Reducing unplanned hospital admissions from care homes: an extended and enhanced systematic review

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Chapter 1. Background

Care home residents include a high proportion of people with complex health and care needs, including frailty and dementia[1]. Consequently, they are at high risk of experiencing unplanned hospital admissions through the urgent and emergency care (UEC) system. While they are sometimes necessary, such admissions can be distressing for the residents, their families and friends, and care home staff, and costly. A report by the Health Foundation concluded that around 40% of unplanned admissions from care homes may be avoidable (conditions potentially manageable outside hospital or possibly caused by poor care or neglect)[2]. In-hospital mortality following unplanned admission is high (up to 34% in a 2014 systematic review) despite specialist emergency care[3].

Interventions to reduce unplanned admissions from care homes or the community can potentially be implemented at various points in the health and social care system[4]. The University of York Centre for Reviews and Dissemination (CRD) conducted an evidence review on the topic for Northumberland Clinical Commissioning Group (CCG) in 2014[5]. This review focused on evidence related to community geriatrician services, case management, discharge planning, integrated working between primary care and care homes, medicines management, the prevention of delirium and end-of-life care. The review drew mainly on existing systematic reviews rather than being a full systematic review in itself. The key finding of the CRD review was that 'there is little good quality comparative evidence to inform strategies for reducing unplanned admissions from care homes'. The authors noted, however, that closer working between healthcare and care home staff, training for care home staff and advance care planning at end-of-life all appeared promising.

Coincidentally, a systematic review of interventions to reduce admissions from care homes was published by Graverholt et al. around the same time as the CRD report[6]. The review included four systematic reviews and five primary studies, covering 11 different interventions. Interventions were categorised as interventions to structure or standardise clinical practice; geriatric specialist services; and influenza vaccination. In line with the CRD report, Graverholt et al. concluded that the quality of evidence was low but some

interventions (for example, advance care planning, palliative care, care pathways and 'geriatric specialist services') represent promising approaches that require further research.

We were not aware of any subsequent broad reviews of this topic at the outset of our review. However, initial literature searching identified a more recent review by Buck et al. published in 2021. We compare our findings with those of Buck et al. in the Discussion section but our systematic treatment of issues related to implementation and applicability gives our work a broader focus than that of Buck et al.

The need for an update is justified by the publication of a substantial volume of new research since 2014. An initial scoping search of Medline, the Cochrane Library and CINAHL (January 2014 to January 2021) identified 647 unique references. Additional references were identified by members of the review team.

Action to reduce unnecessary and/or unhelpful/potentially harmful unplanned admissions among people in care homes and the wider community remains an important priority for health and social care in the UK and internationally. The recent UK Government White Paper *Integration and Innovation* set out plans to promote greater cooperation between health and social care[7]. The current COVID-19 pandemic further demonstrates the need for health and social care systems to work together. An additional concern in the UK is the phenomenon of 'delayed discharge' when patients admitted to hospital are unable to be discharged because of lack of social care support, which in turn affects patients requiring admission from emergency departments. Reduction of unplanned admissions from care homes can help to alleviate this pressure on the wider healthcare system.

Relevant interventions may be delivered in care homes, NHS settings or a mixture of the two and may involve many different health and social care professionals. This means that the research evidence identified and synthesised in this review is of key importance in enabling further development of integrated working between health and social care.

Background references (see also comments)

1. **Gordon AL, Franklin M, Bradshaw L, Logan P, Elliott R, Gladman JR: Health status of UK care home residents: a cohort study. *Age Ageing* 2014, 43(1):97-103.**

2. **Wolters A, Santos F, Lloyd T, Lilburne C, Steventon A: Emergency admissions to hospital from care homes: how often and what for? In. London: The Health Foundation; 2019.**

3. **Dwyer R, Gabbe B, Stoelwinder JU, Lowthian J: A systematic review of outcomes following emergency transfer to hospital for residents of aged care facilities. *Age and ageing* 2014, 43(6):759-766.**

4. **Huntley AL, Chalder M, Shaw ARG, Hollingworth W, Metcalfe C, Benger JR, Purdy S: A systematic review to identify and assess the effectiveness of alternatives for people over the age of 65 who are at risk of potentially avoidable hospital admission. *BMJ Open* 2017, 7(7):e016236.**

5. **Centre for Reviews and Dissemination: Interventions to reduce unplanned admissions from care home settings. In. York: University of York, Centre for Reviews and Dissemination; 2014.**

6. **Graverholt B, Forsetlund L, Jamtvedt G: Reducing hospital admissions from nursing homes: a systematic review. *BMC Health Serv Res* 2014, 14:36.**

7. **Department of Health & Social Care: Integration and innovation; working together to improve health and social care for all. In. London: Department of Health & Social Care; 2021.**

Chapter 2. Methods

Patient and public involvement

Review questions

The overall research questions were:

- What interventions are used in the UK health and social care system to minimise unplanned hospital admissions of care home residents?
- What candidate interventions, used in other applicable settings, could potentially be used in the UK?
- What can we learn from research studies and 'real-world' evaluations about the effects of such interventions on admissions?
- What is known about the feasibility of implementing such interventions in routine practice and their acceptability to care home residents, their families and staff?
- What is known about the costs and value for money associated with these interventions?

Identification of evidence

A broad search was conducted to identify published and peer reviewed literature on interventions to reduce unplanned admissions from care homes in the United Kingdom and other high income countries. Additionally, a search was undertaken to retrieve relevant grey literature.

The search strategy was developed on MEDLINE and then agreed with the research team, it is provided in Appendix 1. The search includes thesaurus and free-text terms and relevant synonyms for the population (residents in care homes for older people) and intervention (interventions to reduce unplanned admissions and named interventions) and makes use of proximity operators where appropriate and the different terms for each concept were combined using the Boolean operator OR. Population and intervention search terms were then combined using the Boolean operator AND. Outcome terms were not included in the search as outcomes information is not always included in title or abstracts meaning that

including these could mean that relevant studies would potentially not be retrieved. The search was limited to research published in English from 2014-Current to reflect developments since the previous review. Methodological search filters were not applied to keep searching broad and ensure all relevant study types were retrieved. However, an attempt was made to remove non-empirical research using the Boolean operator NOT for letters, editorials, news, historical articles, comments and case reports. Additionally, to ensure studies retrieved were on humans not animals the Boolean operator NOT was used to remove terms likely to be in studies on animals not humans. The NICE filter for OECD countries was used to aid retrieval of studies from UK and other high income countries (https://jmla.mlanet.org/ojs/jmla/article/view/978).

Once the MEDLINE search had been agreed it was translated to the other major medical and health-related bibliographic databases in December 2021.

The following databases were searched:

- Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EBSCO)
- EMBASE (Ovid)
- PsycInfo (Ovid)
- Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews (Wiley)
- Science and Social Sciences Citation Indexes (Web of Science)
- Health Management Information Consortium (HMIC)
- Social Care Online (Social Care Institute for Excellence)
- Social Service Abstracts (ProQuest).

Following the main search, an extra focused search was conducted to identify studies investigating interventions to reduce falls in care homes in January 2022. The search used the MeSH term Accidental Falls/pc [Prevention & Control] and free-text terms and was then combined with the main search population terms, the Medline search is provided in Appendix 1.

Targeted 'grey' literature searches were carried out to identify reports, guidelines and policy in January 2022, the websites of the following organisations were searched:

- Department of Health and Social Care https://www.gov.uk/government/organisations/department-of-health-and-social-care
- The Health Foundation https://www.health.org.uk/
- National Institute for Health and Care Excellence https://www.nice.org.uk/
- Nuffield Trust https://www.nuffieldtrust.org.uk/

The databases OpenGrey (https://easy.dans.knaw.nl/ui/advancedsearch) was searched although it is now an archive and no new items are been added.

Stakeholders were asked to identify additional relevant sources.

Citation searching of the 49 initially included studies, from the screen of the main and extra falls searches, was undertaken on Web of Science on 9th March 2022.

Reference checking of included studies and relevant existing reviews was completed.

Search results were downloaded to a bibliographic management database (EndNote X9) and deduplicated. Records were exported to EPPI-Reviewer systematic review software for coding and analysis.

Inclusion and exclusion criteria

Population/participants

The population of interest is residents in care homes for older people. Studies in which the main participants belong to other groups (for example, families and social networks of residents; care home staff; other health and social care professionals providing services for care home residents; and health and social care policy makers/service commissioners)were included if they met the other criteria with a focus on reducing residents' unplanned hospital admissions. We also included residents in assisted living or extra-care housing (with a wide range of services available on-site).

studies involving residential care for children/young people and vulnerable working age adults (e.g. people with learning disabilities) were excluded, as were studies of older adults living in the community, including sheltered housing and those receiving care at home. Studies of mixed samples with a separate subgroup analysis of care home residents were eligible for inclusion.

Interventions

Interventions delivered in care homes or hospitals to reduce unplanned/inappropriate admissions were included. The taxonomy used to classify interventions is presented in Table 1. The final version was modified from the provisional version presented in the protocol based on discussion among the review team during the study selection process.

Table 1: Taxonomy of included interventions

Type of intervention	Setting	Definition	Comments
Quality improvement (QI) programme	Care home	Complex intervention centred on improving staff skills and processes of care	
Integrated working	Care home	Complex intervention centred on improving links between external health care providers and care homes	
Training and workforce development	Care home	General training courses; vocational/educational qualifications	Simpler than QI programmes
Dealing with specific problems	Care home	Management of common causes of unplanned admissions, e.g. delirium, inappropriate prescribing, hydration and nutrition	Includes specific training courses
Paramedic assessment/non-conveyance	Pre-hospital	Paramedic assessment and possible treatment at the scene	Includes qualitative studies of decision-making
Emergency department (ED) interventions	ED	Specialist treatment during and shortly after admission	

Advance care planning (ACP)	Care home	Interventions to encourage ACP by residents and/or family carers	
Palliative/End of life care	Care home	Access to specialist palliative care services	
Other	Any	Relevant interventions not included elsewhere, e.g. protective flooring	

Comparator/Control

Optimally, included studies will compare an intervention with an alternative (such as continuing current practice) using an experimental (e.g. a cluster randomised trial comparing two groups of care homes)[8] or quasi-experimental (e.g. interrupted time series) design. We also included before/after studies with or without a control setting and non-comparative qualitative or mixed-methods studies.

Outcomes

The primary outcomes were measures of impact on unplanned admissions among care home residents (for example, absolute numbers or statistical effect measures from comparative studies); perceived feasibility of implementing the intervention in UK settings (barriers/facilitators); and acceptability to care home residents, their families and staff involved in delivering the intervention. Secondary outcomes include costs/resource use and any measure of 'cost-effectiveness' (value for money). Patient-reported outcome measures (PROMs, i.e. those reported directly by the patient or carer without interpretation by clinicians or others) were included where available.

Study types

We included studies of any design providing data on the outcomes of interest. This includes:

- quantitative research studies of any design
- qualitative research involving interviews, focus groups etc.
- mixed-methods studies
- service evaluations from the UK only
- UK-relevant guidelines, policy documents and grey literature.

We also included systematic literature reviews but in view of the volume of primary literature retrieved these were used for reference checking only..

Settings

The setting of interest is the UK social care and health system. Studies from other high-income countries (as defined by the World Bank) were included but synthesised separately and assessed for relevance to the UK context using the FITAR (Framework for Intervention Transferability Applicability Reporting) tool[9].

Additional exclusion criteria

Editorials, commentaries, opinion surveys, news and discussion articles, books, book chapters, theses and conference abstracts were excluded, as well as articles in languages other than English.

Study selection

Selection of studies for the review was carried out in stages. In view of the large number of records retrieved, keyword searching of EPPI-Reviewer for relevant terms in titles and abstracts was used as a preliminary filter. Search terms included ‘care home(s)’, ‘nursing home(s)’, ‘assisted living’, ‘extra-care’, ‘ambulance’, ‘paramedic’, ‘skilled nursing facility’ and ‘RACF’ (residential aged care facility). Records that contained relevant terms but were

obviously not relevant based on their title were excluded by a single reviewer. Titles and abstracts of remaining records were screened by two reviewers independently using the inclusion criteria above. Discrepancies were resolved by discussion and, if necessary, by reference to a third reviewer. Full-text items that appeared potentially to meet the inclusion criteria were obtained and evaluated by two reviewers independently, with disagreements resolved as above. Records of the process were maintained in EPPI-Reviewer.

Data extraction and quality (risk of bias) assessment

Data were extracted from included studies in EPPI-Reviewer Web (EPPI Centre, University College London, UK) using a customised set of codes covering the study characteristics, key findings/conclusions and strengths/limitations. Data on intervention components and delivery were extracted using the TIDiER-Lite checklist. We used the PARIHS (Promoting Action on Research Implementation in Health Services) framework to support extraction of relevant data on implementation of interventions from included UK studies and the FITAR tool to assess applicability of international evidence to the UK context.

We assessed risk of bias for studies using recognised research designs using the following tools:

- Joanna Briggs Institute (JBI) checklists for randomised controlled trials (RCTs) and quasi-experimental studies
- National Heart, Lung and Blood Institute checklist for cohort and cross-sectional studies
- Mixed Methods Appraisal Tool (MMAT) for mixed methods and qualitative studies

Assessments were performed by two reviewers independently, with discrepancies resolved by consensus or referral to a third reviewer.

Synthesis of evidence

We grouped studies by type of intervention and setting (UK or international) and summarised study characteristics, findings and study quality for each group, together with any general issues about implementation or applicability to the UK setting. Studies were assigned to one intervention group but the synthesis takes account of links between intervention types, for example advance care planning can be a stand-alone intervention, part of a QI programme or linked to an approaching need for palliative/end-of-life care.

We classified the overall strength of evidence for intervention effectiveness as 'stronger', 'weaker', 'very limited' or 'inconsistent' based on the following criteria:

- 'stronger evidence' represents generally consistent findings in multiple studies with a comparator group design,
- 'weaker evidence' represents generally consistent findings in one study with a comparator group design and several non-comparator studies or multiple non-comparator studies,
- 'very limited evidence' represents an outcome reported by a single study and, finally,
- 'inconsistent evidence' represents an outcome for which < 75% of the studies agree on the direction of effect.

Evidence on effectiveness was considered alongside that on feasibility, acceptability and 'cost-effectiveness' to assist decision-makers in forming an overall assessment of the value of the intervention. All studies included in the review were included in the analysis of the overall strength of evidence, with no exclusions based on study design or risk of bias.

Evidence summary tables are presented in the main text. Detailed tables on intervention characteristics, implementation and applicability are presented in Appendices 2 and 3. Risk of bias tables for different study designs are presented in Appendix 4.

Chapter 3. Results

Results of literature search

The database searches retrieved 24656 references which were imported into Endnote X9. After the removal of 7691 duplicates there were 16965 unique references. The unique references were then imported in EPPI-Reviewer systematic reviews software and a check for duplicates found a further 120 duplicates leaving 16845 unique references. The large number of references would have taken up too much time and resource to screen thus searches were undertaken on EPPI to prioritise references for screening. Single reviewer title screening was then undertaken on 4393 references and 568 were then screened on abstract by two reviewers with 226 included for full-text screening. 96 references were included in the full review from the original database search.

The extra focused database search for falls prevention retrieved 198 references after duplicates within the falls and from the original search were removed. All of the 198 references were screened on title and 22 were included for abstract screening. 17 references were included for full-text screening and 7 were included in the review.

Citation searches retrieved 620 references, after deduplication within the citation search results and the Endnote library 406 references were imported into Endnote for screening. Title screening included 84 of these references for abstract screening and 32 were included for full-text screening with 15 included in the final review.

Reference checking of included studies found 4 further studies for inclusion in the review.

A further 2 included studies were found from alerts.

Search of websites of relevant organisations retrieved 6 potential additional publications, none of which were included.

The PRISMA flow diagram illustrates the study selection process.

Summary of included studies

Of the 124 studies from which we extracted data, 30 were from the UK, 44 from the USA, 24 from Australia, 4 from New Zealand, 20 from other countries and 2 from multiple countries (Table 2). The most common types of intervention were integrated working (particularly in the UK and Australia) and QI programmes (particularly in the USA).

Table 2: Distribution of included studies by intervention and country

	UK	Australia	USA	New Zealand	Other
QI programme	3	1	18	4	1

Integrated working	13	15	4	0	4
Training/work force development	4	0	1	0	2
Management of specific problems	4	1	4	0	5
Paramedic assessment/non-conveyance	0	0	0	0	1
ED interventions	0	1	0	0	1
Advance care planning	4	1	5	0	4
Palliative/end of life care	3	5	6	0	2
Other	0	0	4	0	1

In terms of study design, the largest single group was cluster RCTs (17 studies), followed by uncontrolled before-after (15), controlled before-after (13), non-randomised controlled trials (11), qualitative studies (11) and mixed methods studies (10). Four studies used a step wedge design, involving randomisation to introduce the intervention at different times during the study Thirty-two studies used other designs, including cohorts and secondary data analyses.

Quality improvement programmes

UK evidence

We included three studies of interventions in UK settings that were classified as quality improvement (QI) programmes[1-3]. The key feature of QI programmes is an emphasis on developing skills and expertise within the care home. Studies in which the intervention included elements of QI but the main emphasis was on integrating health and social care using expertise from outside the care home are discussed below under 'Integrated working'.

Two of the studies were regionally based and involved around 30 care homes each[1, 2], while the third was smaller with just three care homes involved [3]. Care homes in the study by

Damery et al. were predominantly nursing homes, while Giebel et al.'s study included a mixture of nursing and residential care homes. All three studies used a before/after type of design with no separate control group. Formal risk of bias assessments were not performed because all the studies were potentially at high risk of bias. Study characteristics are summarised in Table 3; Table xx (Appendix 2) gives more details of the interventions. Two studies reported a significant improvement in at least one outcome following implementation of the QI intervention, while one reported a small increase in admissions[1]. These mixed results, together with the weak design of the included studies, suggest that evidence for the effectiveness of QI programmes in the UK is both weak and inconsistent.

The two larger studies reported in some detail on implementation of the programmes while information was more limited for the smaller study by Steel et al. (Table xx). Barriers to implementation centred around high staff turnover and resistance from some care home managers. Factors that acted as facilitators included active facilitation by programme staff, an emphasis on opportunities for career progression in one study[2] and a policy environment in which reducing unplanned admissions is a high priority.

Table 3: summary of UK QI studies

Short Title	Study ID	Study type	Type of care home	Sample size	Comparator	Outcomes	Intervention effect
Damery (2021)	*Damery 2021*[1]	Mixed methods	Nursing home *28/29 provided nursing care*	Care homes *29 care homes from two localities in the West Midlands* Individuals *Over 1000 care home staff received QI training as part of the SPACE intervention*	Standard care (before/after)	All admissions Transport to ED Feasibility of intervention	No effect *Non-significant increase in admissions (p = 0.052); no effect on ED attendance*
Giebel (2020)	*Giebel 2020*[2]	Interrupted time series	Nursing home *15* Residential home *17*	Care homes *32 care homes with 1314 beds* Individuals *Unclear (no individual patient data were collected)*	Standard care (before/after) *1 year pre- and 4 years post-implementation*	Unplanned/preventable admissions *Conveyance to hospital appears to be considered as a 'potentially avoidable admission'* Transport to ED Other (specify) *Emergency calls*	Significant positive effect *19% reduction in conveyance to hospital*
Steel (2022)	*Steel 2022*[3]	Uncontrolled before/after	Residential home	Care homes *Three residential*	Standard care (before/after)	All admissions Costs/cost-effectiveness	Significant positive effect

				homes Individuals *34 care home residents*		Other (specify) *Advance care planning; polypharmacy*	*75% reduction in admissions at one care home*

International evidence

The international evidence on QI programmes comes mainly from the USA (18 studies), with additional evidence from New Zealand (4 studies), Australia and Switzerland (1 study each).

The 18 US studies mainly reported on three QI programmes: INTERACT (Interventions to Reduce Acute Care Transfers); MOQI (Missouri Quality Initiative); and OPTIMISTIC (Optimising Patient Transfers, Impacting Medical Quality and Improving Symptoms: Transforming Institutional Care). Two studies (Ingber 2017; Vadnais 2020) summarised the results of an initiative launched by the Centers for Medicare and Medicaid Services (CMS) in 2012. This initiative covered QI programmes in seven US states, including MOQI and OPTIMISTIC (Indiana).

The 18 included studies are listed in Table 4 and Table 5 summarises the key reports on intervention effectiveness. Table 6 summarises details of the INTERACT, OPTIMISTIC and MOQI interventions as extracted from the key study reports.

Table 4: Included US QI studies*

Reference	**Programme name**	**Effect?**	**Comments**
Blackburn 2020	**OPTIMISTIC**	**Yes**	**Before/after; highlights variation across facilities**
Ersek 2018	OPTIMISTIC		Qualitative study
Galambos 2021	MOQI		Stakeholder surveys
Huckfeldt 2018	INTERACT	Yes	Varies by degree of implementation
Ingber 2017	**Summary of 7 initiatives**	**Yes**	**Relative to comparison groups**
Kane 2017	**INTERACT**	**No**	**RCT of implementation support**
Ouslander 2018	INTERACT		Secondary data analysis
Ouslander 2021	INTERACT		Secondary data analysis

Popejoy 2019	MOQI		Evaluates use of INTERACT tools
Rantz 2015	MOQI	Yes?	Single-facility before/after
Rantz 2017	**MOQI**	**Yes**	**Before/after; main results paper**
Rantz 2018	MOQI		Implementation, role of APRN
Rantz 2021	MOQI		Estimated cost savings
Tappen 2018	INTERACT		No negative effect on safety
Vadnais 2020	**Summary of 7 initiatives**	**Yes**	**Follow-up to Ingber**
Vogelsmeier 2019	MOQI		Analysis of avoidable transfers
Vogelsmeier 2020	MOQI		Implementation: role of support team
Vogelsmeier 2021	MOQI	Yes	6-year follow-up before/after

*Key study reports in **bold**

Table 5: Summary of key US QI study reports

Study ID	Study type	Type of care home	Sample size	Comparator	Outcomes	Intervention effect
Blackburn 2020{Blackburn, 2020 #1570}	Uncontrolled before/after	Nursing home	Care homes *Nineteen facilities in Indiana were enrolled in the OPTIMISTIC programme in October 2012*	Standard care (before/after)	All admissions *Kaplan-Meier curves estimating the probability of a resident being hospitalisation-free from time of eligibility were calculated overall and separately for each facility*	Significant positive effect *Compared with the preintervention period, residents during the intervention period had an increased probability of having no hospitalizations within 1 year, increasing from 0.51 to 0.57, which was statistically significant (P < .001*

Ingber 2017{Ingber, 2017 #4233}	Controlled before/after Mixed methods	Nursing home	Care homes *7 Enhanced Care and Coordination Provider (ECCP) organisations* *143 ECCP facilities* *262 comparison facilities* Individuals *61,636 facility residents* *22,442 from 143 ECCP facilities* *38,194 from 262 comparison facilities*	Standard care (before/after)	Unplanned/preventable admissions All admissions Feasibility of intervention *Processes, successes, challenges, lessons learned, and unintended consequences* Acceptability to residents/families Costs/cost-effectiveness *Medicare expenditure*	Significant positive effect

Kane 2017{Kane, 2017 #4049}	Cluster RCT	Nursing home	Care homes *85 (33 intervention, 52 control)* Individuals *23478 (9050 intervention, 14428 control)*	Standard care (parallel control group)	Unplanned/preventable admissions *Based on Medicare/Medicaid criteria* All admissions Transport to ED *ED visits without admission* Other (specify) *30-day readmissions*	No effect *Effect for avoidable admissions not robust after correction for multiple comparisons*
Rantz 2017{Rantz, 2017 #4014}	Uncontrolled before/after	Nursing home	Care homes *16 NHs within 80 miles of a major city in Missouri, USA* Individuals *5186 enrolled; average 1750 each day*	Standard care (before/after)	Unplanned/preventable admissions All admissions	Significant positive effect *For all-cause admissions in some quarters*

Vadnais 2020{Vadnais, 2020 #1574}	Controlled before/after *Pooled evaluation of 7 separate QI programmes in different US states under the Centers for Medicare and Medicaid Services (CMS) Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents*	Nursing home	Care homes *Not reported but target of 15-30 intervention NHs per state* Individuals *Baseline period: intervention: 24,978, comparison: 41,986 Intervention period: intervention: 67,315, comparison: 117,383*	Standard care (before/after)	Unplanned/preventable admissions All admissions	Significant positive effect *Reduction in all-cause and potentially preventable hospital transfers compared with controls*

Table 6: Characteristics of the INTERACT, OPTIMISTIC and MOQI QI interventions

Study ID	By whom	What	Where	To what intensity	How often

Blackburn 2020{Blackburn, 2020 #1570}	*Full-time registered nurses working with care home staff*	*Working together to assess changes in resident condition and implement quality improvement measures. Additionally, OPTIMISTIC nurse practitioners provide in-person evaluations, and management of residents with acute condition changes. Evidence-based processes implemented under OPTIMISTIC include coordination of care through collaborative*	*Nursing home*	*Nurses employed full-time*	*Not applicable*

		care reviews, advance care-planning facilitation, and the use of tools from Interventions to Reduce Acute Care Transfers.			

Kane 2017{Kane, 2017 #4049}	*INTERACT study team; INTERACT champion and co-champion in each NH*	*Training and support (primarily telephone/online) for implementing INTERACT, including tools to help NH staff identify and evaluate acute changes in NH resident condition and document communication between physicians; care paths to avoid hospitalisation when safe and feasible; and advance care planning and quality improvement tools*	*Participating NHs*	*1-year intervention period (March 2013 to February 2014)*	*Not reported*

Rantz 2017{Rantz, 2017 #4014}	*APRN (nurse practitioner or clinical nurse specialist) at each NH; Project Medical Director; other MOQI team members, including Quality Improvement Coach, Care Transitions Coach (co-ordinating advance care planning and end of life care) and HIT (Health Informatiom Technology) co-ordinator; other stakeholders, including social services, primary care and nursing staff See also Vogelsmeier*	*Early recognition, assessment and management of residents' condition (APRNs); education of APRNs, advice to MOQI team, liaison with participating physicians (Medical Director); use of INTERACT tools, including root cause analysis for all hospital transfers; regular feedback to NH leadership; proactive discussions about end-of-life care and*	*Participating NHs and other treatment settings*	*Full-time APRN in each NH supported by MOQI team*	*Not reported*

	2020{Vogelsmeier, 2020 #2120}	*advance care planning*			

Initial evaluations of OPTIMISTIC{Blackburn, 2020 #1570} and MOQI{Rantz, 2017 #4014} used a before/after design with no control group, placing them at high risk of bias. Subsequently, Ingber et al.{Ingber, 2017 #4233} and Vadnais et al.{Vadnais, 2020 #1574} strengthened the evidence base by using administrative data to create comparison groups (matched by propensity scoring) for both intervention groups, together with five other initiatives funded by the CMS (see Table 5). However, INTERACT was the only programme to undergo a randomised trial, as well as a number of secondary data analyses (Table 4). The trial was subject to unclear risk of bias as key details including method of randomisation were not reported in the paper{Kane, 2017 #4049}.

The main component of INTERACT is a series of tools for care home staff to recognise acute changes in residents' condition, document communication with physicians and use care pathways to avoid hospital admission when safe to do so. The trial performed by Kane et al. compared implementation support for INTERACT with standard care in nursing homes that could be using INTERACT tools without support. By contrast, OPTIMISTIC and MOQI both involved study nurses working in nursing homes to improve staff skills and promote best practice. The MOQI programme also involved use of some of the QI tools developed by INTERACT (see Table 6).

In terms of effectiveness, the trial of implementation support for INTERACT{Kane, 2017 #4049} reported a reduction in avoidable admissions that was not robust after correction for multiple comparisons. Subsequent analyses revealed that nursing homes in the intervention or control group reporting high usage of INTERACT achieved reductions in potentially avoidable admissions of 0.221 per 1,000 resident‐days, representing an 18.9% relative reduction{Huckfeldt, 2018 #6721}. The MOQI and OPTIMISTIC studies reported reductions in unplanned admissions but both were at high risk of bias as noted above.

The initial analysis of the seven CMS-funded initiatives with a controlled before/after design reported mixed results for reductions in potentially avoidable admissions{Ingber, 2017 #4233}. Three of the seven programmes reported statistically significant reductions against matched controls in 2014 and four did so in 2015. Only two programmes (MOQI and OPTIMISTIC) reported significant reductions in both years. These findings suggest the

existence of 'publication bias' in the reporting of this initiative, with only the more successful programmes publishing their results in full. In a subsequent analysis, Vadnais et al. combined data from 2014-16 for all intervention and control groups to produce a single effect estimate{Vadnais, 2020 #1574}. The combined analysis reported an annual decrease in potentially avoidable admissions of 2.01 percentage points (95% CI 2.86 to 1.15), representing an 18% relative reduction. Reductions in potentially avoidable acute care transfers and ED visits were also reported.

In summary, the studies of QI programmes implemented in US nursing homes broadly meet the criteria for 'stronger' evidence but the findings should be interpreted with caution because of possible confounding factors in uncontrolled studies and unclear risk of bias. The inclusion of MOQI and OPTIMISTIC as separate publications and as part of the combined analysis should also be taken into account.

Other studies

Three studies (four publications) described QI programmes evaluated in New Zealand care homes (Table 7). The studies were performed by the same group of authors, were relatively large and performed in a diverse range of settings. Two studies were cluster RCTs and one was a repeated measures before/after study. The study by Boyd et al.{Boyd, 2014 #26013} was at unclear risk of bias because of limited reporting and lack of blinding. The ARCHUS (Aged Residential Care Healthcare Utilisation Study) trial{Connolly, 2015 #5738} was better reported and appeared to be at lower risk of bias, although as usual with this type of intervention, only limited blinding was possible. The third study was at high risk of bias because there was no control group{Connolly, 2018 #3183}.

The interventions used in the three studies are summarised in Table 8. The first study involved a relatively simple intervention with gerontology nurse specialists (GNSs) providing on-site support to care home staff{Boyd, 2014 #26013}. The ARCHUS study added a wider multi-disciplinary team (MDT){Connolly, 2015 #5738} and this intervention was also evaluated in the third study with some minor changes{Connolly, 2018 #3183}.

Neither of the randomised trials found that the intervention reduced potentially preventable admissions compared with standard care. A subsequent 'post-hoc' analysis of the ARCHUS data reported a reduction in admissions for a group of five conditions (cardiac failure,

ischaemic heart disease, chronic obstructive pulmonary disease, stroke and pneumonia) responsible for many admissions among care home residents{Connolly, 2016 #5020} but as an unplanned analysis this should be treated with caution. Connolly et al. 2018{Connolly, 2018 #3183} reported a reduction in admissions post-intervention but causality is uncertain in the absence of a control group. This suggests that the evidence for QI programmes involving GNSs with or without MDT support in New Zealand is at best inconsistent.

One additional study evaluated a QI programme in Switzerland using a stepped wedge design{Zuniga, 2021 #25537}. The intervention, designated INTERCARE, was similar to the US programmes described above, with a nurse appointed to each participating care home as a link between care home staff and physicians. INTERCARE also used tools from the INTERACT programme. As this was a non-randomised study the risk of bias was higher than for similar stepped-wedge studies with randomisation. The study reported a significant reduction in unplanned hospital transfers compared with the pre-implementation period, thus strengthening the international evidence base for QI programmes of the INTERACT type.

Table 7: Summary of New Zealand QI studies

Study ID	Study type	Type of care home	Sample size	Comparator	Outcomes	Intervention effect
Boyd 2014{Boyd, 2014 #26013}	Cluster RCT	Nursing home Residential home	Care homes *Intervention facilities n=29 Comparison facilities n=25* Individuals *Intervention facilities 1,425 residents Comparison facilities 1,128 residents*	Standard care (parallel control group)	Unplanned/preventable admissions *Medical admissions considered as potentially preventable* All admissions *All resident hospitalisations*	No effect *Acute hospitalisation rates increased for both groups, although less for intervention group*

Connolly 2015{Connolly, 2015 #5738}	Cluster RCT	Nursing home *Mixture of 'private hospital care' for those requiring assistance with activities of daily living (ADL) and 24h nurse availability; dementia care (secure rest homes); and psychogeriatric care (for those with dementia and additional needs)* Residential home *'Rest homes' not providing 24h nursing care*	Care homes *36 (18 in each group)* Individuals *1998 (1123 intervention; 875 control)*	Standard care (parallel control group)	Unplanned/preventable admissions *Defined as ambulatory-sensitive hospitalisations, i.e. admission for specific conditions* All admissions *All acute admissions* Length of hospital stay Other (specify) *Mortality*	*No effect* *No difference in avoidable admissions (RR 1.07; 95% CI 0.85-1.36) or mortality*

Connolly 2018{Connolly, 2018 #3183}	Uncontrolled before/after	Nursing home Residential home *Similar to Connolly 2015{Connolly, 2015 #5738}*	Care homes *21 facilities with higher than expected ED presentation/admission rates* Individuals *1296 beds*	None *Repeated measures before/after*	Unplanned/preventable admissions *Emergency admissions for specific conditions; paper appears to use presentation and admission interchangeably (authors note ED presentation more directly under control of care home staff)* Transport to ED	Significant positive effect *25% reduction in ED admissions after intervention*

Table 8: Details of interventions used in New Zealand QI studies

Study ID	By whom	What	Where	To what intensity	How often

Boyd 2014{Boyd, 2014 #26013}	*GNS working with care home staff and primary and secondary health care services*	*Clinical support; education and clinical coaching; and care co-ordination for high-risk residents*	*Care home*	*The GNS was on site at each facility for a mean of 1.9 hours per month. GNSs provided care coordination and comprehensive geriatric assessments for residents of concern as needed (mean 2.6 assessments per facility in 12 months). The GNS also provided care coordination for residents transitioning across healthcare settings, although much of this work was not well captured in GNS records.*	*On-site visits every other month and delivery of standardized gerontology education sessions for nurses and care assistants (mean 5.5 sessions per facility in 12 months). Ad hoc on-site clinical coaching to discuss residents of concern (mean 2.3 sessions per facility in 12 months) occurred at the request of facility staff.*

Connolly 2015{Connolly, 2015 #5738}	*Gerontology nurse specialists (GNS) and study MDT*	*Facility baseline assessment and care plan; monitoring and benchmarking of indicators linked to care quality; MDT meetings to review individual residents' needs; gerontology education and clinical coaching for care home nurses*	*Care home/facility*	*GNS support/education began with weekly visits and gradually reduced in intensity over the 9-month intervention period*	*Benchmarking: 3 times during the intervention period; MDT meetings monthly for the first 3 months at each site*

Connolly 2018{Connolly, 2018 #3183}	*GNSs and study MDT*	*Facility baseline assessment; clinical coaching for nurses and care-givers; MDT meetings, including medication review;*	*Care home/facility*	*Increased clinical coaching time at each facility (relative to ARCHUS)*	*3 one-hour MDT meetings at each facility*

Applicability

Economic evidence

Integrated working

UK evidence

We used 'integrated working' to cover interventions in which the central feature was enhanced health service support for care homes, albeit often as part of a complex intervention with several elements, for example staff training and patient advocacy. We included 13 UK studies in this group, most of which were part of the Enhanced Health in Care Homes (EHCH) initiative[4-11] (Brine; Conti; Lloyd 2017; Lloyd 2019; Morciano; Sherlaw-Johnson; SQW; Vestesson; Wolters) Data from these studies were analysed independently by the Health Foundation, Nuffield Trust and other independent organisations. The remaining publications described or evaluated local initiatives and were mainly published as 'grey literature'[12-14].(Healthwatch; Holder; Royal Pharmaceutical Society; Tunstall)

Five of the EHCH studies (six publications) reported on initiatives in specific English cities or districts (Nottingham, Sutton, Rushcliffe, outer East London and Wakefield) with support from local commissioners and health and social care organisations. Details of the interventions varied (Table x in Appendix 2) and all had multiple elements but strengthening links between care homes and local general practices was a key feature. One intervention differed from the others by including availability of support from a geriatrician[9]. (Sherlaw-Johnson)

Characteristics of these studies are summarised in Table 9. The studies used linked care home and hospital data to compare outcomes of residents in participating care homes with those of a matched control group in homes with similar characteristics but not receiving enhanced support. This means that the comparison was not randomised and limited data on resident

characteristics were available. A further study used administrative data to estimate the effect of new integrated care models (including EHCH) on hospital admissions at the national level.[8].

Four of the five local interventions reported a decrease in emergency admissions, potentially preventable emergency admissions or both compared with matched control groups. The exception was the initiative in Sutton, which the authors suggested may have been evaluated too early for any effect to be detected[5]. Relative reductions of between 18% and 39% were reported but confidence intervals suggested a range of effects from less than 5% to over 50%. A subgroup analysis of the Nottingham study indicated that the reduction in admissions was present for residential homes but not for nursing homes[6], possibly because the lower baseline level of support in these homes gave more scope for improving outcomes. Overall, this group of studies constitutes 'stronger' evidence for the effectiveness of integrated working initiatives but with uncertainty about the size and clinical significance of any effect.

Brine (Nottingham): 18% reduction in emergency admissions
Conti (Sutton): Possible increase in EAs
Lloyd (Rushcliffe): 23% fewer emergency admissions, 28% fewer potentially avoidable
Lloyd: Effect for residential homes only
(Morciano: care homes helped slow increase in rate of EAs)
Sherlaw (outer E London): 36% reduction in EAs, 39% for ACS conditions
Vestesson (Wakefield): not conclusive but potentially avoidable EAs down 27%
Wolters: overall summary, importance of co-production, primary care, allow time to detect effect
Potentially 'stronger' evidence but with some caveats

Implementation barriers/facilitators plus table (Appendix 2)

Table 9: Summary of UK integrated working studies

Study ID	Study type	Type of care home	Sample size	Comparator	Outcomes	Intervention effect

Brine 2019 *{Brine, 2019 #19048}*	Controlled before/after	Nursing home Residential home	Care homes *15 nursing and 23 residential care homes'* Individuals *782 residents*	Standard care (before/after)	Unplanned/preventable admissions All admissions Transport to ED Length of hospital stay Other (specify) *Proportion of deaths that took place outside hospital (as a proxy for dying in preferred place of death)*	Significant positive effect *Emergency admissions were 18% lower for the intervention group and potentially avoidable emergency admissions 27% lower. Differences were only significant for residential homes. There was no difference between groups in ED attendance.*

Conti 2018 *{Conti, 2018 #19080}*	Controlled before/after	Nursing home Residential home	Care homes *Intervention group - 17 nursing homes and 11 residential care homes Matched control group - 97 care homes* Individuals *Intervention group - 297 residents Matched control group - 243 indviduals, 296 records*	Standard care (before/after)	Unplanned/preventable admissions *The subset of 'potentially avoidable' emergency admissions, based on a list of conditions considered to be manageable in community settings or preventable through good quality care* Emergency admissions Transport to ED *A&E attendances* Length of hospital stay *Hospital bed days* Other (specify) *Outpatient appointments Admissions with a UTI as principal diagnosis Proportion of death occurring outside hospitals (taken indicator of successful end of life planning)*	No effect

Lloyd 2017 *{Lloyd, 2017 #19091}*	Controlled before/after	Unclear or NA *Just says care homes*	Care homes *23 Principia care homes* *Comparison group was from 64 care homes* Individuals *588 residents from Principia care homes* *588 residents in comparison group*	Standard care (before/after)	Unplanned/preventable admissions Emergency admissions All admissions Transport to ED Length of hospital stay Other (specify) *Outpatient attendances* *Death*	No effect *Significant reduction in emergency admissions only*

Lloyd 2019{Lloyd, 2019 #2712}	Controlled before/after	Nursing home Residential home	Care homes *Nursing homes: 10 intervention, 27 control; Residential homes: 13 intervention, 47 control* Individuals *568 in each group*	Standard care (before/after)	Unplanned/preventable admissions *Potentially preventable emergency admissions* All admissions *Emergency admissions* Transport to ED Length of hospital stay Other (specify) *Proportion of deaths outside hospital*	Significant positive effect *Residential care homes only*

Morciano 2020{Morciano, 2020 #1036}	Controlled before/after	Nursing home Residential home	Care homes *Not reported (care homes participating in six EHCH pilot projects (Vanguards) were included)* Individuals *Not reported (residents in care homes participating in six EHCH pilot projects (Vanguards) were included)*	Standard care (parallel control group) *Compares data from care home Vanguard sites with non-Vanguard sites; appears to be total hospital admissions and bed-days*	All admissions *Emergency admissions* Length of hospital stay *Hospital bed-days*	Significant positive effect *Significant reduction in rate of emergency admissions for care home Vanguard vs. non-Vanguard areas*

Sherlaw-Johnson 2018{Sherlaw-Johnson, 2018 #15252}	Mixed methods	Nursing home	Care homes *4 (intervention (Health 1000) group; 19 (comparator group)* Individuals *431 (intervention group); 1495 (comparator group)*	Standard care (before/after)	All admissions *Emergency admissions* Transport to ED Length of hospital stay Acceptability to care home staff Costs/cost-effectiveness	Significant positive effect *35% marginal reduction in emergency admissions (95% CI 6% to 55%)*

SQW Ltd 2017*{SQW, 2017 #19092}*	Mixed methods	Nursing home Residential home	Care homes *All Sutton (CCG and LA) care homes invited participated in intervention. January 2017, Sutton CCG had: 81 care homes (covering about 1,300 beds). Comprising 18 nursing homes (with 610 beds) 11 residential homes (with 289 beds) 52 mental health and learning disability*	None	Unplanned/preventable admissions *Non-elective admissions* Emergency admissions Transport to ED Length of hospital stay Acceptability to residents/families Costs/cost-effectiveness Other (specify) *Preferred place of death*	No effect

			homes (with 397 beds). Additionally, there are five homes that are within the London Borough of Sutton but have GPs from outside Sutton CCG2 Care home population not static, residents moved in and and died and care homes, opened and closed. 2015-16 focused on nursing homes from			

			Autumn 2016 residential homes more involved. Individuals *Not reported*			
Vestesson 2019{Vestesson, 2019 #19047}	Controlled before/after	Nursing home Residential home Assisted living/extra care housing *Two supported living schemes received some parts of the support given to care homes*	Care homes *15 in intervention (Vanguard) and 30 in matched control group* Individuals *526 residents in each group*	Standard care (parallel control group) *Matched controls in similar care homes*	Unplanned/preventable admissions *Emergency admissions for specific conditions* Emergency admissions Transport to ED Length of hospital stay *Emergency and elective hospital bed days* Other (specify) *Deaths in hospital*	Significant positive effect *Significant but not conclusive evidence for potentially avoidable admissions*

Wolters 2019{Wolters, 2019 #19046}	Other (specify) *Summary of learning from Health Foundation evaluations of initiatives in Sutton, Rushcliffe, Nottingham and Wakefield*	Nursing home Residential home	Care homes *Not reported (see reports on individual initiatives)* Individuals *Not reported (see reports on individual initiatives)*	Standard care (before/after)	Unplanned/preventable admissions Emergency admissions Transport to ED Feasibility of intervention	Significant positive effect *Varied across sites/outcomes*

International evidence

Training/workforce development

UK evidence

International evidence

Management of specific problems

UK evidence

International evidence

Paramedic assessment/non-conveyance

Emergency department (ED) interventions

Interventions delivered in the ED or by ED staff following admission (e.g. follow-up visits)

Advance/anticipatory care planning

UK evidence

International evidence

Palliative/end-of-life care

UK evidence

International evidence

Other interventions

Chapter 5. Discussion and conclusions

Disclaimer

Acknowledgements

Contribution of authors

Data sharing

References

1. Damery S, Flanagan S, Jones J, Jolly K. The Effect of Providing Staff Training and Enhanced Support to Care Homes on Care Processes, Safety Climate and Avoidable Harms: Evaluation of a Care Home Quality Improvement Programme in England. *Int J Environ Res Public Health* 2021;**18**:16. https://doi.org/https://dx.doi.org/10.3390/ijerph18147581
2. Giebel C, Harvey D, Akpan A, Chamberlain P. Reducing hospital admissions in older care home residents: a 4-year evaluation of the care home innovation Programme (CHIP). *BMC Health Serv Res* 2020;**20**:94. https://doi.org/https://dx.doi.org/10.1186/s12913-020-4945-9
3. Steel A, Hopwood H, Goodwin E, Sampson EL. Multidisciplinary residential home intervention to improve outcomes for frail residents. *BMC Health Serv Res* 2022;**22**. https://doi.org/10.1186/s12913-021-07407-y
4. Brine R, et a. *The impact of providing an enhanced package of care for care home residents in Nottingham City: briefing*. London: Health Foundation; 2019.
5. Conti S, et a. *Briefing: the impact of providing enhanced support for Sutton Homes of Care residents*. London: Health Foundation; 2018.
6. Lloyd T, Conti S, Santos F, Steventon A. Effect on secondary care of providing enhanced support to residential and nursing home residents: a subgroup analysis of a retrospective matched cohort study. *BMJ Qual Saf* 2019;**28**:534-46. https://doi.org/https://dx.doi.org/10.1136/bmjqs-2018-009130
7. Lloyd T, Wolters A, Steventon A. *Briefing: The impact of providing enhanced support for care home residents in Rushcliffe*. London: Health Foundation; 2017.
8. Morciano M, Checkland K, Billings J, Coleman A, Stokes J, Tallack C*, et al.* New integrated care models in England associated with small reduction in hospital admissions in longer-term: A difference-in-differences analysis. *Health Policy* 2020;**124**:826-33. https://doi.org/https://dx.doi.org/10.1016/j.healthpol.2020.06.004
9. Sherlaw-Johnson C, Crump H, Curry N, Paddison C, Meaker R. Transforming health care in nursing homes: an evaluation of a dedicated primary care service in outer east London. 2018.
10. Vestesson E, et a. *The impact of providing enhanced support for care home residents in Wakefield: briefing*. London: Health Foundation; 2019.
11. Wolters A, et a. *Emergency admissions to hospital from care homes: how often and what for?* London: Health Foundation; 2019.
12. Healthwatch I. *Experiences of integrated care and the Integrated Care Ageing team*. London: Healthwatch Islington; 2015.

13. Royal Pharmaceutical S. *Sustainability and transformation partnerships*. London: Royal Pharmaceutical Society; 2018.
14. Tunstall. *NHS demand management from care homes: a £1bn opportunity for NHS England*. London: Tunstall; 2018.

Appendices

Search strategy/strategies

Appendix 1: Medline search strategies

Main search strategy

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to December 14, 2021>

Search Strategy:

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1 residential facilities/ or homes for the aged/ or nursing homes/ (47896)

2 "residential care".ab,ti. (3754)

3 "care home*".ab,ti. (4721)

4 "nursing home*".ab,ti. (32554)

5 Assisted Living Facilities/ (1528)

6 "assisted living".ab,ti. (2410)

7 "extra care housing".ab,ti. (16)

8 or/1-7 (65730)

9 exp *aged/ or exp *geriatrics/ or exp *geriatric nursing/ or (centarian* or centenarian* or elder* or eldest or frail* or geriatri* or nonagenarian* or octagenarian* or octogenarian* or old age* or older adult* or older age* or older female* or older male* or older man or older men or older patient* or older people or older person* or older population or older subject* or older woman or older women or oldest old* or senior* or senium or septuagenarian* or supercentenarian* or very old*).ti,kf. (306918)

10 8 or 9 (355492)

11 Patient Admission/ (25826)

12 (unplanned adj3 (admission* or hospital*)).ab,ti. (2672)

13 (avoidable adj3 (admission* or hospital*)).ab,ti. (947)

14 "community geriatric* service*".ab,ti. (8)

15 Case Management/ (10401)

16 "case management".ab,ti. (11442)

17 (discharg* adj3 plan*).ab,ti. (5382)

18 "Delivery of Health Care, Integrated"/ (13761)

19 (integrated adj3 (working or care)).ab,ti. (12152)

20 Delirium/pc [Prevention & Control] (1248)

21 (prevent* adj3 deliri*).ab,ti. (1173)

22 ((medicine* or medication*) adj3 (manag* or monitor* or review*)).ab,ti. (25092)

23 Terminal Care/ (30296)

24 "terminal care".ab,ti. (1553)

25 "end of life care*".ab,ti. (10925)

26 care, end of life.ab,ti. (128)

27 eol.ab,ti. (2217)

28 Advance Care Planning/ (3619)

29 "advance care planning".ab,ti. (3566)

30 Fluid Therapy/ (21238)

31 (hydration adj3 nutrition).ab,ti. (1154)

32 ("non convey*" or nonconvey*).ab,kw,ti. (52)

33 "specialist paramedic*".ab,ti. (8)

34 (paramedic* adj3 assess*).ab,ti. (196)

35 "training course* ".ab,ti. (5569)

36 ((vocational or educational) adj qualification*).ab,ti. (804)

37 "hydration and nutrition".ab,ti. (232)

38 "geriatric* specialist".ab,ti. (40)

39 Vaccination/ (90966)

40 ((influenza* or flu*) adj3 vaccin*).ab,ti. (26583)

41 covid-19 vaccines/ or influenza vaccines/ (32036)

42 ((covid* or corona* or "SARS CoV 2") adj3 vaccin*).ab,ti. (11950)

43 Pneumococcal Vaccines/ (8162)

44 "pneumo* vaccine*".ab,ti. (4107)

45 Oxygen Inhalation Therapy/ (15411)

46 (oxygen adj1 therap*).ab,ti. (12517)

47 or/11-46 (320076)

48 10 and 47 (16212)

49 letter/ (1162749)

50 editorial/ (589748)

51 news/ (210552)

52 exp historical article/ (406561)

53 anecdotes as topic/ (4746)

54 comment/ (942690)

55 case report/ (2232728)

56 (letter or comment*).ti. (172085)

57 or/49-56 (4669568)

58 randomized controlled trial/ or random*.ti,ab. (1404034)

59 57 not 58 (4640014)

60 animals/ not humans/ (4896931)

61 exp animals, laboratory/ (924650)

62 exp animal experimentation/ (9971)

63 exp models, animal/ (613504)

64 exp rodentia/ (3391961)

65 (rat or rats or mouse or mice).ti. (1384553)

66 or/59-65 (10383418)

67 48 not 66 (14900)

68 afghanistan/ or africa/ or africa, northern/ or africa, central/ or africa, eastern/ or "africa south of the sahara"/ or africa, southern/ or africa, western/ or albania/ or algeria/ or andorra/ or angola/ or "antigua and barbuda"/ or argentina/ or armenia/ or azerbaijan/ or bahamas/ or bahrain/ or bangladesh/ or barbados/ or belize/ or benin/ or bhutan/ or bolivia/ or borneo/ or "bosnia and herzegovina"/ or botswana/ or brazil/ or brunei/ or bulgaria/ or burkina faso/ or burundi/ or cabo verde/ or cambodia/ or cameroon/ or central african republic/ or chad/ or exp china/ or comoros/ or congo/ or cote d'ivoire/ or croatia/ or cuba/ or "democratic republic of the congo"/ or cyprus/ or djibouti/ or dominica/ or dominican republic/ or ecuador/ or egypt/ or el salvador/ or equatorial guinea/ or eritrea/ or eswatini/ or ethiopia/ or fiji/ or gabon/ or gambia/ or "georgia (republic)"/ or ghana/ or grenada/ or guatemala/ or guinea/ or guinea-bissau/ or guyana/ or haiti/ or honduras/ or independent state of samoa/ or exp india/ or indian ocean islands/ or indochina/ or indonesia/ or iran/ or iraq/ or jamaica/ or jordan/ or kazakhstan/ or kenya/ or kosovo/ or kuwait/ or kyrgyzstan/ or laos/ or lebanon/ or liechtenstein/ or lesotho/ or liberia/ or libya/ or madagascar/ or malaysia/ or malawi/ or mali/ or malta/ or mauritania/ or mauritius/ or mekong valley/ or melanesia/ or micronesia/ or monaco/ or mongolia/ or montenegro/ or morocco/ or mozambique/ or myanmar/ or namibia/ or nepal/ or nicaragua/ or niger/ or nigeria/ or oman/ or pakistan/ or palau/ or exp panama/ or papua new guinea/ or paraguay/ or peru/ or philippines/ or qatar/ or "republic of belarus"/ or "republic of north macedonia"/ or romania/ or exp russia/ or rwanda/ or "saint kitts and nevis"/ or saint lucia/ or "saint vincent and the grenadines"/ or "sao tome and principe"/ or saudi arabia/ or serbia/ or sierra leone/ or senegal/ or seychelles/ or singapore/ or somalia/ or south africa/ or south sudan/ or sri lanka/ or sudan/ or suriname/ or syria/ or taiwan/ or tajikistan/ or tanzania/ or thailand/ or timor-leste/ or togo/ or tonga/ or "trinidad and tobago"/ or tunisia/ or turkmenistan/ or uganda/ or ukraine/ or united arab emirates/ or uruguay/ or uzbekistan/ or vanuatu/ or venezuela/ or vietnam/ or west indies/ or yemen/ or zambia/ or zimbabwe/ (1186145)

69 "Organisation for Economic Co-Operation and Development"/ (404)

70 australasia/ or exp australia/ or austria/ or baltic states/ or belgium/ or exp canada/ or chile/ or colombia/ or costa rica/ or czech republic/ or exp denmark/ or estonia/ or europe/ or finland/ or exp france/ or exp germany/ or greece/ or hungary/ or iceland/ or ireland/ or israel/ or exp italy/ or exp japan/ or korea/ or latvia/ or lithuania/ or luxembourg/ or mexico/ or netherlands/ or new zealand/ or north america/ or exp norway/ or poland/ or portugal/ or exp "republic of korea"/ or "scandinavian and nordic countries"/ or slovakia/ or slovenia/ or spain/ or sweden/ or switzerland/ or turkey/ or exp united kingdom/ or exp united states/ (3363943)

71 European Union/ (17009)

72 Developed Countries/ (21011)

73 69 or 70 or 71 or 72 (3379076)

74 68 not 73 (1099831)

75 67 not 74 (14273)

76 limit 75 to english language (12989)

77 limit 76 to yr="2014 -Current" (6385)

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Medline extra falls search

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to January 14, 2022>

Search Strategy:

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1 residential facilities/ or homes for the aged/ or nursing homes/ (48006)

2 "residential care".ab,ti. (3775)

3 "care home*".ab,ti. (4774)

4 "nursing home*".ab,ti. (32705)

5 Assisted Living Facilities/ (1531)

6 "assisted living".ab,ti. (2433)

7 "extra care housing".ab,ti. (16)

8 or/1-7 (65979)

9 exp *aged/ or exp *geriatrics/ or exp *geriatric nursing/ or (centarian* or centenarian* or elder* or eldest or frail* or geriatri* or nonagenarian* or octagenarian* or octogenarian* or old age* or older adult* or older age* or older female* or older male* or older man or older men or older patient* or older people or older person* or older population or older subject* or older woman or older women or oldest old* or senior* or senium or septuagenarian* or supercentenarian* or very old*).ti,kf. (308664)

10 8 or 9 (357423)

11 Patient Admission/ (25879)

12 (unplanned adj3 (admission* or hospital*)).ab,ti. (2699)

13 (avoidable adj3 (admission* or hospital*)).ab,ti. (954)

14 "community geriatric* service*".ab,ti. (8)

15 Case Management/ (10408)

16 "case management".ab,ti. (11481)

17 (discharg* adj3 plan*).ab,ti. (5413)

18 "Delivery of Health Care, Integrated"/ (13793)

19 (integrated adj3 (working or care)).ab,ti. (12255)

20 Delirium/pc [Prevention & Control] (1261)

21 (prevent* adj3 deliri*).ab,ti. (1192)

22 ((medicine* or medication*) adj3 (manag* or monitor* or review*)).ab,ti. (25285)

23 Terminal Care/ (30376)

24 "terminal care".ab,ti. (1556)

25 "end of life care*".ab,ti. (10999)

26 care, end of life.ab,ti. (129)

27 eol.ab,ti. (2238)

28 Advance Care Planning/ (3646)

29 "advance care planning".ab,ti. (3612)

30 Fluid Therapy/ (21285)

31 (hydration adj3 nutrition).ab,ti. (1161)

32 ("non convey*" or nonconvey*).ab,kw,ti. (53)

33 "specialist paramedic*".ab,ti. (8)

34 (paramedic* adj3 assess*).ab,ti. (197)

35 "training course* ".ab,ti. (5611)

36 ((vocational or educational) adj qualification*).ab,ti. (810)

37 "hydration and nutrition".ab,ti. (235)

38 "geriatric* specialist".ab,ti. (39)

39 Vaccination/ (91649)

40 ((influenza* or flu*) adj3 vaccin*).ab,ti. (26718)

41 covid-19 vaccines/ or influenza vaccines/ (32861)

42 ((covid* or corona* or "SARS CoV 2") adj3 vaccin*).ab,ti. (13156)

43 Pneumococcal Vaccines/ (8196)

44 "pneumo* vaccine*".ab,ti. (4126)

45 Oxygen Inhalation Therapy/ (15473)

46 (oxygen adj1 therap*).ab,ti. (12610)

47 or/11-46 (322683)

48 10 and 47 (16328)

49 letter/ (1166322)

50 editorial/ (592842)

51 news/ (210646)

52 exp historical article/ (407003)

53 anecdotes as topic/ (4746)

54 comment/ (947871)

55 case report/ (2239554)

56 (letter or comment*).ti. (173104)

57 or/49-56 (4685317)

58 randomized controlled trial/ or random*.ti,ab. (1411760)

59 57 not 58 (4655618)

60 animals/ not humans/ (4909832)

61 exp animals, laboratory/ (928170)

62 exp animal experimentation/ (10021)

63 exp models, animal/ (616756)

64 exp rodentia/ (3403886)

65 (rat or rats or mouse or mice).ti. (1387516)

66 or/59-65 (10416012)

67 48 not 66 (15012)

68 afghanistan/ or africa/ or africa, northern/ or africa, central/ or africa, eastern/ or "africa south of the sahara"/ or africa, southern/ or africa, western/ or albania/ or algeria/ or andorra/ or angola/ or "antigua and barbuda"/ or argentina/ or armenia/ or azerbaijan/ or bahamas/ or bahrain/ or bangladesh/ or barbados/ or belize/ or benin/ or bhutan/ or bolivia/ or borneo/ or "bosnia and herzegovina"/ or botswana/ or brazil/ or brunei/ or bulgaria/ or burkina faso/ or burundi/ or cabo verde/ or cambodia/ or cameroon/ or central african republic/ or chad/ or exp china/ or comoros/ or congo/ or cote d'ivoire/ or croatia/ or cuba/ or "democratic republic of the congo"/ or cyprus/ or djibouti/ or dominica/ or dominican republic/ or ecuador/ or egypt/ or el salvador/ or equatorial guinea/ or eritrea/ or eswatini/ or ethiopia/ or fiji/ or gabon/ or gambia/ or "georgia (republic)"/ or ghana/ or grenada/ or guatemala/ or guinea/ or guinea-bissau/ or guyana/ or haiti/ or honduras/ or independent state of samoa/ or exp india/ or indian ocean islands/ or indochina/ or indonesia/ or iran/ or iraq/ or jamaica/ or jordan/ or kazakhstan/ or kenya/ or kosovo/ or kuwait/ or kyrgyzstan/ or laos/ or lebanon/ or liechtenstein/ or lesotho/ or liberia/ or libya/ or madagascar/ or malaysia/ or malawi/ or mali/ or malta/ or mauritania/ or mauritius/ or mekong valley/ or melanesia/ or micronesia/ or monaco/ or mongolia/ or montenegro/ or morocco/ or mozambique/ or myanmar/ or namibia/ or nepal/ or nicaragua/ or niger/ or nigeria/ or oman/ or pakistan/ or palau/ or exp panama/ or papua new guinea/ or paraguay/ or peru/ or philippines/ or qatar/ or "republic of belarus"/ or "republic of north macedonia"/ or romania/ or exp russia/ or rwanda/ or "saint kitts and nevis"/ or saint lucia/ or "saint vincent and the grenadines"/ or "sao tome and principe"/ or saudi arabia/ or serbia/ or sierra leone/ or senegal/ or seychelles/ or singapore/ or somalia/ or south africa/ or south sudan/ or sri lanka/ or sudan/ or suriname/ or syria/ or taiwan/ or tajikistan/ or tanzania/ or thailand/ or timor-leste/ or togo/ or tonga/ or "trinidad and tobago"/ or tunisia/ or turkmenistan/ or uganda/ or ukraine/ or united arab emirates/ or uruguay/ or uzbekistan/ or vanuatu/ or venezuela/ or vietnam/ or west indies/ or yemen/ or zambia/ or zimbabwe/ (1192175)

69 "Organisation for Economic Co-Operation and Development"/ (411)

70 australasia/ or exp australia/ or austria/ or baltic states/ or belgium/ or exp canada/ or chile/ or colombia/ or costa rica/ or czech republic/ or exp denmark/ or estonia/ or europe/ or finland/ or exp france/ or exp germany/ or greece/ or hungary/ or iceland/ or ireland/ or israel/ or exp italy/ or exp japan/ or korea/ or latvia/ or lithuania/ or luxembourg/ or mexico/ or netherlands/ or new zealand/ or north america/ or exp norway/ or poland/ or portugal/ or exp "republic of korea"/ or "scandinavian and nordic countries"/ or slovakia/ or slovenia/ or spain/ or sweden/ or switzerland/ or turkey/ or exp united kingdom/ or exp united states/ (3372732)

71 European Union/ (17054)

72 Developed Countries/ (21036)

73 69 or 70 or 71 or 72 (3387922)

74 68 not 73 (1105653)

75 67 not 74 (14378)

76 limit 75 to english language (13092)

77 limit 76 to yr="2014 -Current" (6488)

78 Accidental Falls/pc [Prevention & Control] (10120)

79 (fall* adj3 (prevent* or avoid* or manag* or intervention* or project* or program*)).ab,ti. (10401)

80 78 or 79 (16211)

81 8 and 80 (1071)

82 81 not 66 (1016)

83 82 not 74 (980)

84 limit 83 to english language (869)

85 limit 84 to yr="2014 -Current" (333)

86 hospitalization/ or patient admission/ (147809)

87 hospitali?ation.ab,ti. (160421)

88 12 or 13 or 86 or 87 (267445)

89 85 and 88 (33)

90 89 not 77 (21)

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Appendix 2: Additional tables for Chapter 2 (UK evidence)

Table 2: TIDiER-Lite description of UK QI programmes

Short Title	Study ID	By whom	What	Where	To what intensity	How often
Damery (2021)	**Study ID** Reference *Damery 2021*[1]	**By whom** Staff involved *Two full-time facilitators working with care home staff* *LP - would we also add here the staff who then went on to deliver the intervention?*	**What** Details of intervention *Safer Provision and Caring Excellence (SPACE) Programme. QI intervention with three linked components: training in QI methods; use of QI tools to track trends in avoidable harms; and regular manager forums, 'celebrating success' events and newsletters.*	**Where** Site/setting for delivery *Care home*	**To what intensity** Intensity of intervention *One-to-one coaching, small groups and larger training workshops*	**How often** Frequency of intervention *24-month programme (December 2016 to December 2018); 8 half/full day shared learning events; monthly training on specific topics.*

Giebel (2020)	**Study ID** Reference *Giebel 2020*[2]	**By whom** Staff involved *Community matrons responsible for specific care homes; care home staff; multidisciplinary care team including district nurses, palliative care nurses, urgent care teams, community geriatricians and medicines management; televideo advanced nurse practitioner.*	**What** Details of intervention *The programme was based on quality improvement principles with the inclusion of Plan Do Study Act (PDSA) cycles. Community matron responsible for reactive care and advance care planning; televideo system providing access to clinical advice; 13 CHIP protocols for initial management of common presentations; training of care home staff; monthly newsletter; bi-monthly workstream meetings and*	**Where** Site/setting for delivery *Participating care homes*	**To what intensity** Intensity of intervention *Community matron service 9-5 on weekdays; televideo service available 24 hours/7 days; regular meetings and newsletters (see above); one-off training for care home staff.*	**How often** Frequency of intervention *One-off assessment by CM and staff training session; regular meetings and newsletter (see above); other components as required over 4 years.*

			quarterly collaborative meetings to update on progress and share good practice.			
Steel (2022)	**Study ID** Reference *Steel 2022*[3]	**By whom** Staff involved *Multi-disciplinary team (MDT) including senior and trainee GPs, trainees in geriatrics, psychiatry, pharmacist and residential home senior staff.*	**What** Details of intervention *MDT reviews for residents identified as needing attention: preparation; pre-review MDT meeting; patient review, including comprehensive geriatric assessment (CGA); post-evaluation MDT discussion; educational session; follow-up by GP and psychiatry trainee (where required)*	**Where** Site/setting for delivery *Participating residential homes*	**To what intensity** Intensity of intervention *Not applicable*	**How often** Frequency of intervention *Monthly sessions conducted over two cycles*

Table 3: Implementation barriers, facilitators and role of active facilitation for UK QI programmes

Short Title	Barriers	Facilitators	Active facilitation
Damery (2021) [1]	**Evidence as barrier** Details *Existing evidence of high workloads, high rates of staff turnover and difficulty recruiting and retaining competent staff.* **Context as barrier** Details *Some managers and staff initially feared SPACE would increase bureaucracy and workloads. Programme depended on support of individual managers and ten homes changed manager at least once during the study. Annual staff turnover averaged 31% (range 9.6% to 78.3%). Engagement of individual homes also varied, with a small number showing minimal participation throughout. High staff turnover was also a potential barrier to sustaining the intervention.*	**Evidence as facilitator** Details *Evidence supports association between a positive safety culture and improved outcomes/reduced risk of harm. A previous study in South East England found that QI training improved knowledge and awareness of resident safety and reduced harms in some homes.* **Context as facilitator** Details *Programme gave high priority to workforce development and highlighted opportunities for career progression.*	**Role of facilitation** Details *'Passionate facilitators with an in-depth understanding of issues within the care home sector, who tailored programme support accordingly' were identified as key to success of the SPACE intervention. In addition to training events, facilitators visited each home to give ad hoc support and one-to-one QI coaching.*

Giebel (2020) [2]	**Evidence as barrier** Not reported **Context as barrier** Details *High turnover of care home managers and staff required new staff to be trained and training repeated. Other challenges included cultural differences between homes and lack of contractual levers.*	**Evidence as facilitator** Details *US study found QI intervention reduced ED attendance by 17%. Routine data on 999 calls, ED attendances and use of televideo system were available as part of contract with providers.* **Context as facilitator** Details *NHS Long Term Plan (2019) prioritised measures to reduce hospital admissions in older people and to strengthen NHS support for care homes. The baseline standard (CQC rating) of participating homes was "good" in 56%, "required improvement" in 44%, and one home was graded "inadequate".*	**Role of facilitation** Details *Quarterly collaborative meetings for participating homes were considered vital for team building and promoting joined up working for a shared vision.*
Steel (2022) [3]	**Evidence as barrier** Not reported **Context as barrier** Details *Care home where cycle 2 took place was rated 'inadequate' by CQC (December 2018)*	**Evidence as facilitator** Details *Project was underpinned by the Enhanced Health in Care Homes (EHCH) implementation framework* **Context as facilitator** Details *Integrated healthcare for older people*	**Role of facilitation** Details *Limited details reported. A GP trainee took the lead role for the second cycle to encourage trainee leadership*

		identified as a key NHS priority in the Long-term Plan and Five-year Forward View	

Table 4: TIDiER-Lite description of UK integrated working programmes

Short Title	By whom	What	Where	To what intensity	How often
Brine (2019) [4]	**By whom** Staff involved [info] *Dementia Outreach Team; Care Home Nursing Team (community nurses, advanced nurse practitioners and support workers, working closely with geriatricians); Age UK Nottingham and Nottinghamshire Advocacy; GPs*	**What** Details of intervention [info] *Specialist input and training around dementia; case management of residents with dementia; nursing support to residential homes and nursing homes where required; advocacy support for residents and families; linking specific GP practices to care homes and providing an enhanced level of support*	**Where** Site/setting for delivery [info] *Participating care homes*	**To what intensity** Intensity of intervention [info] *Not reported*	**How often** Frequency of intervention [info] *Not applicable*

Conti (2018) [5]	**By whom** Staff involved [info] *Staff from partner organisations: Sutton CCG (GPs); community services; the local hospital trust; the London Ambulance Service and London Borough of Sutton)care home staff)*	**What** Details of intervention [info] *Pillar 1 (Improving integrated care): weekly health and wellbeing rounds; multidisciplinary care home support team; and hospital transfer pathway Pillar 2 (Supporting care home staff): tailored e-learning; resource package; and care home forum Pillar 3 (Supporting quality assurance and safety): Joint Intelligence Group with all partners represented; quality dashboard; and initiative to foster engagement with residents, carers and families*	**Where** Site/setting for delivery [info] *Participating care homes and local hospitals*	**To what intensity** Intensity of intervention [info] *Some interventions were available to all Sutton care homes (eg educational resources and the Care Home Forum). Overall, the focus of the vanguard from November 2015 to July 2016 was on nursing homes. Attention shifted to residential homes in November 2016*	**How often** Frequency of intervention [info] *Frequency and availability of different elements varied during the study period*
Lloyd (2017) [7]	**By whom** Staff involved [info] *Community interest company (Principia) involving a partnership of general practices, community services and patients in Rushcliffe*	**What** Details of intervention [info] *Enhanced specification of GP care involving aligning care homes with specific practices. Includes review of new residents, comprehensive geriatric*	**Where** Site/setting for delivery [info] *Participating care homes*	**To what intensity** Intensity of intervention [info] *Not reported*	**How often** Frequency of intervention [info] *Varied between elements, e.g. GP visits to care homes*

	(Nottinghamshire) with support from the local CCG	*assessment within 2 weeks and regular GP visits to the home. Advocacy and independent support delivered by Age UK Notts and supported by volunteers Improved community nursing support, including peer-to-peer support and training for care home nurses Engagement with care home managers*			*could be weekly or fortnightly*
Sherlaw-Johnson (2018) [9]	**By whom** Staff involved [info] *Multi-disciplinary team, including GPs, specialist doctors, nurses, physiotherapists, occupational therapists, pharmacists, key workers and social workers.*	**What** Details of intervention [info] *Geriatrician available to support GPs and families; comprehensive medication reviews; named clinician and key workers for each nursing home; support for providing end-of-life care; ward rounds with advice and training for nursing home staff; assessment of acute problems by Health 1000 staff in the nursing home*	**Where** Site/setting for delivery [info] *Participating nursing homes*	**To what intensity** Intensity of intervention [info] *Advice available 8am to 8pm, 7 days/week*	**How often** Frequency of intervention [info] *Frequency of particular elements not reported*

Vestesson (2019) [10]	**By whom** Staff involved [info] *Representatives of voluntary organisations; MDT comprising professionals from areas including mental health, physiotherapy and nursing; GPs from 26 practices with patients living in Vanguard care homes*	**What** Details of intervention [info] *Voluntary sector: activities outside and inside care homes; signposting to services for residents identified as requiring extra help MDT: Screening process to identify residents at risk of inappropriate admission; falls risk assessments; training sessions for care home staff Primary care: 'One GP practice, one care home' model with associated key performance indicators (KPIs)*	**Where** Site/setting for delivery [info] *Participating care homes and local community services*	**To what intensity** Intensity of intervention [info] *MDT delivered 49 training sessions to 286 care home staff. MDT planned to screen all residents for unmet needs but from April 2016 this was limited to residents considered high risk by care home staff*	**How often** Frequency of intervention [info] *MDT met weekly. Frequency of GP visits varied between care homes and was largely based on the practice's relationship with the care home and the Vanguard*

Table 6:

Short Title	Barriers	Facilitators	Active facilitation
Brine (2019)	**Evidence as barrier** Not reported **Context as barrier** Details	**Evidence as facilitator** Not reported **Context as facilitator** Details	**Role of facilitation** Not reported

	[info] *Elements of the intervention were not implemented consistently across the CCG area, e.g. the nursing team did not cover the whole area until 2017. With regard to GP support, some GPs did not want to take on all residents in a care home and some residents were unwilling to change their GP*	[info] *Nottingham City CCG supported initiatives to enhance health of care home residents since 2007; Enhanced Health in Care Homes (EHCH) vanguard formed in 2015*	
Conti (2018)	**Evidence as barrier** Not reported **Context as barrier** Not reported	**Evidence as facilitator** Not reported **Context as facilitator** Details [info] *The Homes of care vanguard built on initiatives developed by the partner organisations that were already in place*	**Role of facilitation** Not reported
Lloyd (2017)	**Evidence as barrier** Not reported **Context as barrier** Not reported	**Evidence as facilitator** Not reported **Context as facilitator** Details [info] *From April 2015, Principia was chosen as a vanguard site for the New Care Models programme that followed from the NHS Five year forward view Area*	**Role of facilitation** Not reported

		with relatively low baseline levels of admissions and socioeconomic deprivation	
Sherlaw-Johnson (2018)	**Evidence as barrier** Not reported **Context as barrier** Details [info] *Nursing homes were in 'geographically difficult' locations and unable to be aligned with a single general practice. Nursing homes were privately owned and had their own procedures which sometimes conflicted with the Health 1000 approach*	**Evidence as facilitator** Details [info] *Model of care was based on Wagner's chronic care model* **Context as facilitator** Details [info] *Mutual trust between GPs and nursing home staff locally was cited as an important element in success. Communication between Health 1000 and nursing home managers was emphasised throughout. High staff turnover and instability among care home providers were not identified as issues locally. Development of Health 1000 was supported by the Prime Minister's Challenge Fund.*	**Role of facilitation** Details [info] *Authors state that 'Health 1000 has been driven forward by a group of committed individuals' in the organisations involved and emphasise the importance of 'strong leadership and clear vision'.*
Vestesson (2019)	**Evidence as barrier** Not reported **Context as barrier** Details [info] *'One GP practice, one care home'*	**Evidence as facilitator** Not reported **Context as facilitator** Details [info] *EHCH Vanguard formed in March*	**Role of facilitation** Not reported

	model was not implemented during the study period	*2015 to pilot new care model announced in the NHS Five year forward view*	

Appendix 3: Additional tables for Chapter 3 (international evidence)

Appendix 4: Risk of bias tables