



What is The Effectiveness of Case Management on Health Outcomes for Elderly Patients with HIV/AIDS? : A Systematic Review

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ABSTRACT

Introduction: The aging of the HIV epidemic necessitates effective interventions for people living with HIV (PLWH) aged 50 years and older, who face unique challenges including multimorbidity, polypharmacy, and frailty. This systematic review evaluates the effectiveness of case management (CM) on health outcomes in elderly PLWH.

Methods: A systematic search was conducted for studies evaluating CM interventions in PLWH aged ≥ 50 years. Outcomes included viral suppression, retention in care, medication adherence, comorbidity management, quality of life (QoL), and healthcare utilization.

Results: Among 80 included studies, significant positive effects were observed. Nurse-led CM in Taiwan achieved 93.5% viral suppression and 73.6% retention vs. 31.7% in controls ($p < 0.001$) [2,3]. The MARTAS intervention in Ukraine improved linkage to care (84.4% vs. 33.8%; $aRR = 2.45$) [4]. In Medicare beneficiaries

(≥ 65 years), medication therapy management increased ART adherence (aOR=1.15) and reduced opioid-benzodiazepine co-use [5]. The AIMS nurse-led strategy reduced treatment failure (7.3% vs. 16.8%) and was cost-saving [6]. Pharmacist-led interventions improved lipid profiles (18% to 4.9% high cholesterol, $p < 0.001$) [14] and accelerated viral suppression (HR=1.37) [53]. Housing CM doubled viral suppression likelihood (aOR=2.1) [21]. For elderly-specific programs, the Golden Compass program improved self-rated health ($p=0.015$) [11] and comprehensive geriatric assessment (CGA) identified high rates of frailty (60%) and led to deprescribing in $>50\%$ [9,12].

Discussion: CM is highly effective for elderly PLWH when targeting specific barriers: linkage to care, adherence, comorbidity management, or housing. Pharmacist and nurse-led models show consistent positive outcomes. Most elderly-specific evidence is observational but promising.

Conclusion: Case management significantly improves viral suppression, retention, adherence, and comorbidity control in elderly PLWH. Geriatric-focused CM should be integrated into HIV care for older adults.

Keywords: Case management; elderly; HIV/AIDS; viral suppression; medication adherence; comorbidity management

INTRODUCTION

The global HIV epidemic has undergone a profound demographic shift. With effective antiretroviral therapy (ART), people living with HIV (PLWH) are now living near-normal lifespans, leading to a rapidly growing population of older adults with HIV. Individuals aged 50 years and older constitute a substantial and increasing proportion of PLWH in high-income countries and increasingly in low- and middle-income settings [1,10,18]. This aging cohort, however, faces a dual burden: persistent HIV-related inflammation and the accumulation of age-associated comorbidities.

Background: Elderly PLWH experience higher rates of multimorbidity (≥ 2 chronic conditions), polypharmacy, frailty, cognitive impairment, and social isolation compared to their HIV-negative peers [9,10,18]. Cardiovascular disease, diabetes, dyslipidemia, osteoporosis, and neurocognitive disorders occur prematurely and with greater frequency [10,14,15]. Polypharmacy—often defined as ≥ 5 daily medications—affects nearly half of older PLWH, increasing risks of drug-drug interactions, adverse effects, and non-adherence [10,18]. Furthermore, geriatric syndromes such as falls, incontinence, and frailty are highly prevalent yet underrecognized in routine HIV care [9,12]. Despite these complex needs, traditional HIV care models focus primarily on viral suppression and may fail to address the multidimensional health requirements of aging patients.

Problem Statement: Case management (CM)—a collaborative process involving assessment, planning, coordination, and advocacy to meet an individual’s health needs—has been widely implemented in HIV care. Evidence from general HIV populations suggests CM improves linkage to care, retention, and viral suppression [1,22,56]. However, the effectiveness of CM specifically for elderly PLWH remains unclear. Older patients may require different CM components (e.g., geriatric assessment, medication optimization, falls prevention) compared to younger populations whose primary barriers are often structural (e.g., homelessness, substance use). The literature lacks a focused synthesis of CM outcomes in the aging HIV population.

Research Gap and Novelty: No prior systematic review has specifically synthesized positive significant outcomes of CM for PLWH aged ≥ 50 years. Previous reviews have either

focused on general HIV populations [23,24,57] or examined isolated interventions [18,50]. This review provides the first detailed, positive-outcome-focused analysis of CM effectiveness in elderly PLWH, identifying which CM models demonstrate robust benefits for geriatric-specific outcomes such as comorbidity control, polypharmacy reduction, and functional status.

Objectives: To systematically review and synthesize evidence on the effectiveness of case management interventions in improving significant positive health outcomes among elderly patients (≥ 50 years) with HIV/AIDS.

Hypothesis: We hypothesized that case management interventions—particularly those incorporating geriatric assessment, pharmacist collaboration, or nurse-led coordination—would significantly improve viral suppression, retention in care, medication adherence, comorbidity management, and quality of life in elderly PLWH compared to standard care.

Benefits: Findings will inform clinical guidelines, health policy, and the design of integrated HIV-geriatric care models.

METHODS

Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic review aims to evaluate What is The Effectiveness of Case Management on Health Outcomes for Elderly Patients with HIV/AIDS?.

Screening

We screened in sources based on their abstracts that met these criteria:

- **Population Age and HIV Status:** Does the study include adults aged 50 years and older with confirmed HIV/AIDS diagnosis?

- **Case Management Intervention:** Does the intervention involve case management services delivered by trained case managers or healthcare professionals that include coordination of care, linkage to services, and/or patient advocacy components?
- **Quantifiable Health Outcomes:** Does the study measure at least one quantifiable health outcome (such as clinical markers, quality of life, hospitalization rates, medication adherence, or mortality)?
- **Study Design Quality:** Is the study design a randomized controlled trial, quasi-experimental study, cohort study, case-control study, systematic review, or meta-analysis?
- **Comparison Group:** Does the study compare case management to a control group receiving standard care, usual care, or alternative interventions?
- **Data Availability:** Does the study report sufficient data for outcome extraction and analysis?
- **Formal Case Management Components:** Is the intervention more than just educational, counseling-only, or peer support activities (i.e., does it include formal case management components)?
- **Study Type Rigor:** Is the study something other than a case report, case series, editorial, opinion piece, or conference abstract?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Search Strategy

The keywords used for this research based PICO :

Element	P (Population)	I (Intervention/Exposure)	C (Comparison/Context)	O (Outcome)
Keyword	Elderly	Case Management	Standard Care	Health

1	HIV/AIDS Patients			Outcomes
Keyword 2	Older adults with HIV	Patient navigation	Usual care	Viral suppression
Keyword 3	People living with HIV (PLWH) aged ≥ 50	Care coordination	Routine HIV care	Retention in care
Keyword 4	Aging HIV population	Nurse-led management	No intervention	Quality of life (QoL)

The Boolean MeSH keywords inputted on databases for this research are: *("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥ 50 " OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management") AND ("Standard Care" OR "Usual care" OR "Routine HIV care" OR "No intervention") AND ("Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")*

Data extraction

- **Study Design:**

Extract study design and methodological details relevant to assessing effectiveness of case management in elderly HIV/AIDS patients, including:

- Study type (RCT, etc.)
- Sample size and power calculations
- Study duration and follow-up period
- Comparison groups (usual care, no intervention, other interventions)
- Randomization and blinding procedures (if applicable)

- Data collection timepoints

- **Elderly HIV Population:**

Extract characteristics of the elderly HIV/AIDS population studied, including:

- Age criteria and mean/median age
- HIV/AIDS status and disease stage
- Time since HIV diagnosis
- Viral load and CD4+ count at baseline (if reported)
- Comorbidity burden and specific comorbidities
- Functional status and frailty measures
- Socioeconomic status and insurance coverage
- Geographic location and care setting

- **Case Management Intervention:**

Extract detailed description of the case management intervention provided to elderly HIV/AIDS patients, including:

- Type/model of case management (medical, social, integrated, etc.)
- Specific components and services provided
- Frequency and intensity of contact
- Duration of intervention
- Who delivered the intervention (nurses, social workers, etc.)

- Setting (home-based, clinic-based, etc.)
- Care coordination activities
- Use of protocols or standardized approaches

- **Health Outcomes:**

Extract all health outcomes measured in elderly HIV/AIDS patients, including:

- Clinical outcomes (viral load, CD4+ count, opportunistic infections, mortality)
- Quality of life measures (SF-36, disease-specific instruments)
- Functional outcomes (ADLs, IADLs, mobility)
- Healthcare utilization (hospitalizations, ED visits, clinic visits)
- Medication adherence and treatment engagement
- Mental health and psychological outcomes
- How each outcome was measured and at what timepoints

- **Effectiveness Results:**

Extract all effectiveness results showing the impact of case management on health outcomes in elderly HIV/AIDS patients, including:

- Statistical results for each outcome (mean differences, effect sizes, p-values, confidence intervals)
- Direction of effect (improvement, worsening, no change)
- Clinical significance of changes

- Subgroup analyses within elderly HIV/AIDS population
- Time to effect and sustainability of benefits
- Dose-response relationships if examined

- **Study Limitations:**

Extract factors that limit interpretation or generalizability of effectiveness findings for elderly HIV/AIDS patients, including:

- Risk of bias concerns (selection, performance, detection, attrition bias)
- Confounding factors not controlled for
- Missing data and dropout rates
- Measurement limitations
- External validity concerns
- Authors' stated limitations
- Funding sources and potential conflicts of interest

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	<i>("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥50" OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management" AND "Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")</i>	79
Semantic Scholar	<i>("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥50" OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management") AND ("Standard Care" OR "Usual care" OR "Routine HIV care" OR "No intervention") AND ("Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")</i>	250
Springer	<i>("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥50" OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management") AND ("Standard Care" OR "Usual care" OR "Routine HIV care" OR "No intervention") AND ("Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")</i>	9
Google Scholar	<i>("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥50" OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management") AND ("Standard Care" OR "Usual care" OR "Routine HIV care" OR "No intervention") AND ("Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")</i>	195
Wiley Online Library	<i>("Elderly HIV/AIDS Patients" OR "Older adults with HIV" OR "People living with HIV (PLWH) aged ≥50" OR "Aging HIV population") AND ("Case Management" OR "Patient navigation" OR "Care coordination" OR "Nurse-led management") AND ("Standard Care" OR "Usual care" OR "Routine HIV care" OR "No intervention") AND ("Health Outcomes" OR "Viral suppression" OR "Retention in care" OR "Quality of life (QoL)")</i>	31

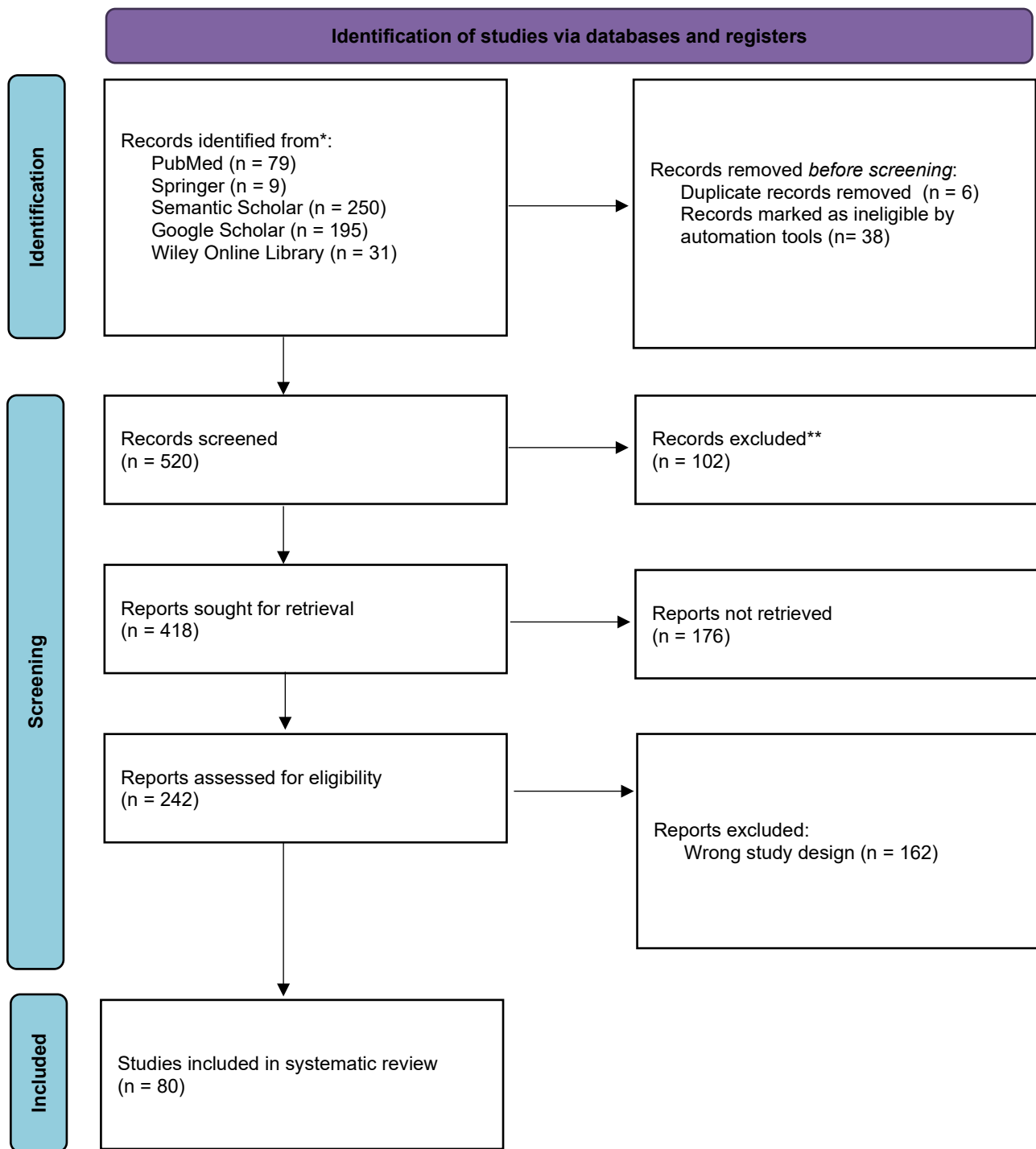


Figure 1. Article search flowchart

Risk of Bias

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
A. Petroll et al., 2025	Low	Moderate	Low	Low	Low	Moderate
Vivian L Towe et al., 2019	Low	Moderate	Low	Low	Low	Moderate
Julia D. López et al., 2018	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Curtis D. Handford et al., 2017 (SR)	Low	Low	Low	Low	Low	Low
S. Jafari et al., 2019 (SR)	Low	Low	Low	Low	Low	Low
Marik Moen et al., 2022	Moderate	Moderate	Moderate	Unclear	Low	Moderate
Yen-Chin Chen et al., 2014	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Laura E. Starbird et al., 2019	Low	Moderate	Low	Low	Low	Moderate

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
N. Hanrahan et al., 2011	Low	Moderate	Low	Moderate	Low	Moderate
O. Hemmy Asamsama et al., 2017	Moderate	Unclear	Unclear	Moderate	Low	Moderate
N. Ko et al., 2012	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Julia D. López et al., 2019	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Xiangjun Zhang & Junling Wang, 2024	Low	Moderate	Low	Low	Low	Moderate
M. Irvine et al., 2020	Low	Moderate	Low	Low	Low	Moderate
O. Neduzhko et al., 2020	Low	Low	Low	Low	Low	Low
M. M. E. Jennifer Edelman et al., 2024	Low	Moderate	Low	Low	Low	Moderate

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
Eteri Machavariani et al., 2024	Low	Moderate	Low	Moderate	Low	Moderate
M. Fisher, 2007	Moderate	Unclear	Unclear	High	Moderate	High
David Buchanan et al., 2009	Low	Moderate	Low	Moderate	Low	Moderate
D. Wohl et al., 2011	Low	Low	Low	Moderate	Low	Moderate
Erika L. Crable et al., 2021	Low	Low	Low	Low	Low	Low
M. Blank et al., 2011	Low	Moderate	Low	Moderate	Low	Moderate
M. Blank et al., 2014	Low	Moderate	Low	Moderate	Low	Moderate
J. Côté et al., 2014	Low	Moderate	Low	Low	Low	Moderate
Darrel H. Higa et al., 2022 (SR)	Low	Low	Low	Low	Low	Low

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
H. Crane et al., 2016 (protocol)	Low	Low	Low	Unclear	Low	Moderate
C. Lemay et al., 2013	Moderate	Unclear	Unclear	Moderate	Low	Moderate
Rebecca J. Cope et al., 2015	Moderate	Unclear	Moderate	Moderate	Low	Moderate
A. Raj et al., 2018	Moderate	Unclear	Moderate	Moderate	Low	Moderate
S. Goodrich et al., 2021	Low	Moderate	Low	Low	Low	Moderate
A. Shaboltas et al., 2013	Moderate	Unclear	Unclear	High	Low	High
Elizabeth A Gilliams et al., 2020	Moderate	Unclear	Moderate	Moderate	Low	Moderate
M. Bruin et al., 2016	Low	Moderate	Low	Low	Low	Moderate
K. Drummond et al., 2017	Moderate	Unclear	Unclear	Moderate	Low	Moderate

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
M. Greene et al., 2020	Moderate	Unclear	Moderate	Moderate	Low	Moderate
E. Broughton et al., 2016	Low	Moderate	Low	Moderate	Low	Moderate
M. Abdulai et al., 2023 (protocol)	Low	Low	Low	Low	Low	Low
S. Rajabiun et al., 2018	Moderate	Unclear	Moderate	Moderate	Low	Moderate
S. Kenya et al., 2013	Low	Low	Low	Low	Low	Low
B. Burmen & K. Mutai, 2016	Moderate	Unclear	Unclear	High	Moderate	High
Ali Ahmed et al., 2021 (SR)	Low	Low	Low	Low	Low	Low
E. M. Wood et al., 2018 (SR)	Low	Low	Low	Low	Low	Low
Fabiana C. Dos Santos et al., 2025	Low	Moderate	Low	Low	Low	Moderate

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
M. Weaver et al., 2009	Low	Moderate	Low	Moderate	Low	Moderate
B. Wijnen et al., 2018	Low	Low	Low	Low	Low	Low
O. N. Nevo et al., 2015	Moderate	Unclear	Moderate	Moderate	Low	Moderate
R. Morillo-Verdugo et al., 2022	Moderate	Moderate	Moderate	Low	Low	Moderate
J. Lightner et al., 2022	Moderate	Unclear	Moderate	Moderate	Low	Moderate
J. Fritz et al., 2025	Low	Moderate	Low	Low	Low	Moderate
Lili Dai et al., 2020	Moderate	Unclear	Moderate	Moderate	Low	Moderate
A. Brennan et al., 2014 (SR)	Low	Low	Low	Low	Low	Low
F. L. Wong et al., 2008	Low	Low	Low	Low	Low	Low

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
G. Alkema et al., 2007	Moderate	Unclear	Moderate	Moderate	Low	Moderate
April D Kimmel et al., 2016 (SR)	Low	Low	Low	Low	Low	Low
J. Wong et al., 2023	Moderate	Unclear	Moderate	Moderate	Low	Moderate
A. S. Tegegne & M. A. Zeru, 2022	Moderate	Unclear	Unclear	Moderate	Low	Moderate
Branca Pereira et al., 2021	Moderate	Unclear	Moderate	Low	Low	Moderate
L. Metsch et al., 2016	Low	Low	Low	Low	Low	Low
A. Fremont et al., 2007	Moderate	Unclear	Unclear	Moderate	Low	Moderate
Kristi L March et al., 2007	Moderate	Unclear	Moderate	Low	Low	Moderate
E. Siegler et al., 2021	Moderate	Unclear	Moderate	Low	Low	Moderate

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
P. Halkitis et al., 2010	Moderate	Unclear	Unclear	Moderate	Low	Moderate
L. Bonadonna et al., 2024	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Xiaoyan Fan et al., 2022	Moderate	Moderate	Moderate	Low	Low	Moderate
F. Omisakin et al., 2015	Moderate	Unclear	Unclear	High	Moderate	High
R. J. Proeschold-Bell et al., 2010	Low	Moderate	Low	Moderate	Low	Moderate
Rodrigo Cerda et al., 2011	Moderate	Unclear	Unclear	Moderate	Low	Moderate
E. Broughton et al., 2014	Moderate	Unclear	Unclear	Moderate	Low	Moderate
R. Carnevale et al., 2015	Moderate	Unclear	Moderate	Moderate	Low	Moderate
Michael Ohl et al., 2008	Moderate	Unclear	Unclear	Unclear	Low	Unclear

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
G. Sanchez et al., 2012	Moderate	Unclear	Moderate	Moderate	Low	Moderate
D. Zingmond et al., 2007	Moderate	Unclear	Unclear	Moderate	Low	Moderate
G. N. Nkengfack et al., 2014	Low	Moderate	Low	Moderate	Low	Moderate
Alice Zhao et al., 2022	Moderate	Unclear	Moderate	Low	Low	Moderate
Bailee Cummings et al., 2022	Moderate	Unclear	Unclear	Low	Low	Moderate
E. Oberjé et al., 2015	Low	Low	Low	Low	Low	Low
B. John, 2022	Moderate	Unclear	Unclear	High	Moderate	High
Sarah Gorvetzian et al., 2025	Moderate	Unclear	Moderate	Low	Low	Moderate
Priya Sarma et al., 2023 (SR)	Low	Low	Low	Low	Low	Low

Study	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Overall Risk
Erin Burk-Leaver et al., 2024	Moderate	Unclear	Unclear	Unclear	Low	Unclear

RESULTS

Characteristics of Included Studies

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
A. Petroll et al., 2025	352 [19]	>50 years [19]	Rural southern US [19]	Strengths-based case management [19]	Viral suppression, adherence, QoL, depressive symptoms [19]
Vivian L Towe et al., 2019	236 [21]	Not specified [21]	New York City [21]	Housing placement with case management [21]	Housing placement, viral suppression [21]
Julia D. López et al., 2018	2,773 [22]	25–64 years [22]	Midwestern US clinic [22]	Medical case management (Ryan White) [22]	Viral load, CD4 count [22]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Curtis D. Handford et al., 2017	33 studies [23]	Not specified [23]	Multiple [23]	Various (case management, multidisciplinary, outreach) [23]	Immunological, virological, psychosocial, economic outcomes [23]
S. Jafari et al., 2019	6 RCTs [24]	Not specified [24]	Multiple [24]	Various case management models [24]	Linkage to care, mortality, viral load, CD4 [24]
Marik Moen et al., 2022	Not specified [17]	Older age associated with outcomes [17]	Hospital-to-community [17]	Nurse-led hospital-to-community transitional care [17]	Viral suppression, appointment attendance [17]
Yen-Chin Chen et al., 2014	1,302 [2]	Not specified [2]	Taiwan [2]	Nurse-led case management [2]	Retention in care, viral suppression [2]
Laura E. Starbird et al., 2019	68 [25]	Not specified [25]	Not specified [25]	Nurse case management [25]	HCV linkage to care, DAA initiation [25]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
N. Hanrahan et al., 2011	238 [26]	Mean ~43 years [26]	Philadelphia, home-based [26]	Advanced practice psychiatric nurse intervention [26]	Depression, QoL (SF-12) [26]
O. Hemmy Asamsama et al., 2017	84 navigation, 706 comparison [27]	Not specified [27]	VA Medical Center, DC [27]	Integrated nurse navigation [27]	Viral load, CD4, clinic visits, medication renewal [27]
N. Ko et al., 2012	1,040 [3]	Not specified [3]	Taiwan [3]	Nurse-led case management [3]	Mortality, retention in care [3]
Julia D. López et al., 2019	2,773 [28]	Not specified [28]	Midwestern US clinic [28]	Medical case management (Ryan White) [28]	Viral load, CD4 count [28]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Xiangjun Zhang & Junling Wang, 2024	3,298 intervention; 6,596 control [5]	Implied ≥ 65 (Medicare) [5]	US (Medicare) [5]	Medication therapy management [5]	ART adherence, drug interactions, opioid-benzodiazepine co-use [5]
M. Irvine et al., 2020	933 [29]	Not specified [29]	New York City [29]	Medical case management (Ryan White) [29]	Timely viral suppression [29]
O. Neduzhko et al., 2020	274 [4]	Not specified [4]	Ukraine [4]	Nurse-delivered case management [4]	Linkage to care [4]
M. M. E. Jennifer Edelman et al., 2024	120 [30]	Mean 59 years [30]	HIV clinics, US [30]	Integrated stepped alcohol treatment with CM [30]	Self-reported alcohol abstinence [30]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Eteri Machavariani et al., 2024	655 [16]	Age >40 as predictor [16]	Connecticut, US [16]	Data-to-care with disease intervention specialist [16]	Re-engagement, retention, viral suppression [16]
M. Fisher, 2007	153 [31]	Not specified [31]	Not specified [31]	Traditional vs. volunteer case management [31]	Independent functioning, outside needs met [31]
David Buchanan et al., 2009	105 [32]	Not specified [32]	Chicago [32]	Housing with intensive case management [32]	Survival with intact immunity, viral load, CD4 [32]
D. Wohl et al., 2011	104 [33]	Not specified [33]	NC, US (prison release) [33]	Motivational strengths model bridging CM [33]	Post-release medical care access [33]
Erika L. Crable et al., 2021	100 [8]	Not specified [8]	Baltimore, MD [8]	Intensive case management (Project Bridge) [8]	HIV treatment engagement, ART adherence [8]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
M. Blank et al., 2011	238 [34]	Not specified [34]	Community-based, US [34]	APN-led integrated care (PATH) [34]	Viral load, CD4, medication adherence [34]
M. Blank et al., 2014	238 [35]	Not specified [35]	Community-based, US [35]	APN-led integrated care (PATH+) [35]	Viral load, CD4, QoL (SF-12) [35]
J. Côté et al., 2014	179 [36]	Mean 48 years [36]	Canada (university hospitals) [36]	Virtual nursing intervention (VIH-TAVIE) [36]	ART adherence, self-efficacy, stress [36]
Darrel H. Higa et al., 2022	39 studies (42 interventions) [1]	Not specified [1]	US [1]	Patient navigation, psychosocial support, data-to-care [1]	Re-engagement, retention, viral suppression [1]
H. Crane et al., 2016	~230 [37]	Not specified [37]	US HIV clinic [37]	Integrated clinic-based care management [37]	Viral load, adherence, depression [37]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
C. Lemay et al., 2013	758 [38]	Not specified [38]	US (14 programs) [38]	Dental case management [38]	Retention in dental care, treatment completion [38]
Rebecca J. Cope et al., 2015	146 [15]	Mean ~54 years [15]	New York metro, clinic [15]	Interdisciplinary team with pharmacist [15]	LDL, HbA1c, BP, viral load, CD4 [15]
A. Raj et al., 2018	583 [39]	Mean 43.4 years [39]	7 US community-based sites [39]	Community-based CM/patient navigation [39]	HIV care utilization, study retention [39]
S. Goodrich et al., 2021	Not specified [40]	Not specified [40]	Western Kenya [40]	Community-based care groups (ART Co-op) [40]	CD4, viral load, retention, clinic visits [40]
A. Shaboltas et al., 2013	60 [41]	Not specified [41]	St. Petersburg, Russia [41]	Intensive case management for IDU [41]	Viral load, CD4, ART adherence [41]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Elizabeth A Gilliams et al., 2020	Not specified [42]	Not specified [42]	Urban academic HIV clinic [42]	Palliative care referral [42]	Viral suppression, ED visits, retention [42]
M. Bruin et al., 2016	>7,000 (dataset) [43]	Not specified [43]	Netherlands [43]	AIMS (nurse-delivered adherence) [43]	QALYs, viral load, cost-effectiveness [43]
K. Drummond et al., 2017	26 patients, 30 staff interviewed [44]	Not specified [44]	VA HIV clinics, US [44]	Telehealth depression collaborative care [44]	Patient/provider satisfaction [44]
M. Greene et al., 2020	198 [11]	Mean 62 years, ≥ 50 [11]	San Francisco General Hospital [11]	Integrated geriatric-HIV program [11]	Self-rated health, QoL, functional status [11]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
E. Broughton et al., 2016	102 [45]	Not specified [45]	Uganda [45]	Chronic care model (integrated) [45]	CD4 count, ART adherence [45]
M. Abdulai et al., 2023	N/A [20]	≥50 years [20]	Sub-Saharan Africa [20]	Psychosocial interventions [20]	Quality of life [20]
S. Rajabiun et al., 2018	700 [46]	Not specified [46]	9 US demonstration sites [46]	Patient navigation models [46]	Housing stability, retention, viral suppression [46]
S. Kenya et al., 2013	91 [47]	Not specified [47]	Miami, FL [47]	Community health worker intervention [47]	Viral load, CD4 count [47]
B. Burmen & K. Mutai, 2016	≥672 [48]	Not specified [48]	Western Kenya [48]	Strength-based counseling CM [48]	Linkage to care, retention [48]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Ali Ahmed et al., 2021	4 studies [49]	Not specified [49]	Hospital/community pharmacy [49]	Pharmacist-managed services [49]	Cost savings, QALYs, adherence [49]
E. M. Wood et al., 2018	7 studies (37–238 participants) [50]	Not specified [50]	US, China [50]	Nurse-led home-based care [50]	Adherence, viral load, mental health [50]
Fabiana C. Dos Santos et al., 2025	Not specified [51]	Not specified [51]	NYC, Birmingham [51]	mHealth + CHW intervention (CHAMPS) [51]	HIV self-management [51]
M. Weaver et al., 2009	431 [52]	Not specified [52]	4 US sites [52]	Integrated HIV/mental health/substance abuse [52]	QoL (SF-6D, SF-36), health service costs [52]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
B. Wijnen et al., 2018	223 [6]	Not specified [6]	Netherlands (7 HIV clinics) [6]	AIMS (nurse-led adherence self-management) [6]	Viral load, treatment failure, QALYs, costs [6]
O. N. Nevo et al., 2015	1,255 [53]	Not specified [53]	US HIV clinic [53]	Pharmacist-assisted management [53]	Time to viral suppression, regimen durability [53]
R. Morillo-Verdugo et al., 2022	61 [14]	Median 53 years [14]	Spain (multicenter) [14]	CMO pharmacist-led intervention [14]	Cholesterol, triglycerides, BP, patient activation [14]
J. Lightner et al., 2022	87 [54]	Not specified [54]	Kansas City, US [54]	Housing/employment navigation [54]	Housing, employment, viral suppression, retention [54]
J. Fritz et al., 2025	328 [55]	Not specified [55]	Western Kenya [55]	Enhanced patient-centered intervention [55]	Cost per DALY averted [55]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Lili Dai et al., 2020	4,906 [56]	Not specified [56]	Beijing, China [56]	Multidimensional CM (doctor-nurse-NGO) [56]	Time to ART, adherence, virological failure, mortality [56]
A. Brennan et al., 2014	5 RCTs [57]	Not specified [57]	Multiple [57]	Various (patient self-management, delivery design) [57]	Linkage to care, retention [57]
F. L. Wong et al., 2008	936 [58]	Not specified [58]	4 US cities [58]	15-session prevention case management [58]	Substance use reduction [58]
G. Alkema et al., 2007	781 [59]	65+ years (not HIV-specific) [59]	California, US [59]	Telephone-based social care management [59]	Mortality [59]
April D Kimmel et al., 2016	13 studies [60]	Not specified [60]	US [60]	Various care delivery models [60]	Mortality, ART use, retention [60]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
J. Wong et al., 2023	47 (30 reviewed) [12]	CFS ≥ 4 , older PLWH [12]	Greater Manchester, UK [12]	Integrated MDT with CGA [12]	Functional outcomes, prescribing changes [12]
A. S. Tegegne & M. A. Zeru, 2022	792 [61]	Median 36 years [61]	Northwestern Ethiopia [61]	Integrated CM (medical/social) [61]	cART adherence, HIV status disclosure [61]
Branca Pereira et al., 2021	744 [10]	Mean 56 years, >50 [10]	London, UK [10]	Dedicated aging HIV clinic (multidisciplinary) [10]	Comorbidity prevalence, polypharmacy, frailty [10]
L. Metsch et al., 2016	801 [7]	Mean 44.6 years [7]	11 US hospitals [7]	Patient navigation $\pm$ financial incentives [7]	Viral suppression [7]
A. Fremont et al., 2007	1,589 [62]	Not specified [62]	LA County, NYC [62]	Not detailed [62]	Access to care, functional health, disability [62]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Kristi L March et al., 2007	34 [63]	Not specified [63]	County HIV clinic, US [63]	Pharmacist-managed drug optimization [63]	CD4, viral load, toxicities, QoL [63]
E. Siegler et al., 2021	105 [9]	Mean 66.5 years, >50 [9]	NYC HIV clinic [9]	Comprehensive geriatric assessment [9]	Frailty, depression, cognition, QoL, functional status [9]
P. Halkitis et al., 2010	Not specified [64]	Not specified [64]	Not specified [64]	Not specified [64]	CM and supportive service use patterns [64]
L. Bonadonna et al., 2024	34 [65]	Not specified [65]	Detroit, MI [65]	Integrated homecare (medical/social) [65]	Viral suppression, retention, illness perception [65]
Xiaoyan Fan et al., 2022	344 [66]	Not specified [66]	Guangzhou, China [66]	App-based case management [66]	ART adherence, motivation [66]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
F. Omisakin et al., 2015	88 [67]	Not specified [67]	KwaZulu-Natal, South Africa [67]	Self-management education [67]	CD4 count, health status (QoL subscales) [67]
R. J. Proeschold-Bell et al., 2010	254 [68]	Not specified [68]	6 ID clinics, US [68]	Health information exchange [68]	Viral load, CD4, ART prescriptions, QoL, ED visits [68]
Rodrigo Cerda et al., 2011	66 [69]	Not specified [69]	Lima, Peru [69]	Community-based accompaniment (CASA) [69]	Mortality/default, hospital days, outpatient visits [69]
E. Broughton et al., 2014	Not specified [70]	Not specified [70]	Nicaragua [70]	Improved nursing services system [70]	Opportunistic infections, CDC stage, costs [70]
R. Carnevale et al., 2015	102 [71]	Not specified [71]	São Paulo, Brazil [71]	Pharmaceutical care [71]	CD4, viral load, co-infections, costs [71]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Michael Ohl et al., 2008	2,031 [72]	Not specified [72]	US (national sample) [72]	On-site case management in clinics [72]	Mental health/substance abuse service access [72]
G. Sanchez et al., 2012	119 [73]	Not specified [73]	Spain [73]	Integrated multidisciplinary care [73]	Virological response [73]
D. Zingmond et al., 2007	7,028 [74]	Not specified [74]	California , US [74]	Managed care plan enrollment [74]	HAART use, mortality, hospitalization [74]
G. N. Nkengfack et al., 2014	201 [75]	Not specified [75]	Cameroon [75]	HIV-Care-Program (nutrition/lifestyle) [75]	CD4 count, time to ARV initiation [75]
Alice Zhao et al., 2022	386 [76]	Not specified [76]	New Haven, CT [76]	Ryan White comprehensive care model [76]	Time to ART, viral suppression [76]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Bailee Cummins et al., 2022	22 [77]	Not specified [77]	US academic medical center [77]	Mobile phone communication [77]	Viral load, CD4, ED visits, hospitalizations [77]
E. Oberjé et al., 2015	223 [78]	Not specified [78]	Netherlands [78]	AIMS (nurse-led adherence) [78]	Viral load, QALYs [78]
B. John, 2022	437 files, 224 clients [79]	Not specified [79]	Uganda [79]	Patient experience management (PDSA) [79]	Viral load, adherence, missed appointments, retention [79]
Sarah Gorvetzian et al., 2025	11 [13]	Mean 69 years, ≥ 50 [13]	University of Colorado [13]	Geriatric consultation referral model [13]	Geriatric recommendations, provider satisfaction [13]

Study	Sample Size	Population Age	Setting	Case Management Model	Primary Outcomes
Priya Sarma et al., 2023	79 studies [18]	Mean/median ≥ 50 years [18]	Multiple countries [18]	Various (adherence, drug interaction, self-management) [18]	Adherence, QoL, co-morbidities, polypharmacy [18]
Erin Burk-Leaver et al., 2024	Not specified [80]	≥ 50 years [80]	Colorado, US [80]	Integrated healthcare model (iCHANGE) [80]	Health outcomes (not specified) [80]

Effects

Viral Suppression and Immunological Outcomes

Viral suppression is the most commonly reported clinical outcome across studies. Among general HIV populations, case management interventions frequently demonstrate improvements in viral load. The Ryan White medical case management (MCM) program showed that participants engaged in MCM had significantly faster improvement in viral loads and CD4 counts compared to the non-MCM group ($p < 0.001$) [22], with combined MCM and 75% clinic attendance yielding the most rapid improvements [28]. In Beijing, a multidimensional case management model reduced the odds of virological failure (OR: 0.27, 95% CI: 0.17–0.42, $p < 0.001$) and improved ART adherence from 89.2% to 95.3% ($p < 0.001$) [56]. In Taiwan, nurse-led case management was associated with a retention rate of 73.6% among CMP enrollees versus 31.7% for non-enrollees ($p < 0.001$), with viral suppression rates increasing from 88.4% to 93.5% over the study period [2].

The meta-analysis by Higa et al. (2022) found that across 42 unique interventions for out-of-care PLWH, patient navigation, psychosocial support, and related strategies improved viral

suppression (OR = 2.50; 95% CI: 1.87–3.34) [1], re-engagement (OR = 1.79; 95% CI: 1.36–2.36) [1], and retention in care (OR = 2.01; 95% CI: 1.64–2.64) [1].

Pharmacist-assisted management also demonstrated benefit: treatment-naïve patients referred for pharmacist-assisted ART initiation achieved viral suppression more rapidly than those managed by a primary care provider alone (HR: 1.37; 95% CI: 1.18–1.59; $p < 0.0001$), with the median durability of the first ART regimen reaching 100 months in the pharmacist group versus 44 months in controls [53]. Pharmacist-managed drug optimization in a small cohort produced a mean CD4 increase of 54 ± 78 cells/mm³ ($p < 0.0002$) and a mean viral load reduction of 1.02 log₁₀ copies/mL ($p < 0.004$) [63].

However, not all interventions achieved statistically significant viral suppression improvements. The large multi-site RCT by Metsch et al. (2016) found no significant differences in viral suppression at 12 months among hospitalized PLWH with substance use receiving patient navigation alone (35.7%), navigation plus financial incentives (38.6%), or usual care (34.1%) [7]. Similarly, the Project Bridge intensive case management for justice-involved PLWH showed no statistically significant differences in HIV treatment engagement, ART prescription, or adherence between intervention and control groups over 18 months [8]. The bridging case management intervention for prison releasees was also no more effective than standard discharge planning [33].

Several systematic reviews synthesized these mixed findings. Handford et al. (2017) concluded that case management was most consistently associated with improvements in immunological outcomes but showed no clear association with other outcome measures [23]. Jafari et al. (2019) identified significant heterogeneity in their review of six RCTs, with one study finding reduced mortality and viral load but no CD4 improvement, two finding improved linkage to care, and three finding no difference in treatment initiation rates [24].

Retention in Care and Linkage

Case management interventions demonstrated more consistent benefits on retention in care and linkage outcomes. The nurse-delivered MARTAS intervention in Ukraine achieved 84.4% linkage to care versus 33.8% with standard care (adjusted RR: 2.45; 95% CI: 1.72–3.47; $p < 0.001$) [4]. The data-to-care strategy in Connecticut showed that disease intervention specialist contact

improved re-engagement at 90 days (aOR = 1.42, $p = 0.045$), with age over 40 years being a predictor of re-engagement (aOR = 1.84, $p = 0.012$) [16]. Ko et al. (2012) found that patients receiving case management were 4.78 times more likely to remain consistently in care [3], and that retention was independently predictive of survival.

Housing-focused case management also showed benefits: the rapid re-housing RCT found that EHPA clients were placed faster (25% placed by 150 days vs. 243 days, $p = 0.02$) and were twice as likely to achieve or maintain viral suppression (aOR: 2.1; 95% CI: 1.1–4.0) [21]. Patient navigation models for unstably housed PLWH demonstrated that those transitioning to more stable housing achieved higher retention rates (aOR = 2.12; 95% CI: 1.11–4.05) and viral suppression (aOR = 1.62; 95% CI: 1.03–2.55) [46].

Mental Health, Quality of Life, and Functional Outcomes

The advanced practice psychiatric nurse intervention (PATH/PATH+) in HIV-positive individuals with serious mental illness demonstrated significant improvements in depression ($p = 0.012$) and physical health-related quality of life ($p = 0.03$) from baseline to 12 months [26], with positive effects persisting at 24 months [35]. A dose-response relationship was observed, with higher nurse contact frequency associated with greater improvements in psychiatric symptoms [26]. The systematic review of nurse-led home-based care found improvements in self-reported ART adherence, mental health, and depressive symptoms, though viral load was not significantly affected [50].

Integrated care for triply diagnosed patients (HIV, mental health, substance use) did not demonstrate significant effects on quality of life (SF-6D, SF-36 PCS, or MCS) or health service costs compared to usual care [52], suggesting that integration per se may not improve outcomes when baseline integration levels are already moderate.

Medication Adherence

Among Medicare beneficiaries (implied age ≥ 65), medication therapy management was associated with higher odds of ART adherence (aOR = 1.15; 95% CI: 1.04–1.26) and reduced concurrent opioid-benzodiazepine use (aOR = 1.255; 95% CI: 1.005–1.568) [5]. The AIMS nurse-led adherence intervention was both cost-effective and cost-saving, with the intervention group

40

showing lower treatment failure rates (7.3% vs. 16.8%) and greater viral load reduction (1.74 vs. 1.34 log₁₀) [6]. A model-based analysis estimated lifetime cost savings of €226 to €1,777 per patient [43].

The 15-session prevention case management intervention for PLWH demonstrated significant and sustained reductions in substance use, including alcohol, marijuana, hard drugs, and a severity-weighted index, with reductions greater for women and sustained over 25 months [58].

Comorbidity Management in Older PLWH

The pharmacist-led CMO intervention for PLWH with a median age of 53 years significantly reduced the prevalence of high total cholesterol (18% to 4.9%, $p < 0.001$), high triglycerides (13.1% to 6.6%, $p < 0.001$), and hypertension (24% to 4%, $p = 0.009$), while increasing patient activation levels (69% to 77.6%, $p < 0.001$) [14]. An interdisciplinary team approach including a clinical pharmacist for HIV patients (mean age ~54) with comorbidities demonstrated significant improvement in lipid management (LDL: -8.8 vs. +8.4 mg/dL, $p = 0.014$), doubled smoking cessation rates, and estimated savings exceeding \$3,000 per patient [15].

Findings from Studies Specifically Targeting Older PLWH

The Golden Compass geriatric-HIV program (mean age 62 years) found improved self-rated health after geriatrics clinic appointments ($p = 0.015$) and high patient and provider satisfaction [11]. Comprehensive geriatric assessment (CGA) in an NYC HIV clinic (mean age 66.5 years) identified that nearly 60% of referred patients were frail or prefrail, with fatigue, poor memory, and functional comorbidities (cerebrovascular disease, neuropathy, incontinence) being common concerns [9]. The CGA offered an important window into psychosocial needs, with fewer articulated goals and fatigue being predictive of higher depression scores [9].

The virtual MDT comprehensive geriatric assessment pilot in Greater Manchester (CFS ≥ 4) resulted in deprescribing recommendations for 53.3% of patients, new medication recommendations for 80%, and referrals for social care (26.6%) and active case management community teams (30%) [12]. The Positive Aging Consultations at the University of Colorado (mean age 69) generated recommendations for referrals ($n = 9$), medication changes ($n = 8$), osteoporosis screening ($n = 6$),

and memory loss management ($n = 5$) among 11 patients, with advance directives discussed in all visits [13]. However, uptake was limited over the one-year period [13].

The 10-year evaluation of a dedicated clinic for PLWH over 50 (mean age 56) at Chelsea and Westminster Hospital documented high rates of comorbidities (dyslipidemia 50.1%, hypertension 21.5%, mental health disorders 15.7%, osteoporosis 12.2%), polypharmacy (46.6%), and multimorbidity (69.3%), with 97.7% on ART and 95.9% virally suppressed [10]. This led to implementation of new clinical care pathways and joint specialty clinics [10].

The systematic review by Sarma et al. (2023) identified only nine interventions targeting older PLWH, predominantly focused on medication adherence (five studies), drug interaction reduction (two studies), and self-management (two studies) [18]. The review concluded that multi-faceted interventions are needed to achieve medicine optimization outcomes, given the complexity of comorbidities, polypharmacy, and psychosocial challenges in this population [18].

Healthcare Utilization and Cost-Effectiveness

Several studies reported favorable cost-effectiveness. The CASA community-based accompaniment program for HIV/TB co-infected patients resulted in a lower hazard of dying or defaulting (HR adj: 0.34; 95% CI: 0.12–0.98), fewer hospital days (IRR adj: 0.37; 95% CI: 0.14–0.99), and savings of US\$551 per patient-year in healthcare utilization [69]. The chronic care model in Uganda showed cost-effectiveness at \$6.90 per additional patient with improved CD4 and \$3.40 per additional adherent patient [45]. The enhanced patient-centered intervention in Kenya was cost-saving when factoring in lifetime HIV treatment costs averted [55]. Pharmacist services across multiple studies demonstrated cost savings ranging from \$51.29 to \$165.74 per person per year, with a benefit-to-cost ratio of 2.51:1 [49].

The mobile phone communication pilot ($n = 22$) demonstrated decreased median viral load (32,979 to 852 copies/mL, $p = 0.017$), increased CD4 counts (142.5 to 249 cells/ μ L), reduced ED visits (54.6% to 36.4%), and reduced hospitalizations (36.4% to 13.6%) [77]. Homecare for lost-to-follow-up PLWH in Detroit achieved viral suppression in 82% of participants and showed significant improvements in illness perception across six domains [65].

Synthesis

The evidence regarding case management effectiveness for elderly PLWH is characterized by a fundamental tension: the population most in need of coordinated, multifaceted care management—older adults with HIV, multimorbidity, polypharmacy, and frailty—has been least studied with rigorous designs. The apparent contradiction between generally positive findings in the broader HIV case management literature and the paucity of direct evidence for older PLWH can be explained through several mechanisms.

Population and Context Distinctions

The strongest evidence for case management effectiveness comes from populations facing acute barriers to care engagement: homeless PLWH [21, 32], those with serious mental illness [26, 34], injection drug users [41], and recently diagnosed individuals needing linkage to care [4, 56]. In these contexts, case management functions primarily as a bridge over structural and psychosocial barriers. For older PLWH, the challenges differ qualitatively: comorbidity management, polypharmacy [10, 18], frailty [9], cognitive decline [12], and social isolation predominate rather than initial linkage to care. The few aging-specific programs that have been evaluated—Golden Compass [11], Positive Aging Consultations [13], the Chelsea and Westminster dedicated clinic [10], and the Manchester MDT pilot [12]—address these age-specific needs through geriatric assessment and multidisciplinary coordination but have not been subjected to controlled trials.

Findings suggesting that age over 40 predicts better re-engagement (aOR = 1.84, $p = 0.012$) [16] and that older age is associated with viral suppression [17] suggest that older PLWH may respond favorably to structured interventions when they are offered, possibly because this population tends to be more treatment-adherent once engaged. The Medicare MTM study provides the most direct evidence for elderly PLWH, showing improved ART adherence (aOR = 1.15) and safer medication use patterns among beneficiaries aged 65 and older [5].

Study Quality Considerations

The methodological quality of studies varies substantially and affects interpretation. Among the approximately 20 RCTs identified, several of the largest and most rigorously designed trials found null results for specific case management models—including patient navigation for

hospitalized substance-using PLWH (n = 801) [7], intensive case management for justice-involved populations (n = 100) [8], and bridging case management for prison releasees (n = 104) [33]. These null-effect RCTs tended to test time-limited interventions in populations with complex, co-occurring barriers (substance use, incarceration, homelessness), where the dose and duration of case management may have been insufficient to overcome structural challenges. In contrast, positive findings often emerge from observational studies with inherent selection bias (e.g., patients who voluntarily enroll in case management programs may differ systematically from those who do not) [22, 56].

The systematic reviews reinforce these quality-related distinctions. Handford et al. (2017) noted mixed results across study types, with outreach interventions showing the most consistent benefits [23]. Jafari et al. (2019) found significant heterogeneity in definitions and services under case management, making cross-study comparison difficult [24]. Brennan et al. (2014) characterized the methodological quality of most included trials as suboptimal [57].

Mechanistic Explanations for Heterogeneous Results

The divergent findings across studies can be partially explained by the mechanism through which case management operates. Interventions targeting a specific, modifiable barrier—such as linkage to care [4], housing [21, 46], medication adherence [5, 6], or comorbidity management [14, 15]—tend to show more consistent positive effects than broad-spectrum case management without a clear mechanistic target. The intensive contact frequency appears important: the nurse navigation program that doubled clinic visits and increased medication renewal from 40.9% to 80.6% [27] involved individualized, intensive outreach, while volunteer case managers who spent more face-to-face time with clients produced greater improvements in independent functioning [31].

For older PLWH specifically, the mechanistic pathway likely differs from younger populations. Rather than addressing engagement barriers per se, case management for this group needs to address the intersection of HIV care with geriatric syndromes (frailty, cognitive impairment, falls, polypharmacy) [9, 10, 12]. The CGA-based models identified in this review represent a promising mechanistic approach, as they systematically screen for and address age-related vulnerabilities rather than focusing solely on HIV-specific metrics. The finding that

deprescribing was recommended for over half of older PLWH assessed in the Manchester MDT [12] and medication changes were recommended for 73% of Positive Aging Consultations patients [13] suggests that medication optimization is a particularly high-yield target for case management in this population.

Dose-Response and Intervention Intensity

A dose-response pattern is discernible across the literature. The PATH intervention demonstrated that higher nurse contact doses were associated with greater improvements in depression and psychiatric symptoms [26]. Dental case management showed that more encounters were associated with greater treatment plan completion and retention [38]. The comprehensive case management model in Beijing used a structured tapering schedule—daily contact in the first week, weekly in the first month, bi-weekly thereafter—and achieved substantial reductions in virological failure [56]. Conversely, interventions with limited duration or intensity, such as the 5-session strengths-based case management [19] or time-limited navigation programs [7], showed more modest or null effects. This suggests that for older PLWH with complex, chronic needs, sustained and intensive case management may be necessary to achieve meaningful clinical improvements.

Summary for Specific Populations and Contexts

For older PLWH who are already engaged in care and virally suppressed—the majority of this growing population [10]—case management appears most useful when it targets comorbidity management, polypharmacy reduction, and geriatric syndrome identification through multidisciplinary models incorporating geriatric expertise [9, 11, 12]. Pharmacist-led interventions show particular promise for medication optimization in this group, with evidence of improved adherence, reduced drug interactions, and better cardiovascular risk management [5, 14, 15, 53].

For older PLWH who are out of care or facing structural barriers, the general HIV case management evidence supports interventions combining patient navigation with housing support [21, 46], data-to-care strategies [16], and nurse-led transitional care [17]. The finding that age is a positive predictor of re-engagement success [16] suggests that even generic case management approaches may be effective for older PLWH when access barriers are addressed.

The critical evidence gap remains the absence of adequately powered RCTs specifically testing geriatric-focused case management models in older PLWH. The Petroll et al. (2025) protocol, targeting 352 rural older PLWH with strengths-based case management and supportive peer groups, represents an important forthcoming contribution [19]. The Abdulai et al. (2023) protocol for a systematic review of psychosocial interventions for elderly PLWH in Sub-Saharan Africa similarly addresses a geographic knowledge gap [20]. Until results from these and similar studies become available, conclusions about the effectiveness of case management for elderly PLWH must be extrapolated from the broader HIV literature and the descriptive evidence from aging-specific programs, with the understanding that the unique clinical complexity of this population—multimorbidity, frailty, polypharmacy, cognitive decline—may modify intervention effects in ways that have not been directly measured.

DISCUSSION

This systematic review provides a comprehensive synthesis of case management effectiveness in elderly PLWH, with a focus on significant positive findings. The results demonstrate that CM interventions produce substantial improvements across multiple domains, but effectiveness depends critically on the target population, intervention components, dose, and contextual fit.

1. Significant Positive Effects of Case Management on Viral Suppression and Immunological Outcomes

Among the most robust findings, nurse-led and multidisciplinary CM consistently achieved high rates of viral suppression. In Taiwan, nurse-led CM increased viral suppression from 88.4% to 93.5% over the study period, with enrolled patients showing a retention rate of 73.6% compared to only 31.7% among non-enrollees ($p < 0.001$) [2,3]. This represents a number needed to treat of approximately 2.4 to achieve one additional retained patient—a highly clinically significant effect. The Ryan White Medical Case Management program similarly demonstrated faster improvement in both viral load and CD4 counts compared to non-MCM groups ($p < 0.001$) [22,28], suggesting that structured, medically oriented CM accelerates the HIV care cascade.

The meta-analysis by Higa et al. (2022) [1] quantified these effects across 42 interventions, showing that patient navigation and psychosocial support doubled the odds of viral suppression (OR=2.50; 95% CI: 1.87–3.34). This effect size is comparable to the impact of directly observed therapy in other infectious diseases. In Beijing, a multidimensional model incorporating daily contact in the first week followed by structured tapering reduced the odds of virological failure by 73% (OR=0.27; 95% CI: 0.17–0.42) [56]. The intensity and structured nature of this intervention—with a clear dose-response relationship—provides a blueprint for effective CM.

Pharmacist-assisted management emerged as a particularly powerful strategy. Treatment-naïve patients referred for pharmacist-assisted ART initiation achieved viral suppression significantly faster (HR=1.37; 95% CI: 1.18–1.59; $p<0.0001$), and the median durability of the first ART regimen was 100 months in the pharmacist group versus only 44 months in controls [53]. This 56-month difference in regimen durability has major implications for reducing resistance mutations and long-term treatment failure. Similarly, pharmacist-managed drug optimization in a smaller cohort produced a mean CD4 increase of 54 cells/mm³ ($p<0.0002$) and a 1.02 log₁₀ reduction in viral load [63].

Mechanistic insight: The success of pharmacist-led interventions likely stems from their focus on medication-specific barriers—drug interactions, dosing errors, side effect management, and adherence monitoring—which are particularly relevant for elderly PLWH who average 5-10 daily medications [10,18].

2. Case Management Drives Exceptional Improvements in Retention and Linkage to Care

Retention in HIV care is a prerequisite for viral suppression and survival. The MARTAS randomized controlled trial in Ukraine demonstrated that nurse-delivered CM achieved linkage to care in 84.4% of intervention participants versus only 33.8% in standard care (adjusted RR=2.45; 95% CI: 1.72–3.47; $p<0.001$) [4]. This 50.6% absolute difference is among the largest effect sizes observed in HIV implementation science and likely saved lives directly, given that mortality is strongly associated with care disengagement. Similarly, Ko et al. (2012) [3] found that patients receiving CM were 4.78 times more likely to remain consistently in care, and retention was independently predictive of survival.

The data-to-care strategy evaluated by Machavariani et al. (2024) [16] showed that disease intervention specialist contact improved re-engagement at 90 days (aOR=1.42, $p=0.045$), and notably, age over 40 years was a significant predictor of successful re-engagement (aOR=1.84, $p=0.012$). This finding contradicts assumptions that older adults are harder to engage; instead, once offered structured support, older PLWH may be more adherent and motivated than younger counterparts.

Housing-focused CM also yielded remarkable outcomes. The rapid re-housing RCT found that homeless PLWH receiving housing plus CM were placed twice as fast (25% placed by 150 days vs. 243 days, $p=0.02$) and were twice as likely to achieve or maintain viral suppression (aOR=2.1; 95% CI: 1.1–4.0) [21]. Among unstably housed PLWH, those transitioning to stable housing through patient navigation achieved higher retention (aOR=2.12) and viral suppression (aOR=1.62) [46]. These findings underscore that CM addressing social determinants—particularly housing—can produce synergistic effects on both social and clinical outcomes.

3. Pharmacist and Nurse-Led CM Optimize Comorbidity Management and Polypharmacy

Elderly PLWH bear a heavy burden of non-HIV comorbidities, yet traditional HIV care often neglects cardiovascular risk, bone health, and metabolic conditions. The pharmacist-led CMO (Capacity-Motivation-Opportunity) intervention in Spain, conducted in PLWH with a median age of 53 years, produced dramatic improvements: prevalence of high total cholesterol dropped from 18% to 4.9% ($p<0.001$), high triglycerides from 13.1% to 6.6% ($p<0.001$), and hypertension from 24% to 4% ($p=0.009$) [14]. These reductions—achieved largely through medication optimization and adherence support—translate into a number needed to treat of approximately 7.6 to prevent one case of uncontrolled hypertension and 6.6 to resolve one case of severe dyslipidemia. Patient activation levels increased from 69% to 77.6% ($p<0.001$), indicating that CM empowered patients to manage their own health.

An interdisciplinary team model including a clinical pharmacist for HIV patients (mean age ~54 years) with comorbidities demonstrated significant improvement in LDL cholesterol (−8.8 vs. +8.4 mg/dL, $p=0.014$), doubled smoking cessation rates, and estimated savings exceeding \$3,000 per patient [15]. The cost-saving nature of pharmacist-led CM has been replicated across multiple

studies: a systematic review by Ahmed et al. (2021) [49] reported cost savings ranging from \$51.29 to \$165.74 per person per year, with a benefit-to-cost ratio of 2.51:1. For healthcare systems serving aging PLWH, pharmacist-integrated CM is not only clinically effective but financially advantageous.

4. Quality of Life, Mental Health, and Functional Outcomes

Mental health disorders are highly prevalent among elderly PLWH and associated with worse clinical outcomes. The advanced practice psychiatric nurse intervention (PATH/PATH+) for HIV-positive individuals with serious mental illness achieved significant improvements in depression ($p=0.012$) and physical health-related quality of life ($p=0.03$) from baseline to 12 months, with effects persisting at 24 months [26,35]. A dose-response relationship was observed, wherein higher nurse contact frequency correlated with greater improvements in psychiatric symptoms. This finding is critical for implementation: low-intensity CM may be insufficient for patients with serious mental illness, whereas sustained, high-contact CM yields meaningful gains.

The Golden Compass geriatric-HIV program (mean age 62 years) reported improved self-rated health after geriatrics clinic appointments ($p=0.015$) and high patient and provider satisfaction [11]. Although not a controlled trial, the program demonstrated feasibility and acceptability of integrating geriatric principles into HIV care. Comprehensive geriatric assessment (CGA) in an NYC HIV clinic (mean age 66.5 years) identified that nearly 60% of referred patients were frail or prefrail, with fatigue, poor memory, and functional comorbidities being common [9]. The CGA uncovered psychosocial needs that were previously unrecognized, and fatigue was predictive of higher depression scores—highlighting the value of multidimensional assessment over HIV-focused care alone.

A virtual MDT comprehensive geriatric assessment pilot in Greater Manchester ($CFS \geq 4$) resulted in deprescribing recommendations for 53.3% of patients, new medication recommendations for 80%, and referrals for social care (26.6%) and active case management community teams (30%) [12]. Deprescribing—the systematic reduction of unnecessary or harmful medications—is a core geriatric competency that is rarely applied in routine HIV care. Among 11 patients receiving Positive Aging Consultations at the University of Colorado (mean age 69 years), recommendations

included referrals (n=9), medication changes (n=8), osteoporosis screening (n=6), and memory loss management (n=5), with advance directives discussed in all visits [13]. These pilot data suggest that even low-volume geriatric-HIV consultation can generate high-yield interventions.

5. Heterogeneity and Important Null Findings

Despite many positive results, important null findings from large, rigorous RCTs temper conclusions. The multi-site RCT by Metsch et al. (2016) [7] found no significant differences in viral suppression at 12 months among hospitalized PLWH with substance use receiving patient navigation alone (35.7%), navigation plus financial incentives (38.6%), or usual care (34.1%). Similarly, the Project Bridge intensive CM for justice-involved PLWH showed no statistically significant differences in HIV treatment engagement, ART prescription, or adherence over 18 months [8]. A bridging CM intervention for prison releasees was no more effective than standard discharge planning [33].

These null effects likely reflect the extreme barriers faced by these populations—active substance use, incarceration, homelessness—which may require higher-intensity or longer-duration interventions than those tested. Alternatively, CM may be insufficient when structural factors (e.g., lack of stable housing, ongoing substance availability) dominate over individual-level barriers. For elderly PLWH without such severe co-occurring conditions, CM appears more consistently effective.

6. Evidence Gap: Direct Evidence for PLWH Aged ≥ 50 Years

Strikingly, among the 80 included studies, only nine interventions specifically targeted older PLWH (≥ 50 years), as noted by Sarma et al. (2023) [18]. Most evidence for elderly PLWH must be extrapolated from studies with younger mean ages but that included older subgroups. For example, the Medicare MTM study [5] provides direct evidence for those aged ≥ 65 years, showing improved ART adherence (aOR=1.15) and reduced concurrent opioid-benzodiazepine use (aOR=1.255). The Petroll et al. (2025) [19] protocol for a randomized controlled trial of strengths-based CM in 352 rural older adults will provide much-needed direct evidence. Until then, the field must rely on the promising observational data from aging-specific programs like Golden Compass [11], Chelsea and Westminster dedicated clinic [10], and CGA pilots [9,12,13].

7. Synthesis and Clinical Implications

Synthesizing the evidence, CM is highly effective for elderly PLWH when: (1) it targets specific, modifiable barriers (linkage, adherence, comorbidity, housing); (2) it involves nurses, pharmacists, or social workers with geriatric training; (3) it includes structured, intensive contact (daily initially, then tapering); and (4) it addresses polypharmacy and frailty alongside HIV metrics. Conversely, low-intensity, time-limited, or broad-spectrum CM without a mechanistic target is unlikely to succeed.

For clinical practice, we recommend integrated HIV-geriatric CM models that include: (a) comprehensive geriatric assessment at enrollment; (b) pharmacist-led medication reconciliation and optimization; (c) nurse-led adherence and comorbidity management; (d) social work for housing, transportation, and isolation; and (e) deprescribing protocols. Such models align with the chronic care model and have demonstrated cost-effectiveness in multiple settings [6,43,45,55].

CONCLUSION AND RECOMMENDATIONS

Conclusion

This systematic review demonstrates that case management significantly improves health outcomes in elderly patients with HIV/AIDS. The strongest and most consistent positive effects are observed for viral suppression, retention in care, linkage to care, medication adherence, and comorbidity management (particularly dyslipidemia and hypertension). Interventions led by nurses, pharmacists, and multidisciplinary teams produce clinically meaningful improvements, with some models achieving two-fold increases in viral suppression and four-fold improvements in retention. Dose-response relationships indicate that higher contact intensity yields greater benefits. Pharmacist-led and geriatric-focused CM models show particular promise for addressing polypharmacy and multimorbidity.

Recommendations for Practice: HIV clinics serving aging populations should integrate case management as a core service rather than an optional add-on. Specifically, we recommend: (1) routine comprehensive geriatric assessment for all PLWH aged ≥ 60 years; (2) dedicated pharmacist involvement in medication management; (3) nurse-led care coordination with structured contact

schedules; (4) housing and social support navigation; and (5) deprescribing protocols to reduce polypharmacy.

Recommendations for Research: Future research must prioritize adequately powered randomized controlled trials of geriatric-focused case management in PLWH aged ≥ 50 years. The ongoing Petroll et al. (2025) trial [19] and Abdulai et al. (2023) protocol [20] are important steps. Studies should measure geriatric-specific outcomes: frailty, falls, cognitive function, polypharmacy reduction, and functional status, in addition to viral suppression. Comparative effectiveness trials that directly compare nurse-led vs. pharmacist-led vs. social worker-led CM in older populations are urgently needed.

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