The management of urinary incontinence in nursing homes: a scoping review

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ABSTRACT

The aim of the research was to identify interventions for the management of urinary incontinence (UI) in nursing homes. A scoping review was conducted with methods adapted from *The Joanna Briggs Institute reviewers' manual 2015 methodology for conducting scoping reviews* and reporting was guided by the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews guidelines.* Findings were synthesised without meta-analysis. Databases that were searched were MEDLINE, Embase, PsychINFO, CINAHL, JBI Evidence-Based Practice Database and the Cochrane Database of Systematic Reviews from 2010 to September 2021. The search was augmented with hand searching.

A total of 3,885 records were located. After exclusions and screening of 370 full-text articles, 30 publications were included – seven systematic reviews, 15 randomised-controlled trials, seven quasi-experimental studies and one cohort study. Studies addressed toileting assistance programs, exercise programs, drug therapies, technology-based interventions, education programs and multi-component interventions.

Multi-component interventions facilitated by specialist healthcare professionals offer the strongest evidence. Evidence about exercise programs was limited and inconsistent, as was evidence for anticholinergics. Transcutaneous posterior tibial nerve stimulation is unlikely to reduce rates of UI in nursing homes with residents with high rates of cognitive impairment. Further evidence is required on the use of telemonitoring systems. Education programs for staff that provide on-site support and competency-based learning, led by specialist healthcare professionals, improve staff knowledge, attitudes and compliance with assessments, toileting and documentation. Education about person-centred approaches is required to provide appropriate care for residents living with dementia.

We conclude that a multicomponent approach led by a specialist such as a nurse with advanced clinical and leadership skills offers the most benefit. Nursing home policies and practices should focus on education programs for staff, with interventions that increase residents' choice, activity level, nutritional status, hydration and toileting opportunities.

Keywords scoping review, urinary incontinence, nursing homes, residential aged care, evidence

INTRODUCTION

Urinary incontinence (UI) in nursing homes has physical, psychological, economic and social consequences for residents, their families and staff. Despite its impact, little is known about strategies for the organisation and delivery of care. Medically, incontinence is conceptualised as a symptom of an underlying condition that can be prevented and treated, even in frail older people in nursing homes[1]. International research suggests 50–70% of nursing home residents have UI[2–5],

Joan Ostaszkiewicz*
National Ageing Research Institute, VIC, Australia
Federation University, Health and Innovation Transformation Centre, VIC, Australia
University of Melbourne, Faculty of Medicine, Dentistry and Health Sciences, VIC, Australia

Leona Kosowicz
National Ageing Research Institute, VIC, Australia

Jess Cecil
National Ageing Research Institute, VIC, Australia

Deidree Somanader
Monash University, Faculty of Medicine, Nursing and Health Sciences, VIC, Australia

Briony Dow
National Ageing Research Institute, VIC, Australia
University of Melbourne, Faculty of Medicine, Dentistry and Health Sciences, VIC, Australia

*Corresponding author

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making it an important policy and practice issue for nurses and the nursing profession. In many countries, the quality of continence care in institutional settings is not consistent with recommended prevention and treatment guidelines and falls far below the public's expectations, as evidenced by the Mid Staffordshire NHS Foundation Trust Public Inquiry[6] in the UK and the Royal Commission into Aged Care Quality and Safety[7] in Australia. However, understandings about what constitutes quality continence care in nursing homes vary[8,9]. As such, an investigation summarising the quantitative evidence about interventions for UI management is required.

THE REVIEW

The causes of UI in nursing homes are multifactorial[1]. The International Consultation on Incontinence identifies both intrinsic (individual) and extrinsic (environmental) factors that increase nursing home residents' risk of developing UI[1]. There is a mounting body of evidence to suggest that the processes of care in nursing home settings are not designed to promote therapeutic continence care for care-dependent older people[6–10].

A modelling of risk factors for UI in nursing home residents living with dementia found the strongest predictor was impaired functional status, expressed and measured as dependence in activities of daily living (ADL)[11]. This is an important finding that highlights the need for interventions to optimise nursing home residents' functional status and prevent premature decline.

Another potential cause of UI in nursing homes is a lack of assessment to identify potentially reversible causes. An early study from the US found up to 81% of nursing home residents had potentially reversible causes of UI that were rarely investigated or treated[12].

UI has a negative impact on some domains of nursing homes residents' quality of life (QOL)[13]. Xu and Kane[13] compared the overall QOL of 8,620 eligible residents with and without UI from 371 nursing homes. Although UI was not associated with overall QOL, it decreased the QOL domains of dignity, autonomy and mood. Jerez-Roig et al.[14] found 24.1% of residents with UI reported a severe impact on their QOL.

UI also impacts on nursing home residents' physical health, increasing their risk of incontinence-associated dermatitis[15], falls[16], functional decline[14] and death[17]. Organisational costs are another important consideration. Research from the US from 2003 reported that the cost of proactively managing UI in nursing homes over a 6-month period was US$586,436, with 46% attributed to direct labour costs alone[18].

Toileting assistance programs have been the focus of prior research on the management of UI in nursing homes. Seminal research conducted by Schnelle[19–23] demonstrated it was possible to reduce rates of UI immediately following the implementation of a toileting assistance program in this setting. The challenge has been for usual care staff to sustain these improvements in usual care conditions[24]. There is a lack of contemporary data about actual rates of toileting assistance programs in nursing homes, as well as evidence about the best ways to identify residents who would benefit from this intervention. Similarly, there are questions about the best ways to implement and sustain toileting assistance programs for residents who need this assistance.

To address the personal, social and financial costs of UI in nursing homes there is a need to better understand the range of interventions available and their evidence base. This information could inform workforce planning, research, future funding and policies and practice for nursing home care.

Aim

The aim of this scoping review was to map and summarise the body of quantitative evidence about interventions for the management of UI in nursing homes. The PICO question was What interventions have been trialled for the management of UI in nursing homes and what is their effectiveness?

METHODS

Design

A scoping review was conducted using methodology adapted from *The Joanna Briggs Institute (JBI) reviewers' manual 2015 methodology for JBI scoping reviews*[25] and reporting methods were guided by *PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews) guidelines*[26]. The rationale for conducting a scoping review rather than a systematic review was to map research about interventions for the management of UI in nursing homes, ie, to identify interventions that have been evaluated using quantitative research methods.

Search methods

The bibliographic search of health and medical databases followed a three-step methodology described by the JBI guidelines. Firstly, limited searches of Ovid MEDLINE and CINAHL were conducted. An experienced librarian was consulted to assist with identifying relevant keywords from the titles and abstracts of the articles retrieved from this initial search. Secondly, a comprehensive search for English-language articles published from 2010 to September 2021 was performed using the finalised keywords and MeSH terms. Six electronic databases were comprehensively searched – MEDLINE, Embase, PsychINFO, CINAHL, JBI Evidence-Based Practice Database, and the Cochrane Database of Systematic Reviews. The search strategy is available in Table 1. Lastly, selected publications were hand searched for additional relevant references.

Inclusion and exclusion criteria

The search was limited to primary sources and systematic reviews of primary sources. Grey literature

and government reporting was excluded. Publications that evaluated interventions for the management of UI in nursing home residents were included. Publications that focused on the management of other types of incontinence (ie, faecal or dual incontinence), incontinence-associated dermatitis, catheter-associated urinary tract infections, urinary catheters or ostomies were excluded. Surgical interventions for the management of UI were also excluded.

Search outcome

All identified articles were imported into Covidence for screening (www.covidence.org). Three reviewers (LK, JO and DS) independently reviewed the titles and abstracts of all identified sources from the database search. Five reviewers (LK, JO, BD, JC and DS) then completed a full-text review of the remaining material, with conflicts resolved through consensus.

Table 1. Search strategy

#	Query	Limiters/ expanders
S1	aged care or nursing home or residential aged care facility or long term care	Limiters: English language Published date: 20100101–20201231 Expanders: apply equivalent subjects Search modes: Boolean/Phrase
S2	(continence or incontinence) OR continence management OR continence assessment OR continence promotion OR continence care OR continence support OR continence assessment tools OR (incontinence or incontinent or urinary incontinence or urinary incontinent or urinary leakage) OR incontinence care OR incontinence management OR bladder management OR toileting program OR toileting assistance OR toileting intervention	
S3	care dependent OR care dependency	
S4	dementia or Alzheimer's or cognitive impairment	
S5	Residents' perspectives OR residents' experiences OR residents' views OR residents' opinions OR residents' attitudes	
S6	(staff perceptions or attitudes or opinions or experiences or views or reflection or beliefs) OR staff perspectives	
S7	(family experience or family perspectives or relatives experiences) OR families perceptions OR family opinions OR family attitudes	
S8	S1 AND S2	
S9	S8 AND S3	
S10	S8 AND S4	
S11	S8 AND S5	
S12	S8 AND S6	

Data abstraction

A data extraction form was developed to identify the key characteristics of each study as well as relevant information regarding interventions for the management of UI in nursing homes. Three reviewers (LK, JO and DS) independently extracted the data and resolved inconsistencies through consensus. The variables included study objectives, methods, setting/sample characteristics, intervention type, outcomes measured, findings, and key recommendations.

Synthesis

Because of anticipated heterogeneity of included studies, findings were synthesised without meta-analysis[27]. They were then reported in narrative form according to the type of intervention, ie, toileting assistance programs, exercise programs, drug therapies, technology-based interventions, education programs, or multicomponent interventions.

RESULTS

Search outcomes

A total of 3,885 records were located through the database search, and one additional study was found through citations. Of the publications identified, 30 were included in the final analysis (Figure 1). This included seven systematic reviews[28–34], 15 randomised-controlled trials (RCTs)[35–49], seven quasi-experimental studies[50–56] and one retrospective cohort study[57]. The majority of intervention studies were from Europe (n=10, 43.6%), while the remaining studies were from the US (n=7, 30.5%), Asia (n=3, 13%), Australia (n=1, 4.3%), New Zealand (n=1, 4.3%) and Iran (n=1, 4.3%).

Characteristics of included studies

Of the 30 included publications, six evaluated toileting assistance programs[29,31,32,42,46,55], four addressed exercise programs[29,34,47,48], three addressed drug therapies[29,33,57], and two described a technology-based intervention[37,56]. A total of 11 publications described the effects of education programs for nursing home staff[38–41,44,45,49,51–54] and six evaluated multicomponent interventions[29,28,35,36,43,50]. There was considerable heterogeneity with respect to the types of interventions, how they were delivered (ie, duration, intensity, components), and how outcomes were evaluated. Therefore, there is no one intervention that can be recommended over another. The following section describes the evidence for each intervention type; detailed characteristics of the included studies are presented in Tables 2–5.

Toileting assistance programs

Systematic reviews from 2011[31], 2012[29] and 2015[32] reported moderate evidence that toileting assistance

programs can reduce the frequency of UI in nursing homes, increase residents' appropriate toileting behaviour, maintain their social continence, and regain continence. However, they also reported that the effects were short-term and dependent on staff resources and time[32].

A further three studies suggest it is possible to implement toileting assistance programs in nursing homes over a longer period of time and with usual care staff. These include a RCT conducted by Lai and Wan[42] that evaluated a 6-month, 2-hourly prompted voiding (PV) intervention implemented by usual care staff in 52 nursing home residents in five nursing homes in Hong Kong. The intervention was compared with usual care. The researchers reported a significant difference in wet episodes per day (p=0.001), UI rate per day (p=0.001), and total continent toileting per day (p≤0.001) with positive results in the intervention group. Using a quasi-experimental design, Suzuki et al.[55] trialled PV for 1 week followed by ultrasound-assisted prompted voiding (USAPV) for 12 weeks in a cohort of 77 nursing homes residents in six nursing homes in Japan. The researchers reported an 11.8% reduction in the cost of incontinence products from baseline (p=0.006) and significant improvements in care workers' QOL.

In 2019, the same authors conducted an RCT comparing PV alone with USAPV in 13 nursing homes with 125 residents over an 8-week period[46]. They reported a significant reduction in daytime UI for the USAPV group than for the PV group (p=0.018), with the proportion of residents whose daytime urine loss decreased by greater than 25% being 51% and 26% in the USAPV and PV group respectively (p=0.020). Furthermore, while carer burden was unchanged in the USAPV group, it significantly worsened in the PV group after the intervention (p=0.010).

Technology-based interventions

One randomised placebo-controlled trial evaluated the effectiveness of a technology-based intervention, namely transcutaneous posterior tibial nerve stimulation[37]. A total of 12 30-minute sessions of this nerve stimulation were provided to 197 nursing home residents with UI over 6 weeks, while 209 residents were provided with sham stimulation. The researchers reported a statistically significant greater reduction in UI over 24 hours in the sham group in comparison to the treatment group (p=0.05). Therefore, this study did not demonstrate evidence that transcutaneous posterior tibial nerve stimulation is an effective intervention for UI.

A quasi-experimental study by Yu et al.[56] evaluated the effectiveness of a telemonitoring system. In this study, a sensor device was placed in residents' incontinence products to detect the onset of wetness episodes in 31 residents over a 72-hour assessment period. The data

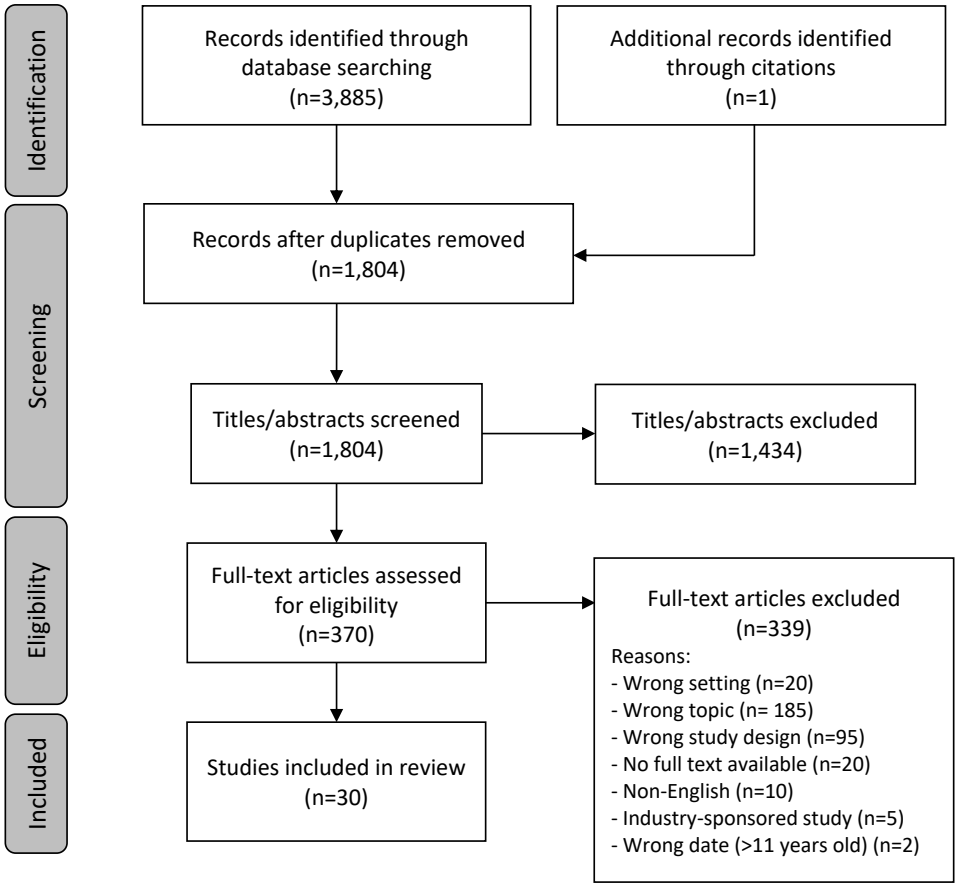

Figure 1. PRISMA diagram of study selection process

obtained from the assessment was used to develop an individualised continence care plan for each resident. The researchers reported a significant reduction in the volume of urine voided into the pads (p=0.015), significant increases in the number of prescribed toileting visits (p=0.015), significant increases in the actual number of toilet visits (p≤0.001), successful toileting events (p=0.011), and in staff adherence to urinary continence care plans (p=0.033).

Exercise programs

In an RCT, Tak et al.[47] evaluated the effects of a 6-month group-based behavioural exercise program on 102 female nursing home residents from 20 nursing homes in the Netherlands. Although physical performance significantly improved for the intervention group compared to the control group (p≤0.001), no significant differences were found for continence-related or QOL outcomes. In contrast, when personalised treatment goals were designed for each resident and physical activity and ADL training was implemented for 3 months, Vinsnes et al.[48] reported a significant decrease in the amount of UI leakage among 35 nursing home residents in Norway (p=0.03). One systematic review reports exercise and functional incidental training programs reduced wetness rates and improved rates of appropriate toileting[29]. However, in a subsequent review, Stenzelius et al.[34] reported a very low quality of evidence for physical activity in combination with ADL training in reducing UI.

Drug therapies

Two systematic reviews were identified that evaluated the use of drug therapies for the management of UI in nursing homes. In one review, anticholinergics showed a small but significant positive effect on urinary leakage in urge UI[33]. However, the review also found that adverse events, including dry mouth and constipation, were common, and studies on the impact of anticholinergics on cognition in this population have not yet been conducted. It was concluded that the use of anticholinergics for the treatment of urge UI in frail older people is not evidence-based. Flanagan et al.[29] reported that the use of anticholinergics (oxybutynin) as an adjunct to toileting therapy may have benefits for the reduction of UI, but benefits appear to be inconsistent and may be small or non-existent.

One cohort study also evaluated the use of drug therapies for the management of UI, namely bladder antimuscarinics (BAMs)[57]. Through new user design, BAM users were compared with propensity score (PS)-matched non-users, and the benefits (change in UI status and QOL) and harmful effects (fracture risk and decline in cognitive performance) of BAM initiation were evaluated. While BAM initiation was significantly associated with improvement in UI (OR=1.34, 95% CI 1.13–1.60), the risk of fractures was also significantly increased in new users compared to non-users (hip fracture: hazard ratio [HR]=3.67, 95% CI 1.46–9.34; 'any' fracture: HR=2.64, 95% CI 1.37–5.10) and there was no clinically significant improvement in social engagement among BAM users. It was concluded that non-selective immediate release BAMs (especially immediate-release oxybutynin chloride) should be approached cautiously as a treatment for UI amongst the nursing home population.

Education programs

Of the 11 publications that evaluated the effects of education programs for nursing home staff, seven were RCTS[38–41,44,45,49] and four were quasi-experimental studies[51–54]. The nature of the educational interventions and the outcomes of interest varied considerably.

Over a 10-month period, Wijk et al.[49] implemented an education program about a person-centred approach to continence care for nursing home staff from two nursing homes in Switzerland. Staff in the intervention group were educated on how to elicit information from residents about their personal identity and preferences and how to use this information to design an individualised continence care plans for each resident. In homes where the approach was used, the number of times residents received toileting assistance was significantly higher during and after the intervention compared to the control home (p=0.019). A significant positive effect was also found in the number of continence assessments conducted in the intervention homes (p≤0.05).

Also conducted in seven Swiss nursing homes over a 14-month period was a step wedge study led by Kohler et al.[41]. The intervention was a 4-hour education program focusing on continence care for residents living with dementia followed by six case conferences (one per month). The researchers found a decrease in UI for all groups which was only significant in the 11-month group (p=0.036). QOL also significantly increased in seven of the nine domains for residents in all groups.

In Austria, Hödl et al.[40] conducted a cluster RCT in which managers from 12 nursing homes received and discussed 29 recommendations for the conservative management of UI. Three months later, residents in the intervention sites were found to have a significantly lower risk of daily UI (p=0.02), were less likely to receive absorbent products (p=0.01), and were five times more likely to receive the recommended interventions (p≤0.001) than those who received usual care.

Two further publications were identified, related to one large cluster RCT conducted across eight nursing homes in four European countries – Sweden, England, Ireland and the Netherlands[39,45]. The aim was to compare standard dissemination of evidence-based guidelines about UI with two different types of facilitation. The guidelines promoted: (i) screening for UI; (ii) a detailed continence assessment; (iii) an individualised treatment plan; and (iv) referral if needed. The researchers reported no between-group significant differences in the documented percentage compliance with the continence recommendations, which was assessed at baseline, and at 6, 12, 18 and 24 months after the intervention and noted that all study arms improved over time. It was not possible

Table 2. Characteristics of included studies: systematic reviews

Legend for all tables:
NH: nursing home; UI: urinary incontinence; FI: faecal incontinence; IG: intervention group; CG: control group
NA: nursing assistant; CNA: certified nursing assistant; CNS: clinical nurse specialist; IF: internal facilitator; LPN: licensed practical nurse

Review objectives	Descriptions of interventions/ phenomena of interest	Methods	Findings
Donald et al. (2013)[28]			
To report quantitative evidence of the effectiveness of advanced practice nursing roles, clinical nurse specialists (CNS) and nurse practitioners (NP) in meeting the healthcare needs of older adults living in long-term NH settings	Evaluation of NP and/or CNS in long-term care Outcome measures: functional status, health status, QOL, health services use, and resident and family satisfaction	Quantitative systematic review	8,277 studies located, 15 papers about four studies included (all interventional studies) Long-term care settings with advanced practice nurses had lower rates of depression, UI, pressure ulcers, restraint use, and aggressive behaviours, more residents who experienced improvements in meeting personal goals, and family members who expressed more satisfaction with medical services Interventions that reduced or slowed decline in UI: • CNS facilitation of evidence-based protocols and CNS provision of staff education, consultation, and direct care to residents for 6 months post-admission • As above, plus CNS membership on the NH's quality assurance committee; CNS provision of formal in-services to certified nursing assistants (CNA); and CNS collaboration with staff in problem solving teams
Flanagan et al. (2010)[29]			
To describe and compare interventions for the management of incontinence and promotion of continence in care home residents	UI, bladder training, PV, timed voiding, habit training, functional incidental training, and prompted walking program	Systematic review of studies investigating urinary and faecal incontinence (FI) in people aged 65 years or older in care homes	181 studies located, 68 included (42 interventional studies, 26 observational/ descriptive studies). 3,224 residents total, mainly female, aged >65 years Most common treatments: • Toileting programs and incontinence pads (effective in reducing frequency of incontinence, increasing appropriate toileting behaviour, helping to maintain social continence, and helping to regain continence) • Drug therapy adjunct to toileting programs (inconsistent benefits) • Combined physical therapy/behavioural therapies (short-term improvements) • Adaptations to physical environment and staff training • Exercise and Functional Incidental Training programs (reduce wetness rates and improve appropriate toileting rates) • Combined complex behavioural interventions (effectiveness not yet determined)
Ostaszkiewicz et al. (2020)[30]			
To describe, critique, and summarise research about the effects of education about UI on nurses' and nursing assistants (NAs)' knowledge and attitudes toward UI, their continence care practices, and patient outcomes	UI educational intervention that reported pre- and post-quantitative data about the effects of education programs designed to evaluate or improve four outcomes: • Nurses' and/or NAs' knowledge of UI • Nurses' and/or NAs' attitudes about UI • Nurses' and/or NAs' continence care practices • Patient outcomes	A systematic review of randomised controlled studies or non-randomised or quasi-randomised trials	Conducted in NH in the US (19 trials, enrolled 1301 participants: 911 nurses, 235 NAs and 155 unclear) Findings: • Nurses and NAs had limited ability to determine UI type and factors that require assessment, interpret clinical data to make a diagnosis, and identify patients who may be suitable for active interventions • Increased knowledge about UI does not necessarily translate into improvements in practices that improve patient outcome • A key barrier to the uptake of educational recommendations about UI could be a lack of audit and feedback data about patients' objective continence status

Review objectives	Descriptions of interventions/ phenomena of interest	Methods	Findings
Roe et al. (2011)[31]			
To undertake a narrative review of descriptive empirical studies on the management of incontinence, promotion of continence or maintenance of continence in people aged 65 years and above in care homes with UI as the primary focus	Descriptive, observational or intervention studies (which include nursing, medical or behavioural interventions) aimed at the management of incontinence or the promotion or maintenance of continence; surgical or pharmacological interventions excluded	A systematic review of studies that used quantitative or qualitative designs and methods was undertaken to provide a narrative synthesis	167 located, 60 included (37 intervention studies, 23 descriptive observation studies). Participants were mainly women, mean age >80 years Findings: • Prevalence of UI was higher than FI with more women affected than men • Use of incontinence pads and toileting programmes comprised the most common management approaches used • The evidence base, theories underpinning toileting practices or their form, frequency and content are unclear from the studies reviewed but are stated to comprise bladder training, scheduled or PV
Roe et al. (2015)[32]			
To synthesise evidence from systematic reviews on the management of UI and promotion of continence using conservative/behavioural approaches in older people in care homes to inform clinical practice, guidelines and research	Conservative approaches for continence promotion, continence maintenance or management of incontinence (excluding drugs or surgical interventions) from behavioural or nursing perspectives	A systematic review of systematic reviews with narrative synthesis	42 located, five included (all systematic reviews). 535,178 residents total mainly females, mean age range 73.9–88.7 years Findings: • Toileting programmes, PV, use of incontinence pads are the main conservative behavioural approaches (evidence of effectiveness in the short-term dependent on staff adherence and resources) • Evidence from associated factors (exercise, mobility, comorbidities, hydration, skin care, staff perspectives, policies, and experiences and preference) are limited
Samuelsson et al. (2015)[33]			
To systematically review the efficacy of pharmacological treatment for UI in the elderly and frail elderly	Pharmacological treatment for UI in the frail elderly population	A systematic review of prospective controlled trials of pharmacological treatment for UI in persons aged 65 years or over	1045 located, 13 included (all placebo-controlled randomised studies), Frail elderly (three studies) and elderly (10 studies) Findings: • Anticholinergic drugs have a small, but significant, effect on urinary leakage in the elderly with urgency UI • Adverse effects (dry mouth, constipation) were common. No studies assessed effect on cognition • Treatment with anticholinergics for urgency UI in the frail elderly is not evidence-based
Stenzelius et al. (2015)[34]			
To investigate the evidence and the effect of conservative treatment of UI and the QOL among older and frail older persons	Conservative treatment including complex interventions, toilet training, behaviour therapy, PV, environmental, complementary therapies, pelvic floor exercise, bladder training and electrical stimulation	A systematic review of randomised controlled studies and prospective, non-randomised studies of interventions of conservative treatment of UI in an older population (65 years or older)	1711 located, nine included (eight studies, three meta-analyses), four studies in NHs Results for NHs: • Attention training (i.e., being reminded to make toilet visits and being helped to go to toilet every hour) in combination with functional exercise reduced urinary leakage episodes (moderate quality of evidence) • Physical training (i.e., physical activity) in combination with ADL training had no significant effect on urinary leakage (very low quality of evidence)

Table 3. Characteristics of included studies: RCTs

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Azizi et al. (2019)[35]				
To examine the effect of a self-care programme on UI and self-esteem in elderly men dwelling in NHs in Iran	n=61 residents (100% male, mean age 68.18 years, UI score ≥3 [severe UI]) n=2 NHs in Iran	Eight 45–60 minute weekly sessions comprising: • Light strengthening exercises • Pelvic floor exercise • Lectures, group discussions, roleplay and educational booklet about UI improvement and the role of behavioural and lifestyle factors in the health of the urinary system IG: self-care programme for 8 weeks plus 4-week follow-up (n=30) CG: usual care for 12 weeks (n=31)	UI severity (ICIQ-SF) Self-esteem (Rosenberg Self-Esteem Scale)	• Significant decrease in the mean scores of ICIQ-SF in the IG compared with CG following intervention (p≤0.001) • Significant increase in self-esteem in IG compared to CG (p≤0.001) • No reported drop out
Boorsma et al. (2011)[36]				
To determine the effects of multidisciplinary integrated care on the quality of care and QOL for elderly people in NHs	n=462 residents randomised (IG 76.1% female, mean age 85.8 years; CG 74.1% female, mean age 85.5 years; all with physical or cognitive disabilities) n=10 NHs in the Netherlands	Geriatric assessment of functional health every 3 months comprising: • Use of the Long-term Care Facility version of the Resident Assessment Instrument by trained nurse assistants to guide the design of an individualised care plan • Discussion of outcomes and care priorities with the family physician, the resident and his or her family • Monthly multidisciplinary meetings with the nurse assistant, family physician, psychologist and geriatrician to discuss residents with complex needs IG: multidisciplinary integrated care (n=201) CG: usual care (n=139)	Primary outcomes: • Sum score of 32 risk-adjusted quality-of-care indicators • Health-related QOL (short-form Rand Health Insurance Study questionnaire) Secondary outcomes: • 32 individual risk-adjusted quality-of-care indicators • ADLs (Groningen Activity Restriction Scale) • Quality of care (QUOTE–Elderly instrument short form) • Hospital admissions recorded at the (single) local hospital • Mortality	Compared with the facilities that provided usual care, IG facilities had a significantly higher sum score of the 32 quality-of-care indicators (mean difference –6.7, p=0.009; a medium effect size of 0.72). They also had significantly higher scores for 11 of the 32 indicators of good care in the areas of communication, delirium, behaviour, continence, pain and use of antipsychotic agents
Booth et al. (2021)[37]				
To determine the clinical effectiveness of transcutaneous posterior tibial nerve stimulation to treat UI in care home residents and to determine the associated costs of the treatment	n=406 residents randomised (mostly female, mean age 85 years, UI at least weekly) n=37 NHs in UK	12 30-minute sessions of transcutaneous posterior tibial nerve stimulation (TPTNS) IG: TPTNS for 6 weeks (n=197 Sham group: Sham stimulation for 6 weeks (n=209)	Primary outcome: • Change in volume of urine leaked over a 24-hour period at 6 weeks Secondary outcomes: • Number of pads used • Perception of bladder condition • Toileting skills • QOL • Resource use	Primary outcome: • Primary intention-to-treat adjusted analysis indicated a mean change of –5ml (standard deviation 362ml) urine leakage from baseline in the IG and –66ml (SD 394ml) urine leakage in the sham group, which was a statistically significant, but not clinically important, between-group difference of 68ml urine leakage (95% CI 0–136ml; p=0.05) in favour of the sham group Secondary outcomes: • No meaningful differences were detected

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Gencbas et al. (2018)[38]				
To assess the effectiveness of the nursing care plan implemented using NNN linkages for elderly women with incontinence and living in NHs	n=62 residents randomised (100% female, 43.8% IG and 53.3% of CG in age range 75–85 years, MMSE score >23) n=5 NHs in Turkey	Staff received education on the use of three Standard Nursing Languages (NANDA, NOC, NIC) and implemented these in incontinence care plans IG: residents received care from SNL trained staff for 12 weeks (n=32) CG: usual care for 12 weeks (n=30)	Pre- and post-intervention measures: • Five Nursing Outcomes Classification (NOC) scales ("0503 urinary elimination", "0502 urinary continence", "1101 tissue integrity: skin and mucous membranes", "0310 self-care toileting" and "medication response") • Incontinence Severity Index (ISI) • Urinary Distress Inventory-6 (UDI-6) • Incontinence QOL (I-QOL) scale	• Statistically significant improvement in all NOC scales in IG compared to the CG (urinary elimination p=0.001; urinary continence p=0.001; tissue integrity p=0.001; self-care toileting p=0.001; medication response p=0.004) • Significant and positive difference was found in terms of the ISI (p=0.001), UDI-6 (p=0.001), and I-QOL (p=0.001) scale scores for the IG group post-intervention
Harvey et al. (2012)[39]				
To describe the process of introducing PACES to internal facilitators (IFs) To discuss the progress made during a 12-month period of collecting and analysing audit data using PACES To summarise the collective experience of using PACES, including reflections on its strengths and limitations	n=8 NHs in Sweden, England, Ireland and the Netherlands	Intervention: a 3-day workshop for NH IFs on evidence-based recommendations about UI, and exposure to different forms of facilitation: • Type A IFs were trained in a pragmatic, quality improvement-based facilitation intervention (use of the JBI PACES) • Type B IFs were trained in an enabling, critical social science-based approach, with an emphasis on inquiry, reflection and emancipatory action	IF compliance with four recommendations related to screening, assessment care planning and specialist referral	• This paper only reported outcomes related to Type A intervention • Delays in introducing PACES led to a lack of baseline audit data resulting in a lack of comparative data. Qualitative data suggested IFs benefited from comparing audit data across sites
Hödl et al. (2019)[40]				
To measure the effectiveness of 29 evidence-based nursing recommendations regarding the conservative management of UI in Austrian NHs	n=381 residents randomised (100% female, mean age 85 years (IG) and 82.3 years (CG), 54.2% (IG) and 38.2% (CG) had dementia (p=0.002), 71.3% (IG) and 66.7% (CG) had UI (p=0.018)) n=12 NHs in Austria	Set of 29 recommendations for conservative UI management were discussed with the NH managers and printed material was provided Supplementary documents (e.g., posters with abridged versions of the UI management recommendations, bladder diaries and questionnaires about QOL regarding UI) were provided IG: conservative UI management strategies for 12 weeks (n=216) CG: usual care for 12 weeks (n=165)	Number of daily UI events, number of UI diagnoses and use of nursing interventions were measured at baseline, 6 weeks and 12 weeks per a resident questionnaire	• IG had lower risk of daily UI (p=0.02), were less likely to receive absorbent products (p=0.01), and were five times more likely to receive recommended interventions (p=0.00) than CG

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Kohler et al. (2018)[41]				
To explore the effects of an educational program and subsequent nursing case conferences on UI and QOL in NH residents with dementia and incontinence	n=140 residents randomised (79% female, mean age 85.17 years, cognitive performance scale mean score 4.06 (moderate impairment), ADL index mean 12.69) n=7 NHs in Switzerland	RNs, health assistants and nursing aides caring for residents received a 4-hour dementia and incontinence training session comprising presentations, group work and discussions. Staff then participated in 1-hour case conferences about persons with incontinence and dementia, occurring 2 weeks after the education session then monthly • Cluster 1: Intervention for 13 months (n=39) • Cluster 2: Intervention for 11 months (n=24) • Cluster 3: Intervention for 9 months (n=37) • Cluster 4: Intervention for 7 months (n=40)	UI (urinary leakage via pad test) and QOL (via QualiDem) were measured at baseline, 2 and 6 months after the intervention in each cluster, and at the end of the study	• Decreases in UI by the end of the study for all clusters, significant only for Cluster 2 (T1–T3 p=0.036; T2–T3 p=0.031). • QOL increased in the total sample in all categories except 'having something to do' and 'social relations', with the increase being significant for 'restless tense behaviour' (p=0.049) and 'positive self-image' (p=0.009).
Lai & Wan (2017)[42]				
To examine whether the effect of the use of PV by NH staff to manage UI among residents in NHs can be sustained for a period of 6 months	n=52 residents randomised (63.5% female, mean age 85.4 years, mean C-MMSE score 13.2, 32.7% severely dependent, 24.9% totally dependent) n=5 NHs in Hong Kong	Residents in the IG were prompted to void every 2 or 2.5 hours from 7:00am to 7:00pm for 7 days a week for 6 months IG: PV for 6 months (n=26) CG: usual care for 6 months (n=26)	Wet episodes per day, incontinence rate per day, self-initiated toileting per day, and total continent toileting per day, measured at baseline, 3 months post-intervention (T1), and 6 months post-intervention (T2)	• Significant differences between the two groups in wet episodes per day (p=0.001), incontinence rate per day (p=0.001), and total continent toileting per day (p≤0.001) at 6 months' post-intervention, with positive results in the IG • Decrease of 9.1% in the incontinence rate in the IG
Schnelle et al. (2010)[43]				
To evaluate effects of a multicomponent intervention on FI and UI outcome	n=112 residents (IG 84% female, CG 81% female, mean age 85.8 years (IG) and 86.1 (CG)) n=6 NHs in the US	Residents were offered toileting assistance, exercise, and choice of food and fluid snacks every 2 hours for 8 hours per day over 12 weeks IG: multicomponent intervention for 12 weeks (n=58) CG: usual care for 12 weeks (n=54)	Frequency of UI and FI and rate of appropriate toileting as determined by direct checks from research staff. Anorectal assessments were completed on a subset of 29 residents	• Significant improvement in frequency of UI (p=0.049) • Significant improvement in frequency of appropriate toileting (p=0.000) • UI participants with higher MMSE scores (less cognitive impairment) responded less well to treatment (p=0.05)

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Schnelle et al. (2013)[44]				
To evaluate an intervention to improve staff offers of choice to NH residents during morning care	n=138 residents randomised (76.3% female, mean age 80.5 years, 74% white, mean MMSE score 15.4, mean MDS-ADL Dependency Score 17.0) n=4 NHs in the US	Nursing aides caring for residents received 12 weekly video-based training sessions on how to offer choice in morning care (when to get out of bed, when to get dressed/what to wear, incontinence care [changing and/or toileting], where to dine). Training sessions were followed by weekly feedback about how often choice was being provided based on standardised observations of care conducted weekly by research staff n=37 residents received the intervention immediately and completed the study n=101 residents acted as a control then received the intervention after a 12-week delay and completed the study	Total number of instances of "choice offered" for each participant within each morning care area and total time to provide care in the targeted areas during each observation period. Measured through standardised observations during a minimum of 4 consecutive morning hours/participant/week for 12 weeks of baseline and 12 weeks of intervention	• Significant increases in frequency that choice was offered for three of the four targeted morning care areas from baseline to intervention: out of bed, 21% to 33% (p≤0.001); dressing, 20% to 32% (p≤0.001); incontinence care, 18% to 23%, (p≤0.014). Dining was not significant • Significant increase in amount of staff time to provide care from baseline to intervention (8.01±9.0 to 9.68±9.9 minutes/person, p≤0.001) (i.e., time taken to provide care was increased by the intervention)
Seers et al. (2018)[45]				
To extend knowledge of facilitation as a process for getting research evidence into practice by testing the effectiveness of and evaluating the contribution two different models of facilitation can make to implementing evidence-based urinary continence recommendations into practice	n=24 long-term nursing care sites in England, Sweden, Netherlands, Republic of Ireland randomised to one of three arms Staff: one IF chosen per facility for study arms 2 and 3 (n=16) Residents: all facilities housed residents aged ≥60 years with documented UI	Arm 1: Lecture about four continence recommendations: • Screen for incontinence • Conduct a detailed continence assessment • Design an individualised treatment plan • Refer to a specialist if needed (n=8 facilities) Arm 2: per Arm 1 plus: • 12-month goal-focused facilitation programme (n=8 facilities) Arm 3: per Arm 1 plus: • 24-month facilitation programme with stakeholder empowerment and strategies to overcome obstacles to use of research in practice (n=8 facilities)	Documented percentage compliance with continence recommendations measured at baseline, 6, 12, 18 and 24 months after intervention	• No significant differences in the documented compliance with continence recommendations between study arms

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Suzuki et al. (2019)[46]				
To determine whether USAPV care is more efficacious than conventional PV (CPV) care for managing UI in NHs	n=80 residents randomised (77% female, mean age 85 years, mean care-needs levels 3.5 (USAPV) and 3.2 (CPV) (moderate-high dependency)) n=13 NHs in Japan	n=45 residents received USAPV intervention (bladder urine volume monitored by an ultrasound device and staff prompted them to void accordingly) n=35 residents received standard PV (residents asked by staff every 2–3 hours whether they had a desire to void and were prompted to void when response was yes)	Primary outcomes: • Change in daytime urine loss and QOL assessed using the EQ-5D from baseline to end of intervention Secondary outcomes: • Scores of mental state, depression, physical function, and level of motivation assessed using the EQ-5D, MMSE, GDS, Barthel index, and vitality index, respectively • Change in caregivers' QOL assessed with the SF-12v223 and mental stress for care burden with the visual analogue scale (VAS)	• Change in daytime urine loss statistically greater for USAPV (median −80.0g) than CPV (median −9.0g; p=0.018) group • Proportion of residents whose daytime urine loss decreased by >25% was 51% and 26% in the USAPV and CPV group, respectively (p=0.020) • No significant changes in QOL for either group • Care burden was unchanged in the USAPV group (p=0.59) but significantly worsened in the CPV group (p=0.010) after the intervention
Tak et al. (2012)[47]				
To compare a group-based behavioural exercise program to prevent or reduce UI, with usual care. The exercise program aimed to improve functional performance of pelvic floor muscle, bladder and physical performance of women living in homes for the elderly	n=192 female residents randomised (100% female, mean age 84.6 years (IG) and 84.7 (CG), with or without UI, with Cognitive Screening Test score >9.6 (good cognition) and able to use the toilet independently) n=20 NHs in the Netherlands	Group-based behavioural exercise program comprising weekly group exercises and independent homework exercises for 6 months IG: exercise program for 6 months (n=85) CG: usual care for 6 months (n=70)	Presence or absence of UI, frequency of episodes (3-day bladder diary), Physical Performance Test, SF-12 physical, SF-12 mental and I-QOL measured at baseline, 3 and 6 months	• Physical performance (PPT) significantly improved in the IG compared to a decline in the CG (p≤0.001) • No significant differences between groups on any other outcome measures
Vinsnes et al. (2012)[48]				
To investigate if an individualised training program designed to improve ADL and physical capacity among residents in NHs has any impact on UI	n=98 residents randomised (75.5% female, mean age 84.3 years, mean MMSE score 12.5, and in need of assistance with at least one ADL) n=24 NHs in Sweden, Norway and Denmark	Personal/individualised treatment goals were elicited for each participant. Each participant was then involved in a training program including accommodated physical activity and ADL training for 3 months IG: training program for 3 months (n=35) CG: usual care for 3 months (n=33)	UI as measured by a 24-hour pad-weighing test, measured at baseline and 3 months post-intervention	• Amount of leakage significantly decreased in the IG after adjusting for baseline leakage, age, sex and functional status (p=0.03)

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Wijk et al. (2018)[49]				
To operationalise, assess and evaluate the feasibility and preliminary effects of implementing a person-centred approach to incontinence care for older adults with cognitive decline in NHs in Sweden	n=79 residents randomised (59.9% female, mean age 83.9 years, MMSE score <23) n=2 NHs in Sweden	Staff (n=24) caring for residents received a 10-month training program about how to encounter and interview residents from a person-centred approach and create person-centred care plans, and received training in incontinence assessment, planning, caring actions and outcome follow-up. Staff used this training to elicit resident narratives and incorporate these narratives into resident care plans IG: residents receiving care from trained staff facilitators (n=2 NHs) CG: residents receiving usual care (n=1 NH)	Process outcome: • Number of assessments conducted for incontinence management Impact outcomes: • QOL (QUALID scale), basal assessment of incontinence, incontinence actions taken, personally chosen incontinence aids Measured at baseline, during implementation, immediately after end of implementation, and 6 months after end of implementation	• Non-significant increase in residents' QOL in IG compared to baseline and CG • Positive effect on the number of UI assessments conducted in the intervention NHs at baseline and follow up 1 (p≤0.05) • Number of person-centred caring actions (e.g., toilet assistance) was significantly higher during and 6 months after implementation of the person-centred approach (p=0.019)

to identify whether different forms of facilitation were influential within very diverse contextual conditions.

In the US, Schnelle et al.[44] conducted a controlled trial to evaluate the effects of educating nursing home staff about offering residents greater choice about toileting assistance, exercise and choice of food and fluid snacks. They were encouraged to offer this choice every 2 hours for 8 hours per day over 3 months. At 3 months, the researchers reported significant increases in the number of time residents received choice-related toileting (p=0.014). However, they also noted a significant increase in the amount of staff time to provide care (p≤0.001).

Gencbas et al.[38] evaluated the effects of educating nursing home staff on the use of a standardised nursing language to identify residents with UI and to design targeted nursing interventions in five nursing homes in Turkey. The cluster RCT conducted over 12 weeks was evaluated with respect to residents' continence status and QOL. The researchers reported a between-group statistically significant improvement in the use of the standardised nursing language, residents' QOL and symptom severity.

All four quasi-experimental studies that examined the effects of educating nursing home staff about UI were conducted in the US[51–54]. They included a 6-week pre/post-study by Mathis et al.[52] involving 166 nursing home staff from six US nursing homes. The education focussed on the types and treatment of incontinence and was delivered face-to-face. The researchers reported significant improvements in post-education staff knowledge about types of UI (p≤0.001 for all domains) and improved attitudes about UI (p≤0.001), but no significant change in staff knowledge about assessment or treatment.

By contrast, Ehlman et al.[51] reported significant improvements in nursing home staff members' attitudes about UI following nine in-service programs designed to teach 107 staff from four skilled nursing facilities in the US how to use a bladder scanner. This was augmented with a DVD on the same topic, a refresher in-service 12 weeks later, and supplementary information and incentives. Post-intervention improvements were also noted for knowledge about using a bladder scanner, but not for the belief that UI is a normal part of ageing.

Rahman et al.[53,54] compared a 5-month course about PV delivered by teleconference with an 8-month course. The researchers reported a significant increase in nursing home staff knowledge compared to baseline (p≤0.05 and p≤0.001) and that varying the number and duration of teleconference sessions did not produce any significant effects. The researchers also evaluated the effects of six 40-minute webinars on the same topic[54]. Based on nursing home documentation, 100% of participating homes implemented toileting assistance following the education and 83% reported that they planned to continue the intervention.

Multi-component interventions

Multi-component interventions that combine

Table 4. Characteristics of included studies: quasi-experimental studies

Aim	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Arnold et al. (2016)[50]				
To assess if conservative therapy can reduce urinary leakage and pad usage and improve QOL in elderly incontinent women living in a rest home setting and, if so, at what additional cost	n=68 residents (100% female, mean age 85.3, mean MMSE score 25.6) n=26 NHs in New Zealand	Residents received tailored, conservative continence treatment from a specialist continence nurse advisor for 12 weeks. Interventions included pelvic floor muscle exercises and bladder retraining with a focus on deferment strategies, fluid intake, optimising bowel function and increased physical activity, and lifestyle changes. PV, techniques to improve bladder emptying, prescription of anticholinergics and oestrogen cream were also recommended to some residents	Primary outcomes: Bladder function (via bladder diary, pad weigh tests, pad usage), and QOL and activities via questionnaires (FIM: Functional Impairment Measure; EQ-5D: EuroQuol 5-dimension score; ICIQ-SF: International Consultation on Incontinence-Short Form) recorded at baseline and after 12 weeks Secondary outcomes: Pad cost, carers' cost for continence care, additional laundry costs and total costs	• Mean urine loss fell significantly by 60ml per day (p=0.024) • Significant reduction in pad changes per week by a mean of 4.3 (p≤0.0005) • ICIQ-SF improved statistically by 2.84 (p≤0.0005) but no significant improvement in any other QOL or activities scales • Pads used per week reduced by a mean of 4.3 with a significant reduction of pad costs per week (mean NZ$2.43/16%) • No significant different in carers' cost or additional laundry costs • Total cost of providing the intervention for 12 weeks (NZ$247.75 minus cost-savings NZ$12.48), was NZ$235.27 per participant
Ehlman et al. (2012)[51]				
To explore differences in attitude and knowledge related to UI among nursing personnel who provide care for NH residents, and examine staff attitude and knowledge about UI	n=107 NH staff (15% registered nurses, 54.2% licensed practical nurse (LPN), 30.8% CNA) n=4 skilled nursing facilities in the US	48 aged care staff completed in-service education about UI and about the use of a bladder ultrasound machine. Facilities had a bladder ultrasound machine made available, and staff completed a pre- and post-intervention surveys	Staff attitudes and knowledge regarding incontinence	• Before the intervention, there was a significant association between position and belief that bladder disorders are a normal part of ageing (more CNAs than LPNs believed this [p≤0.003] as did more CNAs than RNs [p=0.003]) • Study intervention resulted in a significant positive change in attitude toward UI (p≤0.001)
Mathis et al. (2013)[52]				
To determine: staff knowledge about the types of UI before and after participating in the Bladder Buzz program; staff attitudes about UI before and after participating in the program; and staff knowledge about the treatment and management of UI before and after participating in the program	n=166 NH staff (14% registered nurses, 23% LPN, 39% CNA and 23% non-nursing staff) n=6 NHs in the US	38 NH staff members completed a 6-week educational intervention on the types and treatment of UI and attitudes toward UI, and completed pre- and post-intervention surveys	Staff knowledge about UI, attitudes toward UI, and treatment and assessment of UI assessed via a researcher-developed survey before and after the intervention	• Changes in knowledge about the types of UI were significant for stress (p≤0.001), functional (p≤0.003), and overflow (p≤0.00) UI • Changes in attitudes toward UI were significant (p≤0.000) • Changes in staff knowledge of the assessment and treatment of UI were not significant

Aim	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Rahman et al. (2012)[53]				
To determine whether a distance coaching course on improving NH incontinence care could be replicated and brought to scale with a larger group of NHs without sacrificing outcomes	Supervisors and staff (not further described or quantified) from NHs in the US	Course 1: PV education delivered to 14 staff via 8 monthly teleconferences of 60–90 minutes each Course 2: PV education delivered to 34 staff via 5-monthly teleconferences and one 2-month follow-up of 40 minutes each	Number of staff participating in course, implementation of PV intervention, effectiveness of training in increasing knowledge, training program preferences, and course costs	• No significant differences in participation, intervention implementation, knowledge increase or training preferences were found between groups • Both groups showed a significant increase in knowledge compared to baseline (Course 1 p≤0.05, Course 2 p≤0.0001). • The cost of Course 1 was US$1894/facility and the cost of Course 2 was S$514/participating facility
Rahman et al. (2014)[54]				
To administer and evaluate a webinar course that provided extended instruction to help NHs implement toileting trials in accordance with recommended procedures	Staff members (nurses, DONs, MDS coordinators, staff educators, nursing aides) (not further quantified or described) from n=7 NHs in the US	Six 40-minute webinars comprising an online course to assist NH staff to implement toileting trials were delivered to 16 staff over 9 weeks. Between webinars, staff were asked to complete implementation "assignments": • Interview a sample of incontinent residents to assess their preferences for incontinence care • Conduct a 3-day toileting trial with these residents • Re-interview the residents following the trial • Summarise the results from this procedure Facility "champions" attended all webinars and oversaw implementation of assignments (n=7)	Whether the course prompted NH staff to adopt the best-practice toileting trial protocol (evidenced by documentation of new toileting trial assessments being completed for incontinent residents) Evaluation of the course itself (whether staff participants preferred this course to more traditional continuing education models) via course and pilot-test evaluation surveys completed by staff and champions	Primary evaluation results: • 100% of champions reported that their staff had completed all three toileting trial steps (i.e., interview, trial and analysis) with at least some residents • 50% of champions reported that, in their opinion, assessed residents were drier and that more incontinent residents had individualised toileting plans as a result of course participation • 83% of champions said that their facility planned to continue or expand use of all three standardised continence assessment forms that were used in the toileting trials Secondary evaluation results: • 83% of champions and 75% of staff said they preferred the webinar course to other course designs
Suzuki et al. (2016)[55]				
To assess the efficacy and feasibility of USAPV for the management of UI in NHs	n=77 residents (76.6% female, mean age 84.1, primarily dependent [53.2% classified as care needs level 4 or 5]) n=6 NHs in Japan	Residents received a PV intervention for 1 week, followed by USAPV intervention for 12 weeks (residents were prompted to void on the toilet when monitored urine volume reached close to that optimal volume that had calculated for each resident)	Primary outcome: • Change in absorbent cost from baseline to the end of the study Secondary outcomes: • ADLs of participants assessed using the vitality index • Feasibility of the intervention assessed via care worker QOL using SF-36	• Absorbent cost was reduced in 40 of the 77 participants (51.9%) • Being pad-free was attained by two participants (2.9%) at 4 weeks, two at 8 weeks and three (3.9%) at 12 weeks, respectively • Change in total vitality index score from 6.96 to 6.76 was not significant (p=0.236) • Two subscales of the SF-36 Health Survey, role emotional (p=0.020) and mental health (p=0.007), improved significantly after intervention

Aim	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Yu et al. (2014)[56]				
To explore the effects of introducing a telemonitoring and care planning system for urinary continence assessment in a NH and adherence by care staff to urinary continence care plans	n=31 residents (78% female, mean age 81±8) n=1 NH in Australia	Staff who care for residents were trained in the use of video telemonitoring for continence assessment over a 12-week trial	• Weight of urine voided into the continence aid (episode of UI void) • Number of prescribed toileting events in the care plans • Number of actual toileting events • Number of successful toileting events • Secondary measure of the rate of successful toileting • Adherence to care plans by staff Measured at baseline and post-intervention	• Significantly reduced volume of urine voided into continence aids (p=0.015) • Significantly reduced number of prescribed toileting visits (p=0.015) • Significantly increased number of actual toilet visits (p≤0.001) • Significantly increased number of successful toileting events (p=0.011) • Significantly increased adherence to urinary continence care plans by staff (p=0.033)

Table 5. Characteristics of included studies: retrospective cohort studies

Aim(s)	Setting/baseline sample	Intervention(s)	Outcomes measured	Findings
Moga et al. (2013)[57]				
To evaluate risks and benefits of bladder antimuscarinics (BAMs) among elderly NH residents	Retrospective cohort study of older adults (65 years and older) admitted for long-term care between 1 October 2002 and 30 September 2009 in Veterans Affairs (VA) community living centres (NHs)	Retrospective cohort study. Through a new user design, BAM users were compared with propensity score (PS)-matched non-users and the impact of BAM initiation was evaluated A new user was an individual whose first dispensing of a BAM (oxybutynin chloride, tolterodine, darifenacin, solifenacin, trospium, hyoscyamine, dicyclomine, orflavoxate; immediate-release [IR] orextended-release [ER] formulations) occurred more than 3 days after being admitted to a VA NH and who did not have any BAM prescription within 1 year before this first prescription date	Treatment benefits were measured through change in urinary continence status and QOL, whereas fracture risk and decline in cognitive performance were the potential harmful effects studied	BAM initiation was significantly associated with improvement in UI (e.g., from frequently incontinent to occasionally incontinent or from occasionally incontinent to usually continent) (OR=1.34, 95% CI 1.13–1.60). The addition of time-varying covariates did not significantly change the estimate (OR=1.27, 95% CI 1.07–1.5). At 90 days after BAM initiation, 60 new users (16.35%) showed improvement (as compared with 13.02% for non-users). After 180 days, 93 new users (25.34%) had a positive outcome in terms of UI improvement compared with 20.34% in the non-users group. The NNT was 32 (95% CI 17–125), indicating that 32 patients must be treated for 90 days to obtain improvement in UI in one patient. The risk of fractures was significantly increased in new users compared to non-users (hip fracture: hazard ratio [HR]=3.67, 95% CI 1.46–9.34; 'any' fracture: HR=2.64, 95% CI 1.37–5.10)

physical activity with other interventions can reduce UI in nursing homes according to the findings of a systematic review[29]. In addition, two RCTs demonstrated the effectiveness of multi-component interventions that combine physical activity with other interventions. A trial by Schnelle et al.[43] evaluated exercise in combination with toileting assistance and choice of food and fluid snacks every 2 hours for 8 hours per day over 12 weeks. Compared to controls (n=60), residents (n=65) who received this multi-component intervention had a significant reduction in the frequency of UI (p=0.049) and an improvement in the frequency of appropriate toileting (p≤0.001). Azizi et al.[35] compared the effectiveness of an 8-week multi-component program (light strengthening exercises, pelvic floor exercises, and an education program about UI with usual care). Residents (n=30) who participated in the program showed a significant decrease in UI severity (p≤0.001).

An additional three publications described the effect of multi-component interventions, albeit specifically focussing on the role of specialist healthcare professionals. They were a systematic review[28], a cluster RCT[36] and a quasi-experimental study[50]. The systematic review reported on four studies in which a clinical nurse specialist (CNS) facilitated evidence-based protocols, collaborated with staff, and provided staff education, consultation and direct care to residents for 6 months post-admission[28]. Residents in nursing homes who received these interventions showed reduced UI or slowed decline in UI[28]. This finding is further supported by a subsequent quasi-experimental study involving 68 nursing home residents who received tailored, conservative continence treatment from a continence nurse advisor for 12 weeks[50]. A variety of strategies were implemented for each resident. After implementation, mean urine loss fell significantly by 60ml per day (p=0.024) and a significant reduction in pad changes per week by a mean of 4.3 (p≤0.0005) was observed. Incontinence-related QOL scores improved significantly (p≤0.005) but there was no significant improvement in any other QOL or activities scale measured.

In the cluster RCT, Boorsma et al.[36] compared a multidisciplinary integrated care program with usual care in 10 nursing homes in the Netherlands. The program comprised assessments, individualised care plans, discussions between the family physician, resident and their family, and multidisciplinary staff meetings to discuss residents with complex needs. Each component of the program was repeated quarterly for the duration of the study. Compared with the facilities that provided usual care, intervention facilities had a significantly higher sum score of 32 quality of care indicators and significantly higher scores for 11 of 32 indicators of good care, including UI.

DISCUSSION

This scoping review was undertaken to map and summarise evidence about interventions for the management of UI in nursing homes. We identified several different intervention types and grouped them according to whether they represented a toileting assistance program, an exercise program, drug therapy, a technology-based intervention, an education program, or a multi-component intervention.

We identified six publications about toileting assistance programs, namely PV — three systematic reviews[29,31,32], two RCTs[42,46] and one quasi-experimental study[55]. The latter three studies provide recent evidence to support the use of technology to augment assessment processes and for the implementation and sustainability of PV by usual care staff. The use of ultrasound technology to identify when nursing home residents need to void is a relatively new innovation for the management of incontinence in nursing homes, as is the use of sensor alarms. The technology is based on the observation that some nursing home residents' have predictable voiding patterns and that, by identifying the pattern, staff will be better placed to provide targeted and timely assistance. As the technology can provide more accurate and objective information about a person's actual bladder function, they can augment current assessment processes and thereby minimise trial and error. However, important questions remain about the transferability of the findings to different cultural contexts, staff training needs and costs as well as residents' acceptance of the technology. It is important to understand the relationship between the effectiveness of technological interventions in nursing homes, the provision of staff or carer training and support, and the process of fidelity to the intervention.

Recent evidence also points to the need to optimise nursing home residents' functional skills and mobility[11]. Despite this, only two studies specifically described an evaluation of an exercise program, and the findings were inconsistent. The best evidence is for multi-component interventions that combine physical activity programs with systematic efforts to improve residents' choice, food and fluid intake, and access to toileting assistance. Again, studies point to the value of engaging advanced practice registered nurses to facilitate this approach.

This scoping review found limited evidence about the use of drug therapies for the management of UI in nursing homes. Based on two systematic reviews and a cohort study, the benefits of using anticholinergics are outweighed by the risks of adverse effects. It is also clear that, although acceptable, transcutaneous posterior tibial nerve stimulation is unlikely to confer a reduction in UI in nursing homes with a high proportion of older frail residents with reduced cognitive capacity.

Staff education was the focus of 11 publications. Prior research points to gaps in undergraduate education programs for healthcare practitioners in the UK[58] and in the US[59]. A recent review of the effects of UI education for nurses and nursing assistants' knowledge, attitudes and self-reported practices found education improved knowledge, but the most effective forms of education that affects practice and patient outcomes are not known[30].

Nursing home staff should be educated on best practice guidelines. The findings from a large cluster RCT reported by Harvey et al.[39] and Seers et al.[45] highlight the complexities of implementing and evaluating guidelines in nursing homes, even when it is facilitated. The researchers found no significant differences between groups in the documented percentage compliance with the continence recommendations. There could be several reasons for this finding, including limitations of the guidelines themselves. Many guidelines about incontinence are underpinned by the medical goal of diagnosis and treatment. We argue that guidelines and education programs about continence care should place equal value on helping people adjust to changes in bodily function that affect their identity, autonomy, control and independence.

Contemporary forms of education about care in health and social care systems promote person-centred care facilitated through a shared-decision making process[60–62]. This highlights the importance of the intervention implemented and evaluated by Wijk et al.[49] where nursing home staff were educated on how to elicit information from residents about their personal identity and preferences and to then use this information to design individualised continence care plans. It should be noted that introducing a person-centred approach to continence care takes time and commitment and may require a culture change for some nursing homes.

Given the high proportion of residents with a diagnosis of dementia in nursing homes, education programs for staff should also address the prevention and management of incontinence in people with dementia. The education program described by Kohler et al.[41] is an important exemplar. The program addressed dementia as well as incontinence and was augmented with case conferences for staff to discuss problematic and challenging situations concerning specific nursing home residents. Our analysis of education interventions also points to the need for direct hands-on education combined with on-site support and competency-based learning approaches, particularly when led by specialist healthcare professionals.

Two studies provide evidence that organisational structures, staff resources, staffing models and care processes impact on nursing home residents' risk of incontinence[63,64]. Work environment attributes such as team cohesiveness, consistent assignment and staff cohesion affect residents' urinary continence status[63]. Within this context, higher registered nurse to patient ratios is an important consideration. A longitudinal correlational study on the impact of organisational factors on the continence status of patients in Korean long-term care hospitals found higher registered nurse to patient ratios was significantly associated with better resident continence status[64]. These key findings highlight the important role that registered nurses and nursing home leaders have in creating a therapeutic physical and socio-cultural environment that facilitates continence.

Based on one study and a systematic review, we also recommend multicomponent interventions delivered by registered nurses with advanced practice skills[28,50] and for multidisciplinary integrated care[36]. Ideally, the multicomponent intervention should consist of assessments, individualised care plans, discussions between the family physician, residents and their families, and multidisciplinary staff meetings to discuss residents with complex needs.

Strengths and limitations

A weakness of this scoping review was that we did not develop and register an a priori protocol and thus the review does not fully adhere to the *JBI reviewers' manual 2015 methodology for JBI scoping reviews*[25], nor the *PRISMA-ScR guidelines*[26]. At the same time, a key strength of this scoping review is that the broad nature of the design yielded evidence about several types of interventions for the management of UI in nursing homes.

The review was limited to research with quantitative findings. As such, it focussed on questions of effectiveness rather than context. Further reviews are required to summarise qualitative research about the psychological and sociological aspects of UI in nursing homes.

Finally, nursing homes vary considerably, both within and between countries. Therefore, interventions that are effective in one context may not be effective in another. Aligned with this consideration is the cultural bias in the body of evidence. Most of the research identified was conducted in Western countries and none from lower to middle income countries. Of the 30 studies identified, 18 were conducted in nursing homes in Western countries. Hence, the transferability to non-Western and lower to middle income countries should be considered. Further research is also needed to understand whether existing UI management strategies are able to meet the specific needs of residents from diverse backgrounds, such residents from culturally and linguistically diverse (CALD) communities, First Nations residents, and residents who identify as lesbian, gay, bisexual, transgender and/or intersex (LGBTIQA+).

Finally, while each study was appraised, studies were not excluded from the review based on their quality. Moreover, findings were reported descriptively and were not subject to rigorous assessment, taking potential biases into account. In several of the studies unblinding may have introduced significant bias; however, given the nature of some of the interventions (ie, personalised therapies, physical activity programs and workshops), unblinding may be acceptable in this context.

CONCLUSION

UI continues to be a pervasive problem that disproportionately affects people in nursing homes. Interventions to maintain or improve nursing home residents' functional status and reduce their care

dependence should be prioritised. Improvements in staff knowledge, attitudes and continence care practices in nursing homes are possible, particularly when led by specialist healthcare professionals.

This scoping review suggests a multi-component approach to care offers most benefit, ie, where efforts are made to increase residents' activity level, nutritional status, hydration and opportunity to use the toilet. This approach should also be combined with direct forms of education for staff to optimise compliance. Future directions for policy should promote person-centred continence care, comprehensive multi-disciplinary assessments, and a well-educated and supported workforce. Registered nurses play a key role in creating a therapeutic physical and socio-cultural environment that facilitates continence in nursing homes.

AUTHOR CONTRIBUTIONS

All of the authors made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data. They were all involved in drafting the manuscript or revising it critically for important intellectual content and gave final approval of the version to be published.

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