

Factors influencing prescription and administration of analgesic medication: A longitudinal study of people with dementia living in care homes

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Abstract

Objectives: To (1) describe the prescription and administration of regular and 'as required' (pro re nata [PRN]) analgesics in English care homes, (2) investigate individual and care home factors associated with analgesic use.

Methods: We collected data (2014–2016) at 0-, 4-, and 12-months nested in a longitudinal cohort study of 86 English care homes about residents with diagnosed or probable dementia. We describe analgesics prescribed as regular or PRN medication, by class, and PRN administration. We explored individual differences (socio-demographic; dementia severity [Clinical Dementia Rating]), and care home differences (type; ownership; number of beds; dementia-registered/specialist; Care Quality Commission rating) in prescription and administration using multilevel regression models.

Results: Data were available for 1483 residents. At baseline, 967 residents (67.9%) were prescribed analgesics: 426 residents (28.7%) prescribed regular analgesics and 670 (45.2%) prescribed PRN. Paracetamol was the most prescribed analgesic (56.7%), with PRN prescriptions more common than regular (39.7% vs. 16.6%). Across all study visits, 344 residents (mean = 41.9%) with a PRN prescription did not receive any analgesic in the 2 weeks prior to data collection. Male residents and those with severe dementia received fewer analgesics. Care homes differences in PRN administration were not explained by the modelled variables.

Conclusions: Pain management in English care homes largely relies on PRN paracetamol that is frequently prescribed but infrequently administered. Care homes differ in how often they administer PRN analgesics. Some care home residents particularly those with more severe dementia are likely to have untreated pain.

KEYWORDS

analgesics, care homes, dementia, long-term care, old age, pain

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Key points

- English care home residents with dementia are frequently prescribed pro re nata (PRN) analgesics but these are infrequently administered.
- Some groups of residents (male, more severe dementia) receive fewer analgesics and may be at risk of undertreatment for pain.
- Before prescribing pain relief, clinicians need to consider the risk that PRN analgesics may not be administered.
- Pragmatic pain management guidelines specifically for care home residents with dementia and improving medication documentation may optimise analgesic use.

1 | INTRODUCTION

As the United Kingdom (UK) population ages, increasing numbers of older people will spend their last months of life in a care home.¹ These provide accommodation, meals and 24-hour staffing. There are two types in the UK: residential homes, which provide assistance with personal care, and nursing homes, which are similar to residential homes but also employ registered nurses round-the-clock. It is estimated that around 80% of care home residents have some form of dementia or severe memory problem.^{2,3}

Around half of care home residents are in pain and there are concerns that this may be undertreated, particularly in residents with cognitive impairment.^{4,5} Normally, medication is prescribed by general practitioners and administered by care home staff. Paracetamol is indicated as first-line therapy for mild to moderate pain in older adults.^{6,7} Nonsteroidal anti-inflammatory drugs (NSAIDs) are effective in relieving musculoskeletal pain, but are not advised in older adults due to risks including gastrointestinal bleeding and effects on the renal system.⁸ Opioids are the strongest class of analgesic, and are sometimes used long-term to treat severe pain.

There has been an increase in use of analgesic medication; especially opioids and paracetamol in care home residents over recent years.^{9,10} However, this does not necessarily mean that pain management is improving: pain prevalence in this population may be rising due to increasing levels of multimorbidity.¹¹ Contemporaneously, there has also been increasing concern about opioid side effects (including dizziness, constipation, nausea, sedation and falls)⁷ and whether opioids are being overprescribed in this population.

A pan-European study reported that 48.4% of nursing home residents experienced pain.¹² Data from England found pain prevalence to be 54.5%, with 8.1% of all residents in constant pain, 57.4% experiencing intermittent pain, 6.2% experiencing a single episode of pain and 10.9% who had experienced breakthrough pain. Of those in pain, 53.8% received regular analgesic medication, 16.3% were prescribed 'as required' (pro re nata [PRN]) analgesics only, and 4.3% received regular and PRN.¹³ The WHELD study, conducted in England, found that 41.9% of residents in pain were not prescribed regular analgesics.¹⁴ Research exploring analgesic use and individual differences presents a mixed picture. Historically, males, younger

residents and those with a dementia diagnosis have received fewer analgesic prescriptions.^{9,10}

PRN analgesics that are prescribed but not administered, which is often the case,¹⁵ may indicate undertreated pain. In England, it is not possible to accurately measure care home residents' receipt of PRN analgesics as there are no routine datasets or analgesic administration data accessible to inform this.¹⁶ A negative association has been found between PRN administration and dementia severity suggesting that as people become less able to ask for analgesia they are more likely to have untreated pain.^{17,18}

Larger care homes prescribe more medication as PRN,¹⁹ and communication issues between care staff have been implicated in quality of pain management.²⁰ A large European study found that factors that may contribute to poor communication, including heavy workload, high staff turnover and team instability, were associated with inadequate pain management.¹³

The Managing Agitation and Raising QUality of Life in dementia (MARQUE) study is the largest prospective study of English care home residents to date. This study utilised MARQUE data to describe analgesic medication use in a large and representative cohort of English care home residents. Our objectives were to:

- (1) describe the prescription and administration of analgesic drugs and drug classes, and
- (2) understand which care home or resident factors were associated with analgesic prescription or PRN administration.

2 | MATERIALS AND METHODS

2.1 | Recruitment

We analysed data collected between May 2014 and December 2016, as part of a naturalistic 2-year cohort study that formed part of the MARQUE programme.²¹ London (Harrow) National Research Ethics Service Committee (14/LO/0034) gave approval. Recruitment of care homes in England covered a range of care provision (nursing or residential), ownership (state, private or charity sector) and location (urban, suburban or rural), to ensure external validity and generalisability.

Residents were eligible if they had a recorded dementia diagnosis, or if they screened positive on the Noticeable Problems Checklist (NPC),²² a scale validated against clinical diagnosis of dementia. All residents with dementia were invited to take part. We were guided by the UK Mental Capacity Act (2005)²³ when obtaining written consent. If care home staff deemed it likely that the resident would have capacity to consent to research then we approached the resident. If not, then the care home approached the next of kin to request permission for a researcher to make contact, and if they gave permission we sought consultee opinion. In cases where there was no next of kin, a care home staff member who knew the resident well, acted as a professional consultee.

2.2 | Measurement instruments

We recorded care home baseline characteristics (care provision; ownership; registration/specialism; number of beds; Care Quality Commission (CQC) rating, and resident demographics at baseline. Care home staff members gave proxy data regarding dementia severity (Clinical Dementia Rating²⁴ [CDR]) at baseline, 4-month and 12-month study visits. The CDR is a valid and reliable measure of dementia severity generating a global impairment score (from 'none' to 'severe').

Medication prescriptions were obtained from Medication Administration Records. If the prescription was PRN then the number of times it was administered during the preceding 2 weeks was noted. We analysed data regarding oral analgesics, categorised by British National Formulary²⁵ (BNF) classification: simple nonopioids, opioids and NSAIDs.

2.3 | Statistical analyses

Data were analysed using STATA 14.²⁶ For analysis, residents with questionable or very mild dementia were subsumed into the mild dementia group.

Compound drugs were divided into their constituent parts. For each drug and drug class, the number and percentage of residents who were prescribed each drug at baseline and 12 months was reported. For PRN prescriptions (where 14 days' worth of data were available), the percentage of doses administered, of the total potential amount prescribed, was calculated. Multilevel logistic regression models were used to explore resident factors (demographics; dementia severity) and care home factors (demographics; quality rating [CQC]) on: overall analgesic prescription; regular analgesic prescription; PRN analgesic prescription; PRN administration if prescribed a PRN analgesic (as binary [yes/no] variables). The three-level regression models accounted for clustering by care homes and repeated measures (baseline; 4 months; 12 months) within participants. Oral and nonoral nonmorphine opioids

were converted to an equianalgesic dose of oral morphine using BNF conversion rates.²⁷ Prior to this, a sensitivity analysis was run to explore any baseline differences between residents who had died and those who were still alive (χ^2 for binary variables; t -test for continuous) with missingness following death at subsequent visits as an outcome. Mann-Whitney U tests were run for nonparametric data. If any variables predicted missingness they were included as independent variables in the models, as were factors with a clinical reason to do so.

A multilevel linear regression model explored the effects of care home factors (demographics; CQC ratings) on prescriptions and administration at baseline. Prior to this, univariate analyses to identify potential confounders were run, which were included in the final model. If no factors had a relationship with prescribing or administration, then heterogeneity between care homes was quantified by calculating I^2 ($I^2 > 75\%$ is considerable heterogeneity) and forest plots were generated.

3 | RESULTS

3.1 | Demographics

Out of 114 homes approached, 86 participated. Two homes withdrew at the 4-month study visit, and a further two withdrew by the 12-month study visit (Figure S1). Compared to the national average, a higher proportion of dementia-registered and dementia-specialist homes, and homes rated as 'Outstanding' and 'Good' were recruited. Table S1 describes the consented care home characteristics.

We approached 2825 eligible residents, of whom 1489 consented (52.7%). The majority ($n = 1189$; 79.9%) required consultee agreement. Figure S1 describes participant recruitment flow.

Table 1 describes cohort baseline characteristics. At baseline, 1425 residents had medication data. Most residents were female, white British, and had a clinical diagnosis of dementia. The mean age was 84.9 years (standard deviation = 8.6). Severe dementia was the commonest dementia stage at baseline (37.5%) and by the 12-month visit over half (50.4%) had severe dementia.

3.2 | Analgesic prescriptions

Most residents were prescribed analgesics (baseline, 67.9%; 12-months, 70.6%). More were prescribed PRN analgesics (46.9%; 50.5%) than regular analgesics (29.9%; 28.3%). At baseline, 38.0% were prescribed PRN analgesics only. Paracetamol was the most widely prescribed analgesic (56.7%; 59.4%), with PRN prescriptions more common than regular prescriptions (at baseline 39.7% vs. 16.6%). Very few residents (baseline, 0.6%; 12-months, 1.1%) were

TABLE 1 Resident characteristics at baseline ($n = 1425$)

Characteristic	N	%
Gender		
Female	985	69.1
Male	440	30.9
Marital status		
Single/unmarried	201	14.1
Married	331	23.2
Separated	10	0.7
Divorced	3	5.1
Widowed	769	53.7
Common law couple	4	0.3
Ethnicity		
White British	1251	87.8
White Irish	43	3.0
White other	46	3.2
Chinese	2	0.1
Black or Black British Caribbean	22	1.5
Black or Black British African	11	0.8
Asian or Asian British: Indian	7	0.5
Asian or Asian British: Pakistani	3	0.2
Asian or Asian British: Bangladeshi	3	0.2
Mixed: White and Black Caribbean	1	0.1
Other	26	1.9
Dementia diagnosis		
Dementia diagnosis	1231	86.4
NPC	194	13.6
Yes	1318	92.5
No	67	4.7
Dementia severity		
Very mild or mild-baseline	419	29.4
4 month	289	23.8
12 month	160	18.7
Moderate-baseline	464	32.6
4 month	358	29.5
12 month	264	30.8
Severe-baseline	534	37.5
4 month	568	46.8
12 month	431	50.4

Abbreviation: NPC, Noticeable Problems Checklist.

prescribed NSAIDs. At baseline more residents were prescribed weak than strong opioids (13.4% vs. 11.4%) but by twelve-months, stronger opioids were prescribed more frequently (12.4% vs. 14.4%). Overall,

opioids were more likely to be prescribed regularly than PRN (Table 2). Analgesic use did not change significantly over time.

3.3 | PRN administration

Across all three study visits, 41.9% of residents with a PRN prescription did not receive any PRN analgesics during the 2-week periods prior to assessment. Figure S2 describes the prescription and administration of PRN paracetamol and opioids at baseline. At baseline, 41.1% of residents did not receive any analgesic medication (none prescribed, or PRN not administered), and at 12 months this was 54.9%. There were 19 residents who received all of the potential analgesic doses across the study visits, and 344 residents who did not receive any.

3.4 | Factors associated with analgesic use

Table 3 describes resident factors associated with the prescription and administration of analgesics. Females were prescribed significantly more regular analgesics, but there were no sex differences in PRN administration. Tables S2 and S3 describe resident factors and their association with nonopioid and opioid prescription and administration. Residents with severe dementia were prescribed more regular opioids; they were no less likely to be prescribed PRN but were administered significantly fewer PRN analgesics than residents with mild dementia.

The only care home factor significantly associated with prescription of analgesics (at baseline) was if the care home was rated as 'requires improvement' (Table S4). Residents in these care homes were less likely (odds ratio = 0.26; 95% confidence interval = 0.09, 0.92) to receive a prescription for an analgesic compared to residents living in a care home rated as 'Outstanding'. No care home factors were significant when exploring analgesic administration. Post hoc tests of heterogeneity were run to further explore differences. There was no heterogeneity in the analgesic prescribing amongst the care homes ($I^2 = 0.0\%$), but there was moderate heterogeneity in the PRN administration ($I^2 = 56.7\%$). These differences were not associated with the variables that were measured.

4 | DISCUSSION

This is the most comprehensive study in the UK to examine regular and PRN analgesic prescribing and administration in a care home population. Less than a third of residents in this cohort were prescribed regular pain relief; for 4 in 10 residents, pain management was reliant on PRN medication that was given less than half the time.

An increase in the use of strong opioids was observed over the three study visits. Most strong opioids prescribed in this cohort were transdermal patches, primarily buprenorphine. Concerns have been expressed regarding inappropriate use of strong opioids, and

TABLE 2 Prescribing prevalence of analgesics and analgesic drug classes at baseline and 12-month study visit

Drug/drug type	Study visit	Total	Regular only	PRN only	Both regular + PRN
n (%) [95% confidence intervals]					
Any analgesics	Baseline	967 (67.9) [65.4–70.2]	298 (20.9) [18.9–23.1]	542 (38.0) [35.5–40.6]	128 (9.0) [7.6–10.6]
	12-month	604 (70.6) [67.4–73.5]	172 (20.1) [17.5–22.9]	361 (42.2) [38.9–45.5]	71 (8.3) [6.6–10.3]
Simple nonopioids	Baseline	902 (63.3) [60.8–65.8]	277 (19.4) [17.4–21.6]	609 (42.7) [40.2–45.3]	16 (1.1) [0.7–1.8]
	12-month	558 (65.2) [61.9–68.3]	146 (17.1) [14.7–19.7]	405 (47.3) [44.0–50.7]	7 (0.8) [0.4–1.7]
Opioids	Baseline	332 (23.3) [21.2–25.6]	185 (13.0) [11.3–14.8]	121 (8.5) [7.1–10.1]	26 (1.8) [1.2–2.7]
	12-month	202 (23.6) [20.9–26.6]	111 (13.0) [10.9–15.4]	67 (7.8) [6.2–9.8]	24 (2.8) [1.9–4.2]
Weak opioids	Baseline	191 (13.4) [11.7–15.3]	80 (5.6) [4.5–6.9]	110 (7.7) [6.4–9.2]	1 (0.1) [0.0–0.4]
	12-month	106 (12.4) [10.3–14.8]	43 (5.0) [3.7–6.7]	62 (7.2) [5.7–9.2]	1 (0.1) [0.0–0.8]
Strong opioids	Baseline	163 (11.4) [9.9–13.2]	125 (8.8) [7.4–10.4]	24 (1.7) [1.1–2.5]	14 (1.0) [0.6–1.7]
	12-month	121 (14.1) [12.0–16.6]	88 (10.3) [8.4–12.5]	22 (2.6) [1.7–3.9]	11 (1.3) [0.7–2.3]
NSAIDs	Baseline	15 (1.1) [0.7–1.8]	10 (0.7) [0.4–1.3]	5 (0.4) [0.1–0.8]	0 (0.0) [0.0–0.0]
	12-month	5 (0.6) [0.2–1.4]	5 (0.6) [0.2–1.4]	0 (0.0) [0.0–0.0]	0 (0.0) [0.0–0.0]

Abbreviations: PRN, pro re nata; NSAIDs, nonsteroidal anti-inflammatory drugs.

TABLE 3 The association between resident characteristics and analgesic prescription and PRN administration over the three study periods

Characteristic	Analgesic prescription	Regular prescription	PRN prescription	PRN administration
Odds ratio (OR) or coefficient (coef.) (95% confidence intervals)				
Female sex (OR) ^a	1.27 (1.06, 1.53)^b	1.33 (1.10, 1.60)	1.09 (0.92, 1.31)	0.82 (0.49, 1.37)
Age (coef.) ^c	0.00 (–0.01, 0.01)	–0.01 (–0.02, 0.00)	0.00 (–0.00, 0.01)	–0.04 (–0.07, –0.01)
Dementia severity (CDR) ^d (OR) (mild dementia as reference)				
Moderate	1.05 (0.84, 1.31)	0.95 (0.76, 1.19)	1.11 (0.90, 1.37)	0.72 (0.39, 1.34)
Severe	1.01 (0.81, 1.26)	1.21 (0.97, 1.50)	0.95 (0.77, 1.16)	0.50 (0.27, 0.93)
Agitation factors (CMAI) ^d (OR)				
Aggressive behaviours ^e	1.00 (0.99, 1.01)	1.01 (1.00, 1.03)	0.99 (0.98, 1.00)	0.96 (0.93, 0.99)
Physically nonaggressive behaviours ^f	1.00 (0.99, 1.02)	1.00 (0.98, 1.01)	1.00 (0.99, 1.02)	1.05 (1.01, 1.10)
Verbally agitated ^g	1.01 (0.96, 1.03)	1.00 (0.99, 1.02)	1.01 (1.00, 1.03)	1.02 (0.98, 1.07)
Hiding/hoarding ^h	0.94 (0.90, 0.98)	0.95 (0.91, 0.99)	0.95 (0.92, 0.99)	1.03 (0.90, 1.17)

Abbreviations: CDR, Clinical Dementia Rating.

^aControlling for age.

^bSignificant results in bold.

^cControlling for gender.

^dControlling for age and gender.

^eHitting, kicking, pushing, scratching, grabbing, cursing or verbal aggression, hurting self or other, biting, spitting, throwing things, tearing things or destroying property, screaming.

^fPacing or aimless wandering, inappropriate undressing or disrobing, performing repetitive mannerisms, trying to get to a different place, handling things inappropriately, general restlessness.

^gConstant requests for attention, repetitive sentences or questions, complaining, negativism.

^hHiding, hoarding.

residents who are not in severe or round-the-clock pain may be unnecessarily exposed; however, in this population with dementia, many residents have multiple comorbidities and they may require this class of medication. Strong opioids may be prescribed in place of

NSAIDs (especially for those at risk of impaired renal function or gastrointestinal comorbidities), or may be used for their sedative effects; this raises the question whether opioids are being used, instead of antipsychotics, to manage behavioural symptoms.²⁸

Patches may be prescribed due to ease of administration²⁹ or because residents have swallowing difficulties. It is important to note that the difference between strong and weak opioids is somewhat arbitrary: a low dose of buprenorphine is less potent than a high dose of codeine, for example. Typically, residents were prescribed low doses of buprenorphine (5 mcg/h).

Regarding care home differences, analgesic prescriptions did not vary between care homes, but care homes varied considerably in how much they administered PRN analgesics, although it was not clear why. Previous literature has found that factors such as heavy workload and shift work which affect communication between care staff are associated with poor pain management.^{12,20}

Approximately 50% of care home residents have pain, and studies that collect data on pain and analgesia in care homes consistently find evidence that this is undertreated.^{4,5,13} In our study, drug receipt varied between groups. Females were more likely to be prescribed regular analgesics and younger residents were administered more PRN analgesics. Clinical studies suggest females may experience more pain, and report pain more frequently.^{30,31} Residents with severe dementia were more likely to be prescribed regular analgesics but less likely to be administered PRN analgesia, despite being no less likely to be prescribed PRN analgesics. Clinicians prescribe PRN analgesia with the expectation that it may be needed; so the finding that being prescribed PRN analgesia that is not administered is associated with having more severe dementia and being older, which are characteristics that might be expected to be associated with greater risk of pain, could lead to undertreated pain. Care home staff may find it more difficult to assess pain in residents with cognitive impairment, especially if residents have difficulties communicating,³² and undertreatment of pain has been consistently found in this population.^{10,14}

Our findings suggest that while overall analgesic prescribing is similar to other countries, clinicians in England prescribe more PRN analgesics than in other countries where regular pain relief is more commonly used.³³ It is not possible to speculate on the appropriateness of the PRN prescriptions from our study, but assuming that care home populations in other countries are broadly similar, it appears English care home residents are receiving less pain relief than their international counterparts. UK opioid prescriptions in older people residing in the community in their own homes and care homes were similar in 2010 (22.4% vs. 20.1%)³⁴ and in our cohort, prevalence was only slightly higher (22.8%–23.6%), which reflects the upward trend seen elsewhere.³⁵ Therefore, our finding of less prescription of analgesics in English care homes, compared to international levels, may reflect the wider national healthcare system.

4.1 | Strengths and limitations

Earlier studies have commented on the need for PRN administration data^{15,16,18} and this study has presented robust data from a large sample that is representative of a heterogeneous group. The results aid interpretation of the limited existing medication data and

highlight the importance of collecting data on frequency of medication administration. The inclusion criteria were pragmatic, and the use of the NPC meant that residents with dementia that did not have a formal diagnosis were able to participate.

The medication charts did not routinely include the indications for prescriptions, so adjuvant drugs such as amitriptyline or pregabalin prescribed for specific types of pain relief were not included in the analyses. Nor did it collect data about 'home remedies': medications such as paracetamol may not require prescription but are administered by care home staff.

Without pain data it was impossible to assess the appropriateness of prescriptions, type of analgesic, or administration. However, pain can be difficult to assess in this population, and fluctuates over time, so pain assessments may not be accurate.³⁶ Given that care homes and their residents are so heterogeneous, future studies need to balance a large sample size with pain assessments and detailed medication data. Where pain assessment is not feasible, other options include records of potentially painful comorbidities or a medication-based comorbidity index.^{37–40} To assess whether PRN medication was given appropriately, nonparticipant observation could be used in a mixed-methods study.

Furthermore, there is a need for better understanding of how care home staff make decisions to administer PRN analgesics, and to further explore internal care home barriers and facilitators that may be associated with analgesic administration.

5 | CONCLUSIONS/RELEVANCE

Clinicians should be aware that PRN drugs may not be given as often as they anticipate (or at all) and should think carefully before prescribing only PRN analgesics. Some residents (males, older residents and residents with severe dementia) may be more at risk than others for undertreatment and regular medication should be considered. Medical notes for PRN analgesia should include the indication to ensure that care staff have the right information available, which may increase the likelihood of residents receiving appropriate pain relief, and clinicians should review PRN use to check it is being administered appropriately.

In the UK, there are no pain management guidelines for care home residents with dementia. Policymakers should develop pragmatic guidelines specific to care home residents, including residents with different severities of dementia and those with communication difficulties, with clear guidance for the use of opioids.

CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interests.

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DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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