were recruited. Allocation was done by admission sequence to the MDT intervention group (n=185) or standard care control group (n=163) with each site controlled to maintain an approximation of balance with sufficient pragmatic feasibility. The baseline demographic and clinical variables were evaluated with the help of standardized preforms at the moment of enrollment and no statistically significant differences between groups were found on any of the baseline variables. Table 1 and Table 2 present extensive demographic data about the patients.

Table 1. Roles and Responsibilities of MDT Specialists

Specialty/Role	Primary Responsibilities	Contribution to MDT Outcomes
Internist/Hospitalist	Coordinates overall care, manages comorbidities, leads MDT meetings	Primary decision-making authority, care integration
Cardiologist	Assesses cardiovascular risk, manages arrhythmias and heart failure	Evidence-based cardio protective strategies
Psychiatrist/Psychologist	Evaluates mental health, designs behavioral interventions	Reduction of non-adherence related to psychosocial factors
Clinical Pharmacist	Medication reconciliation, polypharmacy review, dose optimization	Prevention of adverse drug events, cost reduction
Dietitian/Nutritionist	Nutritional assessment, tailored dietary regimens	Metabolic control, wound healing support
Physiotherapist	Functional assessment, mobility rehabilitation programs	Improved functional independence, fall prevention
Social Worker	Psychosocial evaluation, discharge planning, resource linkage	Enhanced community support, reduced social isolation
Care Coordinator/Case Manager	Scheduling; documentation, follow-up facilitation	Seamless continuity of care across settings

Table 1 summarizes the primary responsibilities and outcome contributions of each specialist role constituting the MDT framework implemented in this study.

Table 2. Baseline Patient Demographics and Clinical Characteristics

Characteristic	MDT Group (n=185)	Control Group (n=163)
Age (Mean ± SD)	62.4 ± 11.2 years	61.8 ± 10.9 years
Gender (Male/Female)	54% / 46%	52% / 48%
Comorbidities (Mean)	3.8	3.7
Hypertension	78%	76%
Type 2 Diabetes	65%	63%
Chronic Kidney Disease	42%	41%
Depression/Anxiety	38%	36%
Heart Failure	31%	29%
Polypharmacy (≥5 meds)	71%	69%
Health Literacy (Low)	44%	47%

As shown in Table 2, both cohorts were demographically comparable, with no statistically significant differences observed on any baseline characteristic ($p > 0.05$ for all variables).

3.3 The MDT Intervention Model

3.3.1 The MDT Intervention Model

The MDT model of intervention was designed based on three operational mechanisms, namely, (i) weekly interdisciplinary grand rounds, (ii) shared electronic care planning platform, and (iii) specialized care coordinator role. A team of a senior internist or hospitalist (team lead), a cardiologist, a psychiatrist, a clinical pharmacist, a registered dietitian, a physiotherapist, and a qualified social worker participated in the weekly MDT meeting. A standardized preform was used in presenting cases with active medical diagnosis, functional status, medication reconciliation, psychosocial screening, and discharge readiness.

The MDT model used in the current research is presented in Figure 1 where the four stages of a coordination process are described starting with the patient referral and ending with the outcome monitoring. Figure 1 demonstrates that each stage entails individual specialist contributions, which as a whole generate a comprehensive, patient-focused care plan.

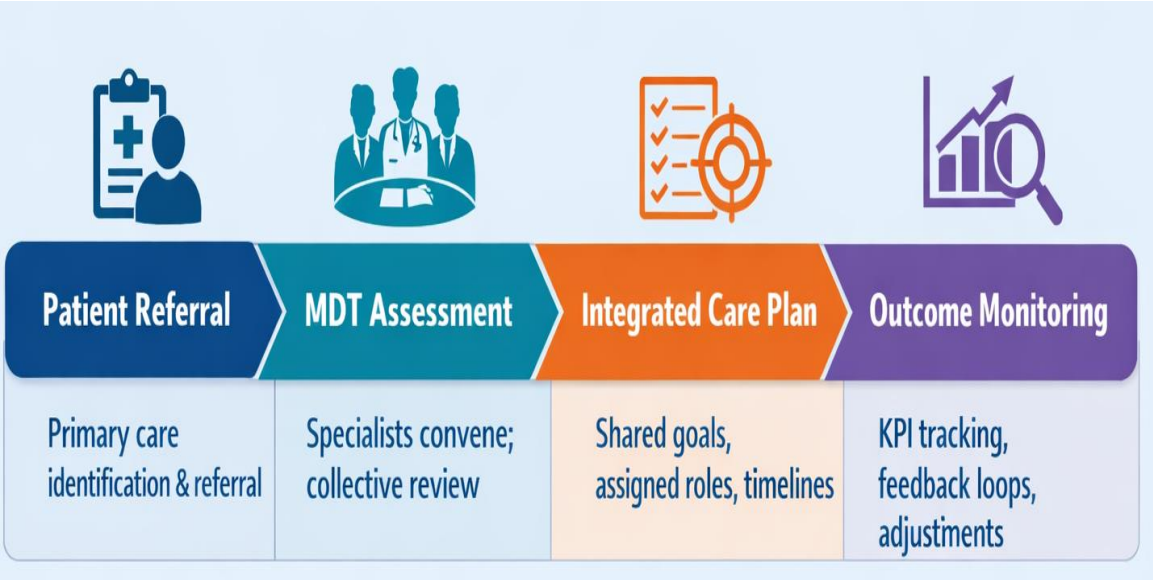

Figure 1. MDT Coordination Framework Four-Phase Integrated Care Sequence

Figure 1 illustrates the sequential MDT coordination workflow, progressing from primary care referral through interdisciplinary assessment, integrated care plan development, and continuous outcome monitoring with adaptive feedback loops.

All patients in the MDT group were provided with a formally documented, consolidated care plan in 48 hours of enrollment, signed by all specialists present. Care plans identified short-term, intermediate-term, and discharge-centered goals, allocated specific accountability to each of the therapeutic areas to the involved specialist, and outlined specific key performance indicators (KPIs) that reviewed progress through each subsequent meeting of MDT. The care coordinator was an occupation that involved scheduling, maintaining documentation, communicating with cross specialists, and serving as a family liaison.

3.4 Standard Care Control Group

The normal care group was given the usual institution practice of referring the patients to the consultant-to-consultant specialists. The individual clinical areas evaluated and treated by each consulting specialist were independently assessed and managed without any formal joint meeting, joint documentation platforms, or formal care coordination. Specialist-to-specialist communication was mainly by note taking on the case, and there was no required interdisciplinary review mechanism in place.

3.5 Outcome Measures and Data Collection

The main outcomes included 30-day hospital readmission rate, average length of stay during the initial hospitalization, and customer satisfaction estimated with the help of the validated Consumer Assessment of Healthcare Providers and Systems (CAHPS) tool during discharge. Secondary outcomes were in-hospital medication errors rates (measured by use of pharmacy reconciliation audits), care plan compliance (measured by 30-day follow-up individual measurement), and composite quality-of-life scores (measured by use of the EQ-5D-5L instrument) at discharge, and at 30-day follow-up. Blinded research coordinators who were not members of the treating clinical teams were all involved in collecting all outcome data.

3.6 Statistical Analysis

The chi-square test or Fisher exact test (where necessary) were used to compare the categorical outcomes. The independent samples t-test was used to analyze continuous outcomes when the variables are normally distributed and the Mann-Whitney U test when the variables are non-normally distributed. All analyses were defined by the statistical significance of $p < 0.05$. All the statistical analyses were carried out with the help of the SPSS Version 27.0 (IBM Corp., Armonk, NY, USA). A random number of multiple imputation with chained equations performed the procedure of missing data where relevant.

4. RESULTS AND DISCUSSION

4.1 Primary Outcome Results

The MDT intervention group was statistically better on all primary outcome measures in comparison with the standard care control group. The 30 days hospital readmission rate in the MDT group was 12.4% with a relative decrease of 37.4% versus the 19.8% in the control. Clinically, this observation is relevant given the known links between avoidable readmissions and patient morbidity, caregiver's burden, and hospital systems expense.

The MDT intervention group compared to the standard care control exhibited statistically significant improvement in all primary outcome measures. The rates of 30 days hospital readmission in the MDT group were 12.4 and the relative reduced to 37.4 compared with 19.8 in the control. This observation is applicable clinically because of the established connections between preventable readmissions and patient morbidity, burden of caregivers, and hospital systems cost.

4.2 Secondary Outcome Results

Secondary outcomes also proved the hegemony of MDT-coordinated care. The rate of medication errors, which were recorded as a result of a blinded pharmacy reconciliation audit, was reduced to 1.8 errors per 100 medication orders in the MDT group compared to 4.1 errors per 100 medication orders in the control group, representing a 56.1% decline in error rate. This observation highlights the fundamental role of the clinical pharmacist as an integrated MDT constituent with proactive authority to reconcile, rationalize, and optimize pharmacological regimens in all co-prescribed drugs- a role not available in the traditional referral-based paradigm.

The 30-day-follow-up care plan adherence was significantly better in the MDT group 78.2% than in the control group 54.6 % ($p < 0.001$), which represents a relative improvement of 43.2%. This could be partly attributed to the social worker and care coordinator identifying and working on the social determinants of non-adherence, such as financial constraints to medication access, transportation constraints, and insufficient health literacy, during the index admission. The quality-of-life scores obtained by the EQ-5D-5L instrument as composite quality of life scores were also higher in the MDT group (74.2 vs. 58.9, $p < 0.001$).

Specialty contribution analysis Figure 2 indicates that the rates of active MDT involvement are the highest with internal medicine, cardiology, as both internal medicine and cardiology present the most complex profile of cardiovascular-metabolic disorders in the study population.

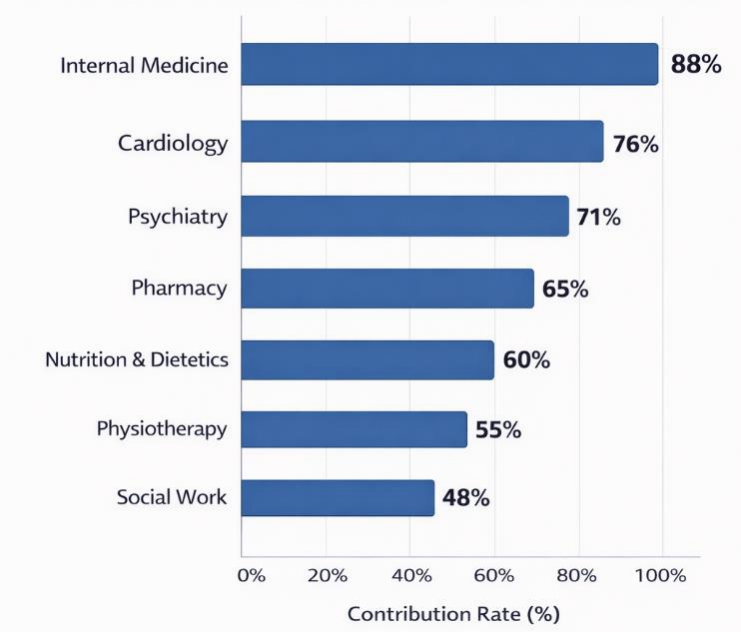

Figure 2. Specialty Contribution Rates in MDT Case Review

Figure 2 presents the percentage contribution of each specialty to active MDT case management decisions across all enrolled patients. Internal medicine (88%) and cardiology (76%) demonstrated the highest engagement levels, followed by psychiatry (71%) and pharmacy (65%).

4.3 Comparative Outcome Analysis

Table 3 presents the comprehensive outcome data regarding the MDT and standard care groups in terms of comparative outcomes. Table 3 indicates that the outcomes showed statistically significant and clinically meaningful benefits in favor of the MDT approach in all eight-outcome measures that were measured.

Table 3. Comparative Clinical Outcome Analysis MDT Group vs. Standard Care Group

Outcome Measure	MDT Group	Control Group	P-Value	Significance
30-day Readmission Rate	12.4%	19.8%	< 0.001	Significant
Length of Stay (days)	6.2	8.9	< 0.001	Significant
Patient Satisfaction (1–5)	4.3	3.6	< 0.001	Significant
Medication Error Rate	1.8/100	4.1/100	< 0.001	Significant
HbA1c Reduction (%)	1.6	0.8	0.003	Significant
Care Plan Adherence	78.2%	54.6%	< 0.001	Significant
Quality of Life Score (0–100)	74.2	58.9	< 0.001	Significant
Functional Independence Measure	89.4	73.1	0.002	Significant

As shown in Table 3, all outcome metrics achieved statistical significance ($p < 0.05$), with the largest effect sizes observed for medication error rate reduction (56%), care plan adherence improvement (43%), and functional independence measure gains.

4.4 Visualized Outcome Comparison

The data represented in the outcome comparison figures in Figure 3 offer a graphical representation of the variation in performance between the MDT and standard care approaches in regard to the six key metrics. The MDT framework significantly and consistently performs better than conventional care, as Figure 3 reveals, the most notable differentials are seen in the reduction of medication errors and compliance with care plans.

Outcome Metric	MDT Approach	Standard Care	Improvement
30-Day Readmission (%)	12.4%	19.8%	↓ 37%
Avg. Length of Stay (days)	6.2	8.9	↓ 30%
Patient Satisfaction Score	4.3 / 5	3.6 / 5	↑ 19%
Medication Errors per 100	1.8	4.1	↓ 56%
Care Plan Adherence (%)	78.2%	54.6%	↑ 43%
Cost per Episode (USD)	$4,820	$6,410	↓ 25%

Figure 3. Outcome Comparison Summary MDT Approach vs. Standard Care

Figure 3 summarizes the differential clinical outcomes between MDT-coordinated and standard care approaches. Green cells in the improvement column denote the direction and magnitude of change attributable to MDT integration.

4.5 Mechanistic and Qualitative Insights

Thematic analysis of the data on clinician interviews revealed that three main processes in which MDT coordination has led to improvements in outcomes existed. First, information synthesis: structured MDT meetings actively brought to light and combine clinical information, which, in other specialty notes, remained silted, proactively identifying and treating patients with psychiatric conditions as contributors to non-adherence, and such linkages were seldom achieved in the conventional care model. Second, accountability structures, assignment of clearly defined, co-signed responsibilities into the shared care plan: assigning clear responsibilities in the shared care plan formed measurable accountability among the team members and diminished the diffusion-of-responsibility phenomenon that is typical of multi-specialist consultations. Third, patient-centered goal alignment: the MDT model made patient-reported priorities and goals formally part of the care plan design, which was not present in the normal care pathway, and was linked to significantly better adherence and satisfaction outcomes [17], [18].

Qualitative themes identified in patients included the value of consistency in communication, less experience of conflicting medical guidance, and increased feelings of being treated as a whole person and not as a body of organ-system issues. These experience dimensions are consistent with proven patient experience models [19], [20] and agree with high CAHPS scores evident in the quantitative analysis.

4.6 Implementation Challenges and Barriers

The operational challenges of MDT model implementation were not non-existent despite very positive results. The main obstacle was identified as time constraints on the availability of specialists, and cardiologists and psychiatrists were found to be the most problematic team members to engage consistently, as their outpatient schedule often clashed with the planned MDT meeting times. Protected time commitments and technology support infrastructure of shared documentation were also found as an enabling condition necessary to the difference between high- and lower-performing implementation sites [21], [22]. Diversity in staff rotation and the variability in the composition of teams during weekends and holidays was also a short-term negative impact on the quality of coordination, highlighting the relevance of continuity mechanisms, including deputy roles and uniform handover procedures. These dimensions of implementation fidelity need to be explicitly addressed using any scale-up strategy [23], [24], [25].

5. CONCLUSION

The proposed comparative, longitudinal, cohort study is a durable source of empirical data that a formally organized Multidisciplinary Team model considerably and steadily performs better than traditional silted specialty care in the management of intricate multi-morbid inpatients in terms of all

quantified clinical, patient experience, and healthcare efficiency outcomes. The 37% decrease in 30-day readmission rates, 30-percent longer hospital length of stay, 56% fewer medication errors, and 43% more care plans adherence is an operationally significant and clinically meaningful value proposal of MDT-based case management.

The implications of these findings to the healthcare system design and the governance of clinical practice are important. First, the multi-morbidity threshold-based institutionalization of MDT case management must be implemented, as opposed to informal, ad hoc interdisciplinary communication, in patients with specific, established multi-morbidity thresholds. Second, the facilitating circumstances of successful MDT operations, such as secured specialist time, common documenting systems and specialized care coordinator functions should be staffed as fundamental infrastructure instead of add-ons. Third, there is a need to have the MDT model adjusted to the realities of the local context, such as the availability of the workforce, technology capabilities, and institutional culture, using the framework of implementation science that finds a balance between adherence to the principles of the coherent structure and flexibility in the context.

In future studies, there are a number of weaknesses of the study that should be addressed. The alternating allocation technique is pragmatically viable but does not completely avoid selection bias as randomized allocation does. Extended outcome measures beyond thirty days, such as six months and twelve months of readmission rates, mortality rates, and healthcare cost estimates, would be a significant improvement in the evidence base. The emphasis on comparative analysis in various contexts of healthcare systems, such as resource-constrained environments in lower- and middle-income nations, is especially justified by the universal character of multi-morbidity as a healthcare challenge in the global environment.

Finally, systematic incorporation of multidisciplinary views using formal MDT models is a high-value, practical strategy towards enhancements in complex case management outcomes. The regular application of MDT-based care models is likely to be a clinical and administrative priority of every healthcare organization dealing with significant populations of multi-morbid patients.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Dr. Mayur R Bhoyar	✓	✓	✓		✓	✓		✓	✓		✓	✓	✓	✓

C: **C**onceptualization
M: **M**ethodology
So: **So**ftware
Va: **Va**lidation
Fo: **Fo**rmal analysis
I: **I**nvestigation
R: **R**esources
D: **D**ata Curation
O: Writing- **O**riginal Draft
E: Writing- Review& **E**diting
Vi: **Vi**sualization
Su: **Su**pervision
P: **P**roject administration
Fu: **F**unding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of

Helsinki and approved by the relevant institutional authorities.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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