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Nurse-led physical health interventions for people with mental illness: an integrative review of international literature

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ABSTRACT
Background: People experiencing mental illness receive physical healthcare from nurses in a variety of settings including acute inpatient, secure extended care, forensic, and community services. While nurse-led clinical practice addressing sub-optimal consumer physical health is salient, a detailed understanding and description of the contribution by nurses to physical health interventions in people experiencing mental illness is not clearly articulated in the literature.
Aims: The aim of this integrative review is to describe the state of knowledge on nurse-led physical health intervention for consumers, focusing on nursing roles, nursing assessment, and intervention settings.
Methods: A systematic search of six databases using Medical Subject Headings from 2001 and 2022 inclusive was conducted. The Mixed Methods Appraisal Tool (MMAT) was utilised for quality appraisal.
Results: Seventy-four studies were identified as "nurse-led". Interventions were most common among community settings ($n=34$, 46%). Nurses performed varied roles, often concurrently, including the collection of 341 physical health outcomes, and multiple roles with 225 distinct nursing actions identified across the included studies. A nurse as lead author was common among the included studies ($n=46$, 62%). However, nurses were not always recognised for their efforts or contributions in authorship.
Conclusions: There is potential gap in role recognition that should be considered when designing and reporting nurse-led physical health interventions.

Introduction

People experiencing mental illness (i.e. a medical diagnosis of psychotic illnesses, primarily schizophrenia spectrum or bipolar affective disorder, and major depressive disorder); henceforth referred to as consumers, receive physical healthcare from nurses in a variety of settings including acute inpatient units (Ball et al., 2022), secure extended care (Furness, Hewavasam, et al., 2018), forensic (Vasudev et al., 2012), and community mental health services (Happell et al., 2018). Physical healthcare practices provided by nurses include education, screening and/or monitoring, co-ordination of care, and lifestyle program delivery (Happell, Platania-Phung, et al., 2014). Nurses are often at the forefront of physical healthcare management which typically focusses on improving consumer cardiometabolic health (T. Brown et al., 2018) and reducing sedentary behaviour (Beebe & Smith, 2010).

Although extant literature demonstrates effectiveness of both nurse-led and multidisciplinary collaborative physical health intervention for consumers, health and healthcare inequalities persist compared with the general population (Solmi et al., 2021). While nurse-led clinical practice addressing sub-optimal consumer physical health is salient, a detailed understanding and description of the contribution made by nurses to physical health interventions in people living with severe mental illness has been largely ignored in the literature. The current integrative review synthesises extent knowledge on nurse-led physical healthcare interventions for mental health consumers, and the roles played by nurses in various intervention types and settings.

Background

Nurses working in mental health settings provide an important role in concurrent mental and physical healthcare. It is

therefore unsurprising that nurse attitudes, needs, and practices have been described in inpatient and community clinical settings (Robson et al., 2013) and collated among integrative (Blythe & White, 2012) and systematic review (Happell, Platania-Phung, et al., 2014). Description and understanding of nurse attitudes, needs, and practices can allow planning of contemporary nursing workforce professional development initiatives, with a focus on promoting and sustaining evidence-based practice (Bianchi et al., 2018), strengthening professional self-concept (Asi Karakaş et al., 2021) and supporting nurse-consumer therapeutic relationships (Moreno-Poyato et al., 2021).

There is an identified need for research about healthcare workforce to be generated from within the healthcare workforce. This is recognised through policies at a variety of levels. In Australia, for example, registered nurse standards for practice include critical thinking and analysis of practice (Standard 1) and evaluation of outcomes to inform practice (Standard 7) (Nursing and Midwifery Board, 2017). Such practice evaluation, often referred to as "quality assurance" can lead to the creation of a research question. When research questions are answered using a methodologically robust approach this will lead to the extension or generation of new knowledge and translation (i.e. evidence-based practice). However, such practice evaluation is often mistakenly used interchangeably with research, which is distinct in that evaluation does not lead to the extension or generation of new knowledge (i.e. research) (Moule et al., 2017).

Nurse researchers play an integral component in the improvement of best practice provision of clinical care (Dobrowolska et al., 2021; Hølge-Hazelton et al., 2016). Clinicians across the healthcare professions involved in research activities are faced with the clinician-consumer relationship (Hay-Smith et al., 2016), where a sense of clinical duty can conflict with research ethics and methods (Czoli et al., 2011). Developing the skills and knowledge required for evaluation and research capability and having the time and opportunity for research capacity is not a challenge exclusive to the clinical discipline of nursing (Rockinson-Szapkiw, 2018). While not all nurses may wish to lead or be involved in research projects, it is important that there is a clear career pathway for those that do. Yet positions are sparse for nurses who want to be research active in clinical settings (Orton et al., 2022). A detailed examination of nurse-led physical health care interventions will provide insights into the contribution nurses make to physical health practice, and research, and may identify scope for future clinician-researcher roles in nurse-led physical health intervention.

Given the well accepted poor physical health of mental health consumers compared with the general population (Correll et al., 2017; Solmi et al., 2021) and subsequent obvious need for beneficial physical health intervention, identification and description of nurse roles among literature reporting nurse-led physical health interventions for consumers is salient. Nurses provide care among, for example, acute inpatient, community, secure extended care, and forensic mental health settings, yet a systematic method has not been used to report on the state of knowledge on nurse-led physical health intervention with focus on nursing roles,

nursing assessment, and intervention settings. To address this knowledge gap, synthesis of literature is needed to describe mental health nurse roles, assessments, and settings and identify capability and capacity. Such synthesis could also inform future strategies to support and promote the integral role of nurses in the provision of evidence-based practices informed by nurse-led physical health research.

Aim

The aim of the current review was to explore and synthesise the state of knowledge on nurse-led physical health intervention for consumers. The questions that guided the review were: (1) how are nurses leading formal physical health intervention research? (2) among what settings are nurses conducting formal physical health intervention research? (3) what physical health characteristics are assessed to measure physical health status in formal nurse-led research?

Methods

Research design

This integrative review includes literature on nurses' roles in nurse-led intervention studies for the physical health of people experiencing mental illness. An integrative review is appropriate in this context since they are broad in nature and present the current state of knowledge of a research question and identify existing gaps which point to areas for future research (Toronto, 2020). Integrative reviews allow for inclusion of all methodologies in a systematic and orderly process with the purpose of critically evaluating and synthesising available evidence to provide a more comprehensive understanding about the question addressed (Whittemore & Knafl, 2005). The present review was guided by the five-stage process of Whittemore and Knafl (2005). The review was registered with PROSPERO in June 2022 (CRD42022321337).

First stage: formulation of the research aim and guiding question.

Second stage: search of the literature. The search was reported using PRISMA guidelines and the PRISMA flowchart (Page et al., 2021) (see Figure 1).

Inclusion criteria

Studies included in the review met the following criteria: (1) published in English, (2) published between 2001 and 2022, (3) published in peer reviewed journals, (4) included adults of any gender or age with a clinical diagnosis of any mental illness, (5) were conducted in any setting (inpatient, outpatient, community etc.), (6) included an interventional component, and (7) identified nurses as undertaking one or more roles in the interventional study in line with established criteria (Jacob et al., 2022).

Exclusion criteria

Studies were excluded from the review if they: (1) focussed on people with dementia/Attention Deficit and Hyperactivity
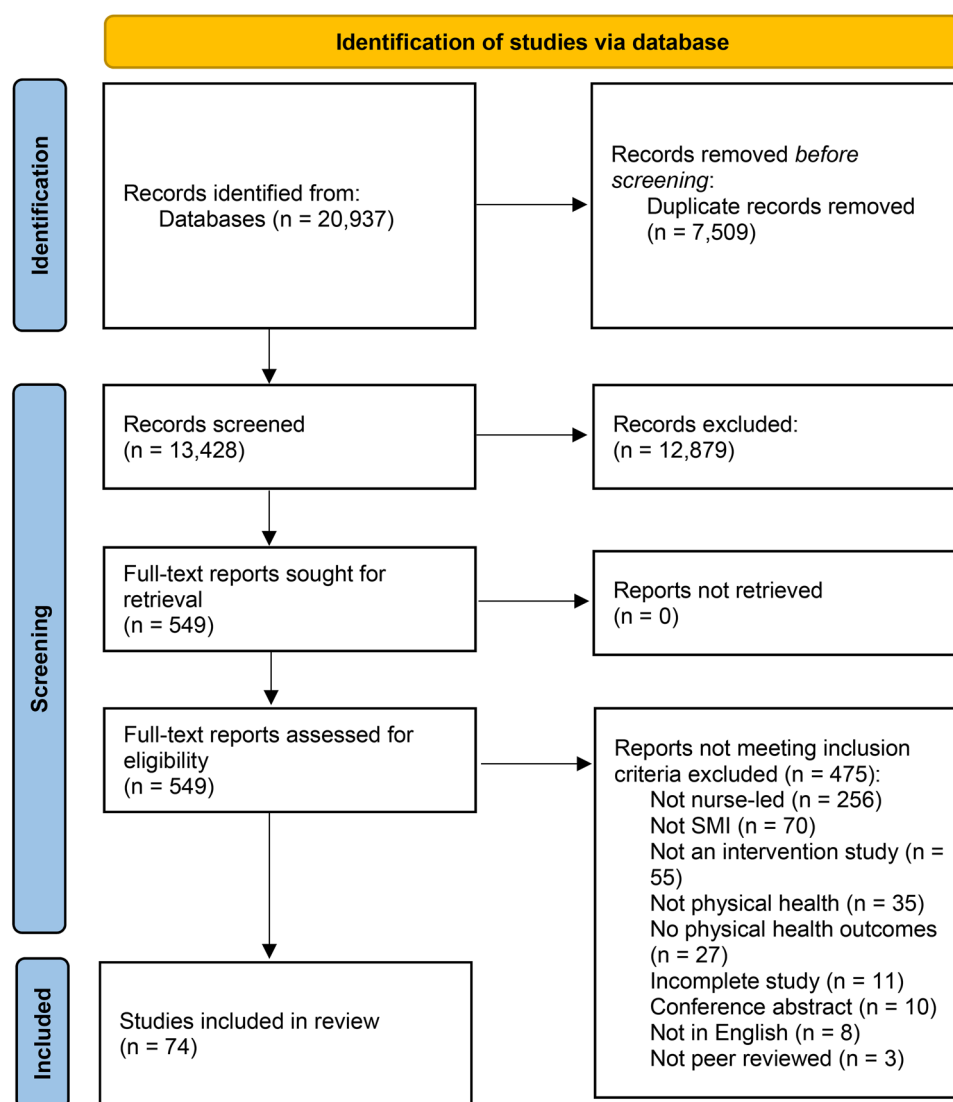
Identification of studies via database

Figure 1. PRISMA flowchart of included studies.

Syndrome, (2) included people under 18 years of age, (3) were not published in peer reviewed journals, (4) were not original research studies, (5) were conference papers/study protocol/dissertations/study not yet completed, (6) provided secondary analysis of data previously reported in another publication, (7) only included staff perceptions, (8) did not include physical health outcomes, and (9) did not identify nurses having any role in the interventional study. Grey literature was excluded from this study as the aim was to identify nurse roles and participation in the formal research process.

Third stage: data collection and evaluation. Six databases were searched for relevant literature (Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, Medline, ProQuest, Embase and PsychInfo). A reference management program (Covidence, Veritas Health Innovation, Melbourne, Victoria, Australia) was used to import the search results. Studies were screened at abstract by two reviewers (AJ and AS, [details removed for blind review]). To ensure that all relevant studies were included, any papers considered relevant by either reviewer were included to full

text review. Full text review was performed by two reviewers. Conflicts were resolved by way of wider team consensus. Key search terms included "Nurse", "Serious Mental Illness, "Physical Health" and MeSH variants and combined using relevant Boolean operators (see Table 1).

Quality appraisal of the final studies for inclusion was performed independently by two reviewers using the Mixed Methods Appraisal Tool (MMAT, version 2018) (Hong et al., 2018). Conflicts were resolved by further authorship team discussion to reach consensus.

Fourth stage: data/content analysis. Content analysis included identification of nurse types, nurse role/s in studies, study setting, and outcome measures. Research design (quantitative, qualitative, mixed methods), and location (country). Outcome measures were grouped into six discrete categories. Explanation of the categories and their inclusion criteria is set out in the results and Table 2. Full details are provided in Table 3.

Fifth stage: discussion of results and presentation of the integrative review. Tabular and diagrammatic presentation was used. The review was drafted, and content synthesis

Table 1. Description of outcome categories used for analysis.

Category	Description	Examples	Number of sub-groups in category	Number of outcomes recorded
Non-invasive, objective outcomes	Outcomes that can be measured in an objective way without the use of an invasive test.	Weight, blood pressure, step counts, health service usage	11	163
Invasive test/medical treatment/medication outcomes	Outcomes that require an invasive medical test to measure OR by their nature require the person to have received an invasive procedure or medication.	Blood glucose, viral loads, PRN medication use	12	67
Non-invasive subjective/ self-reported physical outcomes	Outcomes that are self-reported by participants and able to be impacted by reporting bias.	Dietary habits, sexual habits, sleep habits.	13	58
Engagement	Outcomes that look at engagement with interventions.	Attendance rates, completion rates, motivation to change	4	26
Wellbeing	Outcomes that record subjective perceptions of wellbeing in a quantitative way using survey or other tools.	Self-esteem, quality of life scores, social functioning.	3	17
Qualitative/ perceptions	Outcomes that are subjective, designed to explore personal experience and reliant on the perceptions of the individual participant.	Comments from qualitative interviews	1	6
Other	Outcomes that did not fit other categories.	Health service usage costs, clinician perceived difficulty of care, comprehensiveness of care.	3	4
		Total	51	341

concluded to form an integrated summation of the role nurses play in nurse-led interventions for the physical health of people with serious mental illness.

Results

Study characteristics

Seventy-four studies met the inclusion criteria. Interventions were conducted across 20 different countries. Twenty-six studies (35%) were conducted in The United States, 13 (18%) studies were conducted in each Australia and in The United Kingdom, 6 (8%) in Sweden, 4 in the Netherlands (5%), 2 in Turkey (3%) and 1 study each in Belgium, Canada, China, Denmark, Finland, France, Greece, Korea, Spain, and Thailand.

Study types and quality

The study identified 24 (32%) randomised controlled trials, 30 (41%) quantitative non-randomised trials, four (5%) qualitative studies, 10 (14%) quantitative descriptive studies and six (8%) mixed methods studies. Study quality was assessed using the MMAT tool (Hong et al., 2018) (see Table 3). The MMAT tool is not used to score studies into high or low quality, but rather details specific limitations that can be considered within the context of each study (Hong et al., 2018). Studies were not excluded based on level of quality.

Intervention settings

Studies were conducted in Community Setting ($n = 34$, 46%), Outpatient Settings (n = 15, 20%), Inpatient Settings $n = 13$, 18%), Assisted Living ($n = 7$, 10%), and at discharge ($n = 2$, 3%). There were three (4%) studies that were classified as "Combination" as they were conducted across more than one setting.

Nurse types

The most commonly identified type of nurse was "Mental Health Nurse" in 23 (31%) studies, followed by "Nurse (unspecified)" in 21 (28%) studies, "Nurse Practitioner" in 14 (19%) and "Registered Nurse" in 7 (10%) studies. The nurses in 9 (12%) studies did not fit within broader categories, including studies where the Nurse was described as an Advance Practice Nurse, Enrolled Nurse, and Nursing Assistant.

Roles of nurses in physical health interventions

The roles that nurses performed within the identified studies varied. The most common role performed by nurses was delivering interventions, identified in 55 of the 74 studies (74%). Nurses were specifically referred to as collecting data in 24 of the 74 studies (32%). Nurses often performed multiple roles within individual studies, with 225 roles identified across the 74 studies. The role that nurses performed differed between the identified broad categories of nurses as outlined in Figure 2. Of the included studies, 46 (62%) included nurses as lead authors on the manuscript (based on published author credentials) and 43 (55%) included nurses in the authorship team in other positions of order.

Physical health characteristics assessed by nurses

In the identified studies nurses assessed a range of intervention and physical health outcomes. For the purpose of the present review, outcomes were grouped into six discrete categories. Three categories related to measurement of physical health determinates such as weight, sleep habits or viral loading. The other categories related to specific study effectiveness measures such as program attendance rates, quality of life scores or health service usage during or following intervention periods. Further details are outlined in Table 2. Studies routinely assessed more than one outcome measure.

Table 2. Descriptors of included studies.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Bartels et al., 2014).	Germany Community	Quantitative RCT 4yr study	Total= 183 INT = 90 Control= 93 Inclusion: Adult 50 years +, diagnosis of schizophrenia or schizoaffective disorder or bi-polar or major depression, persistent impairments in multiple areas of functioning. Exclusion: living in nursing home, primary diagnosis of dementia, significant cognitive impairment, current substance dependence, terminally ill.	Nurse (not specified) Conducted intervention,	BP, visual acuity, hearing, serum cholesterol, flu vaccination, cancer screening, ACD, acute service use	National Institute of Mental Health
(Beebe & Smith, 2010)	United States Outpatient. Community Mental Health Centre	Quantitative non-RCT 4 week intervention	Total = 17 Inclusion: Adult 18+, diagnosed SMI, HIV seropositive, receiving case management for mental health support.	Mental health nurse. Participant recruitment. Conducted intervention, lead author, other author.	Attendance at intervention sessions.	National Institutes of Health
(Bernard et al., 2013)	France Inpatient.	Quantitative non-RCT 8 week intervention	Total = 12 Inclusion: Adult 18+, diagnosed with schizophrenia or schizoaffective disorder, smoke >15 cigarettes a day for >1 year, able to participate in group activities, speak French. Exclusion: diagnosed substance abuse, intellectual disability, uncontrolled hypertension, severe chronic obstructive pulmonary disease.	Mental Health Nurse Participant recruitment. Supported intervention.	Wt, Ht, BMI, WC, cigarettes smoked in last 7 days, expired air CO concentration, smoking behaviour	no
(Blank et al., 2011)	United States Community. In-home consultations	Quantitative RCT 12 month study	Total = 238 INT = 128 Control = 110 Inclusion: Adult 18+, diagnosis of HIV, diagnosis of SMI, actively receiving mental health services	Nurse practitioner Participant recruitment, conducted intervention. Advised project team. Other author.	Viral loads & CD4 cell counts, condom use Alcohol and drug use, HIV knowledge, current medication use, hospitalisations, sexual relationships.	Yes (funder not stated)
(Blank et al., 2014)	United States Community. In-home consultations	Quantitative RCT 12 month study	Total = 238 INT = 128 Control = 110 Inclusion: diagnosis of schizophrenia or schizoaffective disorder, able to speak English, medical clearance for moderate exercise. Exclusion: mental retardation, developmental delay, hearing or visual impairments, congestive heart failure, pacemaker, uncontrolled hypertension, history of spinal or hip fractures, neuromuscular or orthopaedic limitations.	Nurse practitioner Conducted intervention.	HIV viral loads, CD4 counts	National Institute on Drug Abuse; National Institute for Nursing Research; The Penn Centre for AIDS Research; The Penn Mental Health AIDS Research Centre
(Blixen et al., 2018)	United States Community. Primary care	Qualitative 60 week study	Total = 10 Inclusion: Adult 18+, diagnosed schizophrenia or schizoaffective disorder or bipolar or major depressive disorder, diagnosed diabetes type 2, able to communicate in English.	Nurse educator (other) Study design, conducted intervention, program evaluation.	Perceptions of intervention.	National Centre for Research Resources

(Continued)

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Blomqvist et al., 2019)	Sweden Outpatient. Outpatient services and supported accommodation	Quantitative non-RCT 2 year, 11 month study	Total = 67 INT = 54 Control = 13 Inclusion: Adult 18–66 years, receiving ongoing psychiatric treatment, received at least 1 face to face counselling session, exclusion: admission for inpatient care.	Mental Health Nurse Study design, participant recruitment, conducted intervention, data collection, evaluate program, lead author, other author.	Ht, Wt, BMI, sagittal abdominal diameter, WC, BP, glycated Hb A1c values Self-reported health and health behaviour changes; salutogenic health and symptoms of illness.	Regional Council for Medical Health Care Research
(Bressington et al., 2018)	China Community. Community psychiatric nursing service	Quantitative RCT 12 month study	Total = 137 INT = 69 Control = 68 Inclusion: Adults 18–65, DSM diagnosis of schizophrenia or bipolar or schizoaffective disorder, able to understand either English or Chinese.	Mental health nurse Conduct intervention, collect data. lead author, other author.	BMI, WC, BP, pulse, cholesterol levels, dietary habits, exercise levels, fluid intake, alcohol use, substance misuse, self-checking behaviours, smoking status, regularity of health check-ups, bowel habits, sleep, urination concerns, caffeine intake, sexual functioning, safe-sex practices.	The Hong Kong Polytechnic University
(A. M. Brown, 2017)	United States Inpatient. inpatient psychiatric unit	Quantitative non-RCT 12 month study	Total = 133 Inclusion: Inpatient psychiatric patients, receiving Electro-convulsive therapy.	Nurse (not specified) Study design, conducted intervention, collect data, data analysis and interpretation, lead author.	Falls rates, knowledge about mitigating falls risks,	Not stated
(T. Brown et al., 2018)	Australia Inpatient. Intensive care area of an adult acute inpatient mental health unit.	Quantitative non-RCT Data audit 2 x 6 month periods of data	Total = 497 Inclusion: Adult, Residents of inpatient mental health unit,	Nurse practitioner, registered nurse. Conducted intervention, other author.	BP, WC, BMI, fasting BGL, lipid profile	Victorian Nurse Practitioner Project
(Brunero et al., 2008)	Australia Outpatient. outpatient clozapine clinic	Quantitative non-RCT 3 month intervention	Total = 68 Follow-up n = 43 Inclusion: consumers at Clozapine clinic, diagnosis of schizophrenia	Mental health nurse, registered nurse. Participant recruitment. Support intervention. Collect data, data analysis, lead author, other author.	Knowledge of physical health, fasting BGL, total cholesterol, Wt, BP	NSW Department of Health
(Burgel et al., 2018)	United States Community. Primary care, and dental centres	Quantitative non-RCT 6 month study	Total = 43 Inclusion: Adults 18+, at least one primary mental behavioural or emotional diagnosis, part of transitional residential care program,	Nurse practitioner, registered nurse. Study design, conducted intervention, lead author, other author.	Attendance at appointments, completion of dental care plan. Number of case management contacts, number of failed, missed or completed appointments.	HSRA Nurse Education, Practice, Quality and Retention Grant & U.S. Department of Education, On-Campus Federal Work-Study Program Agreement
(Castillo et al., 2015)	United States Community. Assertive Community Treatment teams	Quantitative RCT 6 month study	Total = 199 Inclusion: ACT consumers, primary school graduates, BMI > 23.0. Exclusion: pre-existing diagnosis of metabolic syndrome	Nurse (not specified) Support intervention, other author.	WC, BP, BGL, triglycerides, HDL cholesterol	No

(Continued)

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Celik Ince & Partlak Gunusen, 2021)	Turkey Community. Community Mental Health Centre	Quantitative non-RCT 12 month study	Total = 51 INT = 27 Control = 24 Inclusion: Adult 18+, diagnosis of SMI, stable and able to participate in education, not hospitalised in past >3 months, no change in psychotropic drugs in >3 months. Exclusion: pregnant, intellectual disability, special dietary requirements, physical mobility constraints.	Mental health nurse Development of intervention. Conducted intervention. Lead intervention. Data analysis. Lead author. Other author.	BMI, Wt, WC, daily step count, nutrition habits, physical functioning.	Not stated
(Chafetz et al., 2008)	United States Inpatient. Crisis Residential Units	Quantitative RCT 12 month study	Total = 309 INT = 155 Control = 154 Inclusion: Adult, Crisis residential Unit patients Exclusion: severe cognitive disorder, non-English speaking, sole diagnosis of adjustment disorder	Nurse practitioner Study development, conduct intervention, lead author.	Self-perceived health status, global assessment of functioning.	Not stated
(Chiverton et al., 2007)	United States Community	Quantitative non-RCT 16 session intervention (individualised duration)	Total = 87 Inclusion: Adults 18+, English speaking, SMI.	Mental health nurse Conduct intervention, data collection, lead author, other author.	Health risk status, care satisfaction, haemoglobin A1C levels.	Not stated
(Druss et al., 2010)	United States Community. Urban community mental health centre	Quantitative RCT 12 month study	Total = 407 INT = 205 Control = 202 Inclusion: Adults 18+, serious or persistent mental illness, LDL cholesterol >160 mg/dL, economically disadvantaged, from Atlanta Georgia	Registered nurse Conducted intervention, other author.	Eligible preventive services used; screening tests undertaken; eligible vaccinations undertaken; education sessions attended.	NIMH
(Druss et al., 2017)	United States Community. Community mental health centre	Quantitative RCT 12 month study	Total = 447 INT= 224 Control= 223 Inclusion: SMI (schizophrenia, schizoaffective disorder, bipolar disorder, major depression, obsessive-compulsive disorder, or posttraumatic stress disorder, with or without comorbid substance use) and one or more cardiometabolic risk factors. Exclusion: cognitive impairment	Nurse practitioner, nurse (unspecified) Conduct intervention, support intervention.	Quality of cardiometabolic care received fasting BGL, fractionated cholesterol, haemoglobin A1c (HbA1c),Framingham risk score.	NIMH
(Duffy et al., 2015)	United States Inpatient. Multiple Hospitals	Quantitative non-RCT 6 month study	Total = 289 INT = 147 (pre-int = 58, post int = 89) Control = 142 (pre= 77, post = 65) Inclusion: Veterans, smoked in past 1 month, admitted to hospital for psychiatric or substance abuse disorder, projected hospital stay >24hrs. Exclusion: terminal illness, too ill to participate, pregnant, non-English speaking, involved in concurrent trial.	Registered nurse Study design, conduct intervention, data collection, lead author, other author.	Self-reported smoking cessation rate; cotinine-verified smoking cessation rate	Department of Veterans Affairs
(Eldridge et al., 2011)	United Kingdom Community. secondary mental health care setting	Mixed Methods 12 month study	Total = 782 Inclusion: SMI (schizophrenia or bi-polar), enrolled in Wellbeing support program.	Mental health nurse, nurse (unspecified) Advise project team, lead intervention, conduct intervention, data collection.	Number of participant completions; BMI; hypertension; smoking status; alcohol use; substance use; physical activity; diet; self-esteem; qualitative perceptions of program.	Not stated

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Fenton et al., 2021)	United States Outpatient. Integrated Care Clinic	Quantitative non-RCT 12 week study	Total = 29 Inclusion: Adults 18+, diagnosis of SMI (schizophrenia, bipolar disorder, schizoaffective disorder or major depressive disorder), diagnosis of diabetes or pre-diabetes, overweight or obese (BMI > 25 kg/m2), current participants of integrated care program. Exclusion: patients outside of department of community psychiatry	Nurse practitioner Conduct intervention, lead author, other author.	Wt; WC; BP; A1C; medication adherence	No
(Fernández Guijarro et al., 2019)	Spain Community. Community mental health centres	Quantitative RCT 24 week intervention	Total = 61 Inclusion: Adult 18–65 years, taking anti-psychotic medication, three or more risk factors for metabolic syndrome. Exclusion: serious cognitive disorder, medical contraindication for physical activity.	Mental health nurse Lead intervention, conduct intervention, lead author, other author.	Health status, BGL, HDL cholesterol, triglycerides, Ht, Wt, BP	No
(Fogarty et al., 2004)	Australia Inpatient. In-patients community care unit	Quantitative non-RCT 3 month intervention	Total = 6 Inclusion: Adult, psychiatrist confirmed diagnosis of schizophrenia, medically cleared for participation	Mental health nurse Study design, lead author, other author.	Wt, BP, pulse, endurance, muscle strength, upper limb strength, lung function, BMI	Department of Human Services, Victoria
(Fogarty & Happell, 2005)	Australia Community. Community Care Unit	Qualitative 3 month intervention	Total = 6 Inclusion: Adult 20–42 years, male, residents of a Community Care Unit	Nurse (not specified) Support intervention, lead author, data analysis, other author.	Qualitative perceptions	No
(Forsberg et al., 2008)	Sweden Assisted living. Supported housing facilities	Quantitative RCT 12 month study	Total = 41 Inclusion: DSM diagnosis of schizophrenia or bipolar or psychotic disorder or autism disorder, living in supported housing facilities. Exclusion: cognitive impairment.	Nurse (not specified) Supported intervention, data collection, lead author.	Hba1c, P-glucose, P-insulin, lipids, resting heart rate, systolic and diastolic BP, Wt, Ht, WC, BMI, Daily step counts, physical working capacity cholesterol level, smoking habits, BGL	The Vasterbotten County Council, The Swedish Institute for Health Sciences, The Swedish Council for Working Life and Social Research, Stiftelsen J C Kempes Minnes Stipendiefond and The Foundation of Medical Research in Skelleftea
(Forsberg et al., 2010)	Sweden Assisted living. Supported housing facilities.	Qualitative 12 month study	Total = 41 Inclusion: DSM diagnosis of schizophrenia or bipolar or psychotic disorder or autism disorder, living in supported housing facilities. Exclusion: cognitive impairment, previously involved with program pilot.	Mental health nurse Support intervention, lead author, other author.	Quality of life, level of functioning, psychiatric symptoms, sense of coherence, physical health program attendance.	Swedish Inheritance Fund, the Swedish Sports Confederation, the Vasterbotten County Council, The Vardal Institute – Swedish Institute for Health Sciences and the Swedish Council for Working Life and Social Research, J C Kempes memorial scholarship and The Foundation of Medical Research in Skelleftea.

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Forsberg et al., 2011)	Sweden Assisted living. Supported housing facilities	Qualitative 12 month study	Total = 82 Int =24 Interviews= 11 Inclusion: diagnosis of DSM-IV schizophrenia or bipolar or psychotic or personality disorder, living in supported living facility Exclusion: cognitive impairment	Registered nurse Study design, data collection, lead author, other author.	Qualitative perceptions	Not stated
(Frank et al., 2015)	United States Outpatient. Psychiatric Institute and Clinic and in-home	Quantitative RCT 6 month intervention	Total = 114 INT = 58 Control = 56 Inclusion: Adult 18–55 years, diagnosis of bipolar, currently in remission, BMI > 25. Exclusion: ultra rapid cycling bi-polar, pervasive developmental disorder, antisocial personality disorder, current substance dependence or abuse, unstable and severe medical illness, pregnant, breastfeeding or trying to become pregnant.	Nurse practitioner, mental health nurse. Conduct intervention, data collection.	BMI, Ht, Wt	National Institute of Mental Health grant MH081003 (DJK) and the Jan Mueller Trust Fund
(Fraser et al., 2018)	Australia Outpatient. outpatient clinic	Quantitative non-RCT 19 week intervention	Total n = 16 Inclusion: Adults, psychiatric diagnosis from DSM 5, prescribed psychotropic medication, not an inpatient, capacity to be ambulatory, residing in Brisbane. Exclusion: diagnosis of feeding or eating disorder	Registered nurse Participant recruitment, conduct intervention, data collection, lead author, other author.	WC, waist-to-height ratio, Wt, BP, physical activity.	Not stated
(Furness et al., 2020)	Australia Community mental health clinic or telephone	Mixed Methods 12 month study	Quantitative survey. n = 15 Inclusion: referred consumers Data Audit n = 2148 files Inclusion: all new admissions during study period Qualitative interviews. n=10 Inclusion: Attended appointment with NPC, willing to discuss experience with NPC, able to voluntarily consent.	Mental health nurse, nurse practitioner candidates. conduct intervention, other author.	BMI, WC, fasting BGL, total cholesterol, BP, cardiovascular diseases risk status rating. Consumer perspectives on physical health.	Not stated
(Gilbody et al., 2015)	United Kingdom Community. Home visits, and community health clinic	Quantitative RCT 12 month study	Total = 97 INT = 46 Control = 51 Inclusion: Adult 18+, diagnosed SMI, current smoker, expressed interest in smoking reduction. Exclusion: pregnant or breastfeeding, co-morbid drug or alcohol addiction, non-English speakers, unable to consent	Mental health nurse Conduct intervention, other author.	Smoking cessation, CO measure, self-reported abstinence, BMI, nicotine dependence measure, motivation to quit, health questionnaire, drug misuse.	National Institute for Health Research
(Hanrahan et al., 2014)	United States Discharge. In-hospital and followed up in home.	Quantitative RCT 90 day intervention	Total = 40 INT = 20 Control = 20 Inclusion: Adult 18–64 years, diagnosis of SMI, diagnosis of co-morbid medical condition, English speaking, living in Philadelphia	Nurse practitioner Advise project team, conducted intervention, lead author.	Hospitalisation rates, service utilisation, appointments scheduled pre-discharge, appointments scheduled post discharge, HRQoL score	Robert Wood Johnson Foundation Interdisciplinary Nursing Quality Research Initiative
(Happell, Stanton, et al., 2014)	Australia Community. Regional mental health clinics and follow-up in-home	Quantitative RCT 26 week intervention	Total = 21 Completed = 11 Inclusion: Adults, SMI diagnosis, attending community mental health service, identified by healthcare team.	Nurse (not specified) Participant recruitment, conduct intervention, lead intervention, data collection, lead author, other author	Duration of weekly physical activity, fruit/ vegetable intake, attitudes towards saturated fat, self-reported smoking status, alcohol consumption, health behaviour knowledge levels, health behaviour attitudes, awareness of public health messages	No

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Hardy et al., 2014)	England Community. primary care clinics	Quantitative non-RCT 12 month study Measures at baseline and 12 months	Total = 400 Inclusion: identified consecutively from SMI register of participating primary care clinics	Nurse (not specified) Conduct intervention, lead author, other author.	Number of screening domains assessed.	No
(Harney et al., 2021)	Australia Community. Community mental health clinics	Quantitative non-RCT Data audit 3 years of data	Total = 130 Inclusion: SMI diagnosis, history of injecting drug use within 6months,	Nurse practitioner Participant recruitment, lead intervention, conducted intervention, data analysis, advised project team, lead author, other author.	HCV testing, commencement of HCV treatment, cure of HCV positive	No
(Harrold et al., 2018)	United States Community. Veterans' Administration Medical Centre	Quantitative non-RCT 8 week study	Total = 49 Inclusion: Veterans, part of Mental Health Intensive Case Management Program.	Nurse practitioner Conduct intervention, support intervention, lead author.	Wt, step count, BP	SAMHSA. T
(Hjorth et al., 2017)	Denmark Outpatient. Regional Psychiatry clinic.	Quantitative non-RCT 30 month study	Total = 54 Inclusion: schizophrenia, receiving long term outpatient treatment Exclusion: living in residential care	Nurse (not specified) Conduct intervention, lead author, other author.	BMI, WC, Body fat percentage, BP, pulse, smoking habits, alcohol use, diet, sleep, active minutes	Not stated
(Jones et al., 2016)	Wales Assisted living. In-home	Quantitative non-RCT Point in time study	Total = 20 Inclusion: taking anti-psychotic or mood stabilising medication, accessed CRHT for 3 days or more during 2013, able to consent Exclusion: prescribed lithium	Nurse practitioner Recruit participants, conduct intervention, lead author	Number of adverse drug reactions identified	Pembrokeshire and Derwen NHS Trust research and development committee
(Jordan et al., 2002)	Wales Community. Community mental health clinic	Mixed Methods Point in time study	Total = 40 INT = 20 Control = 20 Inclusion: Adult, enduring mental illness, prescribed anti-psychotic medication, attended community mental health service, able to consent	Nurse (not specified) Conducted intervention, advise project team, program evaluation, other author.	Number of adverse drug reactions identified	Wales Office of Research and Development for Health and Social Care.
(Kane & Blank, 2004)	United States Community	Quantitative non-RCT - not stated	Total = 59 INT = 38 Control = 21 Inclusion: Adult 18–75 years, psychiatric condition, normal hearing and sight, English speaking Exclusion: mental retardation	Mental health nurse Study design, support intervention, conduct intervention, lead author	Psychiatric symptoms, community adjustment, disability, physical symptoms, health promotion orientation, consumer satisfaction	NIMH
(Klam et al., 2006)	Canada Outpatient. Outpatient schizophrenia service.	Quantitative non-RCT 8 month study	Total = 75 Inclusion: attending outpatient schizophrenia service, working with designated case manager	Nurse (not specified) Study design, conducted intervention, data collection, data analysis, lead author, other authors.	Wt, BP, fasting BGL, fasting lipids, BMI.	Ottowa Schizophrenia Service
(Knight et al., 2015)	United States Discharge.	Quantitative non-RCT 18 week study	Total = 38 Inclusion: Adult 21–55 years, diagnosis of schizophrenia bipolar depression or psychosis, prescribed anti-psychotic syndrome, two or more risk factors for metabolic syndrome, English speaking. Exclusion: involuntary patient, pregnant	Other Participant recruitment, conducted intervention, lead author, other author.	Wt, WC, BP, LDLs, triglycerides, BGL, healthy living goals,	Not stated

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Kurdal et al., 2014)	Turkey Outpatient	Quantitative non-RCT 11 week intervention Measures at baseline and 3 months post completion	Total = 80 INT = 40 Control = 40 Inclusion: Adult 18–60 years, patient at outpatient MH clinic, diagnosed with bipolar > 1 year, euthymic state, literate, not previous participant in program.	Mental health nurse Study design, conducted intervention, lead author,	Emotional functioning, intellectual functioning, sexual functioning, feelings of stigmatization, social withdrawal, household relations, relations with friends, participating in social activities, daily and recreational activities.	No
(Lee et al., 2014)	United States Outpatient. Tele-health at home	Quantitative non-RCT 8 week intervention	Total= 22 INT = 12 Control = 10 Inclusion: Adult 18–60 years, current or past diagnosis of schizophrenia, receiving psychotropic medication, medical clearance for moderate exercise. Exclusion: pre-existing cardiovascular, endocrine, or orthopaedic disorders, involvement in any other physical activity program	Nurse (not specified) Lead author, other author	Physical activity, BMI, WC, BP, fasting BGL, fasting lipid profiles.	Central Research Development Fund, University of Pittsburgh
(Lee et al., 2020)	Korea Combination. Inpatient Psych Unit and home based service users	Quantitative non-RCT 12 week intervention Measures at baseline and 16 weeks	Total = 40 Inpatient = 21 Community= 19 Inclusion: Adult 20+, Diagnosed schizophrenia, caregivers consent, stable body weight for >4weeks prior to study.	Nurse (not specified) Lead author,	Wt, BMI, WC, Triglycerides, cholesterol	Keimyung University
(Lewis et al., 2010)	United Kingdom Community. Assertive Outreach Team	Mixed Methods - not stated	Total = 76 Inclusion: existing clients of SMI assertive outreach program	Nurse (not specified) Study design, conducted intervention, conducted evaluation, lead author.	Substance abuse, current injecting drug use, screening for HCV, HCV diagnosis, methadone prescription, HAV,HBV vaccination, referral to liver disease service	Not stated
(Littrell et al., 2003)	United States Outpatient. Community Mental Health Centre	Quantitative non-RCT 4 month intervention Measures at baseline and 6 months	Total = 70 Inclusion: by referral, Adult 18+, Diagnosis of schizophrenia or schizoactive disorder, taking conventional anti-psychotics > 3 months, compliant with treatment prescribed.	Nurse (not specified) Conducted intervention, data collection, lead author	Wt, BMI	Not stated
(Looijmans et al., 2019)	Netherlands Community. Community Mental Health organisations, Assisted Living	Quantitative RCT 12 month study	Total = 244 INT = 140 Control = 104 Inclusion: SMI, accessing Flexible Assertive Community Treatment or living in sheltered facility. One or more heightened metabolic risk factors (WC, fasting glucose, cholesterol, BMI). Exclusion: pregnant, BMI < 19, physical impairment	Mental health nurse Designed intervention, conducted intervention, participated in evaluation of intervention,	WC, BMI, fasting BGL, metabolic syndrome (Z-score)	ZonMw
(McKenna, Furness, Wallace, et al., 2014)	Australia Community. Community mental Health services	Quantitative non-RCT Retrospective Data audit. 12 months of data	Total = 432 Inclusion: all new consumer episodes referred to service during study period	Registered nurse Conducted intervention, advised project team, lead author, other author.	BMI, fasting BGL, BP, WC, total cholesterol, triglycerides, low density lipoprotein level, high density lipoprotein level, exercise status, smoking status, aggregated cardiovascular disease risk	No

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Mechling & Arms, 2019)	United States Community. Community Mental Health facility	Quantitative non-RCT 6 month study	Total = 54 INT = 33 Control = 21 Inclusion: Adult 18+, diagnosed mood anxiety or psychotic disorder, receiving psychosocial rehabilitation, physically able to participate in exercise.	Nurse (not specified) Study design, conducted intervention, data collection, lead author, other author.	Wt, BMI, WC, BP	J. Richard Corbett Charitable Trust
(Meepring et al., 2018)	Thailand Outpatient. Hospital outpatient clinic	Quantitative non-RCT Measures at baseline and 12 months	Total = 105 Inclusion: Adult 18–65 years, Thai Resident, Diagnosis of SMI, able to consent Exclusion: primary substance misuse disorder	Mental health nurse Recruitment of participants, conducted intervention, data collection, evaluation of project, lead author, other author.	BMI, BP, flagged HIP-Thai items	Not stated
(Michael & MacDonald, 2020)	Australia Inpatient. Psychiatric inpatient unit	Quantitative non-RCT 12 month study Measures at baseline and 12 months	Total = 107 Pre = 61 Post = 46 Inclusion: all patients discharged from the inpatient psychiatric unit during study period	Nurse (not specified) Conducted intervention.	BMI, WC, BP, Lipids, BGL	No
(Michopoulos et al., 2015)	Greece Inpatient. Psychiatric inpatient unit	Quantitative non-RCT 12 month study	Total = 330 Smokers = 170 Inclusion: Inpatient admissions, consecutive sample	Other Conducted intervention, data collection.	Cigarettes per day	Not stated
(Muladore et al., 2018)	United States Inpatient. Psychiatric inpatient unit	Quantitative non-RCT Measures at 1 month pre-intervention and 1 month post	Pre= 24 Post= 30 Inclusion: Adults 18+, admitted to inpatient MH unit, used tobacco within 30 days of admission	Registered nurse Study design, conducted intervention, data collection, lead author	Nicotine replacement therapy use	Not stated
(Ohlsen et al., 2005)	England Community. Community Mental Health *Trust*	Quantitative non-RCT	Total = 134 Inclusion: Adult 18–65 years, SMI (Schizophrenia, bipolar or schizo-affective disorder), currently receiving anti-psychotic medication, able to consent, MH stable enough to allow participation	Other Study design, conducted intervention, advised project team, lead author, other author.	BP, Wt, BMI, prolactin levels, drug use, diet	Eli Lilly
(D. P. Osborn et al., 2010)	UK Community. Community Mental Health *Trust*	Quantitative RCT 6 month study	Total = 121 INT = 59 Control = 62 Inclusion: Adult, Current Community Mental Health patient, SMI Diagnosis Exclusion: too unwell to participate, receiving home treatment from crisis resolution team	Registered nurse Recruitment of participants, conducted intervention, data collection	Cardiovascular disease screening rates, participant satisfaction	UK Medical Research Council.
(D. Osborn et al., 2018)	England Community. GP practices	Quantitative RCT Measures at baseline, 6 and 12 months	Total = 327 INT= 155 Control = 172 Inclusion: Adult 30–75 years, current smoker, diagnosed SMI, Mean cholesterol 5.0 mmol/l or HDL 4.0 mmol/l and one or more additional cardiovascular risk factors Exclusion: currently using acute psychiatric services, diagnosed personality disorder, life expectancy < 6 months, pre-existing diagnosis of heart disease, pregnant	Nurse (not specified) Conducted intervention, data collection.	Cholesterol, cardiovascular disease risk scores, BP, lipid concentration, HbA, BMI, WC, diet, alcohol, smoking status, quality of life, wellbeing, medication adherence, uptake of statins, service satisfaction, service use, total healthcare costs.	National Institute of Health Research

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Pitkänen et al., 2012)	Finland Inpatient. Psychiatric hospitals	Quantitative RCT Measures at 12months	Total = 269 IT education = 86 Conventional education = 85 Control = 96 Inclusion: Adult 18–65 years, Diagnosis of schizophrenia or related disorders, able to speak and write in Finnish, able to consent Exclusion: unclear diagnosis	Nurse (not specified) Conducted intervention, data collection, lead author, other author.	Quality of life, functional impairment, program drop out rates	The Academy of Finland, The Medical Research Fund of Tampere University Hospital, and the Finnish Foundation of Nursing Education
(Pratt et al., 2013)	United states Community. Tele-health at Home	Quantitative non-RCT 6 month intervention	Total = 70 Inclusion: Adult 18+, accessed community mental health centre, Diagnosed SMI, moderate impairment in multiple domains of functioning, medical diagnosis of diabetes, chronic pain, chronic obstructive pulmonary disease or congestive heart failure, medical or psychiatric instability, able to read, access to landline phone at home. Exclusion: terminal illness, plans to relocate, diagnosis of dementia, significant cognitive impairment, current substance dependence, serious visual impairment.	Other Participant recruitment, supported intervention, data collection.	Intervention adherence, self-reported Wt, BP, BGL, health service utilisation, self-reported knowledge of illness	Robert Bosch Healthcare
(Pratt et al., 2015)	United States Community. Tele-health at home	Quantitative non-RCT 2 year study	Total = 38 Inclusion: Adult 18+, Diagnosed SMI, Multiple hospitalisations or calls to crisis line within previous 12 months, able to read, able to consent, access to landline phone at home Exclusion: terminal illness, plans to relocate, diagnosis of dementia, significant cognitive impairment.	Other Participant recruitment, supported intervention, data collection.	Hospital and emergency service utilisation, self-reported exercise ability, self-reported health and nutrition	Robert Bosch Healthcare, Palo Alto, CA.
(Robson et al., 2013)	UK Inpatient. Acute MH unit and Psychiatric Intensive Care Unit	Quantitative non-RCT 6 month study	Total = 46 Inclusion: Adult 18+, inpatient MH patients, smokers	Other Study design, advised steering committee, conducted intervention, lead author, other author.	Setting quit date, abstinence duration, carbon monoxide reading	The Mental Health Trust
(Rogers et al., 2016)	United States Community. Not for Profit Community Health Center	Quantitative RCT 12 month study Measures at baseline, 3, 6 and 12 months	Total = 200 INT = 94 Control = 106 Inclusion: SMI, eligible for public healthcare, actively receiving MH services, able to consent, Exclusion: Severe symptoms of SMI, unwilling to participate in assessments.	Nurse practitioner Conducted intervention, collected data	Access to primary care, comprehensiveness of care, engagement with treatment outreach program, work functioning, social functioning, general health status, healthy lifestyle habits	National Institute on Disability and Rehabilitation Research and the Substance Abuse and Mental Health Services Administration
(Rönngren, Björk, Audulv, et al., 2018)	Sweden Assisted living. Municipal Mental Health Centre	Quantitative non-RCT 26 week study	Total = 38 Inclusion: Adult 18+, Self-reported SMI, live in residential psychiatric care, able to speak Swedish Exclusion: Acute physical illness, active substance abuse, dementia	Other Lead intervention, collected data, interpreted results, lead author, other author.	6min walk distance, BMI, WC	No

(Continued)

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Rönngren, Björk, Kristiansen, et al., 2018)	Sweden Community. Municipal Mental Health Centre	Qualitative 4 month study	Total = 13 Inclusion: Aged 16–25 years, symptoms of mental illness, difficulty in self-care, difficulty with social skills, communicates in Swedish Exclusion: acute mental illness, active substance abuse, mental retardation	Nurse (not specified) Participant recruitment, lead intervention, collect data, lead author, other author.	Qualitative perceptions	Funded as evaluation
(Shuel et al., 2010)	Scotland Outpatient. Outpatient medication management clinic	Mixed Methods 10 month study	Total = 31 Inclusion: consecutive outpatients	Mental health nurse Lead intervention, data collection, data analysis, other author.	No of physical health issues identified, qualitative perceptions of screening	Bristol-Myers Squibb and Otzuka Pharmaceuticals Co, Ltd.
(Stanley et al., 2020)	Australia Discharge. Wellness clinic - within MH Hospital	Quantitative non-RCT 4 1/2 year study. Measures at baseline, 12, 24 and 36 months	Total = 57 Inclusion: SMI and: not engaged with GP and/or under care of Early intervention in psychosis team, prescribed clozapine or receiving intramuscular injections, or Aboriginal and/or Torres Straight Islander	Nurse practitioner Data collection, other author.	BP, heart rate, Wt, BMI, WC, lipids, smoking, thyroid-stimulating hormone, fasting BGL, haemoglobin A1c percentage, prolactin levels, HDL-C levels. service attendance.	The Curtain project
(Strong et al., 2017)	United States Outpatient. Community mental Health centre	Quantitative non-RCT 6 week intervention	Total = 12 Inclusion: A convenience sample of consumers who routinely attended a rural PRP	Nurse (not specified) Conduct intervention, lead author.	Step counts, pedometer usage	Not stated
(Thomas et al., 2006)	Australia Inpatient. Locked MH High Dependency Unit	Quantitative non-RCT 1 month study. 2 week crossover intervention.	Total = 228 Inclusion: all clints admitted to psychiatric High Dependency Unit Exclusions: none	Nurse (not specified) Conducted intervention, collect data, other author.	p.r.n medication usage	Not stated
(Usher et al., 2013)	Australia Community. Community Mental Health centre	Quantitative RCT 3 year study. 12 week intervention. Measures at baseline and 12 weeks.	Total = 101 INT= 51 Control= 50 Inclusion: 18+, SMI diagnosis, Not currently psychotic, Taking 2nd generation antipsychotics, living in North Queensland, speak and read English	Mental health nurse Study design, lead intervention, conducted intervention, lead author, other author.	Wt, medication compliance	Queensland Nursing Council, Eli Lily
(van Hasselt et al., 2014)	Netherlands Outpatient. Hospital - outpatient clinic	Quantitative non-RCT 2 year study	Total = 118 Inclusion: patients from specific outpatient departments at a general psychiatric hospital	Mental health nurse Conducted intervention, data collection	No of somatic health problems detected	not stated
(van Meijel et al., 2015)	Netherlands Combination. inpatient and outpatient services	Mixed Methods 12 week intervention	Total= 37 INT = 21 Control= 16 Inclusion: admitted to mental health ward at specific hospital Exclusion: Under 18 years, psycho-organic disorder, unable to communicate in Dutch, IQ <70, pregnant, severe somatic conditions, severe cognitive impairment, previously involved in program.	Mental health nurse Advised steering committee, conducted intervention, lead author, other author.	Wt, BMI, WC, BP, eating patterns, health perceptions, physical activity.	GGZ Central Mental Health Care and the In holland University of Applied Sciences, Amsterdam.
(van Veen et al., 2021)	Netherlands Community. Community mental health service centres	Quantitative RCT 12 month intervention Measures at baseline, 6, 12 and 18 months	Total= 93 INT = 59 Control = 34 Inclusion: Adult (18–65 years), non-psychotic disorder, able to communicate in Dutch, receiving long-term treatment (1 or more contacts per week). Exclusion: Psychotic bipolar, cognitive disorder	Mental health nurse Conducted intervention, lead author, other author.	Patient perceived quality of life, clinician perceived difficulty, treatment outcomes, illness outcomes, therapeutic relationship, care needs, social network	Stichting tot steun VCVGZ.

Table 2. Continued.

Author	Country location and setting	Study type and duration	Participants	Nurse type and nurse role**	Outcomes measured	Funding
(Verhaeghe et al., 2013)	Belgium Assisted living. Sheltered housing organisation	Quantitative RCT 10 week intervention Measures at 6 months	Total= 313 INT = 217 Control= 96 Inclusion: Adult (18–75 years), Mental Disorder, Sheltered Housing residents, Flanders Exclusion: 75 years+, gastric ring or pacemaker, cognitive impairment.	Mental health nurse Conducted Intervention.	Wt, BMI, WC, fat mass, physical activity	No
(White et al., 2018)	England Community. Outreach to patients in community	Quantitative RCT 4 year study Measures at baseline and 12 months	Total= 173 INT= 90 Control = 83 Inclusion: Adult (18+), able to give consent, ICD-10 diagnosis of schizophrenia, schizoactive disorder or bipolar disorder. Exclusion: pre-existing medical conditions, pregnant or >6 months post partum, posed risk to research or clinical team.	Nurse (not specified) Participant recruitment, conducted intervention, lead author, other author.	Number of nurse completed health checks, general wellbeing	Not stated

Note: ACD: advance care directives; ACT: assertive community treatment; BGL: blood glucose level; BMI: body mass index; BP: blood pressure; CRHT: crisis resolution and home treatment team; DSM: diagnostic and statistical manual of mental disorders; Ht: height; INT: intervention group; NP: nurse practitioner; NPC: nurse practitioner candidate; RCT: randomised controlled trial; SMI: serious mental illness; PRP: psychiatric rehabilitation program; WC: waist circumference; Wt: weight.
**Nurse role was determined by looking at tasks specifically allocated to a nurse in the text of the article. Roles were not assumed where data was not available. Nurse authorship was determined by looking at postnominals attached to authors in the text, or if no postnominals were mentioned then the authors name and institution were searched. Nurse authorship was not assumed if data was not available.

There were 341 discrete outcomes identified from the 76 studies (mean 4.5, range 2–11). Types of outcome measures assessed varied based on the type of nurse involved in the study, as seen in Table 4.

Discussion

In the current paper, peer reviewed literature was reviewed to identify a) nurse roles in physical health intervention, b) the settings where nurses conducted formal physical health intervention research in, and c) physical health characteristics nurses assess to measure physical health status. The review identified community settings as the most likely place for nurses to deliver physical health interventions. Nursing roles were most often reported to be collecting non-invasive objective physical health characteristics related to cardiovascular and cardiometabolic health.

Considering the prevalence of cardiovascular diseases in this population (Liu et al., 2017), it is perhaps not surprising that our review identified that nurses predominantly assessed physical health characteristics related to cardiovascular and cardiometabolic health. For the first time, the contribution of nurse practitioners assessing both non-invasive and invasive characteristics related to cardiovascular diseases such as blood lipids (Stanley et al., 2020) and blood glucose levels (Fenton et al., 2021) was confirmed. Advance practice roles are known to provide expert clinical practice and leadership (Creamer & Austin, 2017; Furness et al., 2020) and was demonstrated in the included literature of the current review (i.e. $n=14$) through leading and conducting physical health intervention, and leading peer reviewed publications (see Table 2).

Nurse-led physical health interventions were common among community settings ($n=34$; 46%). Community mental health settings are an ideal opportunity to develop partnerships, linkages, and referral to local organisations and supports (Department of Health, 2019) such as community health services and general practitioners (Furness, Wallace, et al., 2018). Among the included nurse-led literature, nurse roles varied from complete design and/or conduct of randomised controlled trials (Happell, Stanton, et al., 2014; Usher et al., 2013) to delivering physical health intervention that was not designed by nurses, yet described as "nurse-led" without the inclusion of nurses in the authorship team (Blixen et al., 2018). Part of this may be linked to the concept of medical dominance in healthcare, with medical doctors continuing to be overrepresented in setting research agendas, shaping ethical review processes and receiving research funding (Humphreys et al., 2014).

There are many distinct levels of involvement in research projects and people may differ in their aspirations towards research engagement. Most of the included literature reported a nurse as the lead author ($n=46$; 62%). Of the four included qualitative studies, three (75%) were reported with a nurse as lead author and involved with data collection (Fogarty & Happell, 2005; Forsberg et al., 2011; Rönngren, Björk, Kristiansen, et al., 2018). Those findings may be supported by the communication (Raeissi et al., 2019) and interpersonal (Kaur, 2020) expertise of nurses that may translate to skill in conduct of semi-structured interviews and focus groups. Despite the identified high proportion of nurses leading authorship, the term "nurse-led" was rarely included in the title of the study, abstract, or key words. The term, "nurse-led" recognises the significant

Table 3. MMAT quality assessment of included studies..

			Qualitative					Quantitative RCT					Quantitative non-RCT					Quantitative descriptive					Mixed methods				
Study reference \ MMAT point	S1.	S2.	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
(Bartels et al., 2014).	1	1						1	1	1	1	1															
(Beebe & Smith, 2010)	1	1											0	1	0	1	1										
(Bernard et al., 2013)	1	1											1	1	1	1	1										
Blank et al., 2011)	1	1						1	1	1	1	1															
(Blank et al., 2014)	1	1						0	1	1	1	1															
(Blixen et al., 2018)	1	1	1	1	1	1	1																				
(Blomqvist et al., 2019)	1	1											1	1	1	1	1										
(Bressington et al., 2018)	1	1						1	1	1	1	1															
(A.M. Brown, 2017)	1	1											0	1	0	1	1										
(T. Brown et al., 2018)	1	1											1	1	1	0	1										
(Brunero et al., 2008)	1	1																					0	1	1	0	0
(Burgel et al., 2018)	1	0																1	0	0	1	0					
(Castillo et al., 2015)	0	0																1	0	0	1	0					
(Celik Ince & Partlak Gunusen, 2021)	1	1											1	1	0	1	1										
(Chafetz et al., 2008)	1	1						1	1	0	0	0															
(Chiverton et al., 2007)	1	1																1	1	1	1	1					
(Druss et al., 2010)	0	1						0	1	1	0	1															
(Druss et al., 2017)	1	1						1	1	1	0	1															
(Duffy et al., 2015)	1	0											0	1	1	1	1										
(Eldridge et al., 2011)	1	1																					1	0	1	0	0
(Fenton et al., 2021)	1	1											0	1	1	0	1										
(Fernández Guijarro et al., 2019)	1	1						1	1	1	1	1															
(Fogarty & Happell, 2005)	1	1	1	1	1	1	1																				
(Fogarty et al., 2004)	1	1											0	1	0	0	1										
(Forsberg et al., 2008)	1	1						1	1	1	0	0															
(Forsberg et al., 2010)	1	1											1	1	0	1	1										
(Forsberg et al., 2011)	1	1	1	1	1	1	1																				
(Frank et al., 2015)	1	1						1	0	1	0	1															
(Fraser et al., 2018)	1	1											0	1	0	0	1										
(Furness et al., 2020)	1	1																					1	1	1	1	1
(Gilbody et al., 2015)	1	1						1	1	0	1	0															
(Hanrahan et al., 2014)	1	1						1	1	1	0	0															
(Happell, Stanton, et al., 2014)	1	1						1	0	0	0	1															

Table 3. Continued.

			Qualitative					Quantitative RCT					Quantitative non-RCT					Quantitative descriptive					Mixed methods				
MMAT point / Study reference	S1.	S2.	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
(Hardy et al., 2014)	1	1											0	1	1	0	0										
(Harney et al., 2021)	1	1											1	1	1	0	1										
(Harrold et al., 2018)	1	1																					0	0	0	0	0
(Hjorth et al., 2017)	1	1																1	0	1	0	1					
(Jones et al., 2016)	1	1											0	1	1	0	1										
(Jordan et al., 2002)	1	1																0	0	0	0	0					
(Kane & Blank, 2004)	1	1											0	1	0	0	0										
(Klam et al., 2006)	0	1											0	1	1	0	1										
(Knight et al., 2015)	1	1																1	1	1	0	0					
(Kurdal et al., 2014)**	1	0											1	1	0	0	1										
(Lee et al., 2014)	1	1						1	0	0	1	1															
(Lee et al., 2020)	1	1						1	0	1	0	1															
(Lewis et al., 2010)	1	1																1	0	1	0	0					
(Littrell et al., 2003)	1	1						1	1	0	0	1															
(Looijmans et al., 2019)	1	1						1	0	1	0	0															
(McKenna, Furness, Dhital, et al., 2014)	1	1																1	1	1	0	1					
(Mechling & Arms, 2019)	1	1											1	1	1	0	0										
(Meepring et al., 2018)	1	1											1	1	1	1	0										
(Michael & MacDonald, 2020)	0	1											1	1	0	1	1										
(Michopoulos et al., 2015)	1	1																1	0	1	0	1					
(Muladore et al., 2018)	1	1											1	0	0	1	0										
(Ohlsen et al., 2005)	1	1											0	1	0	0	0										
(D. Osborn et al., 2018)	1	1						1	1	1	1	0															
(D. P. Osborn et al., 2010)	1	1						1	1	0	0	0															
(Pitkänen et al., 2012)	1	1						1	1	0	0	0															
(Pratt et al., 2013)	1	1											0	0	0	0	0										
(Pratt et al., 2015)	1	1											0	0	0	1	0										
(Robson et al., 2013)	1	1																1	0	1	0	1					
(Rogers et al., 2016)	1	1						1	1	0	0	0															
(Rönngren, Björk, Kristiansen, et al., 2018)	1	1	1	1	1	1	1																				
(Rönngren, Björk, Kristiansen, et al., 2018)	1	1											0	1	1	0	0										
(Shuel et al., 2010)	1	1																					1	1	1	1	0

Table 3. Continued.

			Qualitative					Quantitative RCT					Quantitative non-RCT					Quantitative descriptive					Mixed methods				
MMAT point / Study reference	S1.	S2.	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
(Stanley et al., 2020)	0	1											0	1	0	1	0										
(Strong et al., 2017)	1	1											0	1	0	0	0										
(Thomas et al., 2006)	1	1											1	1	1	0	0										
(Usher et al., 2013)	1	1						1	0	1	0	0															
(van Hasselt et al., 2014)	1	1											0	1	0	1	0										
(van Meijel et al., 2015)	1	1																					1	1	1	0	0
(van Veen et al., 2021)	1	1						1	1	0	0	0															
(Verhaeghe et al., 2013)	1	1						1	1	0	0	0															
(White et al., 2018)	1	0											0	1	0	0	0										

Note: 0 = No/Not clear 1 = Yes.
[a]S1 and S2 refer to the screening questions in the MMAT. Numerals refer to the study design and respective questions for each study design. For example, 1.1–1.5 refer to qualitative studies; 2.1–2.5 refer to quantitative randomised controlled trials; 3.1–3.5 refer to quantitative non-randomised studies; 4.1–4.5 refer to quantitative descriptive studies; 5.1–5.5 refer to mixed methods studies. The complete MMAT manual with question and explanations is available at: http://mixedmethodsappraisaltoolpublic.pbworks.com/w/page/24607821/FrontPage.
[**]Nurse role was determined by looking at tasks specifically allocated to a nurse in the text of the article. Roles were not assumed where data was not available. Nurse authorship was determined by looking at postnominals attached to authors in the text, or if no postnominals were mentioned then the authors name and institution were searched. Nurse authorship was not assumed if data was not available.

Table 4. Study outcomes measured compared by nurse type.

	Mental health nurses ($n=23$)	Nurse (not specified) ($n=21$)	Nurse practitioner ($n=14$)	Other ($n=9$)	Registered nurse ($n=7$)	Total number of outcomes reported across all studies
Non-invasive, objective physical outcomes	56	44	29	18	17	164
Invasive test/medical treatment/medication outcomes	14	20	19	6	9	68
Engagement	6	10	3	2	4	25
Non-invasive subjective/self-reported physical outcomes	23	11	14	5	5	58
Qualitative outcomes	2	2	1		1	6
Wellbeing	6	3	2	2	3	16
Other	1	1	2			4
Total number of outcomes reported across groups	108	91	70	33	39	341

contributions made by nurses in research examining the physical health of people experiencing mental illness and has recently been operationalised in the literature (Jacob et al., 2022). Such inclusion could quickly enable journals, reviewers, and readers of relevant manuscripts to identify nurse-led research and encourage readership (Dash, 2016) beyond brief scrutineering of titles and abstracts (Kate et al., 2017).

Healthcare systems are rooted in historical hierarchies that place medical professionals at the forefront of research and decision making (Willis, 2020). Engaging nurses in the implementation of evidence-based practice is integral to improving care provision (Bianchi et al., 2018). Some nurses may be content to contribute to projects through data collection and facilitation of interventions without engaging with research leadership or seeking academic acknowledgement. However, nurses' contributions to research and leadership of research interventions continued to be widely overshadowed by medical professionals. Identifying and describing roles of nurses in leading research has potential to beneficially impact perception within the profession and may promote future nurse-led physical health intervention for consumers. Subsequent description and understanding of the role nurses have undertaken in nurse-led research and defining "nurse-led" may also provide access for nurses to be engaged as researcher-clinicians and initiate evidence-based practice (Jacob et al., 2022). Recognising the nursing workforce contributions in research has great potential to assist with creation and translation of high-quality evidence-based care for the physical health of people with mental health.

Limitations

There are several limitations to consider relative to the current integrative review. Literature included was limited to nurse-led physical health intervention for consumers. Therefore, scope of nurse-led physical health intervention for people with, for example, generalised anxiety disorders and depression were not identified. It was beyond
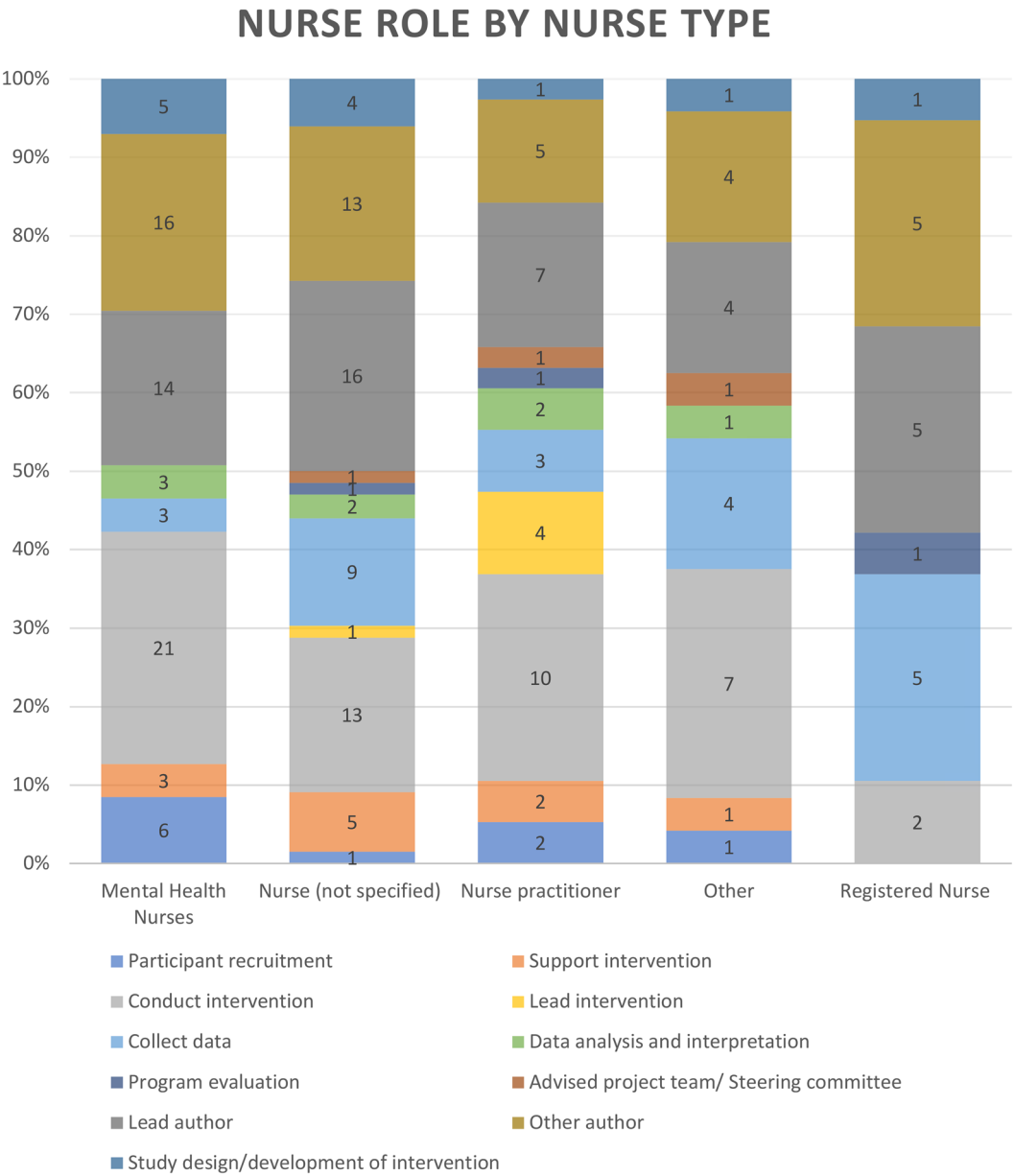
Figure 2. Nurse roles broken down proportionally by nurse type.

the scope of the current review to describe impact (i.e. pre/post changes in physical health outcomes, *p*-values) and efficacy (e.g. effect size or level of evidence generated) of nurse-led physical health intervention. Further systematic review of impact and efficacy of nurse-led physical health intervention is recommended to further describe the nurse-led literature. The current review identified several definitions/descriptions of "nurse" and approximately 40% (*n* = 30) of papers described nurse (unspecified; *n* = 21) and nurse (other; *n* = 9). Subsequent categorising and description of the scope and role of nurses involved in those studies may be confounded as the clinical and/or professional credentials/qualifications were unclear. Future nurse-led physical health intervention should clearly describe nurse credential, qualification, or role to allow a greater understanding and representation of the scope and role of nurses.

Conclusion

The current review identified nurses performing varied roles among the nurse-led physical health literature Nurses-led physical health intervention occurred across all mental health settings and involved the collection of 341 physical health outcomes. This demonstrated broad scope of nursing practice among nurse-led physical health intervention. There were instances where nurses were not recognised among authorship teams despite the physical health intervention being described as "nurse-led". A high proportion of included literature recognised a nurse as the lead author which indicates nurses are capable of leading and disseminating research. Such identification may promote future clinician-researcher roles aiming to improve consumer physical health as the scope and value of nurse-led roles begin to emerge.

Author contributions

All authors contributed to the design and/or conduct of the review. All authors approved the current version of the review.

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