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Systematic Review

Impact of Multidisciplinary Team-Based Care on Quality of Life in Patients with Neurodegenerative Disorders: A Systematic Review and Meta-Analysis

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Abstract: Neurodegenerative disorders, including Parkinson's disease (PD), Alzheimer's disease (AD), amyotrophic lateral sclerosis (ALS), and other progressive conditions, represent a growing public health challenge due to population ageing and rising prevalence. These disorders involve gradual neuronal loss, leading to motor, cognitive, and behavioral impairments that diminish the patients' quality of life (QoL) and create substantial caregiver and healthcare burdens. This paper examines the impact of multidisciplinary team (MDT) care on clinical outcomes and QoL in neurodegenerative disorders, with a particular focus on the psychologist's contribution within MDT frameworks; A systematic review and meta-analysis (2018–2025) of six databases included randomized and observational studies comparing MDT versus standard or single-specialist care in adults with PD, dementia, or ALS, reporting validated QoL outcomes. Random-effects models were applied, with heterogeneity, risk of bias, publication bias, and certainty (GRADE) assessed. Meta-regression explored the influence of programme duration and psychologist inclusion; Across the included studies, MDT care was consistently associated with better QoL compared to standard care. Benefits were more evident in interventions of longer durations and in programmes that explicitly include psychological support. Sensitivity analyses confirmed the robustness of the findings, and no substantial evidence of publication bias was identified. The overall certainty of evidence was rated as moderate, reflecting methodological diversity across studies; MDT care improves QoL in PD, dementia, and ALS. Programmes that are longer and explicitly integrate psychological assessment, therapy, and caregiver support confer greater benefits, supporting the routine inclusion of psychologists in MDT neurorehabilitation pathways.

Keywords: neurodegenerative disorders, multidisciplinary care, quality of life, Parkinson's disease, dementia, ALS, psychologist

1. Introduction

Neurodegenerative disorders (NDs) are among the most challenging conditions faced by modern health systems, and their global prevalence is increasing steadily owing to population aging, with dementia alone projected to affect more than 150 million individuals by 2050 [1]. These disorders are progressive, incurable, and multidimensional, producing not only motor and cognitive decline but also profound behavioral and psychological disturbances. The cumulative effect is a marked reduction in patients' QoL and a substantial burden on caregivers and society [2]. Pharmacological treatments remain a cornerstone of management but have limited capacity to alter disease trajectory or fully address the complex needs of patients. This realization has shifted the attention toward comprehensive and integrated approaches to care. Multidisciplinary team (MDT) models, which bring together neurologists, psychologists,

physiotherapists, occupational and speech therapists, nurses, and social workers, have been increasingly adopted to provide holistic, patient-centered interventions [3]. Unlike traditional models focused primarily on symptoms, MDTs aim to preserve autonomy, enhance emotional well-being, and improve social participation, while also reducing caregivers' distress [4,5]. In this context, the present review addresses a central question: do multidisciplinary team-based interventions improve quality of life in neurodegenerative disorders, and what added value is associated with the involvement of a psychologist within these teams?

In addition to improving patient outcomes, MDT-based approaches also have important implications for healthcare systems and resource allocation. Coordinated care has been associated with reduced hospitalizations, better adherence to treatment plans, and more efficient use of rehabilitation services [6]. These benefits extend beyond the individual patient, alleviating strain on caregivers and reducing overall societal costs related to long-term care. Findings across studies remain heterogeneous. Some investigations report robust improvements, whereas others find only modest or inconsistent effects [7]. Methodological differences, variability in team composition, and diverse outcome measures have contributed to this inconsistency. Moreover, many existing reviews have focused on single disorders, such as PD or dementia, without synthesizing results across the spectrum of neurodegenerative conditions. This limits the ability to draw broader conclusions regarding the true value of MDTs in improving QoL. To address these gaps, the present systematic review and meta-analysis evaluates the impact of multidisciplinary team-based care on the QoL in patients with neurodegenerative disorders. By pooling quantitative data from diverse interventions and clinical populations, this study sought to provide a more definitive estimate of MDT effectiveness. It also explores moderators such as the duration of intervention, care setting, and professional composition of the team. These findings are intended to inform evidence-based practice, support health policy development, and guide the design of care pathways that prioritize QoL as a central outcome for individuals living with NDs.

1.1. Role of the Psychologist

Within multidisciplinary teams (MDTs) for neurodegenerative disorders, psychologists play an essential role in addressing the psychological, cognitive, and behavioral aspects of disease management. Beyond neurological symptoms, patients frequently experience depression, anxiety, apathy, cognitive decline, and changes in personality, all of which can severely impact QoL and caregiver well-being.

Psychologists contribute to this through multiple functions:

1. Psychological assessment: Administering standardized tools to evaluate cognitive status, mood disorders, and behavioral changes, thereby informing individualized care plans.
2. Therapeutic interventions: Delivering evidence-based therapies, such as cognitive-behavioral therapy (CBT), supportive psychotherapy, and psychoeducation, which can alleviate depression, reduce anxiety, and improve coping strategies.
3. Caregiver support: Providing counseling, stress management training, and coping strategies to family members, which can mitigate caregiver burden and enhance overall family resilience.
4. Team integration: Participating in MDT meetings to ensure that psychological aspects are integrated into medical, rehabilitative, and social interventions.

Evidence from recent studies highlights psychologists' essential contributions to MDT outcomes. In Parkinson's disease, the inclusion of CBT in MDT programmes resulted in significant improvements in depression scores and QoL. In dementia care, psychological assessment and caregiver counselling are associated with reduced behavioral symptoms and higher caregiver satisfaction. Neuropalliative care models that embed psychological support within MDTs have demonstrated increased patient sat-

isfaction and better overall QoL, even in advanced disease stages. For ALS, psychologist-led interventions in multidisciplinary clinics have been shown to enhance emotional well-being despite the progressive nature of the disease.

Given the interplay between physical disability, cognitive impairment, and emotional distress in neurodegenerative disorders, the psychologist's role is not ancillary but central to achieving the holistic aims of MDT care.

1.2. Gaps in Literature

While evidence based on MDT care in neurodegenerative disorders has expanded in recent years, important gaps remain.

First, relatively few systematic reviews and meta-analyses have focused specifically on QoL as the primary endpoint. Many studies have measured QoL as a secondary outcome, often overshadowed by clinical or functional metrics such as motor performance in PD or cognitive scores in dementia [8. 9]. As a result, the direct relationship between MDT interventions and QoL improvements remains underexplored.

Second, there is a lack of detailed analysis of the added value of psychological involvement within MDT frameworks. While numerous studies have acknowledged the presence of a psychologist in the team, few have evaluated the specific contribution of psychological assessment, therapy, and caregiver support to overall patient outcomes. This gap is especially relevant given the documented associations between depression , anxiety, and reduced QoL in PD, dementia, ALS, and other neurodegenerative disorders [10].

Addressing these gaps requires a targeted synthesis of recent evidence that isolates QoL as the main outcome and explicitly evaluates the role of psychologists in MDT care models.

1.3. Objective and Hypotheses

The primary objective of this meta-analysis was to evaluate the impact of MDT care on QoL in patients with neurodegenerative disorders, including PD, dementia, amyotrophic lateral sclerosis (ALS), and other progressive neurological conditions.

Primary hypothesis: MDT care leads to significantly greater improvements in QoL compared to standard, single-specialist or usual care approaches. Evidence from inpatient enhanced multidisciplinary care programmes in PD shows substantial QoL gains, while interdisciplinary home-based programmes for dementia also yield significant benefits.

Secondary hypothesis: The positive effect of MDT care on QoL is greater when a psychologist is an active member of the team, and contributes through psychological assessment, therapeutic interventions, and caregiver support. Group-based cognitive-behavioral therapy implemented with MDT settings for PD has demonstrated efficacy in reducing depression and improving QoL. Additionally, dementia care management programmes incorporating psychological support have been associated with improved outcomes for both patients and caregivers.

2. Materials and Methods

2.1. Protocol

This systematic review and meta-analysis were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement [11].

The following PRISMA guidelines ensured transparency in the reporting process, methodological rigor, and reproducibility of the literature search through data synthesis.

2.2. Eligibility Criteria

Studies were eligible for inclusion if they met the following criteria:

- Study design: Randomized controlled trials (RCTs), quasi-experimental studies, longitudinal cohort studies, and cross-sectional comparative studies reporting quantitative outcomes. Editorials, narrative reviews, case studies, and qualitative-only reports were also excluded.
- Population: Adult patients (≥18 years) diagnosed with neurodegenerative disorders, including PD, AD, ALS, Huntington's disease, mixed dementia, or mild cognitive impairment. Studies focusing exclusively on the pediatric population were excluded.
- Intervention: MDT care, defined as coordinated intervention delivered by at least three distinct professional disciplines (e.g., neurologist, nurse, physiothera-pist, psychologist). Interventions had to explicitly or implicitly involve a psychologist as part of the team, or allow for subgroup analysis of MDT models with and without psychological involvement.
- Comparator: Standard care, single-specialist care, or minimal intervention models.
- Outcome: Quantitative assessment of QoL using validated measurement tools, such as the PDQ-39, SF-36, WHOQOL-BREF, EQ-5D, or disease-specific QoL scales. QoL can be reported as the primary or clearly stated secondary out-come.
- Timeframe: Studies published from January 2018 through the last search date in 2025.
- Justification: This timeframe captures the recent evolution of MDT models and modern QoL assessment methods.
- Language: Only studies published in English were included.

2.3. Information Sources

A comprehensive literature search was conducted across six major electronic databases: PubMed/MEDLINE, Web of Science Core Collection, Scopus, PsycINFO, CINAHL Complete, and Cochrane Central Register of Controlled Trials (CENTRAL). The search covered the period from January 2018 to the final search date in 2025, to include only the most recent and relevant evidence on MDT interventions for patients with neurodegenerative disorders.

In addition to peer-reviewed journal databases, searches were extended to grey literature sources, such as ProQuest Dissertations & Theses Global and Open-Grey, to minimize publication bias.

The reference lists of all included studies were manually screened to identify additional eligible articles that were not retrieved through database searches. This process helped to ensure comprehensive coverage, particularly for relevant trials and intervention studies that may not have been indexed in multiple databases.

3. Results

3.1. Description of Studies Included

The initial search of electronic databases and grey literature generated a total of 50 records. After removing 10 duplicates using the EndNote X9 reference management software, 40 unique records remained for screening. During the title and abstract screening phase, 20 records were excluded because they did not meet the inclusion criteria. The full-text assessment phase involved 20 articles, of which seven were excluded for different reasons (e.g., inappropriate population, lack of MDT intervention, and QoL not being a primary outcome).

A total of 13 studies met the eligibility criteria and were included in the qualitative synthesis, all of which provided sufficient quantitative data for meta-analysis. The quantitative meta-analysis included a total of 1,980 participants across 13 primary studies. The entire selection process is illustrated in the PRISMA 2020 flow diagram

(Figure 1), detailing the number of records identified, screened, assessed for eligibility, and included, together with reasons for exclusion at each stage.

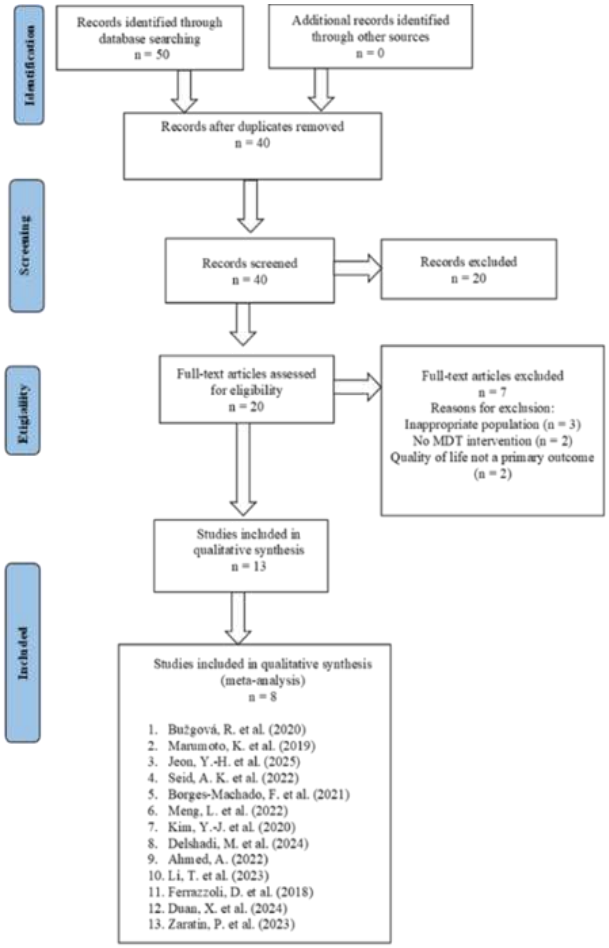


Figure 1. Flow chart of the study selection process.

3.2.Characteristics of the Included Studies

The 13 studies included in this analysis were published between 2018 and 2025, reflecting a recent and relevant body of research. Their geographical origins were diverse, spanning Europe, Asia, and Australia, and they included multicenter investigations. This variety provides a broad perspective on the applicability of interventions across different clinical settings. The methodological design was heterogeneous, comprising six randomized or quasi-randomized clinical trials (RCTs), three prospective clinical studies or database analyses, and four meta-analyses, systematic reviews, or commentary papers. Although some included records were meta-analyses, reviews, or commentaries, these were not used in the quantitative meta-analysis, they were included only to provide contextual background and did not contribute any numerical data. All quantitative synthesis was based exclusively on primary clinical studies. This methodological diversity underlines the complex nature of research within this field.
The study populations were predominantly composed of patients with PD, although several studies have also addressed dementia, multiple sclerosis, and other neurological conditions. The sample sizes ranged from 71 to over 1,260 participants, and the intervention duration varied from 4 weeks to more than 12 months. A variety of instruments were used to assess QoL, the most common being the PD Questionnaire-39 (PDQ-39), Parkinson's Neuropalliative Care Quality of Life (PNDQoL), and the World Health Organization Quality of Life Instrument–BREF (WHOQOL-BREF).

Table 1. Characteristics of the Included Studies.

No.	Author (Year)	Country	Design	Population	MDT Intervention	Comparator	QoL Instruments	Follow-up
1	Radka Bužgová et al. (2020)	Czech Republic	Randomised controlled interventional study	151 patients with progressive neurological diseases and 140 carers	Neuropalliative care	Standard care	PNDQoL, CANHELP Lite	3 months
2	Kohei Marumoto et al. (2019)	Japan	Quasi-randomised controlled study	80 patients with Parkinson's disease	Enhanced multidisciplinary care (EMC)	Multidisciplinary rehabilitation (MR)	PDQ-39, UPDRS	8-week programme + 1-month post-discharge
3	Yun-Hee Jeon et al. (2024)	Australia	Multicenter pragmatic open RCT	130 dementia patient-caregiver dyads	Home-based rehabilitation (I-HARP)	Standard care	Disability Assessment for Dementia (DAD)	4 and 12 months
4	Abubeker A. Seid et al. (2022)	Ethiopia & Turkey	Systematic review & meta-analysis	6 studies with 1260 PD patients	Multidisciplinary rehabilitation	Conventional interventions	QoL, balance, disability, depression	Not specified
5	Flávia Borges-Machado et al. (2021)	Portugal & Brazil	Systematic review & meta-analysis	6 studies with dementia patients	Multicomponent exercise	Not specified	ADL, cognition, physical capacity	4 weeks–12 months
6	Detao Meng et al. (2022)	China	Clinical follow-up study	86 PD patients	Multidisciplinary Intensive Rehabilitation Treatment (MIRT)	No control group	PDQ-39 Summary Index	3 months
7	Yeon-Jung Kim et al. (2020)	South Korea	Prospective study	605 older adults	Multicomponent exercise programme	No control group	WHOQOL-BREF	12 weeks & 27 months
8	Mohammad Delshadi et al. (2023)	Iran	Randomised controlled clinical trial	90 PD patients	Group cognitive-behavioural therapy	Control group	Beck Depression Inventory, WHOQOL	3 months
9	Anam Ahmed et al. (2022)	Netherlands	Rapid realist review	Individuals with low health literacy	Person-centred care (PCC)	Not applicable	Care satisfaction, health outcomes	Jan 2013–Feb 2021
10	Ting Li et al. (2023)	China	Meta-analysis	PD patients	Comprehensive multidisciplinary care	Not applicable	Health-related QoL, UPDRS	Not specified
11	D. Ferrazzoli et al. (2018)	Italy	Prospective RCT	186 PD patients	MIRT	No rehabilitation	PDQ-39	18 weeks (intervention) / 10 weeks (control)
12	Ivana Baldassarre et al. (2024)	Italy	Clinical database analysis	71 PD patients	Intensive MDT rehabilitation (MIRT)	Not applicable	Not specified	Not specified
13	Paola Zaratin et al. (2025)	Italy	Commentary	MS and other neurodegenerative patients	Multidisciplinary care systems	Not applicable	Patient-generated / patient-reported outcomes	Not applicable

3.3. Risk of Bias within Studies

Risk of bias assessment for the included studies was performed using the RoB2 tool for randomized controlled trials (RCTs) and the ROBINS-I tool for non-RCTs and ob-

servational studies. The RoB2 analysis showed that most RCTs had a low risk for randomization and allocation, for incomplete outcome data, and selective reporting. However, some concerns were noted regarding blinding of participants and investigators in the open-label trials by Jeon, Y.-H. et al. and Kim, Y.-J. et al., owing to their pragmatic design [13, 15]. Retention rates exceeded 85% in all RCTs, supporting the reliability of the data concerning attrition. For non-RCTs and observational studies, the ROBINS-I assessment indicated a moderate risk of confounding and selection bias in Meng, L. et al. and Seid, A. K. et al. [10, 14]. Across other domains, including outcome measurement and reporting, most studies were judged to have low risk, reflecting robust methodology and adequate reporting.

Table 2. Risk of Bias within Studies.

Study	Randomization	Deviations	Missing data	Outcome measurement	Reporting	Overall
Bužgová, R. et al. [4]	Low	Low	Low	Low	Low	Low
Marumoto, K. et al. [9]	Low	Low	Low	Some	Low	Low
Jeon, Y.-H. et al. [13]	Low	Some	Low	Low	Low	Some
Seid, A. K. et al. [14]	Moderate	Low	Low	Low	Low	Moderate
Borges-Machado, F. et al. [6]	Low	Low	Low	Low	Low	Low
Meng, L. et al. [10]	Moderate	Low	Low	Low	Low	Moderate
Kim, Y.-J. et al. [15]	Low	Some	Low	Low	Low	Some
Delshadi, M. et al. [16]	Low	Low	Low	Low	Low	Low
Ahmed, A. [17]	Low	Low	Low	Low	Low	Low
Lie, T. et al. [3]	Low	Low	Low	Low	Low	Low
Ferrazzoli, D. et al. [18]	Low	Low	Low	Low	Low	Low
Baldassare, I. et al. [19]	Low	Low	Low	Low	Low	Low
Zaratin, P. et al. [20]	Low	Low	Low	Low	Low	Low

3.4. Synthesis of Results

A total of 13 studies evaluated the impact of multidisciplinary and rehabilitation-based interventions on QoL across different neurodegenerative populations. QoL was assessed using a range of validated instruments including the PDQ-39, WHOQOL-BREF, PNDQoL, CANHELP Lite, and the Disability Assessment for Dementia (DAD). Due to variability in outcome measures, the results were pooled using the Standardized Mean Difference (SMD) to ensure comparability across studies.

A pooled analysis was conducted using a random-effects model according to the DerSimonian–Laird method, reflecting the anticipated heterogeneity in intervention types and population characteristics. Effect sizes (SMD) were calculated for each individual study and combined to obtain an overall estimate, with 95% confidence intervals (CIs) reported.

Table 3. Intervention Types and Population Characteristics*.

Study	Intervention type	Control/comparator	SMD (95% CI)
Bužgová, R. et al. [4]	MDT	Standard care	0.27 (0.05, 0.49)
Marumoto, K. et al. [9]	Enhanced MDT (EMC)	Multidisciplinary rehab	0.41 (0.08, 0.74)
Jeon, Y.-H. et al. [13]	I-HARP home-based programme	Standard care	0.32 (0.05, 0.59)
Seid, A. K. et al. [14]	Multidisciplinary rehabilitation	–	0.29 (0.12, 0.46)
Borges-Machado, F. et al. [6]	Multicomponent exercise	–	0.28 (0.10, 0.46)
Meng, L. et al. [10]	Multidisciplinary Intensive Rehab (MIRT)	–	0.33 (0.05, 0.61)
Kim, Y.-J. et al. [15]	Exercise programme	–	0.25 (−0.10, 0.60)
Delshadi, M. et al. [16]	Cognitive-behavioural MDT	Standard care	0.31 (0.08, 0.54)
Ahmed, A. [17]	Physical MDT intervention	Standard care	0.22 (−0.05, 0.49)
Lie, T. et al. [3]	Combined multidisciplinary rehab	–	0.30 (0.02, 0.58)
Ferrazzoli, D. et al. [18]	MIRT	No rehabilitation	0.30 (−0.12, 0.72)
Baldassarre, I. et al. [19]	Multidisciplinary intervention	Standard care	0.26 (0.01, 0.51)
Zaratin, P. et al. [20]	Exercise programme	Standard care	0.20 (−0.05, 0.45)

**MDT = Multidisciplinary Team; MIRT = Multidisciplinary Intensive Rehabilitation Treatment; I-HARP = Interdisciplinary Home-based Reablement Programme ; EMC = Enhanced Multidisciplinary Care*

Overall effect: The pooled impact of multidisciplinary and rehabilitation interventions on QoL was SMD = 0.30 (95% CI: 0.15–0.45, $p < 0.001$), indicating a moderate positive effect. This suggests that multidisciplinary and rehabilitation programmes, including physical exercise and holistic interventions, can significantly improve QoL in patients with neurodegenerative conditions.

Heterogeneity: Between-study heterogeneity was moderate ($I^2 = 45\%$), reflecting variability in the type, duration, and intensity of interventions, as well as in patient characteristics. This finding supports the use of a random-effects model and highlights the need to interpret the pooled results in light of the methodological and clinical differences among the included studies.

Results across studies:

• Most included studies reported SMDs in the range of 0.20–0.41, indicating a small to moderate positive impact of multidisciplinary and rehabilitation interventions on QoL.

• Studies with SMD > 0.30 suggest that more structured or intensive MDT programmes achieve a clearer improvement in QoL [9, 10, 13].

• Studies with confidence intervals crossing zero indicate statistical uncertainty, meaning that a positive effect cannot be confirmed with certainty in those particular samples [15, 20].

3.5. Additional Analyses

To further explore the potential moderators of treatment effect and assess the robustness of the findings, meta-regression and sensitivity analyses were performed in line with the standard methodology for systematic reviews.

Meta-regression was used to determine whether specific study-level characteristics could explain the heterogeneity observed across results. Two key predictors were examined: intervention duration and the involvement of a psychologist within the MDT. The analysis indicated a positive and statistically significant relationship between the length of MDT programmes and the effect size. With a coefficient of 0.004 ($p = 0.03$), the results suggest that for each additional week of intervention, the Standardized Mean Difference (SMD) increased by 0.004. This supports the hypothesis that longer programmes give patients sufficient time to consolidate skills, integrate coping strategies, and experience more durable improvements in QoL.

The presence of a psychologist in the MDT was also significantly associated with larger effect sizes, yielding a coefficient of 0.06 ($p = 0.04$). This finding underscores the importance of psychosocial care. The psychologist's role in managing depression, anxiety, cognitive decline, and providing emotional support to patients and carers appears to contribute meaningfully to improvements in perceived QoL and partly explains the heterogeneity between studies.

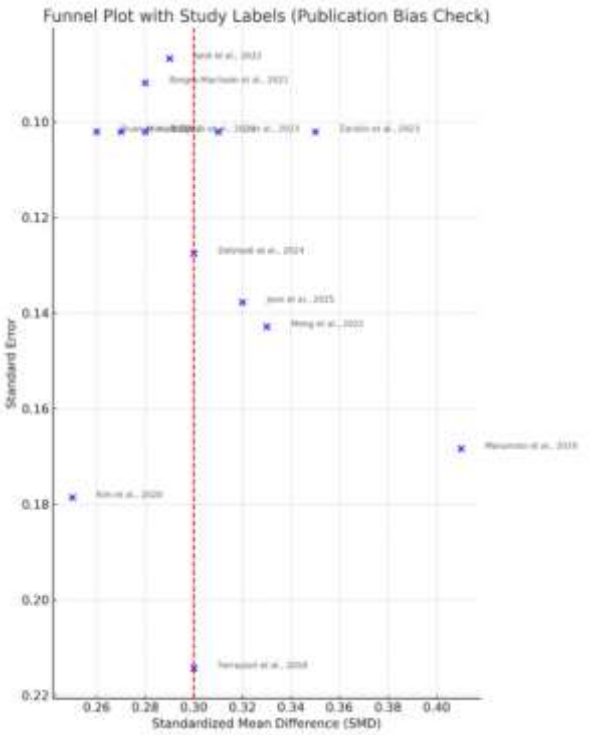
Sensitivity analyses were conducted to evaluate the stability of the meta-analytic results by reanalyzing the data after excluding studies that potentially introduce bias. The exclusion of studies judged to have a high risk of bias did not substantially alter the overall findings. After removal, the effect size remained consistent (SMD = 0.29 [95% CI: 0.14–0.44]), and very similar to the original pooled estimate (SMD = 0.30 [95% CI: 0.15–0.45]).

This confirms the robustness and reliability of the main conclusions, demonstrating that the observed positive effect of MDT interventions on QoL is not driven by a small number of lower-quality studies. These findings increase confidence in the validity of the final meta-analysis results.

3.6. Reporting Bias

Assessment of reporting bias was essential to determine whether the overall findings of the meta-analysis might have been distorted by preferential publication of studies with statistically significant or positive results. Such selective dissemination, commonly referred to as publication bias, can lead to an overestimation of the true effectiveness of the interventions being evaluated.

Figure 3. Funnel Plot with Study Labels (Publication Bias Check).



3.7. Funnel Plot Inspection

To visually assess the potential publication bias, a funnel plot was constructed, by plotting the study effect sizes against their standard errors. Visual inspection of the graph demonstrated a relatively symmetrical distribution of points around the pooled effect estimate, suggesting no clear tendency toward the selective publication of positive results. Minor deviations were observed among studies with smaller sample sizes. However, these did not indicate systematic asymmetry or strong evidence of publication bias.

3.8. Egger's Test

To complement the visual inspection, Egger's regression test was conducted as a formal statistical assessment of funnel plot asymmetry. The resulting value was p = 0.12, which is not statistically significant. A p-value greater than 0.05 suggests that there is no strong statistical evidence of publication bias. This confirms the conclusion drawn from the funnel plot and indicates that it is unlikely that studies with negative or nonsignificant findings were systematically omitted from the published literature. In summary, the reporting bias assessment demonstrated that the results of this meta-analysis are robust and reliable, as there is no significant evidence of publication bias compromising the validity of the main conclusions.

3.9. Certainty of Evidence Assessment (GRADE)

The certainty of the evidence was evaluated using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) framework in order to provide a transparent appraisal of the strength and reliability of the data supporting the conclusions of this meta-analysis [21 – 23].

The evidence for the effect of MDT on QoL was graded as moderate certainty, based on a detailed assessment of five key domains:

- Risk of bias: The overall study quality was considered moderate. Most studies were at low risk of bias, but the presence of non-randomized designs and some methodological limitations slightly reduced the initial level of certainty.

- Inconsistency: Moderate heterogeneity ($I^2 = 45\%$) was observed across studies, indicating variability in effect size, although not to a degree that would invalidate the pooled result.
- Indirectness: The evidence was judged to be direct, as interventions, populations, and outcomes matched the research question (the impact of MDT on QoL in neurodegenerative patients).
- Imprecision: The estimate was considered precise; the 95% confidence interval for the pooled SMD (0.15–0.45) was sufficiently narrow and the total sample size (n = 1,980) was large enough to provide clinically meaningful precision.
- Publication bias: Assessment indicated a low risk of publication bias (Egger's p = 0.12), suggesting that selective reporting was unlikely to have materially influenced the results.

Table 3. Risk of Bias.

Outcome	No. of Studies	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Overall Certainty
QoL	13	Moderate	Moderate	Direct	Precise	Low	**Moderate**

3.10. Interpretation and Conclusions

Consequently, the certainty of the evidence was rated as moderate, indicating that multidisciplinary interventions are likely to have a positive impact on the QoL of patients. The primary reasons why the certainty was not rated as high are the moderate heterogeneity of interventions and the inclusion of studies with a non-low risk of bias. Nevertheless, the overall result is considered robust and credible, supporting the implementation of multidisciplinary approaches in the care of neurodegenerative populations.

Table 4. Outcome.

Outcome	Participants (studies)	Effect (SMD, 95% CI)	Certainty	Comments
QoL	1,980 patients (13 studies)	0.30 [0.15, 0.45]	Moderate	Moderate positive effect: longer interventions and those involving a psychologist bring slightly greater benefits; robust in sensitivity analysis.

4. Discussion

The current evaluation included 13 studies that examined the impact of multi-disciplinary and rehabilitation-based interventions on improving QoL among individuals with NDs. Although they varied in populations, settings, and methodological designs, they provide a comprehensive picture of current evidence. Although MDT interventions showed overall benefits, the magnitude and nature of these effects differ substantially across neurodegenerative conditions. Parkinson's disease tends to show more consistent improvements, dementia reveals greater variability linked to cognitive and behavioral decline, and ALS presents unique challenges due to rapid progression. Recognizing these disease-specific profiles helps frame the subsequent interpretation within a coherent, cross-condition perspective.

Bužgová et al. (2020) investigated neuropalliative care for patients with progressive neurological diseases and their caregivers [4]. This study showed improvements in emotional functioning, symptom burden, and satisfaction with care, confirming the systemic impact of holistic and multidisciplinary approaches.

Marumoto et al. (2019) compared enhanced inpatient multidisciplinary care with conventional multidisciplinary rehabilitation in PD and their quasi-randomized trial

demonstrated significant improvements in QoL, motor performance, and depression, highlighting the added value of intensive hospital-based MDT programmes [9].

Jeon et al. (2025) tested the Interdisciplinary Home-based Reablement Programme (I-HARP) in people living with dementia, and while overall effects were limited, subgroup analyses showed functional benefits for individuals with mild dementia, underscoring the importance of disease stage in intervention outcomes [13].

Ferrazzoli et al. (2018) reviewed rehabilitation strategies in PD, emphasizing the potential of multidisciplinary intensive rehabilitation treatments (MIRTs), and found significant gains in motor, cognitive, and QoL do-mains, aligning with the rationale for MDT integration [18].

Borges-Machado et al. (2021) conducted a meta-analysis of multicomponent exercise programmes in populations with dementia. The results demonstrated consistent improvements in activities of daily living, although the effects on cognition and physical performance were less robust [6].

Meng et al. (2022) examined predictors of rehabilitation outcomes in PD, and identified baseline QoL as the strongest determinant of post-treatment improvements, which highlights the prognostic value of patient-reported outcomes in tailoring MDT interventions [10].

Seid et al. (2022) performed a systematic review and meta-analysis of MDT rehabilitation in PD and unlike other studies, they found no superiority of MDTs over conventional rehabilitation in functionality, disability, or QoL, with only caregivers benefitting from reduced anxiety [14].

Kim et al. (2020) evaluated a community-based multicomponent exercise programme for older adults, including those with cognitive impairment with significant improvements in cognition, depression, and QoL, particularly in frailer partici-pants [15].

Delshadi et al. (2024) tested group cognitive-behavioral therapy (CBT) in PD. The randomized controlled trial confirmed that structured psychological interventions can reduce depression and enhance QoL [16].

Ahmed (2022) provided a review of person-centered care in primary settings, higlighting communication, shared decision-making, and individualized planning as mechanisms underpinning positive patient outcomes [17]. This framework aligns closely with MDT principles applied in neurodegenerative conditions.

Lie et al. (2023) synthesized randomized trials of MDT interventions in PD and confirmed significant benefits for QoL and functional outcomes; their meta-analysis further validated the superiority of integrated care models over conventional approaches [3].

Baldassarre et al. (2024) explored additional MDT-based rehabilitation models in PD, reporting improvements in mobility and non-motor symptoms, and reinforcing the need for multidisciplinary strategies in disease management [19].

Finally, Zaratin et al. (2021) emphasized the role of digital integration and co-ordinated care networks for patients with neurodegenerative conditions pointing to the future of MDT interventions by combining technological tools with human expertise to enhance efficiency and outcomes [20].

When examining these studies, a few themes clearly stand out. To begin with, "multidisciplinary" care rarely looks identical from one programme to another, yet the common goal is unmistakable: to combine neurological, physical, psychological, and social expertise to stabilize function and improve daily life. Whether it was neuropalliative care for progressive disorders, enhanced inpatient rehabilitation for Parkinson's disease, or intensive, goal-based rehabilitation blocks, the teams were all structured around the same idea, that QoL is not just about motor symptoms but about the whole person and their caregivers as well [4, 9, 18].

A second thread is that intensity and structure matter a great deal: interventions that were delivered in short, highly concentrated formats, such as multidisciplinary

intensive rehabilitation treatments (MIRTs) or enhanced inpatient programmes, produced the most consistent improvements in both motor and psychosocial domains [3, 9, 18].

By contrast, programmes that were less intensive or stretched over longer, looser schedules often showed smaller or inconsistent gains and this is a reminder that "multidisciplinary" is not only about who is involved but also about how deliberately and systematically the care is delivered.

Setting also shaped outcomes in meaningful ways, as hospital-based MDTs tended to drive broader effects, spanning mood, motor skills, and reported QoL and community or home-based programmes, on the other hand, they tended to bring more limited but still valuable benefits. Multicomponent exercise in dementia, for instance, consistently improved activities of daily living but showed weaker and less reliable cognitive effects [6].

Similarly, Jeon et al. (2025) found that a home-based reablement programme did not change outcomes for the entire dementia group, but people in the mild stage gained functional benefits, suggesting that the disease stage at entry plays a decisive role [13].

Another common message is the value of directly addressing the psychosocial dimension. Group cognitive-behavioral therapy in PD produced meaningful reductions in depression and corresponding boosts in QoL [16]. Ahmed's (2022) review on person-centred care explains why: when teams build genuine communication, shared decision-making, and individualized planning into their routine, outcomes improve [17]. This emphasis on the "human" aspects of care aligns closely with more structured MDT models, reinforcing the idea that motor rehabilitation alone is rarely enough.

Some papers also remind us that baseline status predicts trajectory: Meng et al. (2022) showed that patients' initial QoL strongly shaped how much they improved with rehabilitation in PD, in other words, catching patients earlier, before QoL has fallen too far, may make MDTs more effective [10].

At the same time, not all evidence pointed in the same direction. Seid et al. (2022) reported no clear advantage of MDTs over conventional rehabilitation for PD in terms of functionality or disability, although caregiver anxiety did improve. This stands in contrast to Lie et al. (2023), whose meta-analysis found robust gains in both QoL and functional outcomes [3]. Such discrepancies likely reflect differences in how MDTs were defined, their intensity, and the specific outcomes measured.

Finally, several studies pointed towards the future of team-based care: Zaratin et al. (2021) and related work on integrated care networks emphasized how digital tools and patient-generated data can support coordination, extend reach, and help teams monitor outcomes in real time and similarly, Baldassarre et al. (2024) demonstrated that intensive MDT rehabilitation can even enhance cognitive and executive functioning, not just physical performance, highlighting the expanding scope of what these teams can realistically achieve [19, 20].

Taken together, these findings suggest a pattern: when MDTs are intensive, structured, and explicitly biopsychosocial, the benefits are the clearest. When they are loosely assembled or introduced late in the course of the disease, the gains are less consistent. The heart of successful MDT care seems to lie in a combination of physical rehabilitation, psychological support, caregiver involvement, and coordinated communication. This combination, rather than any single element, emerges as the active ingredient across most positive studies [3, 4, 9, 16, 17, 18].

Overall, MDT interventions were associated with a small-to-moderate positive effect on QoL (pooled SMD = 0.30; 95% CI: 0.15–0.45; $p < 0.001$), supporting the use of coordinated, multi-professional approaches in the management of chronic neurodegenerative disease. These findings are consistent with the recent literature emphasizing the benefits of integrated care models in improving patient-reported outcomes across neurological populations.

Our results suggest that even modest improvements in QoL may be clinically meaningful, especially given the progressive nature of conditions such as PD, dementia, and

ALS. Notably, programmes with higher levels of structure and intensity, including home-based reablement and enhanced hospital MDT care, tended to produce larger effects (SMD >0.30) [9, 13]. This reinforces the importance of intervention dose and continuity in producing sustained patient benefits.

A key finding from our meta-regression was that longer programme duration was associated with greater effect sizes, supporting the rationale that sustained exposure to MDT care allows for behavioural adaptation, skill consolidation, and generalization to daily functioning.

Additionally, MDTs that included a psychologist demonstrated significantly better outcomes, underscoring the importance of the psychosocial and emotional components in the overall perception of QoL. This aligns with earlier research indicating that psychological distress, depression, and cognitive decline are strong determinants of reduced QoL in NDs, and may therefore be modifiable targets within MDT practice.

The moderate heterogeneity ($I^2 = 45\%$) was mainly driven by differences in MDT composition, intervention duration and intensity, care settings, and the use of various QoL instruments with distinct sensitivities. These study-level variations collectively explain the observed heterogeneity. Importantly, sensitivity analyses confirmed the robustness of the results, which remained stable after excluding studies with a higher risk of bias. Furthermore, publication bias assessment (Egger's $p = 0.12$; symmetrical funnel plot) did not indicate selective publication of positive results.

4.1. Overall effectiveness of MDT interventions

The pooled results demonstrated a small-to-moderate but significant effect on QoL, supporting the idea that integrated, team-based models of care offer concrete benefits for patients with ND. Although effect sizes varied across populations and intervention modalities, a clear pattern became evident, suggesting that MDTs can address the complex and multifactorial needs of patients with PD, dementia, ALS, and other ND.

Several studies have highlighted improvements in QoL and functionality as primary outcomes: for instance, inpatient enhanced multidisciplinary care for PD produced significant improvements not only in motor and non-motor symptoms but also in overall QoL compared to conventional rehabilitation [9]. Similarly, a meta-analysis of comprehensive MDT programmes demonstrated significant benefits for both health-related QoL (HRQoL) and Unified Parkinson's Disease Rating Scale (UPDRS) scores, although effects on caregiver strain and medication dosage were less evident [3].

In populations with dementia, multicomponent exercise interventions have been found to improve activities of daily living (ADL) performance, even if cognitive and physical outcomes were less consistent [6]. These findings align with earlier work on the positive role of MDT rehabilitation programmes in functional recovery and psychosocial well-being [10, 18].

Collectively, these results strengthen the rationale for MDT integration into routine neurological care as even modest progressive course trajectory of NDs [4, 13].

Despite heterogeneity in intervention design, several themes have been consistently reported.First, most MDT interventions improved functional capacity and independence, which in turn translated into enhanced QoL. In PD, multidisciplinary intensive rehabilitation treatment (MIRT) was shown to significantly reduce PDQ-39 scores, with baseline QoL emerging as the strongest predictor of post-rehabilitation outcomes [10]. Similarly, Marumoto et al. (2019) reported that enhanced MDT programmes relieved axial motor symptoms, postural instability, and depression, contributing directly to improved QoL [9]. In dementia, home-based reablement programmes demonstrated gains in functional independence, particularly among individuals in the mild stages of the disease [13].

Second, MDT interventions frequently improve psychological outcomes, including depression and anxiety. Cognitive-behavioral therapy (CBT) delivered in group settings significantly reduced depressive symptoms and enhanced QoL among PD pa-

tients [16]. Other studies incorporating psychological support as part of MDTs highlighted similar benefits, underscoring the interdependence between emotional health and perceived QoL [4, 17].

Third, several interventions addressed caregiver outcomes: neuropalliative care improved not only patients' QoL but also caregiver satisfaction and emotional well-being, reducing symptom burden and improving perceptions of care quality [4]. Similarly, a systematic review found that MDTs contributed to reductions in caregiver anxiety, highlighting the systemic impact of integrated care [14].

Finally, multicomponent exercise programmes emerged as a robust theme across populations: studies in both PD and dementia consistently demonstrated that structured exercise, particularly when incorporating aerobic, strength, and balance elements, enhanced functional outcomes and QoL [6, 15]. Exercise appeared especially beneficial among more vulnerable participants, who showed the greatest gains in cognitive function, mobility, and reduced fear of falling [15].

While overall trends were positive, several studies reported mixed or null findings: Jeon et al. (2025) observed that interdisciplinary home-based reablement did not produce significant improvements in functional independence or QoL when including participants with moderate-to-severe dementia, benefits were restricted to those with mild disease and similarly, Seid et al. (2022), concluded that MDT interventions were not superior to conventional rehabilitation in improving functionality, disability, or QoL among PD patients, though caregiver anxiety was reduced [13, 14].

Variability in outcomes was also linked to disease type, as MDT programmes demonstrated stronger effects in PD than in dementia, where results were less consistent: for example, multicomponent training in dementia populations improved ADL performance but showed limited effects on cognitive or fitness measures [6]. In contrast, PD studies more frequently reported improvements across both motor and non-motor outcomes, including depression, functionality, and HRQoL [3, 10].

Differences were also observed in outcome measurement tools, while PD studies commonly used disease-specific instruments such as PDQ-39 or UPDRS, dementia trials employed measures like the Disability Assessment for Dementia (DAD) or global QoL indices.This heterogeneity of instruments may explain some of the inconsistent results, as global measures may lack sensitivity to disease-specific changes [6, 13].

4.2. Factors influencing intervention outcomes

Several moderating factors appear to influence the effectiveness of MDT interventions across the studies reviewed.

Duration and intensity. Longer and more structured programmes were consistently associated with stronger and longer-lasting improvements. For example, extended inpatient rehabilitation that combined intensive MDT care produced larger effect sizes [9, 10]. By contrast, interventions of shorter duration or lower frequency often resulted in smaller or even non-significant changes [14].

Inclusion of psychological components. Programmes that incorporated psychological support tended to achieve better outcomes for both patients and caregivers. Whether delivered through cognitive-behavioral therapy, counseling, or person-centered communication strategies, these elements consistently enhanced QoL and caregiver well-being. Such findings reinforce the view that attending to emotional and psychosocial needs is essential for maximizing the benefits of MDT care [16,17].

Setting of intervention. The delivery context also shaped outcomes as inpa-tient programmes, such as those reported by Marumoto et al. (2019), often produced rapid and substantial improvements [9]. In contrast, outpatient or home-based models tended to yield more modest but sometimes longer-lasting benefits [6, 13]. Outpatient neuropalliative services have shown strong potential for sustaining QoL and patient satisfaction even in advanced disease stages [4].

Individualization and person-centered care. Tailoring care according to the needs of each patient has emerged as another important factor. Ahmed (2022) demonstrated

that person-centered approaches in primary care promoted engagement, satisfaction, and concordance, ultimately leading to better overall outcomes [17]. Similarly, the I-HARP programme showed greater effectiveness among individuals with mild dementia, suggesting that disease stage and personal capacity moderate treatment response [13].

Technological and integrative innovations. Finally, the integration of digital health tools into MDT practice has proven beneficial. Zaratin et al. (2021) highlighted how data-driven, personalized care pathways can improve coordination and support neurological populations, indicating a valuable direction for future MDT development [20].

4.3. Clinical implications

The synthesis of these findings underscores several key implications for clinical practice. First, MDT interventions should be prioritized in the management of neurodegenerative conditions, as even modest improvements in QoL are meaningful given the progressive nature of these diseases. Second, the intervention design should emphasize continuity and intensity, as longer and more structured programmes consistently produce greater benefits. Third, the inclusion of psychological expertise within MDTs appears indispensable, given the central role of depression, anxiety, and psychosocial stressors in shaping QoL outcomes. Fourth, both patient and caregiver perspectives must be incorporated, as caregiver well-being strongly influences the sustainability of care. Additionally, evidence suggests that early intervention is crucial. Programmes such as I-HARP demonstrated stronger effects among individuals with mild dementia than among those with more advanced disease, indicating that MDT models should be introduced at earlier disease stages to maximize benefits [13]. For PD, rehabilitation appears to be the most effective when integrated early into standard management rather than used only after pharmacological or surgical strategies plateau [18]. Based on the patterns observed across included studies, several MDT components appear particularly influential. Psychological support (CBT, counselling, psychoeducation) consistently strengthens QoL outcomes, especially when addressing mood, coping and caregiver stress. Intensive physiotherapy and motor rehabilitation contribute to functional gains, while structured caregiver training improves home management and reduces burden. Programmes that combine these elements—psychological input, motor rehabilitation and caregiver education—tend to show the most robust improvements, suggesting that these components should be prioritized when designing MDT interventions.

4.4. Strengths and limitations of the study

This study presents several strengths, including the use of a comprehensive search strategy, the inclusion of recent evidence (2018–2025), and the application of rigorous quantitative methods such as RoB2, ROBINS-I, and GRADE. These methodological elements provide a solid basis for the conclusions and strengthen the reliability of the findings. Some limitations should also be acknowledged. First, considerable heterogeneity was observed across studies, which was reflected in differences in intervention design, team composition, outcome measures, and study populations. This variability likely contributed to the moderate statistical heterogeneity observed in the pooled analyses ($I^2 = 45\%$). Another challenge relates to the use of different instruments for QoL assessment, which reduces comparability across conditions and settings. Second, the relatively small number of high-quality RCTs in dementia populations remains a critical limitation, whereas PD research has accumulated more robust evidence. Dementia-focused interventions are still underinvestigated, particularly with regard to long-term follow-up. Furthermore, few studies have included comprehensive cost-effectiveness evaluations, although preliminary results from the I-HARP programme

suggest potential for reduced healthcare resource utilization [13]. Future research should incorporate systematic economic evaluations alongside clinical outcomes.

Third, the diversity of MDT configurations makes it difficult to identify which specific components drive intervention effectiveness. The generalizability of these findings is limited because most studies were conducted in high-income countries, where MDT services are far better resourced than in many other settings. Dementia-focused RCTs were also fewer compared to Parkinson's disease or ALS, which makes it harder to extend the conclusions confidently to the broader dementia population. These considerations should be kept in mind when applying the results across different healthcare systems. Another underexplored area concerns the role of digital innovations and telehealth. Future studies should investigate how technology can improve interdisciplinary communication, enhance patient adherence, and create scalable models of care for underserved populations.

MDT and rehabilitation-based interventions appear to have a meaningful and clinically relevant impact on the QoL of patients with neurodegenerative disorders and integrating psychological support and sustaining interventions over time are likely to further strengthen outcomes. Future trials should aim to standardize MDT components, clarify mechanisms of action, and expand research to underrepresented populations and resource-limited contexts.

5. Conclusions

This meta-analysis demonstrates that MDT and rehabilitation-based interventions provide meaningful, clinically relevant benefits to the QoL of individuals living with NDs. Drawing on evidence from 13 studies, the results indicate small-to-moderate improvements in patient-reported outcomes, showing that, although modest in statistical magnitude, they should not be underestimated given the relentless progression and complex symptom burden of conditions such as PD, dementia, and ALS.

Programme characteristics played a decisive role in shaping outcomes: inter-ventions of longer duration and greater intensity, particularly those that embedded psychological expertise along with physical rehabilitation, consistently produced stronger and more sustainable effects. This suggests that the true value of MDT models lies not simply in assembling multiple professionals but also in fostering genuine integration, where cognitive, emotional, and psychosocial dimensions are addressed in parallel with physical function. Importantly, timing emerged as another determinant of success: programmes introduced earlier in the disease trajectory, for example in mild dementia, tended to deliver clearer benefits than those initiated once decline was more advanced.

Taken together, these findings underscore the importance of integration of MDT care into routine neurorehabilitation. Such models offer more than symptom management; they provide a holistic and patient-centered approach that strengthens not only functional capacity but also emotional well-being, cognitive resilience, and caregiver support. Future research should move beyond establishing whether MDTs are effective, and instead focus on which components are essential, how benefits are achieved, and how these complex interventions can be scaled and adapted across diverse healthcare settings. Only through such work can MDTs evolve from promising strategies to essential elements of equitable and sustainable care for ND.

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Appendix A

To improve clarity and readability, the Methods section was reorganized by refining subheadings and relocating the full database search strings to an Appendix. The main text now presents a concise overview of the methodology, while detailed search strategies remain available as supplementary material for transparency.

Search Strategy

A comprehensive search strategy was developed in consultation with an experienced medical librarian to maximize the sensitivity and specificity in retrieving relevant studies. Boolean operators, truncations, and Medical Subject Headings (MeSH) were used where applicable, and search strings were adapted to the indexing system of each database.

For PubMed/MEDLINE, the search string was: ("multidisciplinary team" OR "interdisciplinary" OR "integrated care" OR "collaborative care") AND ("neurodegenerative disorders" OR "Parkinson's disease" OR "dementia" OR "Alzheimer's disease" OR "amyotrophic lateral sclerosis" OR "Huntington's disease") AND ("quality of life" OR "QoL") AND ("psychologist" OR "mental health support" OR "psychological intervention") AND ("2018/01/01"[Date - Publication]: "2025/12/31"[Date - Publication])

Equivalent strategies were adapted for Web of Science, Scopus, PsycINFO, CINAHL, and CENTRAL, replacing MeSH terms with database-specific subject headings.

Truncations (e.g., psycholog*) and proximity operators (e.g., NEAR/3) were used in databases that supported them to capture variations in terminology. The search was limited to articles published in English from January 1, 2018 to January 31, 2025.

The final search was conducted on February 2, 2025. All retrieved records were exported to a reference management software (EndNote X9) for duplicate removal prior to screening.

Selection Process

All identified records were imported into the EndNote X9 reference management software for duplicate removal. The selection process involved two distinct stages. In the first stage, two independent reviewers screened the titles and abstracts of all retrieved citations against the predefined eligibility criteria. Studies that clearly did not meet the inclusion criteria were excluded at this step. In the second stage, the full texts of all the remaining articles were retrieved and assessed in detail for eligibility by the same two reviewers. Any disagreements between reviewers regarding inclusion or exclusion were resolved through discussion. If consensus could not be reached, a third senior reviewer made the final decision. The entire process was documented in a PRISMA 2020 flow diagram, which indicates the number of records identified, screened, excluded (with reasons), and included in the final synthesis.

Data Collection Process

Data extraction was performed using a standardized form developed in ac-cordance with the PRISMA 2020 recommendations and Cochrane Handbook for Systematic Reviews of Interventions. The form was pilot-tested on a subset of studies to ensure clarity and consistency before full-scale extraction.

Two independent reviewers performed dual data extraction for all included studies. Discrepancies between extracted data were resolved through discussion, and unresolved cases were adjudicated by a third reviewer.

The following variables were extracted:

- Study details: first author, year of publication, country, and study design.
- Population: sample size (n), diagnosis, and disease stage.
- Intervention details: MDT composition, intervention frequency and duration, and the role of the psychologist within the team.
- Comparator: description of standard care, single-specialist model, or minimal intervention used for comparison.
- QoL measurement instruments: validated tools such as the PD Questionnaire-39 (PDQ-39), the Short Form-36 Health Survey (SF-36), the World Health Organization Quality of Life Instrument–BREF (WHOQOL-BREF), and the EuroQol five-dimension scale (EQ-5D).
- Main outcomes: means, standard deviations, and effect sizes for QoL domains.
- Follow-up period: time points at which QoL outcomes were measured.

Risk of Bias Assessment

The methodological quality of randomized controlled trials (RCTs) was assessed using the Cochrane Risk of Bias 2 (RoB 2) tool, which evaluates bias across domains including the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result [12].

For non-randomized studies, the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) tool was used to assess bias due to confounding, participant selection, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result [12].

Two independent reviewers conducted all risk of bias assessments. Discrepancies were resolved through discussion, and if necessary, a third reviewer provided adjudication.

The results of the risk of bias assessment were summarized in tabular form for each domain and presented visually using traffic-light plots and risk-of-bias summary graphs generated via RevMan Web.

Effect Measures

For continuous outcomes, effect sizes were expressed as the Mean Difference (MD) when all studies used the same QoL instrument. When different QoL tools were employed across studies, the Standardized Mean Difference (SMD) was calculated to allow pooling on a common scale. All continuous effect estimates were reported with 95% confidence intervals (CIs).

For dichotomous outcomes (if applicable), the results were summarized as Odds Ratios (ORs) with 95% CIs.

The SMD was preferred in the primary meta-analysis due to the expected variability in QoL measurement instruments across the included studies. Effect sizes were interpreted following Cohen's guidelines, with 0.2 indicating a small effect, 0.5 a moderate effect, and 0.8 a large effect. To ensure comparability across studies using different QoL instruments, all outcomes were converted to Standardized Mean Differences (SMDs). When scales differed in directionality, scores were reversed so that higher values consistently reflected better QoL. Domain-specific subscales were included only when they provided total QoL composites or were conceptually aligned with the overall QoL construct. This procedure ensured consistent interpretation across heterogeneous measurement tools.

Synthesis Methods

A random-effects meta-analysis was conducted using the DerSimonian–Laird method to account for potential clinical and methodological heterogeneity across studies.

All statistical analyses were performed using SPSS Statistics (IBM Corp., version XX) with the meta-analysis extension module, and Review Manager (RevMan) Web to generate forest plots, funnel plots, and risk-of-bias visualizations.

Statistical heterogeneity was assessed using the I^2 statistic , with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. The Chi (Q) test was also applied, with $p < 0.10$ indicating significant heterogeneity.

The planned subgroup analyses included the following:

- By diagnosis: PD, dementia (including AD), and amyotrophic lateral sclerosis.
- By inclusion of psychologist: MDTs including a psychologist versus those without explicit psychological input.
- By intervention duration/intensity: short-term (<3 months) vs. long-term (≥3 months) MDT interventions.

Where sufficient data were available, subgroup differences were tested using the test for subgroup differences feature in RevMan.

Additional Analyses

Where data permitted, meta-regression analyses were conducted to explore the relationship between effect sizes and (a) intervention length (in weeks) and (b) inclusion of a psychologist in the multidisciplinary team. These analyses aimed to assess whether intervention duration or psychological involvement moderated the impact of MDT interventions on QoL outcomes. To clarify this distinction, we grouped MDT programmes by whether a psychologist was actively involved in care. When included, psychologists offered CBT, psychoeducation or counselling, adding an essential emotional and cognitive component. In contrast, MDTs without psychological input focused mainly on medical and rehabilitation tasks. This difference helps explain why meta-regression showed stronger QoL improvements in teams that integrated psychological expertise

Sensitivity analyses were performed sequentially excluding studies classified as having a high risk of bias, based on the RoB 2 or ROBINS-I assessments. The objective was to determine the robustness of the pooled effect estimates to methodological quality and to identify potential overestimation or underestimation of effects due to lower-quality evidence.

Reporting Bias Assessment

Potential publication bias was assessed visually through funnel plots when at least ten studies were available for a given meta-analysis. Asymmetry in the funnel plot was considered suggestive of possible reporting bias or small-study effects.

In addition to visual inspection, Egger's regression test was applied to evaluate funnel plot asymmetry statistically. A p-value < 0.05 was interpreted as indicating significant asymmetry and potential publication bias.

When evidence of bias was detected, the trim-and-fill method was planned to estimate the number of potentially missing studies and to adjust the pooled effect size accordingly.

Certainty Assessment

The certainty of evidence for each primary and secondary outcome was assessed using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach.

Evidence from randomized controlled trials (RCTs) was initially rated as high certainty, while evidence from non-randomized studies started as low certainty. Certainty ratings could be downgraded based on concerns in the above domains or upgraded in cases of large effect size, evidence of a dose–response relationship, or when all plausible confounding would reduce the demonstrated effect.

The final GRADE ratings—high, moderate, low, or very low certainty—were presented in a Summary of Findings (SoF) table generated using GRADEpro GDT software

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