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Core elements and potential of nurse-led care models in residential long-term care: A scoping review

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Abstract

Aims and objective: To identify and summarise core elements, resident-, staff- and process-related outcomes and challenges of nurse-led care models in residential long-term care.

Background: Due to demographic trends, the complexity of residential long-term care has increased. To address this complexity, the implementation of nurse-led care models has been recommended.

Design: Scoping review.

Methods: A systematic search was conducted of English and German articles in CINAHL via EBSCO, MEDLINE via PubMed, Cochrane Library and Scopus. Forward and backward citation tracking via reference lists and Google Scholar supplemented the search. The final update was made on 19 January 2021. To draw conclusions about the potential of nurse-led care models, evaluation studies of the described models for residents in nursing homes were included. Full texts were independently screened and assessed for methodological quality. Data were extracted and summarised in tables and synthesised for analysis. The core elements of the models were described using the Sustainable intEgrated chronic care modeLs for multimorbidity: delivery, FInancing and performancE (SELFIE) framework. The review followed the PRISMA-ScR guideline.

Results: We included 13 studies of 12 nurse-led care models. The different models comprised many of the core elements suggested in the SELFIE framework, particularly in the components *service delivery*, *workforce*, and *leadership and governance*. The studies reported a broad range of resident-, staff- and process-related outcomes and challenges considered relevant to the success of the models.

Conclusions: Studies evaluating nurse-led care models in nursing homes are limited and of moderate quality. This review demonstrates that nurse-led care models include many elements for care coordination and could improve resident-, staff- and process-related outcomes.

Relevance to clinical practice: This review highlights that nurse-led care models share common core elements despite their heterogeneity. It also shows that highly qualified nurses in nurse-led care models can advance nursing practice in nursing homes.

KEYWORDS

advancing nursing care, delivery of healthcare services, long-term care, models of care, nurse-led care, nursing home, organisation of care, person-centred care

1 | INTRODUCTION

In Germany, approximately 4.1 million people are care-dependent. Of these, 818,000 (20%) receive full residential care in 15,400 nursing homes (Statistisches Bundesamt, 2020). Of the total nursing home residents, approximately 70% are living with dementia (Schäufele et al., 2013). Due to demographic trends, an increase in the number of people with care dependency, multimorbidity and dementia is expected (Bertelsmann Stiftung, 2019). As a result, the complexity of nursing and medical care for residents in nursing homes will further increase. Major quality issues in nursing homes include an excessive use of medications, falls, pressure ulcers, malnutrition, incontinence, use of restraints and inadequately managed pain (MDS, 2020). Further challenges arise from the dementia-specific symptoms of the residents. In addition to cognitive impairments, communication difficulties and neuropsychiatric symptoms, such as agitation, depression, apathy, hallucinations, euphoria, delusions, and sleep or eating disorders, are relevant symptoms of dementia. According to an international systematic review, the weighted mean prevalence of nursing home residents with dementia having at least one neuropsychiatric symptom is 82% (Selbæk et al., 2013).

To meet the complex needs of nursing home residents, nurses are increasingly being proposed as leading coordinators internationally, as they have the most daily contact with those in need of care. Moreover, they are aligned with the needs and preferences of care recipients and their families and retain a holistic approach in their core activities (Cropley & Sanders, 2013; Khair & Chaplin, 2017; National Academies of Sciences, Engineering, & Medicine, 2021). As in international recommendations, the implementation of innovative nurse-led care models was recommended in the Concerted Action on Nursing of the Federal Ministry of Health in Germany (Bundesministerium für Gesundheit, 2019). In these models, highly qualified nurses should be deployed according to their competencies in new activities and roles, and interprofessional collaboration and coordination should be promoted to deliver goal-oriented, high-quality, effective and efficient care (Bundesministerium für Gesundheit, 2019). However, how these nurse-led care models are supposed to be designed remains unclear. For this reason, the purpose of this scoping review was to identify key characteristics and factors related to nurse-led care models in nursing homes to guide the development of nurse-led care in Germany.

This first required a definition. The term 'nurse-led care' is frequently used in the literature but has not yet been defined

What does this paper contribute to the wider global clinical community?

- This paper shows that nurse-led care models can enable early recognition and management of resident problems, promote interdisciplinary collaboration and advance nursing practice.
- It can serve as a foundation to inform the future development, implementation and evaluation of nurse-led care models in nursing homes.

consistently. Independent practice and scope for autonomous decision-making, as well as holistic care approaches, are understood to be important aspects of nurse-led care (Richardson & Cunliffe, 2003). The scope for autonomous decision-making can range from leading single episodes in interventions (e.g. leading minor oral surgery) to taking over complex care decisions in nurse-led services or clinics (e.g. leading transitional care for cognitive impaired older adults). Furthermore, nurse-led care can be delivered at different levels, depending on the nurse's qualification and expertise and the level of trust the physicians have in them (Khair & Chaplin, 2017; Richardson & Cunliffe, 2003). In this paper, we define 'nurse-led care' as care that is autonomously steered and coordinated by a nurse with advanced skills. This includes the assessment, planning, management and coordination of residents' care, which is carried out autonomously and under the responsibility of the nurse (holistic care approach). Therefore, the aspect of leading care in a 'nurse-led care model' refers to the organisation of activities with respect to the overall care goal. Here, it is crucial that not only the nurse's own actions but also the collaboration between two or more involved actors is coordinated by the leading nurse to achieve appropriate care for the individual resident (McDonald et al., 2007). The nurse leading the care model can be a nurse with a master's degree (e.g. advanced practice nurse, APN), a bachelor's qualified nurse, or a specialist registered nurse with advanced skills and high expertise in care. To be able to lead depends on the specific tasks the nurse is responsible for and the laws of the country in which the nurse works.

In this article, we map core elements of nurse-led care models with the SELFIE (Sustainable intEgrated chronic care modeLs for multimorbidity: delivery, FInancing and performancE) framework by Leijten et al. (2018). The SELFIE framework is, according to Peterson

et al. (2018), the most unique and comprehensive current framework in terms of the number of care coordination or integrated care concepts. Central to the SELFIE framework is the holistic understanding of the person with multimorbidity in his or her environment. Relevant concepts for the integrated care of people with multimorbidity are grouped around this core into an adapted version of the components of the World Health Organization (WHO) for describing health systems (*service delivery*; *workforce*; *leadership and governance*; *financing*; *technologies and medical products*; *information and research*). Each component is divided into micro, meso and macro levels. Given that most nursing home residents experience multimorbidity and dementia and that we consider the autonomous coordination and steering of nursing care and interprofessional care, as well as a holistic care approach to be key aspects of nurse-led care models, the SELFIE framework is well suited to illustrate the core elements of these care models. The SELFIE framework assumes that persons with multimorbidity benefit from person-centred, proactive, coordinated, multidisciplinary care. In terms of care coordination, continuity of care, clarification of responsibilities and naming a coordinating person are considered important for building good relationships and providing comprehensive care (Leijten et al., 2018). The SELFIE framework uses the term 'concept', which means an abstract idea or general understanding of something (e.g. self-management). Besides concepts, we use the term 'element', which means an essential part of a whole. The reason for this is to highlight the interconnectedness of the parts in the care models.

2 | AIMS

Since neither reviews nor national or international statements about core elements and potential of nurse-led care models in nursing homes exist, the aims of the scoping review were as follows:

1. To describe core elements of nurse-led care models available for residents in nursing homes according to the SELFIE framework;
2. To summarise the resident-, staff- and process-related outcomes associated with nurse-led care models in the included studies; and
3. To identify challenges considered relevant to the success of the models that could constrain the potential of nurse-led care models in the included studies.

3 | METHODS

To ensure high quality, the review was conducted according to the steps recommended for scoping reviews by the Joanna Briggs Institute: (1) defining and aligning the objective/s and question/s, (2) developing and aligning the inclusion criteria with the objective/s and question/s, (3) describing the planned approach to evidence searching, selection, data extraction, and presentation of the evidence, (4) searching for the evidence, (5) selecting the evidence, (6) extracting the evidence, (7) analysis of the evidence, (8) presentation of the results, and (9) summarising the evidence in relation to the purpose of the review, making conclusions and noting any implication of the findings (Peters et al., 2020). The reporting of the review followed the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Review) guideline by Tricco et al. (2018) (guidelines for reporting systematic reviews and meta-analyses (File S1)). No study protocol was registered.

3.1 | Inclusion and exclusion criteria

We used the following inclusion and exclusion criteria (Table 1).

3.1.1 | Participants

We included all studies that examined staff connected to nursing homes and/or adults (age ≥18 years old) living in nursing homes, regardless of their gender, race, or functional and cognitive abilities.

3.1.2 | Concept

For the purpose of this review, we defined a 'nurse-led care model' as described in the background. In our understanding, a nurse-led care model should include the assessment, planning, management, monitoring and evaluation of care in accordance with the general steps of the care process. Studies that did not focus on nurse-led care models or evaluated only single interventions were excluded.

TABLE 1 Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Participants	• Adult residents; staff connected to nursing homes	• Children/adolescents, relatives, hospital patients
Concept	Nurse-led care model • Nurse with advanced skills; works autonomously • Model: resident-centred; interdisciplinary	• Models in which nurses are involved but not coordinating/leading care • Single interventions
Context	• Nursing homes	• Outpatient, hospital, clinic centre • Recruitment during hospitalisations or primary care visits
Type of evidence sources	• Qualitative/quantitative evaluation studies • Scientific studies	• Summaries/comments/discussions

3.1.3 | Context

This scoping review included only studies conducted in nursing homes. This included residential aged care facilities and (long-term) care homes. We excluded studies that focused on adults in hospitals, clinical centres, community settings, assisted living or outpatient care. Studies that conducted initial assessment or recruitment of participants in a hospital or in primary care settings were also excluded, as the models we were interested in should have an explicit focus on residents of nursing homes.

3.1.4 | Types of evidence sources

To draw conclusions about the potential of nurse-led care models, we included peer-reviewed studies with any evaluation of the described model. These included randomised controlled trials, nonrandomised controlled trials, before-and-after studies, retrospective and prospective cohort studies, mixed-method studies and qualitative studies. We excluded nonscientific or non-peer-reviewed studies, such as commentaries or conference abstracts.

3.1.5 | Outcomes

To assess the potential of the models, all resident-, staff- and/or process-related outcomes were collected. No primary or secondary outcomes were prespecified. We did not specifically define the recording of outcomes associated with the nurse-led care model.

As the aim was to capture the largest possible number of previously conducted evaluations of nurse-led care models in nursing homes, no restrictions were applied regarding the year of publication. The literature search was limited to papers published in English or German.

3.2 | Search strategy

We conducted a computerised search in June 2020 using the databases MEDLINE via PubMed, CINAHL via EBSCO, Scopus and Cochrane Library. The final update was performed on 19 January 2021.

We used a three-stage search strategy in this review. To identify all nurse-led care models in nursing homes, we first conducted a limited search of MEDLINE via PubMed to identify keywords and MeSH terms from relevant studies and used these to develop a complex search strategy. This search strategy was guided by the principles of a systematic search. The combination of search terms was then adapted for CINAHL via EBSCO, Scopus and Cochrane Library and used in all databases in the second search. After selecting the relevant literature, we performed forward and backward citation tracking via the reference lists of the included studies and relevant reviews identified by the search and Google Scholar in the third stage. Study protocols or general model reports of the included care models were obtained from Google Scholar and project websites as additional information. In

those cases where we found only a study protocol or a model description but no evaluation of the model, we contacted the study authors. The complete search strategies for all the databases are presented in Appendix 1.

3.3 | Study selection

After removing duplicates, the first author (KS) screened the titles and abstracts of all the search results to identify appropriate studies that met the eligibility criteria. A sensitive approach was taken so that studies about which there was uncertainty were included in the full-text screening. Following the selection of potentially relevant articles, full-text reports of the studies were obtained and reviewed for inclusion and exclusion by two independent reviewers (KS and JK). Any disagreements about the eligibility of a study were resolved by discussion or—if no consensus could be reached—by involving a third experienced researcher (BH).

3.4 | Quality assessment

The methodological quality of the included studies was assessed by two independent reviewers (KS and JK) using the Mixed Methods Appraisal Tool (MMAT). The MMAT is a valid and reliable critical appraisal tool designed for mixed-method systematic studies and assesses the quality of papers using key quality criteria for randomised controlled trials, nonrandomised trials, qualitative studies and mixed-method studies (Hong et al., 2018). Any disagreements that arose regarding the assessment of a study were resolved through discussion. The assessment of the quality of each study was intended to provide transparency. No study was excluded based on its quality assessment after this step.

3.5 | Data extraction

A standardised data extraction form was developed (s. Appendix 2) and pilot-tested using three of the included studies. Adjustments were made as needed. Subsequently, data from each included study were extracted independently by two reviewers (KS and JK). Any disagreements between reviewers were resolved by discussion or—if no consensus could be reached—by involving a third reviewer (BH). The data extraction form included the following specific details: source (author(s), year of publication, origin), aims, context, study design and methods, characteristics of the participants and sample size, inclusion and exclusion criteria, outcomes, and the description of the concept—the nurse-led care model. Extraction items describing the nurse-led care model were selected following TIDieR (Template for Intervention Description and Replication) (Hoffmann et al., 2014) and CReDECI 2 (Criteria for Reporting the Development and Evaluation of Complex Interventions in health care) (Möhler et al., 2015).

3.6 | Syntheses of the extracted evidence

The included studies were highly heterogeneous in terms of the design of nurse-led care models, comparisons or control interventions, and outcome measures. For this reason, both quantitative and qualitative study results were illustrated in the form of figures and tables or presented in a narrative summary to derive evidence of current approaches and findings regarding nurse-led care models in nursing homes. The identified nurse-led care models were analysed using the six components and concepts of the micro and meso levels of the SELFIE framework (Leijten et al., 2018). To derive the potential of nurse-led care models, we described the challenges considered relevant to the success of the models in the included studies in addition to resident-, staff- and process-related outcomes.
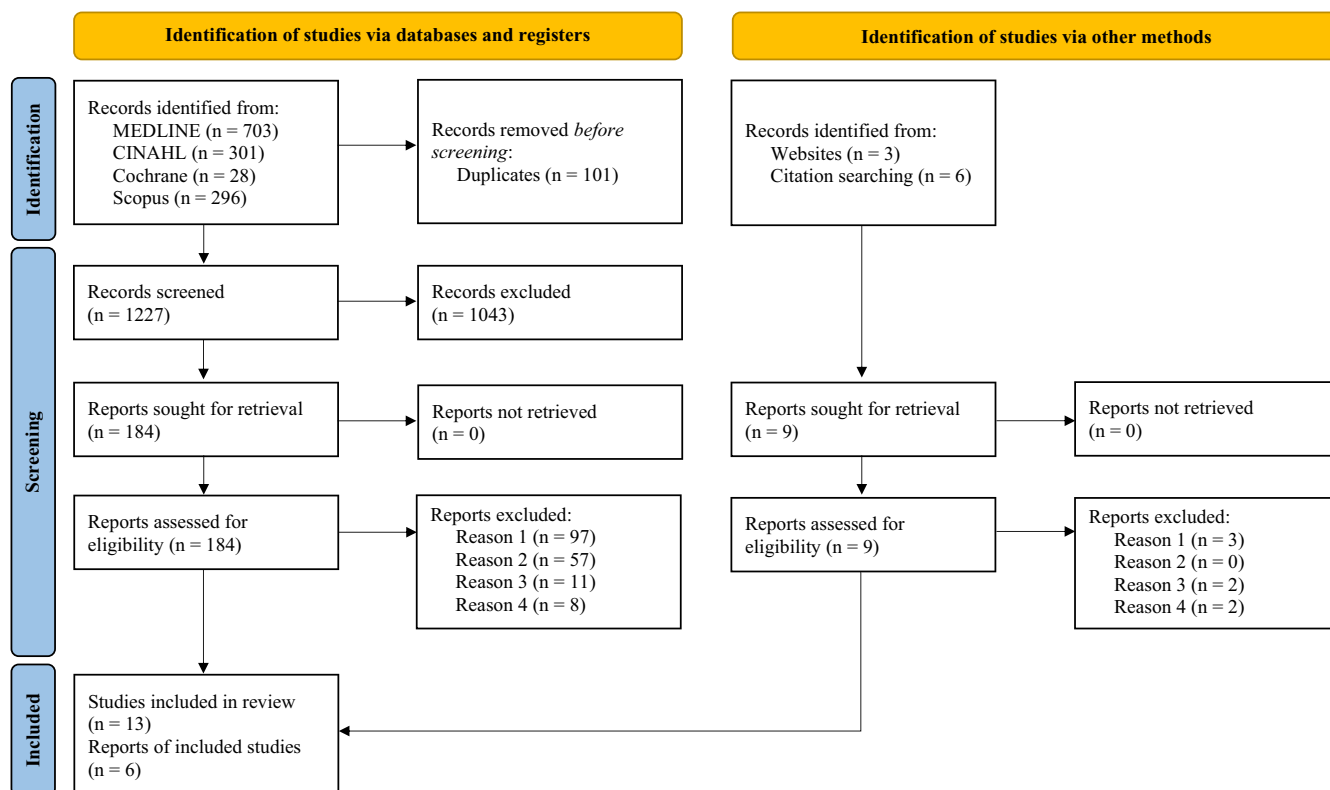
4 | RESULTS

4.1 | Study selection

We identified 1328 reports in four databases. After removing duplicates and screening titles and abstracts, 184 full texts were assessed for eligibility. Through citation tracking and Google Scholar, nine other reports were found, of which two were included. As a result,

13 studies of 12 nurse-led care models were included in the review (Arendts et al., 2018; Borbasi et al., 2011; Day et al., 2014; Dwyer et al., 2017; Ersek et al., 2018; Giebel et al., 2020; Kaasalainen et al., 2016; Kane et al., 2003, 2004; Kim et al., 2020; Koekkoek et al., 2016; Lacny et al., 2016; Rantz et al., 2017) (Figure 1). Six protocol papers or general model reports (Arendts et al., 2014; Borbasi et al., 2010; Kane & Huck, 2000; Kim et al., 2017; Rantz et al., 2014; Unroe et al., 2015) were used to obtain additional information regarding the structure and the content of the included models or the methodology of the study.

4.2 | Description of the included studies

Table 2 presents the characteristics of the studies. A total of 11,670 participants were included (range 22–5168), of which 11,272 participants were residents and 398 participants were healthcare professionals or family members. No participant numbers were reported in the studies by Giebel et al. (2020) and Kane et al. (2004). All studies included residents with cognitive impairment in the sample. The mean age of the residents was between 82–89 years. Only in the study by Koekkoek et al. (2016) were the study participants younger than those in the rest of the studies, with a mean age of 74. The characteristics of the studies demonstrated heterogeneity in terms

Identification of studies via databases and registers

Records identified from:
MEDLINE (n = 703)
CINAHL (n = 301)
Cochrane (n = 28)
Scopus (n = 296)

Records removed *before screening*:
Duplicates (n = 101)

Records screened
(n = 1227)

Records excluded
(n = 1043)

Reports sought for retrieval
(n = 184)

Reports not retrieved
(n = 0)

Reports assessed for eligibility (n = 184)

Reports excluded:
Reason 1 (n = 97)
Reason 2 (n = 57)
Reason 3 (n = 11)
Reason 4 (n = 8)

Identification of studies via other methods

Records identified from:
Websites (n = 3)
Citation searching (n = 6)

Reports sought for retrieval
(n = 9)

Reports not retrieved
(n = 0)

Reports assessed for eligibility (n = 9)

Reports excluded:
Reason 1 (n = 3)
Reason 2 (n = 0)
Reason 3 (n = 2)
Reason 4 (n = 2)

Studies included in review
(n = 13)
Reports of included studies
(n = 6)

Identification
Screening
Included

Reason 1 = concept: not a nurse-led care model
Reason 2 = participants or context: not adult residents or staff connected to nursing homes; not a study that has been conducted in a nursing home
Reason 3 = type of evidence sources: not an evaluation of the described model
Reason 4 = type of evidence sources: not a scientific study

FIGURE 1 PRISMA flow chart of the search

TABLE 2 Study characteristics

Study, country	Name and aim of the model	Inclusion period	Design; data collection
Arendts et al. (2018) Australia	No official name: nurse-led coordination To improve quality of life and to reduce hospital stays for people living in RACF	Recruiting period: • 2 years (June 2012–June 2014) Follow-up: • 12 months	C-RCT with an open cohort Quantitative survey
Borbasi et al. (2011) Australia	Dementia Outreach Service To better manage people with BPSD while building staff capacity	12 months (March 2009–July 2010)	Mixed-method study (CT + qualitative part) Survey, focus groups, interviews, information from reflective journals
Day et al. (2014) USA	Coordinated diabetes disease model (CDDM) To improve diabetes outcomes in a long-term care population (Quality improvement project)	6 months (May 2012–November 2012)	Single-site repeated measures design Chart review; Not further specified
Dwyer et al. (2017) Australia	Residential Acute Care Service (RACS) To reduce avoidable hospitalisation of aged care facility residents	Data collection: • 4 months (July–October 2015)	Qualitative study using the Donabedian framework Semi-structured qualitative interviews
Ersek et al. (2018) USA	Optimizing Patient Transfers, Impacting Medical Quality, and Improving Symptoms: Transforming Institutional Care (OPTIMISTIC) To reduce hospitalisations through optimising patient transfers, impacting medical quality and improving symptoms	Project: • 44 months (February 2013–October 2016) Interviews/analysis: • Last 12 months	Qualitative model evaluation Semi-structured qualitative single and focus interviews
Giebel et al. (2020) UK	Care Home Innovation Program (CHIP) To reduce potentially avoidable ambulance conveyances of older care home residents to hospitals by 30%	Data collection: • 5 years (April 2014–April 2019) Intervention: • April 2015– • June 2018 Before period: • 12 months After period: • 8 months	Uncontrolled pre-post trial; secondary data analysis Anonymised systems data

Setting/Sample	Inclusion criteria	Outcomes
6 RACFs: • IG: 3 • CG: 3 Participants: • IG: 101 • CG: 99 Age years: • IG: 89.9 • CG: 89.9 Female: • IG: 82% • CG: 70%	Residents: • ≥65 years • Life expectancy of more than 180 days • Permanent (non-respite) resident for the facility	**Primary Outcome** • In the IG, fewer ED presentations resulted in fewer hospitalisations over the entire period compared with CG ($p = 0.10$) **Secondary Outcomes** • No difference in the number of patients who had at least one transfer or in the rate of transfers in the first 12 months • No association between ED transfer and intervention after adjustment for dependence and comorbidity • No significant difference between IG and CG throughout follow-up or first 12 months at the individual patient level • Less decline in quality of life in IG • More deaths in IG than CG
20 RACFs: • IG: 7 • CG: 13 Participants: • Baseline: 320 • >3–6 months: response rate dropped to 55%	• RACF staff	IG vs. CG • Greater increase in quality of life in IG • Higher level of confidence and ability of staff in dealing with dementia and managing behaviours in IG ($p < 0.05$) • Greater improvement in knowledge in IG • Decrease in stress in both groups; greater in IG • Greater reduction in difficult behaviour in IG • Decrease in presentation and admission to the ED in IG Qualitative results • Improved self-confidence and capacity among staff to manage behaviours; entrenched behaviours led to a reluctance to alter routines
NHs: 1 Participants: 22 Age years: • 8 < 80 • 8 = 80–89 • 6 ≥ 90 Female: 10 Male: 12	Residents • NH residents • Diabetes Type II (diagnosed)	Before vs. after • Decreased use of sliding scale insulin dosing ($p = 0.004$) • Decreased incidence of hypoglycaemia ($p = 0.018$) • No significant changes in the incidence of hyperglycaemia • No significant differences in the use of metformin, sulfonylureas and DPP-4 inhibitors • Increase in the screening rate for diabetic retinopathy ($p < 0.001$) • Increase in the screening rate of chronic kidney disease ($p = 0.001$) • Significant increase in HbA$_{1c}$ goal achieved ($p = 0.001$) • Increased resident-centred care (patient participation in planning care) ($p = 0.001$)
ACFs: 10 Participants: 15 • 9 health professionals • 4 residents • 2 NPs	Residents, family and health professions • Interactions with NP service	• Resident referral to the NP, timely NP responses and NP interactions with other professionals were influenced by the 'in-reach' nature of the service, distances, professional regulations and model of institutional care • Quality outcomes were influenced by the time taken by the NPs to connect with residents, collaborative care plans, highly skilled staff and the NP's function as a boundary spanner • Improved quality of care due to rapid NP responses, avoidance of hospitalisation, timely return home, collaboration with residents and family, family and staff satisfaction with the NP and time resources saved for other healthcare services • Barriers: distance, funding, restriction of professional work
NHs: 19 Participants: 63 • 23 NH staff • 4 primary care provider • 10 family members • 26 clinical OPTIMISTIC staff	Family members • Worked close with OPTIMISTIC staff • Language English	• Discussions on advanced care planning were associated with reduction in hospitalisation and improved care • The presence of specially trained project RNs and NPs enabled advanced care planning, comprehensive resident assessments and staff training, which contributed to resident goal identification • Barriers: inadequately staff training, resistance from staff, unclear communication of the program goals and activities
Care homes: 32 • 17 RCHs • 15 NHs Residents: • Each care home 10–176 residents (average 38)	No inclusion or exclusion criteria reported	Before vs. after • 15,1% reduction of 999 calls made ($p = 0.002$) over the three years • 18,7% reduction in calls resulting in hospital conveyances • Week inverse correlation between tele-video calls and ambulance conveyances ($R^2 = 0.13$) • Week inverse correlation between tele-video calls and GP out-of-hours visits ($R^2 = 0.21$)

TABLE 2 (Continued)

Study, country	Name and aim of the model	Inclusion period	Design; data collection
Kaasalainen et al. (2016) Canada	No official name: NP and pain team To reduce under-management of pain in long-term care (LTC)	Data collection: • 2010–2012 Intervention: • 12 months Before/after period: • Three months	Mixed-method study (CT + qualitative part) Interviews, quantitative survey
Kane et al. (2004) USA	Evercare To reduce the rate of untoward events and hospital admissions	Census: • February 1999–August 1999 MDS: • June 1998–December 2000 Hospital data: • 12 months before and 15 months after the census	Quasi-experimental post-test design with two CGs: • CG-in: same NH • CG-out: other NH Census, Medicare data, MDS, United Healthcare data
Kane et al. (2003) USA	Evercare To reduce the rate of untoward events and hospital admissions	Census: • February 1999–August 1999 Follow-up: • 15 months after census Medicare/United Healthcare data: • >2 years	Quasi-experimental post-test design with two CGs: • CG-in: same NH • CG-out: other NH Census, Medicare data, MDS, United Healthcare data,
Kim et al. (2020) South Korea	Systems for Person-cantered Elder Care (SPEC) To improve the quality of care in nursing homes	Recruitment: • January 2015–March 2015 Control period: • 3 months Intervention period: • 6 months Data collection: • 21 months • (April 2015–December 2016)	Multicentre, prospective, crossover C-RCT with stepped wedge design (5 steps) Inter-RAI assessment system

TABLE 2 (Continued)

Setting/Sample	Inclusion criteria	Outcomes
LTC homes: 6 • IG full: 2 • IG partial: 2 • CG: 2 Participants: • IG full: 139 • IG partial: 108 • CG: 98 Age years: • CG: 83.1 • IG partial: 84 • IG full: 84 Male: • 25–30% in all groups	LTC homes • Medium to large sized facilities (>120 beds) • Not currently employ an NP • Not have an onsite pain management team Residents • English language	**Primary outcome** • Decrease in pain level for both IGs at rest and during activity ($p = 0.042$–0.001) **Secondary outcomes** • Improved functional status compared with CG (IG partial: $p < 0.001$; IG full: $p = 0.002$) • No significant differences in depression or agitation • Positive changes in clinical practice behaviours in IG full ($p < 0.001$) • Greater trends in reductions of moderate and severe pain in partial and full IG • No differences in medication sub-score or pain management index Qualitative outcomes • Benefits of having access to an NP: resources; positive outcomes • Benefits of the pain team: staff education, better team collaboration, communication and autonomy, improved pain levels of residents • Barriers: lack of knowledge about medication management; problems establishing the NP role; inadequate communication; conflicting team member priorities
NHs :88 • IG: 44 • CG: 44	Residents IG • Enrolled in Evercare before or after census • Less than 30% enrolled in another NP-based capitated program Residents CG • Not enrolled in Evercare • Less than 30% enrolled in another NP-based capitated program	IG vs CG • Rates for mortality were significant lower for IG than for CG-in (1.0 vs. 1.09) but higher than those for CG-out (0.92, $p = 0.013$) • IG had fewer preventable hospitalisations compared with CG-in ($p < 0.05$) and CG-out ($p < 0.05$) • No significant differences in quality indicators • No significant differences in functionality
NHs :88 • IG: 44 • CG: 44 Participants: • IG: 1936 • CG-in: 1123 • CG-out: 1745 Age years: • IG: 83.7 • CG-in: 81.4 • CG-out: 84.0 Female: • IG: 80.3% • CG-in: 72.6% • CG-out: 91.4%	Residents IG • Enrolled in Evercare before census Residents CG • Not enrolled in Evercare • Not enrolled in Part A/B Medicare • Not enrolled in any other HMO	IG vs CG • Incidence of hospitalisations was higher in CG ($p < 0.001$) • Fewer hospital days in IG • Admission rates were the same, although the total days used by IG were fewer ($p < 0.001$) • Hospital length of stay was shorter and fewer ($p < 0.001$) • ED use was half ($p < 0.001$) • Incidence of preventable hospitalisations was higher in the CGs ($p < 0.001$) • More visits of NP/PA, physicians and podiatrists in IG ($p < 0.001$) Cost: Each NP saved approx. 103 000$/year
NHs: 10 Participants: • Baseline: 482 • 3-month: 431 • 6-month: 389 Age years: • IG: 83.1 • CG: 82.7 Female: • IG: 80.9% • CG: 80.3%	Residents • ≥65 years old • At least one week in the NH • No terminal condition • Not comatose	**Primary outcome:** • Significant decrease in quality issues (−11.1%, $p < 0.001$) **Secondary outcome:** • 31.1% decrease in ADL late-loss worsening • 32.5% decrease in cognitive decline • 39.36% decrease in communication decline • 44.72% decrease in delirium new or persistent • 33.36% decrease in behaviour problem worsening • No decrease in bladder continence worsening

TABLE 2 (Continued)

Study, country	Name and aim of the model	Inclusion period	Design; data collection
Koekkoek et al. (2016) Netherlands	No official name: consultation program To improve behavioural problems of nursing home residents	18 months • July 2008–January 2010 Consultations: • Every 6–8 weeks	Uncontrolled pre–post-trial; pilot study NPI-NH assessment
Lacny et al. (2016) Canada	Nurse practitioner-family physician model (NP-FP model) To lower the cost of care through fewer hospital admissions (health system perspective)	Before period: • 18 months (March 2005–August 2006) After period: • 21 months (March 2007–July 2007; March 2008–June 2009)	Cost-effectiveness analysis using a CT with three CGs: • CG-in: internal • CG-out: external • CG+: combined ED-data, estimated medication costs and chart abstraction
Rantz et al. (2017) USA	Missouri Quality Initiative (MOQI) To reduce avoidable hospital admissions/readmissions, overall healthcare spending without restricting and access to care or choice of providers and to improve resident health outcomes and the transition process	2 years, 9 months • January 2014–September 2016	Prospective single group trial with an open cohort • Intervention fully implemented in all facilities; no comparison data Assessment tools, ED-data

Abbreviations: ACF, aged care facilities; BPSD, behavioural and psychological symptoms of dementia; CG, control group; C-RCT, cluster randomised controlled trial; ED, emergency department; HMO, health maintenance organisation; IG, intervention group; MDS, Minimum Data Set; NH, nursing home; PA, physician assistantQI: quality indicators; RACF, residential aged care facilities; RCH, residential care homes.

of participants, types of care models and comparators, observation period and outcomes recorded. Four studies met 80–100% of the quality criteria of the MMAT, but most of the studies had moderate methodological quality (Table 3).

4.3 | Core elements of nurse-led care models

To achieve comparability of the models, the description of the core elements of the nurse-led care models followed the six components (*workforce*; *service delivery*; *leadership and governance*; *financing*; *technologies and medical products*; *and information and research*) and underlying concepts of the micro and meso levels of the SELFIE framework

by Leijten et al. (2018). Only few elements were reported at the meso level. These are described in a narrative form. The core elements at the micro level are additionally presented in Table 4 for ease of comparison.

4.3.1 | Workforce

Micro level

All nurse-led care models included a multidisciplinary team (n = 12) and a nurse as named coordinator: a nurse practitioner (n = 7), an advanced practice registered nurse (n = 1), a psychiatric advanced practice nurse (n = 1), or a community matron (n = 1). Exceptions were the models of Kim et al. (2020) and Ersek et al. (2018), in which a tandem

Setting/Sample	Inclusion criteria	Outcomes
NHs: 7 Participants: • Baseline: 71 • Follow-up: 54 (76%) Female: 56.3% Age years: 74.3	Residents • NHs decided which resident would be discussed	Before vs. after • Decreased NPI-NH delusions ($p = 0.001$) • Decreased NPI-NH hallucinations ($p = 0.008$) • Decreased NPI-NH agitation/aggression ($p = 0.001$) • Decreased NPI-NH depressions/dysphoria ($p = 0.001$) • Decreased NPI-NH anxiety ($p = 0.001$) • No change in NPI-NH elation/euphoria • Decreased NPI-NH apathy/indifference ($p = 0.001$) • Decreased NPI-NH disinhibition ($p = 0.001$) • Decreased NPI-NH irritability/lability ($p = 0.001$) • Decreased NPI-NH aberrant motor behaviour ($p = 0.005$) • Decreased NPI-NH night-time behaviours ($p = 0.001$) • Decreased NPI-NH appetite and eating disorders ($p = 0.001$) • Decreased total NPI-NH ($p = 0.001$) • Decreased staff-perceived work stress ($p = 0.001$)
NHs: 2 • IG: 45 • CG-in: 65 • CG-out: 70 Age years: • IG: 83 • CG-in: 82 • CG-out: 87 Female: • IG: 71% • CG-in:77% • CG- out: 86%	Residents • ≥65 years old For CEA • Residents who were present in before and after time periods	Before vs. after • Increased ED transfer rate in all groups • No significant interaction terms (IG and CG-in $p = 0.97$; IG and CG-out $p = 0.45$; IG and CG+ $p = 0.70$) • Increased costs for each group • Smaller increase in costs and smaller increase in ED transfer rate in IG vs CG-in; smaller increase in costs and larger increase in ED transfer rate in IG vs CG-out; smaller increase in costs and smaller increase in ED transfers in IG vs CG+ • The smaller increase in ED transfers for IG compared with the CG-in and CG+ was 10 times greater than the larger increase in ED transfers of IG compared with CG-out • The probability that the intervention is cost-effective compared with the CG-in, CG-out and CG+ was 26%, 21% and 25%
NHs: 16 Participants: 5168 Median age: 82 (range 20–104)	NHs • Good care quality • Survey history • High rates of hospitalisations Residents • In NH for more than 100 days • Not enrolled in a Medicaid and/or Medicare Advantage plan	• Significant reductions of all-cause hospitalisations in 4/11 quarters • 30% reduction in all-cause hospitalisation from study beginning to endKey events that affected the changes: • March 2014: monthly meeting of MOQI team supervisor, project coordinator and APRN to review the INTERACT RCA tool • July 2014: quality improvement feedback reports of hospital transfers • Later in 2014: weekly check in the report system for each APRN to submit the prior week's planned and unplanned hospital transfers • Avoidable hospitalisations remained consistent (53% to 50%) • The relationship between the percentages of avoidable and non-avoidable hospital transfer rates reversed in the first quarter of 2015: fewer non-avoidable (64–47%), more avoidable (48–54%)

consisting of a registered nurse and a social worker (Kim et al., 2020) or a registered nurse and a nurse practitioner (Ersek et al., 2018) provided care leadership. The registered nurse and the social worker in the study by Kim et al. (2020) and the registered nurse in the study by Ersek et al. (2018) were trained and coached for their role. The core group supporting the leading nurse consisted of a specific care team (n = 4), a family physician or general practitioner (n = 4), a registered nurse (n = 1) or a psychiatrist (n = 1). In two models, it was not clear which individuals were part of the core team.

In all models, the leading nurses or leading tandem (named coordinators) were responsible for assessing the residents' situation, planning care and intervening at an early stage, or coordinating alternative care. Further, they advised and trained the nursing home staff (9 of

12 models), implemented evidence-based protocols or instruments (Arendts et al., 2018; Ersek et al., 2018; Giebel et al., 2020; Kaasalainen et al., 2016) and made recommendations for diagnoses, treatments or medication changes (Borbasi et al., 2011; Ersek et al., 2018; Koekkoek et al., 2016; Rantz et al., 2017). This involved a close exchange with the residents and their families, as well as with the nursing home staff, the physicians and other professionals. The models in Australia and Canada also included expanded tasks such as autonomous ordering and interpretation of screening and diagnostic tests (Lacny et al., 2016), autonomous diagnosis or treatment of illnesses (Arendts et al., 2018), prescriptive authority (Arendts et al., 2018; Dwyer et al., 2017; Kaasalainen et al., 2016; Lacny et al., 2016) and autonomous referral of residents (Borbasi et al., 2011; Dwyer et al., 2017). Moreover, they

TABLE 3 Risk of bias in the included studies according to the Mixed Method Appraisal Tool

Category of study designs	Methodological quality criteria	Arendts et al., 2018	Borbasi et al., 2011	Day et al., 2014	Dwyer et al., 2017	Ersek et al., 2018
Screening questions	S1. Are there clear research questions?	✓	✓	✓	✓	✓
	S2. Do the collected data allow to address the research questions?	✓	✓	✓	✓	✓
1. Qualitative studies	1.1. Is the qualitative approach appropriate to answer the research question?		✓		✓	✓
	1.2. Are the qualitative data collection methods adequate to address the research question?		?		✓	✓
	1.3. Are the findings adequately derived from the data?		?		✓	✓
	1.4. Is the interpretation of results sufficiently substantiated by data?		✓		✓	✓
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?		?		✓	✓
2. Quantitative randomised controlled trials	2.1. Is randomisation appropriately performed?	?				
	2.2. Are the groups comparable at baseline?	✓				
	2.3. Are there complete outcome data?	✓				
	2.4. Are outcome assessors blinded to the intervention provided?	✓				
	2.5 Did the participants adhere to the assigned intervention?	✓				
3. Quantitative nonrandomised studies	3.1. Are the participants representative of the target population?		?	✗		
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?		?	✓		
	3.3. Are there complete outcome data?		✗	✗		
	3.4. Are the confounders accounted for in the design and analysis?		?	✗		
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?		?	?		

Giebel et al., 2020	Kaasalainen et al., 2016	Kane et al., 2003	Kane et al., 2004	Kim et al., 2020	Koekkoek et al., 2016	Lacny et al., 2016	Rantz et al., 2017
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓
	✓						
	?						
	✓						
	✓						
	?						
				✓			
				✓			
				✓			
				✓			
				✓			
?	✓	?	?		✗	✓	
✗	✓	?	✓		✓	✓	
✓	✓	✓	?		✓	?	
✗	✗	✓	✓		✗	✗	
✗	?	?	?		?	?	

TABLE 3 (Continued)

Category of study designs	Methodological quality criteria	Arendts et al., 2018	Borbasi et al., 2011	Day et al., 2014	Dwyer et al., 2017	Ersek et al., 2018
4. Quantitative descriptive studies	4.1. Is the sampling strategy relevant to address the research question?					
	4.2. Is the sample representative of the target population?					
	4.3. Are the measurements appropriate?					
	4.4. Is the risk of nonresponse bias low?					
	4.5. Is the statistical analysis appropriate to answer the research question?					
5. Mixed-methods studies[a]	5.1. Is there an adequate rationale for using a mixed-methods design to address the research question?	✓				
	5.2. Are the different components of the study effectively integrated to answer the research question?	✓				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	✓				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	/				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	✗				

[a]Understood as an embedded mixed-method design—the quantitative method part predominates here, as the qualitative method was additionally used to answer sub-questions during data collection. An integration of the components is therefore only possible to some extent; divergences and inconsistencies do not occur due to different questions.

were responsible for root cause analyses in two models in the USA (Ersek et al., 2018; Rantz et al., 2017) or preparing feedback reports using electronic systems in one model in South Korea (Kim et al., 2020).

Meso level

While general clinical training of the staff was an integral part of almost all care models at the beginning (n = 11), only four models promoted continuous learning at fixed intervals during the study period (Arendts et al., 2018; Dwyer et al., 2017; Giebel et al., 2020; Kim et al., 2020). The extent to which these continuous trainings focused on topics of self-management, communication, teamwork and relationships remained unclear. Support for families occurred in four

models through education and information sharing to improve their coping strategies (Day et al., 2014; Kim et al., 2020; Lacny et al., 2016; Rantz et al., 2017). The extent to which the models contributed to role modelling remained unclear in the reporting of the studies.

4.3.2 | Service delivery

Micro level

Five nurse-led care models followed a person- or patient-centred approach (Arendts et al., 2018; Borbasi et al., 2011; Day et al., 2014; Ersek et al., 2018; Kim et al., 2020), and two other models

Giebel et al., 2020	Kaasalainen et al., 2016	Kane et al., 2003	Kane et al., 2004	Kim et al., 2020	Koekkoek et al., 2016	Lacny et al., 2016	Rantz et al., 2017
							✓
							?
							✓
							?
							✓
	✓						
	✓						
	✓						
	/						
	?						

indicated that the residents' preferences and wishes were considered in care planning (Dwyer et al., 2017; Rantz et al., 2017). Comprehensive geriatric assessment was an element of six of the care models described (Arendts et al., 2018; Borbasi et al., 2011; Dwyer et al., 2017; Ersek et al., 2018; Kim et al., 2020; Rantz et al., 2017), while three models had a specific focus on the assessment of pain (Kaasalainen et al., 2016), psychiatric symptoms (Koekkoek et al., 2016) or diabetes (Day et al., 2014). The models by Giebel et al. (2020), Kane et al. (2004), Kane et al. (2003), and Lacny et al. (2016) included assessments of residents' health status; the focus and scope of these assessments remained unclear due to a lack of reporting. Support of residents' self-management was related to informative consultations or information sharing (Arendts et al., 2018; Day et al., 2014) and educating residents on how to manage symptoms (Kim et al., 2020). In the majority of models (n = 9), care was further delivered proactively and with resident and family involvement (n = 8). In terms of treatment interactions, the models particularly mentioned medication review and rationing as an integral part of the care models (n = 7). To ensure continuity of care, the models used several strategies: (1) on-site staff to ensure regular monitoring and good relationship building among those involved (Borbasi et al., 2011; Kaasalainen et al., 2016; Kane et al., 2003, 2004; Kim et al., 2020); (2) structured progress reports and hand-offs or protocols to avoid information leakage

(Arendts et al., 2018; Ersek et al., 2018; Kaasalainen et al., 2016); and (3) clearly defined responsibilities for coordination and referral (Borbasi et al., 2011; Day et al., 2014; Dwyer et al., 2017), as well as for exchanges between actors in different settings (Giebel et al., 2020; Rantz et al., 2017) to ensure monitored and fluid transitions.

Meso level

At the meso level, the majority of nurse-led care models (n = 9) integrated the leading nurse and core team on an organisational or structural level to ensure continuity of care. To further ensure continuous quality improvement, four models used root cause analysis (Arendts et al., 2018; Ersek et al., 2018; Giebel et al., 2020; Rantz et al., 2017), one model used comparison of benchmark statistics in evidence-based reports (Kim et al., 2020), and one model integrated discussions of outcomes with families and residents on a regular basis to provide continuous feedback (Day et al., 2014).

4.3.3 | Leadership and governance

Micro level

In almost all models (n = 10), staff provided care based on individualised care plans; in five of these models, staff involved family members and residents in the care planning process (Arendts et al., 2018; Day et al., 2014; Dwyer et al., 2017; Ersek et al., 2018; Kim et al., 2020). The coordination varied according to the complexity of each resident's situation in all models, but remained continuous with the person designated as coordinator in advance. Only the study by Kim et al. (2020) described that care coordination could be done with family members and external professionals as needed, and two studies emphasised that staff could decide whether to involve the leading nurse or the care team (Borbasi et al., 2011; Kaasalainen et al., 2016).

Meso level

While the responsibilities were clearly defined in all models (n = 12), only two models actively pursued and promoted a culture of shared vision, goals and ambitions at the meso level (Giebel et al., 2020; Kim et al., 2020). Elements of supportive leadership or performance-based management remained unclear in the reporting of the studies.

4.3.4 | Financing

Micro and meso level

Only five of the included studies reported anything about cost recovery and reimbursement (Ersek et al., 2018; Kane et al., 2003, 2004; Lacny et al., 2016; Rantz et al., 2017). Whereas in the models by Ersek et al. (2018) and Rantz et al. (2017), the leading nurses in the USA were funded by an initiative and their services were not paid for by the facility, the nurses in the model by Lacny et al. (2016) in Canada were salaried by the facility and compensated accordingly.

The Evercare model (Kane et al., 2003, 2004), as a managed care product of Medicare+Choice in the USA, was the only model that made incentive payments to nursing homes and physicians to keep residents in facilities and to reduce emergency visits.

4.3.5 | Technologies and medical products

Micro and meso level

In one care model, electronic medical records were used to facilitate information exchange within nursing homes and between nursing homes and hospitals (Ersek et al., 2018). Information communication tools or general technologies were also used in the studies by Kim et al. (2020) and Rantz et al. (2017) to facilitate health information exchange and documentation. Better equipment with monitoring and screening technology was also described in one model (Day et al., 2014). The nurse-led care models of Arendts et al. (2018) and Giebel et al. (2020) were, furthermore, the only two models that included 24/7 consultation via telephone or televideo for medical advice and remote monitoring. None of the models used e-help tools or telehealth, such as assistive technologies.

4.3.6 | Information and research

Micro level

Although none of the care models worked with systems that promote automatic information dissemination for effective use of individual data, some models included continuous information coverage through written reports (Arendts et al., 2018; Ersek et al., 2018; Kim et al., 2020), apps or cloud-based information systems (Kim et al., 2020), or oral status reports (Borbasi et al., 2011; Day et al., 2014; Kane et al., 2003, 2004) in cyclical intervals. Computational algorithms were reported in the study by Kim et al. (2020) to create needs and risk profiles for individual residents. The studies by Arendts et al. (2018) and Ersek et al. (2018) also implemented care pathways, which were not based on computerised algorithms.

Meso level

Regarding the meso-level aspects, the study by Rantz et al. (2017) was the only one that described aspects of data privacy and data use.

4.4 | Potential of nurse-led care models

The quantitative results show the extent to which the nurse-led care models were able to influence resident- and staff-related outcomes. Additionally, the qualitative results and discussions demonstrated which components of the nurse-led care models were considered promising and important at the process level and which challenges were considered relevant to the success of the models. We defined

components at the process level as anything that influenced the way care or interdisciplinary collaboration was delivered.

4.4.1 | Resident-related outcomes

In terms of resident-related outcomes, (avoidable) hospital admissions (n = 5), transfer or presentation to the emergency department (n = 4), and changes in functional status or activities of daily living (n = 3) were those most commonly recorded. More than one study also evaluated length of hospital stay (n = 2), use of external professionals (n = 2), mortality (n = 2), quality of life (n = 2), general behavioural symptoms (n = 2) or aggression/agitation (n = 2), and depression (n = 2).

Some nurse-led care models significantly reduced emergency hotline calls (Giebel et al., 2020) (n = 1/1), emergency department transfers or presentations (Kane et al., 2003) (n = 1/4), hospital admissions (Kane et al., 2003, 2004; Rantz et al., 2017) (n = 3/5), and length of hospital stay (Kane et al., 2003) (n = 1/2), whereas the use of external professionals increased significantly compared with that in the control groups in one study (Kane et al., 2003) (n = 1/1). The improvements in functionality or activities of daily living were significantly better in the intervention group in two studies (Kaasalainen et al., 2016; Kim et al., 2020) (n = 2/3). In addition, Kim et al. (2020) found further significant improvements in the intervention group in the quality indicators of the Minimum Data Set and communicative and cognitive impairment and with respect to the mitigation of behavioural symptoms and the reduction in persistent or new delirium. With respect to behavioural symptoms, Koekkoek et al. (2016) confirmed significant reductions in the occurrence of all neuropsychiatric symptoms except euphoria, and Kaasalainen et al. (2016) complementarily showed that the nurse-led care model was able to significantly improve pain behavioural response. Day et al. (2014) further showed specific improvements in the reduction in hypoglycaemia and in the achievement of the HbA1c target.

4.4.2 | Staff-related outcomes

In terms of the nursing home staff, few outcome measures were evaluated. Nurse-led care models enabled significant reductions in staff stress or burden (Koekkoek et al., 2016), as well as improvements in nurses' clinical practice behaviours (Kaasalainen et al., 2016) and in staff self-confidence in managing the specific disease (Borbasi et al., 2011; Day et al., 2014).

4.4.3 | Positive components at the process level

The qualitative evaluations and discussions showed that the nature of the relationship between the leading nurse and the nursing home staff and the bridging role of the leading nurse in the care models were important, as they enabled good communication of the leading nurse with both physicians and nurses (Borbasi et al., 2011; Dwyer et al., 2017). The on-site staff further perceived the leading nurses as trustworthy mentors (Ersek et al., 2018; Giebel et al., 2020) and as extra pairs of hands that could help manage heavy workloads (Ersek et al., 2018). In addition, stakeholders associated extensive discussions on advanced care planning with reduced hospital admissions (Ersek et al., 2018; Kaasalainen et al., 2016) and linked rapid responses and interactions with other professionals, as well as the close collaboration of residents and family members with the leading nurse with high-quality care and higher satisfaction (Dwyer et al., 2017; Kaasalainen et al., 2016). In particular, locating the specially trained nurses on site in the nursing home allowed constant responsiveness, more intensive care and comprehensive assessment of the resident, as well as a close relationship with the resident and continuous staff collaboration and training (Borbasi et al., 2011; Kaasalainen et al., 2016). This proximity was considered particularly valuable for identifying residents' goals (Ersek et al., 2018). The use of feedback reports to visualise participating facilities' own progress each month was further considered an important strategy allowing direct execution of corrective actions (Rantz et al., 2017).

4.4.4 | Relevant challenges to the success of the models

Several challenges to the success of nurse-led care models were particularly evident, namely, the entrenched culture in the facility and reluctance or resistance to change among staff, as well as dysfunctional behaviours among clinical staff (Borbasi et al., 2011; Ersek et al., 2018). Additional impediments to the effective use of the named coordinator arose from several quarters. In some nursing facilities, the role of the leading nurses and their goals and activities were not communicated or established clearly enough (Dwyer et al., 2017; Ersek et al., 2018; Kaasalainen et al., 2016), and/or they lacked authority to promote the necessary changes in the facilities (Ersek et al., 2018). The referral process in a reactive model could therefore contribute to the service not being used as planned due to a traditional understanding or because trust has not yet been built, limiting potential benefits (Dwyer et al., 2017). In addition, inadequate communication between professionals (Ersek et al., 2018), high turnover rates or leadership changes (Borbasi et al., 2011; Ersek et al., 2018; Kane & Huck, 2000; Rantz et al., 2017), inadequate staff training (Ersek et al., 2018; Kaasalainen et al., 2016), lack of time, resources and funding (Dwyer et al., 2017; Ersek et al., 2018), facility leadership style, lack of support from primary care providers, and the clinical complexity of residents (Ersek et al., 2018) presented challenges to necessary programme adoption.

5 | DISCUSSION

The review included 13 studies of 12 nurse-led care models. The nurse-led care models comprised many elements suggested in the

TABLE 4 Core elements of the care models according to the micro level of the SELFIE framework

	Service delivery							Leadership & governance			Workforce
	Person-centred	Tailored holistic assessment	Self-management support	Pro-active	Informal caregiver involvement	Treatment interaction	Continuity	Shared decision-making	Individual care planning	Coordination tailored to complexity of care needs	Multidisciplinary team
Arendts et al. (2018)	x	x	x	x	x	x	x	x	x		x
Borbasi et al. (2011)	x	x				x	x		x	x	x
Day et al. (2014)	x		x	x	x		x	x	x		x
Dwyer et al. (2017)	?	x			x		x	x	x		x
Ersek et al. (2018)	x	x	x	x	x	x	x	x	x		x
Giebel et al. (2020)		?	x		x		x		x		x
Kaasalainen et al. (2016)			x				x		x	x	x
Kane et al. (2003), Kane et al. (2004)		?	x	x			x		?		x
Kim et al. (2020)	x	x	x	x	x		x	x	x	x	x
Koekkoek et al. (2016)						x			x		x
Lacny et al. (2016)		?		x	x	x	?		x		x
Rantz et al. (2017)	?	x		x	x	x	x	?	?		x

Note: ?: Question marks indicate that the reports of the studies are not completely clear.

NP: nurse practitioner; GP: general practitioner; RN: registered nurse; CM: community matron; SW: social worker; APN: advanced practice nurse; FP: family physician; APRN: advanced practice registered nurse.

SELFIE framework. Individual care planning, proactive care services, informal caregiver involvement, continuity, multidisciplinary teams, a named coordinator and a named core group were present in the majority of nurse-led care models. Few elements were reported related to financing and evidence-based technology or products to support intervention delivery. We also found a large number of positive resident- and staff-related outcomes, as well as positive components at the process level, demonstrating the potential of nurse-led care models. However, the results simultaneously revealed typical challenges that can limit the success of the models, such as high turnover rates, inadequate staff training, lack of resources or support, and entrenched cultures or ambiguity regarding the leading nurses' roles.

The systematic review by Deschodt et al. (2020)—which also used the SELFIE framework to describe the core elements of nurse-led care models for home-dwelling older people—showed similar results. Individualised care planning, proactive care services, informal caregiver involvement, continuity, multidisciplinary teams, a nurse as named coordinator and a named core group were also mentioned

in the majority of studies here (n≥13 of 19 studies). In contrast to the nurse-led care models in nursing homes in our review, most nurse-led care models for home-dwelling older people also included a person-centred approach, tailored holistic assessments and shared decision-making (n≥15 of 19 studies) (Deschodt et al., 2020). Reasons for the differences in the frequency of holistic assessments could be that Deschodt et al. (2020) included only studies that examined older adults aged ≥65 or with a reported mean age of ≥75 years who did not have disease specifications. In contrast, our review considered all studies that examined residents aged ≥18 years, including studies with disease-specific populations (Day et al., 2014; Koekkoek et al., 2016). The specific clinical outcomes measured in the single studies may additionally be a reason why person-centred care and shared decision-making were less frequently included in the models, as they may not have been considered relevant to improve those outcomes.

Regarding the structure of the nurse-led care models, other reviews confirm the benefits of implementing highly qualified nurses. Prajankett and Markaki (2021) evaluated the provision of integrated care by highly qualified nurses in primary care—defined by

Named coordinator	Core group	Financing			Technologies & medical products				Information & research	
		Coverage & reimbursement	Out of pocket costs	Financial incentives	Electronical medical records & patient portals	E-health tools or telemedicine	Assistive technologies	Remote monitoring	Effective use of individual level data	Individual risk prediction
NP	NP, GP							x	x	x
NP	NP, DEMOS Team								x	
NP	NP, Diabetes Team					x			x	
NP	NP, RN									
NP; RN	RN, NP, GP	x			x				x	x
CM								x		
NP	NP, Pain Team								?	
NP	NP, GP	x		x					x	
RN; SW					x				x	x
APN	APN, Psychiatrist									
NP	NP, FP	x							?	
APRN	APRN, Expert Team	x			x				?	

first contact—in the USA and Thailand. Their findings confirm that nurse practitioners and clinical nurse specialists in the USA and registered nurses with additional training in Thailand use a range of strategies and approaches in caring for older people that contribute to integrated, high-quality, person-centred care in the community. Strategies among registered nurses in Thailand primarily included supplemental approaches: empowering and engaging individuals, families and informal caregivers; prioritising services based on needs and social preferences; emphasising health promotion, prevention and public health; and coordinating care for individuals and health programmes or providers. Nurse practitioners and clinical nurse specialists in the USA took on more substitutive activities: strengthening mutual accountability, using technology, and strengthening information systems and knowledge management (Prajankett & Markaki, 2021). This is consistent with our findings. In the included studies, highly qualified nurses also used both substitutive and supplemental strategies. However, we found that the described substitutive strategies (*self-management support*; *informal caregiver involvement*; *and shared decision-making*) were also provided

by nurse practitioners in the USA and Australia (Arendts et al., 2018; Day et al., 2014; Dwyer et al., 2017; Ersek et al., 2018). Additionally, the highly qualified registered nurse employed in the model in South Korea performed substitutive and supplemental activities, such as strengthening technologies and information systems (Kim et al., 2020). The former is also in line with the findings of Chavez et al. (2018). They found in their international scoping review that nurse practitioners working in geriatric primary care, home care, acute care, long-term care or transitional care settings took on both substitutive and supplemental role elements to meet specific unmet needs of geriatric patients or residents (Chavez et al., 2018). The differences could be explained by the settings of the reviews. While the review by Prajankett and Markaki (2021) referred exclusively to primary care, we included only nurse-led care models in nursing homes. This supposition is confirmed by the fact that the review results of Chavez et al. (2018)—who included all settings—indicate that nurse practitioners in long-term care have a broader range of tasks than in the other settings. Reviews that examined APNs in nursing homes confirmed the positive impact on specific resident-related outcomes

but did not investigate the specific strategies APNs use in providing care (Bakerjian, 2008; Donald et al., 2013).

The general tasks highly qualified nurses performed in the included nurse-led care models correspond to the professionally demanding tasks detailed under the Nursing Professions Act of 2017 in Germany (§ 4 II PflBG) but also complement them with substitutive and supplemental activities. Consistencies arise from our definition of a nurse-led care model. Thus, providing care following the steps of the general care process and taking a holistic view of residents are established focuses of nursing care. Additionally, nurse-led care models are characterised by increased autonomy of nurses. In the included models, highly qualified nurses exhibited an autonomous scope of practice and were responsible for care ranging from assessment to the provision of unplanned acute care. The models are also characterised by the fact that the leading nurses were responsible for the training of the staff and for the care and monitoring of highly complex cases in which not only their own activities but also collaboration with other professionals had to be coordinated. In some models, the nurses further provided medication management (Arendts et al., 2018; Borbasi et al., 2011; Lacny et al., 2016), ordered diagnostic tests (Lacny et al., 2016), deployed technologies (Kim et al., 2020), or reviewed unplanned transfers and initiated quality improvements (Arendts et al., 2018).

As in our review, Deschodt et al. (2020) found a variety of heterogeneous outcomes associated with nurse-led care models for home-dwelling older people in their review. These included quality of life, activities of daily living, mortality and hospitalisations, present in at least 11 of 19 studies (Deschodt et al., 2020). Although there was an even wider variety of outcomes in our review, the outcomes of hospitalisation, emergency department visits and activities of daily living were also the most frequently reported in our included studies. In their meta-analysis, Deschodt et al. (2020) did not find a significant impact of nurse-led care models on the quality of life, activities of daily living, hospitalisations, emergency department presentations, nursing home admissions or mortality of home-dwelling patients. The authors assumed that the absence of a theoretical foundation for some of the models, as well as the absence of contextual analyses and process evaluations in the development and evaluation of the models, may have contributed to implementation problems and influenced the success of the models (Deschodt et al., 2020). Another review examining the clinical effectiveness of home-based, nurse-led health promotion interventions found statistically significant reductions in mortality and statistically nonsignificant reductions in falls. But again, due to lack of reporting and heterogeneity of the studies, the exact factors that contribute to these improvements remain unclear (Tappenden et al., 2012). These 'deficiencies' are also evident in the majority of the studies included in our review. Only one study reported its care model's theoretical foundation (Kim et al., 2020). Context-specific characteristics were considered in two models (Kim et al., 2020; Rantz et al., 2014), and process evaluations were conducted in four models (Dwyer et al., 2017; Ersek et al., 2018; Kaasalainen et al., 2016; Rantz et al., 2017) and planned in two

(Arendts et al., 2014; Kim et al., 2017). However, consideration of the context is essential in the nursing home setting to achieve improvements in care through new interventions (Devi et al., 2020). In addition, none of the studies included in our review reported a logic model of the assumed effects of single elements and targeted component interactions, even though the models of care represent complex interventions.

Regarding the evidence for single elements of the SELFIE components *service delivery* and *leadership and governance* in the nursing home setting, Ouslander et al. (2016) confirmed the benefits of these elements in the INTERCARE project. They emphasised that a proactive approach, earlier individual care planning, and conversations with patients and families about care preferences could prevent hospitalisations and, consequently, that an integrated root cause analysis can provide insights into focus areas for improving care processes and guide direct model adjustments (Ouslander et al., 2016). In relation to the elements of the SELFIE component *workforce*, the results of a systematic review by Nazir et al. (2013) indicate that interdisciplinary interventions had a positive impact on resident-related outcomes in nursing homes in general. The inclusion of primary care physicians and/or pharmacists in the interventions, as well as communication and coordination within the team, were important elements of the successful interventions in this review (Nazir et al., 2013). In addition, the results of a multiple embedded case study by Antypas and Kirkevold (2020) confirm the positive impact of the use of new professional roles on interdisciplinary collaboration. According to these authors' findings, the work of a highly qualified nurse (here, an advanced geriatric nurse, AGN) in a primary care model supported collaboration with physicians through a higher level of trust in each other's abilities. Stronger patient-centeredness in the care provided was further described as a result of the AGN's additional time and close collaboration with the patients (Antypas & Kirkevold, 2020). This is consistent with the described positive components at the process level obtained from the qualitative results and discussions of the included studies in our review (s. chapter 4.4.3). Finally, regarding the elements of the SELFIE component *technologies and medical products*, Zhao et al. (2021)—among others—assume that smart health care can improve the quality of residential long-term care and express their intention to conduct a scoping review to examine the variety and characteristics of evidence on existing smart concepts and healthcare technologies in nursing homes.

The following were challenges identified in our review: entrenched culture of the care unit; lack of clarity regarding the role of the leading nurse or the goals of the model; inadequate communication between professionals; high turnover rates; leadership changes; inadequate staff training; lack of time, resources or funding; lack of support from managers or primary care providers; and high complexity of resident care. A recent scoping review on barriers and facilitators to implementing nurse-led interventions in dementia care across all settings by Karrer et al. (2020) found similar challenges. The authors confirmed that typical factors influence the implementation and success of nurse-led interventions, including organisational culture; financial and time resources; turnover rates; management

support; perceived value of the intervention; type of intervention training; staff knowledge, experience and skills; and staff attitudes towards the intervention. Complementarily, they identified policy barriers such as unclear reimbursement or government regulations regarding task-oriented practices and dementia-specific influencing factors (Karrer et al., 2020) that were not explicitly mentioned in our studies. In a subsequent qualitative study with care professionals and managers from Switzerland, Hirt et al. (2021) concluded that active engagement and commitment building were essential prerequisites to ensure that the value of the intervention is clear to all individuals involved. The authors additionally emphasised the need to secure low turnover rates, to provide accurate information about the intervention, and to promote disease-specific skills through training to allow individualised and flexible adaptation of the intervention to meet the complex needs of the residents (Hirt et al., 2021). Antypas and Kirkevold (2020) further examined factors influencing the deployment of AGNs in primary care models at the meso and micro levels. The authors confirmed that stakeholder participation in the design of the care models, the clarity of the models and their goals, and the evaluation of the models and their adaptation are relevant factors at the meso level, whereas collaboration within implemented models and the role clarity of the AGN are relevant conditions at the micro level (Antypas & Kirkevold, 2020). The results of the other studies are consistent with the challenges identified in our review. Aspects that were touched on only briefly in our studies but could be important influencing factors include financing strategies and legal regulations of task-oriented practices in specific models. Particularly in German nursing homes, these could be the most relevant challenges that limit the potential of nurse-led care models, as the refinancing options and legal requirements for the task-oriented practices of highly qualified nurses remain unclear to date (Bertelsmann Stiftung, 2019).

Overall, nurse-led care models using highly qualified nurses could enrich care in nursing homes through their holistic, person-centred and multidisciplinary approach and highly coordinative role in the care of complex residents. Due to the shortage of nursing professionals in Germany, as in other European countries (McGrath, 2020), highly qualified nurses should not only be responsible for leading specific episodes of single interventions. In contrast, nurse-led care models that include autonomous decision-making for a combination of medical and nursing care aspects can provide holistic care, represent an attractive option for nurses and contribute to advancing nurse practice. Finally, the necessary qualification of the leading nurses (master, bachelor or advanced training) should be discussed according to the specific tasks the nurses perform, the complexity of care and considering the refinancing options and legal requirements to achieve sustainable implementation of the models. To address these challenges and to select the relevant outcomes and topics for German nursing homes, we plan a context analysis in German nursing homes and the involvement of stakeholders in the development of a nurse-led care model. The findings of the review will be integrated into the construction of the case studies and the discussions with stakeholders.

5.1 | Strengths and limitations

First, this review has several strengths. To our knowledge, this is the first review of nurse-led care models in nursing homes. We executed a comprehensive search strategy in several literature databases and performed forward and backward citation tracking to find as many studies as possible. In addition, we disclosed the search strategy, critical appraisals and detailed descriptions of the studies to achieve a transparent description of our approach and the studies. The core elements of the nurse-led care models were further grouped into the micro- and meso-level concepts of the SELFIE framework, which enabled a clear summary of the heterogeneous models. However, there are also several limitations. We included only nurse-led care models that had been implemented in practice and evaluated in some way. This ensured that we analysed only existing models and were able to assess the potential of these models. However, this may have led to a lack of coverage of other interesting designs of nurse-led care models. As the first author was the only author to perform the title and abstract screening, it is also possible that relevant studies were excluded too early. To minimise this risk, we used a sensitive approach in the exclusion of studies and a second independent reviewer in the full-text screening. Additionally, we may have excluded nurse-led care models by including only English and German articles. Finally, given the heterogeneity of the nurse-led care models, comparison groups and outcomes collected, our results cannot be generalised.

6 | CONCLUSION

This scoping review provides an initial overview and a greater understanding of the core elements, outcomes, and challenges associated with nurse-led care models in nursing homes. It can serve as a foundation to inform the future development, implementation and evaluation of nurse-led care models. To improve the care of residents in nursing homes, current nurse-led care models focus primarily on individual elements of the SELFIE framework components *service delivery*, *workforce*, and *leadership and governance*. Other components that have been addressed to a lesser extent include financing aspects and the use of technology. Furthermore, the results of the scoping review show that nurse-led care models in nursing homes could have the potential to influence resident-, staff- and process-related outcomes and to advance nursing practice if organisational-, context- and culture-specific challenges are addressed. However, due to the heterogeneity of the models and the outcome criteria, no generalised conclusions can be made about the impacts of nurse-led care models. To strengthen the evidence on nurse-led care models in nursing homes, further well-designed studies are needed that address the challenges relevant to the success of the models. In addition, the development of international practice guidelines that explicitly recommend nurse-led care models in nursing homes should be pursued.

7 | RELEVANCE TO CLINICAL PRACTICE

To date, only a few nurse-led care models have been implemented and evaluated in nursing homes internationally. As the complexity of care for nursing homes residents will increase due to demographic trends, more nurse-led care models will be needed to address this complexity and to strengthen resident-centred care. The deployment of highly qualified nurses with new tasks and roles according to existing needs will strengthen the nurses' role development, promote interdisciplinary collaboration and enable early recognition and management of resident problems. Given that there are few highly qualified nurses (nurses with advanced training, bachelor or master) in German nursing homes—as in other European countries—the specific tasks and roles of these nurses in the nurse-led care models must be precisely defined, and aspects of financing and legal requirements should be clarified to improve clinical nursing practice in the long term.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

Study concept and design: KS and BH; literature search and data selection, appraisal, extraction and analysis: KS; full-text screening, data appraisal and extraction: JK; supervision of the process: BH; writing—first draft of the manuscript: KS; writing—final version: all authors. All authors made significant contributions to the interpretation and discussion of the data, contributed to editing and approved the final version of the manuscript.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

APPENDIX 1

Search strategies

Search	Query	Results
Search strategy MEDLINE via PubMed		
#41	#39 AND #30 Filters: English, German	703
#40	#39 AND #30	711
#39	#38 OR #37	25,296
#38	#13 AND #24	313
#37	#31 OR #32 OR #33 OR #34 OR #35 OR #36	22,285
#36	"innovative model of care"	19,394
#35	"integrated model of care"	4
#34	"innovative care model"	25
#33	"integrated care model"	243
#32	"innovative model"	640
#31	"integrated model"	2,474
#30	#25 OR #26 OR #27 OR #28	91,772
#29	"long term care"	40,951
#28	residential facilities[MeSH Terms]	53,466
#27	"long-term care"	40,951
#26	nursing home[MeSH Terms]	40,089
#25	"nursing home"	23,679
#24	#14 OR #15 OR #16 OR #17 OR #19 OR #20 OR #21 OR #22 OR #23	3,021,554
#23	"approach"	1,426,503
#22	"intervention"	668,106
#21	"programme"	142,356
#20	"program"	934,286
#19	"coordination"	131,58

Search	Query	Results
#18	coordination	312,026
#17	"care models"	2,821
#16	"care model"	5,604
#15	"models of care"	3,608
#14	"model of care"	4,101
#13	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12	5,145
#12	"nurse designed"	19
#11	"nurse-designed"	19
#10	"nurse managed"	548
#9	"nurse-managed"	548
#8	"nurse based"	258
#7	"nurse-based"	258
#6	"nurse delivered"	353
#5	"nurse-delivered"	353
#4	"nurse coordinated"	75
#3	"nurse-coordinated"	75
#2	"nurse led"	3,973
#1	"nurse-led"	3,973
Search strategy Scopus		
25	(("care model*") OR ("model* of care") OR (coordination) OR (program*)) AND (("nurse-led") OR ("nurse led") OR ("nurse-managed") OR ("nurse managed") OR ("nurse-delivered") OR ("nurse delivered") OR ("nurse-based") OR ("nurse based") OR ("nurse-coordinated") OR ("nurse coordinated")) AND (TITLE-ABS (("long-term care") OR ("nursing home*") OR ("residential care") OR ("residential facilit*"))) AND (LIMIT-TO(LANGUAGE, "English") OR LIMIT-TO(LANGUAGE, "German"))	296
24	(("care model*") OR ("model* of care") OR (coordination) OR (program*)) AND (("nurse-led") OR ("nurse led") OR ("nurse-managed") OR ("nurse managed") OR ("nurse-delivered") OR ("nurse delivered") OR ("nurse-based") OR ("nurse based") OR ("nurse-coordinated") OR ("nurse coordinated")) AND (TITLE-ABS (("long-term care") OR ("nursing home*") OR ("residential care") OR ("residential facilit*")))	305
23	TITLE-ABS (("long-term care") OR ("nursing home*") OR ("residential care") OR ("residential facilit*"))	68,930
22	("long-term care") OR ("nursing home*") OR ("residential care") OR ("residential facilit*")	380,248
21	"residential facilit*"	10,570
20	"residential care"	37,899
19	"nursing home*"	178,883
18	"long term care"	221,633
17	"long-term care"	221,633
16	("nurse-led") OR ("nurse led") OR ("nurse-managed") OR ("nurse managed") OR ("nurse-delivered") OR ("nurse delivered") OR ("nurse-based") OR ("nurse based") OR ("nurse-coordinated") OR ("nurse coordinated")	25,395
15	"nurse coordinated"	1,029
14	"nurse-coordinated"	1,029
13	"nurse based"	1,660
12	"nurse-based"	1,660
11	"nurse delivered"	2,767
10	"nurse-delivered"	2,767
9	"nurse managed"	2,994
8	"nurse-managed"	2,994
7	"nurse led"	18,323

Search	Query	Results
6	"nurse-led"	18,323
5	("care model*") OR ("model* of care") OR (coordination) OR (program*)	11,118,303
4	program*	9,976,973
3	coordination	1,485,424
2	"model* of care"	24,907
1	"care model*"	34,248
Search strategy CINAHL via EBSCO		
S28	S8 AND S19 AND S26 Narrow by Language: -english	301
S27	S8 AND S19 AND S26	317
S26	S20 OR S21 OR S22 OR S23 OR S24 OR S25	92,951
S25	residential facilit*	6,498
S24	residential care	12,057
S23	nursing homes	55,488
S22	nursing home	55,488
S21	long-term care	38,849
S20	long term care	38,886
S19	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18	17,982
S18	nurse-coordinated	64
S17	nurse coordinated	226
S16	nurse-based	457
S15	nurse based	8,614
S14	nurse-delivered	342
S13	nurse delivered	1,266
S12	nurse-managed	2,796
S11	nurse managed	3,518
S10	nurse-led	4,788
S9	nurse led	5,990
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	546,462
S7	programme	503,582
S6	program	503,672
S5	coordination	18,824
S4	models of care	38,676
S3	model of care	38,676
S2	care models	27,450
S1	care model	27,450
Search strategy Cochrane Library		
S23	#5 AND #16 AND #22	28
S22	#17 OR #18 OR #19 OR #20 OR #21	10,111
S21	("residential facilit*"):ti,ab,kw	1
S20	("nursing-home*"):ti,ab,kw	3,437
S19	("nursing home*"):ti,ab,kw	3,437
S18	("long term care"):ti,ab,kw	7,066
S17	("long-term care"):ti,ab,kw	7,066
S16	#6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15	2,304
S15	("nurse coordinated"):ti,ab,kw	67
S14	("nurse-coordinated"):ti,ab,kw	67
S13	("nurse managed"):ti,ab,kw	100

Search	Query	Results
S12	("nurse-managed"):ti,ab,kw	100
S11	("nurse delivered"):ti,ab,kw	274
S10	("nurse-delivered"):ti,ab,kw	274
S9	("nurse based"):ti,ab,kw	118
S8	("nurse-based"):ti,ab,kw	118
S7	("nurse led"):ti,ab,kw	1,794
S6	("nurse-led"):ti,ab,kw	1,794
#5	#1 OR #2 OR #3 OR #4	129,552
#4	(program*):ti,ab,kw	125,099
#3	(coordination):ti,ab,kw	4,432
#2	("model* of care"):ti,ab,kw	644
#1	("care model*"):ti,ab,kw	1,393

APPENDIX 2

Data extraction form

Study details and characteristics
Bibliographical data
Author(s); year of publication; country of origin
Study characteristics
Objective; design; methods; study period
Context
Setting; geographical location)
Participants
Inclusion/exclusion criteria; sample size; characteristics of participants
Results
Details of the care model (according to TIDieR and CReDECI 2)
Foundation of the care model
Theoretical/empirical
Objective of the care model
Core elements
Reasons for selection; goals/functions
Intended interactions between components
Qualification/competencies of the leading nurse
Consideration of context-specific factors
Pilot study and implication for the care model
Strategy for implementation of the care model
Materials and tools used
Duration of application
Adjustments/changes made
Process evaluation and theoretical basis
Internal barriers and facilitators
External conditions/factors that may have influenced the mode of action
Cost/resources