Pain Management Interventions in the Nursing Home: A Structured Review of the Literature

Adam D. Herman, MD,† Theodore M. Johnson, II, MD, MPH,*† Christine S. Ritchie, MD, MSPH,‡§ and Patricia A. Parmelee, PhD†‖**

Residents in nursing homes (NHs) experience pain that is underrecognized and undertreated. This pain contributes to a decline in quality of life. Although descriptive studies of pain assessment and management have been conducted, few have been published that critically evaluate interventions to improve pain management. Identification of the strengths and gaps in the current literature is required. A literature search was conducted of clinical trials that evaluated prospective interventions to improve pain management. Information on the intervention type, resident sample and setting, endpoints, and study design were extracted. Studies were classified based on a modification of Donabedian's model of healthcare quality. Four categories of interventions were identified: actor, decision support, treatment, and systems. The search strategy and selection criteria yielded 21 articles. Eleven studies used an actor intervention; of these, eight also employed a systems intervention, and one also used a treatment intervention. Two studies used a decision support intervention, seven used a treatment intervention, and one used a systems intervention. The overall quality of research was uneven in several areas: research design—nine studies were quasi-experimental in nature, endpoints measures were not consistent—three did not perform statistical analysis, and characteristics of the resident samples varied dramatically. In conclusion, the number of high-quality studies of pain management in NHs remains limited. Process endpoints are used as surrogate measures for resident endpoints. Systematic approaches are needed to understand how each type of intervention improves the quality of pain management at the resident level.
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From the *Division of Geriatric Medicine and Gerontology and ‖Department of Psychiatry, Emory University, Atlanta, Georgia; †Birmingham/Atlanta Geriatric Research, Education and Clinical Center, Atlanta Veterans Affairs Medical Center, Decatur, Georgia; ‡Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham, Birmingham, Alabama; and §Birmingham/Atlanta Geriatric Research, Education and Clinical Center, Birmingham Veterans Affairs Medical Center, Birmingham, Alabama.

**Currently at the Center for Mental Health and Aging, University of Alabama, Tuscaloosa, Alabama.

Address correspondence to Adam D. Herman, 1841 Clifton Road NE., Atlanta, GA 30329. E-mail: adherma@emory.edu

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Despite the fact that pain is a common symptom in nursing home (NH) residents, with a prevalence in early studies ranging from 49% to 83%,[1–5] it continues to be underrecognized and undertreated.[6–8] In comparison, pain prevalence in the general community ranges from less than 10% to 40%[9,10] and approximately 60% in hospitalized patients.[11,12] More than half of all NH residents with pain receive analgesic medications only on an as-needed (PRN) basis.[13,14] Based on data from the NH Minimum Data Set (MDS), 25% of residents reporting daily pain receive no analgesic medication.[14,15] The consequences of untreated pain for NH residents are significant, including depression, impaired ambulation, sleep disturbance, less social interaction, and greater healthcare utilization.[1,16,17] Pain can exacerbate some conditions (cognitive impairment, malnutrition), lead to polypharmacy, delay recovery (shallow rehabilitation trajectory, deconditioning), and impair physical functioning (worsen gait abnormalities, increase risk of falls, and increase complications from polypharmacy).[18] These findings raise concerns about how pain is identified and treated in NH residents.

Some aspects of pain assessment and evaluation are known. Assessment of pain can vary based on patient characteristics such as age,[14,15] cognitive status,[2,6,8,16] and the acute or chronic nature of the pain, as well as cancer status and other chronic disease.[19–21] Even when pain is identified, appropriate care plans may not be implemented.[22–24] These findings suggest that, despite mandatory pain evaluations, NHs lack assessment and treatment processes to address residents' pain.

Although there have been numerous descriptive studies on pain management and design and validation of pain assessment instruments in NHs, there have been few prospective experimental studies to evaluate interventions to improve pain management in this setting. Interventions to

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improve quality of pain assessment and treatment strategies are central to providing effective pain management to NH residents. This article reports findings from a structured review of the literature on prospectively designed intervention studies in NH pain management. The goals are to provide a categorization method (discussed below) to facilitate the evaluation of pain management in NH, describe the strengths and weaknesses of the literature, and identify opportunities for future research investigations.

METHODS

Search Strategy and Selection Criteria

Target articles were those that described clinical trials that evaluated an *intervention* to improve pain management in NHs and that measured some *endpoint relevant to the quality of pain management*. These articles were identified by combining the following terms: "nursing home" or "skilled nursing facility," "pain," "pain measurement," "palliative care," "hospice care," or "terminal care." Filters were used to identify randomized trials, controlled clinical trials, and clinical trials. This strategy was used in MEDLINE 1966 to June 2007, CINAHL 1982 to June 2007, and EMBASE. Additionally, reference lists of selected articles were reviewed. Articles that focused on pain scale validation or development or reported prevalence data in the context of observational cohorts were not included for review.

Data Extraction

The first author (ADH) reviewed titles and abstracts resulting from the search. Full articles were obtained for potentially relevant studies. The reviewer was not blind to the author's names, institutions, or journal of publication. Data on intervention, endpoints, study design, and sample and setting were extracted into an Excel template (Microsoft Corp., Redmond, WA) for review.

Categorization Framework—Model

Because of the complex nature of pain management in NHs and its dependence on multiple spheres of influence (e.g., resident, facility, processes of care delivery), a model developed by Donabedian was used to evaluate the quality of medical care and continuous quality improvement. This model delineates interventions according to structure, process, and outcome.[25] *Structure* represents fixed characteristics of the institution, its resources, and its resident population; *process* represents the mechanisms by which trained healthcare personnel deliver health care and residents and families receive it; and *outcome* represents changes to individual residents due to the care they received.[25] Subdivisions were added in this study in the *process* component and two endpoint types (process and resident endpoints) were identified that further help to discriminate the studies considered in this review (Figure 1).

Identified interventions to improve pain management in NHs all fall under the *process* component of Donabedian's model, yet there are clear subdivisions within *process* that can be differentiated. *Process* interventions were therefore further characterized as *actor modifications*, *decision support*, *treatment modifications,* and *system modifications*. These categories are not mutually exclusive, and a particular study may include more than one type of intervention. *Actor modification* attempts to change actor knowledge. Although some may argue that education is a structural component, in many instances, the primary purpose of actor modification is to affect care processes. Actors include healthcare providers (e.g., doctors, nurses, certified nursing assistants), as well as residents and families. *Decision support* introduces algorithms or other guidelines for therapy; it may not identify specific treatments but attempts to standardize the process of care. *Treatment modifications* introduce a specific treatment or therapy, such as medications or nonpharmacological interventions, to deliver care to residents. *Systems modifications* incorporate quality improvement and feedback analysis to improve the process of care delivery (Table 1). Conceptualizing pain management using this model provides an effective and efficient framework to classify studies attempting to improve pain management for NH residents. Moreover, it emphasizes the need for a more comprehensive approach to pain in the NH.

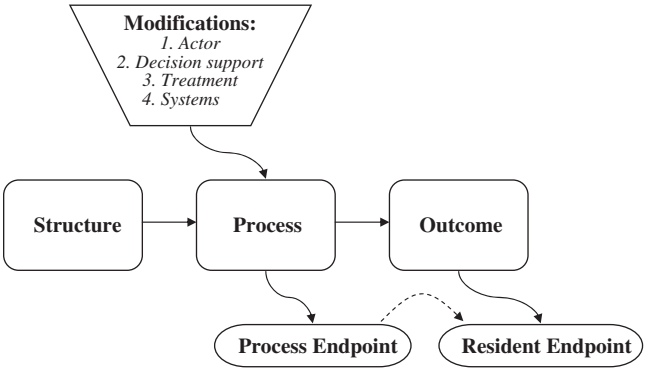

Figure 1. A framework to classify studies that attempt to improve pain management in nursing homes. Based on Avedis Donabedian's model to evaluate the quality of medical care and continuous quality improvement.[25] The dotted arrow represents the common use of process endpoints as "surrogate" measures of resident endpoints.

The study departed slightly from Donabedian's model with respect to outcomes. As noted above, outcomes relate primarily to changes in health, behavior, and satisfaction of residents in NHs due to the care they receive (resident endpoints). This definition would not capture a change in process as an "outcome" in Donabedian's model. In practice, a change in process is often measured in surrogate terms—for example, greater completion of a pain assessment is often presumed to lead to a better resident endpoint for pain. Therefore, it is important to denote two types of endpoint measures: those that occur at the resident level and those that occur upstream from the resident level. In this review, the former are referred to as *resident endpoints* and the latter as *process endpoints*. Resident endpoints are those that capture measures that directly reflect the resident's pain or its effects, for example, resident report or independent measures of pain (e.g., pain report, changes in behavior or activity that may reflect pain) and patient and family satisfaction with pain management. Process endpoints include pain assessment practices, prescribing patterns, therapies employed, documentation practices, knowledge, and adherence to institutional pain management quality measures.

Table 1. Terms and Definitions

Term	Definition
Structure	Fixed characteristics of an institution, its resources, and its resident population
Process	The mechanisms by which trained healthcare personnel delivered health care and residents and their families receive it
Outcome	Changes to individual residents due to the care they receive
Actor modification	Attempts to change actor knowledge to affect care processes. Actors include healthcare providers (e.g., doctors, nurses, certified nursing assistants), as well as residents and families
Decision support	Algorithms or guidelines for therapy that may not identify specific treatments but attempt to standardize the process of care
Treatment modification	Specific treatments or therapies, such as medications or nonpharmacological interventions that provide care to residents.
Systems modification	Quality improvement and feedback analysis to improve the process of care delivery
Process modification	Interventions that affect process such as actor, decision support, treatment, and systems or some combination of these process components
Process endpoint	A measure of pain assessment practices, prescribing patterns, therapies employed, documentation practices, knowledge, or adherence to institutional pain management quality measures
Resident endpoint	A measure that directly reflects the resident's pain or its effects

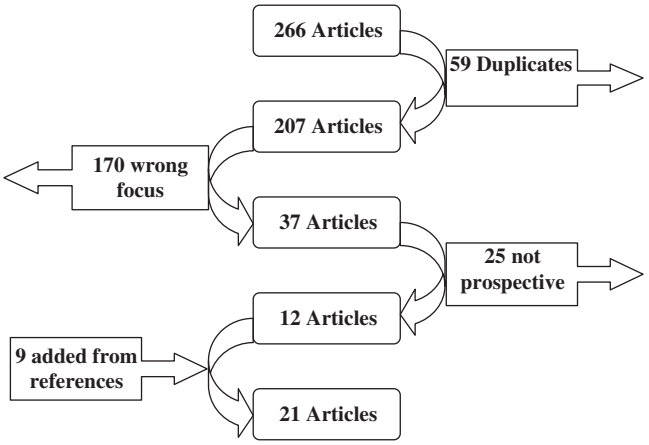

Figure 2. Search strategy results and article selection process.

RESULTS

Applying the described search strategy, 266 citations were retrieved. Fifty-nine duplicate records, non-English articles, letters, and comments were removed. One hundred seventy of these articles were excluded because they did not relate specifically to pain management in NHs as defined by primary search criteria (e.g., no intervention, not occurring in NHs, or did not focus on process or resident endpoints associated with pain). Twenty-five studies were excluded because they focused on pain scale validation or were not prospective in nature, leaving 12 articles for review. An additional nine articles were identified through bibliographies of the original 12, yielding a total of 21 articles (Figure 2 and Table 2).

The 21 articles meeting selection criteria were published between 1982 and 2007, with resident sample sizes ranging from four to 2,033 and NH participation ranging from one to 87 sites (Table 3). All of the reviewed articles fell under the process component of Donabedian's model. Eleven studies used an actor intervention; of these, eight also employed a systems intervention, and one also used a treatment intervention.[26–36] Two studies used a decision support intervention,[37,38] seven used a treatment intervention,[39–45] and one used a systems intervention.[46] With respect to resident characteristics, four studies focused on cognitively impaired residents,[37,38,40,41] and two focused on residents at the end of life.[31,46] The remainder did not target a specific resident population, but some had exclusion criteria that limited participants to those who were more cognitively intact. Five studies were conducted at a single NH,[39,43–46] eight studies included two to 10 NHs,[27–29,31,32,40–42] seven included 11 to 50 NHs,[26,30,33–35,37,38] and one had more than 50 NHs.[36]

Eight studies used a randomized design,[32,34,37,40–42,44,45] nine used quasiexperimental designs (e.g., single-group-repeated measures design),[26,27,29,33,35,36,38,43,46] and the remaining four used a comparative nonrandomized design.[28,30,31,39]

Thirteen studies attempted to analyze process and resident endpoints,[27,30–32,34,35,37–39,41–43,45] two examined only resident endpoints,[40,46] and five studies examined only process endpoints.[26,28,29,33,36] Three studies did not publish statistical analysis on pain endpoints.[27,39,43]

Actor Modifications

Actor modification (11 studies) was the most common intervention. Only two of the 11 examined actor modification in isolation from the other intervention modalities.[32,33] Eight also attempted to implement systems modifications,[26–31,35,36] and one also attempted a treatment modification.[34] Of the 11 actor modification studies, eight targeted some combination of multiple actors (resident or family, nursing, physician, administration) or did not clarify the targeted actors,[26–30,34–36] one attempted to modify only resident or family knowledge about pain,[32] one targeted NH administration only,[33] and one targeted only physicians.[31]

Only four studies provided some insight into the intervention exposure rate to the population of interest.[29,32,34,36] One reported attendance at four educational sessions (2 workshops and 2 teleconferences); whereas the first workshop had 100% of facilities participating, the three follow-up sessions had significantly lower attendance (44% (4/9), 78% (7/9), and 44% (4/9), respectively).[29] A second investigation reported 60% to 65% penetration for staff education on reducing nonsteroidal anti-inflammatory drug (NSAID) use and 100% contact and delivery of an educational message to all primary physicians of participating residents (in person or over the telephone).[34] A third trial randomized NH residents to one of three educational interventions; of the 661 randomized, only 12 were excluded.[32] The fourth study[36] reported that 54% of NHs had a senior administration official present at one educational

Table 2. Articles

Study	Intervention Type*	Intervention	Design†	Resident Sample and Setting	Measures‡	Findings
Brechtl[46]	4	Daily use of a modified Edmonton Symptom Assessment Scale	3	46 residents (end-of-life) at one NH	1	A rapid assessment protocol reduced pain within 48 hours.
Kovach et al.[38]	2	Five-step Serial Trial Intervention clinical protocol	1	114 residents (dementia) in 14 NHs	1,2	Intervention arm had more intervention attempts and lower DS-DAT scores; BEHAVE-AD did not change.
Stevenson et al.[35]	1,4	Two educational conferences; audit performance and feedback; leadership teams; policy and procedure enhancements	3	10 residents at 49 NHs (in 6 states)	1,2	Increased policies and procedures for management and staff knowledge; a decrease in moderate to severe pain; no change in resident satisfaction.
Buhr et al.[27]	1,4	Two educational sessions; educational materials for staff and residents; leadership teams, policy revision; performance and audit cycles (PDSA paradigm)	3	15–20 residents (half cognitively impaired) at four NHs	1,2	Statistical analysis was not performed. Improvements reported in documentation and staff knowledge; no change in mean resident satisfaction.
Horner[29]	1,4	Two workshops and two teleconferences; leadership teams; educational materials; action plans for practice improvement; performance and audit cycles (PDSA paradigm)	3	265 residents (pain on MDS) in nine NHs	2	Assessments and nonpharmacological treatments improved; no change in pharmacological treatment of pain; complete assessments were associated with prescribed analgesics.
Baier et al.[26]	1,4	Six bimonthly educational workshops, leadership teams with structured mentoring; performance and audit cycles (PDSA paradigm); between-site information sharing	3	20 residents (pain on MDS) at 21 NHs	2	Assessment and nonpharmacological treatments improved; no change in pharmacological treatments; Documented pain (in MDS) decreased at intervention facilities.
Buffum et al.[40]	3	Scheduled acetaminophen with placebo PRN vs scheduled placebo with acetaminophen PRN	1	39 residents (dementia with painful conditions) in three NHs	1	DS-DAT scores did not differ in controlling for baseline discomfort and PRN acetaminophen use
Simmons et al.[45]	3	Scheduled exercise and toileting routine	1	51 residents (incontinent) at one NH	1	No significant difference in pain report; mobility was maintained in the intervention group.
Stein[34]	1,3	Educational training sessions (1–3 per site); physician contact from research staff; facility policy change to NSAID use	1	147 residents in 20 NHs (NSAID use)	1,2	Decrease in NSAID use; increase in acetaminophen use; no change in opioid use; no change in pain report or function; trend toward higher arthritic pain score in the intervention arm.
Weissman et al.[36]	1,4	Four educational programs; educational materials, leadership teams; action plan for institutional commitment to improve pain management practices and indicators	3	5 residents at 87 NHs	2	Increase in facility pain process indicators and adequate resident pain documentation.
Resnick et al.[33]	1	A 2-day educational program for NH administration on the implementation of clinical practice guidelines	3	138 residents in 10 NHs	2	Nonsignificant increase in pain process indicators.
Cook et al.[42]	3	Cognitive behavioral therapy (intervention) vs attention or support therapy	1	21 residents (chronic pain) at 2 NHs (Canada)	1,2	Less pain and pain-related disability; pain medication rating did not change; finding persisted at 4 months.

(*Continued*)

Table 2. (Contd.)

Study	Intervention Type*	Intervention	Design†	Resident Sample and Setting	Measures‡	Findings
Adams et al.[39]	3	Humorous movies (intervention) vs nonhumorous movies for 6 weeks	2	13 residents (chronic pain) at one NH	1,2	Statistical analysis for pain outcome not performed; authors reported decrease in PRN analgesics.
Moye et al.[44]	3	Six sessions; five behavioral techniques were taught, used, and reviewed	1	13 residents at 1 VA NH	1	Modest decrease in subjective pain, not significantly different from control.
Miller and Francis[43]	3	Staff use of reinforcement (praising of exercise, activity participation, and nonpain behaviors) and extinction (ignoring pain or pain-related behaviors) techniques	3	4 residents (chronic pain in physical therapy) at 1 NH	1,2	Statistical analysis not performed; data suggest a decrease in PRN medications, painful behaviors, pain report; no change in activity participation.
Kovacs et al.[32]	1	Brief educational program for residents; educational materials for residents to reduce low back pain	1	661 residents at 12 NH (Spain)	1	Disability and pain improved in all groups; no significant difference between groups.
Jones et al.[30]	1,4	Multiple educational sessions; educational materials for staff and residents, leadership teams; pain process and policy change	2	2,033 residents at 12 NHs	1,2	Pain reported by residents did not change; decrease in "constant pain"; overall assessment rates improved but there was no difference between control and intervention arms.
Chibnall et al.[41]	3	Scheduled acetaminophen vs placebo	1	25 residents (dementia) in 2 NHs	1,2	Increased time spent in "social interaction," "engaging in media" and "work-like activities"; no change in agitation or psychotropic medication use.
Kovach et al.[38]	2	Assessment of Discomfort in Dementia protocol	3	104 residents (dementia) in 32 NH	1,2	DS-DAT scores decreased; scheduled analgesics and nonpharmacological interventions increased; no change in psychotropic medications or PRN analgesics.
Keay and White[31]	1,4	One half-day adult educational program for physicians; audit and feedback with providers; systematic quality improvement suggestions	2	203 residents cared for by 61 physicians in 5 NHs	1,2	Decreased uncontrolled pain and symptoms at end of life; stronger analgesics were used; control site did not see these changes.
Hanson et al.[28]	1,4	Six educational sessions for NH staff; leadership teams, structured feedback (PDSA paradigm), policy and procedure development	2	1,169 residents in 9 NHs	2	Increased knowledge of leadership team members; improved assessment and nonpharmacological treatments; no change in prevalence of residents with analgesics.

*Intervention types: 1 = actor; 2 = decision support; 3 = treatment; 4 = systems.

†Study design: 1 = randomized controlled trial; 2 = nonrandomized comparative; 3 = quasiexperimental.

‡Endpoint measure: 1 = resident; 2 = process.

NH = nursing home; PRN = as needed (pro re nata); PDSA = Plan-Do-Study-Act; MDS = Minimum Data Set; NSAID = nonsteroidal anti-inflammatory drug; DS-DAT = Discomfort Scale—Dementia of the Alzheimer's Type; BEHAVE-AD = Behavioral Pathology in Alzheimer's Disease Rating Scale.

Table 3. Summary of Articles According to Intervention Type

Study Characteristics	Actor* (n = 11)	Decision Support (n = 2)	Treatment* (n = 8)	Systems* (n = 9)
Design				
Randomized control trial	2	1	6	—
Comparative	3	—	1	3
Quasiexperimental	6	1	1	6
Sampling				
Dementia	—	2	2	—
End of life	1	—	—	1
Number of nursing homes				
1	—	—	4	1
2–9	4	—	3	4
10–50	6	2	1	3
>50	1	—	—	1
Number of residents				
1–10	1	—	6	2
51–150	3	2	2	1
151–350	1	—	—	1
>350	6	—	—	5
Endpoints†				
Process	10	2	5	8
Resident	6	2	8	5

* Eight studies combined actor and system modifications; one study combined actor and treatment modifications.

† Some studies measured process and resident endpoints; thus totals may be greater than the total number of articles for that intervention type.

session, at least one facility-designated team member attending at least three of four educational sessions, and 60% of facilities participating in a preceptorship program. The remaining actor modification studies did not report exposure; most made statements that actors were encouraged to participate but did not report statistics.

Actor modifications were diverse. Many used educational workshops lasting between 2 hours and 2 days.[26,28,29,31,33,35,36] Several studies provided episodic interventions over a period of time,[26,28,29,35,36] and some provided only a single intervention.[26,28,29,31–33,35,36]

Studies that specifically targeted physicians along with other actors (nursing, administration, residents) used different modalities to reach physicians. Two studies offered a separate customized educational session to physicians.[30,35] A third employed a research physician to communicate, in person or over the telephone, the educational component.[34]

Of the two studies that used only an actor modification, one attempted to measure direct resident endpoints.[32] This randomized trial assessed the effect of printed educational material and a 20-minute patient education presentation on back pain in older NH residents in northern Spain. Primary analysis did not show significant differences between intervention and control arms; secondary analysis showed a modest reduction in low back pain disability at 180 days postintervention in residents with baseline low back pain. There was no measure of educational effect on the residents (i.e., retention of the educational materials or reported use of the printed materials), making it difficult to draw firm inferences about the effect of education on low back pain disability scores. Unmeasured confounding variables were not addressed or discussed.

The second actor modification–only study[33] examined a one-time, 2-day conference workshop on clinical practice guideline implementation (one of which was pain) for NH administrators in Maryland. Of the 40 attending the conference, 23 (58%) agreed to participate, and of these, 10 (25%) planned to implement pain clinical practice guidelines. At these 10 facilities, chart evidence of pain assessment tools, completed assessments, treatment plans, and reevaluation were measured in a small cohort of residents before and after the conference workshop; there were no significant changes in the presence of clinical practice guideline indicators for pain. No resident endpoint measures were collected. The remaining nine studies that used actor modifications also employed other modifications (systems and therapy modifications), and the specific effect of the actor modifications cannot be extracted from the other types of interventions employed.

Several studies[27,28,30,35] commented on actor knowledge "improvement" (a process endpoint). All but one used uncontrolled convenience samples pre- and postintervention; thus, inferences about individual knowledge improvement in pain management cannot be made. Only one study[28] had actors (staff leadership team members) complete a knowledge survey pre- and postintervention. Fifty-eight percent of the actors completed both surveys; the results showed significant improvement on some pain management knowledge questions and in actor confidence in providing palliative care at the end of life.

Decision Support

Two articles[37,38] used decision support to improve discomfort in severely cognitively impaired NH residents. The first[38] was a single-group repeated-measures trial instituting the Assessment of Discomfort in Dementia (ADD) protocol. The ADD protocol uses a stepwise approach to help nurses examine the components triggering discomfort and provides a hierarchical protocol to treat resident discomfort. A sample of 104 residents from 32 Wisconsin NHs participated. A significant increase in scheduled analgesics and nonpharmacological comfort interventions (process endpoints) and a decrease in the modified Discomfort Scale—Dementia of the Alzheimer's Type (DS-DAT)) scores (resident endpoint) were observed.

A second trial from the same research team used a randomized controlled trial to evaluate the Serial Trial Intervention (STI) protocol, similar to the ADD protocol.[37] Only 40% of consenting residents completed the study. Forty percent were excluded, because they did not exhibit a behavioral symptom consistent with discomfort. A higher persistence to treat (process endpoint) and a decrease in DS-DAT scores (resident endpoint) were seen in the intervention arm. Improvement in the Behavioral Pathology in Alzheimer's Disease Rating Scale scores were observed but did not differ between the control and intervention arms.

Treatment Modifications

Eight studies evaluated treatment modifications to improve pain management.[34,39–45] A pharmacological treatment modification was implemented in three studies,[34,40,41] one of which also used an actor modification.[34] Two of these three evaluated the use of acetaminophen in patients with dementia to reduce discomfort and agitation and improve well-being.[40,41] Both used a randomized, double-blind, placebo-controlled, crossover trial design. Exclusion criteria were extensive for both; only one of the studies described the population source from which residents were recruited.[40] One study found no difference in DS-DAT score between intervention and placebo conditions (resident endpoint) and reported that only seven PRN doses of pain medication were received by any of the 39 resident subjects in the study during a 4-week period (process endpoint); three of the doses were during the intervention and four during the placebo time periods.[40] The second study[41] (n = 25) used dementia care mapping (direct observation of activities), which showed improvement in some activity levels that correlate with improved comfort but no change in agitation scores (resident endpoints). Additionally, there was no change in psychotropic medication use (process endpoint).

As mentioned earlier, a third trial used actor and treatment modifications to reduce NSAID use while maintaining adequate pain control.[34] This was a randomized trial in 147 older residents with osteoarthritic pain taking scheduled NSAIDS at 10 paired NHs (intervention/control) in Tennessee. An algorithm was used to convert study residents from NSAIDS to acetaminophen treatment. As expected, there was a significant decrease in NSAID use and an increase in acetaminophen use in the intervention arm. There was no significant change in pain or function from baseline at 3-month follow-up. The pain assessment tool was changed during the trial period, reducing the analyzed sample to 94 of the 147 (64%) residents who completed the study and 40% (94/239) of the source population eligible for enrollment.[34]

Nonpharmacological treatment modifications were used in five studies.[39,42–45] In two studies, one evaluating humorous movies[39] (n = 13) and one evaluating reinforcement and extinction behaviors[43] (n = 4), statistical analyses were not performed, but the authors reported the appearance of less PRN medication use (process endpoint)[39,43] and improved pain index measures (resident endpoint).[43] Three randomized trials evaluated nonpharmacological therapies, including exercise,[45] cognitive behavioral therapy,[42] and relaxation techniques.[44] Relaxation techniques were used at a single NH site where residents (n = 13) were randomized to intervention or wait list control. No improvement was observed on a 5-point visual analogue scale for self-reported pain.[44] A trial evaluating intensive cognitive behavioral therapy was performed at two Canadian NHs (n = 21) and reported decreased pain (resident endpoint) at study completion that persisted at the 4-month follow-up interview; there was no change in a composite pain medication use score (process endpoint).[42] One trial examined the effect of an intensive exercise and toileting intervention on pain in residents (n = 51) with urinary incontinence at one NH.[45] There was no change in the report of pain after a 32-week intervention period.

Although the treatment modification studies were more rigorously designed than actor or decision support interventions (6 of 8 were randomized), results were not encouraging. Lack of a significant finding may have been due to inadequate power to see smaller changes in effect size; only two studies enrolled more than 50 residents.[34,45] The pharmacological treatment modifications used in two studies[40,41] (e.g., acetaminophen) were modest pain interventions and represent only the first level of a pharmacological intervention strategy; more-aggressive treatment modifications may be necessary to see large changes. One study[45] regarding exercise in the NH setting was not initially designed with hypotheses about pain but eventually added pain measurement at one NH site. Finally, two studies[39,43] did not report statistical analysis because of limited sample size and subjectivity of measurement endpoints.

Systems Modifications

Nine studies examined systems modifications: eight in conjunction with actor modifications[26–31,35,36] and one in isolation of other interventions.[46] Only one systems modification study was conducted at a single site;[46] the other studies ranged from four to 87 NHs. Systems modifications were diverse. Components frequently included facility team development, policy and practice changes, and quality improvement techniques (e.g., audit and feedback cycles).

Seven studies instituted facility leadership teams that addressed pain management.[26–30,35,36] The composition of teams varied from study to study and between study sites. Five studies identified specific members of the facility teams,[26–28,30,36] which primarily included nursing leadership and nursing managers. Four studies identified team size; several reported team size of two to three,[30,35,36] and one reported team size of five to eight members.[27] Variable team size and composition make comparison of studies difficult.

All but one[46] of the interventions employed an audit or feedback systems modification. Four studies[26–29] specifically identified the Plan-Do-Study-Act paradigm for continuous quality improvement. Most attempted to implement policy, procedure, or guideline changes to pain management practices by providing institutional consultation,[26,29–31,35,36] pain policy revisions,[26–28,31] and comparative feedback between participating NHs.[26] Particulars of systems modifications in all studies were vague, and participating NHs within the same study were noted to focus on different quality improvement mechanisms. One uncontrolled trial[46] initiated a policy to use a modified symptom assessment scale daily on residents at the end of life in one New York NH and found that symptom burden was reduced in five areas, including pain 48 hours after initial assessment.

There were no randomized studies examining systems modification changes. Three studies used a comparative trial design; one had an unintended control NH site[31] (did not start the intervention), and two others[28,30] selected controls at the outset. Six used a one-group pre/post quasiexperimental design.[26,27,29,35,36,46]

Four of the system modification studies[26,28,29,36] assessed process endpoints that focused on implementation of

pain assessment practices, documentation, and pharmacological and nonpharmacological treatments. Of the five studies that examined process and resident endpoints, one did not report statistical analysis;[27] the remaining four reported decreased pain.[30,31,35,46] Process and resident endpoint measures reported for the systems modification studies varied. The validity of these studies must be considered in light of the prominent systematic design flaws, including the lack of randomized controlled studies, the use of process endpoints, and variability across studies in the endpoint measures reported.

DISCUSSION

The study of pain management improvement in NHs is complex. Many factors can be modified: actor, decision support, treatment, and systems. The basis of actor modification is that knowledge about pain and pain management is increased through direct patient and family education, direct care staffing education (nurses, clinical nurse specialists, and physicians), and NH administration education to improve resident measures of pain control in the NH. Actor modifications should focus on dissemination of knowledge about pain so that all actors can participate and move care toward best practices. Future efforts should include measures on the effect of staff and patient education projects at NH facilities. Knowledge testing (acquisition and retention of knowledge), is a vital component of understanding actor modification effects on pain. Decision support interventions should focus on algorithm development and implementation of predefined pain management order-sets or pathways of care for NH residents. Order-set development and care pathways have been shown to improve pain management practices in hospitalized patients at the end of life.[47] Treatment modifications examine pharmacological and nonpharmacological tools that can be used to address or improve pain management in NHs. Multiple opportunities exist to investigate dose, duration, and schedule aspects of pain treatments. In other arenas, such as postoperative[48] and hospital[49] care, effective treatment modifications have been used to improve pain management. System modifications provide the basis of measurement and audit feedback methodology essential to improvement in pain management in NHs. Emphasis on standardizing assessment forms, scales, and process for audit feedback cycles should be pursued. Although the articles presented here attempt to address one or more of these critical areas for quality pain management in NHs, the overall quality of research is uneven in design, endpoint measures, and sample populations.

Although some of the articles reviewed showed statistically significant findings using randomized designs,[37,41,42] their clinical significance may be limited because of the stringent exclusion and inclusion criteria for subject enrollment. Thirteen of the 21 studies reviewed were not randomized; eight of these did not have contemporaneous controls. Weak study designs are prey to selection bias, confounding, and noncomparative evaluation. Well-controlled trial designs (randomized control trials) are needed to determine effective interventions.

Process and resident endpoints varied widely. As a result, it was difficult to compare and contrast results of studies. Although there was some similarity in endpoint measures in defined groups (e.g., DS-DAT in residents with dementia) most resident endpoints were individualized to the study. Process measures also varied for documentation of pain assessment, pharmacological interventions, and nonpharmacological therapies. Some studies considered only process endpoints and showed significant findings, but process endpoint measures should not be used as a surrogate for resident endpoints. The challenge facing research on pain management in NHs is to demonstrate that process changes can lead to real pain reduction for residents. Efforts are needed to use standardized measurements for process and resident endpoints to facilitate the comparison of study data in the future.

Resident sampling criteria also varied (e.g., general, cognitive performance, and end of life). This variability, along with the heterogeneous nature of the process modification (actor, decision support, treatment, and systems), adds another layer of complexity. Future research will need to identify process modifications that can be broadly applied and to address specific subgroup needs for pain management in the NH.

It is important to identify standard endpoint measures such as pain reduction, increased activity (functional status), and satisfaction with pain relief and use them more frequently to facilitate comparisons of studies. Interventions will need to consider the complexities of pain types (e.g., neuropathic, visceral, somatic) and pain severity. The adoption of standards in pain management, such as those developed by the World Health Organization (which are still underused) should be pursued in the NH setting.[13–15,24] Use of activity-based resident endpoints as a measure of response to pain management should be a component of all studies evaluating pain management in NHs. These measures can be used to augment direct resident report of pain and provide the best alternative measure for those who cannot provide direct report, such as those who are severely cognitively impaired.

Future research on pain management in NH residents needs to integrate process modifications (actor, decision support, treatment, systems), in well controlled studies, to examine the sufficient and necessary components of pain management interventions that achieve pain reduction for residents. Structured comparisons between single- and multicomponent process modifications should be examined. Multicomponent approaches to other conditions, such as delirium,[50] have been proven effective. It may be that some minimal threshold in actor, decision support, treatments, and systems modifications is necessary to realize the full potential of any one component; some combination of improvement in multiple process modifications may be necessary before real pain reduction in NH residents is attained.

CONCLUSION

Prospective intervention strategies to improve pain management in NHs are still in their infancy. Systematic approaches need to be pursued to understand how the modification of a process component may enhance the quality of pain management. A conceptual framework can be employed to identify mechanisms by which pain

management is employed and helps highlight the gaps in comprehensive pain management in NHs. Actor, decision support, treatment, and system modifications identify the basic components that need to be addressed to accomplish quality pain management in the NH. Recognizing the complexity of the resident mix, including baseline impairments and comorbid status (e.g., depression, chronic disease, functional limitations) and facility-level characteristics, more-comprehensive investigations of NH pain management are required.

Future research will need to focus on several issues. First, establishing common agreed-upon resident endpoint measures is critical. The focus should move from process endpoints (surrogate measures) to resident endpoints that reflect real NH resident pain reduction. Standardized measures should be agreed upon for NH research that could then be used to compare NH locations across the nation. Moreover, agreement on clinically meaningful improvement in NH pain management should be addressed. If process endpoints (surrogate measures) are to be used, directed research that links these endpoints to resident endpoints must be conducted. The implicit assumption that improvements in process endpoints equate with improvement in resident endpoints (e.g., knowledge about pain treatment practices or documentation practices resulting in improvement of resident-reported pain or other objective validated pain assessments) should be investigated. Second, employing controlled study designs will be vital to provide valid, reproducible findings. This is especially challenging because of the diversity of resident and facility characteristics. Efforts that focus on multisite interventions that risk adjust for these characteristics should be a priority. Third, once there is an understanding of how individual process components affect resident endpoints, it may be necessary to assess the effect of multiple process modifications. Moreover, it may be discovered that significant improvement in NH pain management requires a multifaceted approach.

In conclusion, pain continues to be a significant concern in NH residents. The number of high-quality studies of pain management in NHs remains limited. Scientific rigor in clinical research is needed to advance pain management in the NH.

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