Published in final edited form as:

Res Gerontol Nurs. 2019 March 01; 12(2): 61–69. doi:10.3928/19404921-20190122-01.

Analgesic Use Patterns among Patients with Dementia during Transitions from Hospitals to Skilled Nursing Facilities

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Abstract

Gaps in pain management, including discontinuity in analgesic medication prescribing, frequently complicate transitions from hospital-to-skilled nursing facilities (SNFs) for patients with dementia. The objective of the current study was to examine analgesic medication use and prescribing patterns in the last 48 hours of hospitalization and upon discharge to SNF among stroke and hip fracture patients with dementia. Of 318 patients that received an analgesic medication within the last 48 hours of hospitalization, 23% experienced potentially abrupt discontinuations upon discharge. These rates varied by medication, with acetaminophen with codeine (27%), hydromorphone (19%), and acetaminophen with hydrocodone (19%) having the highest rates of potentially abrupt discontinuations. Conversely, 38% of patients experienced potentially abrupt additions of an analgesic medication upon discharge. Findings suggest that changes to analgesic regimens prior to and upon discharge may be common practice, potentially hindering care continuity and pain control during transitions.

Keywords

Care Transitions; Pain Management; Dementia; Analgesic Medications; Post-acute Care; Acute Care

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The authors would also like to acknowledge Shanna Mohler, Gloria Morel, Emily Schmitz, Daniel Jung, and Zoe Waizenegger for their assistance with data acquisition and review, and Shehrose Charania and Shannon Mullen for manuscript assistance. The authors have obtained written consent from all contributors who are not authors and are named in this section.

Conflicts of Interest

The authors have no conflicts of interest to report.

INTRODUCTION

Individuals with dementia frequently transition across settings of care, often moving between acute and post-acute care settings (Callahan et al., 2015). These individuals are particularly vulnerable during these transitions due to diminished ability to recall and communicate recent experiences and changes to their care plan (Gilmore-Bykovskyi, Roberts, King, Kennelty, & Kind, 2016). However, transitions between care settings are regularly accompanied by inadequate inter-setting communication and care coordination, placing patients at risk for adverse outcomes (Coleman, 2003). Discharge to a skilled nursing facility (SNF)—experienced by 34% of hospitalized patients with dementia—is challenging for patients and caregivers alike, and evidence suggests presence of dementia and discharge to a SNF increase re-hospitalization risk (Callahan et al., 2012; Davydow et al., 2014; Jencks, Williams, & Coleman, 2009). Hospital-to-SNF transitions are further complicated by gaps in pain management, which may exacerbate dementia-related behavioral symptoms and patient/caregiver dissatisfaction with care (Gilmore-Bykovskyi et al., 2016; King et al., 2013). Timely, complete, and accurate discharge communication describing pain and effectiveness of different treatment approaches is integral to orchestrating high quality transitions and may help prevent rehospitalizations (Gilmore-Bykovskyi et al., 2016; King et al., 2013; Martin, Williams, Hadjistavropoulos, Hadjistavropoulos, & MacLean, 2005; Simmons et al., 2016). In prior qualitative studies, SNF nurses have reported routine receipt of incomplete, inaccurate medication histories, highlighting abrupt discontinuation or additions in medications, including analgesics, prior to discharge as a common problem (Gilmore-Bykovskyi et al., 2016; King et al., 2013). Potentially abrupt changes to analgesic medications have unintended consequences, including delayed availability of newly ordered controlled substances, underrecognition of adverse medication events, and inadequate pain management.

A prospective study by Simmons et al. (2016) found that a majority of patients with dementia report moderate to severe pain during hospital-to-SNF transitions. The high prevalence and underrecognition of pain in individuals with dementia, coupled with care coordination deficits common during hospital-to-SNF transitions, may be further complicated by abrupt changes in analgesic medications. The extent of changes made to analgesic medications during hospital-to-SNF transitions has not been previously examined, limiting approaches to pain management during hospital-to-SNF transitions. The objective of the current study was to examine analgesic medication use and prescribing patterns in the last 48 hours of hospitalization and upon discharge to SNF among stroke and hip fracture patients with dementia. Specifically, researchers aimed to determine the prevalence of specific analgesic use surrounding hospital discharge and to characterize the type and extent of potentially abrupt changes to analgesic medications upon discharge.

METHODS

Sample/Setting

The study sample comprised Medicare beneficiaries with dementia who were discharged from hospital to a SNF with a primary diagnosis of hip fracture or stroke. This group was selected for study because of the high percentage of Medicare beneficiaries who are

discharged to SNFs each year (25%) (MedCAP, 2018), and the high prevalence of hip fracture (Friedman, Menzies, Bukata, Mendelson, & Kates, 2010) and stroke (Pendlebury, 2012) in persons with dementia who require pain management in SNFs.

All patients were discharged from an urban academic or urban community hospital to a sub-acute care facility from 2003–2008. Dementia was identified using ICD-9 codes for Alzheimer's disease and related dementias, as validated by Taylor, Ostbye, Langa, Weir, and Plassman (2009). Medicare claims data for this sample were linked to electronic health record (EHR) data using a combination of Medicare identification number, study hospital, discharge/admission dates, age, and sex. Discharge destination was identified using administrative data compiled by hospital case managers.

Data Collection and Quality

Four medical record abstractors with clinical training in nursing or medicine accessed each patient's EHR and performed structured review of analgesic medication administration records and discharge summary orders. Abstraction procedures were standardized through abstraction manuals and tools with training and guidance for medical record review and variable selection (Appendix Table 1) (Polnaszek et al., 2016). Medical record abstractors worked independently, and interrater reliability and agreement assessments were conducted for 10% of patient charts using contingency tables and Cohen's κ for a target percent agreement of 85% or higher. Disagreements were resolved by another medical record abstractor. Following arbitration, the circumstances regarding specific disagreements and the data in question were discussed at study team meetings to foster greater reliability in abstraction. Across all variables, overall percent agreement was 88.7%, and the Cohen's κ average was 0.92.

Data Analysis

Analyses were performed in STATA version 15. Descriptive statistics on patient sociodemographic characteristics, analgesic medication, prevalence of administration during hospitalization and prescribing in discharge summary orders were calculated. Variables characterizing analgesic use patterns were constructed using abstracted medical record data and included rate of potentially abrupt medication discontinuation, addition, and transition events during the last 48 hours of hospitalization and upon discharge.

Operationalization of Analgesic Use Patterns

Analgesic use pattern analyses focused on widely used analgesics, defined in this study as any analgesic that 5% of the study sample was exposed to during the last 48 hours of hospitalization or upon discharge (Table A; widely used analgesics denoted by bold font). Variables for quantifying analgesic use patterns were calculated separately for each widely used analgesic. *Potentially abrupt discontinuations* were defined as medication change events for which there was an administration of a specific analgesic in the last 48 hours of hospitalization wherein the same analgesic was not ordered in SNF discharge summary orders. *Potentially abrupt additions* were defined as medication change events for which there was a SNF discharge summary order for an analgesic that was not administered within last 48 hours of hospitalization. *Potentially abrupt analgesic transitions* were defined as

transitions between two distinct analgesic medications during the last 48 hours of hospitalization and/or upon discharge—thus characterizing how many patients were exposed to both potentially abrupt additions and discontinuation events. All analgesic use pattern categories were mutually exclusive and calculated at a patient-level.

RESULTS

Patient and Analgesic Use Characteristics

Sample (N=343) characteristics are presented in Table 1. The sample was largely Caucasian and 74% female, reflecting the population surrounding the two urban hospitals, with an average age at discharge of 84.5 years. Across the sample, the mean Hierarchical Condition Category (HCC) was 1.3, and the mean Elixhauser Comorbidity Score 6.9. A HCC score, or a calculated measure of projected health costs, above 1.0 is considered high (CMS Fact Sheet, 2017), and Elixhauser Scores, which measure the number of concurrent medical conditions, range from -19 to +89 with more positive integers representing higher risk (van Walraven, Austin, Jennings, Quan, & Forster, 2009).

Most patients in the sample sustained hip fractures (77%). Of the 343 patients included, 318 (93%) received analgesics in last 48 hours of hospitalization, and 297 (87%) had analgesics prescribed in their discharge summary orders. Of 265 patients with a hip fracture, 96% (N=254) received analgesics in the last 48 hours of hospitalization, and 90% (N=238) were prescribed analgesics in their discharge summary orders. Of 78 patients with a stroke, 82% (N=64) received analgesics in the last 48 hours of hospitalization, and 76% (N=59) had analgesics prescribed in their discharge summary orders. Of the 343 patients examined, 16% experienced 30-day re-hospitalization and/or death.

Overall, 36 unique analgesic medications were identified in the medical records (Appendix Table 1). Of these, 29 analgesic medications were administered and/or prescribed to less than 5% of patients and were analyzed descriptively but not examined for medication change events. The more widely used analgesic medications administered during the last 48 hours of hospitalization included acetaminophen ("Tylenol"; 62%), aspirin (38%), oxycodone (27%), hydrocodone and acetaminophen ("Vicodin"; 20%), hydromorphone hydrochloride ("Dilaudid"; 10%), morphine (9%), and acetaminophen with codeine (8%).

Potentially Abrupt Discontinuation of Analgesics on Discharge

Of 318 patients who received analgesics during the last 48 hours of hospitalization, 73 (23%) experienced a potentially abrupt discontinuation of that analgesic on discharge. Among patients with hip fracture receiving analgesics during the last 48 hours of hospitalization (N= 254), 61 (24%) experienced a potentially abrupt discontinuation upon discharge. Among patients with stroke receiving analgesics during the last 48 hours of hospitalization (N=64), 11 (17%) experienced potentially abrupt discontinuations. Codeine with acetaminophen, hydromorphone, and hydrocodone with acetaminophen had the highest rates of potential abrupt discontinuation (27%, 19%, and 19%, respectively) (Figure 1). The proportion of potentially abrupt discontinuation events that involved an opioid analgesics, non-opioid analgesics, or multiple medications being discontinued are reported in Table 2.

Semi-equivalent groups of patients experienced potentially abrupt discontinuations of opioid analgesics and non-opioid analgesics (30, 9% and 26, 8% respectively), and 16 (5%) patients experienced potentially abrupt discontinuations of more than one analgesic medication (e.g. aspirin, acetaminophen and hydromorphone hydrochloride administered during hospitalization but not ordered on discharge).

Potentially Abrupt Additions in Analgesics on Discharge

Across both disease groups, 297 (87%) patients had an analgesic prescribed in their discharge summary orders. Of these patients, 112 (38%) experienced a potentially abrupt addition of an analgesic medication on SNF discharge orders that had not been administered in the last 48 hours of hospitalization. Of 238 patients with hip fracture discharged with analgesic, 85 (36%) experienced potentially abrupt additions; and of 59 patients with stroke discharged with analgesic, 27 (46%) experienced potentially abrupt additions. The most common potentially abrupt additions were hydromorphone, morphine, acetaminophen, and acetaminophen with codeine (50%, 38%, 30%, and 23%, respectively) (Figure 2). The proportion of potentially abrupt analgesic addition events that involved an opioid analgesics, non-opioid analgesics, or multiple medications being added in the last 48 hours of hospitalization are reported in Table 3. More patients experienced potentially abrupt additions of non-opioid analgesic medications (55, 19%) than opioid analgesic medications (24, 8%), and 33 (11%) patients experienced potentially abrupt additions of more than one analgesic medication (e.g. oxycodone and fentanyl citrate transmucosal ordered on discharge but neither administered during last 48 hours of hospitalization).

Potentially Abrupt Analgesic Transition Events across Hospitalization and Discharge

Of 318 patients who received an analgesic medication during the last 48 hours of hospitalization, 78 (23%) experienced potentially abrupt analgesic medication transition events (e.g. a transition from the administration of one analgesic medication during the last 48 hours of hospitalization to another, distinct analgesic medication upon discharge). The proportion of potentially abrupt medication transition events are further classified as: a) transitions from a non-opioid to an opioid analgesic, b) transitions from an opioid to a non-opioid analgesic, c) transitions from one opioid to another opioid, d) transitions from one non-opioid to another non-opioid, and e) transitions between more than 2 distinct analgesic medications (Table 4).

Of 254 patients with a hip fracture who received an analgesic medication during the last 48 hours of hospitalization, 67 (26%) experienced potentially abrupt analgesic medication transition events. Across the same 254 patients with hip fracture, 13 (5%) experienced a transition from a non-opioid analgesic medication during the last 48 hours of hospitalization to an opioid analgesic medication upon discharge, 9 (4%) experienced a transition from one opioid analgesic medication during the last 48 hours of hospitalization to another opioid analgesic medication upon discharge, and 17 (7%) experienced a transition from an opioid analgesic medication during hospitalization to a non-opioid analgesic medication upon discharge. Lastly, 28 (11%) patients with hip fracture experienced transitions across two or more medications during the last 48 hours of hospitalization and upon discharge (e.g.

transition from oxycodone during hospitalization to lidocaine and morphine upon discharge).

Of 64 patients with a stroke who received analgesic medications during the last 48 hours of hospitalization, 6 (9%) experienced potentially abrupt analgesic medication transition events. Of 64 patients with a stroke, 3 (5%) experienced a transition from a non-opioid analgesic medication during hospitalization to an opioid analgesic medication upon discharge, 1 (2%) experienced a transition from one opioid analgesic medication during hospitalization to another opioid analgesic medication upon discharge, and 1 (2%) experienced a transition from a non-opioid analgesic medication during hospitalization to another non-opioid analgesic medication upon discharge. Finally, 1 (2%) patient with stroke experienced a transition across two or more analgesic medications during the last 48 hours of hospitalization and upon discharge.

DISCUSSION

Study findings reveal that changes to analgesic medications immediately preceding transfers from hospitals to SNFs were common among patients with dementia and a hip fracture or stroke. Overall, there was a lower rate of analgesics ordered on discharge as compared to administration in the last 48 hours of hospitalization for both diagnostic groups, with 23% of the sample experiencing a medication discontinuation upon discharge. This is consistent with prior qualitative study findings wherein SNF providers have reported medication changes surrounding discharge as common practice (Gilmore-Bykovskyi et al., 2016; King et al., 2013); however, this is the first study to classify and quantitatively characterize these medication changes. This study provides information about analgesic use patterns surrounding hospital-to-SNF transfers, which can impact translation of evidence-based pain management guidelines, future research on pain management during high risk transitions in care, and inter-setting communication approaches surrounding hospital discharge. Findings from this study also provide insights into potential limitations of acute care prescribing practices which may impact pain management during hospital-to-SNF transfers.

Descriptively, the data provide insights into prescribing practices for a vulnerable patient population at high risk for persistent and acute pain (Corbett et al., 2012). While very few studies have focused specifically on analgesic prescribing and pain management during transitions in care for patients with dementia, there is a growing body of literature on evidence-based pain management strategies that merit consideration. Notably, although acetaminophen is the recommended non-opioid agent for mild to moderate pain among older adults (Cornelius, Herr, Gordon, Kretzer, & Butcher, 2017), it was only prescribed to 66.5% of patients with a hip fracture and 42.2% of patients with stroke during hospitalization. Additionally, 15% of patients had acetaminophen discontinued upon discharge. In addition to its favorable safety profile and efficacy in management mild-moderate pain, acetaminophen has been shown to be beneficial in reducing agitation in patients with dementia (Husebo, Ballard, & Aarsland, 2011; Sandvik et al., 2014). The continuation of acetaminophen to prevent agitation in patients with dementia during transitions to SNF has been recommended (Sury, Burns, & Brodaty, 2013).

Furthermore, 19% of patients who received hydromorphone and 14% who received morphine in 48 hours preceding discharge had the medication discontinued. While these medications may not be commonly used in SNFs, their discontinuation has potential consequences for patients whose pain is best controlled on opioid regimens. Providers may discontinue or modify these medications under the misconception that the SNF provider will automatically assess the patient and reinstitute appropriate regimens for pain management, as has been suggested in prior qualitative studies (King et al., 2013). However, SNF providers may be limited in their ability to conduct comprehensive pain and medication history assessment (Jones et al., 2004) and they may not systematically identify or have access to prior medication histories (King et al., 2013), which could lead to potential long-standing deficits in pain management and lengthier recovery times. Inpatient providers' limited understanding of how plans of care are implemented in SNF and unawareness regarding limited availability of advance practice providers may serve as a barrier to care continuity during hospital-to-SNF transfers (Gilmore-Bykovskyi et al., 2016; King et al., 2013).

Current pain management guidelines emphasize the importance of introducing one medication at a time and monitoring dose and drug changes, allowing sufficient time for efficacy and response to new drugs to be assessed (Cornelius et al., 2017). Arguably, changing analgesic agents immediately before transfer to a new facility, unfamiliar with patient's recent history, does not provide opportunity for these prescribing principles to be achieved. This study provides preliminary insights into the potential role of hospital prescribing patterns on sub-optimal pain management among SNF patients. Research is needed to further our understanding of the context surrounding individual prescribing decisions and to examine the influence of these prescribing patterns on pain management and other patient outcomes following hospital discharge.

The current study included patients with dementia from two major diagnostic groups that enter SNFs at high rates, both of which are independently associated with moderate to severe pain (Foss, Kristensen, Palm, & Kehlet, 2009; Jonsson, Lindgren, Hallstrom, Norrving, & Lindgren, 2006). A major concern of clinicians in caring for hospitalized older adults with dementia is risk for delirium (Inouye, Westendorp, & Saczynski, 2014). It is possible that some prescribing changes identified in this study were intended to reduce exposure to opioid analgesics, reflecting provider concerns regarding side-effects and/or uncertainty regarding the appropriateness of opioids for patients with dementia as these are often suspected of increasing delirium risk, especially in patients with hip fracture (Auret & Schug, 2005; Barry, Parsons, Peter Passmore, & Hughes, 2012; Kaasalainen et al., 2007) (Fick, Agostini, & Inouye, 2002). Such prescribing practice has been found in other studies in which patients with hip fracture and dementia received lower rates of opioid analgesics postoperatively (Jensen-Dahm, Palm, Gasse, Dahl, & Waldemar, 2016). However, evidence-based guidelines for management of acute pain in older adults identify opioid analgesics as an important part of pain control for moderate to severe pain (Cornelius et al., 2017), particularly for treating nociceptive pain, which contributes substantially to central post-stroke pain (Paolucci et al., 2016). Furthermore, systematic reviews and other evidence syntheses highlight the risk of total opioid avoidance in high-risk groups, as untreated pain is a strong risk factor for development of delirium and other negative outcomes, including

depression, behavioral symptoms, and poorer physical functioning (Cheung et al., 2018; Clegg & Young, 2011; Erdal et al., 2017; Kolanowski et al., 2015; Miu & Chan, 2014; Won et al., 1999). In addition, previous studies found providers may transition patients to different medications on discharge due to concerns regarding investigation of over-prescribing of opioid medications or prescribe a Schedule III rather than Schedule IV medication (Nwokeji, Rascati, Brown, & Eisenberg, 2007). Future studies focused on transitional care pain management should examine whether misconceptions regarding use of opioids may be driving decisions regarding medication prescribing during hospitalization and upon discharge.

Investigators should examine inter-setting communication around medication histories as a way to facilitate the development of individualized care plans in SNF setting. Broader adoption of improved hand-offs between nurses during hospital-to-SNF transfers is critical to improving quality of transitional care for patients undergoing these transfers. The current findings suggest that explicitly addressing recent changes to analgesic agents is an important component of these hand-offs, as this information is unlikely to be included in written discharge summary communication (King et al., 2013). Although this study examined a 48-hour timeframe prior to discharge, hand-offs between teams may benefit from a broader timeframe as signs of some adverse medication events may be delayed. Various templates exist to support communication between hospitals and SNFs to improve patient outcomes, most notably the Interventions to Reduce Acute Care Transfers (INTERACT®) Program, which provides support to nurses in managing changes in resident condition (Ouslander, Bonner, Herndon, & Shutes, 2014), and a framework upon which inter-setting communication on pain management could be developed.

The current study has several limitations. This study focused on two specific populations of patients with dementia, those with hip fracture and stroke. Patterns in analgesic use may be different for other patient populations. By virtue of its retrospective design, this study did not address patient-level conditions that might influence pain prescribing, such as long-standing or chronic pain-related diagnoses. In addition, although aspirin was commonly used in this study, it is likely many patients are prescribed aspirin for prevention of cardiovascular disease. However, this study did not collect data on indications for medication use due to inconsistent availability and poor reliability of these data in EHRs. Lastly, the study population was largely Caucasian and as such, findings are likely not generalizable to non-majority racial and ethnic minority groups. Future work should examine similar analgesic use patterns among more representative samples, as racial and ethnic minorities have been found to experience significant disparities in pain assessment and treatment. (Mossey, 2011)

CONCLUSION

This retrospective cohort study found patients with dementia hospitalized for stroke or hip fracture were exposed to multiple potentially abrupt changes in analgesic medications in the last 48 hours of hospitalization and upon discharge. In general, patients with hip fracture were exposed to more frequent and complex medication transition events. Patients with hip fracture had greater rates of opioid analgesic medication additions, and lower rates of non-opioid analgesic addition events—including a 15% potentially abrupt discontinuation rate

for acetaminophen. Well-documented challenges in effectively transitioning patients with dementia between hospitals and SNFs may be exacerbated by sub-optimal pain management caused by frequent changes in analgesic medications in the period immediately prior to discharge. The clinical impact of various analgesic use patterns in high-risk population merit further investigation within more diverse cohorts and disease groups.

Funding

Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health under Award Number K76AG060005. Dr. Gilmore-Bykovskyi also reports receiving support from the Wisconsin Alzheimer's Disease Research Center (P50AG033514), and the National Hartford Centers of Gerontological Nursing Excellence. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Appendix Table 1.: Analgesic Medication Administration Rates during Hospitalization and Prescribing Rates in Discharge Summary Orders (n, %)

Analgesic Medication		Overall Sample N=343		Hip Fracture Patients N=265		Stroke Patients N=78	
Generic Name	Brand Name	Patients with Analgesic Administered during Last 48 Hours of Hospitalization N=318* (93%)	Patients with Analgesic Discharge Summary OrdersN=297(87%)	Patients with Analgesic Administered during Last 48 Hours of HospitalizationN=254(96%)	Patients with Analgesic Discharge Summary OrdersN=238(90%)	Patients with Analgesic Administered during Last 48 Hours of HospitalizationN=64(82%)	Patients with Analgesic Discharge Summary OrdersN=59(76%)
Nonsteroidal anti-inflammatory drugs (NSAIDs)							
Aspirin	Bayer	120 (37.7%)	140 (47.1%)	79 (31.1%)	105 (44.1%)	41 (64.0%)	35 (59.3%)
Ibuprofen	Advil	5 (1.6%)	7 (2.4%)	2(0.8%)	4(1.3%)	3(4.7%)	3(5.1%)
Naproxen	Aleve	2(0.6%)	0 (0.0%)	2(0.8%)	0(0.0%)	0(0.0%)	0 (0.0%)
Celecoxib	Celebrex	1 (0.3%)	1 (0.3%)	1(0.4%)	1 (0.4%)	0(0.0%)	0 (0.0%)
Nabumetone	Relafen	1 (0.3%)	1(0.3%)	1 (0.4%)	1 (0.4%)	0 (0.0%)	0 (0.0%)
Ketorolac	Toradol	1 (0.3%)	0 (0.0%)	1 (0.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Meloxicam	Mobic	0 (0.0%)	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.7%)
Indomethacin	Indocin	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.6%)	0 (0.0%)
Feldene	Feldene	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.6%)	0 (0.0%)
Diclofenac sodium	Voltaren	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Etoricoxib	Lodine	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Ketoprofen	Orudis	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Oxaprozin	Daypro	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Sulfadac	Clinoril	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Opioids							
Acetaminophen with codeine	Tylenol with codeine	26 (8.2%)	22(7.4%)	25 (9.8%)	22 (9.2%)	1 (1.6%)	0 (0.0%)
Oxycodone (immediate-release)	Roxicodone	87 (27.4%)	75 (25.3%)	85 (33.5%)	73(30.6%)	2 (3.1%)	2 (3.4%)
Hydrocodone bitartrate and acetaminophen**	Vicodin	63 (19.8%)	49 (16.5%)	61 (24.0%)	43 (18.1%)	2 (3.1%)	6 (10.2%)
Hydromorphone hydrochloride	Dilaudid	32 (10.1%)	2 (0.7%)	31(12.2%)	2 (0.8%)	1 (1.6%)	0 (0.0%)
Morphine	N/A	29 (9.1%)	8 (2.7%)	28 (11.0%)	6 (2.5%)	1 (1.6%)	2 (3.4%)
Fentanyl transdermal	Duragesic	15 (4.7%)	11 (3.7%)	15(5.9%)	10 (4.2%)	0 (0.0%)	1 (1.7%)
Oxycodone and acetaminophen [†]	Percocet or Roxicet	14 (4.4%)	12 (4.0%)	14 (5.5%)	11 (4.6%)	0 (0.0%)	1 (1.7%)

*NSAIDs

†Fentanyl transdermal patch available in the United States only

**Hydrocodone bitartrate and acetaminophen

Analgesic Medication		Overall Sample N=343		Hip Fracture Patients N=265		Stroke Patients N=78	
Hydrocodone bitartrate and acetaminophen [†]	Norco	9 (2.8%)	11 (3.7%)	9 (3.5%)	9 (3.8%)	0 (0.0%)	2 (3.4%)
Morphine sulfate (extended-release)	MS Contin	4 (1.3%)	5 (1.7%)	4 (1.6%)	4 (1.7%)	0 (0.0%)	1 (1.7%)
Methadone hydrochloride	Dolophine	1 (0.3%)	1 (0.3%)	1 (0.4%)	1 (0.4%)	0 (0.0%)	0 (0.0%)
Propoxyphene and acetaminophen [§]	Darvocet	7 (2.2%)	9 (3.0%)	7 (2.8%)	9 (3.8%)	0 (0.0%)	0 (0.0%)
Oxycodone (extended-release)	Oxycontin (extended-release)	0 (0.0%)	4 (1.3%)	0 (0.0%)	4 (1.7%)	0 (0.0%)	0 (0.0%)
Tramadol	Ultram	2 (0.6%)	2 (0.7%)	2 (0.8%)	2 (0.8%)	0 (0.0%)	0 (0.0%)
Codeine	N/A	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Fentanyl citrate transmucosal	Actiq	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Meperidine	Demerol	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Tramadol and acetaminophen [¶]	Ultracet	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other							
Acetaminophen	Tylenol	196 (61.6%)	204 (68.7%)	169 (66.5%)	169 (71.0%)	27 (42.2%)	35 (59.3%)
Gabapentin	Neurontin	15 (4.7%)	17 (5.7%)	14 (5.5%)	16 (6.7%)	1 (1.6%)	1 (1.7%)
Lidocaine	Lidoderm	15 (4.7%)	14 (4.7%)	14 (5.5%)	12 (5.0%)	1 (1.6%)	2 (3.4%)
Butorbital containing products	See list [#]	1 (0.3%)	1 (0.3%)	1 (0.4%)	1 (0.4%)	0 (0.0%)	0 (0.0%)
Propofol	Lyrica	1 (0.3%)	1 (0.3%)	1 (0.4%)	1 (0.4%)	0 (0.0%)	0 (0.0%)

Notes

* Overall sample for each column indicates the total number of patients per disease group/overall with exposure to any analgesic during the last 48 hours of hospitalization or ordered in the discharge summary.

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Components: Hydrocodone bitartrate 5 mg/acetaminophen 300 mg, Hydrocodone bitartrate 7.5 mg/acetaminophen 300 mg, or Hydrocodone bitartrate 10 mg/acetaminophen 300 mg

†

Components: Oxycodone 2.5 mg/acetaminophen 325 mg, Oxycodone 5 mg/acetaminophen 325 mg, Oxycodone 7.5 mg/acetaminophen 325 mg, or Oxycodone 10 mg/acetaminophen 325 mg

‡

Components: Hydrocodone bitartrate 5 mg/acetaminophen 325 mg

§

Components: Propoxyphene 50 mg/acetaminophen 325 mg, or Propoxyphene 100 mg/ acetaminophen 650 mg

//

Components: Tramadol 37.5 mg/acetaminophen 325 mg

¶

Components: Acetaminophen 300 mg/codeine 30 mg, or Acetaminophen 300 mg/ codeine 60 mg

#

Axotal, Fiorinal, Butalbital compound, Faribital, Fiorial, Fiorinal with codeine, Fiorinal with codeine III, Ascomp with codeine, Fiorinal with codeine, Fioricet, Esigic-Plus, Bupap, Phrenilin, Tencon, Phrenilin Forte, Fioricet with codeine, Phrenilin with caffeine and codeine

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Figure 1.

Patients with an analgesic administered during last 48 hours of hospitalization that is not ordered on their discharge summary orders.

Figure 2.

Patients with an analgesic ordered on discharge summary orders that was not administered during last 48 hours of hospitalization

Table 1.**Sample Characteristics (N=343)**

<i>Characteristic</i>	<i>N = 343</i>
<i>Patient Sociodemographic Characteristics</i>	
Female, n(%)	254 (74.1)
Average Age in Years at Discharge, mean (SD)	84.5 (6.8)
Age, n(%)	
<75 years	22 (6.4)
75–79 years	53 (15.5)
80–84 years	83 (24.2)
85 years	185 (53.9)
Medicaid Beneficiaries, n(%)	40 (11.7)
<i>Patient Prior Medical History</i>	
Mean Hierarchical Condition Category ³³ (SD)	1.3 (0.2)
Elixhauser Comorbidity Score (SD)	6.9 (6.8)
Index Hospital Length of Stay in Days, mean (SD)	6.1 (3.8)
Length of Stay, n(%)	
1–4 days	115 (33.5)
5 days	77 (22.4)
6–7 days	91 (26.5)
>8 days	60 (17.5)
Primary Diagnosis, n(%)	
Stroke	78 (22.7)
Hip Fracture	265 (77.4)
<i>Post-Hospital Care Trajectories, n(%)</i>	
Re-hospitalization Within 30 Days	34 (9.9)
Death Within 30 Days	28 (8.2)
30 Day Re-hospitalization and/or Death (Combined Outcome)	55 (16.0)
<i>Receipt of Analgesic Medication, n(%)</i>	
Receipt of Analgesic During Last 48 Hours of Hospitalization	318 (92.7)
Receipt of Analgesic on Discharge Summary	297 (86.6)

SD = standard deviation

Table 2.

Proportion of patients experiencing a potentially abrupt analgesic discontinuation event (patients who received an analgesic medication during last 48 hours of hospitalization but not upon discharge) (n, %)

	Total, N=318	Hip, N=254	Stroke, N=64
Total number of patients experiencing <i>potentially abrupt discontinuation events</i>	72 (23%)	61 (24%)	11 (17%)
Number of patients experiencing a potentially abrupt discontinuation of an <i>opioid analgesic</i>	30 (9%)	29 (11%)	1 (2%)
Number of patients experiencing a potentially abrupt discontinuation of a <i>non-opioid analgesic</i>	26 (8%)	16 (6%)	10 (16%)
Number of patients experiencing a potentially abrupt discontinuation of <i>more than one distinct analgesic</i>	16 (5%)	16 (6%)	0 (0%)

Table 3.

Proportion of patients experiencing a potentially abrupt analgesic addition event (patients with an analgesic medication ordered on discharge that did not receive any analgesic in the last 48 hours of hospitalization) (n, %)

	Total, N=297	Hip, N=238	Stroke, N=59
Total number of patients experiencing <i>potentially abrupt addition events</i>	112 (38%)	85 (36%)	27 (46%)
Number of patients experiencing a potentially abrupt addition of an <i>opioid analgesic</i>	24 (8%)	20 (8%)	4 (7%)
Number of patients experiencing a potentially abrupt addition of a <i>non-opioid analgesic</i>	55 (19%)	37 (16%)	18 (31%)
Number of patients experiencing a potentially abrupt addition of <i>more than one distinct analgesic</i>	33 (11%)	28 (12%)	5 (8%)

Table 4.

Proportion of patients experiencing a potentially abrupt analgesic transition event (patients who experienced a potentially abrupt transition between two distinct analgesic medications across the last 48 hours of hospitalization and discharge) (n, %)

	Total, N=318	Hip, N=254	Stroke, N=64
Total number of patients experiencing <i>potentially abrupt analgesic transition events</i>	73 (23%)	67 (26%)	6 (9%)
Number of patients experiencing a transition from a <i>non-opioid to an opioid</i> analgesic	16 (5%)	13 (5%)	3 (5%)
Number of patients experiencing a transition from an <i>opioid to a non-opioid</i> analgesic	17 (5%)	17 (7%)	0 (0%)
Number of patients experiencing a transition from one <i>opioid to another opioid</i> analgesic	10 (3%)	9 (4%)	1 (2%)
Number of patients experiencing a transition from one <i>non-opioid to another non-opioid</i> analgesic	1 (.3%)	0(0%)	1(2%)
Number of patients experiencing a transition across <i>two or more distinct analgesic</i> medications	29 (9%)	28 (11%)	1 (2%)