Opiate Prescribing in Hospitalized Older Adults: Patterns and Outcomes

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BACKGROUND/OBJECTIVES: Whereas opiate prescribing patterns have been well described in outpatient and emergency department settings, they have been less defined in hospitalized older adults. The objective was to describe patterns of opiate prescribing and associated outcomes in hospitalized older adults.

DESIGN: Retrospective cohort study.

SETTING: Tertiary care facility.

PARTICIPANTS: Hospitalized medical patients aged 65 and older (N = 9,245; mean age 80.3, 55.2% female, 72.3% white, 90.8% non-Hispanic).

MEASUREMENTS: Opiate exposure and duration of action, concurrent use of potentially inappropriate medications (PIMs), adverse events, discharge disposition, length of stay (LOS), and 30-day readmissions.

RESULTS: There was no difference in sex, race, ethnicity, or Charlson Comorbidity Index between opiate exposure groups. Participants who had never received opiates had a significantly shorter mean LOS than prior and new opiate users (5.2, 6.8, 7.7 days; P < .001) and were more likely to be discharged home (88.6%, 82.8%, 82.5%; P < .001) and significantly less likely to be readmitted within 30 days (19.6%, 25.0%, 22.3%; P < .001). Participants who had never been exposed to opiates had a significantly shorter mean LOS than those receiving short- and long-acting opiates (5.2, 7.3, 8.6 days; P < .001) and were more likely to be discharged home (88.6%, 82.6%, 82.4%; P < .001) and significantly less likely to be readmitted within 30 days (19.6%, 27.7%, 28.9%; P < .001).

CONCLUSION: Opiate use is widespread during hospitalization and is associated with significant negative clinical outcomes and quality metrics. There is an urgent need to develop innovative pain management alternatives to opiate use. J Am Geriatr Soc 2017.

Key words: opiates; older adults; short-acting opiates; long-acting opiates; clinical outcomes

As the U.S. population ages at unprecedented rates, healthcare providers face the complexity of managing multiple coexisting chronic conditions, including pain syndromes. With the national opiate epidemic, the consumption of opiates more than doubled from 1999 to 2011, and the use of oxycodone increased by nearly 500%. During the same period, the opiate overdose death rate nearly quadrupled. Opiate use has become increasingly common in older adults. The Medicare population has one of the highest and fastest-growing rates of diagnosed opioid use disorder, with more than 6 of every 1,000 beneficiaries diagnosed a year. In 2014, the Centers for Disease Control and Prevention added opioid overdose prevention to its list of top five public health challenges.

Older adults are more prone to adverse effects from opiates than younger individuals because of pharmacokinetic and pharmacodynamic changes and polypharmacy secondary to their higher rates of comorbidities. In older adults, opiates have been associated with poor outcomes such as falls and cognitive and functional impairment. Additionally, opiate use in older adults has been linked to an increase in suicidal intent and fatal outcomes.

Opiate use has been primarily studied in emergency departments, as well as in ambulatory facilities and surgical and trauma units, using data obtained from prescriptions filled in the outpatient setting from Center for Medicare and Medicaid Services (CMS) data. Although opiate prescription patterns have been well

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described in ambulatory settings and emergency departments, they have been less defined in hospitalized older adults.\textsuperscript{12,15,22} Medicare beneficiaries account for more than half of hospital discharges, and adequate pain control is a required quality metric in these individuals whether they are admitted to surgical or medical units.\textsuperscript{23} An extensive study conducted in 623,957 Medicare beneficiaries in 2011 confirmed the frequent use of new opioid prescribing, specifically at hospital discharge.\textsuperscript{23} In 2013, CMS issued national regulations on prescription drug monitoring programs to decrease misuse of opiates.\textsuperscript{23}

Given the dearth of research exploring opioid use by hospitalized older adults, our primary objective was to study the relationship between opioid prescribing patterns and associated outcomes in older adults hospitalized for reasons other than surgery.

\textbf{METHODS}

This 1-year (September 22, 2014 to October 3, 2015) retrospective cohort study of hospitalized medical patients aged 65 and older in an 806-bed academic tertiary center in the New York metropolitan area, assessed opioid exposure, duration of action, and associated outcomes. Data abstracted from electronic medical records included opioid exposure, opioid duration of action, concurrent use of potentially inappropriate medications (PIMs, including benzodiazepines, anticholinergics, and antipsychotics), adverse events, discharge disposition, length of stay (LOS), and 30-day readmissions. Opiate exposure was defined as nonopiates (participants who did not report prior use of opiates and who were not prescribed opiates during hospitalization), prior opiates (participants who reported active use of opiates at admission), and new opiates (participants who did not report opiate use before admission and were prescribed opiates during their hospitalization) (Figure 1). In addition, we explored outcomes according to duration of action (short vs long acting (which may include additional short-acting opiates)). Finally, we sought to determine whether these patterns were associated with negative short-term clinical outcomes.

Variables included demographic characteristics, discharge diagnoses, comorbidities, use of opiates prior to admission, opioid exposure, concurrent use of PIMs, markers of delirium (restraint use, constant observation), use of bladder catheters, opiate prescribing at time of discharge, LOS, discharge disposition, and 30-day readmissions. Participants who died or were in the intensive care unit or discharged to hospice were excluded. Data were collected without protected health information using Sunrise Clinical Manager (SCM) and stored in REDCap (Research Electronic Data Capture, Vanderbilt University, TN).

\textbf{Statistical Analyses}

Descriptive statistics (mean ± standard deviation for continuous variables; frequency and percentage for categorical variables) were calculated for the overall sample and separately for the following groups: nonopiates, prior opiate, new opiate use; nonuse, use before admission, new opiate use during hospitalization; nonopiates, short-acting opiate, long-acting opiate use. For the two group comparisons, the two-sample t-test was used to compare the groups for continuous measures, and the chi-square test or Monte Carlo estimate for the exact test was used to compare the groups for categorical variables. For the three group comparisons, analysis of variance or the Kruskal-Wallis test, as deemed appropriate, was used to analyze continuous measures, and the chi-square test or Monte Carlo estimate for the exact test was used to compare the groups for categorical variables. LOS was analyzed by applying standard methods of survival analysis (computing the Kaplan-Meier product limit curves with group as the stratification variable). No data were considered censored. The groups were compared using the log-rank test. A result was considered statistically significant at P < .05. All analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC).

\textbf{RESULTS}

\textbf{Participant Characteristics}

Participants (N = 9,245) had a mean age of 80.3; 55.2% were female, 72.3% were white, 90.8% were non-Hispanic; 49.4% were married, 30.2% were widowed, 11.2% were single, and 4.4% were divorced (Table 1). Participants who were not prescribed opiates (nonopiates) during hospitalization were significantly older (80.9) than those who reported active use of opiates at admission (prior opiates) (76.5) and those who did not report opiate use before admission and were prescribed opiates during their hospitalization (new opiates) (78.9) (P < .001). There were no significant differences in opiate status according to sex, race, or ethnicity. Morbidity did not differ according to...
opiate exposure, with an overall mean Charlson Comorbidity Index (CCI) of 7.1. The three most-frequent discharge diagnoses were infectious disease (24.8%), cardiovascular (18.5%), and gastrointestinal (GI) (12.7%). Marital status and discharge diagnosis differed significantly according to opiate exposure group ($P < .001$).

### Opiate Use Patterns

With regard to morphine equivalents per person, the mean was significantly higher for participants receiving long-acting (1,915.3) than for those receiving short-acting (50.1) opiates ($P < .001$) and for those that used opiates before admission (421.9) than those that received opiates only during hospitalization (296.9) ($P < .001$) (Table 2).

### Outcome Measures

#### Opiate Exposure Comparisons

Nonopiate participants had a significantly shorter mean LOS than prior opiate and new opiate participants (5.2, 6.8, 7.7; $P < .001$) and were more likely to be discharged home (88.6%, 82.8%, 82.5%; $P < .001$) and significantly less likely to be readmitted within 30 days (19.6%, 25.0%, 22.3%; $P < .001$). Nonopiate participants were also significantly more likely to have dementia (8.2%, 2.8%, 4.3%; $P < .001$), constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have Nil per os or nothing by mouth (NPO) (29.4%, 42.3%, 36.8%; $P < .001$) and an indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$) (Supplementary Table S1). Nonopiate participants were significantly more likely to have dementia (8.2%, 4.4%, 2.1%; $P < .001$) and be under constant observation (3.6%, 1.9%, 3.3%; $P = .001$) and significantly less likely to have NPO (29.4%, 42.3%, 36.8%; $P < .001$) and indwelling bladder catheter (11.0%, 14.3%, 17.7%; $P < .001$).
Opiate Duration of Action Comparisons

Participants who were not exposed to opiates had a significantly shorter mean LOS (5.2 days) than those receiving short- (7.3 days) and long-acting (8.6 days) (P < .001) opiates and were more likely to be discharged home (88.6%, 82.6%, 82.4%; P < .001) and significantly less likely to be readmitted within 30 days (19.6%, 27.7%, 28.9%; P < .001) (Supplementary Table S1). Participants who were not exposed to opiates had a significantly shorter mean LOS (5.2 days) than those receiving short- (7.3 days) and long-acting (8.6 days) (P < .001) opiates and were more likely to be discharged home (88.6%, 82.6%, 82.4%; P < .001) and significantly less likely to be readmitted within 30 days (19.6%, 27.7%, 28.9%; P < .001). Participants who only received opiates during hospitalization were more likely to receive benzodiazepines (65.8%) than nonusers (11.1%) and those that only received opiates during hospitalization were significantly more likely to receive anticholinergics (8.1%) than nonusers (3.9%) and those who used opiates before admission (6.3%) (P < .001).

Opiate Use Patterns

Participants who were not exposed to opiates had a significantly shorter mean LOS (5.2 days) than those receiving short- (7.3 days) and long-acting (8.6 days) (P < .001) opiates and were more likely to be discharged home (88.6%, 82.6%, 82.4%; P < .001) and significantly less likely to be readmitted within 30 days (19.6%, 27.7%, 28.9%; P < .001). Participants who only received opiates during hospitalization were more likely to receive benzodiazepines (65.8%) than nonusers (11.1%) and those that only received opiates during hospitalization were significantly more likely to receive anticholinergics (8.1%) than nonusers (3.9%) and those who used opiates before admission (6.3%) (P < .001).

Table 2. Opiate Use Patterns

<table>
<thead>
<tr>
<th>Opiate</th>
<th>Short-Acting Opiates</th>
<th>Long-Acting Opiates</th>
<th>P-Value</th>
<th>Opiate Use Before Admission</th>
<th>New Opiate Use During Hospitalization</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphone equivalent per participant, mean ± standard deviation (median)</td>
<td>50.1 ± 127.1 (17.5)</td>
<td>1,915.3 ± 4,443.5 (402.4)</td>
<td>&lt;.001</td>
<td>421.9 ± 1,948.3 (34.0)</td>
<td>296.9 ± 1,779.1 (22.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Morphine, n (%)</td>
<td>Yes 1,024 (51.6)</td>
<td>161 (48.9)</td>
<td>.38</td>
<td>180 (45.0)</td>
<td>1,005 (52.5)</td>
<td>.007</td>
</tr>
<tr>
<td></td>
<td>No 962 (48.4)</td>
<td>168 (51.1)</td>
<td></td>
<td>220 (55.0)</td>
<td>910 (47.5)</td>
<td></td>
</tr>
<tr>
<td>Hydromorphone, n (%)</td>
<td>Yes 115 (5.8)</td>
<td>46 (14.0)</td>
<td>&lt;.001</td>
<td>34 (8.5)</td>
<td>127 (6.6)</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>No 1,871 (94.2)</td>
<td>283 (86.0)</td>
<td></td>
<td>366 (91.5)</td>
<td>1,788 (93.4)</td>
<td></td>
</tr>
<tr>
<td>Fentanyl, n (%)</td>
<td>Yes 21 (1.1)</td>
<td>210 (63.8)</td>
<td>&lt;.001</td>
<td>51 (12.8)</td>
<td>180 (9.4)</td>
<td>.04</td>
</tr>
<tr>
<td></td>
<td>No 1,965 (98.9)</td>
<td>119 (36.2)</td>
<td></td>
<td>349 (87.3)</td>
<td>1,735 (90.6)</td>
<td></td>
</tr>
<tr>
<td>Oxycodone, n (%)</td>
<td>Yes 1,337 (67.3)</td>
<td>199 (60.5)</td>
<td>.01</td>
<td>277 (69.3)</td>
<td>1,259 (65.7)</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>No 649 (32.7)</td>
<td>130 (39.5)</td>
<td></td>
<td>123 (30.8)</td>
<td>656 (34.3)</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Our study aimed at evaluating opiate prescribing patterns and associated outcomes in a cohort of hospitalized older adults. Although opiate prescribing patterns have been investigated in emergency departments and outpatient and surgical settings and are generally indicated for acute trauma or postoperative control of pain, their use has not been thoroughly evaluated in the inpatient medical setting.

Although we observed that opiates continue to be frequently prescribed during hospitalization, where pain control is a major metric in measuring quality care, a sharp decline in opiate prescribing was noted at the time of hospital discharge. This pattern may be the result of new national regulations, which enforce a rigorous and time-consuming monitoring process. As of December 2015, 49 states and the District of Columbia have passed state-managed prescription drug monitoring program legislation to improve outpatient care and safety,24 but there are no such CMS restrictions in the hospital setting.

Prior studies have shown that female sex and older age are associated with higher opioid use. Our study did not confirm this association. There was no difference in terms of sex, race, ethnicity, or Charlson Comorbidity Index between opiate exposure groups, although married participants and those with a history of dementia received fewer opiates. Individuals with dementia have been reported to have poorly controlled pain. A previous study found that 21% of skilled nursing facility residents were unable to make their needs known because of cognitive impairment.25 Of those who complained of pain, 17% could not complete any of the quantitative pain assessment scales but were able to express pain qualitatively.25

Our study demonstrated that opiate exposure is significantly associated with discharge diagnosis, specifically musculoskeletal fracture or falls. These findings are supported by a recent study that found that diseases of the musculoskeletal system and connective tissue had among the largest associations with new opioid use after hospitalization in a population of Medicare beneficiaries.23

This study demonstrates that, in older hospitalized adults, any opiate exposure, whether before or during hospitalization, is associated with poor outcomes, including longer stay, discharge to a skilled nursing facility, and 30-day readmission, despite similar demographic characteristics and comorbidities between groups. Participants with
exposure to opiates before hospitalization and those taking long-acting opiates were particularly vulnerable to care practices (e.g., NPO, bed rest, Foley catheters) known to trigger poor outcomes. Our study supports previous findings that opiate exposure is associated with surrogate markers of functional decline and falls.9,10

Our study is not without limitations. Data were collected in a single hospital, although this 806-bed academic center provided us with a sample size of more than 10,000 individuals cared for by more than 80 prescribing physicians during the 1-year study period. Furthermore, records were collected using electronic medical records rather than claims data. The retrospective nature of this study did not allow for assessment of adverse outcomes before admission or after discharge from the hospital. Another limitation of our study is that we did not control for covariates, but there was no difference in terms of sex, race, ethnicity, or Charlson Comorbidity Index between opiate exposure groups. Future studies should explore the full spectrum of opiate prescribing, across transitions of care.

Pain management in hospitalized older adults is a priority and a challenge for healthcare practitioners. Although the benefits of appropriately prescribing opiates under specific circumstances must be recognized, their use is clearly associated with negative outcomes. Alternative nonpharmacological approaches to pain management that the Joint Commission and CMS have recommended as a first-line approach, such as massage, relaxation techniques, and physical therapy, although more practical in outpatient settings for nonacute pain, perhaps should also be considered for inpatient pain management in the hospital setting.

CONCLUSION

This study demonstrates widespread use of opiates in hospitalized older adults on medical units. Opiate use was associated with significant negative clinical outcomes and hospital quality metrics, which is of particular concern for older adults. These troublesome findings further support the urgent need to develop innovative pain management approaches as alternatives to traditional opiate use during hospitalization and at the critical time of care transition, particularly for vulnerable hospitalized older adults.

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Conflict of Interest: The authors report no conflict of interest.

Author Contributions: Sutapa Maiti and Liron Sinvani had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Sutapa, Sinvani, Kozikowski, Patel, Pekmezaris, Wolf-Klein: Study concept and design. Sinvani: Data acquisition. Sutapa, Sinvani, Kozikowski, Smilios, Akerman, Pisano, Qiu, Patel, Pekmezaris, Wolf-Klein: Data analysis and interpretation. Sutapa, Sinvani, Kozikowski, Patel, Pekmezaris, Wolf-Klein: Drafting of manuscript. Sutapa, Sinvani, Kozikowski, Smilios, Patel, Akerman, Qiu, Pisano, K.Patel, Nouryan, Pekmezaris, Wolf-Klein: Critical revision of manuscript for important intellectual content.

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REFERENCES

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Outcome Measures by Opiate Exposure and Opiate Duration of Action

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