BMJ Open

Which interventions are effective at decreasing or increasing emergency department attendances or hospital admissions from long-term care facilities? A systematic review

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To cite: Searle B, Barker RO, Stow D, *et al*. Which interventions are effective at decreasing or increasing emergency department attendances or hospital admissions from long-term care facilities? A systematic review. *BMJ Open* 2023;**13**:e064914. doi:10.1136/bmjopen-2022-064914

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2022-064914).

Received 27 June 2022
Accepted 19 January 2023

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ABSTRACT

Objective UK long-term care facility residents account for 185 000 emergency hospital admissions each year. Avoidance of unnecessary hospital transfers benefits residents, reduces demand on the healthcare systems but is difficult to implement. We synthesised evidence on interventions that influence unplanned hospital admissions or attendances by long-term care facility residents.

Methods This is a systematic review of randomised controlled trials. PubMed, MEDLINE, EMBASE, ISI Web of Science, CINAHL and the Cochrane Library were searched from 2012 to 2022, building on a review published in 2013. We included randomised controlled trials that evaluated interventions that influence (decrease or increase) acute hospital admissions or attendances of long-term care facility residents. Risk of bias and evidence quality were assessed using Cochrane Risk Of Bias-2 and Grading of Recommendations Assessment, Development and Evaluation.

Results Forty-three randomised studies were included in this review. A narrative synthesis was conducted and the weight of evidence described with vote counting. Advance care planning and goals of care setting appear to be effective at reducing hospitalisations from long-term care facilities. Other effective interventions, in order of increasing risk of bias, were: nurse practitioner/specialist input, palliative care intervention, influenza vaccination and enhancing access to intravenous therapies in long-term care facilities.

Conclusions Factors that affect hospitalisation and emergency department attendances of long-term care facility residents are complex. This review supports the already established use of advance care planning and influenza vaccination to reduce unscheduled hospital attendances. It is likely that more than one intervention will be needed to impact on healthcare usage across the long-term care facility population. The findings of this review are useful to identify effective interventions that can be combined, as well as highlighting interventions that either need evaluation or are not effective at decreasing healthcare usage.

PROSPERO registration number CRD42020169604.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Our systematic review methodology was transparent and robust, with double checking of a proportion of screening and risk of bias assessments.
⇒ Many of the studies were at high risk of bias, which may reflect the challenges of research in this setting.
⇒ Data were not available to support meta-analysis.
⇒ We did not exclude any categories of interventions, in order to produce a comprehensive overview of the available evidence. As a result, we have reviewed a diverse range of interventions. Many were complex and multifaceted; and it was impossible to know which aspects had impacted on healthcare usage.
⇒ Nearly one-third of the studies were described in isolation, providing no data on comparative effectiveness.

INTRODUCTION

Long-term care facility residents aged over 75 years are three times more likely to be admitted to hospital than people of a similar age who live in their own homes.[1] Attendance at a hospital may be appropriate to meet a healthcare need, for example, if intervention is needed to control symptoms.[2] However, hospital admission or attendance at emergency departments (EDs) can also be distressing or even harmful.[3] In hospital, residents are exposed to risk of infection,[3] medication errors[4 5] and are liable to hospital acquired delirium. A retrospective analysis of unscheduled ED presentations from nursing homes in Ireland showed hospital admission did not improve survival rates among residents.[6] Overall one-third of the long-term care facility residents admitted acutely to hospital die during that stay.[2 7] For residents who survive transfer to an ED or hospital, functional outcomes are worse than for residents treated in their home.[7] When they are

asked, few long-term care facility residents or families express a preference to receive care or die in hospital.[8]

Avoiding hospital attendances can benefit the residents and the healthcare system too. Overall, UK long-term care facility residents account for 185 000 emergency admissions each year.[9] Estimates suggest that an additional 8000 hospital beds will be needed in the future to meet the demand from long-term care facilities.[10] Hospital admissions for long-term care facility residents are most frequent in the period preceding death, with 25–50% of the admissions occurring in the last 12 months of life.[11] Emergency transfers from long-term care facility to hospital in the last year of life are also increasing, with costs expected to double by 2041.[10]

A range of interventions have been proposed to decrease transfers from long-term care facility, including shared decision-making, advance care planning (ACP), involvement of the palliative care team, interdisciplinary teamwork and improved communication and handovers.[12–17] Receipt of palliative care has been associated with a significantly decreased risk of ED attendance in the last year of life,[3] and palliative care is particularly effective at reducing end-of-life hospitalisations for long-term care facility residents with dementia.[18] A review of healthcare provision in long-term care facilities reported that specialist nurse input reduced the rates of unplanned hospital transfers, but evidence for specialist doctor interventions was unclear.[19] However, the majority of previous reviews have focused on single interventions in long-term care facilities and other settings, with hospital usage as an outcome. As the number of older people in the population continues to rise, with stable long-term care facility bed numbers, policymakers are likely to need a suite of interventions to address the growing demands on health services.

The aim of this study is to synthesise current evidence on how best to intervene to reduce unplanned hospital attendances, admissions or readmissions from long-term care facilities. Older people are more likely to be acutely unwell and need unscheduled care due to factors such as multimorbidity and polypharmacy. It is not the aim of this review to judge whether their healthcare usage was appropriate.

METHODS

Search strategy and selection criteria

We searched for randomised controlled trials with people living in long-term care facilities (the population), interventions delivered in primary care or the long-term care facility, that intended to influence acute hospital admissions or ED attendances (the outcome). Studies involving people living in private households, warden-controlled homes, supported living facilities or living at home with carers were excluded. It is likely that interventions tailored for delivery in these settings will differ in terms of the way in which they are delivered (by whom, how, when, where and how often). The populations living in these settings also likely represent a broader spectrum of frailty than you would expect to see within long-term care facilities and for these reasons findings would not be applicable in answering our research question. Observational and qualitative studies were excluded. Admissions to hospices, cottage or rehabilitation hospitals or planned or routine hospital contacts, for example, scheduled outpatient or ambulatory care appointments were excluded. Interventions delivered in hospital or inpatient settings were excluded. This review was limited to English language publications. Publications in languages other than English are documented in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram (figure 1).

This review uses the term long-term care facility. Long-term care facility is an umbrella term for: nursing homes, (residents receive nursing as well as personal care); aged care facilities or residential aged care facilities (terms used in Australia and New Zealand for facilities similar to nursing homes); and care homes (a UK term for residential care with and without nursing).

Searches were carried out in July 2022 in the Cochrane Library, PubMed, MEDLINE Ovid 1946, EMBASE Ovid 1974, ISI Web of Science and CINAHL EBSCO. The search strategy is included in online supplemental appendix A. This study updated the search of Graverholt *et al*,[20] to identify studies published between June 2012 and July 2022. An error was noted in the Graverholt's PubMed search, their final search line restricted records retrieved by publisher. This restriction reduced studies identified from 4437 to 32. This error was identified by an information specialist before we started our searches. As a result, the PubMed search for this review was performed from inception rather than 2012, and any papers published before June 2012 had their citations screened to ensure no pertinent records were omitted from the review.

The protocol was registered on PROSPERO.

Study selection and synthesis

Titles and abstracts of all records were screened by the main reviewer and 10% of the titles and abstracts were examined by two researchers. An online screening tool, Rayyan, was used to manage the screening process. Any disagreements were discussed; the disagreements were less than 5%. Full texts were screened by two reviewers. Study details and data were extracted into a Microsoft Excel spreadsheet, data extraction was checked in a non-blinded manner by a second reviewer. Decisions regarding grouping of interventions were made by coauthors on completing data extraction. All studies were quality assessed by two reviewers using Cochrane Risk Of Bias-2 (ROB-2) (online supplemental appendix B). Grading of Recommendations Assessment, Development and Evaluation (GRADE) assessment was also performed, and a quality rating applied to each body of evidence across outcomes of interest.[21]

Due to the clinical and the methodological diversity of the interventions and outcomes, it was not appropriate

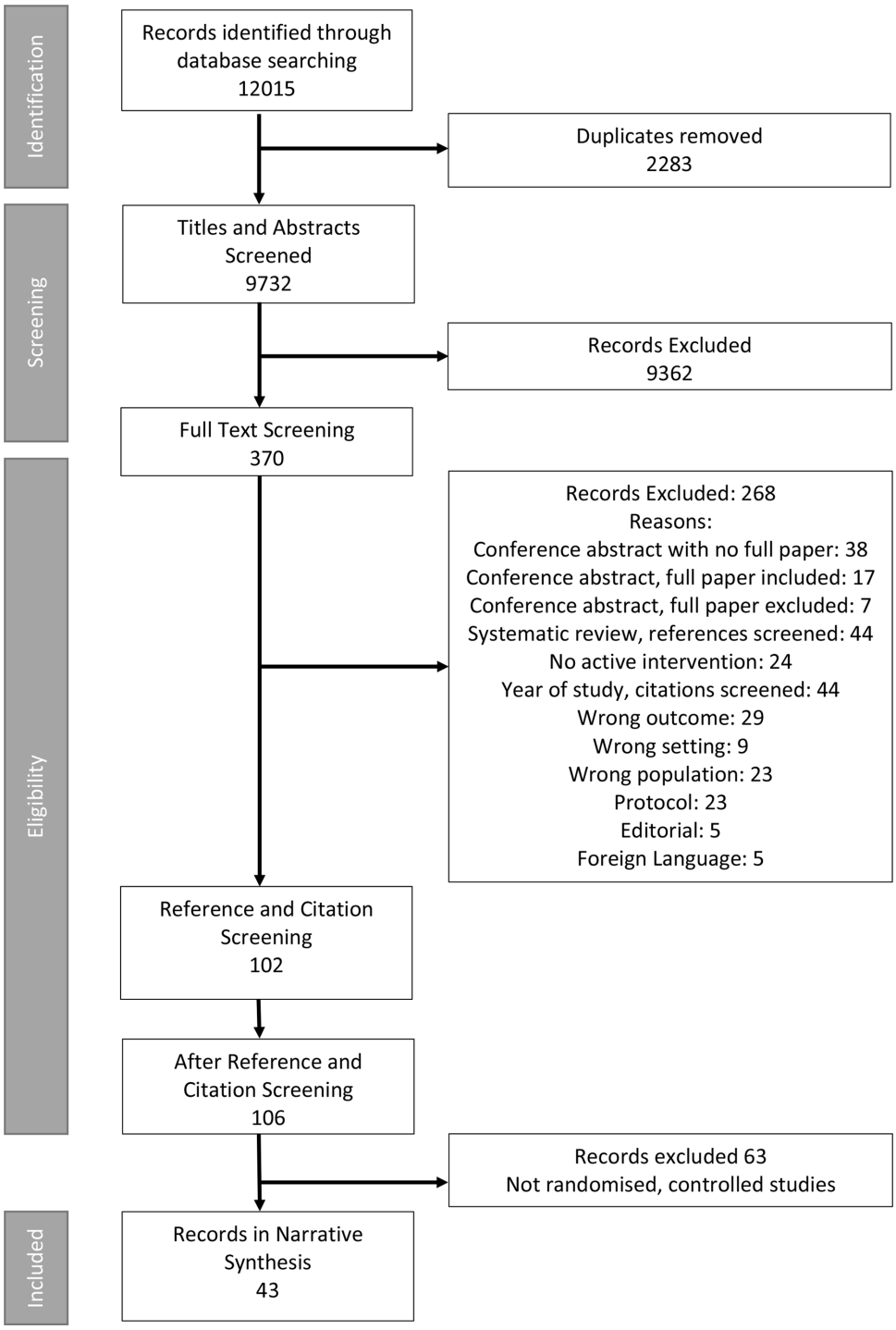

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram.

to perform a meta-analysis. A narrative synthesis was performed; with vote counting used. Guidance from the Economic and Social Research Council and Synthesis Without Meta-Analysis was used to structure the narrative synthesis.[22 23]

Patient and public involvement

Through the VOICE online platform, the public and patient involvement and engagement group was convened. An online meeting was held with five participants, whose experience encompassed caring for/being a relative of long-term care facility residents, facility inspection, community nursing and social care. They highlighted the need to explore not only interventions but the barriers to their implementation.

Findings

Forty-three randomised controlled trials were included in this review. These studies are summarised in online supplemental appendix C. The studies were placed into three outcome groups (hospitalisation, ED attendance, readmission to hospital) and then subdivided by

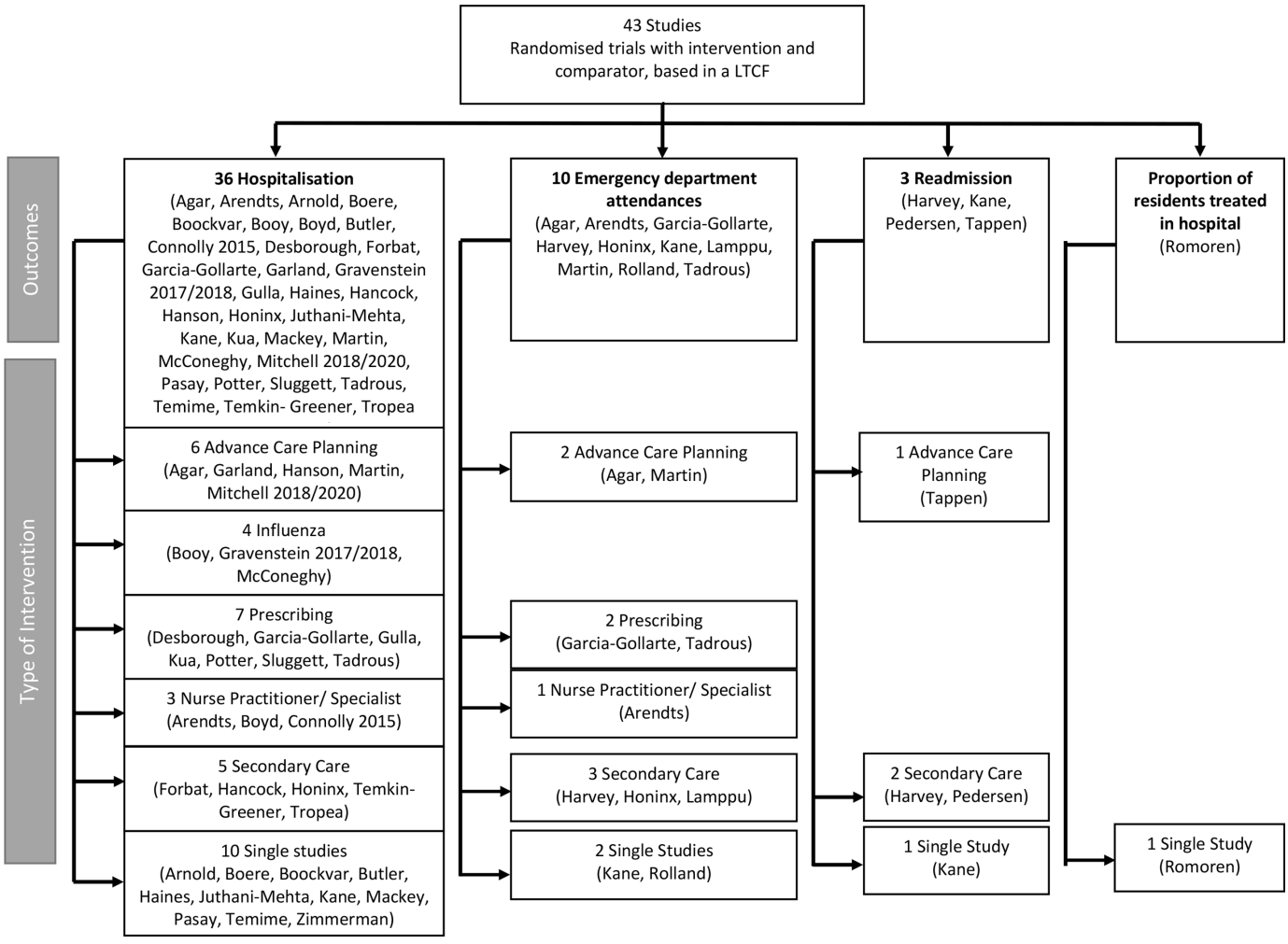

Figure 2 Flowchart describing how studies were grouped. LTCF, long-term care facility.

intervention type (figure 2). The remaining study investigated the proportion of residents treated in the nursing home and hospital and was analysed separately.[24] Figure 3 is a harvest plot that describes the findings of each study and groups them by type of intervention. A summary ROB-2 assessment for each study is given in online supplemental appendix B.

ACP

ACP is the discussion and completion of documentation stating the resident's and family's preference for future level of care the resident will receive if their health condition changes. Five of the six ACP studies resulted in a decrease in hospitalisations. Adequately powered studies reported statistically significant findings. There were no significant results for the outcomes of readmissions and ED attendances. Overall, the GRADE assessment for this group of studies was low.

Influenza

Influenza outbreaks in care facilities can result in increases in healthcare usage. Vaccination or treatment has potential benefits for the residents and the healthcare system. The four influenza management and vaccination trials reported a consistent and significant decrease in hospitalisation. However, these studies had comparatively high risk of bias assessments compared with the other trials in the review.[25–27] One study of oseltamivir produced non-significant findings, but the authors reported that the trial was underpowered.[28] Two of the vaccination trials and the oseltamivir trial included staff plus residents, when the original authors adjusted for staff participation there was no difference in results.[25 26 28] The certainty of this combined result, assessed through GRADE, was very low due to concerns about the risk of bias, imprecision and indirectness due to the difference in the interventions.

Prescribing

Prescribing interventions included medication reviews using a range of frameworks and educational programmes on prescribing in long-term care facility populations. The seven prescribing interventions included in this review produced inconsistent findings. One reported a significant reduction in hospitalisation rates but was at a high risk of bias due to a lack of blinding of staff and researchers.[29] Also, the package included an ACP intervention.[29] Another found a significant decrease in

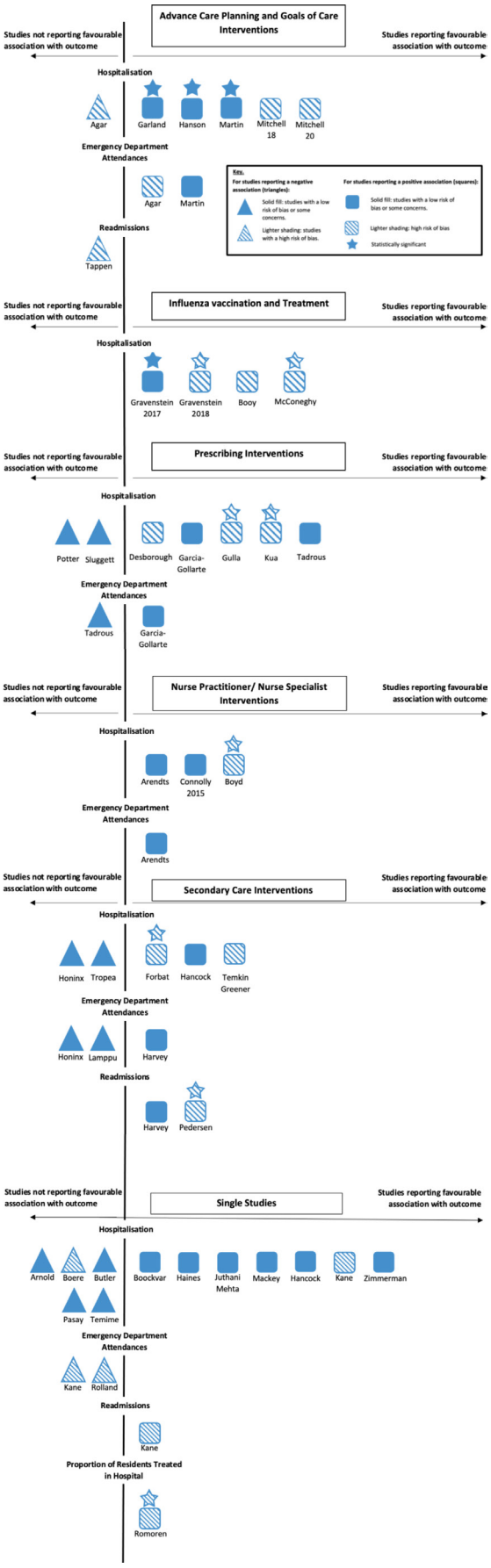

Figure 3 Harvest plot of studies' outcomes grouped by their type of intervention.

hospitalisations but also had significant differences in baseline hospitalisation rates, possibly due to background high levels of influenza.[30] Others did not have sufficient power or were at high risk of bias.[31 32] Deprescribing of specific groups of medications (antihypertensives and antipsychotics) was examined in two studies.[29 33] Non-significant increases in outcomes were reported by both these studies.[29 33] There were no significant results for ED attendances. Prescribing interventions had the largest number of studies (three) that non-significantly increased healthcare usage.[33–35] Other studies that non-significantly increased healthcare usage are presented in figure 3.

Nurse practitioners/specialists

Studies of input from nurse practitioners and specialists were considered together as they provided support for existing care facility teams and offered a continuity of care. All nurse specialist/nurse practitioner studies reported a reduction in the rate of hospitalisations or ED attendances. Findings in only one study reached statistical significance, and this was unblinded and at high risk of bias.[36] There were no significant results for ED attendances.

Secondary care

Five studies investigated the use of palliative care teams, one study reported a significant decrease in hospitalisations.[37 38] However, there was a risk of confounding in this study and two others due to the intervention containing ACP.[37–39]

Two studies focused on geriatrician interventions. One reported a significant reduction in readmissions, but the risk of bias assessment was high because of missing data and unconcealed allocation.[40] A cardiologist and nurse specialist intervention resulted in a non-significant reduction in hospitalisation.[41]

The GRADE quality assessment of secondary care intervention studies (low or very low) suggests uncertainty in the findings.

Single studies

There were 13 studies with interventions that could not be easily grouped, 12 of which presented non-significant findings. Romøren *et al* found that providing training on intravenous fluids and antibiotics resulting in a significant reduction of the proportion of residents being managed in hospital.[24] However, the risk of bias assessment was high due to the allocation not being concealed, unequal baseline characteristics and missing data on outcome forms.[24]

Publication bias

It was not possible to perform a formal assessment of publication bias due to the heterogeneity of the interventions and their outcomes. In addition, hospitalisation/ED attendance/readmissions were often a secondary outcome or a measure of harm.

Table 1 demonstrates concerns about the preferential publication of studies which demonstrate a reduction in

Table 1 Assessment of publication bias

Author and year	Participants	Direction of result	Significant
Hancock *et al*, 2012[41]	25	Decrease	No
Potter *et al*, 2016[34]	95	Increase	No
Harvey *et al*, 2014[51]	116	Decrease	No
Boere *et al*, 2021[52]	148	Increase	No
Juthani-Mehta *et al*, 2016[53]	185	Decrease	No
Tappen *et al*, 2020[54]	192	Increase	No
Arendts *et al*, 2018[55]	200	Decrease	No
Boockvar *et al*, 2020[56]	219	Decrease	No
Sluggett *et al*, 2020[35]	242	Increase	No
Agar *et al*, 2017[57]	286	Increase	No
Gulla *et al*, 2018[29]	295	Decrease	Yes
Kua *et al*, 2021[30]	295	Decrease	Yes
Romøren *et al*, 2017[24]	296	Decrease	No
Hanson *et al*, 2017[58]	302	Decrease	Yes
Butler *et al*, 2020[59]	310	Increase	No
Lamppu and Pitkala, 2021[39]	324	Increase	No
Martin *et al*, 2019[60]	326	Decrease	Yes
Mackey *et al*, 2019[61]	357	Decrease	No
Mitchell *et al*, 2018[62]	402	Decrease	No
Pedersen *et al*, 2018[40]	648	Decrease	Yes
Booy *et al*, 2012[28]	652	Decrease	No
Garland *et al*, 2022[63]	713	Decrease	Yes
García-Gollarte *et al*, 2014[31]	716	Decrease	No
Desborough *et al*, 2020[32]	826	Decrease	No
Tropea *et al*, 2022[64]	1304	Increase	No
Rolland *et al*, 2020[65]	1401	Increase	No
Arnold *et al*, 2021[66]	1625	Increase	No
Forbat *et al*, 2020[38]	1700	Decrease	Yes
Zimmerman *et al*, 2020[67]	1935	Decrease	No
Connolly *et al*, 2015[68]	1998	Decrease	No
Boyd *et al*, 2014[36]	2553 beds	Decrease	Yes
Gravenstein *et al*, 2018[25]	2957	Decrease	Yes
Tadrous *et al*, 2020[33]	5363	Increase	No
Temkin-Greener *et al*, 2018[69]	5830	Decrease	No
Mitchell *et al*, 2020[70]	30 016	Decrease	No
Kane *et al*, 2017[71]	36 717	Decrease	No
Gravenstein *et al*, 2017[26]	38 256	Decrease	Yes
McConeghy *et al*, 2020[27]	50 012	Decrease	Yes
Haines *et al*, 2020[72]	15 aged care facilities	Decrease	No
Temime *et al*, 2018[73]	26 nursing homes	Increase	No
Pasay *et al*, 2019[74]	42 nursing homes	Increase	No
Honinx *et al*, 2020[37]	78 nursing homes	Increase	No

healthcare usage. Reassuringly, significant results were spread across different sizes of studies.

Figure 4 shows that statistically significant results were more likely to be published for primary outcomes, and less likely to be published if the outcome was negative. This assessment of publication bias is limited by the hospitalisation, ED attendance or readmissions outcomes being secondary outcomes in 24 of the studies. Many of these 24 studies had significant primary outcomes to prompt publication, with healthcare usage often used as a measure of harm.

Discussion

Summary of findings

ACP and goals of care setting appear to be effective at reducing hospitalisations from long-term care facilities. Other effective interventions, in order of increasing risk of bias, were nurse practitioner/specialist input, palliative care intervention, influenza vaccination and enhancing access to intravenous therapies in long-term care facilities. We identified few comparative studies, which limits our ability to comment on the superiority of one intervention over another.

Comparison with other work

In most cases, our findings are in line with similar previous work. It is not surprising that completion of an ACP form leads to a decrease in hospitalisations, if it prompts reflection on the level of care provided at home. A recent systematic review found ACP reduced hospitalisation by between 9% and 26%, but that hospitalisation did not reduce mortality.[42] Another reported that 'do not hospitalise' orders were effective at decreasing hospitalisation and increasing hospice use.[43] All the nurse specialist/nurse practitioner studies in this review reported a reduction in the rate of hospitalisations or ED attendances, consistent with previous systematic reviews.[19 44]

The three influenza vaccination studies in our review described significant reductions in hospitalisation.[25 26] However, it is important to note that these studies investigated vaccine dosing and were not questioning the effectiveness of a vaccination programme. Our review also concurred with a Cochrane Review that found no evidence for reductions in hospitalisation for nursing home residents managed with the influenza antiviral therapy, oseltamivir.[45]

We observed that the impact of prescribing interventions on healthcare usage were inconsistent, despite the likely influence on medication burden, polypharmacy and adverse events. This is consistent with previous work.[13 46] The three palliative care interventions in this review also

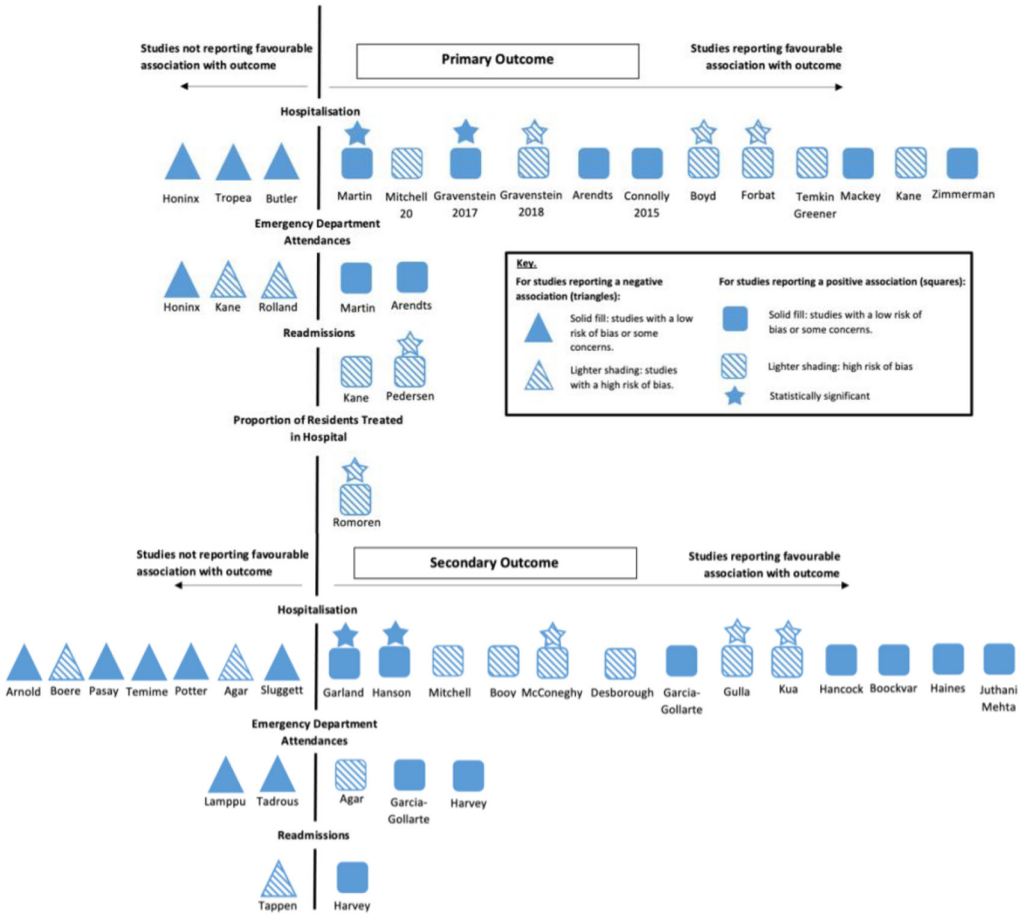

Figure 4 Harvest plot of primary and secondary outcomes to assess publication bias.

reported inconsistent findings. A systematic review of the impact of external palliative care teams on healthcare use reported a reduction in ED visits and hospital transfers.[47]

The only single study with a statistically significant reduction in healthcare usage investigated use of intravenous fluids and antibiotics use in long-term care facilities.[24] This provided a level of support in the long-term care facilities that is more usually seen in hospitals. However, if the staff skills and financial resources are available, this approach may reduce hospital transfers while maintaining a high level of care.

This review uses an adapted version of the search strategy used in Graverholt's review published in 2013.[20] Their searches from database inception to April 2012 yielded 6250 studies.[20] Our searches from 2012 to 2022 yielded 9732 studies. This demonstrates how the body of research has grown in the last 9 years. Their review reported that influenza vaccination, specialist geriatric services and different ways of structuring/standardising care were all effective at reducing healthcare usage.[20] Our systematic review also found high dose influenza vaccination to be effective at decreasing hospitalisation. In our review interventions in secondary care that involved geriatricians generated mixed results, of uncertain significance.

Strengths and limitations

Our systematic review methodology was transparent and robust, with double checking of a proportion of screening and risk of bias assessments.[48 49] Many of the included studies were at high risk of bias, which may reflect the challenges of research in this setting but nonetheless limits our certainty in review findings. Data were not available to support meta-analysis. We did not exclude any categories of interventions, in order to produce a comprehensive overview of the available evidence. As a result, we have reviewed a diverse range of interventions. Many were complex and multifaceted; and it was impossible to know which aspects had impacted on healthcare usage. Studies of prescribing interventions on healthcare usage were inconsistent. This inconsistency may be explained by how the interventions were grouped by both medication reviews and education of prescribers. The levels of acuity among residents could also vary in this group. For these studies healthcare usage was a secondary outcome to assess for harm from the medication changes. Nearly one-third of the studies were described in isolation, providing no data on comparative effectiveness.

Implications

ACP and influenza vaccination are routine practice in most long-term care facilities that should minimise

hospital contacts. ACP in this setting was promoted at the start of the COVID-19 pandemic in the UK.[50] This review provides supporting evidence for that strategy. ACP has been shown to reduce hospital contacts from long-term care facilities, though in practice the existence of an ACP is not a barrier to hospital admission. Completion of an ACP form is likely to act as a trigger for staff, residents, relatives and healthcare professionals to consider current and future care. Future research on how to optimise the impact of the ACP process may be helpful, questioning whether increasing compliance with ACP decisions is the most important aspect.

Post-discharge follow-up by hospital specialists (geriatricians) rather than general practitioners also reduces healthcare usage. Current workforce restrictions would limit the real-world implications of this finding.[47] However, inclusion of geriatricians in multidisciplinary teams that review long-term care facility residents is a model that has been introduced in England. Exploiting specialist expertise in a multidisciplinary team may be a particularly efficient way of maximising the impact of scarce resources.

The development of more robust research on palliative care and specialist nurse interventions in this setting is needed, to produce findings that can persuade commissioners.

CONCLUSIONS

This review demonstrates that there are multiple effective interventions to reduce hospital contacts from long-term care facilities, at both individual and population levels. This review supports the already established use of ACP and influenza vaccination to reduce unscheduled hospital attendances. The factors that influence healthcare usage are complex, so it is likely that more than one intervention will be needed to reduce healthcare usage across the population of long-term care facility residents.

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Acknowledgements Thank you to Graverholt et al. for sharing their search strategy.

Contributors Conceptualisation: BS, FP, BH. Data curation: BS, GFS, DS, ROB. Formal analysis: BS, GFS. Methodology: BS, FP, BH. Supervision: FP, BH. Visualisation: BS. Writing—original draft: BS. Writing—review and editing: All authors. Guarantor: BS.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

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