Title

Sex concordance between physicians and patients and discharge opioid prescribing

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Publication Date

2024-05-09

DOI

10.1002/jhm.13389

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Running Title: Sex concordance and opioid prescribing

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Manuscript Word Count: 2307 words

Disclosures and Additional Statements: Dr. Fang receives funding through the National Institutes of Health K24HL141354 award. Deidentified data is available per reasonable request. All listed authors have contributed to the manuscript substantially and have agreed to the final submitted version. The authors declare that they do not have a conflict of interest.

Abstract

Inpatient pain management is challenging for clinicians and inequities are prevalent. We examined sex concordance between physicians and patients to determine if discordance was associated with disparate opioid prescribing on hospital discharge. We examined 15,339 hospitalizations from 2013-2021. Adjusting for patient, clinical, and hospitalization-level characteristics, we calculated the odds of a patient receiving an opioid on discharge and the days of opioids prescribed, across all hospitalizations and for patients admitted with a common pain diagnosis. We did not find an overall association between physician-patient sex concordance and discharge opioid prescriptions. Compared to concordant sex pairs, patients in discordant pairs were not significantly less likely to receive an opioid prescription (OR 1.04; 95% CI 0.95, 1.15) and did not receive significantly fewer days of opioids (2.1 fewer days of opioids; 95% CI -4.4, 0.4). Better understanding relationships between physician and patient characteristics is essential to achieve more equitable prescribing.

Introduction

Inpatient pain management is a complex challenge for clinicians with significant consequences for patients and public health.[1,2] We must better understand what drives disparate opioid prescribing to balance the risk between opioid overdose, dependence, and adequate pain management. Inequities in pain management based on patient-level characteristics, like sex and gender, have been identified in some areas.[3,4] Prior work regarding pain management for general medicine inpatients focused on the patient's demographic profile, while little is known regarding physician demographic characteristics and their relationship to patient characteristics.[5,6] Concordance refers to similarity between a physician and their patient i.e. a female physician and female patient. Results from the existing literature on the impact of gender/sex concordance on patient outcomes have been varied.[5,7–12] There is limited work regarding concordance and pain management, and no previous studies examining concordance and discharge opioid prescriptions for adult general medicine inpatients. Prior research in the surgical literature demonstrate that sex discordance between surgeons and patients negatively affected outcomes following common procedures and research in emergency medicine found that provider gender was associated disparate pain medication prescribing.[5,13]

Therefore, we hypothesized that sex discordance between physicians and patients would be associated with disparate outcomes in opioid prescribing compared to sex concordant pairings. To test this hypothesis, we evaluated the association between physician and patient sex concordance and opioid prescriptions upon hospital discharge. Better understanding the relationship between physician and patient characteristics is essential to identifying pathways to more equitable prescribing practices.

Methods

This is a retrospective cohort study of all adult general medicine hospitalizations at the University of California San Francisco (UCSF) Medical Center from January 2013 through September 2021. Patient level demographics, hospitalization variables, and pain assessments were obtained from our electronic health record (EHR), Epic[14], and Clarity[15], the database that stores Epic data. Discharging hospitalist physicians were identified by having greater than 25 total patient discharges during the study period. This cut-off was selected to identify practicing hospitalists, to exclude moonlighters, and to ensure an adequate sample size of discharges per hospitalist. Hospitalizations were excluded if the patient spent time in the intensive care unit, if they were admitted to a non-medical service or non-direct care hospitalist service, if the patient received comfort focused or hospice care, and if there were any patient sex categorization other than male or female due to inconsistent classification at UCSF prior to 2020 (Supplemental Figure 1).

The primary exposures included patient/physician concordance by sex. We evaluated concordance by binary measures and by specific physician/patient sex pairs. Patient sex was derived from documented legal sex and physician sex was ascertained from the National Provider Identifier database and reviewed for completeness by the Chief of the Division of Hospital Medicine. Binary concordance was defined simply as whether the physician and patient shared their sex (concordant) or had different sexes (discordant). The specific physician/patient sex pairs were evaluated separately by male physicians and female physicians (i.e. male physicians with male patients were concordant, and male physicians with female patients were discordant). For patients and physicians, gender identity was not available.

We adjusted for the patient's race/ethnicity, age, language, year of discharge, insurance, Elixhauser Comorbidity Index, presence of cancer-related pain, prescription of opioids prior to admission, history of substance use, average self-reported pain score, and whether the pain or palliative care services were consulted.

We had two primary outcomes: 1) Odds of a patient being prescribed opioids on discharge and 2) Days of opioids prescribed on discharge, for those prescribed opioids. Discharge opioid days were calculated as the total morphine milligram equivalents (MMEs) prescribed divided by the MMEs given during the last 24 hours of the patient's hospitalization.[16]

We performed three subgroup analyses. First, we repeated the analyses for the top three most common pain-related conditions by frequency, in aggregate, on our general medicine service, which included abdominal pain, acute back pain, and pancreatitis. This subgroup was performed to analyze potential confounding by medical condition. The conditions were identified through the EHR by International Classification of Diseases (ICD)-10 code and is documented by the hospitalist on discharge (Supplemental Table 1). Second, to further address confounding for patients with an opioid prescription prior to admission, we repeated the analyses for the overall cohort for only patients without opioids prior to admission. Third, we examined duration of opioids on discharge using an alternative metric of days intended by the prescriber as opposed to our discharge metric described above (Supplemental Table 2).

All analyses were done with Stata v.18 using multivariable logistic regression for the odds of receiving an opioid prescription on discharge and multivariable negative binomial regression for days of opioids prescribed on discharge. Negative binomial regression results were reported using average marginal effects (AMEs), which describes the average difference in days of opioids prescribed on discharge between the comparison and reference groups. Cluster-robust variance by the discharging physician was used to account for clustering by provider.[17]

Results

There was a total of 11,329 patients, over 15,339 hospitalizations. (Table 1) Male patients comprised 49.3% of the cohort. There were 109 discharging hospitalist physicians with 40.4% male and 59.6% female. A total of 7,712 (50.3%) hospitalizations were sex concordant. For concordant sex pairings, 26.9% of hospitalizations ended in an opioid prescription, with the mean days of opioids at discharge at 26.6 days. For discordant sex pairings, 26.8% of hospitalizations ended in an opioid prescription, with the mean days of opioids at discharge at 25.2 days.

In adjusted analyses, patients in discordant sex pairs were not significantly less likely to receive an opioid prescription on discharge compared to concordant pairs (OR 1.04; 95% CI 0.95, 1.15). Patients in discordant sex pairs also did not receive significantly fewer days of opioids on discharge compared to concordant pairs (2.1 fewer days of opioids; 95% CI -4.4, 0.4). (Table 2) We then calculated the adjusted odds of receiving an opioid prescription on discharge by specific physician-patient sex pairs. Male patients with female physicians and female patients with male physicians had no significant differences in odds of receiving opioids on discharge or days prescribed on discharge compared to concordant pairs.

In the adjusted models of the overall cohort, there were several significant associations between opioid prescription and other covariates. Most significantly, patients with opioid prescriptions prior to admission (OR 4.40; 95% CI 4.00, 4.86), a cancer related pain diagnosis (OR 3.68; 95% CI 2.95, 4.59), and with higher pain scores (0-10 scale) (OR 1.68; 95% CI 1.64, 1.73) had higher odds of receiving a discharge prescription. Patients with substance use disorders (OR 0.64; 95% CI 0.52, 0.79) and generally each progressive year from 2013 onwards were associated with lower odds of opioids on discharge. For the adjusted days of opioids on discharge, patients with opioid prescriptions prior to admission (18.3 days; 95% CI 14.2, 22.4) received more days of opioids. Patients with higher pain scores (-4.9 days, 95% CI -5.9, - 3.8) received fewer days (Supplemental Table 3).

For the first subgroup analysis of patients admitted with pain-related diagnoses, we did not find any significant differences in the odds of receiving an opioid on discharge or the duration of opioids prescribed between overall sex concordant and discordant pairs. For the specific physician-patient pair of a female patient with a male physician, female patients received

significantly more opioids compared to male patients (3.6 more days, 95% CI 0.6, 6.7). For the second subgroup analysis examining patients naïve to opioids (without a prior to admission opioid prescription), we did not find any significant differences for discordant sex pairs or by specific physician-patient sex pairs. For the third subgroup analysis examining duration of opioid prescription on discharge using days intended by the prescriber, we did not find significant differences by discordant sex pairs or by specific physician-patient sex pairs. (Supplemental Table 4)

Discussion

In this study of discharge opioid prescribing from a general medicine service, we overall did not find a significant association between physician-patient sex concordance and opioid prescriptions, controlling for demographic, patient, and hospitalization level factors. For the specific physician-patient pairs (female patient with male physicians) in the pain diagnosis subgroup, female patients received longer durations of opioids compared with male patients. Other variables in our models were strongly associated with opioid prescription and duration on discharge including previous opioid prescriptions, cancer related pain, and pain score.

Our findings are novel as the topic of concordance has not been studied in the context of opioid prescriptions after a general medicine hospitalization. There is some evidence that physicians may underassess female patient's pain,[18] females report higher postoperative pain,[3] female patients are less likely to report higher levels of pain to male providers,[19] and that female providers may be more likely to prescribe psychosocial treatments for pain for female patients than for male patients.[12] With regards to sex discordance, prior studies have found differences in post-surgical outcomes[5] and mortality after myocardial infarction,[20] where female patients with male physicians had worse outcomes. A study of emergency medicine patients, found that male providers were more likely to prescribe opioids to male patients, and female providers were more likely to prescribe opioids to female patients.[13] Concordance has generally been associated with positive outcomes, including better reported communication, patient satisfaction, higher rates of cancer screening and referral to palliative care at end-of-life.[8–11,21] These studies, albeit in other settings, informed our hypothesis that sex discordance would be associated with disparate opioid prescribing.

Why then did we find no association between sex concordance and prescribing in our main analysis? First, prior concordance studies focused on outpatients, which is distinct from the inpatient study setting. The discharging inpatient physician may have only taken care of the patient for one day and not had time to develop a longitudinal relationship with the patient. We can only speculate on how the duration of a physician-patient relationship and concordance impacts decision-making, but this is an area needing further investigation. Second, the measured outcome in this study of opioid prescriptions is different than outcomes previously analyzed in outpatient settings. Patient satisfaction, cancer screening, and medication adherence are all based on patient autonomy. The decision to prescribe opioids, while multifactorial, is controlled more by the discharging physician than other health decisions. Third, specifically for the pain-related hospitalizations, our sample may have been underpowered to detect a difference.

There were other significant findings from this study that merit discussion. First, we found that patients on opioids prior to admission had increased odds of receiving opioids on discharge. This may be due to the patients running out of opioids prior to admission and prompting a hospital presentation or that they may have had higher pain management needs related to their hospitalization. Patients with existing opioid prescriptions prior to admission represent potential confounding. Notably, our subgroup analysis examining opioid naïve patients found similar results to the overall analysis. Second, we also found that, overall, female patients received more days of opioids on discharge compared to male patients. While this did not reach statistical significance in both the overall and top 3 pain-related diagnoses models, this may have been due to insufficient statistical power and merits further study. Indeed, for the specific pairing of female

patients with male physicians for a pain related diagnosis, female patients received longer durations of opioids compared to male patients. Third, we found that higher patient reported pain scores were inversely related to the number of days of opioids prescribed on discharge. While speculative, this result may be due to patients not responding effectively to opioid therapy, being prescribed non-opioid medications to treat their higher levels of pain while admitted (i.e. ketamine), or potentially already having filled opioid prescriptions at home, and therefore not requiring a new prescription on discharge.

There are several limitations in this analysis. First, there are likely unmeasured confounders that influence opioid prescription on discharge, including follow-up care, physician level factors like years of experience, physician race/ethnicity, and training history, language concordance, and the use of medical interpreters. We were also unable to identify patients with chronic pain diagnoses prior to admission or the exact indication for every admission. We attempted to address this through our subgroup analyses. Second, our findings are institutionally specific and more recent efforts to center equity in clinical care and pain management may have influenced prescribing decisions. Third, we used biologic sex and not self-identified gender. Fourth, we note that this study encompassed 10 years, during which there has been a significant change in national opioid prescribing practices. This may have masked some of the more subtle changes in prescribing practices. Notably, we did find that each year since 2013 was associated with fewer odds of opioids prescribed on discharge.

Nevertheless, this is the first study to examine sex concordance and discharge opioid prescriptions after hospitalization on a general medicine service. These findings are relevant to hospitalists broadly. Our cohort of patients is a very diverse and generalizable group. Future studies will be necessary to further examine the association between race, ethnic, and language concordance, and physician experience and personal preferences with opioid prescribing.

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Table 1: Baseline Patient and Physician Characteristics

Patient Characteristic	No. patients (%) (N= 11,329)
Age, y	
Mean (SD); Median (IQR)	62.0 (19.4); 64 (48-77)
Sex	
Male	5,587(49.3%)
Female	5,742 (50.7%)
Race/Ethnicity	
White	5,329 (47.0%)
Black	1,471 (13.0%)
Asian	2,469 (21.8%)
Latino	1,301 (11.5%)
Multiracial	232 (2.1%)
Native Hawaiian or Pacific Islander	99 (0.9%)
Other	279 (2.5%)
Unknown/Declined	103 (0.9%)
Limited English Proficiency	1,888 (16.7%)
Average Pain Score[a]	
Mean (SD), Median (IQR)	2.2 (2.2); 1.4 (0.2-3.7)
Average inpatient opioids (MME)	
Mean (SD), Median (IQR)	43.7 (132.1); 1 (0-28)
Elixhauser mortality score, mean (SD)	7.9 (10.4)
Cancer related pain (yes)	466 (4.1%)
Opioids on admission (yes)	4,262 (37.6%)
History of substance use disorder[b] (yes)	910 (8.0%)
Pain or palliative care consult (yes)	567 (5.0%)
Insurance	
Medicare	6,042 (53.3%)
Medi-Cal	2,597 (22.9%)
Private/Self-Pay/Other	2,690 (23.7%)
Physician Characteristic	No. physicians (%) (N= 109)
Average discharges per provider	
Mean (SD); Median (IQR)	141 (122); 103 (48-181)
Sex	
Male	44 (40.4%)
Female	65 (59.6%)

[a] the pain score range is between 0-10

[b] i.e. alcohol use disorder, opioid use disorder, stimulant use disorder

Table 2: Adjusted regression results for the overall cohort and subgroup 1

Group	Odds of opioids on discharge (95% CI)	p-value	No (#) of hospitalizations In analysis	Days of Opioids on discharge (95% CI)	p-value	No (#) of hospitalizations In analysis
Overall Cohort						
Overall Discordant Sex	1.04 (0.95-1.15)	0.378	15,339	-2.1 (-4.5 – 0.4)	0.110	4,121
Male patient with female physician*	1.03 (0.92-1.15)	0.566	10,012	-2.5 (-5.1 – 0.5)	0.055	2,695
Female patient with male physician*	1.06 (0.89-1.26)	0.548	5,327	0.2 (-4.4 – 4.7)	0.940	1,426
Subgroup 1: Top 3 Pain Related Diagnoses						
Overall Discordant Sex	0.95 (0.65-1.40)	0.809	560	-3.1 (-6.8 - 0.6)	0.100	311
Male patient with female physician	1.13 (0.70-1.81)	0.620	354	-4.0 (-9.0 – 1.0)	0.116	206
Female patient with male physician	0.81 (0.36-1.86)	0.624	206	3.6 (0.6 – 6.7)	0.020	105

*For specific physician-patient sex pairings, the comparison is to discordant patient sex. For example, male patient with female physician is compared to female patient with female physician.

Supplemental Table 1: ICD-10 codes associated with Top 3 pain related diagnoses

Top 3 Pain Related Diagnoses		
Abdominal Pain	Abdominal pain (844)	R10.9
	Chronic abdominal pain (34)	R10.9, G89.29
	RUQ abdominal pain (16)	R10.11
	Acute abdominal pain (15)	R10.9
	Abdominal pain, acute (13)	R10.9
	Epigastric abdominal pain (13)	R10.13
	Abdominal pain, epigastric (12)	R10.13
	Functional abdominal pain syndrome (12)	R10.9
	RUQ pain (10)	R10.11
	Generalized abdominal pain (9)	R10.84
	Intractable abdominal pain (9)	R10.9
	Abdominal pain, other specified site (7)	R10.9
	Rectal pain (7)	K62.89
	Abdominal pain, acute, epigastric (5)	R10.13
Acute Back Pain	Back pain (136)	M54.9
	Low back pain (31)	M54.50
	Acute back pain (7)	M54.9
	Lower back pain (6)	M54.50
	Back pain of thoracolumbar region (5)	M54.50, M54.6
	Intractable back pain (5)	M54.9
Pancreatitis	Pancreatitis (274)	K85.90
	Chronic pancreatitis (178)	K86.1
	Acute pancreatitis (95)	K85.90
	Pancreatitis, acute (24)	K85.90
	Acute on chronic pancreatitis (20)	K85.90, K86.1
	Gallstone pancreatitis (20)	K85.10
	Pancreatitis, chronic (19)	K86.1
	Pancreatitis, recurrent (16)	K85.90
	Idiopathic chronic pancreatitis (13)	K86.1
	Other chronic pancreatitis (11)	K86.1
	Necrotizing pancreatitis (10)	K85.91
	Acute gallstone pancreatitis (9)	K85.10
	Recurrent pancreatitis (9)	K85.90
	Acute alcoholic pancreatitis (8)	K85.20
	Pancreatitis, unspecified pancreatitis type (8)	K85.90 K86.1
	Chronic recurrent pancreatitis (7)	K85.20
	Alcoholic pancreatitis (6)	K85.20
	Pancreatitis, alcoholic, acute (6)	K85.10
	Acute biliary pancreatitis without infection or necrosis (5)	K85.90, K83.1
	Pancreatitis due to biliary obstruction (5)	K85.91
	Pancreatitis, necrotizing (5)	

Supplemental Table 2: Definitions for Key Data Elements

Variable	Definition/Description
Discharging hospitalist sex	Identified by the publicly available National Provider Identifier database and confirmed by study authors based on internal review.
Cancer related pain	G89.3 ICD-10 code was used to identify cancer related pain if identified in both the billed ICDs and Problem List.
History of substance use disorders	Identified using Clinical Classification Software (CCS) categories which group ICD-10 codes. The CCS codes utilized were MBD017, MBD025, MBD034, SYM008, SYM009, and EXT028.
Opioid use prior to admission	Identified from the admission medication reconciliation which is usually performed by the admitting hospitalist. It can also be completed by a pharmacist or pharmacy tech.
Average self-reported pain score	Self-reported pain comes from the nurse-assessed, patient-reported pain assessments performed on admission, after unit transfers, before, during, and after procedures, at routine vital sign checks, and prior to and after analgesic administration. These are performed multiple times per day for each patient. Pain was assessed using patient-reported scales-- the Numeric Rating Scale, Verbal Descriptor Scale, or the FACES Pain Scale-Revised. For each patient hospitalization, average pain assessment score was calculated as the mean of all scores across the hospitalization. Scores using the Numeric Rating Scale or the FACES Pain Scale-Revised are reported on a scale of 0 to 10, with higher numbers indicating worse pain. Results from the Verbal Descriptor Scale, which report pain as “none”, “mild”, “moderate” or “severe”, were converted to the 0 to 10 scale: “none” – 0; “mild” – 2.5; “moderate” – 5.5; “severe” – 8.5.
Opioids prescribed at discharge -based on last 24 hrs (primary outcome) -intended duration (subgroup outcome 3)	The primary outcome was new opioids prescribed as the total morphine milligram equivalents (MMEs) divided by the MMEs given during the last 24 hours of the patient’s hospitalization. This was calculated using inpatient medication admission record data from Clarity and the discharge medication list. The subgroup outcome of intended opioid days similarly uses the discharge medication list. Intended duration or days of dosage is calculated by the number of pills prescribed and the dosage/frequency (i.e. if 21 pills are prescribed with q8 hour dosing, it would be 7 days).

Supplemental Table 3: Overall regression results for all variables

Variable	Odds of opioids on discharge (95% CI)	p-value	Days of Opioids on discharge (95% CI)	p-value
Sex discordance	1.04 (0.95-1.15)	0.378	-2.09 (-4.54-0.36)	0.095
Patient Race/Ethnicity (base is White)				
American Indian/Alaska Native	0.78 (0.30-2.05)	0.620	9.94 (-13.92-33.81)	0.414
Asian	0.94 (0.80-1.10)	0.433	3.97 (-0.76-8.70)	0.100
African American	1.00 (0.85-1.17)	0.960	3.31 (0.46-6.16)	0.023
Latino	1.02 (0.88-1.18)	0.803	3.94 (-0.69-8.56)	0.095
Multiracial	1.06 (0.75-1.52)	0.739	10.55 (-8.68-29.78)	0.282
Native Hawaiian/Pacific Islander	0.95 (0.53-1.69)	0.850	12.31 (-10.61-35.23)	0.292
Other	0.74 (0.53-1.02)	0.068	5.80 (-1.24-12.83)	0.106
Unknown	0.65 (0.33-1.28)	0.212	4.11 (-10.68-18.91)	0.586
Limited English Proficiency	1.04 (0.89-1.21)	0.654	2.19 (-2.70-7.07)	0.381
Age	1.00 (1.00-1.00)	0.891	0.24 (0.15-0.34)	<0.001
Average Pain Score	1.68 (1.64-1.73)	<0.001	-4.88 (-5.93-3.83)	<0.001
Elixhauser Comorbidity Score	1.02 (1.01-1.02)	<0.001	0.90 (-0.03-0.22)	0.166
Cancer Pain	3.68 (2.95-4.59)	<0.001	3.31 (-0.02-6.65)	0.051
Opioids on Admission	4.40 (4.00-4.86)	<0.001	18.29 (14.20-22.38)	<0.001
Inpatient Opioids MME/day	1.00 (1.00-1.00)	<0.001	0.0007 (-0.002-0.003)	0.593
Substance Use Disorder	0.64 (0.52-0.79)	<0.001	-2.36 (-8.96-4.23)	0.482
Pain or palliative care consult	1.01 (0.81-1.26)	0.928	2.95 (0.003-5.90)	0.05
Insurance (base is Medicaid)				
Medicare	1.05 (0.92-1.20)	0.476	-0.41 (-4.17-3.35)	0.831
Private	1.37 (1.18-1.58)	<0.001	-0.65 (-4.56-3.26)	0.744
Year of Study (base 2013)				
2014	0.86 (0.69-1.07)	0.168	3.74 (-2.05-9.53)	0.206
2015	0.93 (0.72-1.20)	0.571	-0.70 (-5.91-4.50)	0.791
2016	0.73 (0.59-0.90)	0.003	2.95 (-5.24-11.14)	0.480
2017	0.66 (0.53-0.83)	<0.001	-3.47 (-8.56-1.66)	0.185
2018	0.58 (0.47-0.72)	<0.001	-2.39 (-8.19-3.41)	0.419
2019	0.48 (0.39-0.60)	<0.001	-3.34 (-8.15-1.46)	0.173
2020	0.51 (0.41-0.62)	<0.001	-2.49 (-7.59-2.60)	0.338
2021	0.50 (0.40-0.62)	<0.001	-5.43 (-10.75- -0.11)	0.046

Supplemental Table 4: Additional subgroup results for opioid naïve patients and opioids on discharge as intended prescription duration

Group	Odds of opioids on discharge (95% CI)	p-value	No (#) of hospitalizations In analysis	Days of Opioids on discharge (95% CI)	p-value	No (#) of hospitalizations In analysis
Subgroup 2: Patients not prescribed opioids prior to admission only						
Overall Discordant Sex	1.07 (0.91-1.27)	0.405	8,948	-1.3 (-3.5-0.9)	0.262	907
Male patient with female physician	1.00 (0.82-1.23)	0.963	5,796	-2.1 (-5.3-1.1)	0.207	592
Female patient with male physician	1.17 (0.81-1.70)	0.394	3,152	1.5 (-1.3-4.2)	0.291	315
Subgroup 3: Overall Cohort with intended days prescribed as outcome						
Overall Discordant Sex	N/A			-0.6 (-1.5-0.2)	0.135	5,353
Male patient with female physician				-0.8 (-2.0-0.3)	0.167	3,524
Female patient with male physician				0.5 (1.3-1.4)	0.944	1,829

Supplemental Figure 1: Consort diagram for hospitalizations included in analysis