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EFFECTIVENESS OF STROKE COORDINATED CARE INTERVENTIONS DELIVERED TO STROKE SURVIVORS IN LOW AND MIDDLE-INCOME COUNTRIES: A SYSTEMATIC REVIEW AND META-ANALYSIS

BY

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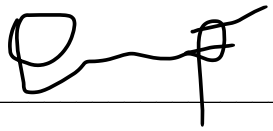
DECLARATION

I, Stephanopoulos Kofi Junior Osei, hereby declare that this thesis is my original work and has not been submitted, in whole or in part, for any other degree at any other institution. Any sources and references used in this thesis have been duly acknowledged and cited.

Signature  Date: 19/04/2025

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ABSTRACT

Background: Stroke survivors receive complex care requiring navigation of multiple services and care providers. Considering this, stroke care is prone to care fragmentation and potentially poor outcomes in patients. Care coordination provides deliberate organisation of stroke care and services, ensuring that personnel and resources are interconnected through communication and relations. The goal is to ensure that care is comprehensive, meets the needs and preferences of patients and families, and ultimately, clinical expectations. This systematic review sought to identify components of stroke care coordination in low and middle-income countries (LMICs) and assess this intervention's impact on patients' clinical outcomes.

Methods: Electronic databases, trial registries and non-database sources were searched; PubMed, LILACS, CINAHL via EBSCOhost, Scopus, Cochrane CENTRAL, WHO International Clinical Trials Registry Platform (ICTRP), Web of Science Core Collection and Preprint collection, ProQuest and Google Scholar. from 2000 to 31st December 2024, without language restriction. Hand searches for references for relevant studies were carried out. Title and abstract screening of unique records after deduplication were conducted using a study selection flow chart developed from the PICOS elements (P ─ patient, I ─ intervention, C ─ comparator, O ─ outcomes and S ─study). Full-texts of potentially relevant studies were retrieved and screened. Study selection, data extraction and risk of bias assessment were conducted independently by two reviewers. Risk of bias studies were assessed using the Risk of Bias in Randomised Trials (RoB 2) and the non-randomised studies of intervention (ROBINS-I) tools. Disagreements between the reviewers on study selection, data extraction and risk of bias assessment were resolved through discussions. Risk ratio (RR) for binary outcomes and mean differences (MD) or standardised mean differences (SMD) for continuous outcomes were the effect measures for expressing the effectiveness of care-

coordinated interventions. A random-effects model was used to pool effect estimates. Narrative syntheses were provided when meta-analysis was not plausible.

Results: The research retrieved 9,715 studies, of which 16 met the inclusion criteria; 12 (75%) were conducted in Asia, two (12.5%) in Africa, and two (12.5%) in Southern America. Care-coordinated interventions predominantly had multiple participants (100%), an interprofessional meeting channel of communications (93.8%) as components, with activities predominantly targeting patients' direct care and families. Stroke care coordinated interventions resulted in improved performance of activities of daily living (ADLs) (SMD = 0.92; CI= 0.37 – 1.48), cognitive functioning (SMD = 0.55; CI= 0.21 – 0.89), and quality of life (QoL) of stroke survivors (SMD= 1.00; CI= 0.21 – 1.78). The results indicated no difference in mortality rate, upper extremity motor function, lower extremity motor function, and depression levels between care coordination and standard care groups. Limited data did not support sub-analyses of moderators of care coordination interventions. Limited data did not allow meaningful comparisons of sub-groups to detect potential differences in outcomes across stroke types, variation in care coordination components, and stroke severity. None of the studies included reported adverse events of stroke care-coordinated interventions.

Conclusion: Stroke care-coordinated interventions in LMICs vary from one context to another. Current approaches result in improved independence and quality of life for stroke survivors. The evidence is, however, inconclusive on the moderating roles of clinical and intervention variables on stroke outcomes.

DEDICATION

I dedicate this thesis to all stroke survivors worldwide, including my father and my Aunt Bea. Your resilience is out of this world, and I hope that I and the many dedicated researchers find evidence-based solutions that improve your survival and quality of life.

ACKNOWLEDGEMENTS

It takes a village to raise a child, and I am thankful to my village. First off, I bless God for granting me my village, which was tailor-made, SIR.

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To my resilient mother who stands by me even in times when she does not understand what I am doing. My prayer backbone, Maa, may God richly bless you. Thank you for being my greatest love. To all my family members, friends, lecturers, teachers, and mentors, thank you for being my village.

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In the spirit of self-care and appreciation, I would thank myself. For pulling myself through the dark days and for coming thus far.

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LIST OF ABBREVIATIONS

ADLs	Activities of Daily Living
FIM	Functional Independence Measure
HICs	High Income Countries
ICTRP	International Clinical Trials Registry Platform
LMICs	Low and Middle-Income Countries
NIHSS	National Institute of Health Stroke Scale
NRTs	Non-Randomized Trials
PACTR	Pan African Clinical Trials Registry
PICO	Population Intervention Comparator Outcome
RCTs	Randomized Controlled Trials
RoB 2	Revised tool for Risk of Bias in randomized trials
ROBINS-I	Risk Of Bias in Non-randomized Studies of Interventions
QoL	Quality of Life
SoF	Summary of Findings
SSA	Sub-Saharan Africa
UGCESP	University of Ghana Centre for Evidence Synthesis and Policy
WHO	World Health Organisation
WSO	World Stroke Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background

Stroke remains a pervasive public health challenge, particularly in low and middle-income countries (LMICs). Globally, stroke is the second leading cause of death and the third leading cause of both death and disability (Feigin et al., 2022). In 2021, about 12 million new cases of stroke were reported, and currently, there are over 93 million stroke survivors worldwide (Feigin et al., 2021).

Disparities in Global and Regional Burden of Stroke

The burden of stroke is, however, disproportionately distributed across global regions (Figure 1). Currently, LMICs account for 77% of prevalent strokes and 83% of incident stroke cases (Feigin et al., 2021). Survivors in these countries are also at a higher risk of death compared to their counterparts in high-income countries (HICs). Regardless of age, individuals who suffer a stroke in LMICs are 3.7 times more likely to die or suffer long-term disability compared to those in high-income countries (Figure 2) (Feigin et al., 2021). Other estimates indicate that over 80% of stroke-related deaths occur in LMICs.

It is evident that preventive efforts (e.g. tobacco control, optimal nutrition and primary care service interventions) for stroke in LMICs have intensified (Owolabi et al., 2021; Pandian et al., 2018). However, care and management of stroke survivors continues to face substantial challenges requiring health strengthening and innovation (Pandian et al., 2020).

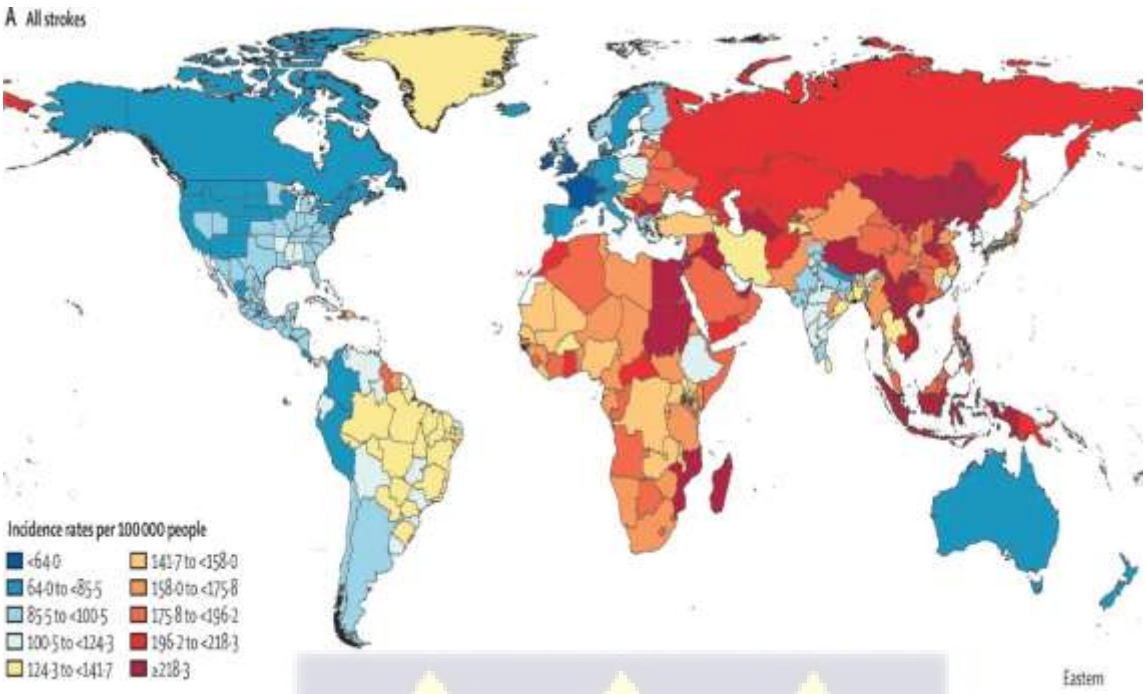

Figure 1: Age-standardized stroke incidence rates per 100 000 people by stroke type and country, for both sexes, 2019 [Source: Global, regional and national burden of stroke and its risk factors, 1990-2019, GBD 2019 Stroke Collaborators. Lancet Neurol. 202t1 Oct.]

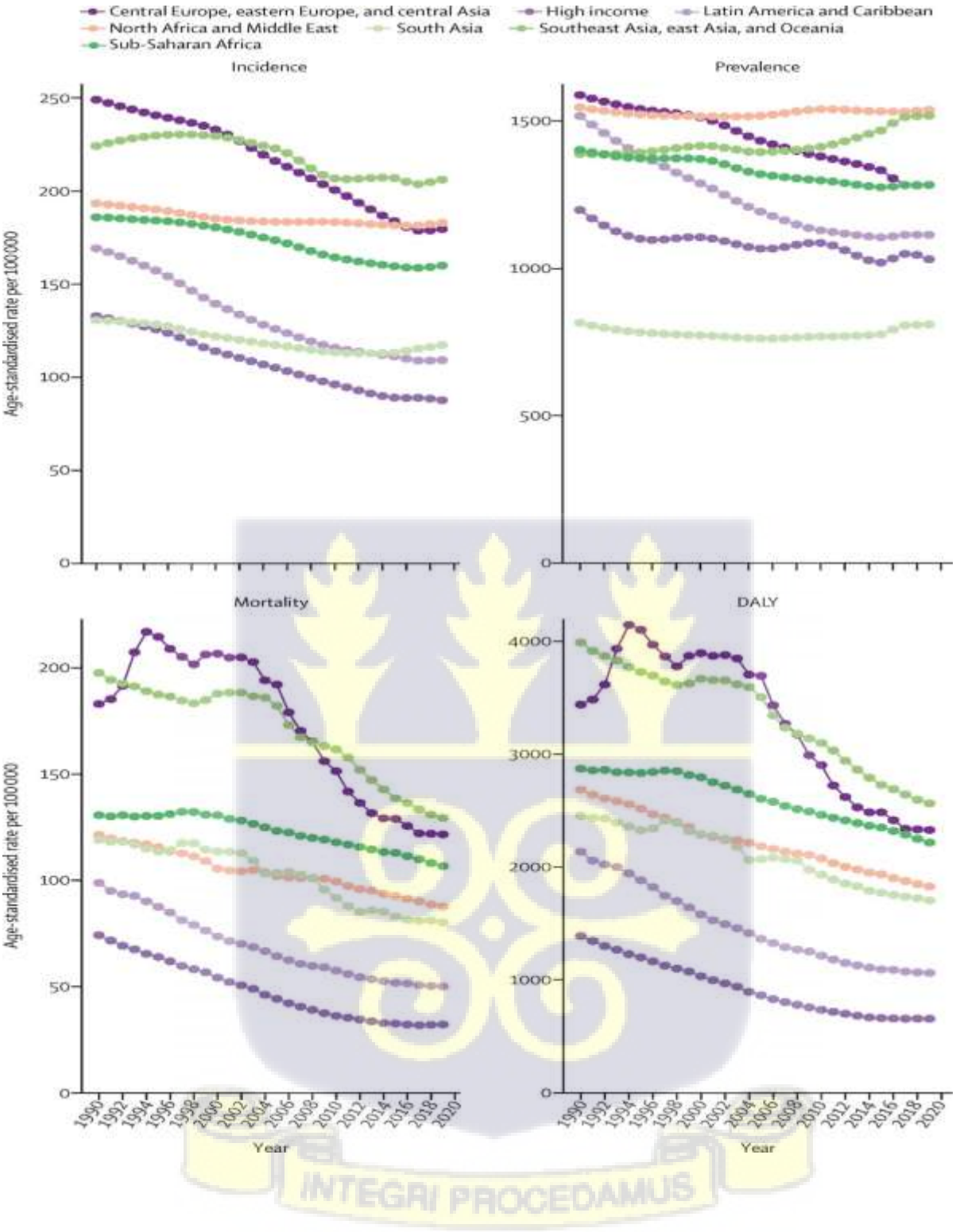

Figure 2:Age-standardised incidence, prevalence, mortality, and DALY rates (per 100 000 people per year) in seven GBD super regions, 1990–2019, for both sexes and all ages [Source:

Global, regional and national burden of stroke and its risk factors, 1990-2019, GBD 2019 Stroke Collaborators. Lancet Neurol. 2021 Oct.]

Pathophysiology of Stroke

Stroke is a neurological disorder resulting from an abrupt injury to cerebral (brain) blood vessels (Murphy & Werring, 2020). The injury is associated with acute and focal neurological deficits that could impact an individual's ability to perform physical (motor) and cognitive functions (Kuriakose & Xiao, 2020). There are two major types of strokes (ischemic and hemorrhagic) based on the mechanism of the condition. Ischemic stroke, which accounts for 65% of all strokes, is caused by limited blood and oxygen supply to the brain primarily due to occlusion from thrombotic or embolic agents (Alrabghi et al., 2018; Feigin et al., 2024). Thrombotic agents may result from the buildup of plaques in the brain's blood vessels, causing increased constriction and occlusion. Embolic factors, on the other hand, are characterised by the travel of built-up plaques and blood clots from other organs outside the brain to the cerebral blood vessel (Kanyal, 2015). In both situations, this leads to occlusion of blood vessels, inflammation, and cell death due to limited oxygen supply. Hemorrhagic stroke, on the other hand, is caused by the rupture of the blood vessels in the brain, leading to internal bleeding, increased intracranial pressure (increased pressure in the skull) and infarction (tissue death due to obstruction of blood supply) (Kuriakose & Xiao, 2020).

Risk Factors of Stroke

Risk factors of stroke for hemorrhagic and ischemic stroke are quite similar but could have some notable differences (Boehme et al., 2017). Stroke risk factors are broadly categorised as modifiable or non-modifiable. Non-modifiable factors (also known as risk makers) include genetics and socio-demographic characteristics (age, sex, race-ethnicity) that increase an individual's risk of stroke (Boehme et al., 2017). According to Boehme et al. (2017), stroke is associated with increasing age, with the incidence of stroke rising significantly after 45 years for hemorrhagic stroke (Boehme et

al., 2017). The age-standardised incidence rate (ASIR) of ischemic stroke progressively increases with advancing age, reaching its highest peak at age 95 and older (Li et al., 2024). There is an interplay between sex and age as risk markers of stroke. For instance, among the population aged 40 years and older, the incidence of ischemic stroke in males surpasses that in females. This disparity progresses with advancing age but diminishes at 85 years of age (Li et al., 2024). There are a few explanations for the disparity in stroke incidence between the sexes. The most prominent is that males and females have varying lifestyle behaviours that are risk factors for stroke. Others have proposed protective effect of endogenous oestrogen reduces the risk of stroke incidence in females (Fekadu et al., 2019). The role of genetics in stroke incidence remains complex; however, single-gene disorders such as CADASIL, CARASIL, sickle cell disease and certain genome-wide loci have been reported to be associated with the mechanism of stroke (Murphy & Werring, 2020).

Modifiable risk factors of stroke are predominantly lifestyle behaviours, environmental factors and disease conditions that mediate or moderate the mechanism of stroke. Hypertension, particularly high systolic pressure, has been identified as the most prevalent modifiable risk factor of stroke (Murphy & Werring, 2020). Approximately 64% of individuals diagnosed with stroke are also hypertensives (Wajngarten & Silva, 2019). Hypertension promotes the remodelling and thickening of cerebral arteries, the development of atherosclerotic plaques and ultimately limited blood flow to the brain. Hypertension could also cause disorders such as lipohyalinosis, further damaging cerebral vessels and leading to cerebral bleeding (Yu et al., 2011). Diabetes is another prominent risk factor, mainly associated with ischemic stroke as compared to hemorrhagic stroke. Diabetes increases oxidative stress, further damaging the walls of the microvessels of the brain. Diabetes is also associated with increased levels of cholesterol and other lipids that could occlude the vessels of the brain (Tun et al., 2017). Other cardiovascular conditions, including atrial fibrillation and

coagulopathies, increase the risk of thrombotic occlusion of cerebral blood vessels and the risk of stroke (Murphy & Werring, 2020). Diabetes is associated with hypertension and further increased arterial stiffness, a prominent predictor of haemorrhagic stroke (Mosenzon et al., 2023).

Lifestyle behaviours increase the risk of cardiovascular conditions and diabetes mellitus, which are prominent independent risk factors of stroke. In an umbrella review, Wang et al. (2022) reported that obesity and limited physical activity are positively associated with stroke as they could potentiate the risk of diabetes and hyperlipidemia. Also, the authors reported that smoking could lead to dysfunction of blood pressure regulatory systems and increased risk of stroke. Environmental factors, including air pollution, have also been identified as potent risk factor for all types of strokes (Feigin et al., 2021).

Stroke Diagnosis

Stroke diagnosis is facilitated by physical examination, diagnostic tests and imaging. (Hurford et al., 2020). Physical examination involves assessment and recognition of clinical signs of stroke, including unilateral weakness of the limbs, and speech disturbance and assessment of symptoms, including headache, altered level of consciousness and dizziness (Murphy & Werring, 2020). These assessments are aided by validated clinical tools such as the National Institute of Health Stroke Scale (NIHSS), Rapid Arterial Occlusion Evaluation (RACE) and Field Assessment Stroke Triage for Emergency Destination (FAST-ED), which are essential for determining severity and detecting potential sub-types of strokes (Antipova et al., 2019).

Since stroke mimics other conditions such as seizures, neoplasms, systemic infections, and hypoglycaemia (low blood sugar), there is a need for haematological tests and imaging of the brain to rule any differential condition other than stroke (Buck et al., 2021). Also, diagnostic tests and

imaging are conducted to determine the aetiology of the condition, eligibility for therapy and treatment goals.

The diagnostic tests include blood glucose test, oxygen saturation, serum electrolytes, prothrombin time (blood clot test) and echocardiogram and full blood count (Powers et al., 2019). Neurological and neurovascular imaging remains the gold standard for diagnosing stroke, although they are insufficient in LMICs (Aguirre et al., 2023). Imaging tests are mainly non-contrast computed tomography scans and brain MRI scans, which are essential for visualising the brain injury for further classification and management (Parmar, 2018).

Acute Stroke Management

Acute stroke management is complex and requires a multidisciplinary approach. During the acute phase of Ischemic stroke, the goal is to remove the occluding agent and promote blood flow to the region of occlusion (Hui et al., 2022). This is achieved either through pharmacological management and/or surgery (Powers et al., 2019). Pharmacological management may consist of the use of anticoagulants such as aspirin and heparin to prevent blood clot formation and further occlusion of neurological vessels (Abbas et al., 2023). Thrombolytic agents such as alteplase recombinant (tpA) are also effective in destroying thrombolytic agents occluding blood vessels when administered within the first 3 hours of stroke symptoms onset (Barreto, 2011). The pharmacological interventions indicated are effective for managing small vessel occlusion. However, they are not well-suited for the management of large vessel occlusion. As such, surgical removal of the thrombotic agents (thrombectomy) is recommended for large vessel occlusions (Hurford et al., 2020).

Since haemorrhagic stroke is characterised by cerebral bleeding, acute management is targeted at stopping the bleed and decreasing oedema caused by the bleeding. Clinical management of haemorrhagic stroke includes the use of beta-blockers (e.g. labetalol, esmolol) and other antihypertensives to reduce blood pressure (Hurford et al., 2020). Platelet transfusion and vitamin K administration may be indicated for patients with low platelet levels and on anticoagulant therapy, respectively (Greenberg et al., 2022). Intracranial pressure due to oedema and cerebral bleeding is also managed by sedation, hyperosmolar fluid administration and positioning of patients (Addis et al., 2023). Surgical interventions, including hematoma evacuation procedures and craniotomy, may be recommended for preventing complications associated with haemorrhagic stroke; however, these procedures remain controversial as evidence on their effectiveness is in equipoise (Morotti & Goldstein, 2016).

Stroke patients are also provided with general supportive care to support resuscitation and prevent complications. Supportive care includes oxygen administration, temperature control, blood glucose control, head positioning, dysphagia screening, modified to suit stroke deficits, deep vein thrombosis prophylaxis and depression screening (Powers et al., 2019).

Rehabilitation, longer-term stroke management and preventing stroke recurrence

Although acute stroke management targets improving cerebral circulation and ultimately curbing deficits due to brain injury, stroke patients may still incur long-term impairments. Stroke rehabilitation is the aspect of stroke care targeted at preventing deterioration of functions, improving functioning and attainment of the optimum level of physical, psychological and social independence with the constraints of stroke-induced impairments (Belagaje, 2017). Stroke rehabilitation is dependent on the deficits accrued due to the condition and the risk of

complications. Essentially, rehabilitation efforts are targeted at maximising function and independence in the presence of accrued impairments. Different therapy approaches, including motor skills training (physiotherapy) for improved physical functioning, usually begin during the acute management of stroke. Motor and physical rehabilitation is crucial for improving mobility and supports the prevention of complications such as contractures and deep vein thrombosis (Powers et al., 2019).

Cognitive rehabilitation targets resolving cognitive deficits such as attention deficits, unilateral neglect (neglect of the affected part of the body), language deficits (speech difficulties and communication deficits) and physical functioning (Cicerone et al., 2019). There are a myriad of interventions targeted at these deficits. The interventions include, but are not limited to, functioning training, occupational therapy, attention and memory training and visual search training (Merriman et al., 2019). Although the use of pharmacotherapies in cognitive rehabilitation remains unclear, medications such as donepezil have been reported to improve cognitive outcomes in patients with stroke (Gorelick et al., 2011).

Stroke survivors post-discharge from inpatient settings and specialised rehabilitation units require additional support for reintegration into their communities and occupations. Long-term stroke management predominantly involves risk factor management (e.g. lifestyle and pharmacological interventions to reduce systolic blood pressure) to mitigate the likelihood of recurrence (Boeheme et al., 2021). Other interventions are also targeted at multidisciplinary approaches to reduce post-stroke complications and disability and improve self-management of survivors (Boeheme et al., 2021; Urimubenshi et al., 2018).

Stroke Care-Related Challenges in LMICs

Stroke management is complex and spans over a lifetime. Stroke survivors require comprehensive and complex care targeted at improving outcomes during various phases of the condition's trajectory (Krishan et al., 2017). As indicated earlier, stroke care services span from pre-hospital management to rehabilitation and long-term community support. However, stroke survivors may face prominent challenges in navigating these healthcare structures for optimum outcomes, especially in low-resource settings. Even in high-income countries like the US, Ducan et al. (2020) reported that 1 in 4 stroke survivors are discharged home post-acute care without additional care services despite residual deficits. These challenges are more pronounced in low and middle-income countries. In a systematic review, Pandian et al. (2017) highlighted that LMICs are faced with limited and ill-equipped stroke facilities, such as emergency departments, diagnostic departments, and rehabilitation facilities. This is further compounded by limited trained human resources such as specialists, social workers and medical staff (Roushdy et al., 2022). Despite these challenges, Pandian et al. (2022) argue that innovative care models in LMICS, which are mostly characterised by multidisciplinary approaches, task-sharing, and coordination that exist in these countries, have the potential to strengthen care capacities and improve patient outcomes.

Stroke Care Coordination

Considering the complexity and challenges of stroke care in LMICs – navigating multiple care services/personnel and limited resources – there is an apparent need to 1) coordinate services for comprehensive care and 2) organise resources for optimal service coverage and efficiency. Care coordination is a deliberate organisation of patient care activities usually between more than two participants (including the patients) to facilitate appropriate delivery of care services (NEJM Catalyst, 2018; Shultz & McDonald, 2014). The organisation of care involves a conscious effort

to mobilise care professionals and resources to complete all required care tasks. The organisation is typically facilitated by information exchange among participants responsible for various aspects of care and clarification of roles and responsibilities among these participants. Care-coordinated interventions recognise that there are numerous health services and personnel in stroke care management, and these services are dependent on each other. Care coordination interventions also integrate care activities to facilitate the appropriate delivery of care services (McDonald et al., 2007).

How care coordination might work

Care coordination of stroke interventions aims to facilitate collaboration among the multiple care providers in stroke management (e.g. neurologists, physiotherapists, speech therapists, primary care physicians and nurses) to ensure that they have aligned efforts that support patients' recovery (Karam et al., 2021). Coordination also synchronises interdependent care activities such as medication management, rehabilitation, and management of comorbidities (Shultz & McDonald, 2014). These efforts promote deliberate and organised information exchange among care providers and patients, ensuring that all parties are informed on patients' status, treatment progress, and evolving needs.

Care-coordinated intervention reduces fragmentation of care (Agha et al., 2017), promotes health service utilisation and ultimately improves patient outcomes (Joo, 2023). These outcomes may be related to improve communication that enhances clarity among multiple providers and reduces errors (e.g medication errors) associated with complications and other adverse outcomes. Care coordination also provides opportunities for continued monitoring and adjustment of care plans

based on patient needs, supporting recovery progress and achievement of clinical expectations of patients, caregivers (families), and care providers.

1.2 Problem Statement

Stroke remains a leading cause of disability, imposing a substantial burden on individuals, families, and healthcare systems (Gillespie & Campbell, 2011; Donkor, 2018). There are 101 million individuals living with stroke, and the bulk of these survivors (77%) reside in LMICs. In 2021, there were over 7 million stroke-related deaths reported globally. These deaths are estimated to rise to 10 million in 2050, and about 90% of these deaths are expected to occur in LMICs (The Lancet Neurology, 2024).

One of the key factors accounting for disproportionate distribution of stroke-related deaths and disability in LMICs is limited clinical and rehabilitation management capacities (Bernhardt et al., 2020). Management of stroke is crucial for reducing related mortality and disability. However, in LMICs, optimal clinical and community management of stroke is threatened by prominent challenges such as low health worker-to-patient ratios and resource shortages, making stroke a near-death and disability sentence in these contexts (Feigin et al., 2023). These challenges further result in patchy and fragmented stroke care and threaten comprehensive provision of stroke management (Baatiema et al., 2020). The fragmentation also disrupts continuity of care, limiting patients' access to comprehensive management and rehabilitation, especially post-acute care discharge, ultimately impeding their recovery and increasing the risk of death.

The use of innovative care models in LMICs in addressing gaps in current stroke systems of care has been reported to improve patient and system outcomes despite key challenges (Liu et al., 2024).

One of such proposed models in the face of stroke care fragmentation is stroke care coordination. This model of care proposes deliberate organisation of resources and personnel to support comprehensive stroke management. The goal of the model is to establish efficient use of limited resources and connect care providers, patients and families for comprehensive management of stroke.

Although stroke care coordination has the potential to improve stroke management in LMICS, there are gaps in our comprehensive understanding of how they are delivered/implemented in LMICs settings, associated patient outcomes and how variations in these interventions influence variations in outcomes.

1.3 Justification

Stroke remains a leading cause of disability and mortality globally, imposing a substantial burden on individuals, families and the healthcare system (Gillespie & Campbell, 2011; Donkor, 2018). Despite advancements in stroke care services provision, stroke survivors, especially in LMICs, face significant challenges in accessing comprehensive care, ultimately leading to increased risk of mortality and disability (Pandian et al., 2020).

Due to the complexity and challenges associated with seamless access to comprehensive stroke care, there is a crucial need to utilise innovative care practices such as care coordination (Misra et al., 2020; NJEM Catalyst, 2018). In resource-limited settings, innovative care practices are deemed to improve the quality of stroke care services and promote optimal patient outcomes (Pandian et al., 2020). The current investigation seeks to determine the effectiveness of stroke care-coordinated interventions. The study will characterise care coordination interventions in LMICs by identifying the different components and implementation strategies of stroke-coordinated care interventions.

The study will also assess associated outcomes of stroke care coordination and factors that influence the relationship between these care models and patient outcomes.

The study aligns with the Sustainable Development Goals (SDG) 3 and 10. SDG 3 is an action call for ensuring healthy lives and well-being for all at all ages. By exploring innovative care models that promote better stroke outcomes, the study makes a key contribution to global and national agendas of promoting good health and improved quality of life among stroke survivors. The study also has a focus on reducing inequalities in accessing quality stroke care due to the fragmentation of healthcare services and limited resources.

The study provides high-level evidence to support health workers in making informed decisions on care coordination interventions, as the study provides a comprehensive evaluation of all evidence on the effectiveness of these interventions. This systematic review also serves as the foundation for clinical guidelines on stroke care coordination and supports clinicians in prioritising which variations could yield the best patient outcomes and result in the most efficient use of resources. For policy, the synthesis provides robust evidence to support the building of health systems to drive coordinated care interventions.

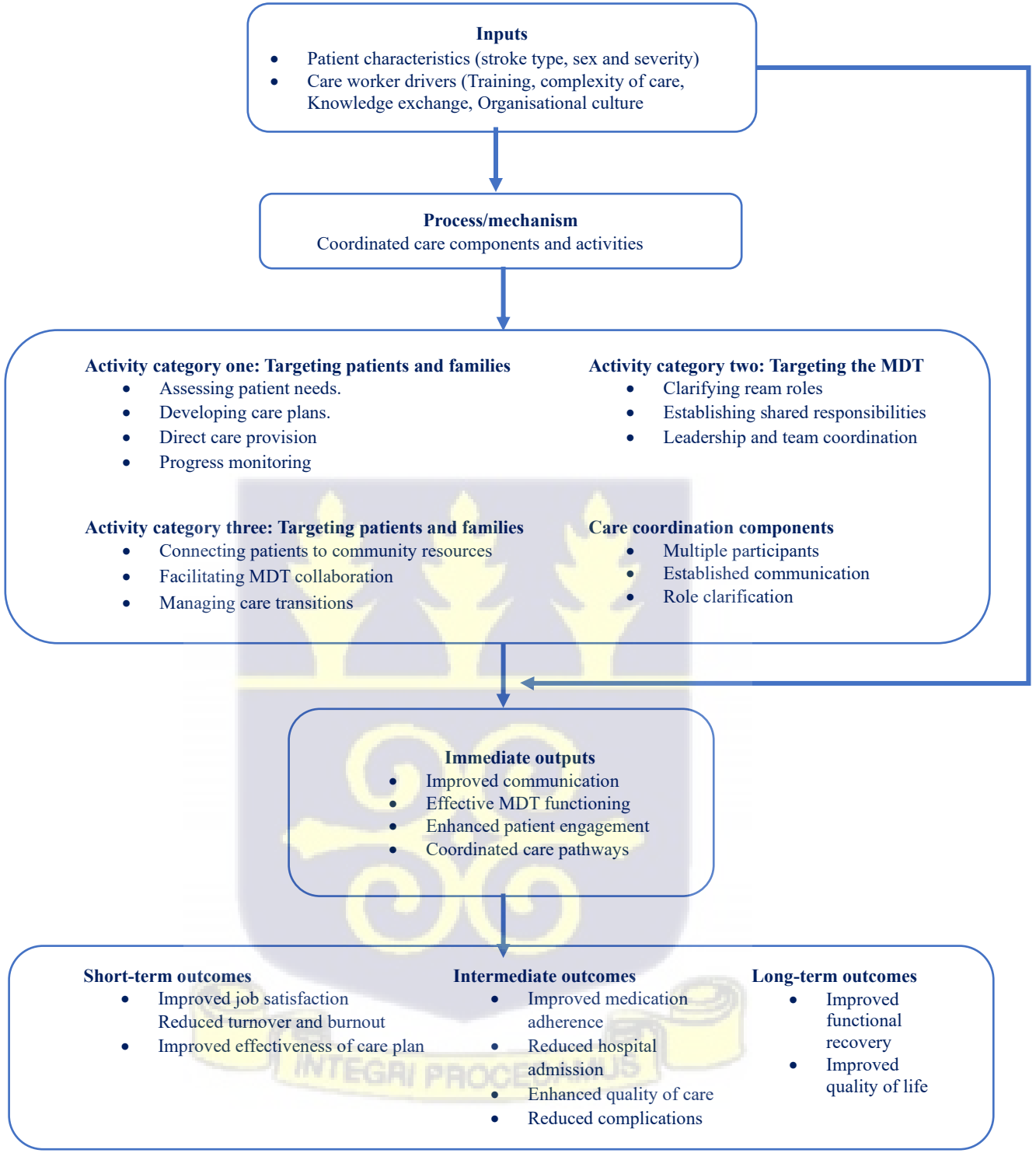

Figure 3: Conceptual Framework:

1.6 Narrative of the Conceptual Framework

The conceptual framework (Figure 3) provides a visualisation of care coordination as an intervention, associated outcomes and plausible confounders of these outcomes.

Care coordination as an intervention

Care coordination interventions have three main components: multiple participants, established communication (McDonald et al., 2007). These components are demanding grounds and key facilitators of care coordination. In stroke care, patients, caregivers/family, doctors, nurses, physiotherapists, neurologists, etc. are often involved in the delivery of health care and care services (Urimubenshi et al., 2018). These participants, their services no matter how specialised, are interdependent and contribute to comprehensive care for patient outcomes. These participants also need adequate knowledge about available resources and other participant roles. This could be achieved through established communications and information exchange and clarification of the varying roles.

Activities of care coordination

As proposed by Karam et al. (2021), care coordination interventions typically have three categories of activities. The activities include those that target the patients and their families, those that target care professionals and services (MDT) and those that link patients to services and personnel. There is a cross-cutting activity which involves interpersonal communication and information exchange among teams of care professionals, patients and families/caregivers.

Outcomes of Care Coordination

Originally, Githell (2002) proposed that relational coordination leads to four main categories of outcomes: quality outcomes, efficiency outcomes, workers outcomes and innovation. In the clinical context, quality outcomes would emerge as quality-of-care outcomes. The indicators of quality-of-care outcomes include reduced length of stay on admission, improved continuity of care, shorter care initiating period, patient satisfaction and reduction of complications such as mortality, and discharge destination (Nishi et al., 2017; Santos et al., 2022; Sinnamon et al., 2022). Efficiency outcomes involve improved systems that are characterised by collaboration among health workers, and high utilisation among patients with reduced cost of care (Santos et al., 2022). Coordinated care is also deemed to reduce errors in diagnoses and management as care workers collaborate and become less overwhelmed with their workloads (Santos et al., 2022; Sinnamon et al., 2022).

There are moderators of the relationship between coordinated care and associated outcomes. Hanssen et al. (2021) noted that longer-term coordination interventions (12 months or more) were associated with improved patient outcomes compared to shorter-term interventions. Additionally, the clinical condition and socio-demographic factors of the patient have been reported as moderators of the outcome-intervention relationship (Di Capua et al., 2017; Hansen et al., 2021**).**

1.8 Review Questions

1. What are the components and activities of stroke-coordinated care interventions?

2. Does the implementation of coordinated care improve clinical outcomes (mortality, readmission rates, stroke severity improvement, length of hospital stay, motor recovery and independence,

cardiovascular risk management, mental health, health service utilisation) among stroke patients compared to other care models?

3. What is the effect of coordinated care interventions on self-reported outcomes such as quality of life and patient satisfaction?

4. Do clinical stroke type and subtypes and severity of stroke influence the relationship between care coordination intervention and patient outcomes?

1.9 Objectives

1.9.1 General Objective

To determine the effectiveness of coordinated care interventions delivered to stroke survivors in LMICs.

1.9.2 Specific Objectives

1. To identify the components and activities of coordinated care interventions delivered to survivors in LMICs.

2. To evaluate the effectiveness of coordinated care on clinical outcomes (mortality, readmission rates, stroke severity improvement, length of hospital stay, motor recovery and independence, cardiovascular risk management, mental health, health service utilisation) of stroke survivors in similar facilities and settings compared to other care models.

3. To determine the effect of coordinated care interventions on self-reported outcomes (quality of life and patient satisfaction).

4. To assess the impact of clinical stroke types and subtypes (ischaemic and haemorrhagic), subtypes (intracerebral and subarachnoid haemorrhage, small vessel blockade, etc.), and severity (mild, moderate and severe/critical) and the effect of stroke coordinated care and patient outcomes.

CHAPTER TWO

LITERATURE REVIEW

2.1 The Concept of Care Coordination

The concept of care coordination is associated with varied explanations depending on the context in which it is applied. However, there are central characteristics that remain consistent despite the apparent diversity. Reviewing multiple definitions, Shultz and McDonald (2014) stipulated that care coordination is a deliberate organisation of care activities between two or more participants as an effective approach to healthcare service delivery. The organisation of care is activities involves marshalling care providers and resources to carry out needed patient care activities and is supported by information exchange among these personnel responsible for the different aspects of care. This definition has been utilised as a guide by other researchers in many other contexts for conceptualising care coordination (Chen et al., 2023; Choi et al., 2017; Karam et al., 2021).

Reflecting on Shultz and McDonald's (2014) definition, care coordination appears to be centred on a conscious effort to seamlessly link care personnel for comprehensive and quality delivery of care. For example, Choi et al. (2017) reported that care coordination in cancer care involved ensuring appropriate delivery of healthcare services, often information communication among different clinicians such as medical and radiation oncologists, surgeons and primary care physicians who are responsible for different aspects of care. However, some authors have indicated that care coordination may extend beyond a multiple-personnel approach to comprehensive care delivery. Khatri et al. (2023) also highlighted that care coordination in the context of primary care includes information and relational continuity not only at the level of healthcare personnel but at organisational or system levels, focusing on addressing specific health needs across life spans and different care settings. Evidently the context and population in focus

influence how care coordination is defined and even measured. The definitions also shape what is considered an element or component of care coordination functions (Shultz & McDonald, 2014).

2.2 Components and Characteristics of Care Coordination

There are varying characteristics proposed to be inherent in care coordination. As part of these efforts, Shultz and McDonald's (2014) review suggests that care coordination has five core components. These components are typical of care coordination interventions. The suggested elements were: (1) care coordination involves numerous participants, (2) it is necessitated by interdependence among these participants and their activities, (3) it requires knowledge of others' roles and resources, (4) it is dependent on information exchange, and (5) it has the goal of promoting appropriate and quality healthcare delivery.

2.2.1 Multiple Participants

Care coordination is necessary in managing and supporting patients with complex care needs and requiring multiple care providers, patients, and their families (Doessing & Burau, 2015; Walton et al., 2020). Shultz and McDonald (2014) found that in most contexts, care coordination involves multiple participants, including patients, primary care providers, specialists and units or organisations. As such, other studies have advocated for the team-based model of care coordination (Karam et al., 2021). The involvement of multiple participants in care coordination is underscored by the purpose of care coordination. In many situations, care coordination interventions target patients with complex needs and require complex care interventions. As such, managing the care of such patients requires a collaborative approach (Kianfar et al., 2019).

2.2.2 Information Exchange and Understanding Roles

Sustaining care coordination requires effective information exchange between the multiple participants (Doessing et al., 2015; Ehrlich et al., 2009). As such, Schultz (2019) ascribes information exchange as the core element of care coordination, crucial for managing the many interdependent activities of care coordination and monitoring patient health care in the process. Botcher et al. (2020) assert that care coordination involves a two-way information exchange between participants (patients and family/caregivers) and healthcare professionals. Karam et al. (2021) also describe information exchange in care coordination as information transfer to healthcare providers that involves interpersonal care coordination. Since the participants of care coordination are inclusive of patients, Karam et al.'s (2021) description of information exchange in care coordination may appear limited. However, the emphasis may have been simply placed on care professionals.

The goals of information exchange in care coordination vary predominantly based on the participants involved. For instance, Kianfar et al. (2019) found that communication between health professionals, patients, and families was targeted at discussing patients' needs, exchanging information about errors between care professionals, and planning care.

Information could be facilitated by different channels in the care coordination process. These channels include face-to-face verbal discussion between care professionals and patients on plan and monitoring of care and coordinated delivery approaches (Kianfar et al., 2019; Choi et al., 2012). As healthcare systems adopt technologies, the use of information technology to facilitate information exchange is becoming more and more established, especially in high-income settings (Anderson & Hewner, 2021). Kianfar et al. (2019) reported that information exchange is facilitated

through technologies such as phones, instant messaging and conference calls. Other contexts may have designed communication systems such as secured and accessible web-based interfaces for sharing data and communication among patients, care professionals and units/services (Mosher, 2014).

2.3 Care Coordination Activities

To synthesise evidence on care coordination interventions, Karam et al. (2014) identified three categories of activities within the interventions. These activities either targeted patients and families (in close collaboration with the multidisciplinary team), linked patients with services and the multidisciplinary team (MDT), or only targeted the MDT. Activities targeting patients and families are characterised by identifying needs and goals, developing a plan of care, implementing care, and monitoring the progress of planned care (Karam et al., 2014; Timmers et al., 2019). Timmers et al. (2019) further indicated that care coordination activities may involve implementing strategies like case management and care management, collaborating with multidisciplinary teams, developing protocols, utilising electronic medical records, conducting nursing consultations, providing health education, and ensuring patient preparation for returning home and post-discharge outcomes.

Activities targeting the MDT are focused on clarifying roles, negotiating responsibilities, establishing shared accountability and sustaining leadership (Karam et al., 2014). This is achieved mainly through information exchange between the participants or providers involved (Cheng et al., 2023; Anderson & Hewner, 2021).

Care coordination interventions also target linking patients with services and multiple care providers. This is achieved through activities such as transferring information between health care

professions, linking patients to partner community services and resources and linking general practitioners with specialists (Cheng et al., 2023; Karam et al., 2014; Elrich et al., 2009). According to Karam et al. (2014), as part of efforts to link patients and families to services and the MDT, health professionals and patients (and or their families) may hold conferences and organise referrals to services. Additionally, patients may be assisted in preparing and booking appointments or, on a broader scale, be trained in navigating the health care system.

2.4 Impact of Stroke Coordinated Care on Clinical Outcomes

2.4.1 Readmission

Limited care coordination has been reported to be associated with readmission of patients post-discharge, although the strength of evidence varies. In a cross-sectional survey aimed at describing patient self-reported gaps in care coordination, Kern et al. (2020) indicated that patients who reported increased gaps in care coordination had increased odds of readmissions, drug-drug interactions, and hospitalisation. Care coordination was described in this study as a lack of communication among doctors and poor coordination among health professionals. Similarly, Nahab et al. (2012) in a retrospective analysis reported that 29% of 174 patients readmitted were due to inadequately coordinated care. However, both studies relied on retrospective or self-reported data, which are susceptible to recall bias and unmeasured confounding, limiting causal inference.

Evidence evaluating the effectiveness of interventions to improve coordination is mixed. Markel-Reid et al. (2023) reported no significant difference in all-cause readmissions among participants who received a transitional care intervention with care coordination as a component compared to a control group who received usual rehabilitation care from multiple providers with no care

coordination. In a single-group pretest-posttest evaluation, a stroke unit program involving structured interdisciplinary bedside rounds to enhance care coordination, Jala et al. (2021) reported that the within-28-day readmission rates were not significantly different between the intervention group and the control group. The control group essentially received care in a stroke unit utilising a multidisciplinary model. Notably, both studies had a small sample size and patients (60-100 patients per group) with limited statistical power in detecting significant differences in readmission rates (Jala et al., 2021; Markel-Reid et al., 2023). In a rather larger sample study, Kaufman et al. (2019), concluded that a financial program supporting hospitals in establishing care coordination programs was not associated with significant changes in readmissions. Although Kaufman et al. (2019) could not implement randomisation at the patient's level in their study, they adjusted for possible factors of readmission, such as stroke severity.

Across studies, there is considerable heterogeneity in how "care coordination" is conceptualised, the intensity and duration of interventions, and the measurement of readmission outcomes (e.g., 28-day vs. 30-day vs. 90-day readmission). These variations limit comparability and may partly explain inconsistent findings. Furthermore, most existing evidence originates from high-income countries with established discharge planning systems and MDT structures, raising concerns about generalisability to LMIC contexts where care continuity is weaker.

2.4.2 Functional Recovery

Care coordination facilitates a liaison of patients with different healthcare professionals targeted at improving outcomes such as functional recovery (Walton et al., 2020). Studies assessing the effect of care coordination have focused on physical function as a plausible outcome (Fens et al., 2014; Joubert et al., 2019). Findings from a pragmatic RCT indicated that a care coordination

incorporated intervention resulted in improved physical functions of patients with stroke (Markel-Reid et al., 2023).

Similarly, Joubert et al. (2019) and Fens et al. (2014) reported results affirming that interventions comprising care coordination could have a significant and positive effect on physical functioning. According to Fens et al. (2014) an intervention characterized by referral to stroke coordinator, assessment of patient problems and consultations between stroke coordinator and the multidisciplinary team on patient management was not associated with significant difference in Barthel's physical function index when compared to controlled group that received stroke coordinator services but no structured assessments. Joubert et al. (2019) also reported a significant improvement in Barthel's physical functioning index among their intervention group whose care was coordinated between their general physicians and specialists.

Although the interventions in both studies (Fens et al., 2021; Joubert et al., 2019) varied in components, the main targets of both interventions involved assessing the risk of patients, providing patient education and coordinating care of patients among multiple members of the multidisciplinary team. Finally, the majority of these interventions were delivered in high-income settings with established MDT structures, raising concerns about the applicability of these findings to LMIC contexts where health workforce capacity and care continuity systems are less developed.

2.4.3 Stroke Recurrence

Care-coordinated interventions targeting the mitigation of recurrent stroke vary greatly in composition. A number of these interventions comprise preventive components such as patient education utilising verbal and written communications, improving medication adherence, monitoring of risks such as blood pressures, and supporting self-management among patients

(Joubert et al., 2020; Towfighi et al., 2017; Owolabi et al., 2014). Most of the interventions had a shared component of facilitating communication either between patients and their healthcare providers and communication among healthcare professionals for optimum care outcomes (Cheng et al., 2021; Owolabi et al., 2014). However, these interventions differ substantially in intensity, duration, and the extent to which they integrate multidisciplinary care, making direct comparison difficult and potentially influencing observed effects.

As indicated earlier, care-coordinated stroke interventions have targeted improving self-management behaviours that reduce patients' risk of recurrent stroke. Mei Li et al.'s (2018) care coordination intervention, which provided patients with education on stroke risk factors, individual reminders on medications via a mobile application and communication with healthcare professionals, was associated with higher adherence rates and better knowledge of stroke warning signs among the intervention group compared to a control group. Owolabi et al. (2021) reported a significant improvement in blood pressure control associated with their intervention that included preappointment reminders, patient education on stroke warning signs, and the use of a customized report to facilitate discussions among physicians of stroke survivors. To improve risk factor management among stroke survivors, Joubert et al. (2020) conducted an RCT implementing an intervention which involved bidirectional feedback between general practitioners and specialists' units, patient education and ongoing input from the multidisciplinary team. Similar to Owolabi et al. (2021) findings, Joubert et al. (2020) reported a significant improvement in recurrent stroke risk factors such as blood pressure control, cholesterol level control, alcohol consumption control and physical activity levels. The generalizability of these findings to stroke survivors may be limited. Small sample sizes greatly reduce statistical power and increase the likelihood that reported effects may be unstable or overestimated. All three studies had relatively small samples,

and in the case of Joubert et al. (2021), a balanced high drop-out rate in the intervention and control groups. Additionally, the studies had limited durations to evaluate the recurrence of stroke; as such risk of recurrent stroke was evaluated to determine whether or not recurrent stroke in the future has a higher possibility in the control groups as compared to their intervention counterparts. The short follow-up periods also limit the ability to detect true recurrence events, and the reliance on surrogate outcomes (e.g., blood pressure, cholesterol) instead of actual recurrent stroke further weakens the strength of the evidence. Furthermore, most interventions were implemented in high-income settings with well-established primary care and follow-up systems, which raises concerns about their applicability to LMIC contexts where care continuity, medication access, and health system capacity are more constrained.

2.5 Stroke-coordinated care and patient-reported outcomes

2.5.1 Quality of life

As indicated by Shultz and McDonald (2014), care coordination targets the improvement of the delivery of care. In the case of stroke management, care coordination intervention components may target reducing the health care burden of patients and support patient recovery, improving overall quality of life (Anderson & Hewner, 2021).

Improvement of quality of life is a focused outcome of care coordination. Different researchers exploring the relationship between care coordination rely on self-reported quality of life of participants (Claibone et al., 2006; Looman et al., 2018; Ramirez et al., 2020). Although quality of life, has been a well-considered outcome of care coordination, there are varying validated instruments employed for the assessment of patient-reported quality of life. For instance, Claibone et al. (2006), operationally defined quality of life as a multidimensional construct with physical,

mental and social functioning components. As such, they relied on the SF-36 questionnaire, which assesses eight domains of quality of life. Ramirez et al. (2020), on the other hand, utilised the Functional Assessment of Cancer Therapy - General (FACT-G), which assesses the 4 domains of quality of life (physical, social/family, emotional and functional well-being). Notably, the different validated instruments used in assessing quality of life as an outcome of care coordination have cross-cutting components. These tools recognise that quality of life has multifaceted components (physical, emotional and social). As such, the different tools recognise the crucial components. However, the use of different instruments across studies makes comparison of findings challenging, because each tool captures slightly different aspects of well-being and varies in sensitivity to change. Moreover, many of these instruments were developed for general or cancer populations, raising questions about their validity for stroke survivors specifically.

Quality of life, which is an individual's satisfaction with their changing living conditions, is directly affected by the incidence of stroke (Aqtam et al., 2023; Ramos et al., 2018). Specifically, an association between stroke and lowering of quality of life in varying dimensions, physical, psychological and spiritual well-being has been reported (Ramos et al., 2018; Tiwari et al., 2021). It is evident that quality of life is very important for both patients and carers, and hence a focused outcome of care coordination interventions. Care coordination has been reported to support the provision of comprehensive care that supports patients as they adapt to their new chronic conditions (Claibone et al., 2006). Also, care coordination may address supportive care needs associated with both physical and psychological threats to quality of life (Beesley et al., 2018). Despite this, the evidence base remains limited by heterogeneity in intervention designs, varying follow-up durations, and the predominance of studies conducted in high-income countries, where psychosocial support systems and rehabilitation services are more readily available than in LMIC

settings. These contextual differences may significantly influence observed effects on quality of life and limit the generalisability of findings.

2.5.2 Patient Experience and Satisfaction

Studies have indicated that coordinating stroke care interventions is associated with satisfaction and experience. Patient satisfaction and experience are two key indicators of effective healthcare services for people moving from hospital to home after a stroke. These concepts, however related, are different in that patient satisfaction is usually the subjective assessment of quality of care while patient experience includes a broad range of interactions and processes within the healthcare system (Friedel et al., 2023). This distinction is important because many interventions may influence patient experience (e.g., communication, accessibility, continuity) without necessarily improving overall satisfaction scores, which tend to be influenced by expectations and individual perceptions.

Two notable studies give an overall picture of these phenomena. In their study, Zimmerman et al. (2021) investigated the Transitions of Care Coordination (TOCC) intervention aimed at improving patients' satisfaction via better coordination during the discharge process. Despite this positive trend whereby those in the TOCC group had higher median scores than their counterparts in the usual care group, there was no statistically significant difference obtained from the results. The lack of statistical significance may reflect limitations such as small sample size, ceiling effects in satisfaction measures, or the possibility that discharge-focused coordination alone is insufficient to influence patient-perceived quality of care. Additionally, the intervention occurred within an already structured health system, which may have reduced the contrast between intervention and usual care.

However, Maureen Markle-Reid et al. (2023) had carried out a study on the Stroke Transitional Care Intervention (TCSI), which not only focused on care coordination, but virtual visits and monthly team conferences were included in it as well as online resources. The patient-centred comprehensive stroke care model is more effective than traditional forms of transitional care as demonstrated by the Person-Centred Coordinated Care Experiences Questionnaire (P3CEQ). The success of this intervention points to the significance of involving patients and caregivers actively in the process, hence enhancing their overall experience. Unlike the TOCC study, the TCSI intervention involved multiple components delivered over a longer post-discharge period, suggesting that more intensive, multimodal interventions may be required to meaningfully influence patient experience. This also raises questions about which specific components—virtual follow-up, interdisciplinary communication, or caregiver inclusion—were most influential. Bringing together these studies indicates how complicated it is to enhance patient outcomes in transition-based stroke care. However, while both interventions were aimed at improving quality of care, TSCI was found to be more holistic and interactive with a greater impact on patient experience, thus suggesting that multiple approaches revolving around patients can be more useful in achieving significant changes in terms of satisfaction and experience. Nevertheless, both studies share notable limitations, including modest sample sizes, reliance on self-reported measures, and implementation within well-resourced, high-income settings. These contextual and methodological issues limit the generalisability of findings to low- and middle-income countries, where gaps in communication, follow-up systems, and care integration remain more pronounced.

CHAPTER THREE

METHODS

The systematic review and meta-analysis were conducted per the Cochrane methodology for systematic reviews of interventions (Higgins et al., 2023) and informed by earlier published effectiveness systematic reviews (Abadulai et al., 2023; Danso-Appiah et al., 2024; Imakando et al., 2024). The review was reported using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (Shamseer et al., 2015). This systematic review and meta-analysis protocol has been registered with the International Prospective Register of Systematic Reviews (PROSPERO), CRD42024587311, and accepted for publication in PLOS One.

3.1 Patient and Public Involvement

Patient involvement in systematic reviews could influence the scope and impact how the review is interpreted and disseminated. This is essential for ensuring that the review reflects patient and community members' priorities (Hyde et al., 2016). Patients and public consultations were not carried out during the design and execution of this review. However, the relevant literature on patient expectations of neurorehabilitation (stroke rehabilitation) and multidisciplinary stroke interventions was examined to determine outcomes important to stroke survivors and their caregivers. The interventions under focus in these reviewed expectation studies included telerehabilitation, multidisciplinary rehabilitation, early supported discharge, and mindfulness program (Chen et al., 2019; Ghosh et al., 2022; Groeneveld et al., 2018; Lin et al.,2022; Wrapson et al., 2020).

Improvement in physical and cognitive functioning is a prime expectation of stroke survivors during acute management and rehabilitation (Lin et al., 2022; Ghosh et al., 2022; Chen et al., 2019;

Groeneveld et al., 2018). As an abrupt condition that leaves patients and caregivers emotionally distressed (Lin et al., 2022), post-stroke mental well-being was also a prominently reported expectation of stroke survivors receiving varying interventions (Lin et al., 2022; Wrapson et al., 2020). Other expectations included improved knowledge and self-care skills, social well-being, and intensified motivation (Chen et al., 2019; Ghosh et al.,2022; Lin et al., 2022). These reported expectations of stroke survivors and plausible mechanisms of care coordination guided the selection of outcomes to explore in this review.

3.2 Criteria for considering Studies for this review

Type of studies

Randomised controlled trials (RCTs), quasi-experimental studies, and cohort studies reporting on any care coordination interventions implemented during the post-emergency phase of stroke care in LMICs were considered for inclusion. Reviews on these interventions were not included; however, the reference lists of these reviews were screened for potentially eligible primary studies missed in our searches. Commentaries, expert opinions, newsletters, case series, and case studies were excluded.

Population

The population of interest was adult stroke survivors (all stroke types and subtypes) who had survived beyond the first seven days post-stroke and were within their first year of recovery (≤6 months). These survivors must have received care-coordinated interventions in LMICs. Survivors receiving emergency care were excluded from the review as emergency care typically focuses on acute, life-saving management rather than long-term care coordination outcomes (Urimubenshi et al., 2018).

Intervention

Care coordination can be operationalized differently based on patient groups, context, and goals of the intervention (Karam et al., 2014). The current review defines stroke care coordination as a deliberate organisation of care activities (i.e., structured, patient-centered tasks and interventions performed to address ongoing medical, functional, psychological, and social needs of stroke survivors) between two or more participants (patients, families, multiple healthcare providers, social workers, etc.). In this systematic review, interventions/stroke care were considered to be coordinated if they had two of the three main components of care coordination proposed by McDonald et al. (2007). These two components are: 1) there should be multiple participants (patients, families, health and care providers) involved in care activities and 2) an established mechanism of information exchange, such as interprofessional meetings, exchange of information via electronic health systems, etc. The third core component is the clarification of participant roles and responsibilities through some techniques, such as orientation, outlining roles, and disseminating and providing knowledge on available resources for care. Studies were not excluded if the third component was not present in the intervention. In addition to the two core components, the intervention should have at least one of the supporting activities described by Karam et al. (2021). These supporting activities fall under three categories: ***activities targeting patients and families*** which include assessing patient needs, developing care plans, providing direct care, and monitoring responses to care, ***activities linking patients with services and the multidisciplinary team (MDT)*** which encompass partnering with community resources, fostering collaboration within and across MDTs, and facilitating care transitions, and ***activities targeting the MDT*** which focus on clarification of roles, negotiating responsibilities, establishing shared responsibilities, and exercising leadership.

Comparator

The comparators were fragmented or standard care/interventions lacking the core components of care coordination (i.e. multiple participants' involvement, established communication, and role clarification).

Outcomes

The outcomes of interest reflect clinical goals of stroke management between the post-emergency phase (first 7 days of stroke) to the late sub-acute phase (4-6 months). The outcomes were also selected considering patients' and caregivers' expectations of care models of stroke.

Primary Outcomes

The primary outcomes are those directly related to patients' clinical and functional status. They include mortality, functional recovery and independence (motor recovery, activities of daily living performance, and balance), cognitive recovery (executive function and speech and language outcomes), and cardiovascular risk management (blood pressure control, glycaemic control, and lipid management).

- **Mortality:** Rates of stroke-related deaths during the follow-up period of the study.
- **Readmission:** Rates of unplanned rehospitalization of stroke survivors.
- **Stroke severity:** Improvement in the severity of stroke symptoms as assessed by validated scales.
- **Length of hospital stay (LOHS):** The number of days survivors spend hospitalized during the acute and sub-acute phases of stroke
- **Motor recovery and independence:** Changes in upper and lower extremity motor recovery, activities of daily living (ADLs) performance, gait and balance, and cognitive function improvement (executive functioning and speech and language) as measured by appropriate validated clinical tools.
- **Cardiovascular risk management**: Changes in systolic blood pressure, glycated haemoglobin (HbA_1C), and lipid profiles (total cholesterol, LDL, HDL, and triglycerides).

For outcomes measured using continuous scales, if we identify some studies that reported them as categorical variables, we will report the categorical outcomes as separate outcomes from the continuous measures.

Secondary outcomes

Secondary outcomes are patient-centred and healthcare system effects of care coordination. In this review, secondary outcomes included quality of life (QoL), mental health outcomes of patients and caregivers, health service utilisation, patient satisfaction with care, and community reintegration.

- **Quality of life**: Changes in overall quality of life or changes in a particular domain (e.g. health-related quality of life) evaluated using validated tools.
- **Mental health**: Incidence of depression and anxiety in patients and caregivers or changes in prevalence of anxiety and depression in patients/caregivers.
- **Health service use:** The number of scheduled or unscheduled outpatient visits to healthcare providers (e.g. rehabilitation, primary care) following stroke discharge, or use of services including diagnostics.

3.3 Search methods for identification of studies

3.3.1 Electronic Searches

Databases and non-databases were searched for published and unpublished studies. The databases searched included PubMed, LILACS, CINAHL via EBSCOhost, Scopus, and Cochrane CENTRAL from 2000 (when the term care coordination became much more formalized to reflect on the current definition) to October 2024. The WHO International Clinical Trials Registry Platform (ICTRP) which host multiple registries across the globe was searched. To identify unpublished sources all preprint repositories hosted on Web of Science, ProQuest and Google

Scholar were searched. The search terms included “stroke”, “care integration”, “continuity of care”, “information exchange", “patient-centred care”, “multidisciplinary care”, “case management”, together with their alternative terms and synonyms, singular and plural forms, American and British spelling. The search terms and their alternatives will be combined using Boolean operators to form the search strategy developed for PubMed (Table 1), which was adapted for other databases (appendix 1). The reference lists of relevant articles (studies included for the review and other reviews relevant to the current topic) were screened for potential studies that may have been missed during the searches.

Table I: PubMed Search Strategy

Concept	Query	Hits
#1 Stroke survivor/patient	“Stroke” [Mesh] OR “Transient Ischemic Attack*” OR TIA	207,812
#2 Care Coordination	(“Care coordinat*” OR “care co-ordinat*” OR “coordinated care” OR “co-ordinated care” OR “coordinating care” OR “co-ordinating care” OR “coordination care”[Title/Abstract:~3] OR “co-ordination care”[Title/Abstract:~3] OR “coordinating care”[Title/Abstract:~3] OR “co-ordinating care”[Title/Abstract:~3] OR “coordinator care”[Title/Abstract:~3] OR “co-ordinator care”[Title/Abstract:~3]) OR ("case management" OR "care management" OR "disease* management" OR "patient navigation" OR "integrated care" OR "care coordinat*" OR	142,331

	"patient-centered medical home" OR "Delivery of Health Care, Integrated")	
#1 AND #2	("Stroke"[MeSH Terms] OR "transient ischemic attack*"[All Fields] OR "TIA"[All Fields]) AND ("care coordinat*"[All Fields] OR "care co ordinat*"[All Fields] OR "coordinated care"[All Fields] OR "co-ordinated care"[All Fields] OR "coordinating care"[All Fields] OR "co-ordinating care"[All Fields] OR "coordination care"[Title/Abstract:~3] OR "co-ordination care"[Title/Abstract:~3] OR "coordinating care"[Title/Abstract:~3] OR "co-ordinating care"[Title/Abstract:~3] OR "coordinator care"[Title/Abstract:~3] OR "co-ordinator care"[Title/Abstract:~3] OR ("case management"[All Fields] OR "care management"[All Fields] OR "disease* management"[All Fields] OR "patient navigation"[All Fields] OR "integrated care"[All Fields] OR "care coordinat*"[All Fields] OR "patient-centered medical home"[All Fields] OR "delivery of health care integrated"[All Fields]))	1,536

3.4 Selection of studies

All records (hits) identified from searches were uploaded to Rayyan (an artificial intelligence web-based platform for organizing, managing and collaborating systematic reviews) for deduplication

and screening of studies. After deduplication, screening was conducted by two reviewers using a PICO-based selection criterion (Figure 4). Any disagreements in these selections were discussed among the reviewers for resolution.

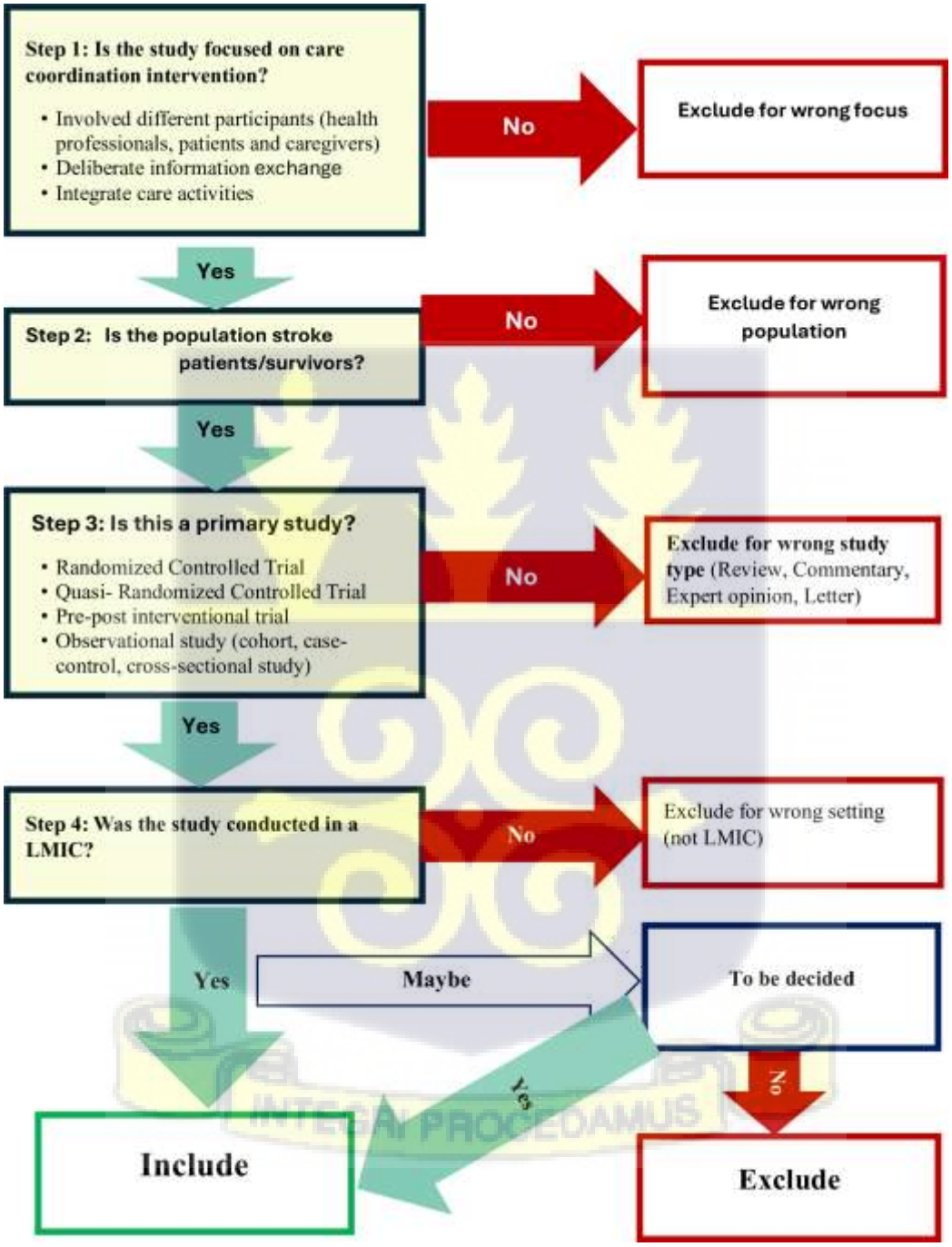

Figure 4: Algorithm for title and abstract screening.

3.5 Data Extraction

Data from included studies were extracted using a Cochrane-adapted data collection for RCT and non-randomised studies by Cochrane (Higgins et al., 2024). The tool was pretested with three studies and revised based on concerns and suggestions of data extractors. The form captured the study ID (author name and year), the country the study was conducted, the year of data collection, study design, characteristics of study participants, setting, study duration, care coordination components, and supporting activities, care activities being coordinated, providers involved, and outcomes of interest. Data from each study was extracted by two team members independently.

3.6 Data Management

All retrieved full-text and supporting documents (e.g., associated supplementary files) were labelled with unique IDs and stored in a cloud folder. All members of the data extraction team had a year or more experience in data extraction for systematic reviews and data analysis. The team were provided information and training on the study purpose and current protocol, extraction form and planned data analysis procedures. The team was also provided with a written standard of extraction procedures (SEPs). A mock extraction was conducted to determine areas of challenge and error. The team was reconvened to discuss these issues, and further information was provided to resolve any uncertainties.

Extraction of data was carried Excel spreadsheet. After extracting, consistency checks were carried out between a pair of reviewers. If there were conflicts, an arbitrator reviewed the study in question and made necessary corrections. After consistency checks range checks and missing data were assessed. After these quality checks, the clean spreadsheet was saved for data analysis.

3.7 Handling Missing Data

The authors of the included studies were contacted for information in the case of missing data (e.g. data needed for calculating effect estimates). If there was no feedback, the study was reconsidered for analysis depending on the missing data. Missing data were not imputed.

3.8 Risk of Bias Assessment

The revised tool for Risk of Bias in Randomised Trials (RoB 2) and Risk of Bias in Non-randomised studies of intervention (ROBINS-I) tools (Higgins et al., 2024) were used for assessing the risk of bias in individual studies (appendices 5 and 6). Rob 2 is structured in five domains where bias might be introduced into the conduct and results of included studies. The domains are 1) bias arising from the randomisation process, 2) bias due to deviation from intended intervention, 3) bias due to missing outcome data, 4) bias in the measure of outcome, and 5) bias in selecting the reported results. Each domain has a series of signalling questions to elicit information for determining the risk of bias in the included study. For each domain, a judgment of 'low risk' of bias, 'high risk' of bias, or 'some concerns' is informed by responses to signalling questions. The domain judgments are further used to inform the overall risk of bias in an included study. ROBINS-I, on the other hand, has seven domains. Risk of bias assessment was carried out by two independent reviewers, and disagreements will either be resolved through discussions or by a third reviewer.

3.9 Data Analysis

For continuous outcomes, mean differences and standard deviations (either between intervention and control group or pre-post mean differences) were computed from included studies. In a

situation where the continuous outcome was measured by different authors with different instruments, a standardised mean difference was computed prior to meta-analysis.

For categorical outcomes, the risk ratio (RR) was computed as an effect measure for expressing the effectiveness of care coordination. Considering the high possibility of included studies (i.e. different study designs, populations, settings, and components of care coordination interventions), a random effects model was employed for pooling effect sizes and estimating 95% confidence intervals (CI) of these pooled effects. The pooled effects estimates were displayed as forest plots. In a situation where a meta-analysis (pooling effect sizes) was not appropriate, a narrative synthesis was provided to summarise results on an outcome. All statistical analyses were carried out using Excel and RevMan.

3.9.1 Subgroup Analysis

When plausible, subgroup analyses were conducted to explore potential factors influencing differences in the effectiveness of care coordination intervention. The factors considered were stroke type, stroke severity, setting of intervention, and presence or absence of core components.

3.9.2 Heterogeneity

Heterogeneity in the effect measures of individual studies may arise from several factors, and also due to random errors. To determine what proportion of variation can be explained by real differences and not random error, the I^2 was computed. The Q statistics and associated p-values were computed to determine if the individual effect sizes were significantly different from each other.

CHAPTER FOUR

RESULTS

4.1.1 Description of studies

The search retrieved 10,307 studies from electronic databases, a trial registry, and Google Scholar: Cochrane CENTRAL = 1055, PubMed = 6138, CINAHL = 285, LILACS = 42, SCOPUS = 1928, Web of Science = 267, ICTRP = 131, and Google Scholar = 461. Some 1,188 duplicates were removed, and the remaining were screened for relevance. Further, 8,990 were excluded after title and abstract screening, leaving 129 articles whose full texts were retrieved for screening. A total of 16 studies were included in the review after full-text screening, after meeting the pre-specified criteria (Fig. 5)

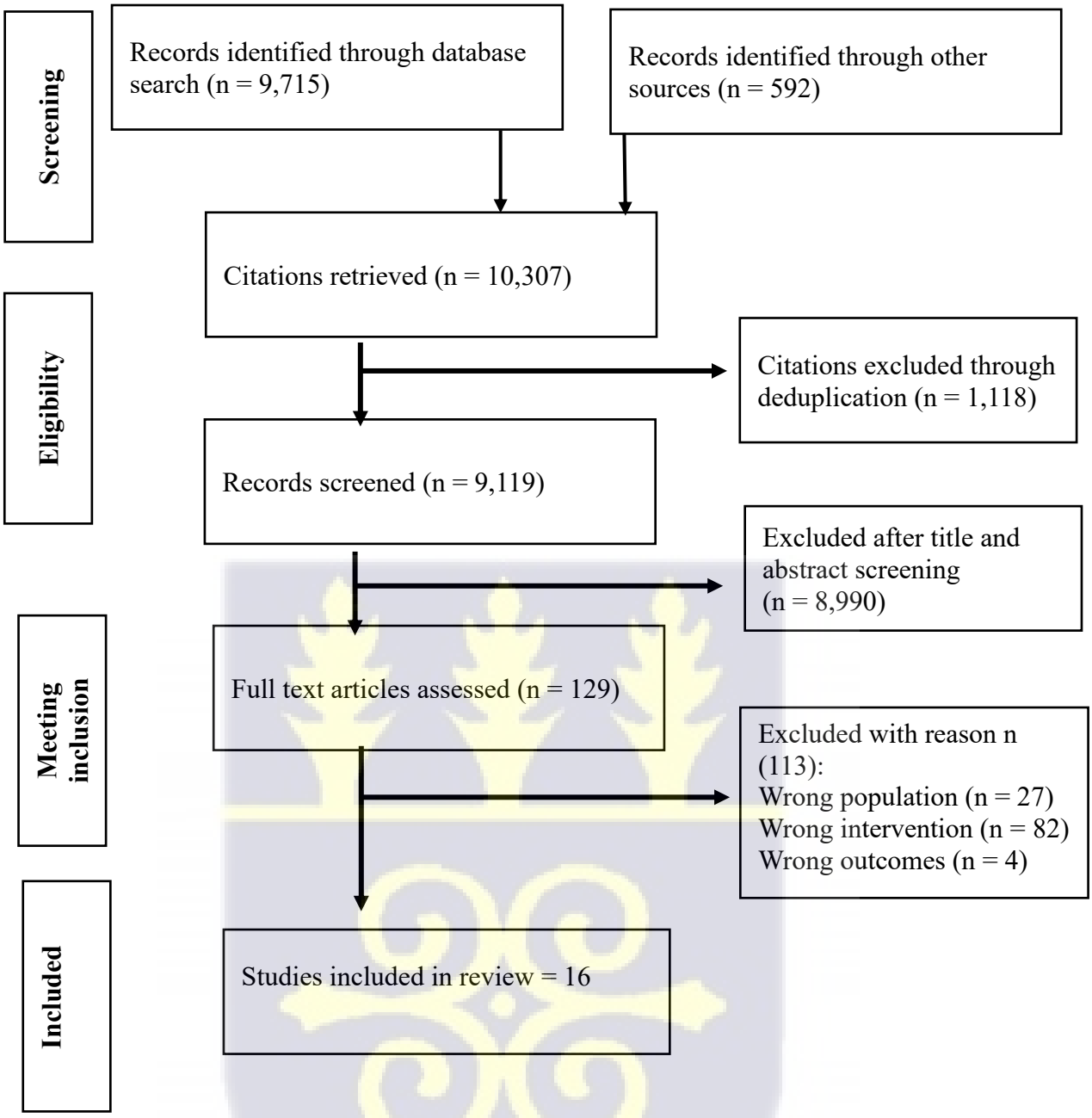

Figure 5: PRISMA Flow Diagram

As indicated in Table 2, nine of the included studies were RCTs (Deng et al., 2020; Feng et al., 2023; He et al., 2020, 2023; Lo et al., 2023; Mohammadi et al., 2021; Wong et al., 2022; Wong et al., 2024; Wu et al., 2020), one was a cluster randomized trial (Wang et al., 2018), three were quasi-experimental (pre and post designs) studies (Jorge et al., 2014; Souza et al., 2022; Yagura et al., 2005). The rest were prospective and retrospective cohort studies (Adeniji et al., 2023; de Villiers

et al., 2022; Wu et al., 2024). In total, 6,694 stroke survivors were recruited across the 16 studies. The largest study recruited 4,800 (Wang et al., 2018) and the smallest study recruited 14 participants (Souza et al., 2022). Four of these studies involved only ischemic stroke survivors (Wang et al., 2018; Wong et al., 2022; Wong et al., 2024; Wu et al., 2024) and the rest included survivors who either had an ischemic or haemorrhagic stroke. Across the studies, participants varied in age and stroke severity. All the studies included both men and women. Two studies were carried out in community settings (He et al., 2020; Souza et al., 2022), and the rest in hospitals.

The majority of the included studies were conducted in Asia (n =12, 75%). Out of the 12 Asian studies 10 were conducted in China (He et al., 2020; He et al., 2023; Feng et al., 2023; Lo et al., 2023; Wu et al., 2024; Wang et al., 2018; Wong et al., 2022; Wong et al., 2024; Deng et al., 2020; Wu et al., 2020), one in Iran (Mohammadi et al., 2021) and Japan (Yagura et al., 2005). Only two studies were from African countries: Nigeria (Adeniji et al., 2023) and South Africa (de Villiers et al., 2009). The remaining two studies were conducted in South America specifically Brazil (Jorge et al., 2014; Souza et al., 2022).

Table 2: Characteristics of studies

Study ID	Country	Study design*	Study setting	Health facility type (Level of facility/community)	Sample size	Age of participantstt	Type of stroke#	Criteria for diagnosing stroke
de Villiers et al . (2009)	South Africa	Prospective cohort study	Urban	Secondary level hospital	Total = 195 Control = 101 Intervention = 94	Control = 60 Intervention = 57	All types of stroke	WHO criteria
Adeniji et al. (2023)	Nigeria	Retrospective cohort study	Urban	Tertiary hospital	Total =323 Pre MDT =155 Post MDT = 168	59.78 ± 12.3	Total ischemic = 204 Pre MDT Ischemic = 99 Post MDT Ischemic = 105	Clinical diagnosis confirmed by CT or MRI
Wong et al. (2022)	China	RCT	Urban	Acute general hospital	Control = 58 Intervention = 58	66.6 ± 9.34	Ischemic	MRI and clinical diagnosis by neurologist
Wong et al. (2024)	China	RCT	Urban	Tertiary hospital	Control = 58 Intervention = 58	66	Ischemic	Clinical diagnosis
Wang et al. (2018)	China	CRT	Urban	Secondary and Tertiary grade hospitals	Total = 4800 Control = 2400 patients/20 hospitals Intervention = 2400 patients/20 hospitals	65	Ischemic stroke	Stroke confirmed by CT scan and MRI

Wu et al. (2020)	China	RCT	Urban	University hospital	Total = 64 Control=32 Intervention = 32	57.67 ± 10.22	Control Ischemic stroke = 24 Intervention Ischemic = 20	Chinese Medical Association Criteria and confirmed by CT and/or MRI scan
Jorge et al. (2014)	Brazil	Pre-post experimental study	Urban	Rehabilitation hospital	28	54.1 ± 16.2	All types of stroke	not reported
Deng et al. (2020)	China	RCT	Urban	Tertiary hospital	Control=49 Intervention = 49	61.4 ± 18.3	Control Ischemic stroke = 40 Intervention Ischemic = 41	WHO criteria
Souza et al. (2022)	Brazil	Quasi Experimental study	Urban	Community	14	56-65	Ischemic	Clinical diagnosis
He et al., (2020)	China	RCT	Urban	Community	Control=39 Intervention = 39	Control = 56.21 ± 2.28 Intervention = 56.19 ± 3.21	Control Ischemic stroke = 8 Intervention Ischemic = 9	Diagnostic criteria by the 4th National Cerebrovascular Disease Academic Conference and confirmed by CT or MRI
Mohammed et al. (2021)	Iran	RCT	Urban	Tertiary hospital	Total = 67 Control=36 Intervention = 31	Control = 69.61 ± 8.36 Intervention = 66.8 ± 6.05	All types of stroke	Clinical diagnosis
He et al. (2023)	China	RCT	Urban	Tertiary hospital	Control=100 Intervention = 99	Control = 50.94 ± 6.06 Intervention = 51.34 ± 5.21	Control ischemic =73 Intervention ischemic = 71	Chinese Guidelines for the Diagnosis and Treatment of Acute Ischemic Stroke CT or MRI

Yagura et al. (2005)	Japan	NRCT	Urban	Hospital	Control = 87 Intervention = 91	Control=59.1 ± 11.6 Intervention=60.7 ± 11.3	Control ischemic= 44 Intervention ischemic = 54	Clinical diagnosis
Wu et al. (2024)	China	NRCT	Urban	Tertiary hospital	Control = 35 Intervention = 43	Control = 61.2 (SD,5.5) Intervention = 60.7 (SD, 7.9)	Ischemic Stroke	Clinical diagnosis and imaging
Lo et al. (2023)	China	RCT	Urban	10 Public Hospitals	Control = 166 Intervention = 169	Control = 63.1 ± 9.8 Intervention = 61.5 ± 9.9	Ischemic control = 150 Ischemic intervention = 152	Clinical diagnosis
Feng et al. (2023)	China	RCT	Urban	Tertiary hospital	Control= 60 Intervention = 60	Control = 70.27 ± 5.41 Intervention = 70.52 ± 5.73	Ischemic control = 39 Ischemic intervention = 41	CT or MRI

**PCS= Prospective cohort study, NRCT = Non-randomized Controlled Trial*

ǂMean age or range of study participants

4.1.2 Care provided to intervention groups

The interventions being coordinated or left fragmented varied across studies (Table 5).

Table 3: Care provided to groups

Study ID	Care provided to the intervention group	Care provided to control/unexposed groups
de Villiers et al., 2009	• Acute care treatment • Rehabilitation	• Clinical management by medical officers • Rehabilitation services by a physiotherapist • Social worker service
Adeniji et al., 2023	• Clinical treatment	• Clinical management in supervised by neurologist
Wong et al., 2022	• Rehabilitation and complication prevention	• Advice on rehabilitation and complication prevention • Out-patient follow up from nurse
Wong et al., 2024	• Clinical treatment • Home-based rehabilitation	• Instructions on medication regime, • Blood pressure and sugar monitoring, • Diet daily living care, • Rehabilitation and medical follow-up
Wang et al., 2018	• Clinical treatment	• Clinical treatment

Wu et al., 2020	• Health education • Rehabilitation	• Rehabilitation • health education
Jorge et al., 2014	• Rehabilitation	• Rehabilitation
Deng et al., 2020	• Clinical management, transitional care • Rehabilitation, • Medication reconciliation, s • Self-management education	• Risk screening
Souza et al., 2022	• Post-stroke case management • Rehabilitation	• Post-stroke case management • Rehabilitation
He et al., 2020	• drug supervision, • health education, • Rehabilitation therapy, • psychological care	• Self-rehabilitation • medical examination, • Medication and diet

4.1.3 Outcomes reported

Across the included studies, a range of outcomes was assessed to evaluate the impact of care coordination interventions on stroke survivors. The most frequently reported outcome was activity of daily living (ADLs) performance, which was examined in seven studies (Deng et al., 2020; Jorge et al., 2014; Mohammed et al., 2021; Wang et al., 2018; Wong et al., 2022; Wu et al., 2024. Other commonly reported outcomes included length of hospital stay ((Adeniji et al., 2023; de Villiers et al., 2009; Wong et al., 2024; Yagura et al., 2005), motor recovery (He et al., 2020; He et al., 2023; Wong et al., 2022; Yagura et al., 2005; Wu et al., 2020) and health utilisation (Adenjii et al., 2023; de Villiers et al., 2009; Wong et al., 2022), mental health (He et al., 2020; Wu et al., 2024) and quality of life (Deng et al., 2020; Wong et al., 2022; Wu et al., 2020).

Less frequently assessed outcomes included (Adeniji et al., 2023; de Villiers et al., 2009; Wang et al., 2018), readmission rates (Wong et al., 2024), cognitive function (Jorge et al., 2014; Wong et al., 2022), and systolic blood pressure (Souza et al., 2022).

Table 4: Outcomes reported

Study ID	Outcomes reported
de Villiers et al 2009	• Mortality • service utilisation • Number of referrals • Duration of hospitalisation
Adeniji et al 2023	• Brain neuroimaging done • Duration of hospitalisation • Discharge rate • Number of appointments
Wong et al 2022	• Quality of life

	• Motor recovery • Cognitive function • ADLs • Self-efficacy
Wong et al 2024	• Health utilisation • Readmission rates
Wang et al 2018	• Mortality • ADLs performance
Wu et al 2020	• Motor recovery • Gait and balance • ADLs performance • Stroke specific QoL
Jorge et al 2014	• Upper extremity motor function • Cognitive functions • Performance of ADLs • Length of stay

4.2.1 Stroke care coordination components identified

All studies reported the involvement of multiple participants in stroke care coordinated interventions comprising mainly patients, rehabilitation therapists, nurses and nurse specialists, physicians, and physicians specialists. Most of the included studies reported interprofessional meetings (n =14, 87.5%) and electronic information channels (n = 9, 56.3%) to establish communications for care coordination interventions (Table 4). Only three studies reported sharing electronic health records of patients/non-electronic patient records to establish communication among multiple participants. Of the 16 studies, 12 reported explicit clarification of the roles of multiple participants during care coordination.

Table 5: Components of care coordination

Study	Interprofessional meetings	Electronic Information (emails, calls etc.)	Shared Electronic Health Records/patient records	Clarification of roles
de Villiers et al. (2009)	*x*			*x*
Adeniji et al. (2023)	*x*	*x*	*x*	*x*
Wong et al. (2022)	*x*			*x*
Wong et al. (2024)	*x*			
Wang et al. (2018)	*x*			*x*
Wu et al. (2020)	*x*	*x*	*x*	
Jorge et al. (2014)	*x*			
Deng et al. (2020)	*x*			*x*
Souza et al. (2022)				
He et al. (2020)	*x*	*x*	*x*	*x*
Mohammed et al. (2021)	*x*	*x*		*x*
He et al. (2023)	*x*	*x*	*x*	*x*
Yagura et al. (2005)	*x*			*x*
Wu et al. (2024)				*x*
Lo et al. (2023)	*x*	*x*		
Feng et al. (2023)	*x*	*x*	*x*	*x*

4.2.2 Stroke Care Coordination Activities Identified

All studies reported the inclusion of patient assessment, care plan development, and care implementation as activities of care coordination interventions (Table 4). Three studies did not report on care evaluation as an activity of care coordination (de Villiers et al., 2009; Deng et al., 2020; Mohammadi et al., 2021). Only five studies reported protocol development as care coordination activity (Adeniji et al., 2023; Feng et all., 2023; He et al., 2023; Wang et al., 2018; Wong et al., 2022; Wong et al., 2024).

Table 6: Activities of care coordination

Study ID	Patient assessment (Assessing patient needs and goals)	Care plan development	Care plan implementation	Care evaluation or monitoring (including follow-up care)	Care coordinator	Protocol development	Information system*	Linking patients to specialists	Linking patients to community resources
de Villiers et al. (2009)	*x*	*x*	*x*		*x*	*x*			
Adeniji et al .(2023)	*x*	*x*	*x*		*x*	*x*	*x*		
Wong et al. (2022)	*x*	*x*	*x*	*x*	*x*	*x*		*x*	*x*
Wong et al. (2024)	*x*	*x*	*x*	*x*	*x*	*x*		*x*	*x*
Wang et al. (2018)	*x*	*x*	*x*	*x*	*x*	*x*	*x*		
Wu et al. (2020)	*x*	*x*	*x*	*x*	*x*		*x*		
Jorge et al. (2014)	*x*	*x*	*x*						
Deng et al. (2020)	*x*	*x*	*x*	*x*	*x*			*x*	*x*
Souza et al. (2022)	*x*	*x*	*x*	*x*	*x*			*x*	*x*
He et al. (2020)	*x*	*x*	*x*	*x*			*x*		*x*
Mohammed et al. (2021)	*x*	*x*	*x*	*x*					
He et al. (2023)	*x*	*x*	*x*	*x*	*x*	*x*	*x*		
Yagura et al. (2005)	*x*	*x*	*x*	*x*	*x*				
Wu et al. (2024)	*x*	*x*	*x*	*x*	*x*		*x*		
Lo et al. (2023)	*x*	*x*	*x*	*x*	*x*		*x*	*x*	
Feng et al. (2023)	*x*	*x*	*x*	*x*	*x*	*x*	*x*		*x*

* Tools and technologies used to support the sharing, management, and tracking of patient information across multiple providers, teams, and settings

4.3 Primary outcomes

4.3.1 Mortality rate

Three studies (Adeniji et al., 2023; de Villiers et al., 2009; Wang et al., 2018) were included in the meta-analysis assessing the effect of coordinated care intervention on mortality. The pooled risk ratio was 0.48 (95% CI: 0.21, 1.08), which was not statistically significant. The results also indicated that 93.8% of the variation in individual study effects could be accounted for by true differences; in design, study populations, and/or intervention variations.

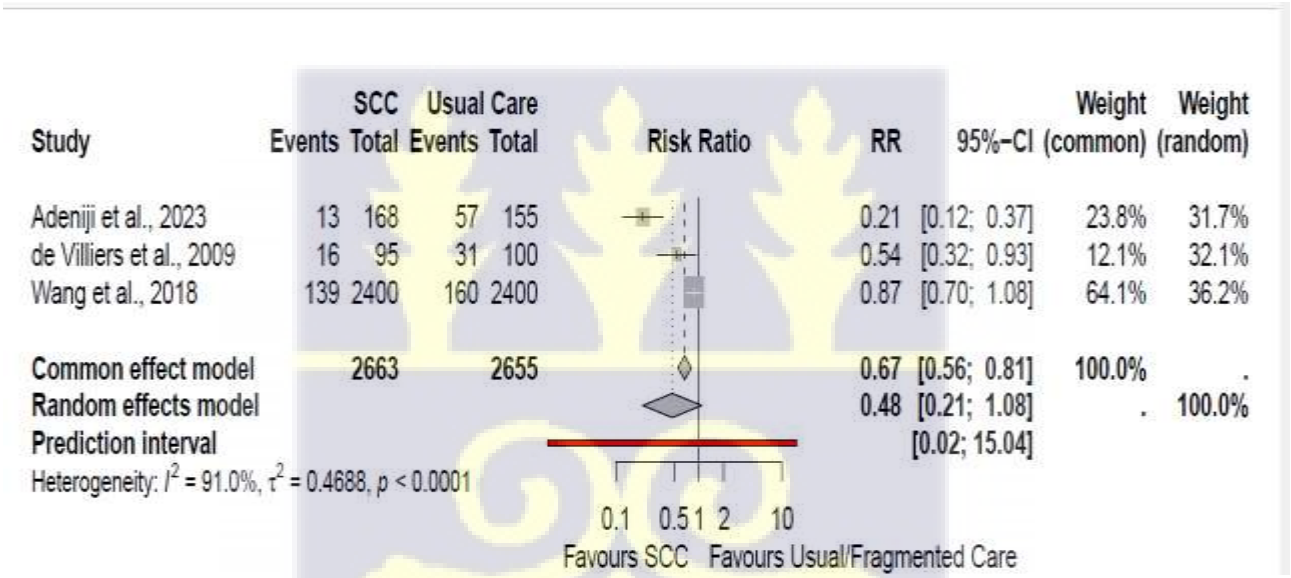

Figure 6: Mortality rate

4.3.2 Readmission Rates

Only one study (Wong et al., 2024) reported the effect of stroke care coordination on readmissions. The results indicated that there was no statistically significant difference ($p > 0.05$) in one-year readmission rates between patients who received care coordination (M = 0.26, 95% CI 0.13 – 0.38) and those who received usual treatment (M=0.45, 95% CI 0.26 – 0.63).

4.3.3 Performance of Activities of Daily Living (ADLs)

Seven studies (Deng et al., 2020; Jorge et al., 2014; Mohammed et al., 2021; Wang et al., 2018; Wong et al., 2022; Wu et al., 2024) assessed the effect of stroke care coordination on stroke survivors' ability to perform ADLs. Data from Wu et al. (2024) could not be extracted as the authors provided only graphs on outcome data and did not report exact estimates. Wang et al. (2018) reported ADLs as a categorical outcome. As such, only the remaining five studies were included in the meta-analysis. The pooled SMD was 0.92 (95% CI: 0.37 to 1.48, p = 0.001), indicating a statistically large effect in favour of stroke-coordinated care. The results from Wang et al. (2018) indicated stroke survivors who received coordinated care had an 18% reduced risk of severe disability (deteriorating capacity to perform ADLs). However, this was not statistically significant (RR = 0.92, 95% CI, 0.83 to 1.01, p = 0.08).

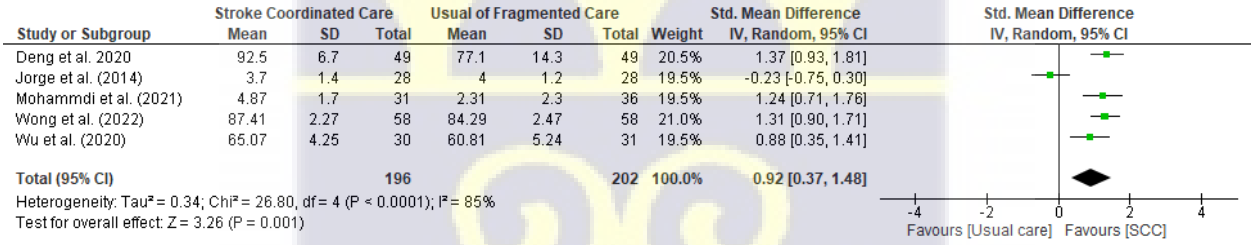

Figure 7: Activities of Daily Living (ADLs)

4.3.4 Upper extremity motor function

The pooled SMD of four studies (He et al., 2023; Jorge et al., 2014; Wong et al., 2022; Wu et al., 2020) reporting upper extremity functioning as an outcome of stroke coordinated care indicated average stroke coordinated care recipients had better upper extremity functioning recovery compared to their fragmented care counterparts. However, this was not statistically significant.

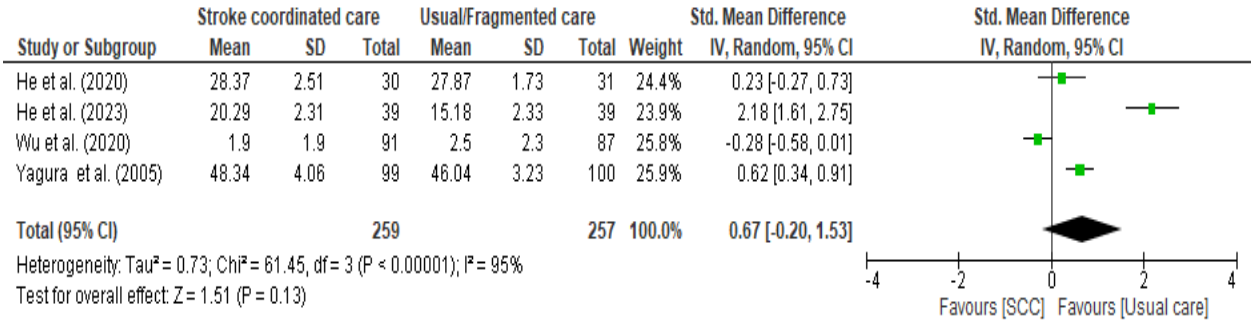

Figure 8: Upper extremity motor function

4.3.5 Lower extremity motor function

Four studies (He et al., 2020; He et al., 2023; Yagura et al., 2005; Wu et al., 2020) assessed the effect of stroke-coordinated care on lower extremity functioning. The results indicate that on average, stroke survivors who received stroke care coordination had moderately better lower extremity functioning compared to their usual care participants, but this was not statistically significant (SMD = 0.67, 95% CI: -0.20 to 1.53, $p = 0.13$).

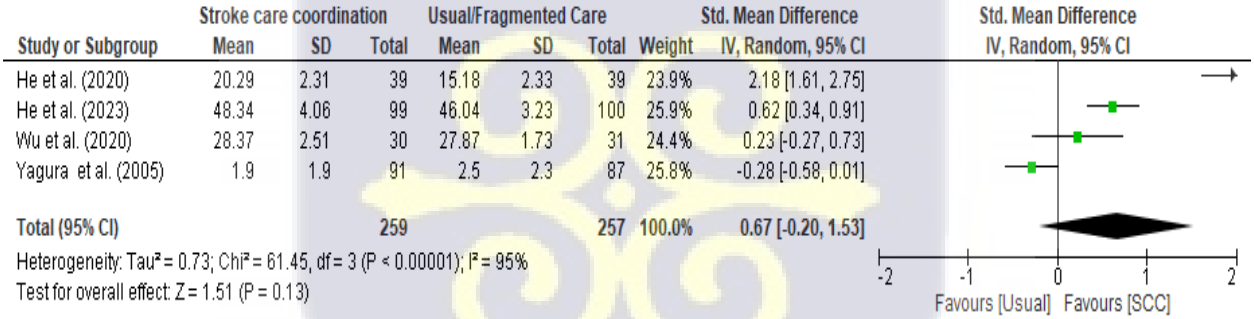

Figure 9: Lower extremity motor function

4.3.6 Cognitive Functioning

Two studies (Jorge et al., 2014; Wong et al., 2022) reported the effect of stroke care coordination on cognitive functioning (memory and thinking). The meta-analysis of SMDs indicates that, on

average, stroke survivors who received care coordination had significantly better cognitive function recovery than their usual care participants (SMD = 0.55, 95% CI: 0.21 to 0.89, $p = 0.001$).

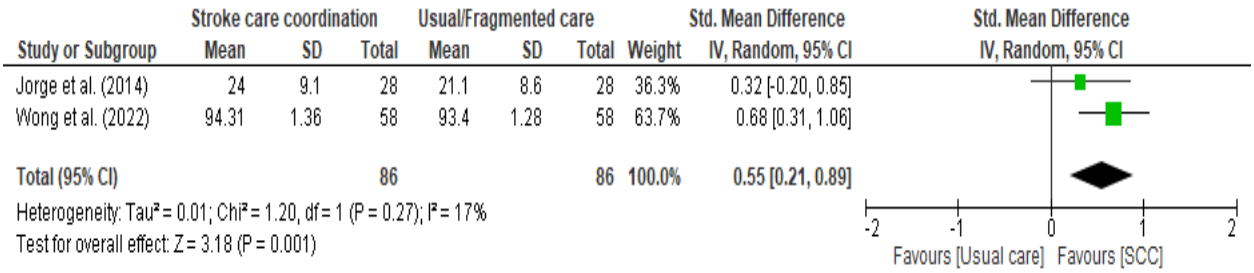

Figure 10: Cognitive Functioning

4.3.5 Length of stay (LOS)

Four studies (Adeniji et al., 2023; de Villiers et al., 2009; Wong et al., 2024; Yagura et al., 2005) reported the effect of stroke care coordination on stroke survivors' length of stay. Adeniji et al. (2023) reported this outcome as a median, and Wong et al. (2024) did not provide enough information to compute a standard deviation. As such, they were excluded from the meta-analysis. The meta-analysis of SMDs indicates no significant difference in LOS between stroke survivors who received care coordination interventions and their usual care counterparts (SMD = 0.16, 95% CI: -0.04 to 0.36, $p = 0.12$).

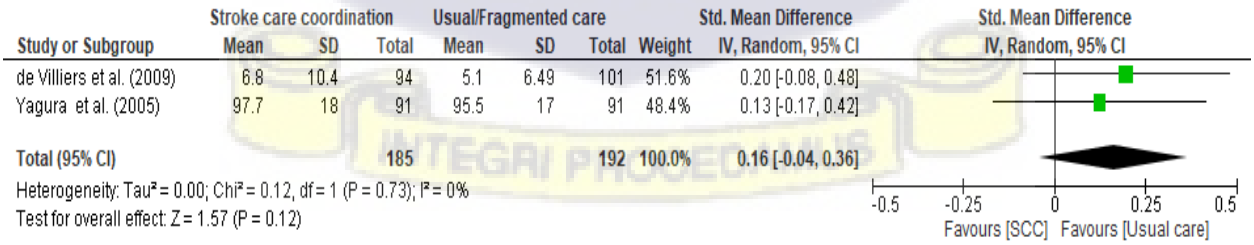

Figure 11: Length of hospital stay

4.3.6 Systolic blood pressure

Only one study reported the effect of care coordination intervention on systolic blood pressure. Souza et al. (2022) reported care coordination was not associated with a significant reduction in systolic blood pressure among the intervention group (RR = 2.03, CI = 0.73- 5.62, p=.115).

4.3.7 Healthcare service utilisation

Three studies (Adeniji et al., 2023; de Villiers et al., 2009; Wong et al., 2024) reported on health service utilisation. The authors reported on three indicators of health service utilisation: access to diagnostics (Adeniji et al., 2023; de Villiers et al., 2009), access to rehabilitation services (de Villiers et al., 2009; Wong et al., 2024), and follow-up appointments kept. With regards to access to CT scan, pooled results from Adeniji et al. (2021) and De Villiers et al. (2009) indicated no significant differences in access between stroke care coordination groups and fragmented groups (RR = 0.89, CI 0.54 to 1.48, $p = 0.68$).

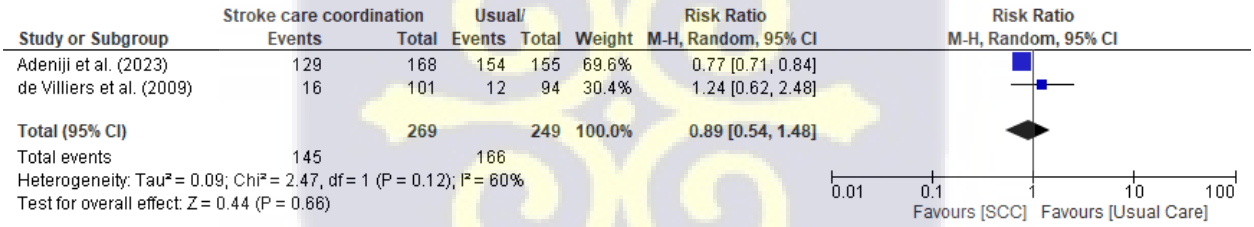

Figure 12: Access to CT scan

Only Adeniji et al. (2023) reported on access to MRI scans as an outcome, and results from their results indicated that individuals who received stroke care coordination had a 79% more likely to access MRI compared to their fragmented care counterparts (RR = 1.80, CI 1.45 to 2.22, $p = 0.01$). Adeniji et al. (2023) also reported that patients who received stroke care coordinated interventions

(38.3%) had a significantly higher proportion of follow-up appointments kept (χ^2[1, N = 323] = 44.09, p < .001) than those in control groups (7%). De Villiers et al. (2009) reported that patients who received stroke care coordinated interventions (12.8%) had a significantly higher proportion of inpatient rehabilitation access (χ^2[1, N = 195] = 5.95, p = .01) than those in control groups (3.2%).

4.4 Secondary Outcomes

4.4.1 Anxiety

Two studies (Feng et al., 2023; Wong et al., 2022) assessing the effect of care coordination on anxiety were included in the meta-analysis. Although He et al. (2020) reported on this outcome, data could not be extracted due to how they were presented. The meta-analysis of SMDs indicates that, on average stroke survivors who received care coordination had significantly reduced levels of anxiety than their usual care participants (SMD = -0.88, 95% CI:- 1.09 to -0.52, p = 0.001).

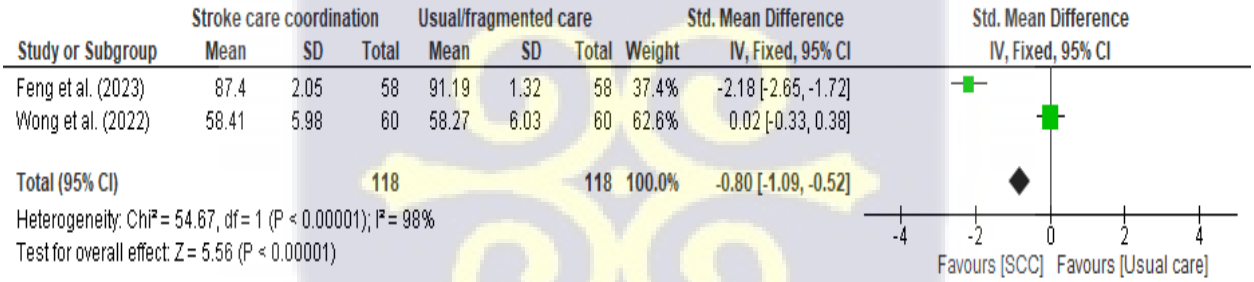

Figure 13: Anxiety

4.4.2 Depression

Three studies (Feng et al., 2023; Lo et al., 2023; Wong et al., 2022) assessing the effect of care coordination on depression were included in the meta-analysis. Although He et al. (2020) and Wu et al. (2024) reported on this outcome, data could not be extracted due to how they were presented. The meta-analysis of SMDs indicates no significant difference in depression levels between stroke survivors who received care coordination interventions and their usual care counterparts (SMD = -0.04, 95% CI: -0.21 to 0.12, $p = 0.62$).

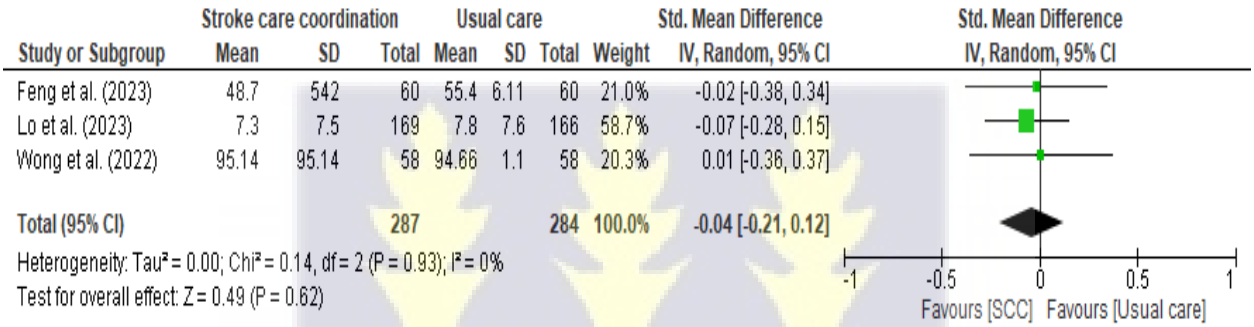

Figure 14: Depression

4.4.3 Quality of life (QoL)

Four studies (Deng et al., 2020; He et al., 2023; Mohammadi et al., 2021; Wu et al., 2020) assessing the effect of care coordination on QoL were included in the meta-analysis. Although He et al. (2020) reported this outcome, data could not be extracted due to how they were presented. The meta-analysis of SMDs indicates no significant difference in the QoL of stroke survivors who received care coordination interventions compared to their usual care counterparts (SMD = 1.00, 95% CI: 0.21 to 1.78, $p = 0.01$).

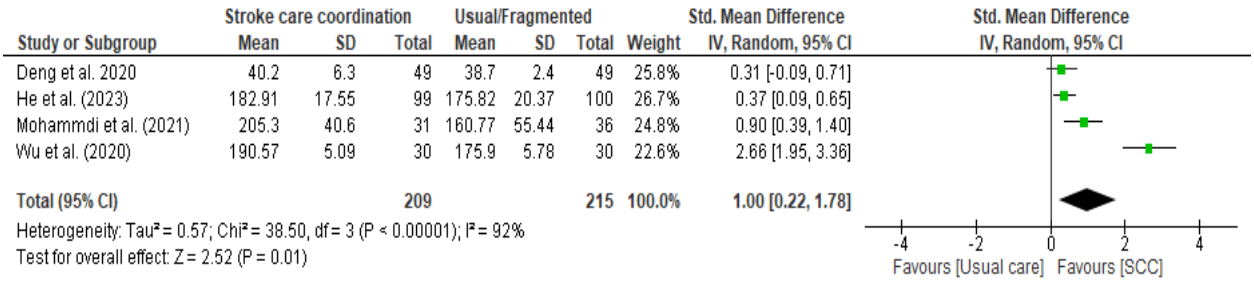

Figure 15: Quality of Life

4.5 Risk of Bias of Included Studies

4.5.1 Risk of Bias Assessment of RCT and CRT studies

The nine RCTs and one CRT were assessed using the Cochrane RoB-2 tool. Three RCTs and the CRT were judged to be at low risk of bias overall (Deng et al., 2020; Wang et al., 2018; Wong et al., 2022; Wong et al., 2024) and only one of the RCTs was judged to have some concerns (Lo et al., 2023). The remaining were judged to have an overall high risk of bias (Figure 6).

Randomization process

Four studies (Feng et al., 2023; He et al., 2020; He et al., 2023; Wu et al., 2020) were rated at being at high risk of bias for randomization processes. These studies mainly did not provide information on whether allocation sequencing was concealed or not.

Deviation from intended interventions

All studies were judged to be at low risk for deviation from intended interventions.

Missing outcomes

All studies were judged to be at low risk of bias for this domain as all outcomes reflected what authors have presented in their study protocols.

Measurement outcomes

Four of the studies (Feng et al., 2023; He et al., 2020; He et al., 2023; Mohammadi et al., 2020) were judged to be at high risk of bias for measurement outcomes and one study (Lo et al., 2023) was judged to have some concerns. The four studies with high risk of bias either did not provide information on blinding of the outcome assessors or indicated that the assessors were aware of intervention groups.

Selection of the reported results

One study (Mohammadi et al., 2021) had some concerns in this domain. The was a discrepancy between final reported results and analysis plan.

Figure 16: Risk of Bias Assessment of included RCT and CRT studies

4.5.2 Risk of Bias Assessment of Non-RCT studies

Five of the non-RCT studies (Jorge et al., 2014; Souza et al., 2022; de Villiers et al., 2009; Wu et al., 2024; Yagura et al., 2005) were judged to be at critical risk overall and did not have their domains assessed. These studies did not have key confounders (age, stroke type, and stroke severity) controlled by the study authors, not during the design phase or the analysis phase. The remaining one study (Adeniji et al., 2023) was judged to have an overall serious risk of bias. The study did not provide any information on the adherence of participants to assigned interventions.

CHAPTER FIVE

DISCUSSION

The management of stroke is complex and requires the services of multiple care providers. Although the roles of the providers are dependent on each other, the risk of fragmentation in care is quite high (Joo, 2023). Care coordination is a key effort to reduce fragmentation of care and improve patient outcomes. This systematic review and meta-analysis aimed to characterise how stroke care is coordinated in stroke outcomes and the effectiveness of care-coordinated interventions on patient outcomes.

Main findings

In this systematic review and meta-analysis of 16 studies, the results indicated that stroke care coordination components and their implementation (multiple participants' involvement, cross-provider/team communication, and role clarification) varied across different contexts. However, care coordination activities were similar across different studies. With regards to the effectiveness of stroke coordination, the results indicated that stroke survivors who received coordinated interventions had significant improvement in their ADL performance capacity, upper extremity (limbs) motor functioning, and cognitive functioning. Stroke-coordinated care recipients had significantly reduced anxiety levels and a higher quality of life. However, the care coordination intervention did not result in a significant reduction in the risk of death and increased quality of life in survivors.

Interpreting findings

Stroke care coordination, on average, is not associated with a significant reduction in the risk of mortality. All the studies included in the meta-analysis provided estimates indicating a reduced

risk effect of care coordination interventions. However, the upper limit of confidence interval for Wang et al. (2018), which was the most powered study (with the largest sample size), indicated that stroke care coordination could also lead to 8% increased risk of death in survivors. Wang et al. (2018) did not report this possible increase in risk as an adverse outcome of stroke care coordination. The confidence intervals of the individual studies included in the meta-analysis assessing stroke mortality risk as an outcome varied considerably, which could be a reflection of variations in the components, care activities and coordination activities.

Impairment in motor, cognitive, and sensorimotor function of stroke survivors hinders their ability to perform activities of daily living. As such, ADLs' performance improvement is a desired outcome clinically and an indicator of independence to stroke survivors. Across the studies, care coordination intervention was associated with improved ADL performance capacity, except in Jorge et al.'s (2014) study, where stroke care coordination was associated with reduced levels of ADL performance. The average mean difference could lie between 0.35 and 1.41, which is quite narrow considering the variations in interventions and study design. Although all five studies (Deng et al., 2020; Jorge et al., 2014; Mohammadi et al., 2021; Wong et al., 2022; Wu et al., 2020) included in the ADL performance meta-analysis had variations in care coordination intervention, Jorge et al. (2014) comparably lacked more components and coordination activities.

Motor and cognitive function are key predictors of ADL performance (Verbeek et al., 2011). Meta-analyses indicated that while stroke coordination compared to fragmented care was, on average, effective for improving cognitive functioning (He et al., 2020; Jorge et al., 2014; Wong et al., 2022; Wu et al., 2020), this was not the case for upper and lower limb functioning (He et al., 2020; He et al., 2023; Yagura et al., 2005; Wu et al., 2020). These findings are partly in disagreement with

HIC studies on care coordination. For instance, Fens et al. (2014), Joubert et al. (2019), and Markel-Reid et al. (2023) reported results affirming that care-coordinated interventions were effective for improving physical function. It is unclear why this discrepancy may exist. It is worth noting that there were inconsistencies in the effect sizes of the meta-analysis assessing the effect of stroke care coordination on upper extremity motor recovery. This could signify the varying effects associated with differences in intervention components and activities.

For mental health and quality of life, the meta-analysis was indicative of the effectiveness of care coordination interventions in improving mental health (particularly anxiety) and quality of life of stroke survivors. These findings are consistent with HIC studies (Claiborne et al., 2006; Looman et al., 2018; Ramirez et al., 2020). It is worth noting that assessment tools for assessing anxiety and quality of life across included studies varied greatly, with some studies focusing on just a particular dimension of quality of life (e.g. physical health-related quality of life).

Strengths and limitations of this review

This review provides a comprehensive synthesis of stroke-coordinated care interventions in LMICs, offering valuable insights into their components, implementation, and effectiveness.

A key strength of this review is its focus on LMICs, where healthcare systems often face unique challenges, such as limited infrastructure, workforce shortages, and fragmented care delivery. By characterising care coordination in LMICs and identifying gaps in implementation, such as the inconsistent use of protocol development and the omission of care evaluation in some interventions, this review provides actionable insights for policymakers and healthcare practitioners aiming to optimises stroke care in resource-limited settings. Furthermore, the review

applies a rigorous methodological approach, ensuring a transparent and reproducible assessment of the included studies. The adherence to established frameworks for evaluating care coordination components enhances the reliability and applicability of the findings.

Despite its strengths, this review has some limitations. First, heterogeneity in study designs, intervention components, and outcome measures posed a challenge in drawing definitive conclusions about the overall effectiveness of stroke-coordinated care in LMICs.

Some included studies presented data in a manner that did not support extraction. These missing data could have a biased impact on the meta-analysis estimates and confidence intervals presented.

While the review sought to provide valuable insights into the influence of stroke type, subtype, and severity, the findings are constrained by the fact that many studies did not stratify results based on these factors. This limits the ability to draw precise conclusions regarding how different stroke presentations impact the effectiveness of coordinated care interventions.

CHAPTER SIX

CONCLUSION

This systematic review with meta-analysis sought to evaluate the effectiveness of stroke care coordination in improving patient outcomes. The findings indicated that stroke-coordinated interventions could improve patients' independence, upper extremity motor recovery, mental health, and quality of life. However, this conclusion could be impacted by other confounders or even biased due to the current methodological issues in the included studies.

Recommendations

Recommendations for clinical practice

The available evidence supports the implementation of care coordination as an effective approach for reducing the risk of fragmented care and adverse patient outcomes associated with it in clinical and community settings. In implementing stroke care coordination, clinicians should consider incorporating multiple coordinated patient-centred activities that target linking patients to multidisciplinary care, community resources, and fostering collaboration. This may be influenced by organisational resources.

Recommendations for future research

Further research is necessary to identify which variations in care coordination are associated with the best outcomes. Also, future studies should consider assessing the confounding effects of stroke characteristics such as stroke severity, type and subtype, and presence of comorbidities on the relationship between stroke care coordination and patient outcomes.

Contribution to Knowledge

This review makes several important contributions to the existing body of knowledge on stroke coordinated care, particularly in the context of LMICs. By systematically evaluating the components, implementation, and outcomes of coordinated care interventions, this study provides insights into how such models function in resource-limited settings, filling a significant gap in stroke care research.

One of the key contributions of this review is its identification of essential components and activities of stroke-coordinated care interventions. While previous research has explored care coordination in high-income countries, this study highlights the specific activities adopted in LMICs, such as patient assessment, care plan development, and care implementation. Notably, the review identifies gaps in care evaluation and protocol development, emphasising areas that require improvement for more structured and effective coordination models.

Furthermore, this review contributes to knowledge by demonstrating the effectiveness of stroke-coordinated care on both clinical and self-reported outcomes in LMIC settings. The findings suggest, with limitations, that coordinated care models could improve stroke recovery, quality of life, and some indicators of motor functioning even in low-resource settings.

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Appendices

Appendix 1

Search Output of Electronic Databases

Cochrane Database

ID	Search Hits	
#1	MeSH descriptor: [Stroke] explode all trees	18002
#2	"Cerebrovascular accident"	19099
#3	CVA	1099
#4	"Transient ischemic attack"	3732
#5	TIA	2567
#6	stroke	90323
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	94449
#8	integrat* NEAR/3 care	4208
#9	integrat* NEAR/3 service*	990
#10	care NEAR/3 continui*	2302
#11	MeSH descriptor: [Continuity of Patient Care] explode all trees	40545
#12	MeSH descriptor: [Health Information Exchange] explode all trees	17
#13	MeSH descriptor: [Health Information Interoperability] explode all trees	4
#14	patient-cent*	6695

#15 patient centered 9307

#16 patient centred 9307

#17 MeSH descriptor: [Patient-Centered Care] explode all trees 1288

#18 MeSH descriptor: [Patient Care Team] explode all trees 2339

#19 multidisciplinary 10815

#20 team-based 912

#21 "team based" 913

#22 collaborat* NEAR/3 care 2017

#23 MeSH descriptor: [Case Management] explode all trees 942

#24 "case management" 3222

#25 care NEAR/3 coordina* 2061

#26 care NEAR/3 co-ordina* 196

#27 patient NEAR/3 navig* 920

#28 #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 71631

#29 #7 AND #28 7411

#30 "Sub-Saharan Africa" OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria OR Angola OR Argentina

OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe 297629

#31 MeSH descriptor: [Developing Countries] explode all trees 1302

#32 MeSH descriptor: [Sub-Saharan African People] explode all trees 8

#33 MeSH descriptor: [Africa] explode all trees 12737

#34 MeSH descriptor: [Latin America] explode all trees 211

#35 MeSH descriptor: [Asia, Southern] explode all trees 5994

#36 #30 OR #31 OR #32 OR #33 OR #34 OR #35 298018

#37 #29 AND #36 1407**

338 Cochrane Reviews

13 Cochrane Protocols

1055 Cochrane Central Register of Controlled Trials

PubMed

Concept	**Query**	**Results**
#1 Stroke	("stroke"[tw] OR "cerebrovascular accident"[tw] OR CVA[tw] OR "transient ischemic attack"[tw] OR TIA[tw] OR stroke[mesh])	633832
#2 Care Coordination	(“Integration care”[Title/Abstract:~3] OR “integrat* care” OR “care integrat*” OR “Integration service”[Title/Abstract:~3] OR “Integration services”[Title/Abstract:~3] OR “integrat* service*” OR “care integrat*” OR “service integrat*” OR "Delivery of Health Care, Integrated"[mesh] OR “care continuity” OR “continuity care”[Title/Abstract:~3] OR "Continuity of Patient Care"[Mesh] OR "Health Information Interoperability"[Mesh] OR "Health Information Exchange"[Mesh] OR “exchange information”[Title/Abstract:~3] OR Patient-centered OR “patient centred” OR “patient centered” OR patient-centred OR multidisciplinary OR “collaborative care” OR	438501

	team-based OR “team based” OR “case management”[mesh] OR “Care coordinat*” OR “care co-ordinat*” OR “coordinated care” OR “co-ordinated care” OR “coordinating care” OR “co-ordinating care” OR “coordination care”[Title/Abstract:~3] OR “co-ordination care”[Title/Abstract:~3] OR “coordinating care”[Title/Abstract:~3] OR “co-ordinating care”[Title/Abstract:~3] OR “coordinator care”[Title/Abstract:~3] OR "care coordinat*" OR "patient navigat*")	
#3	#1 AND #2	32,432
#4 LIMCs	("Developing Countries"[Mesh] OR "Africa South of the Sahara"[Mesh] OR "Africa"[Mesh] OR "Latin America"[Mesh] OR "Asia, Southern"[Mesh] OR "Sub-Saharan Africa" OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria OR Angola OR Argentina OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti	8,075,983

	OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe)	
#5	#3 AND #4	***6,321*** ***6,183 after date restriction***

CINAHL via EBSCOhost

#1	("stroke" OR "cerebrovascular accident" OR CVA OR "transient ischemic attack" OR TIA OR (MH "Stroke+"))	**151,141**
#2	((MH "Health Care Delivery, Integrated") OR (integrat* N5 care) OR (care N5 integrat*) OR (integrat* N5 servic*) OR (servic* N5 integrat*) OR (MH "Continuity of Patient Care+" OR (contin* N5 care) OR (care N5 contin*) OR (MH "Health Care Information Exchange (Iowa NIC)") OR (MH "Electronic Data Interchange+") OR "exchange N5 information" OR "information exchange" OR (MH "Patient Centered Care") OR "patient-centered care" OR "patient-centred care" OR "patient centered care" OR "patient centred care" OR (MH "Multidisciplinary Care Team") OR "collaborative care" OR team-based OR "team based" OR (MH "Case Management+") OR "case manag*" OR (care N5 coordinat*) OR (care N5 co-ordinat*) OR (coordinat* N5 care) OR (co-ordinat* N5 care) OR "patient navigat*))	**206, 904**
#3	#1 AND #2	**3,363**
#4	((MH "Developing Countries" OR (MH "Africa+") OR (MH "Africa South of the Sahara+") OR (MH "Latin America") OR (MH "Asia+" OR "Sub-Saharan Africa" OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria OR Angola OR Argentina OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic"	**715, 466**

	OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe))	
#5	#3 AND #4	**285**

LILACS

#1	(stroke OR mh:stroke OR "cerebrovascular accident" OR "cerebrovascular accidents" OR CVA OR "transient ischemic attack" OR "transient ischemic attacks" OR "TIA")	26, 399
#2	"integration of care" OR "integrated care" OR "integrating care" OR "integration of service" OR "integrated service" OR "integrating service" OR "integration of services" OR "integrated services" OR "integrating services" OR "care integration" OR "service integration" OR mh:" Delivery of Health Care, Integrated" OR mh:"health information interoperability" OR mh:"continuity of patient care" OR "care continuity" OR "continuity of care" OR "information exchange" OR "exchange of information" OR mh:"health information exchange" OR patient-centered OR patient-centred OR "patient centered" OR "patient centred" OR "patient centeredness" OR mh:"patient-centered care" OR multidisciplinary OR "collaborative care" OR "care collaboration" OR "team based" OR team-based OR mh:"case management" OR "case management" OR "case manager" OR "coordinated care" OR "co-ordinated care" OR "care coordination" OR "care co-ordination" OR "coordinating care" OR "co-ordinating care" OR "coordination of care" OR "co-ordination of care" OR "Care coordinator" OR "care co-ordinator" OR "patient navigation" OR "navigating care" OR "patient navigator"	33,396

#3	(mh:"Developing Countries" OR mh:"Africa South of the Sahara" OR mh:"Africa" OR mh:"Latin America" OR mh:"Caribbean region" OR "Sub-Saharan Africa" OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria OR Angola OR Argentina OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua	232,197

	New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe)	
#4	#1 AND #2 AND #3	42

Scopus

Scopus Concept	**Query**	**Results**
#1 Stroke	(stroke OR "cerebrovascular accident*" OR CVA OR "transient ischemic attack*" OR "transient ischaemic attack*" OR "TIA")	1, 872, 347

#2 Care Coordination	((integrat* W/5 care) OR (care W/5 integrat*) OR (integrat* W/5 service*) OR (service W/5 intergrat*) OR "health information exchange" OR (exchange W/5 information) OR (information W/5 exchange) OR patient-centered OR patient-centred OR multidisciplinary OR (collaborat* W/5 care) OR team-based OR "team based" OR "case manage*" OR (care W/5 coordinat*) OR (care W/5 co-ordinat*) OR (co-ordinat* W/5 care) OR (coordinat* W/5 care) OR (patient W/3 naviga*))	2, 234, 827
#3	#1 AND #2	109,552
#4 LIMCs	("Developing Countries" OR "low income countr*" OR "low and middle income countr*" OR "SSA" OR "Sub Saharan Africa" OR "Sub-Saharan Africa" OR "Asia" OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR afghanistan OR albania OR algeria OR angola OR argentina OR armenia OR azerbaijan OR bangladesh OR barbados OR benin OR belarus OR belize OR bhutan OR bolivia OR bosnia OR herzegovina OR botswana OR brazil OR burkina AND faso OR burundi OR cambodia OR cameroon OR "Cape Verde" OR "Central African Republic" OR chad OR chile OR china OR colombia OR comoros OR congo OR "Cote d'Ivoire" OR cuba OR djibouti OR "Dominican Republic" OR ecuador OR egypt OR el AND salvador OR eritrea OR ethiopia OR fiji OR gabon OR gambia OR georgia OR ghana OR	**535,453**

	guatemala OR guinea OR guyana OR haiti OR honduras OR india OR indonesia OR iran OR iraq OR jamaica OR jordan OR kazakhstan OR kenya OR kiribati OR korea OR kosovo OR kyrgyzstan OR laos OR lebanon OR lesotho OR liberia OR libya OR madagascar OR malawi OR malaysia OR maldives OR mali OR marshall AND islands OR mauritania OR mauritius OR mexico OR micronesia OR moldova OR mongolia OR montenegro OR morocco OR mozambique OR myanmar OR namibia OR nepal OR nicaragua OR niger OR nigeria OR pakistan OR palau OR panama OR papua AND new AND guinea OR paraguay OR peru OR philippines OR rwanda OR samoa OR "Sao Tome and Principe" OR senegal OR serbia OR seychelles OR "Sierra Leone" OR "Solomon Islands" OR somalia OR "South Africa" OR "Sri Lanka" OR sudan OR suriname OR swaziland OR syria OR tajikistan OR tanzania OR thailand OR timor-leste OR togo OR tonga OR tunisia OR turkey OR turkmenistan OR tuvalu OR uganda OR ukraine OR uruguay OR uzbekistan OR vanuatu OR venezuela OR vietnam OR yemen OR zambia OR zimbabwe)	
#5	#3 AND #4	***1,928***

#1	(TI=(stroke OR "cerebrovascular accident*" OR "transient ischemic attack*" OR CVA OR TIA) OR AB=(stroke OR "cerebrovascular accident*" OR "transient ischemic attack*" OR CVA OR TIA))	338, 038
#2	(TI=("integration of care" OR "integrat* care" OR "integration of servic*" OR "integrat* servic*" OR "care integrat*" OR "service integrat*" OR "care contin*" OR "conti* of care" OR "exchange of information" OR "information exchange" OR "patient-cent*" OR "patient center*" OR multidisciplinary OR "collabora* care" OR team-based OR "team based" OR "case manag*" OR "care co-ordinate*" OR "care coordinat*" OR "co-ordinat* care" OR "coordinat* care" OR "patient navigat*") OR AB=("integration of care" OR "integrat* care" OR "integration of servic*" OR "integrat* servic*" OR "care integrat*" OR "service integrat*" OR "care contin*" OR "conti* of care" OR "exchange of information" OR "information exchange" OR "patient-cent*" OR "patient center*" OR multidisciplinary OR "collabora* care" OR team-based OR "team based" OR "case manag*" OR "care co-ordinat*" OR "care coordinat*" OR "co-ordinat* care" OR "coordinat* care" OR "patient navigat*"))	271,478
#3	**#1 AND #2**	**3,722**
#4	(((TI=("Developing Countries" OR “low income countr*” OR “low and middle income countr*” OR “SSA” OR “Sub Saharan Africa” OR “Sub-Saharan Africa” OR “Asia” OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria	3,896,915

	OR Angola OR Argentina OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe)) OR (AB=("Developing Countries" OR “low income countr*” OR “low and middle income countr*” OR	

	“SSA” OR “Sub Saharan Africa” OR “Sub-Saharan Africa” OR “Asia” OR "South Asia" OR "Southeast Asia" OR "Latin America" OR "Caribbean Region" OR "West Africa" OR "Central Africa" OR "East Africa" OR "Southern Africa" OR "Pacific Islands" OR Afghanistan OR Albania OR Algeria OR Angola OR Argentina OR Armenia OR Azerbaijan OR Bangladesh OR Barbados OR Benin OR Belarus OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Botswana OR Brazil OR Burkina Faso OR Burundi OR Cambodia OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Chile OR China OR Colombia OR Comoros OR Congo OR "Cote d'Ivoire" OR Cuba OR Djibouti OR "Dominican Republic" OR Ecuador OR Egypt OR El Salvador OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Georgia OR Ghana OR Guatemala OR Guinea OR Guyana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Rwanda OR Samoa OR "Sao Tome and Principe" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR “Solomon Islands” OR Somalia OR “South Africa” OR “Sri Lanka” OR Sudan OR Suriname OR Swaziland OR Syria OR Tajikistan OR Tanzania OR Thailand OR Timor-Leste OR Togo OR Tonga OR	

	Tunisia OR Turkey OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR Yemen OR Zambia OR Zimbabwe))))	
#5	**#3 AND #4**	**267**

WHO International Clinical Trials Registry Platform (ICTRP)

In the condition	stroke OR "cerebrovascular accident" OR "cerebrovascular accidents" OR "transient ischemic attack" OR "transient ischemic attacks" OR "transient ischaemic attack" OR "transient ischaemic attacks"	4533
In the intervention	2 “integration of care” OR “integrated care” OR “integrating care” OR “integration of service” OR “integrated service” OR “integrating service” OR “integration of services” OR “integrated services” OR “integrating services” OR “care integration” OR “service integration” OR “care continuity” OR “continuity of care” OR “information exchange” OR “exchange of information” OR patient-centered OR patient-centred OR “patient centered” OR “patient centred” OR “patient centeredness” OR multidisciplinary OR “collaborative care” OR “care collaboration” OR “team based” OR team-based OR “case management” OR “case manager”	742

	OR “coordinated care” OR “co-ordinated care” OR “care coordination” OR “care co-ordination” OR “coordinating care” OR “co-ordinating care” OR “coordination of care” OR “co-ordination of care” OR “Care coordinator” OR “care co-ordinator” OR “patient navigation” OR “navigating care” OR “patient navigator”	
Combined	combined	131

Google Scholar (Via Publish or Perish)

stroke AND ("integrated care" OR "care integration" OR "care coordination" OR "continuity of care" OR "patient-centered" OR multidisciplinary OR "team-based")

Total = 10,458