Journal of Hospital Medicine®

www.journalofhospitalmedicine.com

APRIL 2018 NO. 4 VOL. 13

An Official Publication of the Society of Hospital Medicine

shm Society of Hospital Medicine

Journal of Hospital Medicine Volume 13, Number 4, April 2018 Pages 217–292

Journal of
Hospital Medicine

New Editor-in-Chief Search Announced

The Position

Lead the authoritative peer-reviewed journal for hospitalists that promotes leadership in patient care and health system change.

Timeline

Applications due: *June 1, 2018.*
Applicant reviews and interviews: *June 15 - August 31, 2018.*

Term

*January 1, 2019 - December 31, 2024**

For a full job description, requirements and to apply, please visit **hospitalmedicine.org/editor2018**

*Please note: Some duties of the new editor will begin during a transition period starting October 1, 2018.

journalofhospitalmedicine.org

shm
Society of Hospital Medicine

Journal of Hospital Medicine®

Journal of Hospital Medicine®

Publisher: The Journal of Hospital Medicine (Print ISSN 1553-5592; E-ISSN 1553-5606) is published monthly for the Society of Hospital Medicine by Frontline Medical Communications, with business offices at 7 Century Drive, Suite 302, Parsippany, NJ 07054-4609, telephone 973-206-3434, fax 973-206-9378. Periodicals postage paid at Parsippany, NJ and at additional mailing offices.

Postmaster: Send address changes to Journal of Hospital Medicine, Subscription Service, 151 Fairchild Ave, Suite 2, Plainview, NY 11803-1709.

Reprints: For article reprint requests in the United States and Canada, please contact Wright's Media, toll free: (877) 652-5295; frontline@wrightsmedia.com. For those outside the US/Canada, contact Ray Thibodeau, Content Ed Net, at (267) 895-1758; ray.thibodeau@contentednet.com.

Subscriptions: Individual, USA: $406.00 p.a.; institution, USA: $845.00 p.a.; student, resident, intern, USA: $118.00; $35.00 per copy, USA. Individual, Canada/Mexico: $438.00 p.a.; institution, Canada/Mexico: $925.00 p.a.; $47.00 per copy, Canada/Mexico. Individual, all other nations: $739.00 (surface mail), $950.00 (air mail); institution, all other nations: $925.00; $59.00 per copy, all other nations. For back issues, call (800) 480-4851 to charge to your credit card. Written requests will be accepted and must be accompanied by check or money order. Send payment and request to Journal of Hospital Medicine, Subscription Service, 151 Fairchild Ave, Suite 2, Plainview, NY 11803-1709.

For subscriptions, please call (800) 480-4851, Journal of Hospital Medicine, Subscription Service, 151 Fairchild Ave, Suite 2, Plainview, NY 11803-1709 or e-mail frontline@emscirc.com.

All claims for replacement of missing copies of Journal of Hospital Medicine, without charge, must be made within 3 months of date of missing issue requested. Otherwise, cost of replacement is $47.00 USA, $59.00 Canada/Mexico, $71.00 Other per copy. Produced in the USA.

WEBSITE
www.journalofhospitalmedicine.com

EDITORIAL STAFF

Managing Editor
Susan D. Hite
(240) 221-2471
susanhite@mdedge.com

ART

Creative Director
Mary Ellen Niatas

Art Director
John J. DeNapoli

PRODUCTION AND MANUFACTURING

Production Manager
Mike Wendt
(973) 206-8010
mwendt@mdedge.com

CIRCULATION

Subscription Service:
(800) 480-4851
frontline@emscirc.com

PUBLISHING STAFF

Publisher
Mark Branca
(973) 290-8246
mbranca@mdedge.com

Director, Business Development
Angela Labrozzi, MBA
(973) 206-8971
Cell (917) 455-6071
alabrozzi@mdedge.com

Classified Sales
Linda Wilson
(973) 290-8243
lwilson@mdedge.com
Heather Gonroski
(973) 290-8259
hgentile@mdedge.com

Accounts Receivable
Joan Friedman
(973) 290-8211
jfriedman@mdedge.com

Journal of Hospital Medicine®

shm Society of Hospital Medicine
Empowering hospitalists. Transforming patient care.

TABLE OF CONTENTS

Volume 13 | Number 4 | April 2018

ORIGINAL RESEARCH

BRIEF REPORT

REVIEWS

CONSENSUS STATEMENT

CHOOSING WISELY®: NEXT STEPS IN IMPROVING HEALTHCARE VALUE

CHOOSING WISELY®: THINGS WE DO FOR NO REASON

Continued >

CLINICAL CARE CONUNDRUM

EDITORIALS

Implementation of a Process for Initiating Naltrexone in Patients Hospitalized for Alcohol Detoxification or Withdrawal

John R. Stephens, MD[1]*, Carlton Moore, MD[1], Kelly V. Stepanek, ANP[1], James C. Garbutt, MD[2], Britta Starke, CCS[2], Allen Liles, MD[1], Daniel E. Jonas, MD, MPH[3]

[1]Department of Medicine, Division of Hospital Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina; [2]Department of Psychiatry, University of North Carolina School of Medicine, Chapel Hill, North Carolina; [3]Department of Medicine, Division of General Medicine and Clinical Epidemiology, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

BACKGROUND: Naltrexone trials have demonstrated improved outcomes for patients with alcohol use disorders. Hospital initiation of naltrexone has had limited study.

OBJECTIVES: To describe the implementation and impact of a process for counseling hospitalized patients with alcohol withdrawal about naltrexone.

DESIGN: A pre-post study analysis.

SETTING: A tertiary academic center.

PATIENTS: Patients hospitalized for alcohol withdrawal.

INTERVENTIONS: (1) Provider education about the efficacy and contraindications of naltrexone and (2) algorithms for evaluating patients for naltrexone.

MEASUREMENTS: The percentages of patients counseled about and prescribed naltrexone before discharge and the percentages of pre- and postintervention patients with 30-day emergency department (ED) revisits and rehospitalizations.

RESULTS: We identified 128 patient encounters before and 114 after implementation. The percentage of patients counseled about naltrexone rose from 1.6% preimplementation to 63.2% postimplementation ($P<.001$); the percentage of patients prescribed naltrexone rose from 1.6% to 28.1% ($P<.001$). Comparing preintervention versus postintervention groups, there were no unadjusted differences in 30-day ED revisits (25.8% vs 19.3%; $P=.23$) or rehospitalizations (10.2% vs 11.4%; $P=.75$). When adjusted for demographics and comorbidities, postintervention patients had lower odds of 30-day ED revisits (odds ratio [OR]=0.47; 95% confidence interval [CI], 0.24-0.94) but no significant difference in rehospitalizations (OR=0.76; 95% CI, 0.30-1.92). In subgroup analysis, postintervention patients counseled versus those not counseled about naltrexone were less likely to have 30-day ED revisits (9.7% vs 35.7%; $P=.001$) and rehospitalizations (2.8% vs 26.2%; $P<.001$).

CONCLUSIONS: The implementation of a process for counseling patients hospitalized for alcohol withdrawal about using naltrexone for the maintenance of sobriety was associated with lower 30-day ED revisits but no statistically significant difference in rehospitalizations. *Journal of Hospital Medicine* 2018;13:221-228. © 2018 Society of Hospital Medicine

Alcohol use disorders (AUDs) are common, with an estimated lifetime prevalence of 17.8% for alcohol dependence.[1] Alcohol misuse is costly, accounting for $24.6 billion in annual healthcare expenditures, including $5.1 billion for alcohol-related hospitalizations.[2] A number of trials have demonstrated that naltrexone can help patients with AUDs maintain abstinence or diminish heavy drinking.[3-10] A recent meta-analysis of pharmacotherapy trials for patients with AUDs reported that for patients using 50 mg of naltrexone daily, the number needed to treat was 12 to prevent a return to heavy drinking and 20 to prevent a return to any drinking.[11] Despite good evidence for its effectiveness, naltrexone is not prescribed to the majority of patients with AUDs. In a study of veterans with AUDs cared for in the Veterans Affairs health system, only 1.9% of patients were prescribed naltrexone over the 6-month study period.[12] A 2003 survey of 2 professional organizations for addiction treatment specialists reported that a mean of 13% of providers prescribed naltrexone to their patients.[13]

When naltrexone is prescribed, it is most frequently in the outpatient setting.[3-10] Data for initiation of naltrexone in the inpatient setting are more limited. Wei et al.[14] reported on the implementation of a discharge protocol, including counseling about naltrexone, for hospitalized patients with AUDs at an urban academic medical center. They reported a significant increase in the prescription of naltrexone to eligible patients by the time of discharge that was associated with a significant decrease in 30-day readmissions. Initiation of naltrexone in the inpatient versus the outpatient setting has some potential advantages. First, patients hospitalized for alcohol withdrawal have AUDs, obviating the need for screen-

***Address for correspondence:** John R. Stephens, MD, UNC Hospitals, Division of Hospital Medicine, 101 Manning Drive, CB#7085, Chapel Hill, NC 27599-7085; Telephone: 984-974-1931; Fax: 984-974-2216; E-mail: stephenj@med.unc.edu

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

Published online first January 24, 2018.

Received: May 20, 2017; **Revised**: September 20, 2017;

Accepted: September 25, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2900

TABLE 1. **Patient Characteristics, Process and Outcome Measures Overall, and Pre- Versus Postintervention**

Study Variable	Overall (n = 242)	Preintervention (n = 128)	Intervention (n = 114)	*P* Value
Age, years (SD)	45.9 (11.5)	45.2 (11.6)	46.7 (11.5)	.30
Female, %	28.5	28.1	29.0	.89
Race, %				
White	83.1	83.6	82.5	.81
Black	8.7	7.8	9.7	.61
Asian	1.2	0.8	1.8	.60
Other	7.0	7.8	6.1	.61
Insurance, %				
Private	23.3	20.3	28.1	.20
Medicare	11.4	11.7	11.0	.87
Medicaid	17.6	18.0	17.1	.87
Self-pay	47.6	50.0	43.9	.39
Length of stay, days (SD)	3.3 (2.6)	3.3 (3.0)	3.4 (2.1)	.89
Comorbidities, %				
Hypertension	25.2	18.0	33.3	**.006**
Anxiety/PTSD	15.7	7.8	24.6	**<.001**
Depression	12.4	6.3	19.3	**.002**
Cirrhosis	8.3	6.3	10.5	.23
Diabetes	5.0	2.3	7.9	.07
Congestive heart failure	2.1	2.3	1.8	1.00
Study outcomes, %				
Naltrexone counseling	30.6	1.6	63.2	**<.001**
Naltrexone prescribed	14.1	1.6	28.1	**<.001**
Naltrexone prescription filled	10.3	0.8	21.1	**<.001**
ED revisit within 30 days	22.7	25.8	19.3	.23
Rehospitalization within 30 days	10.7	10.2	11.4	.75

NOTE: Abbreviations: ED, emergency department; PTSD, posttraumatic stress disorder; SD, standard deviation. Statistically significant *P* values are in bold.

ing. Second, the outpatient trials of naltrexone typically required 3 days of sobriety before initiation, which is generally achieved during hospitalization for detoxification or withdrawal.

Previous work at our institution centered on standardizing the process of evaluating patients needing alcohol detoxification at the time of referral for admission.[15] The use of a standardized protocol reduced the number of inpatient admissions for alcohol-related diagnoses but had no effect on the 30-day readmission rate (28%) for those patients who were hospitalized. Our hospitalist group had no standardized process for discharging hospitalized patients with AUDs, and the discharge process rarely included counseling on medications for maintenance of sobriety. In this manuscript, we describe the implementation and impact of a process for counseling patients hospitalized for alcohol detoxification or withdrawal about naltrexone for maintenance of sobriety by the time of hospital discharge.

METHODS

Study Setting

The University of North Carolina (UNC) Hospitals is an 803-bed tertiary academic center. UNC Hospital Medicine is staffed by 29 physicians and 3 advanced practice providers (APPs). During the study period, there were 3 hospital medicine services at UNC Hospitals with a combined average daily census of approximately 40 patients, and each service was staffed by one attending physician every day of the week and one APP Monday through Friday.

Study Design

We used a pre-post study design, in which we implemented a new process for standardizing the discharge of hospitalized patients with AUDs, including a process for counseling about naltrexone by the time of discharge. We sought and received institutional review board (IRB) approval for this study (UNC IRB 15-1441).

Interventions

We formed an improvement team that included 3 physicians and an APP in hospital medicine, a general internist and a psychiatrist, both with expertise in the use of medications for

TABLE 2. **Subgroup Analysis, Postintervention Patient Characteristics and Outcome Measures, Comparing Those Not Counseled Versus Counseled about Naltrexone before Discharge**

Study Variable	Not Counseled (n = 42)	Counseled (n = 72)	*P* Value
Age, years (SD)	47.5 (12.0)	46.3 (11.3)	.57
Female, %	21.4	33.3	.18
Race, %			
White	76.2	86.1	.18
Black	11.9	8.3	.53
Asian	4.8	0.0	.06
Other	7.1	5.6	.73
Insurance, %			
Private	28.6	23.6	.58
Medicare	16.7	9.7	.28
Medicaid	16.7	15.3	.84
Self-pay	38.1	51.4	.17
Length of stay, days (SD)	3.4 (2.5)	3.3 (1.9)	.86
Comorbidities, %			
Hypertension	35.7	31.9	.68
Anxiety/PTSD	28.6	22.2	.45
Depression	28.6	13.9	.06
Cirrhosis	14.3	8.3	.32
Diabetes	9.5	6.9	.72
Congestive heart failure	2.4	1.4	1.00
Study outcomes, %			
ED revisit within 30 days	**35.7**	**9.7**	**.001**
Rehospitalization within 30 days	**26.2**	**2.8**	**<.001**

NOTE: Abbreviations: ED, emergency department; PTSD, posttraumatic stress disorder; SD, standard deviation. Statistically significant *P* values are in bold.

maintenance of sobriety, the director of UNC's Alcohol and Substance Abuse Program, and 2 case managers. The team developed a number of interventions, including group education, a process for patient identification, and algorithms for counseling about, prescribing, and documenting the discussion of naltrexone.

Group Education

We presented evidence about medications for the maintenance of sobriety at a regularly scheduled hospitalist meeting. An hour-long session on motivational interviewing techniques was also presented at a separate meeting. All created algorithms were circulated to the group electronically and posted at workstations in the hospitalist work area. As data were generated postimplementation, control charts of process measures were created, posted in the hospitalist work area, and presented at subsequent group meetings.

Identification of Patients

We focused our interventions on patients admitted for alcohol detoxification or withdrawal (including withdrawal seizures). We asked our group to preferentially admit these patients to 1 of our 3 hospitalists services, on which the service APP (K.S.) was also an improvement team member.

Creation of Algorithms and Scripts for Counseling

We created a simple algorithm for evaluating patients for naltrexone. We recommended that all patients admitted for alcohol detoxification or withdrawal be counseled about naltrexone for the maintenance of sobriety before discharge. The contraindications to naltrexone we included were (1) concurrent opioid use, (2) documented cirrhosis, and/or (3) liver function tests greater than 3 times the upper limit of normal by the time of hospital discharge.

We also created a suggested script for motivational interviewing (supplemental Appendix 1). This was presented at a group meeting and circulated via e-mail. The actual counseling technique and process was left up to individual providers. In practice, counseling took place in the course of daily rounds, generally the day before or day of hospital discharge.

Prescription of Medication

For interested patients without contraindications, we recommended a prescription of naltrexone at 50 mg daily for 3

TABLE 3. **Subgroup Analysis, Postintervention Patient Characteristics and Outcome Measures, Comparing Those Not Prescribed Versus Prescribed Naltrexone before Discharge**

Study Variable	Not Prescribed (n = 82)	Prescribed (n = 32)	*P* Value
Age, years (SD)	47.1 (11.0)	45.9 (12.9)	.64
Female, %	28.0	31.3	.74
Race, %			
White	82.9	81.3	.83
Black	8.5	12.5	.52
Asian	2.4	0.0	.37
Other	6.1	6.3	.98
Insurance, %			
Private	24.4	28.1	.68
Medicare	13.4	9.4	.56
Medicaid	18.3	9.4	.24
Self-pay	43.9	53.1	.38
Length of stay, days (SD)	3.4 (2.2)	3.3 (1.8)	.81
Comorbidities, %			
Hypertension	36.6	25.0	.24
Anxiety/PTSD	28.1	15.6	.23
Depression	22.0	12.5	.30
Cirrhosis	12.2	6.3	.51
Diabetes	8.5	6.3	1.00
Congestive heart failure	2.4	0.0	1.00
Study outcomes, %			
ED revisit within 30 days	22.0	12.5	.25
Rehospitalization within 30 days	13.4	6.3	.28

NOTE: Abbreviations: ED, emergency department; PTSD, posttraumatic stress disorder; SD, standard deviation.

months. For patients prescribed naltrexone without medical insurance (n = 17), we utilized our existing pharmacy assistance program, whereby discharging patients can obtain an initial 14-day supply after applying to the program and then can fill subsequent prescriptions if they meet program financial requirements.

Follow-up Appointments

For patients with established outpatient providers, we asked patients to schedule follow-up appointments within a month of discharge. Patients prescribed naltrexone without primary providers (n = 16) were eligible for an existing program, the UNC Transitions Program, whereby patients identified as having moderate-to-high risk of hospital readmission can receive a follow-up appointment at UNC Internal Medicine or UNC Family Medicine within 2 weeks of discharge.

Creation of "Smart Phrases"

To aid in documentation, we created "smart phrases" (easily accessed, previously created phrases that can be adopted by all users) within the hospital electronic health record. We created one smart phrase for documentation of counseling about naltrexone, which included dropdown menus for contraindications and the patient's preference and one for discharge instructions for patients started on naltrexone (supplemental Appendix 2).

Implementation

After the presentation of suggested interventions in July 2015 and the subsequent dissemination of educational materials, we implemented our new process on August 1, 2015.

Data Collection

Patients were identified for inclusion in the study analysis by querying UNC Hospitals' billing database for the inpatient diagnosis codes (diagnosis-related groupings) 896 and 897, "alcohol/drug abuse or dependence without rehabilitation therapy," with and without major comorbidity or complication, respectively, and with hospital medicine as the discharging service. All encounters were then manually reviewed by 2 investigators (J.S. and C.M.). Encounters were included if the history and physical indicated that the primary reason for admission was alcohol detoxification or withdrawal. Encounters with other primary reasons for admission (eg, pancreatitis, gastro-

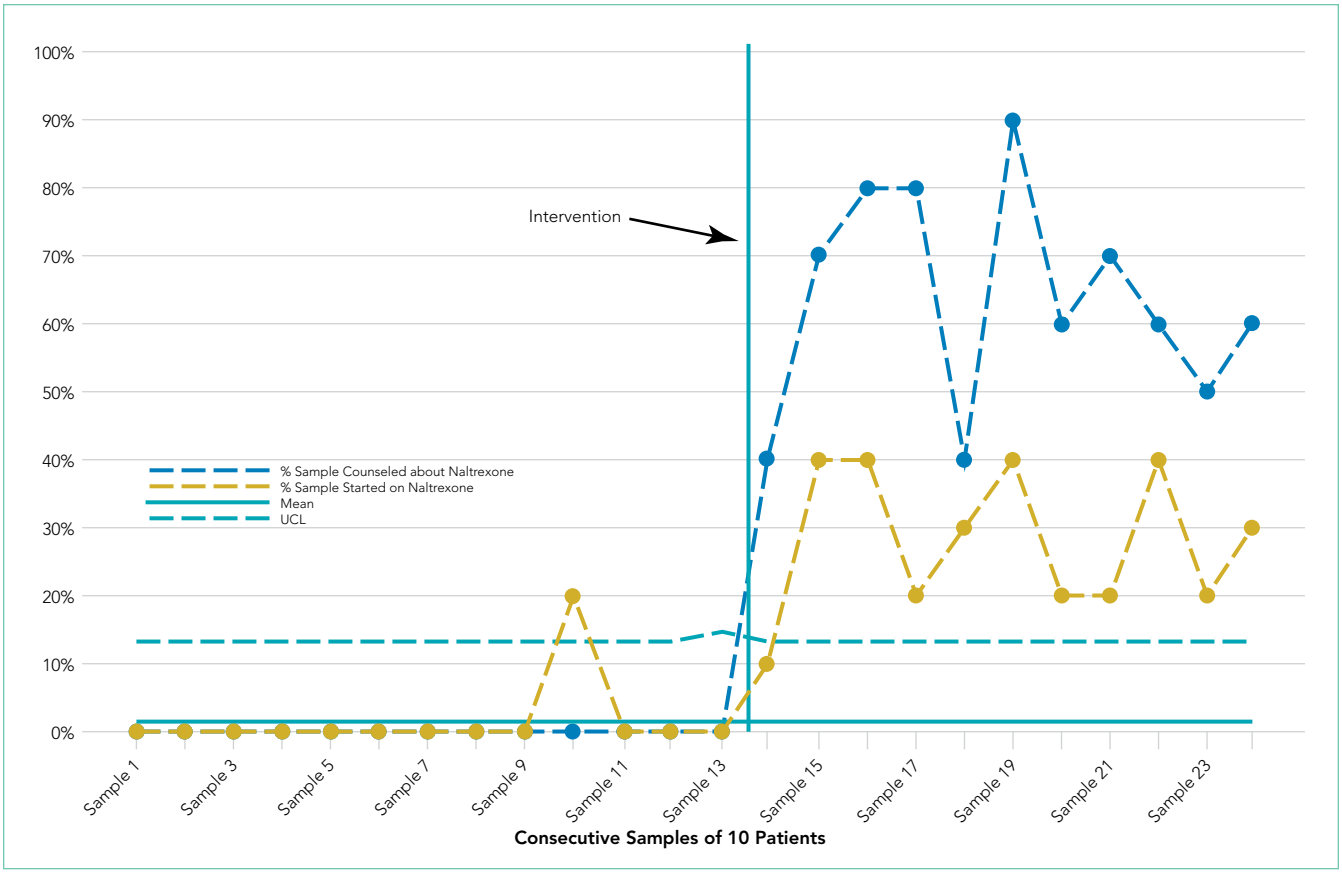

FIG. Percentages of consecutive samples of 10 patients hospitalized for alcohol withdrawal or detoxification counseled about and started on naltrexone for maintenance of sobriety by the time of discharge. The mean values were calculated by averaging the results of the preintervention samples. The UCL was calculated according to standard rules for control charts, utilizing the mean and n value for each sample. Lower control limits were also calculated, but were less than 0 for all samples and are not displayed. Values above the UCL meet criteria for special cause variation, meaning they are unlikely to have occurred because of normal variation or chance alone.[16] NOTE: Abbreviation: UCL, upper control limit.

intestinal bleeding) were excluded. For patients with multiple encounters, only the first eligible encounter in the pre- and/or postimplementation period was included. Comorbidities for identified patients were assessed via the search of study encounters for the *International Classification of Diseases, 9th Revision-Clinical Modification* codes for hypertension, anxiety, depression, cirrhosis, diabetes, and congestive heart failure.

Process, Outcomes, and Balancing Measures

The study process measures included the percentage of patients hospitalized for alcohol detoxification or withdrawal with documentation of counseling about naltrexone by the time of discharge, before and after process intervention. Documentation was defined as the description of counseling about naltrexone in the discharge summary or progress notes of identified encounters. We also measured the percentage of patients started on naltrexone before and after intervention. Lastly, we measured the percentage of patients prescribed naltrexone who filled at least 1 prescription for the medication, assessed by calls to the pharmacy where the medication was prescribed. Prescriptions that could not be confirmed (ie, paper rather than electronic prescriptions) were counted as not filled.

For outcome measures, we recorded the percentages of study patients who returned to the emergency department (ED) and were readmitted to UNC Hospitals (inpatient or observation) for any reason within 30 days of discharge. These outcomes were determined by manual chart review.

In order to ensure the new process was not associated with delays in patient discharge, we measured the mean length of stay in days for study patient encounters before and after intervention as a balancing measure.

Statistical Analysis

Demographic and clinical characteristics for included patients were compared for the 16 months preimplementation (April 1, 2014 through July 31, 2015) and the 19 months postimplementation (August 1, 2015 through February 28, 2017). Descriptive statistics were calculated by using the Student t test for continuous variables and the χ^2 test for dichotomous variables. We used multivariate logistic regression to evaluate the associations between the intervention arms (pre- vs postintervention) and study outcomes, adjusting for age, gender, race, insurance type, and medical comorbidities. We chose these variables for inclusion based on their association with study outcomes at the $P \leq .20$ level in bivariate analyses. $P < .05$ was considered statistically significant. All analyses were performed by using

Stata version 13.1 (StataCorp LLC, College Station, Texas).

For 2 process measures, the percentages of patients counseled about and started on naltrexone, we plotted consecutive samples of 10 patients before and after intervention on a control chart, using preintervention data to calculate means and control limits.

Subgroup Analysis

We used multivariate logistic regression to evaluate the associations between counseling versus no counseling and prescription of naltrexone versus no prescription for study outcomes in the postintervention subgroup, adjusting for age, gender, race, insurance type, and medical comorbidities.

RESULTS

Patients

We identified 188 preimplementation encounters and excluded 12 patients (6.4%) for primary admission reasons other than alcohol withdrawal or detoxification and 48 (25.5%) repeat hospitalizations, leaving 128 unique patient encounters. We identified 166 postimplementation encounters and excluded 25 (15.1%) hospitalizations for admission reason and 27 repeat hospitalizations (16.3%), leaving 114 unique patient encounters (flow diagram in supplemental Appendix 3). The most common admission reason for the exclusion of encounters was withdrawal from a substance other than alcohol (supplemental Appendix 4). The percentages of encounters excluded in preimplementation and postimplementation periods were similar at 31.9% and 31.4%, respectively.

The majority of patients were male and white, and almost half were uninsured (Table 1). There were no demographic differences between patients in the pre- versus postimplementation groups. For studied comorbidities, postintervention patients were more likely to have hypertension, anxiety, and depression.

Process Measures

The percentage of patients counseled about naltrexone rose from 1.6% preimplementation to 63.2% postimplementation ($P < .001$; Table 1). The percentage of patients prescribed naltrexone at discharge rose from 1.6% to 28.1% ($P < .001$). When consecutive samples of 10 patients were plotted on a control chart, the fraction of almost every postintervention sample was above the upper control limit for those same process measures, meeting control chart rules for special cause variation (Figure 1).[16]

Among those counseled about naltrexone before discharge, 34 of 74 patients (45.9%) had no contraindications to naltrexone and were interested in taking the medication. Among the 40 patients who were counseled about but not prescribed naltrexone, 19 (47.5%) declined, 9 (22.5%) had liver function tests elevated more than 3 times the upper limit of the reference range, 9 (22.5%) had concurrent opiate use, and 3 (7.5%) had multiple contraindications.

Among the 34 patients who were prescribed naltrexone, 25 (73.5%) filled at least 1 prescription as confirmed by phone call to the relevant pharmacy.

Outcome Measures

Comparing preintervention to postintervention patients, there were no differences in ED revisits or rehospitalizations within 30 days in the unadjusted analysis (Table 1). In the adjusted analysis, the postintervention odds ratio (OR) for ED revisits was lower (OR = 0.47; 95% confidence interval [CI], 0.24-0.94); the OR for rehospitalization (OR = 0.76; 95% CI, 0.30-1.92) was not significant.

Subgroup Analysis

Postintervention patients who were documented to have counseling about naltrexone before discharge had significantly lower unadjusted rates of ED revisit (9.7% vs 35.7%; $P = .001$) and rehospitalization within 30 days (2.8% vs 26.2%; $P < .001$; Table 2). In adjusted analysis, the ORs for 30-day ED revisit (OR = 0.21; 95% CI, 0.07-0.60) and rehospitalization (OR = 0.07; 95% CI, 0.01-0.35) were significantly lower in those counseled.

There were no significant differences in 30-day ED visits or rehospitalizations for those prescribed versus not prescribed naltrexone in the postintervention group (Table 3). In the adjusted analysis, the ORs for those prescribed naltrexone for ED revisit (OR = 0.53; 95% CI, 0.16-1.79) and rehospitalization (OR = 0.43; 95% CI, 0.09-2.10) were not statistically significant.

Balancing Measure

The mean length of stay for all patient encounters was 3.3 days. There were no differences in length of stay comparing pre- with postintervention patient encounters (Table 1) or those postintervention patients counseled versus not counseled (Table 2).

DISCUSSION

Our study demonstrates that counseling about medications for the maintenance of sobriety can be implemented as part of the routine care of hospitalized patients with AUDs. In our experience, about half of the patients counseled had no contraindications to naltrexone and were willing to take it at discharge. Almost three-fourths of those who were prescribed naltrexone filled the prescription at least once. The counseling process was not associated with increased length of stay. In the adjusted analysis, postintervention patients had significantly lower odds of 30-day ED returns. Additionally, in subgroup analysis, postintervention patients counseled about naltrexone had significantly lower rates of subsequent healthcare utilization compared with those not counseled, with absolute differences of 26% for ED revisits and 22% for rehospitalizations within 30 days.

The failure to demonstrate a difference in adjusted rehospitalization rates in the postintervention versus the preintervention group has several possible explanations. First, we had incomplete fidelity to our interventions, documenting counseling about naltrexone before discharge in over 60% of postintervention patients, raising the possibility that better fidelity may have resulted in improved outcomes. Related to this, only 28% of postintervention patients were prescribed naltrexone, which may be an inadequate sample size to demonstrate positive effects from the medication. Another possible explanation

is that the postintervention group had higher rates of some of the comorbidities we assessed, namely, anxiety, depression, and hypertension, which could have negatively impacted the effectiveness of the interventions to prevent rehospitalization; however, after adjusting for comorbidities, the odds of rehospitalization were still not significantly different. It is interesting that the odds of postintervention ED revisits (but not rehospitalizations) were lower in the adjusted analysis. It may be that patients who revisit the ED and are not rehospitalized are different in important ways from those who are readmitted. Alternately, the larger number of ED revisits overall (about twice the rate of rehospitalization) may have made it easier to identify positive effects from the intervention for this outcome than rehospitalization (ie, the study may have been underpowered to detect a relatively small reduction in rehospitalization). It is also possible, however, that the interventions were simply insufficient to prevent rehospitalization.

The subgroup analysis, however, did find significant differences in both outcome measures for postintervention patients counseled versus not counseled about naltrexone before discharge. There are several possible explanations for these results. First, there may have been unmeasured differences in those counseled versus not counseled that explain the reductions observed in subsequent healthcare utilization. For example, the counseled patients could have been more motivated to change and, thus, more readily approached by providers for counseling. The lack of any demographic differences between the 2 groups and the relative simplicity of the counseling part of the intervention occurring as part of daily rounds argue against this hypothesis, but there are many potential unmeasured confounders (eg, homelessness, ability to afford medications), and this possibility remains. A second possible explanation is that patients counseled about naltrexone could have been more likely than those not counseled to seek subsequent care at other institutions. A third possibility is that that the counseling about (and prescribing when appropriate) naltrexone itself led to the observed decreases in subsequent ED visits and hospitalizations. This hypothesis would have been more supported had we been able to demonstrate a statistically significant reduction in healthcare utilization in those prescribed versus not prescribed naltrexone. But there were nonsignificant trends in the reduction of ED revisits and rehospitalizations among those prescribed the medication, suggesting we may have been able to demonstrate statistically significant reductions with a larger sample size.

Comparing our results with existing literature is challenging. The majority of randomized trials of naltrexone for AUDs were conducted in the outpatient setting.[3-10] Most of these trials utilized some type of psychosocial intervention in addition to naltrexone.[3-5,8-10] The 1 prior naltrexone study we identified conducted in the inpatient setting by Wei et al.[14] is the most similar to our study. The authors reported the effects of a new process for assessing hospitalized patients with AUDs, including the use of a discharge planning tool for all patients admitted with alcohol dependence. The discharge tool included prompts for naltrexone in appropriate patients. The measured outcomes included the percentage of eligible patients prescribed naltrexone at discharge and the percentages of ED revisits and rehospitalizations within 30 days. Postintervention, 64% of eligible patients were prescribed naltrexone compared with 0% before, very similar to our results. There were significant decreases among all discharged patients with alcohol dependence for 30-day ED revisits (18.8% pre- vs 6.1% postimplementation) and rehospitalizations (23.4% vs 8.2%). The study differed from ours in a number of important respects, including a location in a large urban setting and implementation on a teaching service rather than an attending-only hospitalist service. Additionally, the authors studied 1 month of process implementation and compared it to another month 1 year before the new process, with an overall smaller sample size of 64 patients before and 49 patients after implementation. Potential reasons why Wei et al.[14] were able to document lower rehospitalization rates postintervention when we did not include the differences in patient population (eg, high homeless rate, lower percentage of female patients in Wei study) and secular trends unrelated to interventions in either study.

Limitations of our study include the nonrandomized and uncontrolled design, which introduces the possibility of unmeasured confounding factors leading to the decrease we observed in healthcare utilization. Additionally, the single-center design precludes our ability to assess for healthcare utilization outcomes in other nearby facilities. We had incomplete implementation of our new process, counseling just over 60% of patients. As our primary outcomes relied on documentation in the medical record, both undersampling (not documenting some interventions) and reporting bias (being more likely to record positive sessions from intervention) are possible. Lastly, despite a moderate total sample size of almost 250 patients, the relatively small numbers of patients who were actually prescribed naltrexone in our study lessens our ability to show direct impact.

In conclusion, our study demonstrates a practical process for counseling about and prescribing naltrexone to patients hospitalized for alcohol detoxification or withdrawal. We demonstrate that many of these patients will be interested in starting naltrexone at discharge and will reliably fill the prescriptions if written. Counseling was associated with a significant reduction in subsequent healthcare utilization. These results have a wide potential impact given the ubiquitous nature of AUDs among hospitalized patients in community and academic settings.

Disclosures: The authors have no conflicts of interest relevant to this article to disclose. There were no sources of funding for this work.

References

1. Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry.* 2007;64(7):830-842.
2. Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the U.S., 2006. *Am J Prev Med.* 2011;41(5):516-524.
3. Anton RF, Moak DH, Waid LR, Latham PK, Malcolm RJ, Dias JK. Naltrexone and cognitive behavioral therapy for the treatment of outpatient alcoholics: results of a placebo-controlled trial. *Am J Psychiatry.* 1999;156(11):1758-1764.

4. Anton RF, Moak DH, Latham P, et al. Naltrexone combined with either cognitive behavioral or motivational enhancement therapy for alcohol dependence. *J Clin Psychopharmacol.* 2005;25(4):349-357.
5. Guardia J, Caso C, Arias F, et al. A double-blind, placebo-controlled study of naltrexone in the treatment of alcohol-dependence disorder: results from a multicenter clinical trial. *Alcohol Clin Exp Res.* 2002;26(9):1381-1387.
6. Kiefer F, Jahn H, Tarnaske T, et al. Comparing and combining naltrexone and acamprosate in relapse prevention of alcoholism: a double-blind, placebo-controlled study. *Arch Gen Psychiatry.* 2003;60(1):92-99.
7. Latt NC, Jurd S, Houseman J, Wutzke SE. Naltrexone in alcohol dependence: a randomised controlled trial of effectiveness in a standard clinical setting. *Med J Aust.* 2002;176(11):530-534.
8. Morris PL, Hopwood M, Whelan G, Gardiner J, Drummond E. Naltrexone for alcohol dependence: a randomized controlled trial. *Addiction.* 2001;96(11):1565-1573.
9. O'Malley SS, Jaffe AJ, Chang G, Schottenfeld RS, Meyer RE, Rounsaville B. Naltrexone and coping skills therapy for alcohol dependence. A controlled study. *Arch Gen Psychiatry.* 1992;49(11):881-887.
10. O'Malley SS, Robin RW, Levenson AL, et al. Naltrexone alone and with sertraline for the treatment of alcohol dependence in Alaska natives and non-natives residing in rural settings: a randomized controlled trial. *Alcohol Clin Exp Res.* 2008;32(7):1271-1283.
11. Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for adults with alcohol use disorders in outpatient settings: a systematic review and meta-analysis. *JAMA* 2014;311(18):1889-1900.
12. Petrakis IL, Leslie D, Rosenheck R. Use of naltrexone in the treatment of alcoholism nationally in the Department of Veterans Affairs. *Alcohol Clin Exp Res.* 2003;27(11):1780-1784.
13. Mark TL, Kranzler HR, Song X. Understanding US addiction physicians' low rate of naltrexone prescription. *Drug Alcohol Depend.* 2003;71(3):219-228.
14. Wei J, Defries T, Lozada M, Young N, Huen W, Tulsky J. An inpatient treatment and discharge planning protocol for alcohol dependence: efficacy in reducing 30-day readmissions and emergency department visits. *J Gen Intern Med.* 2015;30(3):365-370.
15. Stephens JR, Liles EA, Dancel R, Gilchrist M, Kirsch J, DeWalt DA. Who needs inpatient detox? Development and implementation of a hospitalist protocol for the evaluation of patients for alcohol detoxification. *J Gen Intern Med.* 2014;29(4):587-593.
16. Provost LP, Murray SK. *The Health Care Data Guide: Learning from Data for Improvement.* San Francisco: Jossey-Bass; 2011.

The Enhanced Care Program: Impact of a Care Transition Program on 30-Day Hospital Readmissions for Patients Discharged From an Acute Care Facility to Skilled Nursing Facilities

Bradley T. Rosen, MD, MBA, FACP, SFHM[1,2]*, Ronald J. Halbert MD, MPH[1,3], Kelley Hart, LVN[1], Marcio A. Diniz, PhD[1], Sharon Isonaka, MD, MS[1], Jeanne T. Black, PhD, MBA[1]

[1]Cedars-Sinai Health System, Los Angeles, California; [2]David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, California; [3]Jonathan and Karin Fielding School of Public Health, University of California, Los Angeles, Los Angeles, California.

BACKGROUND: Increased acuity of skilled nursing facility (SNF) patients challenges the current system of care for these patients.

OBJECTIVE: Evaluate the impact on 30-day readmissions of a program designed to enhance the care of patients discharged from an acute care facility to SNFs.

DESIGN: An observational, retrospective cohort analysis of 30-day hospital readmissions for patients discharged to 8 SNFs between January 1, 2014, and June 30, 2015.

SETTING: A collaboration between a large, acute care hospital in an urban setting, an interdisciplinary clinical team, 124 community physicians, and 8 SNFs.

PATIENTS: All patients discharged from Cedars-Sinai Medical Center to 8 partner SNFs were eligible for participation.

INTERVENTION: The Enhanced Care Program (ECP) involved the following 3 interventions in addition to standard care: (1) a team of nurse practitioners participating in the care of SNF patients; (2) a pharmacist-driven medication reconciliation at the time of transfer; and (3) educational in-services for SNF nursing staff.

MEASUREMENT: Thirty-day readmission rate for ECP patients compared to patients not enrolled in ECP.

RESULTS: The average unadjusted, 30-day readmission rate for ECP patients over the 18-month study period was 17.2% compared to 23.0% among patients not enrolled in ECP ($P < .001$). After adjustment for sociodemographic and clinical characteristics, ECP patients had 29% lower odds of being readmitted within 30 days ($P < .001$). These effects were robust to stratified analyses, analyses adjusted for clustering, and balancing of covariates using propensity weighting.

CONCLUSIONS: A coordinated, interdisciplinary team caring for SNF patients can reduce 30-day hospital readmissions. *Journal of Hospital Medicine* 2018;13:229-235. Published online first October 4, 2017 © 2018 Society of Hospital Medicine

Public reporting of readmission rates on the Nursing Home Compare website is mandated to begin on October 1, 2017, with skilled nursing facilities (SNFs) set to receive a Medicare bonus or penalty beginning a year later.[1] The Centers for Medicare & Medicaid Services (CMS) began public reporting of hospitals' 30-day readmission rates for selected conditions in 2009, and the Patient Protection and Affordable Care Act of 2010 mandated financial penalties for excess readmissions through the Hospital Readmission Reduction Program.[2] In response, most hospitals have focused on patients who return home following discharge. Innovative interventions have proven successful, such as the Transitional Care model developed by Naylor and Coleman's Care Transitions Intervention.[3-5] Approximately 20% of Medicare beneficiaries are discharged from hospitals to SNFs, and these patients have higher readmission rates than those discharged home. CMS reported that in 2010, 23.3% of those with an SNF stay were readmitted within 30 days, compared with 18.8% for those with other discharge dispositions.[6]

Some work has been undertaken in this arena. In 2012, the Center for Medicare and Medicaid Innovation (CMMI) and the Medicare-Medicaid Coordination Office jointly launched the Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents.[7] This partnership established 7 Enhanced Care and Coordination Provider organizations and was designed to improve care by reducing hospitalizations among long-stay, dual-eligible nursing facility residents at 143 nursing homes in 7 states.[8] At the time of the most recent project report, there were mixed results regarding program effects on hospitalizations and spending, with 2 states showing strongly positive patterns, 3 states with reductions that were consistent though not statistically strong, and mixed re-

***Address for correspondence:** Bradley T. Rosen, MD, MBA, FACP, SFHM, Cedars-Sinai Health System, 8700 Beverly Blvd. Becker B220, Los Angeles, CA 90048; Telephone: 310-423-5610; Fax: 310-423-8441; E-mail: RosenB@cshs.org

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

Received: January 9, 2017; **Revised**: July 10, 2017; **Accepted**: July 20, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2852

sults in the remaining states. Quality measures did not show any pattern suggesting a program effect.[9] Interventions to Reduce Acute Care Transfers (INTERACT) II was a 6-month, collaborative, quality-improvement project implemented in 2009 at 30 nursing homes in 3 states.[10] The project evaluation found a statistically significant, 17% decrease in self-reported hospital admissions among the 25 SNFs that completed the intervention, compared with the same 6 months in the prior year. The Cleveland Clinic recently reported favorable results implementing its Connected Care model, which relied on staff physicians and advanced practice professionals to visit patients 4 to 5 times per week and be on call 24/7 at 7 intervention SNFs.[11] Through this intervention, it successfully reduced its 30-day hospital readmission rate from SNFs from 28.1% to 21.7% ($P < .001$), and the authors posed the question as to whether its model and results were reproducible in other healthcare systems.

Herein, we report on the results of a collaborative initiative named the Enhanced Care Program (ECP), which offers the services of clinical providers and administrative staff to assist with the care of patients at 8 partner SNFs. The 3 components of ECP (described below) were specifically designed to address commonly recognized gaps and opportunities in routine SNF care. In contrast to the Cleveland Clinic's Connected Care model (which involved hospital-employed physicians serving as the SNF attendings and excluded patients followed by their own physicians), ECP was designed to integrate into a pluralistic, community model whereby independent physicians continued to follow their own patients at the SNFs. The Connected Care analysis compared participating versus nonparticipating SNFs; both the Connected Care model and the INTERACT II evaluation relied on pre–post comparisons; the CMMI evaluation used a difference-in-differences model to compare the outcomes of the program SNFs with those of a matched comparison group of nonparticipating SNFs. The evaluation of ECP differs from these other initiatives, using a concurrent comparison group of patients discharged to the same SNFs but who were not enrolled in ECP.

METHODS

Setting

Cedars-Sinai Medical Center (CSMC) is an 850-bed, acute care facility located in an urban area of Los Angeles. Eight SNFs, ranging in size from 49 to 150 beds and located between 0.6 and 2.2 miles from CSMC, were invited to partner with the ECP. The physician community encompasses more than 2000 physicians on the medical staff, including private practitioners, nonteaching hospitalists, full-time faculty hospitalists, and faculty specialists.

Study Design and Patients

This was an observational, retrospective cohort analysis of 30-day same-hospital readmissions among 3951 patients discharged from CSMC to 8 SNFs between January 1, 2014, and June 30, 2015. A total of 2394 patients were enrolled in the ECP, and 1557 patients were not enrolled.

ECP Enrollment Protocol

Every patient discharged from CSMC to 1 of the 8 partner SNFs was eligible to participate in the program. To respect the autonomy of the SNF attending physicians and to facilitate a collaborative relationship, the decision to enroll a patient in the ECP rested with the SNF attending physician. The ECP team maintained a database that tracked whether each SNF attending physician (1) opted to automatically enroll all his or her patients in the ECP, (2) opted to enroll patients on a case-by-case basis (in which case an ECP nurse practitioner [NP] contacted the attending physician for each eligible patient), or (3) opted out of the ECP completely. When a new SNF attending physician was encountered, the ECP medical director called the physician to explain the ECP and offer enrollment of his or her patient(s). Ultimately, patients (or their decision-makers) retained the right to opt in or out of the ECP at any time, regardless of the decision of the attending physicians.

Program Description

Patients enrolled in the ECP experienced the standard care provided by the SNF staff and attending physicians plus a clinical care program delivered by 9 full-time NPs, 1 full-time pharmacist, 1 pharmacy technician, 1 full-time nurse educator, a program administrator, and a medical director.

The program included the following 3 major components:

1. Direct patient care and 24/7 NP availability: Program enrollment began with an on-site, bedside evaluation by an ECP NP at the SNF within 24 hours of arrival and continued with weekly NP rounding (or more frequently, if clinically indicated) on the patient. Each encounter included a review of the medical record; a dialogue with the patient's SNF attending physician to formulate treatment plans and place orders; discussions with nurses, family members, and other caregivers; and documentation in the medical record. The ECP team was on-site at the SNFs 7 days a week and on call 24/7 to address questions and concerns. Patients remained enrolled in the ECP from SNF admission to discharge even if their stay extended beyond 30 days.
2. Medication reconciliation: The ECP pharmacy team completed a review of a patient's SNF medication administration record (MAR) within 72 hours of SNF admission. This process involved the pharmacy technician gathering medication lists from the SNFs and CSMC and providing this information to the pharmacist for a medication reconciliation and clinical evaluation. Discrepancies and pharmacist recommendations were communicated to the ECP NPs, and all identified issues were resolved.
3. Educational in-services: Building upon the INTERACT II model, the ECP team identified high-yield, clinically relevant topics, which the ECP nurse educator turned into monthly educational sessions for the SNF nursing staff at each of the participating SNFs.[10]

Primary Outcome Measure

An inpatient readmission to CSMC within 30 days of the hospital discharge date was counted as a readmission, whether the

TABLE 1. **Distribution of Patient Characteristics**

Patient Characteristics	Total n = 3951	ECP n = 2394 (60.6%)	Comparison n = 1557 (39.4%)
Mean age at index discharge, years (SD)	78.1 (12.3)	78.1 (12.6)	78.2 (12.0)
<65 years	12.8	13.3	12.0
65-84 years	51.4	50.5	52.9
≥85 years	35.8	36.2	35.1
Male gender	40.8	39.7	42.4
Race and/or ethnicity			
Non-Hispanic white	72.3	74.3[a]	69.3[a]
Black or African American	19.1	18.0[a]	20.8[a]
Hispanic and/or Latino	5.1	4.3[b]	6.3[b]
Asian	2.9	3.1	2.8
Other	0.6	0.4	0.9
Preferred language			
English	74.8	81.6[b]	64.4[b]
Russian	9.2	6.7[b]	13.2[b]
Farsi	8.4	5.0[b]	13.6[b]
Spanish	3.4	2.8[a]	4.3[a]
Other	4.2	3.9	4.6
Payer			
Medicare fee for service	45.9	52.9[b]	35.0[b]
Dual eligible	42.9	35.1[b]	55.0[b]
Other	11.2	12.0	10.0
Hospital clinical service line			
Orthopedic surgery	25.7	28.7[b]	21.1[b]
General internal medicine	20.6	20.1	21.4
General surgery	8.5	9.1	7.7
Cardiology, medical	8.3	7.4[b]	9.7[b]
Cardiology, interventional	2.0	2.1	1.9
Gastroenterology	7.0	6.1[a]	8.2[a]
Pulmonary	7.4	6.0[b]	9.7[b]
Neurology	6.1	5.9	6.6
Other surgical	7.9	9.2[b]	5.8[b]
Psychiatry	0.5	0.5	0.6
Other service	5.6	5.1[b]	7.4[b]
APR-DRG severity of illness	(n = 3946)	(n = 2389)	(n = 1557)
Minor	8.1	8.7	7.1
Moderate	27.1	26.8	27.7
Major	43.2	42.9	43.6
Extreme	21.6	21.6	21.6
Index discharge length of stay in days (SD)	8.04 (8.45)	8.28 (8.94)	7.66 (7.62)
Index hospitalization length of stay			
1 to 3 days	25.1	24.6	26.0
4 to 5 days	24.4	23.8	25.4
6 to 9 days	26.9	26.9	26.9
>9 days	23.6	24.8[a]	21.7[a]

[a]Percentages between the ECP and comparison differ at $P < .05$.

[b]Percentages differ at $P < .001$.

NOTE: Values are percentages unless otherwise indicated. Totals may not add to 100% due to rounding. Unless otherwise indicated, n = 3951. Abbreviations: APR-DRG, All Patients Refined Diagnosis Related Group; ECP, Enhanced Care Program; SD, standard deviation.

patient returned directly from an SNF or was readmitted from home after an SNF discharge.

Data

ECP patients were identified using a log maintained by the ECP program manager. Non-ECP patients discharged to the same SNFs during the study period were identified from CSMC's electronic registry of SNF discharges. Covariates known to be associated with increased risk of 30-day readmission were obtained from CSMC's electronic data warehouse, including

TABLE 2. **Multivariable Logistic Regression: Odds of 30-Day Same-Hospital Readmission From SNFs**

Patient Characteristics	Odds Ratio	95% CI	*P* Value
ECP participation	0.71	0.60-0.85	<.001
Age category			
<65 years	1.25	0.95-1.64	.105
65-84 years	Reference		
≥85 years	1.02	0.84-1.23	.845
Gender			
Male	1.27	1.07-1.50	.005
Female	Reference		
Race			
White	Reference		
Black or African American	1.07	0.86-1.33	.559
Hispanic and/or Latino	0.54	0.30-0.97	.041
Asian	0.90	0.52-1.52	.667
Other	Dropped	NA	NA
Preferred Language			
English	Reference		
Russian	0.79	0.56-1.12	.192
Farsi	0.82	0.58-1.15	.242
Spanish	1.83	0.96-3.50	.069
Other	1.62	1.05-2.48	.028
Payer			
Medicare fee-for-service	Reference		
Dual eligible	1.37	1.10-1.69	.004
Other	0.96	0.69-1.34	.818
Hospital clinical service line			
Orthopedic surgery	Reference		
General internal medicine	1.35	1.01-1.79	.042
General surgery	1.11	0.78-1.58	.562
Cardiology, medical	1.89	1.35-2.65	<.001
Cardiology, interventional	1.31	0.71-2.41	.381
Gastroenterology	1.91	1.33-2.73	<.001
Pulmonary	1.66	1.16-2.37	.005
Neurology	1.12	0.74-1.69	.590
Other surgical	0.98	0.67-1.42	.901
Psychiatry	1.01	0.28-3.63	.986
Other service	1.53	1.04-2.25	.031
APR-DRG severity			
Minor	1.35	0.89-2.06	.158
Moderate	Reference		
Major	1.81	1.42-2.30	<.001
Extreme	2.22	1.66-2.97	<.001
Index hospital length of stay			
1 to 3 days	0.68	0.53-0.89	.004
4 to 5 days	0.81	0.64-1.03	.092
6 to 9 days	Reference		
>9 days	1.45	1.16-1.82	.001

NOTE: Abbreviations: APR-DRG, All Patients Refined Diagnosis Related Group; CI, confidence interval; ECP, Enhanced Care Program; NA, not applicable, SNF, skilled nursing facility.

demographic information, length of stay (LOS) of index hospitalization, and payer.[12] Eleven clinical service lines represented patients' clinical conditions based on Medicare-Severity Diagnosis-Related groupings. The discharge severity of illness score was calculated using 3M All Patients Refined Diagnosis Related Group software, version 33.[13]

Analysis

Characteristics of the ECP and non-ECP patients were compared using the χ^2 test. A multivariable logistic regression model with fixed effects for SNF was created to determine the program's impact on 30-day hospital readmission, adjusting for patient characteristics. The Pearson χ^2 goodness-of-fit test and the

link test for model specification were used to evaluate model specification. The sensitivity of the results to differences in patient characteristics was assessed in 2 ways. First, the ECP and non-ECP populations were stratified based on race and/or ethnicity and payer, and the multivariable regression model was run within the strata associated with the highest readmission rates. Second, a propensity analysis using inverse probability of treatment weighting (IPTW) was performed to control for group differences. Results of all comparisons were considered statistically significant when $P < .05$. Stata version 13 was used to perform the main analyses.[14] The propensity analysis was conducted using R version 3.2.3. The CSMC Institutional Review Board (IRB) determined that this study qualified as a quality-improvement activity and did not require IRB approval or exemption.

RESULTS

The average unadjusted 30-day readmission rate for ECP patients over the 18-month study period was 17.2%, compared to 23.0% for patients not enrolled in ECP ($P < .001$) (Figure 1). After adjusting for patient characteristics, ECP patients had 29% lower odds (95% confidence interval [CI], 0.60-0.85) of being readmitted to the medical center within 30 days than non-ECP patients at the same SNFs. The characteristics of the ECP and comparison patient cohorts are shown in Table 1. There were significant differences in sociodemographic characteristics: The ECP group had a higher proportion of non-Hispanic white patients, while the comparison group had a higher proportion of patients who were African American or Hispanic. ECP patients were more likely to prefer speaking English, while Russian, Farsi, and Spanish were preferred more frequently in the comparison group. There were also differences in payer mix, with the ECP group including proportionately more Medicare fee-for-service (52.9% vs 35.0%, $P < .001$), while the comparison group had a correspondingly larger proportion of dual-eligible (Medicare and Medicaid) patients (55.0% vs 35.1%, $P < .001$).

The largest clinical service line, orthopedic surgery, had the lowest readmission rate. The highest readmission rates were found among patients with medical cardiology hospitalizations, pulmonary diseases, and gastroenterology conditions. There was a significant monotonic relationship between quartiles of index hospital LOS and 30-day readmission (Supplemental Table 1).

The largest clinical differences observed between the ECP and non-ECP groups were the proportions of patients in the clinical service lines of orthopedic surgery (28.7% vs 21.1%, $P < .001$), medical cardiology (7.4% vs 9.7%, $P < .001$), and surgery other than general surgery (5.8% vs 9.2%, $P < .001$). Despite these differences in case mix, no differences were seen between the 2 groups in discharge severity of illness or LOS of the index hospitalization. The distribution of index hospital LOS by quartile was the same, with the exception that the ECP group had a higher proportion of patients with longer LOS.

Results of the multivariable logistic regression analysis are shown in Table 2. Males had 27% higher odds of readmission (95% CI, 1.07-1.50), and patients who were dually eligible for Medicare and Medi-Cal (California's Medicaid program) had

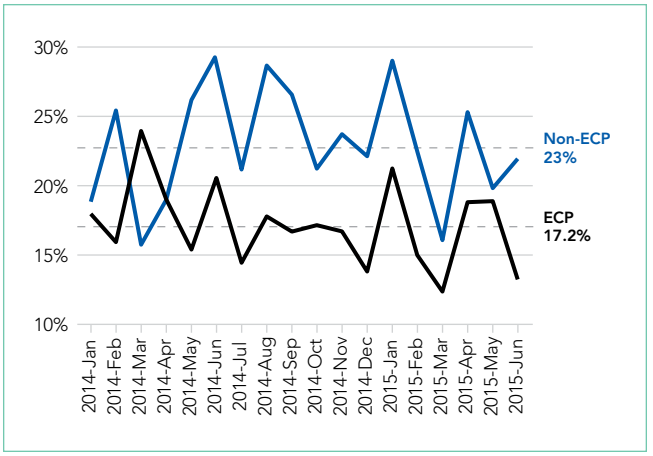

FIG 1. Monthly rate of 30-day readmissions to CSMC, ECP vs Non–ECP.

Abbreviations: CSMC, Cedars-Sinai Medical Center; ECP, Enhanced Care Program; Non-ECP, Non–Enhanced Care Program

37% higher odds of readmission (95% CI, 1.10-1.69). Compared with patients who had orthopedic surgery, the clinical service lines with significantly higher rates of readmission were gastroenterology (odds ratio [OR] 1.91; 95% CI, 1.33-2.73), medical cardiology (OR 1.89; 95% CI, 1.35-2.65), and pulmonary (OR 1.66; 95% CI, 1.16-2.37). Severity of illness at discharge and index hospital LOS were both positively associated with readmission in the adjusted analysis.

Sensitivity Analyses

The results were robust when tested within strata of the study population, including analyses limited to dual-eligible patients, African American patients, patients admitted to all except the highest volume facility, and patients admitted to any service line other than orthopedic surgery. Similar results were obtained when the study population was restricted to patients living within the medical center's primary service area and to patients living in zip codes in which the proportion of adults living in households with income below 100% of the poverty level was 15% or greater (see Supplementary Material for results).

The effect of the program on readmission was also consistent when the full logistic regression model was run with IPTW using the propensity score. The evaluation of standardized cluster differences between the ECP and non-ECP groups before and after IPTW showed that the differences were reduced to <10% for being African American; speaking Russian or Farsi; having dual-eligible insurance coverage; having orthopedic surgery; being discharged from the clinical service lines of gastroenterology, pulmonary, other surgery, and other services; and having an index hospital LOS of 4 to 5 days or 10 or more days (results are provided in the Supplementary Material).

Figure 2 displays the 30-day readmission rate for all Cedars-Sinai patients discharged to any SNF in the 3 years preceding and 4 years following the intervention. The readmission rate in the 12-month period immediately prior to the launch of the ECP was 19.6%. That rate dropped significantly to 17.5% in the first 12-month period postimplementation ($P = .016$) and to

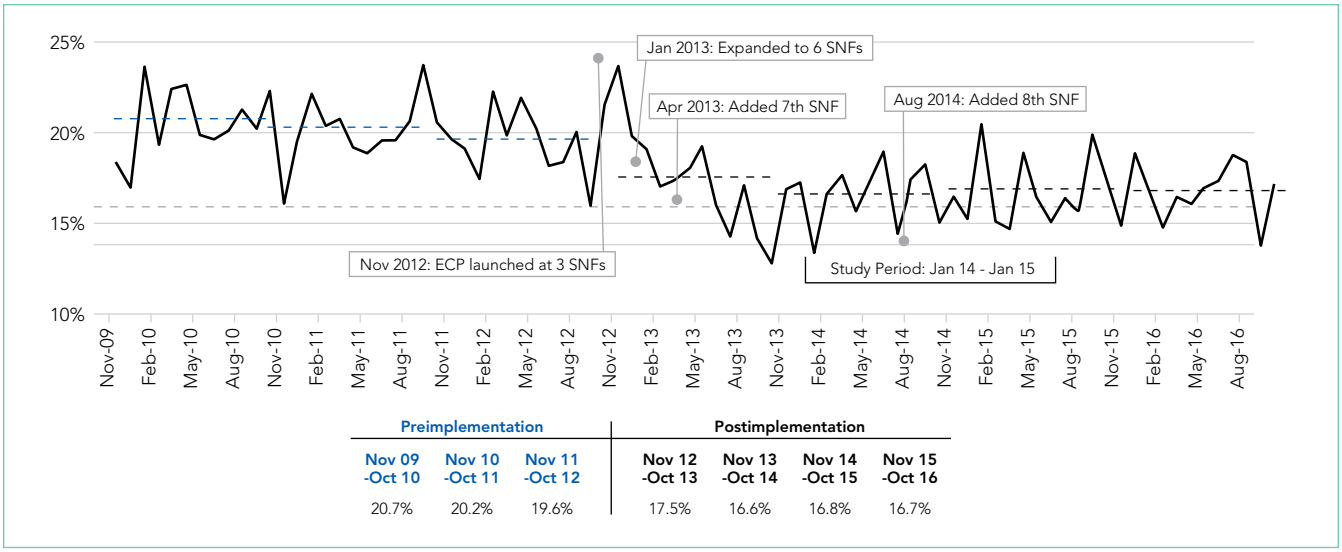

FIG 2. Mean 12-month same-hospital readmission rates of all patients discharged to SNF, pre- and postimplementation of ECP.

Abbreviations: ECP, Enhanced Care Program; SNF, skilled nursing facility.

16.6% in the next 12 months ($P > .001$ for the overall decline). During the study period, 66% of all Cedars-Sinai patients who were discharged to a SNF were admitted to 1 of the 8 participating SNFs. More than half of those patients (representing approximately 40% of all CSMC SNF discharges) were enrolled in the ECP.

DISCUSSION

Hospitals continue to experience significant pressure to manage LOS, and SNFs and hospitals are being held accountable for readmission rates. The setting of this study is representative of many large, urban hospitals in the United States whose communities include a heterogeneous mix of hospitalists, primary care physicians who follow their patients in SNFs, and independent SNFs.[15] The current regulations have not kept up with the increasing acuity and complexity of SNF patients. Specifically, Medicare guidelines allow the SNF attending physician up to 72 hours to complete a history and physical (or 7 days if he or she was the hospital attending physician for the index hospitalization) and only require monthly follow-up visits. It is the opinion of the ECP designers that these relatively lax requirements present unnecessary risk for vulnerable patients. While the INTERACT II model was focused largely on educational initiatives (with an advanced practice nurse available in a consultative role, as needed), the central tenet of ECP was similar to the Connected Care model in that the focus was on adding an extra layer of direct clinical support. Protocols that provided timely initial assessments by an NP (within 24 hours), weekly NP rounding (at a minimum), and 24/7 on-call availability all contributed to helping patients stay on track. Although the ECP had patients visited less frequently than the Connected Care model, and the Cleveland Clinic started with a higher baseline 30-day readmission rate from SNFs, similar overall reductions in 30-day readmissions were observed. The key point from both initiatives is that an increase in clinical touchpoints and ease of access to clinicians generates myriad opportunities to identify and address small issues before they become clinical emergencies requiring hospital transfers and readmissions.

Correcting medication discrepancies between hospital discharge summaries and SNF admission orders through a systematic medication reconciliation using a clinical pharmacist has previously been shown to improve outcomes.[16-18] The ECP pharmacy technician and ECP clinical pharmacist discovered and corrected errors on a daily basis that ranged from incidental to potentially life-threatening. If the SNF staff does not provide the patient's MAR within 48 hours of arrival, the pharmacy technician contacts the facility to obtain the information. As a result, all patients enrolled in the ECP during the study period received this intervention (unless they were rehospitalized or left the SNF before the process was completed), and 54% of ECP patients required some form of intervention after medication reconciliation was completed (data not shown).

This type of program requires hospital leadership and SNF administrators to be fully committed to developing strong working relationships, and in fact, there is evidence that SNF baseline readmission rates have a greater influence on patients' risk of rehospitalization than the discharging hospital itself.[19-21] Monthly educational in-services are delivered at the partner SNFs to enhance SNF nursing staff knowledge and clinical acumen. High-impact topics identified by the ECP team include the following: fall prevention, hand hygiene, venous thromboembolism, cardiovascular health, how to report change in condition, and advanced care planning, among others. While no formal pre–post assessments of the SNF nurses' knowledge were conducted, a log of in-services was kept, subjective feedback was collected for performance improvement purposes, and continuing educational units were provided to the SNF nurses who attended.

This study has limitations. As a single-hospital study, generalizability may be limited. While adherence to the program com-

ponents was closely monitored daily, service gaps may have occurred that were not captured. The program design makes it difficult to quantify the relative impact of the 3 program components on the outcome. Furthermore, the study was observational, so the differences in readmission rates may have been due to unmeasured variables. The decision to enroll patients in the ECP was made by each patient's SNF attending physician, and those who chose to (or not to) participate in the program may manifest other, unmeasured practice patterns that made readmissions more or less likely. Participating physicians also had the option to enroll their patients on a case-by-case basis, introducing further potential bias in patient selection; however, <5% of physicians exercised this option. Patients may have also been readmitted to hospitals other than CSMC, producing an observed readmission rate for 1 or both groups that underrepresents the true outcome. On this point, while we did not systematically track these other-hospital readmissions for both groups, there is no reason to believe that this occurred preferentially for ECP or non-ECP patients.

Multiple sensitivity analyses were performed to address the observed differences between ECP and non-ECP patients. These included stratified examinations of variables differing between populations, examination of clustering effects between SNFs, and an analysis adjusted for the propensity to be included in the ECP. The calculated effect of the intervention on readmission remained robust, although we acknowledge that differences in the populations may persist and have influenced the outcomes even after controlling for multiple variables.[22-25]

In conclusion, the results of this intervention are compelling and add to the growing body of literature suggesting that a comprehensive, multipronged effort to enhance clinical oversight and coordination of care for SNF patients can improve outcomes. Given CMS's plans to report SNF readmission rates in 2017 followed by the application of financial incentives in 2018, a favorable climate currently exists for greater coordination between hospitals and SNFs.[26] We are currently undertaking an economic evaluation of the program.

Acknowledgments

The authors would like to thank the following people for their contributions: Mae Saunders, Rita Shane, Dr. Jon Kea, Miranda Li, the ECP NPs, the ECP pharmacy team, CSMC's performance improvement team, and Alan Matus.

Disclosure: No conflicts of interest or disclosures.

References

1. Centers for Medicare & Medicaid Services (CMS), HHS. Medicare Program; Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities (SNFs) for FY 2016, SNF Value-Based Purchasing Program, SNF Quality Reporting Program, and Staffing Data Collection. Final Rule. *Fed Regist.* 2015;80(149):46389-46477.
2. "Readmissions Reduction Program," Centers for Medicare & Medicaid Services. http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html. Accessed November 5, 2015.
3. Naylor MD, Brooten D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA.* 1999;281:613-620.
4. Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. *J Am Geriatr Soc.* 2004;52:675-684.
5. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med.* 2006;166:1822-1828.
6. CMS Office of Information Products and Data Analytics. National Medicare Readmission Findings: Recent Data and Trends. 2012. http://www.academyhealth.org/files/2012/sunday/brennan.pdf. Accessed September 21, 2015.
7. Centers for Medicare & Medicaid Services, CMS Innovation Center. *Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents.* https://innovation.cms.gov/initiatives/rahnfr/. Accessed November 5, 2015.
8. Unroe KT, Nazir A, Holtz LR, et al. The Optimizing Patient Transfers, Impacting Medical Quality and Improving Symptoms: Transforming Institutional Care Approach: Preliminary data from the implementation of a Centers for Medicare and Medicaid Services nursing facility demonstration project. *J Am Geriatr Soc.* 2015;65:165-169.
9. Ingber MJ, Feng Z, Khatstsky G, et al. *Evaluation of the Initiative to Reduce Avoidable Hospitalizations among Nursing Facility Residents: Final Annual Report Project Year 3.* Waltham, MA: RTI International, RTI Project Number 0212790.006, January 2016.
10. Ouslander JG, Lamb G, Tappen R, et al. Interventions to reduce hospitalizations from nursing homes: Evaluation of the INTERACT II collaborative quality improvement project. *J Am Geriatr Soc.* 2011:59:745-753.
11. Kim L, Kou L, Hu B, Gorodeski EZ, Rothberg M. Impact of a Connected Care Model on 30-Day Readmission Rates from Skilled Nursing Facilities. *J Hosp Med.* 2017;12:238-244.
12. Kansagara D, Englander H, Salanitro A, et al. Risk Prediction Models for Hospital Readmission: A Systematic Review. *JAMA.* 2011;306(15):1688-1698.
13. Averill RF, Goldfield N, Hughes JS, et al. *All Patient Refined Diagnosis Related Groups (APR-DRGs): Methodology Overview.* 3M Health Information Systems Document GRP-041 (2003). https://www.hcup-us.ahrq.gov/db/nation/nis/APR-DRGsV20MethodologyOverviewandBibliography.pdf. Accessed November 5, 2015.
14. StataCorp. 2013. *Stata Statistical Software: Release 13.* College Station, TX: StataCorp LP.
15. Cebul RD, Rebitzer JB, Taylor LJ, Votruba ME. Organizational fragmentation and care quality in the U.S. healthcare system. *J Econ Perspect.* 2008;22(4):93-113.
16. Tjia J, Bonner A, Briesacher BA, McGee S, Terrill E, Miller K. Medication discrepancies upon hospital to skilled nursing facility transitions. *J Gen Intern Med.* 2009;24:630-635.
17. Desai R, Williams CE, Greene SB, Pierson S, Hansen RA. Medication errors during patient transitions into nursing homes: characteristics and association with patient harm. *Am J Geriatr Pharmacother.* 2011;9:413-422.
18. Chhabra PT, Rattinger GB, Dutcher SK, Hare ME, Parsons KL, Zuckerman IH. Medication reconciliation during the transition to and from long-term care settings: a systematic review. *Res Social Adm Pharm.* 2012;8(1):60-75.
19. Rahman M, Foster AD, Grabowski DC, Zinn JS, Mor V. Effect of hospital-SNF referral linkages on rehospitalization. *Health Serv Res.* 2013;48(6, pt 1):1898-1919.
20. Schoenfeld AJ, Zhang X, Grabowski DC, Mor V, Weissman JS, Rahman M. Hospital-skilled nursing facility referral linkage reduces readmission rates among Medicare patients receiving major surgery. *Surgery.* 2016;159(5):1461-1468.
21. Rahman M, McHugh J, Gozalo P, Ackerly DC, Mor V. The Contribution of Skilled Nursing Facilities to Hospitals' Readmission Rate. *HSR: Health Services Research.* 2017;52(2):656-675.
22. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *New Engl J Med.* 2009;360(14):1418-1428.
23. Hasan O, Meltzer DO, Shaykevich SA, et al. Hospital readmission in general medicine patients: a prediction model. *J Hosp Med.* 2010;25(3)211-219.
24. Allaudeen N, Vidyarhi A, Masella J, Auerbach A. Redefining readmission risk factors for general medicine patients. *J Hosp Med.* 2011;6(2):54-60.
25. Van Walraven C, Wong J, Forster AJ. LACE+ index: extension of a validated index to predict early death or urgent readmission after discharge using administrative data. *Open Med.* 2012;6(3):e80-e90.
26. *Protecting Access to Medicare Act of 2014*, Pub. L. No. 113-93, 128 Stat. 1040 (April 1, 2014). https://www.congress.gov/113/plaws/publ93/PLAW-113publ93.pdf. Accessed October 3, 2015.

Issues Identified by Postdischarge Contact after Pediatric Hospitalization: A Multisite Study

Kris P. Rehm, MD[1,2]*, Mark S. Brittan, MD, MPH[3], John R. Stephens, MD[4], Pradeep Mummidi, MS, MMHC[1], Michael J. Steiner, MD, MPH[4], James C. Gay, MD, MMHC[1,2], Soleh Al Ayubi, PhD[5], Nitin Gujral, BS[5], Vandna Mittal, MPH[5], Kelly Dunn, MS, RN, CPNP[5], Vincent Chiang, MD[5,6], Matt Hall, PhD[7], Kevin Blaine, MaED[5], Margaret O'Neill, BS[5], Sarah McBride, MD[5,6], Jayne Rogers, MS, RN, NEA-BC, CPHQ[5], Jay G. Berry, MD, MPH[5,6]

[1]*Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, Tennessee;* [2]*Vanderbilt University School of Medicine, Nashville, Tennessee;* [3]*Children's Hospital Colorado, University of Colorado School of Medicine, Aurora, Colorado;* [4]*North Carolina Children's Hospital, University of North Carolina School of Medicine, Chapel Hill, North Carolina;* [5]*Boston Children's Hospital, Boston, Massachusetts;* [6]*Harvard Medical School, Boston, Massachusetts;* [7]*Children's Hospital Association, Overland Park, Kansas.*

BACKGROUND: Many hospitals are considering contacting hospitalized patients soon after discharge to help with issues that arise.

OBJECTIVES: To (1) describe the prevalence of contact-identified postdischarge issues (PDI) and (2) assess characteristics of children with the highest likelihood of having a PDI.

DESIGN, SETTING, AND PATIENTS: A retrospective analysis of hospital-initiated follow-up contact for 12,986 children discharged from January 2012 to July 2015 from 4 US children's hospitals. Contact was made within 14 days of discharge by hospital staff via telephone call, text message, or e-mail. Standardized questions were asked about issues with medications, appointments, and other PDIs. For each hospital, patient characteristics were compared with the likelihood of PDI by using logistic regression.

RESULTS: Median (interquartile range) age of children at admission was 4.0 years (0-11); 59.9% were non-Hispanic white, and 51.0% used Medicaid. The most common reasons for admission were bronchiolitis (6.3%), pneumonia (6.2%), asthma (5.1%), and seizure (4.9%). Twenty-five percent of hospitalized children (n = 3263) reported a PDI at contact (hospital range: 16.0%-62.8%). Most (76.3%) PDIs were related to follow-up appointments (eg, difficulty getting one); 20.8% of PDIs were related to medications (eg, problems filling a prescription). Patient characteristics associated with the likelihood of PDI varied across hospitals. Older age (age 10-18 years vs <1 year) was significantly ($P < .001$) associated with an increased likelihood of PDI in 3 of 4 hospitals.

CONCLUSIONS: PDIs were identified often through hospital-initiated follow-up contact. Most PDIs were related to appointments. Hospitals caring for children may find this information useful as they strive to optimize their processes for follow-up contact after discharge. *Journal of Hospital Medicine* 2018;13:236-242. Published online first February 2, 2018. © Society of Hospital Medicine

Many hospitals are considering or currently employing initiatives to contact patients after discharge. Whether conducted via telephone or other means, the purpose of the contact is to help patients adhere to discharge plans, fulfill discharge needs, and alleviate postdischarge issues (PDIs). The effectiveness of hospital-initiated postdischarge phone calls has been studied in adult patients after hospitalization, and though some studies report positive outcomes,[1-3] a 2006 Cochrane review found insufficient evidence to recommend for or against the practice.[4]

Little is known about follow-up contact after hospitalization for children.[5-11] Rates of PDI vary substantially across hospitals. For example, one single-center study of postdischarge telephone contact after hospitalization on a general pediatric ward identified PDIs in ~20% of patients.[10] Another study identified PDIs in 84% of patients discharged from a pediatric rehabilitation facility.[11] Telephone follow-up has been associated with reduced health resource utilization and improved patient satisfaction for children discharged after an elective surgical procedure[6] and for children discharged home from the emergency department.[7-9]

More information is needed on the clinical experiences of postdischarge contact in hospitalized children to improve the understanding of how the contact is made, who makes it, and which patients are most likely to report a PDI. These experiences are crucial to understand given the expense and time commitment involved in postdischarge contact, as many hospitals may not be positioned to contact all discharged patients. Therefore, we conducted a pragmatic, retrospective, naturalistic study of differing approaches to postdischarge

***Address for correspondence:** Kris P. Rehm, MD, Division of Hospital Medicine, 8000E VCH, 2200 Children's Way, Nashville, TN 37232-9452; Telephone: 615-936-0257; Fax: 615-875-4623; E-mail: kris.rehm@vanderbilt.edu

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

Received: April 3, 2017; **Revised:** August 14, 2017; **Accepted**: August 24, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2934

TABLE 1. **Characteristics of Postdischarge Contact Made by Each Hospital**

	Children's Hospital			
	Hospital A	**Hospital B**	**Hospital C**	**Hospital D**
Period of postdischarge contact used for analysis				
Study length	12 months	17 months	13 months	12 months
Dates	1/2014-12/2014	9/2013-2/2015	7/2014-7/2015	1/2012-12/2012
Approach taken to make postdischarge contact[a]				
Mode	Telephone call	Telephone call	Telephone text	Telephone call
Timing	Within 72 hours	Within 2 weeks[a]	Within 72 hours	Within 72 hours
Number of attempts	up to 2	up to 2	up to 2	up to 3
Personnel making contact	Nonclinical administrative staff	Nonclinical administrative staff	Automated text, triaged to a nurse practitioner	Attending physician
Patients eligible for contact	All inpatients	All medicine services aside from cardiology	General hospitalist service	General hospitalist service
Questions asked during postdischarge contact				
Medications	Have you been able to fill your child's prescriptions?	Were you able to get your child's prescriptions filled?	Do you have your child's prescribed medications?	Medications: Receiving them? Tolerating? Appropriate adherence?
	If not, why? Do you think you will be able to fill them within the next 24 hours?	Did you have any questions regarding giving the prescription?		
Appointments	Do you have a follow-up appointment? If not, can I help?	Have you scheduled your follow-up appointment?	Do you have a scheduled follow-up appointment with your child's pediatrician?	Follow up appointment: any issues?
Other	Problems receiving oxygen/medical equipment/nursing care?	Did you have any questions about your discharge instructions?	Do you have any new concerns that you would like to discuss?	Child's health condition: better, same, or worse?
	Other discharge process concerns?			Durable medical equipment received?
Responses[b]				
Attempted	17,147	6969	530	613
Responded	7989	4216	268	513
Response rate	46.6%	60.5%	50.6%	83.7%

[a]Please see the supplementary Appendix for more information on the contact approach implemented in each hospital, including details on specific exclusions.
[b]Sixty percent of patients were contacted within 4 days of discharge.

contact occurring in multiple hospitals. Our main objective was to describe the prevalence and types of PDIs identified by the different approaches for follow-up contact across 4 children's hospitals. We also assessed the characteristics of children who have the highest likelihood of having a PDI identified from the contact within each hospital.

METHODS

Study Design, Setting, and Population

This is a retrospective analysis of hospital-initiated follow-up contact that occurred for 12,986 children discharged from 4 US children's hospitals between January 2012 and July 2015. Postdischarge follow-up contact was a component of ongoing, natural clinical operations at each institution during the study period. Methods for contact varied across hospitals (Table 1). In all hospitals, initial contact was made within 14 days of inpatient discharge by hospital staff (eg, administrative, nursing, or physician) via telephone call, text message, or e-mail. During contact, each site asked a child's caregiver a set of standardized questions about medications, appointments, and other discharge-related issues (Table 1). Additional characteristics about each hospital and their processes for follow-up contact (eg, personnel involved, timing, eligibility criteria, etc.) are reported in the supplementary Appendix.

Main Outcome Measures

The main outcome measure was identification of a PDI, defined as a medication, appointment, or other discharge-related issue, that was reported and recorded by the child's caregiver during conversation from the standardized questions that were asked during follow-up contact as part of routine discharge care (Table 1). Medication PDIs included issues filling prescriptions and tolerating medications. Appointment PDIs included not having a follow-up appointment scheduled. Other PDIs included issues with the child's health condition, discharge instructions, or any other concerns. All PDIs had been recorded prospectively by hospital contact personnel (hospitals A, B, and D) or through an automated texting system into a database (hospital C). Where available, free text comments that were recorded by contact personnel were reviewed by one of the authors (KB) and categorized via an existing framework of PDI designed

TABLE 2. **Rates of Pediatric Postdischarge Issues Identified When Contacting Families**

	Hospital			
Postdischarge Issue	Hospital A (N = 7989)	Hospital B (N = 4216)	Hospital C (N = 268)	Hospital D (N = 513)
Any problem	27.7%	16.3%	16.0%	62.8%
Appointments	21.8%	10.6%	7.8%	54.8%
Medications	5.1%	5.0%	2.2%	11.3%
Other	3.0%	2.6%	7.8%	9.0%

by Heath et al.[10] in order to further understand the problems that were reported.

Patient Characteristics

Patient hospitalization, demographic, and clinical characteristics were obtained from administrative health data at each institution and compared between children with versus without a PDI. Hospitalization characteristics included length of stay, season of admission, and reason for admission. Reason for admission was categorized by using 3M Health's All Patient Refined Diagnosis Related Groups (APR-DRG) (3M, Maplewood, MN). Demographic characteristics included age at admission in years, insurance type (eg, public, private, and other), and race/ethnicity (Asian/Pacific Islander, Hispanic, non-Hispanic black, non-Hispanic white, and other).

Clinical characteristics included a count of the different classes of medications (eg, antibiotics, antiepileptic medications, digestive motility medications, etc.) administered to the child during admission, the type and number of chronic conditions, and assistance with medical technology (eg, gastrostomy, tracheostomy, etc.). Except for medications, these characteristics were assessed with *International Classification of Diseases, Ninth Revision-Clinical Modification* (ICD-9-CM) diagnosis codes.

We used the Agency for Healthcare Research and Quality Chronic Condition Indicator classification system, which categorizes over 14,000 ICD-9-CM diagnosis codes into chronic versus nonchronic conditions to identify the presence and number of chronic conditions.[12] Children hospitalized with a chronic condition were further classified as having a complex chronic condition (CCC) by using the ICD-9-CM diagnosis classification scheme of Feudtner et al.[13] CCCs represent defined diagnosis groupings of conditions expected to last longer than 12 months and involve either multiple organ systems or a single organ system severely enough to require specialty pediatric care and hospitalization.[13,14] Children requiring medical technology were identified by using ICD-9-CM codes indicating their use of a medical device to manage and treat a chronic illness (eg, ventricular shunt to treat hydrocephalus) or to maintain basic body functions necessary for sustaining life (eg a tracheostomy tube for breathing).[15,16]

Statistical Analysis

Given that the primary purpose for this study was to leverage the natural heterogeneity in the approach to follow-up contact across hospitals, we assessed and reported the prevalence and type of PDIs independently for each hospital. Relatedly, we assessed the relationship between patient characteristics and PDI likelihood independently within each hospital as well rather than pool the data and perform a central analysis across hospitals. Of note, APR-DRG and medication class were not assessed for hospital D, as this information was unavailable. We used χ^2 tests for univariable analysis and logistic regression with a backwards elimination derivation process (for variables with $P \geq .05$) for multivariable analysis; all patient demographic, clinical, and hospitalization characteristics were entered initially into the models. All statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC), and $P < .05$ was considered statistically significant. This study was approved by the institutional review board at all hospitals.

RESULTS

Study Population

There were 12,986 (51.4%) of 25,259 patients reached by follow-up contact after discharge across the 4 hospitals. Median age at admission for contacted patients was 4.0 years (interquartile range [IQR] 0-11). Of those contacted, 45.2% were female, 59.9% were non-Hispanic white, 51.0% used Medicaid, and 95.4% were discharged to home. Seventy-one percent had a chronic condition (of any complexity) and 40.8% had a CCC. Eighty percent received a prescribed medication during the hospitalization. Median (IQR) length of stay was 2.0 days (IQR 1-4 days). The top 5 most common reasons for admission were bronchiolitis (6.3%), pneumonia (6.2%), asthma (5.2%), seizure (4.9%), and tonsil and adenoid procedures (4.1%).

Postdischarge Issues

Across all hospitals, 25.1% (n = 3263) of families contacted reported a PDI for their child (Table 2). PDI rates varied significantly across hospitals (range: 16.0%-62.8%; $P < .001$). Most (76.3%) PDIs were related to appointments (range across hospitals: 48.8%-87.3%), followed by medications (20.8%; range across hospitals: 14.0%-30.9%) and other problems (12.7%; range across hospitals: 9.4%-32.5%) (Table 2). Available qualitative comments indicated that most medication PDIs involved problems filling a prescription (84.2%); few involved dosing problems (5.5%) or medication side effects (2.3%). "Other" PDIs (n = 416) involved problems such as understanding discharge instructions (25.4%) and concerns about a change in the child's health status (20.2%).

Characteristics Associated with Postdischarge Issues

PDI rates varied significantly by patients' demographic, hospitalization, and clinical characteristics in 3 of the hospitals (ie, all aside from hospital C) (Table 3 and Figure). The findings associated with age, medications, length of stay, and CCCs are presented below.

Age

Older age was a consistent characteristic associated with PDIs in 3 hospitals. For example, PDI rates in children 10 to 18 years versus <1 year were 30.8% versus 21.4% ($P < .001$) in hospital A,

TABLE 3. **Univariable Associations of Experiencing a Postdischarge Issue with Patients' Demographic, Clinical, and Hospital Characteristics**

	Hospital A		Hospital B		Hospital C		Hospital D[a]	
Attribute	**%**	***P* value**	**%**	***P* value**	**%**	***P* value**	**%**	***P* value**
Age								
<1	21.4%	<.001	13.7%	.002	23.1%	.4	44.7%	<.001
1-4	27.6%		16.1%		12.8%		55.4%	
5-9	27.8%		19.4%		14.8%		70.8%	
10-18	30.8%		18.1%		15.8%		70.3%	
Female	27.4%	.6	15.5%	.2	17.3%	.6	61.4%	.6
Race/ethnicity								
Non-Hispanic white	28.5%	.2	15.7%	.006	16.0%	.8	65.4%	.1
Non-Hispanic black	27.6%		19.9%		15.0%		60.9%	
Hispanic	27.1%		0.0%		8.7%		0.0%	
Asian	21.6%		9.8%		22.2%		0.0%	
Other	25.6%		14.5%		19.1%		58.0%	
Season								
Spring	24.8%	.006	15.6%	<.001	20.5%	.1	62.4%	.3
Summer	29.4%		14.7%		11.8%		63.4%	
Fall	28.7%		22.2%		11.9%		54.7%	
Winter	27.9%		10.6%		25.0%		67.1%	
Payor								
Government	27.2%	.3	17.7%	.02	17.9%	.8	59.8%	.2
Private	28.3%		14.7%		15.2%		68.6%	
Other	20.8%		11.1%		25.0%		77.8%	
Complex chronic condition								
Neuromuscular	27.6%	1.0	21.3%	.006	12.5%	.8	68.4%	.1
Cardiovascular	21.3%	<.001	17.2%	.7	0.0%	.2	45.8%	.08
Respiratory	25.1%	.2	17.8%	.5	50.0%	.2	40.6%	.007
Renal	30.9%	.2	13.8%	.4	0.0%	.3	58.8%	.7
Gastrointestinal	28.9%	.4	19.3%	.1	9.1%	.5	49.3%	.01
Heme/immune	16.5%	<.001	12.5%	.1	20.0%	.7	66.7%	.7
Metabolic	22.4%	.03	18.2%	.4	18.8%	.8	57.6%	.5
Congenital/genetic defect	30.5%	.06	20.1%	.1	16.7%	1.0	71.2%	.2
Malignancy	16.0%	<.001	11.2%	.05	0.0%	.5	40.0%	.1
Neonatal	20.0%	.07	12.6%	.4	100.0%	.02	25.0%	.1
Technology dependent	26.4%	.2	16.7%	.8	16.7%	1.0	46.8%	.002
Transplant	15.6%	<.001	10.0%	.3	0.0%	.7	50.0%	.7
Any	25.0%	<.001	16.3%	1.0	16.1%	1.0	63.6%	.7
Chronic condition count								
0	27.8%	.1	14.9%	.2	21.9%	.1	55.3%	.1
1	29.2%		17.6%		12.1%		68.5%	
2+	26.7%		16.6%		13.8%		62.0%	
Drug class count								
0	12.7%	<.001	16.4%	.9	11.8%	.4	NA	
1-2	23.5%		16.6%		12.5%			
3-4	25.4%		15.5%		15.1%			
5+	29.2%		16.1%		21.9%			
Length of stay								
0-1 d	33.9%	<.001	15.4%	.5	15.5%	.2	66.5%	.08
2-3 d	26.6%		17.4%		12.1%		62.4%	
4-6 d	22.0%		15.9%		28.6%		63.8%	
7+ d	19.0%		16.7%		23.5%		47.2%	

[a]Number of drug classes unavailable for hospital D.
NOTE: Abbreviations: d, days; NA, not applicable.

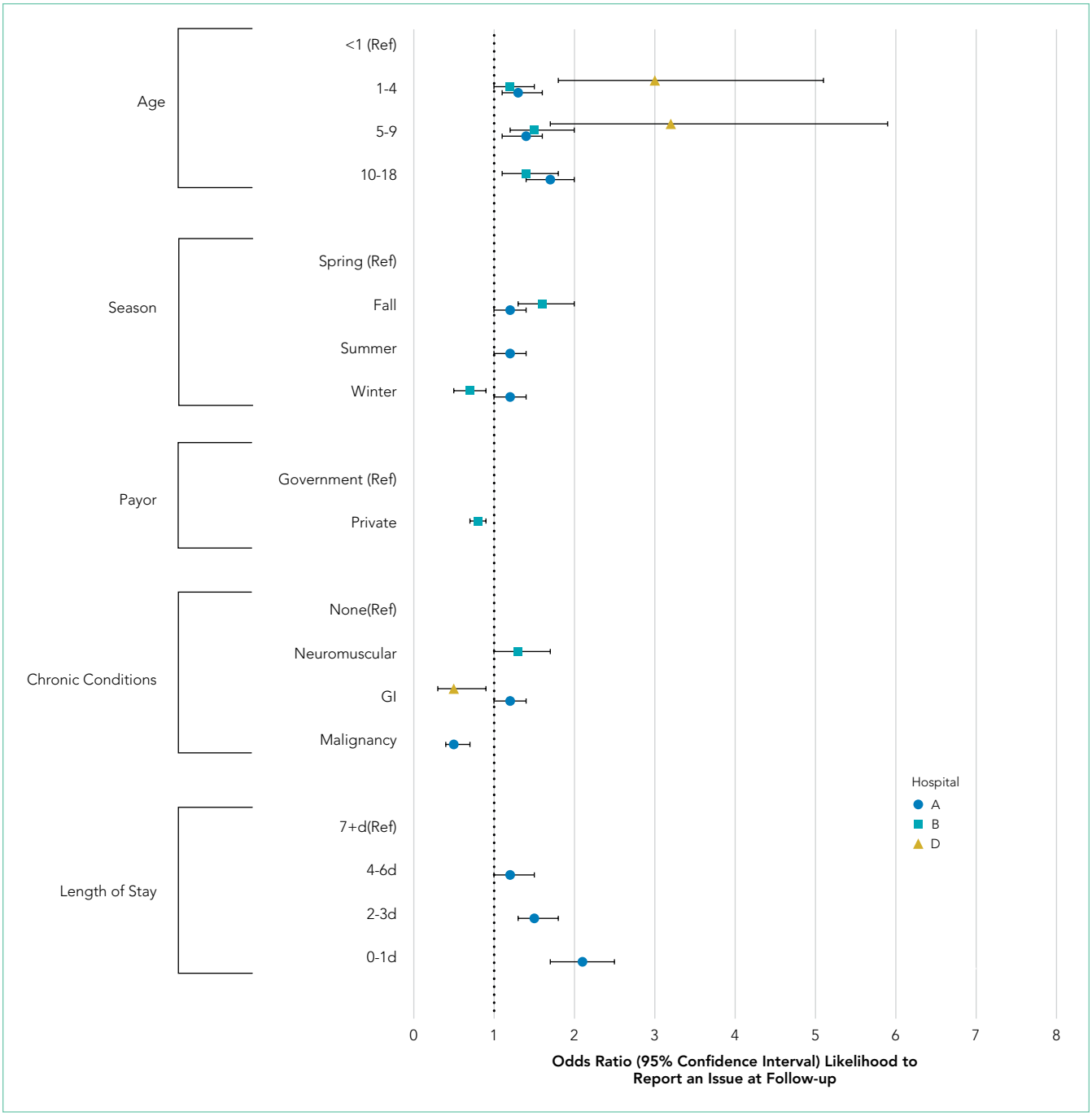

FIG. Shown in the figure are the adjusted odds ratios and 95% confidence intervals of a patient experiencing a postdischarge issue obtained from a logistic regression model derived for each hospital.

19.4% versus 13.7% ($P = .002$) in hospital B, and 70.3% versus 62.8% ($P < .001$) in hospital D. In multivariable analysis, age 10 to 18 years versus <1 year at admission was associated with an increased likelihood of PDI in hospital A (odds ratio [OR] 1.7; 95% CI, 1.4-2.0), hospital B (OR 1.4; 95% CI, 1.1-1.8), and hospital D (OR 1.7; 95% CI, 0.9-3.0) (Table 3 and Figure).

Medications

The number of medication classes administered was associated with PDI in 1 hospital. In hospital A, the PDI rate increased significantly ($P < .001$) from 12.7% to 29.2% as the number of medication classes administered increased from 0 to ≥5 (Table 3). In multivariable analysis, ≥5 versus 0 medication classes was not associated with a significantly increased likelihood of PDI ($P > .05$, data not shown).

Length of Stay

Shorter length of stay was associated with PDI in 1 hospital. In hospital A, the PDI rate increased significantly ($P < .001$) from 19.0% to 33.9% as length of stay decreased from ≥7 days to

≤1 day (Table 3). In multivariable analysis, length of stay to ≤1 day versus ≥7 days was associated with increased likelihood of PDI (OR 2.1; 95% CI, 1.7-2.5) in hospital A (Table 3 and Figure).

Complex Chronic Conditions

A neuromuscular CCC was associated with PDI in 2 hospitals. In hospital B, the PDI rate was higher in children with a neuromuscular CCC compared with a malignancy CCC (21.3% vs 11.2%). In hospital D, the PDI rates were higher in children with a neuromuscular CCC compared with a respiratory CCC (68.9% vs 40.6%) (Table 3). In multivariable analysis, children with versus without a neuromuscular CCC had an increased likelihood of PDI (OR 1.3; 95% CI, 1.0-1.7) in hospital B (Table 3 and Figure).

DISCUSSION

In this retrospective, pragmatic, multicentered study of follow-up contact with a standardized set of questions asked after discharge for hospitalized children, we found that PDIs were identified often, regardless of who made the contact or how the contact was made. The PDI rates varied substantially across hospitals and were likely influenced by the different follow-up approaches that were used. Most PDIs were related to appointments; fewer PDIs were related to medications and other problems. Older age, shorter length of stay, and neuromuscular CCCs were among the identified risk factors for PDIs.

Our assessment of PDIs was, by design, associated with variation in methods and approach for detection across sites. Further investigation is needed to understand how different approaches for follow-up contact after discharge may influence the identification of PDIs. For example, in the current study, the hospital with the highest PDI rate (hospital D) used hospitalists who provided inpatient care for the patient to make follow-up contact. Although not determined from the current study, this approach could have led the hospitalists to ask questions beyond the standardized ones when assessing for PDIs. Perhaps some of the hospitalists had a better understanding of how to probe for PDIs specific to each patient; this understanding may not have been forthcoming for staff in the other hospitals who were unfamiliar with the patients' hospitalization course and medical history.

Similar to previous studies in adults, our study reported that appointment PDIs in children may be more common than other types of PDIs.[17] Appointment PDIs could have been due to scheduling difficulties, inadequate discharge instructions, lack of adherence to recommended follow-up, or other reasons. Further investigation is needed to elucidate these reasons and to determine how to reduce PDIs related to postdischarge appointments. Some children's hospitals schedule follow-up appointments prior to discharge to mitigate appointment PDIs that might arise.[18] However, doing that for every hospitalized child is challenging, especially for very short admissions or for weekend discharges when many outpatient and community practices are not open to schedule appointments. Additional exploration is necessary to assess whether this might help explain why some children in the current study with a short versus long length of stay had a higher likelihood of PDI.

The rate of medication PDIs (5.2%) observed in the current study is lower than the rate that is reported in prior literature. Dudas et al.[1] found that medication PDIs occurred in 21% of hospitalized adult patients. One reason for the lower rate of medication PDIs in children may be that they require the use of postdischarge medications less often than adults. Most medication PDIs in the current study involved problems filling a prescription. There was not enough information in the notes taken from the follow-up contact to distinguish the medication PDI etiologies (eg, a prescription was not sent from the hospital team to the pharmacy, prior authorization from an insurance company for a prescription was not obtained, the pharmacy did not stock the medication). To help overcome medication access barriers, some hospitals fill and deliver discharge medications to the patients' bedside. One study found that children discharged with medication in hand were less likely to have emergency department revisits within 30 days of discharge.[19] Further investigation is needed to assess whether initiatives like these help mitigate medication PDIs in children.

Hospitals may benefit from considering how risk factors for PDIs can be used to prioritize which patients receive follow-up contact, especially in hospitals where contact for all hospitalized patients is not feasible. In the current study, there was variation across hospitals in the profile of risk factors that correlated with increased likelihood of PDI. Some of the risk factors are easier to explain than others. For example, as mentioned above, for some hospitalized children, short length of stay might not permit enough time for hospital staff to set up discharge plans that may sufficiently prevent PDIs. Other risk factors, including older age and neuromuscular CCCs, may require additional assessment (eg, through chart review or in-depth patient and provider interviews) to discover the reasons why they were associated with increased likelihood of PDI. There are additional risk factors that might influence the likelihood of PDI that the current study was not positioned to assess, including health literacy, transportation availability, and language spoken.[20-23]

This study has several other limitations in addition to the ones already mentioned. Some children may have experienced PDIs that were not reported at contact (eg, the respondent was unaware that an issue was present), which may have led to an undercounting of PDIs. Alternatively, some caregivers may have been more likely to respond to the contact if their child was experiencing a PDI, which may have led to overcounting. PDIs of nonrespondents were not measured. PDIs identified by postdischarge outpatient and community providers or by families outside of contact were not measured. The current study was not positioned to assess the severity of the PDIs or what interventions (including additional health services) were needed to address them. Although we assessed medication use during admission, we were unable to assess the number and type of medications that were prescribed for use postdischarge. Information about the number and type of follow-up visits needed for each child was not assessed. Given the variety of approaches for follow-up contact, the findings may generalize best to individual hospitals by using an approach that best matches to one of them. The current study is not positioned to

correlate quality of discharge care with the rate of PDI.

Despite these limitations, the findings from the current study reinforce that PDIs identified through follow-up contact in discharged patients appear to be common. Of PDIs identified, appointment problems were more prevalent than medication or other types of problems. Short length of stay, older age, and other patient and/or hospitalization attributes were associated with an increased likelihood of PDI. Hospitals caring for children may find this information useful as they strive to optimize their processes for follow-up contact after discharge. To help further evaluate the value and importance of contacting patients after discharge, additional study of PDI in children is warranted, including (1) actions taken to resolve PDIs, (2) the impact of identifying and addressing PDIs on hospital readmission, and (3) postdischarge experiences and health outcomes of children who responded versus those who did not respond to the follow-up contact. Moreover, future multisite, comparative effectiveness studies of PDI may wish to consider standardization of follow-up contact procedures with controlled manipulation of key processes (eg, contact by administrator vs nurse vs physician) to assess best practices.

Disclosures: Mr. Blaine, Ms. O'Neill, and Dr. Berry, Dr. Brittan, Dr. Rehm, and Dr. Steiner were supported by the Lucile Packard Foundation for Children's Health. The authors have no financial relationships relative to this article to disclose. The authors have no conflicts of interest to disclose.

References

1. Dudas V, Bookwalter T, Kerr KM, Pantilat SZ. The impact of follow-up telephone calls to patients after hospitalization. *Dis Mon.* 2002;48(4):239-248.
2. Sanchez GM, Douglass MA, Mancuso MA. Revisiting Project Re-Engineered Discharge (RED): The Impact of a Pharmacist Telephone Intervention on Hospital Readmission Rates. *Pharmacotherapy.* 2015;35(9):805-812.
3. Jones J, Clark W, Bradford J, Dougherty J. Efficacy of a telephone follow-up system in the emergency department. *J Emerg Med.* 1988;6(3):249-254.
4. Mistiaen P, Poot E. Telephone follow-up, initiated by a hospital-based health professional, for postdischarge problems in patients discharged from hospital to home. *Cochrane Database Syst Rev.* 2006(4):CD004510.
5. Lushaj EB, Nelson K, Amond K, Kenny E, Badami A, Anagnostopoulos PV. Timely Post-discharge Telephone Follow-Up is a Useful Tool in Identifying Post-discharge Complications Patients After Congenital Heart Surgery. *Pediatr Cardiol.* 2016;37(6):1106-1110.
6. McVay MR, Kelley KR, Mathews DL, Jackson RJ, Kokoska ER, Smith SD. Postoperative follow-up: is a phone call enough? *J Pediatr Surg.* 2008;43(1):83-86.
7. Chande VT, Exum V. Follow-up phone calls after an emergency department visit. *Pediatrics.* 1994;93(3):513-514.
8. Sutton D, Stanley P, Babl FE, Phillips F. Preventing or accelerating emergency care for children with complex healthcare needs. *Arch Dis Child.* 2008;93(1):17-22.
9. Patel PB, Vinson DR. Physician e-mail and telephone contact after emergency department visit improves patient satisfaction: a crossover trial. *Ann Emerg Med.* 2013;61(6):631-637.
10. Heath J, Dancel R, Stephens JR. Postdischarge phone calls after pediatric hospitalization: an observational study. *Hosp Pediatr.* 2015;5(5):241-248.
11. Biffl SE, Biffl WL. Improving transitions of care for complex pediatric trauma patients from inpatient rehabilitation to home: an observational pilot study. *Patient Saf Surg.* 2015;9:33-37.
12. AHRQ. Clinical Classifications Software (CCS) for ICD-9-CM. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed on January 31,2012.
13. Feudtner C, Christakis DA, Connell FA. Pediatric deaths attributable to complex chronic conditions: a population-based study of Washington State, 1980-1997. *Pediatrics.* 2000;106(1 Pt 2):205-209.
14. Berry JG, Hall DE, Kuo DZ, et al. Hospital utilization and characteristics of patients experiencing recurrent readmissions within children's hospitals. *JAMA.* 2011;305(7):682-690.
15. Palfrey JS, Walker DK, Haynie M, et al. Technology's children: report of a statewide census of children dependent on medical supports. *Pediatrics.* 1991;87(5):611-618.
16. Feudtner C, Villareale NL, Morray B, Sharp V, Hays RM, Neff JM. Technology-dependency among patients discharged from a children's hospital: a retrospective cohort study. *BMC Pediatr.* 2005;5(1):8-15.
17. Arora VM, Prochaska ML, Farnan JM, et al. Problems after discharge and understanding of communication with their primary care physicians among hospitalized seniors: a mixed methods study. *J Hosp Med.* 2010;5(7):385-391.
18. Brittan M, Tyler A, Martin S, et al. A Discharge Planning Template for the Electronic Medical Record Improves Scheduling of Neurology Follow-up for Comanaged Seizure Patients. *Hosp Pediatr.* 2014;4(6):366-371.
19. Hatoun J, Bair-Merritt M, Cabral H, Moses J. Increasing Medication Possession at Discharge for Patients With Asthma: The Meds-in-Hand Project. *Pediatrics.* 2016;137(3):e20150461. doi:10.1542/peds.2015-0461.
20. Berry JG, Goldmann DA, Mandl KD, et al. Health information management and perceptions of the quality of care for children with tracheotomy: a qualitative study. *BMC Health Serv Res.* 2011;11:117-125.
21. Berry JG, Ziniel SI, Freeman L, et al. Hospital readmission and parent perceptions of their child's hospital discharge. *Int J Qual Health Care.* 2013;25(5):573-581.
22. Carusone SC, O'Leary B, McWatt S, Stewart A, Craig S, Brennan DJ. The Lived Experience of the Hospital Discharge "Plan": A Longitudinal Qualitative Study of Complex Patients. *J Hosp Med.* 2017;12(1):5-10.
23. Leyenaar JK, O'Brien ER, Leslie LK, Lindenauer PK, Mangione-Smith RM. Families' Priorities Regarding Hospital-to-Home Transitions for Children With Medical Complexity. *Pediatrics.* 2017;139(1):e20161581. doi:10.1542/peds.2016-1581.

Predictors of Long-Term Opioid Use After Opioid Initiation at Discharge From Medical and Surgical Hospitalizations

Hilary J. Mosher, MFA, MD[1,2]*, Brooke A. Hofmeyer, PharmD[3], Katherine Hadlandsmyth, PhD[1,4], Kelly K. Richardson, PhD[1], Brian C. Lund, PharmD[1,5]

[1]Center for Comprehensive Access and Delivery Research and Evaluation, Iowa City Veterans Affairs Health Care System, Iowa City, Iowa; [2]Department of Internal Medicine, Roy J. and Lucille A. Carver College of Medicine, University of Iowa, Iowa City, Iowa; [3]Iowa City Veterans Affairs Quality Scholars Fellowship Program, Iowa City Veterans Affairs Health Care System, Iowa City, Iowa; [4]Department of Anesthesia, Roy J. and Lucille A. Carver College of Medicine, University of Iowa, Iowa City, Iowa; [5]Department of Epidemiology, College of Public Health, University of Iowa, Iowa City, Iowa.

Opioid analgesics may be initiated following surgical and medical hospitalization or in ambulatory settings; rates of subsequent long-term opioid (LTO) use have not been directly compared. This retrospective cohort study of the Veterans Health Administration (VHA) included all patients receiving a new outpatient opioid prescription from a VHA provider in fiscal year 2011. If a new outpatient prescription was filled within 2 days following hospital discharge, the initiation was considered a discharge prescription. LTO use was defined as an episode of continuous opioid supply lasting a minimum of 90 days and beginning within 30 days of the initial prescription. We performed bivariate and multivariate analyses to identify the factors associated with LTO use following surgical and medical discharges. Following incident prescription, 5.3% of discharged surgical patients, 15.2% of discharged medical patients, and 19.3% of outpatient opioid initiators received opioids long term. Medical and surgical patients differed; surgical patients were more likely to receive shorter prescription durations. Predictors of LTO use were similar in medical and surgical patients; the most robust predictor in both groups was the number of days' supply of the initial prescription (odds ratio [OR] = 1.24 and 95% confidence interval [CI], 1.12-1.37 for 8-14 days; OR = 1.56 and 95% CI, 1.39-1.76 for 15-29 days; and OR = 2.59 and 95% CI, 2.35-2.86 for >30 days) compared with the reference group receiving ≤7days. Rates of subsequent LTO use are higher among discharged medical patients than among surgical patients. Characteristics of opioid prescribing within the initial 30 days, including initial dose and days prescribed, were strongly associated with LTO use. *Journal of Hospital Medicine* 2018;13:243-248. © 2018 Society of Hospital Medicine

While patients may be newly exposed to opioids during medical and surgical hospitalization and the prescription of opioids at discharge is common,[1-5] prescribers of opioids at discharge may not intend to initiate long-term opioid (LTO) use. By understanding the frequency of progression to LTO use, hospitalists can better balance postdischarge pain treatment and the risk for unintended LTO initiation.

Estimates of LTO use rates following hospital discharge in selected populations[1,2,4-6] have varied depending on the population studied and the method of defining LTO use.[7] Rates of LTO use following incident opioid prescription have not been directly compared at medical versus surgical discharge or compared with initiation in the ambulatory setting. We present the rates of LTO use following incident opioid exposure at surgical discharge and medical discharge and identify the factors associated with LTO use following surgical and medical discharge.

***Address for correspondence:** Hilary J. Mosher, MFA, MD, Iowa City VA Health Care System, 601 Highway 6 West, Mailstop 111, Iowa City, IA 52246-2208; Telephone: 319-338-0581 extension 7723; Fax: 319-887-4932; E-mail: hilary.mosher@va.gov

Received: August 2, 2017; **Revised**: November 3, 2017; **Accepted**: November 11, 2017

2017 Society of Hospital Medicine DOI 10.12788/jhm.2930

METHODS

Data Sources

Veterans Health Administration (VHA) data were obtained through the Austin Information Technology Center for fiscal years (FYs) 2003 through 2012 (Austin, Texas). Decision support system national data extracts were used to identify prescription-dispensing events, and inpatient and outpatient medical SAS data sets were used to identify diagnostic codes. The study was approved by the University of Iowa Institutional Review Board and the Iowa City Veterans Affairs (VA) Health Care System Research and Development Committee.

Patients

We included all patients with an outpatient opioid prescription during FY 2011 that was preceded by a 1-year opioid-free period.[7] Patients with broadly accepted indications for LTO use (eg, metastatic cancer, palliative care, or opioid-dependence treatment) were excluded.[7]

Opioid Exposure

We included all outpatient prescription fills for noninjectable

TABLE 1. **Baseline Characteristics of Patients Initiating Outpatient Opioid Use Following Surgical or Medical Discharge**

Patient Demographics	Surgery N = 26,476	Medicine N = 16,551	χ^2; DF; P
Age, years			558; 5; <.001
18-34	997 (3.8%)	956 (5.8%)	
35-49	2270 (8.6%)	1814 (11.0%)	
50-64	12,099 (45.7%)	7644 (46.2%)	
65-79	9178 (34.7%)	4315 (26.1%)	
≥80	1748 (6.6%)	1685 (10.2%)	
Unknown	184 (0.7%)	137 (0.8%)	
Gender			38; 1; <.001
Male	24,669 (93.2%)	15,665 (94.6%)	
Female	1807 (6.8%)	886 (5.4%)	
Race			194; 2; <.001
White	18,089 (68.3%)	10,841 (65.5%)	
Black	4178 (15.8%)	3451 (20.9%)	
Other/unknown	4209 (15.9%)	2259 (13.6%)	
Residence			90; 3; <.001
Isolated	2267 (12.5%)	1176 (7.1%)	
Small rural	1991 (7.5%)	1075 (6.5%)	
Large rural	3316 (8.6%)	1795 (10.8%)	
Urban	18,902 (71.4%)	12,505 (75.6%)	
Mental health characteristics			
Mental health clinic visit			386; 1; <.001
At least 1 in prior year	7287 (27.5%)	6045 (36.5%)	
None	19,189 (72.5%)	10,506 (63.5%)	
Substance abuse diagnosis			819; 1; <.001
Present	3152 (11.9%)	3687 (22.3%)	
Not present	23,324 (88.1%)	12,864 (77.7%)	
Anxiety disorder diagnosis			56; 1; <.001
Present	1961 (7.4%)	1561 (9.4%)	
Not present	24,515 (92.6%)	14,990 (90.6%)	
Benzodiazepine use			472; 2; <.001
Active at opioid start	1743 (6.6%)	2044 (12.3%)	
Use within last year	1257 (4.8%)	988 (6.0%)	
No recent use	23,476 (88.7%)	13,519 (81.7%)	
Depressive disorder diagnosis			157; 1; <.001
Documented	2362 (8.9%)	2104 (12.7%)	
Not documented	24,114 (91.1%)	14,447 (87.3%)	
Antidepressant use			514; 1; <.001
Active at opioid start	4838 (18.3%)	4560 (27.6%)	
Not active at opioid start	21,638 (81.7%)	11,991 (72.4%)	

Continued on page 245

dosage forms of butorphanol, fentanyl, hydrocodone, hydromorphone, levorphanol, meperidine, methadone, morphine, oxycodone, oxymorphone, pentazocine, and tramadol. Consistent with the Centers for Disease Control and Prevention and VA/Department of Defense guidelines, LTO use was defined conceptually as regular use for >90 days. Operationalizing this definition to pharmacy refill data was established by using a cabinet supply methodology,[7] which allows for the construction of episodes of continuous medication therapy by estimating the medication supply available to a patient for each day during a defined period based on the pattern of observed refills. LTO use was defined as an episode of continuous opioid supply for >90 days and beginning within 30 days of the initial prescription. While some studies have defined LTO use based on onset within 1 year following surgery,[5] the requirement for onset within 30 days of initiation was applied to more strongly tie the association of developing LTO use with the discharge event and minimize various forms of bias that are introduced with extended follow-up periods.

Clinical Characteristics

Patients were classified as being medical discharges, surgical discharges, or outpatient initiators. Patients with an opioid in-

TABLE 1. **Baseline Characteristics of Patients Initiating Outpatient Opioid Use Following Surgical or Medical Discharge (continued)**

Patient Demographics	Surgery N = 26,476	Medicine N = 16,551	χ^2; DF; P
Pain-related characteristics			
Chronic pain diagnosis			157; 1; <.001
Present in prior year	10,982 (41.5%)	5861 (35.4%)	
Not present	15,494 (58.5%)	10,690 (64.6%)	
Nonopioid analgesic use, days in prior year			1; 1; .315
>90	4265 (16.1%)	2727 (16.5%)	
≤90	22,211 (83.9%)	13,824 (83.5%)	
Muscle relaxant use			297; 2; <.001
Active at opioid start	1190 (4.5%)	1415 (8.5%)	
Use within prior year	1348 (5.1%)	868 (5.2%)	
None	23,938 (90.4%)	14,268 (86.2%)	
Opioid prescription characteristics at index			
Opioid prescribed			4310; 3; <.001
Hydrocodone	16,612 (62.7%)	8041 (48.6%)	
Oxycodone	8660 (32.7%)	4281 (25.9%)	
Tramadol	540 (2.0%)	3073 (18.6%)	
Other	664 (2.5%)	1156 (7.0%)	
Morphine equivalents, mg per day			534; 3; <.001
≤15	6714 (25.4%)	5577 (33.7%)	
15.01 to ≤30	11,416 (43.1%)	7190 (43.4%)	
30.01 to ≤45	4963 (18.7%)	2099 (12.7%)	
> 45	3383 (12.8%)	1685 (10.2%)	
Days' supply of first prescription			1286; 3; <.001
≤7	7805 (29.5%)	5842 (35.3%)	
8-14	9888 (37.3%)	4072 (24.6%)	
15-29	3949 (14.9%)	1802 (10.9%)	
≥30	4834 (18.3%)	4835 (29.2%)	

NOTE: Abbreviation: DF, degrees of freedom.

dex date within 2 days following discharge were designated based on discharge bed section; additionally, if patients had a surgical bed section during hospitalization, they were assigned as surgical discharges. Demographic, diagnosis, and medication exposure variables that were previously associated with LTO use were selected.[8,9] Substance use disorder, chronic pain, anxiety disorder, and depressive disorder were based on *International Classification of Diseases, 9th Revision* (ICD-9) codes in the preceding year. The use of concurrent benzodiazepines, skeletal muscle relaxants, and antidepressants were determined at opioid initiation.[10] Rural or urban residence was assigned by using the Rural-Urban Commuting Area Codes system and mapped with the zip code of a veteran's residence.[11]

Analysis

Bivariate and multivariable relationships were determined by using logistic regression. The multivariable model considered all pairwise interaction terms between inpatient service (surgery versus medicine) and each of the variables in the model. Statistically significant interaction terms ($P < .05$) were retained, and all others were omitted from the final model. The main effects for variables that were involved in a significant interaction term were not reported in the final multivariable model; instead, we created fully specified multivariable models for surgery service and medicine service and reported odds ratios (ORs) for the main effects. All analyses were conducted by using SAS version 9.4 (SAS Institute Inc, Cary, North Carolina).

RESULTS

During FY 2011, 43,027 patients received an incident opioid prescription at discharge from a VHA hospital, including 26,476 surgical discharges and 16,551 medical discharges. Discharged veterans differed on nearly all the examined characteristics (Table 1). A lower proportion of surgical patients used VA mental health services, had a substance use disorder, anxiety, or depression diagnosis, or had active benzodiazepine or antidepressant prescriptions. A higher proportion of surgical patients had a chronic pain diagnosis. At discharge, a larger proportion of surgical patients (62.7%) than medical patients (48.6%) received hydrocodone and daily doses of ≥45 mg per day of

TABLE 2. **Demographic, Clinical, and Prescription Characteristics Associated with LTO Use Following Hospital Discharge**

Characteristic	Distribution N (column %)	Frequency of LTO Use n (row %)	LTO Use Bivariate Models OR (95% CI)	LTO Use Multivariate Model[a] OR (95% CI)
Inpatient service				
Medicine	16,551 (38.5)	2509 (15.2)	3.18 (2.97-3.41)	Not applicable[a]
Surgery	26,476 (61.5)	1408 (5.3)	Reference	
Patient demographics				
Age, years				
18-34	1953 (4.5)	175 (9.0)	0.77 (0.65-0.90)	0.72 (0.61-0.86)
35-49	4084 (9.5)	438 (10.7)	0.94 (0.84-1.04)	0.91 (0.81-1.02)
50-64	19,743 (45.9)	2246 (11.4)	Reference	Reference
65-79	13,493 (31.4)	852 (6.3)	0.53 (0.48-0.57)	0.59 (0.54-0.65)
≥80	3433 (8.0)	186 (5.4)	0.45 (0.38-0.52)	0.41 (0.35-0.49)
Missing	321 (0.8)	20 (6.2)	0.52 (0.33-0.82)	0.49 (0.31-0.79)
Sex				
Male	40,334 (93.7)	3721 (9.2)	Reference	Reference
Female	2693 (6.3)	196 (7.3)	0.77 (0.67-0.90)	0.73 (0.63-0.86)
Race				
White	28,930 (67.2)	2727 (9.4)	Reference	Interaction[a]
Black	7629 (17.7)	693 (9.1)	0.96 (0.88-1.05)	$\chi^2 = 7.9$; DF = 2; $P = .019$
Other/unknown	6468 (15.0)	497 (7.7)	0.80 (0.72-0.88)	
Residence				
Isolated	3443 (8.0)	453 (8.9)	0.97 (0.85-1.10)	1.02 (0.92-1.14)
Small rural	3066 (7.1)	331 (10.8)	1.22 (1.08-1.38)	1.29 (1.14-1.47)
Large rural	5111 (11.9)	301 (8.7)	0.98 (0.88-1.09)	1.02 (0.90-1.17)
Urban	31,407 (73.0)	2832 (9.0)	Reference	Reference
Mental health characteristics				
Mental health clinic visit				
At least 1 in prior year	13,332 (31.0)	1601 (12.0)	1.61 (1.51-1.73)	0.98 (0.89-1.07)
None	29,695 (69.0)	2316 (7.8)	Reference	Reference
Substance abuse diagnosis				
Documented ICD in prior year	6839 (15.9)	992 (14.5)	1.93 (1.79-2.08)	Interaction[a]
Not documented	36,188 (84.1)	2925 (8.1)	Reference	$\chi^2 = 10.7$; DF = 1; $P = .001$
Anxiety disorder diagnosis				
Documented ICD in prior year	3522 (8.2)	456 (13.0)	1.55 (1.40-1.72)	1.07 (0.95-1.21)
Not documented	39,505 (91.8)	3461 (8.8)	Reference	Reference
Benzodiazepine use				
Active at opioid start	3787 (8.8)	678 (17.9)	2.45 (2.23-2.68)	1.56 (1.41-1.73)
Use within prior year	2245 (5.2)	210 (9.4)	1.16 (0.99-1.34)	0.84 (0.72-0.98)
No use in prior year	36,995 (86.0)	3029 (8.2)	Reference	Reference
Depressive disorder diagnosis				
Documented ICD in prior year	4466 (10.4)	571 (12.8)	1.54 (1.40-1.70)	0.92 (0.82-1.03)
Not documented	38,561 (89.6)	3346 (8.7)	Reference	Reference
Antidepressant use				
Active at opioid start	9398 (21.8)	1291 (13.7)	1.88 (1.75-2.02)	1.26 (1.16-1.37)
Not active at opioid start	33,629 (78.2)	2626 (7.8)	Reference	Reference

Continued on page 247

morphine equivalents (12.8% vs 10.2%). Medical patients were more likely to receive an initial supply of ≥30 days.

The rate of LTO initiation was higher in medical patients (15.2%) than in surgical patients (5.3%; OR = 3.18; 95% confidence interval [CI], 2.97-3.41; Table 2). For reference, the rate of subsequent LTO initiation among outpatients was 19.3% (93,076 of 483,472). LTO use was most common among patients ages 50 to 64 years. Relative to urban areas, LTO risk was higher among residents of small, rural areas (OR = 1.29; 95% CI, 1.14-1.47). The interaction between inpatient service and

TABLE 2. **Demographic, Clinical, and Prescription Characteristics Associated with LTO Use Following Hospital Discharge (continued)**

Characteristic	Distribution N (column %)	Frequency of LTO Use n (row %)	LTO Use Bivariate Models OR (95% CI)	LTO Use Multivariate Model[a] OR (95% CI)
Pain characteristics				
Chronic pain diagnosis				
Documented ICD in prior year	16,843 (39.1)	1759 (10.4)	1.30 (1.22-1.39)	1.18 (1.04-1.21)
Not documented	26,184 (61.9)	2158 (8.2)	Reference	Reference
Nonopioid analgesic use				
>90 days in prior year	6992 (16.2)	1014 (14.5)	1.94 (1.79-2.09)	Interaction[a]
≤90 days in prior year	36,035 (83.8)	2903 (8.1)	Reference	χ^2 = 7.1; DF = 1; *P* = .008
Muscle relaxant use				
Active at opioid start	2605 (6.1)	539 (20.7)	2.94 (2.66-3.26)	1.69 (1.52-1.89)
Use within prior year	2216 (5.2)	265 (12.0)	1.53 (1.34-1.75)	1.17 (1.01-1.35)
No use within prior year	38,206 (88.8)	3113 (8.2)	Reference	Reference
Opioid use characteristics				
Opioid prescribed at index				
Hydrocodone	24,653 (57.3)	1766 (7.2)	Reference	Reference
Oxycodone	12,941 (30.1)	1077 (8.3)	1.18 (1.09-1.27)	0.96 (0.88-1.05)
Tramadol	3613 (8.4)	746 (20.7)	3.37 (3.07-3.70)	1.55 (1.39-1.72)
Other	1820 (4.2)	328 (18.0)	2.85 (2.50-3.24)	1.23 (1.05-1.45)
Morphine equivalents, mg per day				
≤15	12,291 (28.6)	1219 (9.9)	Reference	Reference
15.01 to ≤30	18,606 (43.2)	1537 (8.3)	0.82 (0.76-0.89)	1.11 (1.02-1.21)
30.01 to ≤45	7062 (16.4)	540 (7.6)	0.75 (0.68-0.84)	1.18 (1.05-1.33)
> 45	5068 (11.8)	621 (12.3)	1.27 (1.15-1.41)	1.70 (1.49-1.94)
Days' supply, index prescription				
≤7	13,647 (31.7)	882 (6.5)	Reference	Reference
8-14	13,960 (32.4)	932 (6.7)	1.04 (0.94-1.14)	1.24 (1.12-1.37)
15-29	5751 (13.4)	502 (8.7)	1.38 (1.24-1.55)	1.56 (1.39-1.76)
≥30	9669 (22.5)	1601 (16.6)	2.87 (2.63-3.13)	2.59 (2.35-2.86)

[a]The multivariable model considered all pairwise interaction terms between inpatient service (medicine versus surgery) and each of the other variables in the model. Significant interactions were observed for 3 variables: race, substance abuse diagnosis, and nonopioid analgesic use. All nonsignificant interaction terms were omitted from the final multivariable model. Because the main effects of the variables involved in a statistical interaction term cannot be independently interpreted, these estimates were omitted. In order to describe these relationships, we performed separate multivariable analyses for medicine service and surgery service patients. For medicine service patients, the associations between race and LTO use were OR of 0.77 (95% CI, 0.69-0.87) for black race and OR of 0.89 (95% CI, 0.78-1.02) for other races relative to white race. For surgical service patients, these associations were OR of 0.96 (95% CI, 0.83-1.13) and OR of 0.78 (95% CI, 0.66-0.92), respectively. Substance abuse diagnosis was associated with increased risk for LTO use but to a greater extent in surgical patients (OR = 1.56; 95% CI, 1.34-1.81) than in medicine patients (OR = 1.14; 95% CI, 1.02-1.27). Similarly, the risk for LTO use associated with prior nonopioid analgesic use was greater in surgical patients (OR = 1.83; 95% CI, 1.60-2.08) than medicine patients (OR = 1.44; 95% CI, 1.29-1.62).

NOTE: Abbreviations: CI, confidence interval; DF, degrees of freedom; ICD, *International Classification of Diseases*; LTO, long-term opioid; OR, odds ratio.

race (χ^2 = 7.9; degrees of freedom = 2; *P* = .019) was significant; black race was associated with a reduced risk for LTO use in medicine service patients (OR = 0.77; 95% CI, 0.69-0.87) but not surgical patients (OR = 0.96; 95% CI, 0.83-1.13; Table 2).

Concurrent use of benzodiazepines, antidepressants, and muscle relaxants and chronic pain diagnosis (but not mental health clinic use and anxiety and depressive disorders) were associated with LTO use. Interactions with inpatient services were observed for substance use disorder diagnoses and prior nonopioid analgesic use; the magnitude of the association was higher among surgical service patients than in the medical patients model (Table 2).

Days' supply was associated with LTO use in a dose-dependent fashion relative to the reference category of ≤7 days: OR of 1.24 (95% CI, 1.12-1.37) for 8 to 14 days; OR of 1.56 (95% CI, 1.39-1.76) for 15 to 29 days; and OR of 2.59 (95% CI, 2.35-2.86) for ≥30 days (Table 2). LTO risk was higher among patients with an estimated dose of ≥15 morphine equivalents per day (MED) compared with those with doses of <15 equivalents (OR = 1.11; 95% CI, 1.02-1.21); patients who received >45 MED were at the greatest risk (OR = 1.70; 95% CI, 1.49-1.94).

DISCUSSION

Our observed LTO use rate of 5.3% among surgical patients compares with rates of 0.12% to 1.41%[5] and 5.9% to 6.5%[12] in privately insured samples and 4.1% among discharges in a single US hospital that included both medical and surgical patients in the United States.[1] The LTO use rate of 15.2% among medical-

ly discharged patients more closely resembles the rates found among outpatient initiators[13] and lacks robust comparators.

The observation that subsequent LTO use occurs more frequently in discharged medical patients than surgical patients is consistent with the findings of Calcaterra et al.[1] that among patients with no surgery versus surgery during hospitalization, opioid receipt at discharge resulted in a higher adjusted OR (7.24 for no surgery versus 3.40 for surgery) for chronic opioid use at 1 year. One explanation for this finding may be an artifact of cohort selection in the study design: patients with prior opioid use are excluded from the cohort, and prior use may be more common among surgical patients presenting for elective inpatient surgery for painful conditions. Previous work suggests that opioid use preoperatively is a robust predictor of postoperative use, and rates of LTO use are low among patients without preoperative opioid exposure.[6]

Demographic characteristics associated with persistent opioid receipt were similar to those previously reported.[5,8,9] The inclusion of medication classes indicated in the treatment of mental health or pain conditions (ie, antidepressants, benzodiazepines, muscle relaxants, and nonopioid analgesics) resulted in diagnoses based on ICD-9 codes being no longer associated with LTO use. Severity or activity of illness, preferences regarding pharmacologic or nonpharmacologic treatment and undiagnosed or undocumented pain-comorbid conditions may all contribute to this finding. Future work studying opioid-related outcomes should include variables that reflect pharmacologic management of comorbid diagnoses in the cohort development or analytic design.

The strongest risk factors were potentially modifiable: days' supply, dose, and concurrent medications. The measures of opioid quantity supplied are associated with subsequent ongoing use and are consistent with recent work based on prescription drug–monitoring data in a single state[14] and in a nationally representative sample.[15] That this relationship persists following hospital discharge, a scenario in which LTO use is unlikely to be initiated by a provider (who would be expected to subsequently titrate or monitor therapy), further supports the potential to curtail unintended LTO use through judicious early prescribing decisions.

We assessed only opioids that were supplied through a VA pharmacy, which may lead to the misclassification of patients as opioid naive for inclusion and an underestimation of the rate of opioid use following discharge. It is possible that differences in the rates of non-VA pharmacy use differ in medical and surgical populations in a nonrandom way. This study was performed in a large, integrated health system and may not be generalizable outside the VA system, where more discontinuities between hospital and ambulatory care may exist.

CONCLUSION

The initiation of LTO use at discharge is more common in veterans who are discharged from medical than surgical hospitalizations, likely reflecting differences in the patient population, pain conditions, and discharge prescribing decisions. While patient characteristics are associated with LTO use, the strongest associations are with increasing index dose and days' supply; both represent potentially modifiable prescriber behaviors. These findings support policy changes and other efforts to minimize dose and days supplied when short-term use is intended as a means to address the current opioid epidemic.

Acknowledgments

The work reported here was supported by the Department of Veterans Affairs Office of Academic Affiliations and Office of Research and Development (Dr. Mosher and Dr. Hofmeyer), and Health Services Research and Development Service (HSR&D) through the Comprehensive Access and Delivery Research and Evaluation Center (CIN 13-412) and a Career Development Award (CDA 10-017; Dr. Lund).

Disclosures: The authors report no conflict of interest in regard to this study. The authors had full access to and take full responsibility for the integrity of the data. All analyses were conducted by using SAS version 9.2 (SAS Institute Inc, Cary, NC). This manuscript is not under review elsewhere, and there is no prior publication of the manuscript contents. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs. The study was approved by the University of Iowa Institutional Review Board and the Iowa City Healthcare System Research and Development Committee.

References

1. Calcaterra SL, Yamashita TE, Min SJ, Keniston A, Frank JW, Binswanger IA. Opioid Prescribing at Hospital Discharge Contributes to Chronic Opioid Use. *J Gen Intern Med.* 2016;31(5):478-485.
2. Raebel MA, Newcomer SR, Reifler LM, et al. Chronic use of opioid medications before and after bariatric surgery. *JAMA.* 2013;310(13):1369-1376.
3. Mosher HJ, Jiang L, Vaughan Sarrazin MS, Cram P, Kaboli PJ, Vander Weg MW. Prevalence and characteristics of hospitalized adults on chronic opioid therapy. *J Hosp Med.* 2014;9(2):82-87.
4. Holman JE, Stoddard GJ, Higgins TF. Rates of prescription opiate use before and after injury in patients with orthopaedic trauma and the risk factors for prolonged opiate use. *J Bone Joint Surg Am.* 2013;95(12):1075-1080. 5. Sun EC, Darnall BD, Baker LC, Mackey S. Incidence of and Risk Factors for Chronic Opioid Use Among Opioid-Naive Patients in the Postoperative Period. *JAMA Intern Med.* 2016;176(9):1286-1293.
6. Goesling J, Moser SE, Zaidi B, et al. Trends and predictors of opioid use after total knee and total hip arthroplasty. *Pain.* 2016;157(6):1259-1265.
7. Mosher HJ, Richardson KK, Lund BC. The 1-Year Treatment Course of New Opioid Recipients in Veterans Health Administration. *Pain Med.* 2016. [Epub ahead of print].
8. Sullivan MD, Edlund MJ, Fan MY, Devries A, Brennan Braden J, Martin BC. Risks for possible and probable opioid misuse among recipients of chronic opioid therapy in commercial and medicaid insurance plans: The TROUP Study. *Pain.* 2010;150(2):332-339.
9. Seal KH, Shi Y, Cohen G, et al. Association of mental health disorders with prescription opioids and high-risk opioid use in US veterans of Iraq and Afghanistan. *JAMA.* 2012;307(9):940-947.
10. Mosher HJ, Richardson KK, Lund BC. Sedative Prescriptions Are Common at Opioid Initiation: An Observational Study in the Veterans Health Administration. *Pain Med.* 2017. [Epub ahead of print].
11. Lund BC, Abrams TE, Bernardy NC, Alexander B, Friedman MJ. Benzodiazepine prescribing variation and clinical uncertainty in treating posttraumatic stress disorder. *Psychiatr Serv.* 2013;64(1):21-27.
12. Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults. *JAMA Surg.* 2017;152(6):e170504.
13. Mellbye A, Karlstad O, Skurtveit S, Borchgrevink PC, Fredheim OM. The duration and course of opioid therapy in patients with chronic non-malignant pain. *Acta Anaesthesiol Scand.* 2016;60(1):128-137.
14. Deyo RA, Hallvik SE, Hildebran C, et al. Association Between Initial Opioid Prescribing Patterns and Subsequent Long-Term Use Among Opioid-Naive Patients: A Statewide Retrospective Cohort Study. *J Gen Intern Med.* 2017;32(1):21-27.
15. Shah A, Hayes CJ, Martin BC. Factors Influencing Long-Term Opioid Use Among Opioid Naive Patients: An Examination of Initial Prescription Characteristics and Pain Etiologies. *J Pain.* 2017;18(11):1374-1383.

The Evaluation of Medical Inpatients Who Are Admitted on Long-Term Opioid Therapy for Chronic Pain

Hilary J. Mosher, MD[1,2], Shoshana J. Herzig, MD, MPH[3,4], Itai Danovitch, MD, MBA[5], Christina Boutsicaris, MD[5], Sameer Hassamal, MD[5], Karl Wittnebel, MD, MPH[5], Azadeh Dashti, MD[5], Teryl Nuckols, MD, MSHS[5,6]*

[1]Department of General Internal Medicine, University of Iowa Carver College of Medicine, Iowa City, Iowa; [2]Iowa City VA Medical Center, Iowa City, Iowa; [3]Beth Israel Deaconess Medical Center, Boston, Massachusetts; [4]Harvard Medical School, Harvard University, Boston, Massachusetts; [5]Division of General Internal Medicine, Cedars-Sinai Medical Center, Los Angeles, California; [6]RAND Corporation, Santa Monica, California.

Individuals who are on long-term opioid therapy (LTOT) for chronic noncancer pain are frequently admitted to the hospital with acute pain, exacerbations of chronic pain, or comorbidities. Consequently, hospitalists find themselves faced with complex treatment decisions in the context of uncertainty about the effectiveness of LTOT as well as concerns about risks of overdose, opioid use disorders, and adverse events. Our multidisciplinary team sought to synthesize guideline recommendations and primary literature relevant to assessing medical inpatients on LTOT, with the objective of assisting practitioners in balancing effective pain treatment and opioid risk reduction. We identified no primary studies or guidelines specific to assessing medical inpatients on LTOT. Recommendations from outpatient guidelines on LTOT and guidelines on pain management in acute-care settings include the following: evaluate both pain and functional status, differentiate acute from chronic pain, investigate the preadmission course of opioid therapy, obtain a psychosocial history, screen for mental health conditions, screen for substance use disorders, check state prescription drug monitoring databases, order urine drug immunoassays, detect use of sedative-hypnotics, and identify medical conditions associated with increased risk of overdose and adverse events. Although approaches to assessing medical inpatients on LTOT can be extrapolated from related guidelines, observational studies, and small studies in surgical populations, more work is needed to address these critical topics for inpatients on LTOT. *Journal of Hospital Medicine* 2018;13:249-255. Published online first December 6, 2017. © 2018 Society of Hospital Medicine

Hospitalists face complex questions about how to evaluate and treat the large number of individuals who are admitted on long-term opioid therapy (LTOT, defined as lasting 3 months or longer) for chronic noncancer pain. A recent study at one Veterans Affairs hospital, found 26% of medical inpatients were on LTOT.[1] Over the last 2 decades, use of LTOT has risen substantially in the United States, including among middle-aged and older adults.[2] Concurrently, inpatient hospitalizations related to the overuse of prescription opioids, including overdose, dependence, abuse, and adverse drug events, have increased by 153%.[3] Individuals on LTOT can also be hospitalized for exacerbations of the opioid-treated chronic pain condition or unrelated conditions. In addition to affecting rates of hospitalization, use of LTOT is associated with higher rates of in-hospital adverse events, longer hospital stays, and higher readmission rates.[1,4,5]

Physicians find managing chronic pain to be stressful, are often concerned about misuse and addiction, and believe their training in opioid prescribing is inadequate.[6] Hospitalists report confidence in assessing and prescribing opioids for acute pain but limited success and satisfaction with treating exacerbations of chronic pain.[7] Although half of all hospitalized patients receive opioids,[5] little information is available to guide the care of hospitalized medical patients on LTOT for chronic noncancer pain.[8,9]

Our multispecialty team sought to synthesize guideline recommendations and primary literature relevant to the assessment of medical inpatients on LTOT to assist practitioners balance effective pain treatment and opioid risk reduction. This article addresses obtaining a comprehensive pain history, identifying misuse and opioid use disorders, assessing the risk of overdose and adverse drug events, gauging the risk of withdrawal, and based on such findings, appraise indications for opioid therapy. Other authors have recently published narrative reviews on the management of acute pain in hospitalized patients with opioid dependence and the inpatient management of opioid use disorder.[10,11]

METHODS

To identify primary literature, we searched PubMed, EMBASE, The Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Health Economic Evaluations Database, key

***Address for correspondence:** Teryl Nuckols, MD, MSHS, Cedars-Sinai Medical Center, 8700 Beverly Drive, Becker 113, Los Angeles, CA 90048; Telephone: 310-423-2760; Fax: 310-423-0436; E-mail: teryl.nuckols@cshs.org

Received: June 19, 2017; **Revised**: August 24, 2017; **Accepted**: August 27, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2889

TABLE 1. **List of Guidelines and Position Statements Potentially Applicable to Hospitalized Adults on Opioids for Chronic Pain**

Guideline	Development Body	Abbreviation	Year of Publication	Citation
Hospital settings				
Guidelines for Opioid Management within a Hospital Setting	Massachusetts Health & Hospital Association Substance Use Disorder Prevention and Treatment Task Force	MHHA	2016	11
Reducing Adverse Drug Events Related to Opioids Implementation Guide	Society for Hospital Medicine's Center for Hospital Innovation & Improvement	SHM	2015	12
Clinical Policy: Critical Issues in the Prescribing of Opioids for Adult Patients in the Emergency Department	American College of Emergency Physicians Opioid Guideline Writing Panel	ACEP2012	2012	13
Acute pain				
Health Care Guide: Acute Pain Assessment and Opioid Prescribing Protocol	Institute for Clinical Systems Improvement	ICSI2014	2014	14
Optimizing the Treatment of Pain in Patients with Acute Presentations	Joint Statement by the American College of Emergency Physicians, American Pain Society, American Society for Pain Management Nursing, and the Emergency Nurses Association	ACEP2010	2010	15
Acute Pain Management: Scientific Evidence, 3rd Edition	Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine	AUS/NZ	2010	9
LTOT for chronic pain and published by a national body				
VA/DoD Clinical Practice Guideline for Opioid Therapy for Chronic Pain	Department of Veterans Affairs and Department of Defense	VA	2017	21
CDC Guideline for Prescribing Opioids for Chronic Pain	Centers for Disease Control and Prevention	CDC	2016	20
Health Care Guide: Assessment and Management of Chronic Pain	Institute for Clinical Systems Improvement	ICSI2013	2013	22
Guidelines for Responsible Opioid Prescribing in Chronic Non-Cancer Pain	American Society of Interventional Pain Physicians	ASIPP	2012	19
Practice Guidelines for Chronic Pain Management, An Updated Report	American Society of Anesthesiologists Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine	ASA	2010	23
Canadian Guideline for Safe and Effective Use of Opioids for Chronic Non-Cancer Pain	National Opioid Use Guideline Group, Canada	Canada	2009	18
Pharmacological Management of Persistent Pain in Older Persons	American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons	AGS	2009	16
Opioid Treatment Guidelines, Clinical Guidelines for the Use of Chronic Opioid Therapy in Chronic Noncancer Pain	American Pain Society and the American Academy of Pain Medicine	APS-AAPM	2009	17

NOTE: Abbreviations: CDC, Centers for Disease Control and Prevention; DoD, Department of Defense; LTOT, long-term opioid therapy; VA, Veterans Affairs.

meeting abstracts, and hand searches. To identify guidelines, we searched PubMed, National Guidelines Clearinghouse, specialty societies' websites, the Centers for Disease Control and Prevention (CDC), the United Kingdom National Institute for Health and Care Excellence, the Canadian Medical Association, and the Australian Government National Health and Medical Research Council. Search terms related to opioids and chronic pain, which was last updated in October 2016.[12]

We selected English-language documents on opioids and chronic pain among adults, excluding pain in the setting of procedures, labor and delivery, life-limiting illness, or specific conditions. For primary literature, we considered intervention studies of any design that addressed pain management among hospitalized medical patients. We included guidelines and specialty society position statements published after January 1, 2009, that addressed pain in the hospital setting, acute pain in any setting, or chronic pain in the outpatient setting if published by a national body. Due to the paucity of documents specific to inpatient care, we used a narrative review format to synthesize information. Dual reviewers extracted guideline recommendations potentially relevant to medical inpatients on LTOT. We also summarize relevant assessment instruments, emphasizing very brief screening instruments, which may be more likely to be used by busy hospitalists.

RESULTS

We did not find any primary literature specific to the assessment of pain among medical inpatients on LTOT. We identified 14 eligible guidelines and position statements (see Table 1). Three documents address pain in the hospital setting, including an "implementation guide" from the Society for Hospital Medicine.[13-15] Three documents address acute pain,[9,16,17] and 8

TABLE 2. **Guideline and Position Statement Recommendations Relevant to Prescribing Opioids for Hospitalized Adults with Chronic or Recurring Pain**

Statement	Guidelines Making Similar Recommendations
Obtaining a comprehensive pain history	
Determine whether the clinical situation warrants emergent or urgent treatment with opioids without comprehensive assessment, such as if pain prevents the patient from providing a detailed history	ICSI2014, ACEP2010
Assess pain and functional status	MHHA, ICSI2014, AUS/NZ, CDC, ASIPP, Canadian, AGS
Assess whether pain is worse than baseline, whether pain represents an exacerbation of chronic pain or new acute pain, and whether pain exacerbation may be a manifestation of withdrawal	ICSI2014, AUS/NZ, ASIPP
Obtain a detailed pain history including onset, pattern, intensity, location, quality, exacerbating and alleviating factors, prior treatments, effects	VA, CDC, Canadian
Obtain a medical history from both the patient and caregivers	SHM, ICSI2014
Review the medical record and contact the primary outpatient prescriber to ascertain history of pain and treatment, including opioids medications prescribed, doses, and frequencies	MHHA, SHM, ICSI2014, AUS/NZ, CDC, Canadian
Obtain detailed psychosocial history to identify additional stressors or pain contributors, and gain insight into pain coping skills	SHM, ICSI2014, CDC, Canadian, APS-AAPM
Screen for depression, suicidality, anxiety, and other mental health conditions	MHHA, SHM, ICSI2014, VA, CDC, Canadian
Identifying misuse and opioid use disorders	
Screen for current and prior misuse of opioids, alcohol, and other controlled substances	MHHA, SHM, ICSI2014, VA, APS-AAPM
Check state PDMP databases	MHHA, SHM, ACEP2012, ICSI2014, VA, CDC, ASIPP, APS-AAPM
Order urine drug immunoassay screening test for opioids and drugs of abuse	MHHA, ICSI2014 VA, CDC, ASIPP, Canadian, APS-AAPM
If there is evidence of misuse of opioids or other substances, share concerns with patient, assess whether patient meets criteria for opioid or other substance use disorder, and consider referral to a specialist	MHHA, ICSI2014, AUS/NZ, VA, CDC
Assessing the risk of overdose and adverse events	
Carefully assess risks and benefits when opioid doses exceed 50 mg of morphine equivalents per day	CDC
Inquire about use of sedative-hypnotics, including benzodiazepines, and alcohol	MHHA, ICSI2014, VA, CDC, Canadian, AGS, APS-AAPM
Check skin for fentanyl patches	SHM
Identify comorbidities that increase risk of overdose, including sleep disordered breathing and kidney, liver, and obstructive lung disease	MHHA, SHM, ICSI2014, AUS/NZ, Canadian
Identify risk factors for other adverse events, such as advanced age, cognitive impairment, fall risk	SHM, ICSI2014, Canadian

NOTE: Abbreviations: ACEP2010, Joint Statement by the American College of Emergency Physicians, American Pain Society, American Society for Pain Management Nursing, and the Emergency Nurses Association; ACEP2012, American College of Emergency Physicians Opioid Guideline Writing Panel; AGS, American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons; APS-AAPM, American Pain Society and the American Academy of Pain Medicine; ASIPP, American Society of Interventional Pain Physicians; AUS/NZ, Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine; Canada, National Opioid Use Guideline Group, Canada; CDC, Centers for Disease Control and Prevention; ICSI, Institute for Clinical Systems Improvement; MHHA, Massachusetts Health & Hospital Association Substance Use Disorder Prevention and Treatment Task Force; PDMP, prescription drug monitoring program; SHM, Society for Hospital Medicine's Center for Hospital Innovation & Improvement; VA, Department of Veterans Affairs and Department of Defense.

documents address LTOT for chronic noncancer pain.[18-25] Table 2 lists guideline recommendations potentially relevant to inpatients on LTOT.

DISCUSSION

We grouped guideline recommendations into the following 3 categories applicable to inpatient assessment of patients on LTOT: obtaining a comprehensive pain history, identifying misuse and opioid use disorders, and assessing the risk of overdose and adverse drug events. Although we did not find recommendations that specifically spoke to assessment for opioid withdrawal and appraising indications for opioid therapy, we briefly discuss these areas as highly relevant to inpatient practice.

TABLE 3. **Instruments for Assessing Pain, Function, Psychological Health, Opioid Use Disorders, and Withdrawal**

Instruments	Items	Scale	Positive Score	Citations
Assessing pain intensity: Numerical rating scale	Patient selects a whole number that best reflects the intensity of the pain.	ordinal by integer 0 = no pain 10 = worst pain imaginable	Variable	25,26
Assessing pain intensity and function: Pain average, interference with enjoyment of life, and interference with general activity assessment scale[a]		Average of 3 items	Not reported	28
	What number best describes your pain on average in the last week?	0 = no pain 10 = pain as bad as you can imagine		
	What number best describes how, during the past week, pain has interfered with your enjoyment of life?	0 = does not interfere 10 = completely interferes		
	What number best describes how, during the past week, pain has interfered with your general activity?	0 = does not interfere, 10 = completely interferes		
Screening for depression: Single item from screening tool for psychological distress	Over the past week, how much have you been bothered by feeling sad, down, or uninterested in life?	0 = not at all 9 = severely	≥4	30,31
Screening for anxiety: Single item from screening tool for psychological distress	Over the past week, how much have you been bothered by feeling anxious or nervous?	0 = not at all 9 = severely	≥5	31
Screening for misuse and opioid use disorders: Single-item screening question for unhealthy drug use in primary care patients[a]	How many times in the past year have you used an illegal drug or used a prescription medication for nonmedical reasons (eg, because of the experience or feeling it caused)?	0 to any number of times	≥1	39

[a]Not yet tested among inpatients.

Obtaining a Comprehensive Pain History

Hospitalists newly evaluating patients on LTOT often face a dual challenge: deciding if the patient has an immediate indication for additional opioids and if the current long-term opioid regimen should be altered or discontinued. In general, opioids are an accepted short-term treatment for moderate to severe acute pain but their role in chronic noncancer pain is controversial. Newly released guidelines by the CDC recommend initiating LTOT as a last resort, and the Departments of Veterans Affairs and Defense guidelines recommend against initiation of LTOT.[22,23]

A key first step, therefore, is distinguishing between acute and chronic pain. Among patients on LTOT, pain can represent a new acute pain condition, an exacerbation of chronic pain, opioid-induced hyperalgesia, or opioid withdrawal. Acute pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in relation to such damage.[26] In contrast, chronic pain is a complex response that may not be related to actual or ongoing tissue damage, and is influenced by physiological, contextual, and psychological factors. Two acute pain guidelines and 1 chronic pain guideline recommend distinguishing acute and chronic pain,[9,16,21] 3 chronic pain guidelines reinforce the importance of obtaining a pain history (including timing, intensity, frequency, onset, etc),[20,22,23] and 6 guidelines recommend ascertaining a history of prior pain-related treatments.[9,13,14,16,20,22] Inquiring how the current pain compares with symptoms "on a good day," what activities the patient can usually perform, and what the patient does outside the hospital to cope with pain can serve as entry into this conversation.

The standard for assessing pain intensity remains patient self-report using a validated instrument, such as the Numerical Rating Scale (Table 3).[23,24,27] Among patients with chronic pain, clinically meaningful differences in pain intensity correspond to 1- to 2-point changes on these scales.[27,28] Pain scores should not be the only factor used to determine when opioids are indicated because other factors are relevant and scores may not correlate with patients' preference to receive opioid therapy.[29] Along with pain intensity, 3 guidelines for hospital settings/acute pain and 4 chronic pain guidelines recommend assessing functional status.[9,13,16,18,20-22] The CDC guideline endorses 3-item the "Pain average, interference with Enjoyment of life, and interference with General activity" (PEG) assessment scale [22,30] (Table 3). The instrument would need to be adapted for the hospital setting, but improvement in function, such as mobility, is a good indicator of clinical improvement among inpatients as well.

In addition to function, 5 guidelines, including 2 specific guidelines for acute pain or the hospital setting, recommend obtaining a detailed psychosocial history to identify life stressors and gain insight into the patient's coping skills.[14,16,19,20,22] Psychiatric symptoms can intensify the experience of pain or hamper coping ability. Anxiety, depression, and insomnia frequently coexist in patients with chronic pain.[31] As such, 3 hospital setting/acute pain guidelines and 3 chronic pain guidelines recommend screening for mental health issues including anxiety and depression.[13,14,16,20,22,23] Several depression screening instruments have been validated among inpatients,[32] and there are validated single-item, self-administered instruments for both depression and anxiety (Table 3).[32,33]

Although obtaining a comprehensive history before making treatment decisions is ideal, some patients present in extremis. In emergency departments, some guidelines endorse prompt administration of analgesics based on patient self-report, prior to establishing a diagnosis.[17] Given concerns about the growing prevalence of opioid use disorders, several states now recommend emergency medicine prescribers screen for misuse before giving opioids and avoid parenteral opioids for acute exacerbations of chronic pain.[34] Treatments received in emergency departments set patients' expectations for the care they receive during hospitalization, and hospitalists may find it necessary to explain therapies appropriate for urgent management are not intended to be sustained.

Identifying Misuse and Opioid Use Disorders

Nonmedical use of prescription opioids and opioid use disorders have more than doubled over the last decade.[35] Five guidelines, including 3 specific guidelines for acute pain or the hospital setting, recommend screening for opioid misuse.[13,14,16,19,23] Many states mandate practitioners assess patients for substance use disorders before prescribing controlled substances.[36] Instruments to identify aberrant and risky use include the Current Opioid Misuse Measure,[37] Prescription Drug Use Questionnaire,[38] Addiction Behaviors Checklist,[39] Screening Tool for Abuse,[40] and the Self-Administered Single-Item Screening Question (Table 3).[41] However, the evidence for these and other tools is limited and absent for the inpatient setting.[21,42]

In addition to obtaining a history from the patient, 4 guidelines specific to hospital settings/acute pain and 4 chronic pain guidelines recommend practitioners access prescription drug monitoring programs (PDMPs).[13-16,19,21-24] PDMPs exist in all states except Missouri, and about half of states mandate practitioners check the PDMP database in certain circumstances.[36] Studies examining the effects of PDMPs on prescribing are limited, but checking these databases can uncover concerning patterns including overlapping prescriptions or multiple prescribers.[43] PDMPs can also confirm reported medication doses, for which patient report may be less reliable.

Two hospital/acute pain guidelines and 5 chronic pain guidelines also recommend urine drug testing, although differing on when and whom to test, with some favoring universal screening.[11,20,23] Screening hospitalized patients may reveal substances not reported by patients, but medications administered in emergency departments can confound results. Furthermore, the commonly used immunoassay does not distinguish heroin from prescription opioids, nor detect hydrocodone, oxycodone, methadone, buprenorphine, or certain benzodiazepines. Chromatography/mass spectrometry assays can but are often not available from hospital laboratories. The differential for unexpected results includes substance use, self treatment of uncontrolled pain, diversion, or laboratory error.[20]

If concerning opioid use is identified, 3 hospital setting/acute pain specific guidelines and the CDC guideline recommend sharing concerns with patients and assessing for a substance use disorder.[9,13,16,22] Determining whether patients have an opioid use disorder that meets the criteria in the *Diagnostic and Statistical Manual, 5th Edition*[44] can be challenging. Patients may minimize or deny symptoms or fear that the stigma of an opioid use disorder will lead to dismissive or subpar care. Additionally, substance use disorders are subject to federal confidentiality regulations, which can hamper acquisition of information from providers.[45] Thus, hospitalists may find specialty consultation helpful to confirm the diagnosis.

Assessing the Risk of Overdose and Adverse Drug Events

Oversedation, respiratory depression, and death can result from iatrogenic or self-administered opioid overdose in the hospital.5 Patient factors that increase this risk among outpatients include a prior history of overdose, preexisting substance use disorders, cognitive impairment, mood and personality disorders, chronic kidney disease, sleep apnea, obstructive lung disease, and recent abstinence from opioids.12 Medication factors include concomitant use of benzodiazepines and other central nervous system depressants, including alcohol; recent initiation of long-acting opioids; use of fentanyl patches, immediate-release fentanyl, or methadone; rapid titration; switching opioids without adequate dose reduction; pharmacokinetic drug–drug interactions; and, importantly, higher doses.12,22 Two guidelines specific to acute pain and hospital settings and 5 chronic pain guidelines recommend screening for use of benzodiazepines among patients on LTOT.13,14,16,18-20,22,21 The CDC guideline recommends careful assessment when doses exceed 50 mg of morphine equivalents per day and avoiding doses above 90 mg per day due to the heightened risk of overdose.[22] In the hospital, 23% of patients receive doses at or above 100 mg of morphine equivalents per day,[5] and concurrent use of central nervous system depressants is common. Changes in kidney and liver function during acute illness may impact opioid metabolism and contribute to overdose.

In addition to overdose, opioids are leading causes of adverse drug events during hospitalization.[46] Most studies have focused on surgical patients reporting common opioid-related events as nausea/vomiting, pruritus, rash, mental status changes, respiratory depression, ileus, and urinary retention.[47] Hospitalized patients may also exhibit chronic adverse effects due to LTOT. At least one-third of patients on LTOT eventually stop because of adverse effects, such as endocrinopathies, sleep disordered breathing, constipation, fractures, falls, and mental status changes.[48] Patients may lack awareness that their symptoms are attributable to opioids and are willing to reduce their opioid use once informed, especially when alternatives are offered to alleviate pain.

Gauging the Risk of Withdrawal

Sudden discontinuation of LTOT by patients, practitioners, or intercurrent events can have unanticipated and undesirable consequences. Withdrawal is not only distressing for patients; it can be dangerous because patients may resort to illicit use,

diversion of opioids, or masking opioid withdrawal with other substances such as alcohol. The anxiety and distress associated with withdrawal, or anticipatory fear about withdrawal, can undermine therapeutic alliance and interfere with processes of care. Reviewed guidelines did not offer recommendations regarding withdrawal risk or specific strategies for avoidance. There is no specific prior dose threshold or degree of reduction in opioids that puts patients at risk for withdrawal, in part due to patients' beliefs, expectations, and differences in response to opioid formulations. Symptoms of opioid withdrawal have been compared to a severe case of influenza, including stomach cramps, nausea and vomiting, diarrhea, tremor and muscle twitching, sweating, restlessness, yawning, tachycardia, anxiety and irritability, bone and joint aches, runny nose, tearing, and piloerection.[49] The Clinical Opiate Withdrawal Scale (COWS)[49] and the Clinical Institute Narcotic Assessment[51] are clinician-administered tools to assess opioid withdrawal similar to the Clinical Institute Withdrawal Assessment of Alcohol Scale, Revised,[52] to monitor for withdrawal in the inpatient setting.

Synthesizing and Appraising the Indications for Opioid Therapy

For medical inpatients who report adequate pain control and functional outcomes on current doses of LTOT, without evidence of misuse, the pragmatic approach is to continue the treatment plan established by the outpatient clinician rather than escalating or tapering the dose. If opioids are prescribed at discharge, 3 hospital setting/acute pain guidelines and the CDC guideline recommend prescribing the lowest effective dose of immediate release opioids for 3 to 7 days.[13,15,16,22]

When patients exhibit evidence of an opioid use disorder, have a history of serious overdose, or are experiencing intolerable opioid-related adverse events, the hospitalist may conclude the harms of LTOT outweigh the benefits. For these patients, opioid treatment in the hospital can be aimed at preventing withdrawal, avoiding the perpetuation of inappropriate opioid use, managing other acute medical conditions, and communicating with outpatient prescribers. For patients with misuse, discontinuing opioids is potentially harmful and may be perceived as punitive. Hospitalists should consider consulting addiction or mental health specialists to assist with formulating a plan of care. However, such specialists may not be available in smaller or rural hospitals and referral at discharge can be challenging.[53]

Beginning to taper opioids during the hospitalization can be appropriate when patients are motivated and can transition to an outpatient provider who will supervise the taper. In ambulatory settings, tapers of 10% to 30% every 2 to 5 days are generally well tolerated.[54] If patients started tapering opioids under supervision of an outpatient provider prior to hospitalization; ideally, the taper can be continued during hospitalization with close coordination with the outpatient clinician.

Unfortunately, many patients on LTOT are admitted with new sources of acute pain and or exacerbations of chronic pain, and some have concomitant substance use disorders; we plan to address the management of these complex situations in future work.

Despite the frequency with which patients on LTOT are hospitalized for nonsurgical stays and the challenges inherent in evaluating pain and assessing the possibility of substance use disorders, no formal guidelines or empirical research studies pertain to this population. Guidelines in this review were developed for hospital settings and acute pain in the absence of LTOT, and for outpatient care of patients on LTOT. We also included a nonsystematic synthesis of literature that varied in relevance to medical inpatients on LTOT.

CONCLUSIONS

Although inpatient assessment and treatment of patients with LTOT remains an underresearched area, we were able to extract and synthesize recommendations from 14 guideline statements and apply these to the assessment of patients with LTOT in the inpatient setting. Hospitalists frequently encounter patients on LTOT for chronic nonmalignant pain and are faced with complex decisions about the effectiveness and safety of LTOT; appropriate patient assessment is fundamental to making these decisions. Key guideline recommendations relevant to inpatient assessment include assessing both pain and functional status, differentiating acute from chronic pain, ascertaining preadmission pain treatment history, obtaining a psychosocial history, screening for mental health issues such as depression and anxiety, screening for substance use disorders, checking state prescription drug monitoring databases, ordering urine drug immunoassays, detecting use of sedative-hypnotics, identifying medical conditions associated with increased risk of overdose and adverse events, and appraising the potential benefits and harms of opioid therapy. Although approaches to assessing medical inpatients on LTOT can be extrapolated from outpatient guidelines, observational studies, and small studies in surgical populations, more work is needed to address these critical topics for inpatients on LTOT.

Disclosure: Dr. Herzig was funded by grant number K23AG042459 from the National Institute on Aging. The funding organization had no involvement in any aspect of the study, including design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript. All other authors have no relevant conflicts of interest with the work.

References

1. Mosher HJ, Jiang L, Sarrazin MSV, Cram P, Kaboli PJ, Vander Weg MW. Prevalence and Characteristics of Hospitalized Adults on Chronic Opioid Therapy. *J Hosp Med*. 2014;9(2):82-87.
2. Campbell CI, Weisner C, Leresche L, et al. Age and Gender Trends in Long-Term Opioid Analgesic Use for Noncancer Pain. *Am J Public Health*. 2010;100(12):2541-2547.
3. Owens PL, Barrett ML, Weiss AJ, Washington RE, Kronick R. *Hospital Inpatient Utilization Related to Opioid Overuse among Adults, 1993–2012*. Rockville, MD: Agency for Healthcare Research and Quality; 2014.
4. Gulur P, Williams L, Chaudhary S, Koury K, Jaff M. Opioid Tolerance--a Predictor of Increased Length of Stay and Higher Readmission Rates. *Pain Physician*. 2014;17(4):E503-507.
5. Herzig SJ, Rothberg MB, Cheung M, Ngo LH, Marcantonio ER. Opioid Utilization and Opioid-Related Adverse Events in Nonsurgical Patients in US Hospitals. *J Hosp Med*. 2014;9(2):73-81.
6. Jamison RN, Sheehan KA, Scanlan E, Matthews M, Ross EL. Beliefs and At-

titudes About Opioid Prescribing and Chronic Pain Management: Survey of Primary Care Providers. *J Opioid Manag.* 2014;10(6):375-382.
7. Calcaterra SL, Drabkin AD, Leslie SE, et al. The Hospitalist Perspective on Opioid Prescribing: A Qualitative Analysis. *J Hosp Med.* 2016;11(8):536-542.
8. Helfand M, Freeman M. Assessment and Management of Acute Pain in Adult Medical Inpatients: A Systematic Review. *Pain Med.* 2009;10(7):1183-1199.
9. Macintyre P, Schug S, Scott D, Visser E, Walker S. *Acute Pain Management: Scientific Evidence.* Melbourne, Australia: Australian and New Zealand College of Anesthetists and Faculty of Pain Medicine; 2010.
10. Raub JN, Vettese TE. Acute Pain Management in Hospitalized Adult Patients with Opioid Dependence: A Narrative Review and Guide for Clinicians. *J Hosp Med.* 2017;12(5):375-379.
11. Theisen-Toupal J, Ronan MV, Moore A, Rosenthal ES. Inpatient Management of Opioid Use Disorder: A Review for Hospitalists. *J Hosp Med.* 2017;12(5):369-374.
12. Nuckols TK, Anderson L, Popescu I, et al. Opioid Prescribing: A Systematic Review and Critical Appraisal of Guidelines for Chronic Pain. *Ann Intern Med.* 2014;160(1):38-47.
13. Massachusetts Health & Hospital Association Substance Use Disorder Prevention and Treatment Task Force. *Guidelines for Opioid Management within a Hospital Setting.* Boston, MA: Massachusetts Health & Hospital Association; 2009.
14. Society for Hospital Medicine's Center for Hospital Innovation & Improvement. *Reducing Adverse Drug Events Related to Opioids Implementation Guide.* Philadelphia, PA; 2015.
15. Cantrill S, Brown M, Carlisle RJ, et al. Clinical Policy Critical Issues in the Prescribing of Opioids for Adult Patients in the Emergency Department. *Ann Emerg Med.* 2012;60(4):499-525.
16. Thorson D, Biewen P, Bonte B, et al. *Acute Pain Assessment and Opioid Prescribing Protocol.* Bloomington, MN: Institute for Clinical Systems Improvement; 2014.
17. American Society for Pain Management N, Emergency Nurses A, American College of Emergency P, American Pain S. Optimizing the Treatment of Pain in Patients with Acute Presentations. Policy Statement. *Ann Emerg Med.* Jul 2010;56(1):77-79.
18. American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons. Pharmacological Management of Persistent Pain in Older Persons. *J Am Geriatr Soc.* 2009;57(8):1331-1346.
19. Chou R, Fanciullo GJ, Fine PG, et al. Clinical Guidelines for the Use of Chronic Opioid Therapy in Chronic Noncancer Pain. *J Pain.* 2009;10(2):113-130.
20. Furlan AD, Reardon R, Weppler C. Opioids for Chronic Noncancer Pain: A New Canadian Practice Guideline. *CMAJ.* 2010;182(9):923-930.
21. Manchikanti L, Abdi S, Atluri S, et al. American Society of Interventional Pain Physicians (ASIPP) Guidelines for Responsible Opioid Prescribing in Chronic Non-Cancer Pain: Part 2--Guidance. *Pain Physician.* 2012;15(3 Suppl):S67-116.
22. Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain--United States, 2016. *JAMA.* 2016;315(15):1624-1645.
23. The Opiod Therap for Chronic Pain Work Group. VA/DoD Clinical Practice Guideline for Opioid Therapy for Chronic Pain. Version 3.0. https://www.healthquality.va.gov/guidelines/Pain/cot/VADoDOTCPG022717.pdf. AccessedAugust 3, 2016.
24. Hooten W, Timming R, Belgrade M, et al. *Assessment and Managemeent of Chronic Pain.* Bloomington, MN: Institute for Clinical Systems Improvement; 2013.
25. American Society of Anesthesiologists Task Force. Practice Guidelines for Chronic Pain Management: An Updated Report by the American Society of Anesthesiologists Task Force on Chronic Pain Management and the American Society of Regional Anesthesia and Pain Medicine. *Anesthesiology.* 2010;112(4):810-833.
26. International Association for the Study of Pain. IASP Taxonomy. https://www.iasp-pain.org/Taxonomy. Accessed August 3, 2016.
27. Hawker GA, Mian S, Kendzerska T, French M. Measures of Adult Pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), Mcgill Pain Questionnaire (MPQ), Short-Form Mcgill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). *Arthritis Care Res (Hoboken).* 2011;63 Suppl 11:S240-252.
28. Farrar JT, Young JP, LaMoreaux L, Werth JL, Poole RM. Clinical Importance of Changes in Chronic Pain Intensity Measured on an 11-Point Numerical Pain Rating Scale. *Pain.* 2001;94(2):149-158.
29. van Dijk JF, Kappen TH, Schuurmans MJ, van Wijck AJ. The Relation between Patients' NRS Pain Scores and Their Desire for Additional Opioids after Surgery. *Pain Pract.* 2015;15(7):604-609.
30. Krebs EE, Lorenz KA, Bair MJ, et al. Development and Initial Validation of the PEG, a Three-Item Scale Assessing Pain Intensity and Interference. *J Gen Intern Med.* 2009;24(6):733-738.
31. Finan PH, Smith MT. The Comorbidity of Insomnia, Chronic Pain, and Depression: Dopamine as a Putative Mechanism. *Sleep Med Rev.* 2013;17(3):173-183.
32. IsHak WW, Collison K, Danovitch I, et al. Screening for Depression in Hospitalized Medical Patients. *J Hosp Med.* 2017;12(2):118-125.
33. Young QR, Nguyen M, Roth S, Broadberry A, Mackay MH. Single-Item Measures for Depression and Anxiety: Validation of the Screening Tool for Psychological Distress in an Inpatient Cardiology Setting. *Eur J Cardiovasc Nurs.* 2015;14(6):544-551.
34. Poon SJ, Greenwood-Ericksen MB. The Opioid Prescription Epidemic and the Role of Emergency Medicine. *Ann Emerg Med.* 2014;64(5):490-495.
35. National Institute on Alcohol Abuse and Alcoholism (NIAAA). Rates of Nonmedical Prescription Opioid Use and Opioid Use Disorder Double in 10 Years. https://www.nih.gov/news-events/rates-nonmedical-prescription-opioid-use-opioid-use-disorder-double-10-years. Accessed on August 3, 2016.
36. National Alliance for Model State Drug Laws. Status of Prescription Drug Monitoring Programs (PDMPs). http://www.pdmpassist.org/pdf/PDMPProgramStatus.pdf. Accessed August 3, 2016.
37. Butler SF, Budman SH, Fernandez KC, et al. Development and Validation of the Current Opioid Misuse Measure. *Pain.* 2007;130(1-2):144-156.
38. Compton PA, Wu SM, Schieffer B, Pham Q, Naliboff BD. Introduction of a Self-Report Version of the Prescription Drug Use Questionnaire and Relationship to Medication Agreement Noncompliance. *J Pain Symptom Manage.* 2008;36(4):383-395.
39. Wu SM, Compton P, Bolus R, et al. The Addiction Behaviors Checklist: Validation of a New Clinician-Based Measure of Inappropriate Opioid Use in Chronic Pain. *J Pain Symptom Manage.* 2006;32(4):342-351.
40. Atluri SL, Sudarshan G. Development of a Screening Tool to Detect the Risk of Inappropriate Prescription Opioid Use in Patients with Chronic Pain. *Pain Physician.* 2004;7(3):333-338.
41. McNeely J, Cleland CM, Strauss SM, Palamar JJ, Rotrosen J, Saitz R. Validation of Self-Administered Single-Item Screening Questions (SISQS) for Unhealthy Alcohol and Drug Use in Primary Care Patients. *J Gen Intern Med.* 2015;30(12):1757-1764.
42. Kaye AD, Jones MR, Kaye AM, et al. Prescription Opioid Abuse in Chronic Pain: An Updated Review of Opioid Abuse Predictors and Strategies to Curb Opioid Abuse (Part 2). *Pain Physician.* 2017;20(2):S111-S133.
43. Paulozzi LJ, Strickler GK, Kreiner PW, Koris CM. Controlled Substance Prescribing Patterns - Prescription Behavior Surveillance System, Eight States, 2013. *MMWR Surveillance Summaries.* 16 2015;64(9):1-14.
44. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 5th ed. Washington, DC; 2013.
45. Substance Abuse and Mental Health Services Administration. *Substance Abuse Confidentiality Regulations.* Rockville, MD; 2016.
46. Lucado J, Paez K, Elixhauser A. *Medication-Related Adverse Outcomes in U.S. Hospitals and Emergency Departments, 2008: Statistical Brief #109.* Rockville, MD: Agency for Healthcare Research and Quality (AHRQ); April 2011.
47. Wheeler M, Oderda GM, Ashburn MA, Lipman AG. Adverse Events Associated with Postoperative Opioid Analgesia: A Systematic Review. *J Pain.* Jun 2002;3(3):159-180.
48. Noble M, Tregear SJ, Treadwell JR, Schoelles K. Long-Term Opioid Therapy for Chronic Noncancer Pain: A Systematic Review and Meta-Analysis of Efficacy and Safety. *J Pain Symptom Manage.* Feb 2008;35(2):214-228.
49. Wesson DR, Ling W. The Clinical Opiate Withdrawal Scale (COWS). *J Psychoactive Drugs.* 2003;35(2):253-259.50.
50. Tompkins DA, Bigelow GE, Harrison JA, Johnson RE, Fudala PJ, Strain EC. Concurrent Validation of the Clinical Opiate Withdrawal Scale (COWS) and Single-Item Indices against the Clinical Institute Narcotic Assessment (CINA) Opioid Withdrawal Instrument. *Drug Alcohol Depend.* 2009;105(1-2):154-159.
51. Sullivan JT, Sykora K, Schneiderman J, Naranjo CA, Sellers EM. Assessment of Alcohol Withdrawal: The Revised Clinical Institute Withdrawal Assessment for Alcohol Scale (CIWA-Ar). *Br J Addict.* 1989;84(11):1353-1357.
52. Rosenblatt RA, Andrilla CH, Catlin M, Larson EH. Geographic and Specialty Distribution of US Physicians Trained to Treat Opioid Use Disorder. *Ann Fam Med.* Jan-Feb 2015;13(1):23-26.
53. Berna C, Kulich RJ, Rathmell JP. Tapering Long-Term Opioid Therapy in Chronic Noncancer Pain: Evidence and Recommendations for Everyday Practice. *Mayo Clin Proc.* Jun 2015;90(6):828-842.

Safe Opioid Prescribing for Acute Noncancer Pain in Hospitalized Adults: A Systematic Review of Existing Guidelines

Shoshana J. Herzig, MD, MPH[1,2]*, Susan L. Calcaterra, MD, MPH[3,4], Hilary J. Mosher, MD[5,6], Matthew V. Ronan, MD[2,7,8], Nicole Van Groningen, MD[9], Lili Shek, MD[9], Anthony Loffredo, MD[10], Michelle Keller, MPH[11], Anupam B. Jena, MD, PhD[2,12], Teryl K. Nuckols, MD[9]

[1]Department of Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts; [2]Harvard Medical School, Boston, Massachusetts; [3]Department of Medicine, Denver Health Medical Center, Denver, Colorado; [4]Department of Medicine, Division of General Internal Medicine, University of Colorado, Aurora, Colorado; [5]The Comprehensive Access and Delivery Research and Evaluation Center at the Iowa City Veterans Affairs Healthcare System, Iowa City, Iowa; [6]Department of Internal Medicine, Carver College of Medicine, University of Iowa, Iowa City, Iowa; [7]Department of Internal Medicine, West Roxbury Medical Center, Veterans Health Administration Boston Healthcare System, West Roxbury, Massachusetts; [8]Boston University School of Medicine, Boston, Massachusetts; [9]Division of General Internal Medicine, Cedars-Sinai Medical Center, Los Angeles, California; [10]Department of Emergency Medicine, Cedars-Sinai Medical Center, Los Angeles, California; [11]Division of Health Services Research, Cedars-Sinai Medical Center, Los Angeles, California; [12]Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts.

BACKGROUND: Pain is common among hospitalized patients. Inpatient prescribing of opioids is not without risk. Acute pain management guidelines could inform safe prescribing of opioids in the hospital and limit associated unintended consequences.

PURPOSE: To evaluate the quality and content of existing guidelines for acute, noncancer pain management.

DATA SOURCES: The National Guideline Clearinghouse, MEDLINE via PubMed, websites of relevant specialty societies and other organizations, and selected international search engines.

STUDY SELECTION: Guidelines published between January 2010 and August 2017 addressing acute, noncancer pain management among adults were considered. Guidelines that focused on chronic pain, specific diseases, and the nonhospital setting were excluded.

DATA EXTRACTION: Quality was assessed using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument.

DATA SYNTHESIS: Four guidelines met the selection criteria. Most recommendations were based on expert consensus. The guidelines recommended restricting opioids to severe pain or pain that has not responded to nonopioid therapy, using the lowest effective dose of short-acting opioids for the shortest duration possible, and co-prescribing opioids with nonopioid analgesics. The guidelines generally recommended checking the prescription drug monitoring program when prescribing opioids, developing goals for patient recovery, and educating patients regarding the risks and side effects of opioid therapy. Additional recommendations included using an opioid-dose conversion guide, avoidance of co-administration of parenteral and oral opioids, and using caution when co-prescribing opioids with other central nervous system depressants.

CONCLUSIONS: Guidelines, based largely on expert opinion, recommend judicious prescribing of opioids for severe, acute pain. Future work should assess the implications of these recommendations on hospital-based pain management. *Journal of Hospital Medicine* 2018;13:256-262. © 2018 Society of Hospital Medicine

Pain is prevalent among hospitalized patients, occurring in 52%-71% of patients in cross-sectional surveys.[1-3] Opioid administration is also common, with more than half of nonsurgical patients in United States (US) hospitals receiving at least one dose of opioid during hospitalization.[4] Studies have also begun to define the degree to which hospital prescribing contributes to long-term use. Among opioid-naïve patients admitted to the hospital, 15%-25% fill an opioid prescription in the week after hospital discharge,[5,6] 43% of such patients fill another opioid prescription 90 days post-discharge,[6] and 15% meet the criteria for long-term use at one year.[7] With about 37 million discharges from US hospitals each year,[8] these estimates suggest that hospitalization contributes to initiation of long-term opioid use in millions of adults each year.

Additionally, studies in the emergency department and hospital settings demonstrate large variations in prescribing of opioids between providers and hospitals.[4,9] Variation unrelated to patient characteristics highlights areas of clinical uncertainty and the corresponding need for prescribing standards and guidance. To our knowledge, there are no existing guidelines

***Address for correspondence:** Shoshana J. Herzig, MD, MPH, Beth Israel Deaconess Medical Center, 330 Brookline Ave, CO-1309, Boston, MA 02215; Telephone: (617) 754-1413; Fax: (617) 754-1440.

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

Received: December 28, 2017; **Revised:** February 23, 2018; **Accepted:** March 5, 2018

2018 Society of Hospital Medicine DOI 10.12788/jhm.2979

on safe prescribing of opioids in hospitalized patients, aside from guidelines specifically focused on the perioperative, palliative care, or end-of-life settings.

Thus, in the context of the current opioid epidemic, the Society of Hospital Medicine (SHM) sought to develop a consensus statement to assist clinicians practicing medicine in the inpatient setting in safe prescribing of opioids for acute, noncancer pain on the medical services. We define "safe" prescribing as proposed by Aronson: "a process that recommends a medicine appropriate to the patient's condition and minimizes the risk of undue harm from it."[10] To inform development of the consensus statement, SHM convened a working group to systematically review existing guidelines on the more general management of acute pain. This article describes the methods and results of our systematic review of existing guidelines for managing acute pain. The Consensus Statement derived from these existing guidelines, applied to the hospital setting, appears in a companion article.

METHODS

Steps in the systematic review process included: 1) searching for relevant guidelines, 2) applying exclusion criteria, 3) assessing the quality of the guidelines, and 4) synthesizing guideline recommendations to identify issues potentially relevant to medical inpatients with acute pain. Details of the protocol for this systematic review were registered on PROSPERO and can be accessed at https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=71846.

Data Sources and Search Terms

Information sources included the National Guideline Clearinghouse, MEDLINE via PubMed, websites of relevant specialty societies and other organizations, and selected international search engines (see Figure). We searched PubMed using the medical subject heading "Analgesics, opioid" and either 1) "Practice Guidelines as Topic" or "Guidelines as Topic," or 2) publication type of "Guideline" or "Practice Guideline." For the other sources, we used the search terms opioid, opiate, and acute pain.

Guideline Inclusion/Exclusion Criteria

We defined guidelines as statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harm of alternative care options, consistent with the National Academies' definition.[11] To be eligible, guidelines had to be published in English and include recommendations on prescribing opioids for acute, noncancer pain. We excluded guidelines focused on chronic pain or palliative care, guidelines derived entirely from another guideline, and guidelines published before 2010, since such guidelines may contain outdated information.[12] Because we were interested in general principles regarding safe use of opioids for managing acute pain, we excluded guidelines that focused exclusively on specific disease processes (eg, cancer, low-back pain, and sickle cell anemia). As we were specifically interested in the management of acute pain in the hospital setting, we also excluded guidelines that focused exclusively on specific nonhospital settings of care (eg, outpatient care clinics and nursing homes). We included guidelines related to care in the emergency department (ED) given the hospital-based location of care and the high degree of similarity in scope of practice and patient population, as most hospitalized adults are admitted through the ED. Finally, we excluded guidelines focusing on management in the intensive care setting (including the post-anesthesia care unit) given the inherent differences in patient population and management options between the intensive and nonintensive care areas of the hospital.

Guideline Quality Assessment

We used the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument[13-15] to evaluate the quality of each guideline selected for inclusion. The AGREE II instrument includes 23 statements, spanning 6 domains. Each guideline was rated by 3 appraisers (S.J.H., S.L.C., M.V.R., N.V., L.S., A.L., and M.K.) who indicated the degree to which they agreed with each of the 23 statements using a scale from 1 (strongly disagree) to 7 (strongly agree). They additionally rated the overall quality of the guideline, also on a scale of 1 to 7, and indicated whether they would recommend the guideline for use. Scaled domain scores are reported as a percentage and calculated as described in Table 1.

Guideline Synthesis and Analysis

We extracted recommendations from each guideline related to the following topics: 1) deciding when to use opioids, nonopioid medications, and nonmedication-based pain management modalities, 2) best practices in screening/monitoring/education prior to prescribing an opioid and/or during treatment, 3) opioid selection considerations, including selection of dose, duration, and route of administration, 4) strategies to minimize the risk of opioid-related adverse events, and 5) safe practices on discharge.

Role of the Funding Source

The Society of Hospital Medicine provided administrative and material support for the project, but had no role in the design or execution of the scientific evaluation.

RESULTS

We identified 923 unique records for screening, from which we identified 4 guidelines meeting the selection criteria (see Figure). Guidelines by the American College of Occupational and Environmental Medicine (ACOEM) and the Washington State Agency Medical Directors' Group (WSAMDG) include recommendations related to management of acute, subacute, postoperative, and chronic pain.[16,17] The guideline by the American College of Emergency Physicians (ACEP) focuses on management of acute pain in the ED setting,[18] and the guideline by the National Institute for Health and Care Excellence (NICE) focuses on safe opioid management for any indication/setting.[19] Almost all of the studies upon which the recommenda-

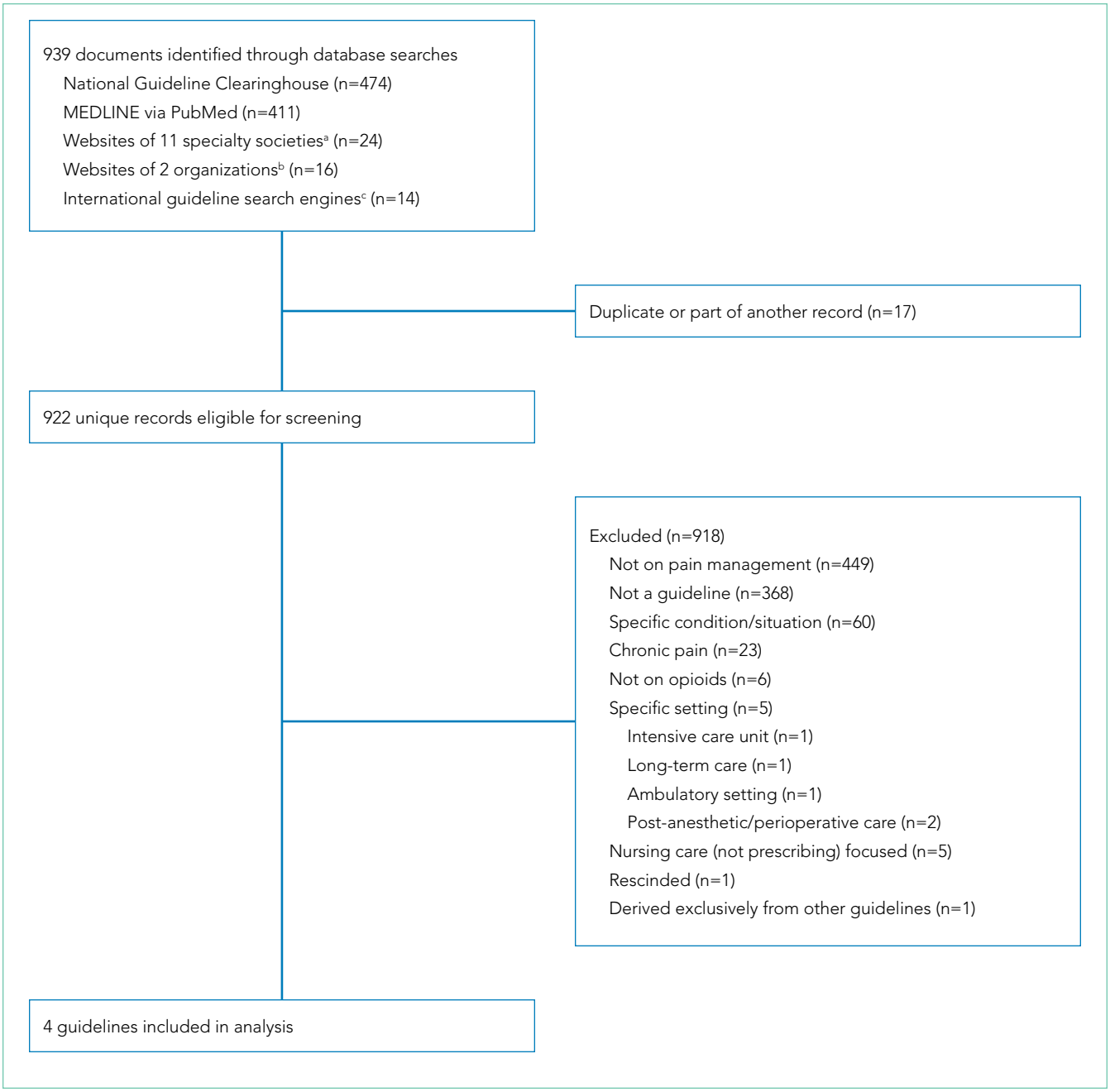

FIG. Summary of Evidence Search and Selection.

[a]Includes American Academy of Family Physicians, American Academy of Pain Medicine, American Academy of Physical Medicine & Rehabilitation, American College of Physicians, American Geriatrics Society, American Society of Addiction Medicine, American Society of Anesthesiologists, American Society of Interventional Pain Physicians, Association of Military Surgeons of the United States, National Medical Association, Society of Medical Consultants to the Armed Forces

[b]Includes Centers for Disease Control and Prevention, Washington State government

[c]Includes National Institute for Health and Care Excellence [NICE], Canadian Medical Association Clinical Practice Guidelines Infobase, Australian Government National Health and Medical Research Council, Australian Clinical Practice Guidelines Portal Web

tions were based occurred in the outpatient setting. Only the guidelines by NICE[19] and WSAMDG[17] made recommendations related to prescribing in the hospital setting specifically (these recommendations are noted in Table 2 footnotes), often in the context of opioid prescribing in the postoperative setting, which, although not a focus of our systematic review, included relevant safe prescribing practices during hospitalization and at the time of hospital discharge.

Guideline Quality Assessment

See Table 1 for the AGREE II scaled domain scores, and Appendix Table 1 for the ratings on each individual item within a domain. The range of scaled scores for each of the AGREE II domains were as follows: Scope and purpose 52%-89%, stakeholder involvement 30%-81%, rigor of development 46%-81%, clarity of presentation 59%-72%, applicability 10%-57%, and editorial independence 42%-78%. Overall guideline as-

TABLE 1. **Scaled Domain Scores[a] Across Domains of the AGREE II Instrument and Overall Assessment Scores**

	Guideline Development Group (reference)			
Domain	**ACEP[17]**	**ACOEM[15]**	**NICE[18]**	**WSAMDG[16]**
Scope and Purpose	89%	63%	87%	52%
Stakeholder Involvement	46%	30%	81%	48%
Rigor of Development	65%	61%	81%	46%
Clarity of Presentation	59%	59%	63%	72%
Applicability	10%	24%	57%	32%
Editorial Independence	42%	61%	78%	61%
Overall Assessment[b]	4	4.3	5.3	4
Recommend this guideline for use				
Yes	2	0	2	2
Yes with modification	1	3	1	1
No	0	0	0	0

[a]Each individual item within a domain was rated on a Likert scale with a maximum of 7 points. The scores were averaged across the 3 appraisers. The scaled domain score is calculated as follows: (obtained score [sum of the mean scores for individual items within a domain] - minimum possible score) / (maximum possible score - minimum possible score).

[b]Mean score on a scale from 1 to 7

NOTE: Abbreviations: ACEP, American College of Emergency Physicians; ACOEM, American College of Occupational and Environmental Medicine; NICE, National Institute for Healthcare Excellence; WSAMDG, Washington State Agency Medical Directors' Group.

sessment scores ranged from 4 to 5.33 on a scale from 1 to 7. Three of the guidelines (NICE, ACOEM, and WSAMDG)[16,17,19] were recommended for use *without* modification by 2 out of 3 guideline appraisers, and one of the guidelines (ACEP)[18] was recommended for use *with* modification by all 3 appraisers. The guideline by NICE[19] was rated the highest both overall (5.33), and on 4 of the 6 AGREE II domains.

Although the guidelines each included a systematic review of the literature, the NICE[19] and WSAMDG[17] guidelines did not include the strength of recommendations or provide clear links between each recommendation and the underlying evidence base. When citations were present, we reviewed them to determine the type of data upon which the recommendations were based and included this information in Table 2. The majority of the recommendations in Table 2 are based on expert opinion alone, or other guidelines.

Guideline Synthesis and Analysis

Table 2 contains a synthesis of the recommendations related to each of our 5 prespecified content areas. Despite the generally low quality of the evidence supporting the recommendations, there were many areas of concordance across guidelines.

Deciding When to Use Opioids, Nonopioid Medications, and Nonmedication-Based Pain Management Modalities

Three out of 4 guidelines recommended restricting opioid use to severe pain or pain that has not responded to nonopioid therapy,[16-18] 2 guidelines recommended treating mild to moderate pain with nonopioid medications, including acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs),[16,17] and 2 guidelines recommended co-prescribing opioids with nonopioid analgesic medications to reduce total opioid requirements and improve pain control.[16,17] Each of these recommendations was supported by at least one randomized controlled trial.

Best Practices in Screening/Monitoring/Education to Occur Prior to Prescribing an Opioid and/or During Treatment

Three guidelines recommended checking prescription drug monitoring programs (PDMPs), all based on expert consensus.[16-18] Only the WSAMDG guideline offered guidance as to the optimal timing to check the PDMP in this setting, specifically recommending to check before prescribing opioids.[17] Two guidelines also recommended helping patients set reasonable expectations about their recovery and educating patients about the risks/side effects of opioid therapy, all based on expert consensus or other guidelines.[17,19]

Opioid Selection Considerations, Including Selection of Dose, Duration, and Route of Administration

Three guidelines recommended using the lowest effective dose, supported by expert consensus and observational data in the outpatient setting demonstrating that overdose risk increases with opioid dose.[16-18] Three guidelines recommended using short-acting opioids and/or avoiding use of long-acting/extended-release opioids for acute pain based on expert consensus.[16-18] Two guidelines recommended using as-needed rather than scheduled dosing of opioids based on expert recommendation.[16, 17]

TABLE 2. **Selected Guideline Recommendations Related to Mitigating the Risks of Opioid Therapy for Treating Acute Pain**

	Guideline Development Group (reference)			
Recommendation	**ACEP[17]**	**ACOEM[15]**	**NICE[18]**	**WSAMDG[16]**
Deciding when to use opioids, nonopioid medications, and nonmedication based pain management modalities				
Restrict use to severe pain or pain that has not responded to nonopioid therapy.	√[d]	√[a]		√[d]
Treat mild to moderate pain with nonopioid medications, including acetaminophen and NSAIDs		√[a]		√[a]
Combine opioid with nonopioid medications to reduce total opioid requirements and improve pain control		√[d]		√[a]
Consider scheduling nonopioids for more steady analgesia and to avoid multiple as-needed medications for pain				√[d]
Combine opioids with nonpharmacologic therapies				√[a-e depending on modality]
Best practices in screening/monitoring/education prior to prescribing an opioid and/or during treatment				
Check prescription drug monitoring programs	√[d]	√[d,f]		√[d]
Use caution when prescribing to patients with concomitant psychiatric disorders or other risk factors for adverse effects		√[b]		
Consider psychiatric and/or mental health consultation for those who do not improve as expected and require high doses or prolonged use		√[d,f]		
Track pain and function over time				√[d] (Recommend 3-item PEG or 2-item Graded Chronic Pain Scale)
Help patient set reasonable expectations about their recovery			√[d,e]	√[d]
Educate patient about potential risks/side effects			√[d,e]	√[d]
Opioid selection considerations				
Use lowest effective dose	√[d]	√[b]		√[d,f]
Use short-acting opioid/avoid long-acting opioids	√[d]	√[d]		√[d,f]
Do not use immediate-release oral transmucosal formulations of fentanyl	√[d]			
Use lowest effective potency		√[d]		
Use as needed rather than scheduled dosing		√[d]		√[d,f]
Oral route generally preferred; intravenous administration by intermittent bolus recommended for rapid control of severe acute pain				√[a,f]
Strategies to minimize the risk of opioid-related adverse events				
Use a recognized opioid dose conversion guide when prescribing, reviewing or changing opioid prescriptions		√[d]	√[d,e]	
Use lower doses in elderly, women, low body weight		√[d]		
When switching between opioids, the morphine equivalent dose of the new opioid should be 50% of the prior dose		√[e]		
Avoid therapeutic duplication of opioids consisting of more than one type of as-needed short-acting opioid				√[d,f]
Avoid co-administration of parenteral and oral as-needed opioids; If as-needed opioids from different routes are necessary, provide a clear indication for use of each			√[d,e]	√[d,e,f]
Intravenous administration associated with increased risk of respiratory depression; level of sedation should be monitored				√[d,f]
Avoid/use caution when co-prescribing opioids with other CNS depressant medications		√[b]		√[d,f]
Initiate a bowel regimen to minimize opioid-induced bowel dysfunction (constipation)				√[d,f]
Safe practices on discharge				
Prescribe a limited duration[g]	1 week[d]	1-2 weeks[d]	No more than 30 days[d,e]	Taper as acute pain episode resolves, usually < 2 weeks[d,f]
Provide education on safekeeping and safe disposal of opioids, benzodiazepines, and other controlled substances			√[d,e]	√[d,f]
Counsel patients and families about risks of using alcohol and other CNS depressants with opioids				√[d,f]
Counsel patients about how opioids may affect the ability to drive			√[d,e]	
Involve primary care provider in prescribing decisions, and ensure the record of administration is readily accessible to outpatient providers			√[d,e,f]	
When prescribing "as-needed" opioids, document clear instructions for when and how to take, as well as maximum daily amount to be printed on prescription label; ask patient and take into account any existing opioid supply			√[d,e]	
When supplying more than one formulation (eg, immediate-release and sustained-release formulations), discuss the differences between the formulations with the patient/caregivers, and check that they understand what the different formulations are for and when to take them			√[d,e]	

[a]Evidence from randomized, controlled trial/trials

[b]Evidence from observational study/studies

[c]Evidence from systematic review

[d]Evidence from expert consensus

[e]Based on other guidelines

[f]Recommendation specifically designated for the hospital setting

[g]Maximum recommended durations of use reflect the entire acute pain episode (ie, not prescribing on discharge specifically)

NOTE: Abbreviations: ACEP, American College of Emergency Physicians; ACOEM, American College of Occupational and Environmental Medicine; CNS, central nervous system; NICE, National Institute for Health and Care Excellence; PEG, Pain intensity, interference with Enjoyment of life, and interference with General activity; WSAMDG = Washington State Agency medical directors' group

Strategies to Minimize the Risk of Opioid-Related Adverse Events

Several strategies to minimize the risk of opioid-related adverse events were identified, but most were only recommended by a single guideline. Strategies recommended by more than one guideline included using a recognized opioid dose conversion guide when prescribing, reviewing, or changing opioid prescriptions (based on expert consensus);[16,19] avoiding co-administration of parenteral and oral as-needed opioids, and if as-needed opioids from different routes are necessary, providing a clear indication for use of each (based on expert consensus and other guidelines);[17,19] and avoiding/using caution when co-prescribing opioids with other central nervous system depressant medications[16,17] (supported by observational studies demonstrating increased risk in the outpatient setting).

Safe Practices on Discharge

All 4 of the guidelines recommended prescribing a limited duration of opioids for the acute pain episode; however the maximum recommended duration varied widely from one week to 30 days.[16-19] It is important to note that because these guidelines were not focused on hospitalization specifically, these maximum recommended durations of use reflect the entire acute pain episode (ie, not prescribing on discharge specifically). The guideline with the longest maximum recommended duration was from NICE, based in the United Kingdom, while the US-based guideline development groups uniformly recommended 1 to 2 weeks as the maximum duration of opioid use, including the period of hospitalization.

DISCUSSION

This systematic review identified only 4 existing guidelines that included recommendations on safe opioid prescribing practices for managing acute, noncancer pain, outside of the context of specific conditions, specific nonhospital settings, or the intensive care setting. Although 2 of the identified guidelines offered sparse recommendations specific to the hospital setting, we found no guidelines that focused exclusively on the period of hospitalization specifically outside of the perioperative period. Furthermore, the guideline recommendations were largely based on expert opinion. Although these factors limit the confidence with which the recommendations can be applied to the hospital setting, they nonetheless represent the best guidance currently available to standardize and improve the safety of prescribing opioids in the hospital setting.

This paucity of guidance specific to patients hospitalized in general, nonintensive care areas of the hospital is important because pain management in this setting differs in a number of ways from pain management in the ambulatory or intensive care unit settings (including the post-anesthesia care unit). First, there are differences in the monitoring strategies that are available in each of these settings (eg, variability in nurse-to-patient ratios, frequency of measuring vital signs, and availability of continuous pulse oximetry/capnography). Second, there are differences in available/feasible routes of medication administration depending on the setting of care. Finally, there are differences in the patients themselves, including severity of illness, baseline and expected functional status, pain severity, and ability to communicate.

Accordingly, to avoid substantial heterogeneity in recommendations obtained from this review, we chose to focus on guidelines most relevant to clinicians practicing medicine in nonintensive care areas of the hospital. This resulted in the exclusion of 2 guidelines intended for anesthesiologists that focused exclusively on perioperative management and included use of advanced management procedures beyond the scope of practice for general internists,[20,21] and one guideline that focused on management in the intensive care unit.[22] Within the set of guidelines included in this review, we did include recommendations designated for the postoperative period that we felt were relevant to the care of hospitalized patients more generally. In fact, the ACOEM guideline, which includes postoperative recommendations, specifically noted that these recommendations are mostly comparable to those for treating acute pain more generally.[16]

In addition to the lack of guidance specific to the setting in which most hospitalists practice, most of the recommendations in the existing guidelines are based on expert consensus. Guidelines based on expert opinion typically carry a lower strength of recommendation, and, accordingly, should be applied with some caution and accompanied by diligent tracking of outcome metrics, as these recommendations are applied to local health systems. Recommendations may have unintended consequences that are not necessarily apparent at the outset, and the specific circumstances of each patient must be considered when deciding how best to apply recommendations. Additional research will be necessary to track the impact of the recommended prescribing practices on patient outcomes, particularly given that many states have already begun instituting regulations on safe opioid prescribing despite the limited nature of the evidence. Furthermore, although several studies have identified patient- and prescribing-related risk factors for opioid-related adverse events in surgical patient populations, given the differences in patient characteristics and prescribing patterns in these settings, research to understand the risk factors in hospitalized medical patients specifically is important to inform evidence-based, safe prescribing recommendations in this setting.

Despite the largely expert consensus-based nature of the recommendations, we found substantial overlap in the recommendations between the guidelines, spanning our prespecified topics of interest related to safe prescribing. Most guidelines recommended restricting opioid use to severe pain or pain that has not responded to nonopioid therapy, checking PDMPs, using the lowest effective dose, and using short-acting opioids and/or avoiding use of long-acting/extended-release opioids for acute pain. There was less consensus on risk mitigation strategies, where the majority of recommendations were endorsed by only 1 or 2 guidelines. Finally, all 4 guidelines recommended prescribing a limited duration of opioids for the acute pain episode, with US-based guidelines recommending 1 to 2 weeks as the maximum duration of opioid use, including

the period of hospitalization.

There are limitations to our evaluation. As previously noted, in order to avoid substantial heterogeneity in management recommendations, we excluded 2 guidelines intended for anesthesiologists that focused exclusively on perioperative management,[20,21] and one guideline focused on management in the intensive care unit.[22] Accordingly, recommendations contained in this review may or may not be applicable to those settings, and readers interested in those settings specifically are directed to those guidelines. Additionally, we decided to exclude guidelines that focused on managing acute pain in specific conditions (eg, sickle cell disease and pancreatitis) because our goal was to identify generalizable principles of safe prescribing of opioids that apply regardless of clinical condition. Despite this goal, it is important to recognize that not all of the recommendations are generalizable to all types of pain; clinicians interested in management principles specific to certain disease states are encouraged to review disease-specific informational material. Finally, although we used rigorous, pre-defined search criteria and registered our protocol on PROSPERO, it is possible that our search strategy missed relevant guidelines.

In conclusion, we identified few guidelines on safe opioid prescribing practices for managing acute, noncancer pain, outside of the context of specific conditions or nonhospital settings, and no guidelines focused on acute pain management in general, nonintensive care areas of the hospital specifically. Nevertheless, the guidelines that we identified make consistent recommendations related to our prespecified topic areas of relevance to the hospital setting, although most recommendations are based exclusively on expert opinion. Our systematic review nonetheless provides guidance in an area where guidance has thus far been limited. Future research should investigate risk factors for opioid-related adverse events in hospitalized, nonsurgical patients, and the effectiveness of interventions designed to reduce their occurrence.

ACKNOWLEDGMENTS

Dr. Herzig had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

The authors would like to acknowledge and thank Kevin Vuernick, Jenna Goldstein, Meghan Mallouk, and Chris Frost, MD, from SHM for their facilitation of this project and dedication to this purpose.

Disclosures: Dr. Herzig received compensation from the Society of Hospital Medicine for her editorial role at the *Journal of Hospital Medicine* (unrelated to the present work). Dr. Jena received consulting fees from Pfizer, Inc., Hill Rom Services, Inc., Bristol Myers Squibb, Novartis Pharmaceuticals, Vertex Pharmaceuticals, and Precision Health Economics (all unrelated to the present work). None of the other authors have any conflicts of interest to disclose.

Funding: The Society of Hospital Medicine (SHM) provided administrative assistance and material support, but had no role in or influence on the scientific conduct of the study. Dr. Herzig was funded by grant number K23AG042459 from the National Institute on Aging. Dr. Mosher was supported, in part, by the Department of Veterans Affairs Office of Academic Affiliations and Office of Research and Development and Health Services Research and Development Service (HSR&D) through the Comprehensive Access and Delivery Research and Evaluation Center (CIN 13-412). None of the funding agencies had involvement in any aspect of the study, including design, conduct, or reporting of the study.

References

1. Melotti RM, Samolsky-Dekel BG, Ricchi E, et al. Pain prevalence and predictors among inpatients in a major Italian teaching hospital. A baseline survey towards a pain free hospital. *Eur J Pain*. 2005;9(5):485-495.
2. Sawyer J, Haslam L, Robinson S, Daines P, Stilos K. Pain prevalence study in a large Canadian teaching hospital. *Pain Manag Nurs*. 2008;9(3):104-112.
3. Strohbuecker B, Mayer H, Evers GC, Sabatowski R. Pain prevalence in hospitalized patients in a German university teaching hospital. *J Pain Symptom Manage*. 2005;29(5):498-506.
4. Herzig SJ, Rothberg MB, Cheung M, Ngo LH, Marcantonio ER. Opioid utilization and opioid-related adverse events in nonsurgical patients in US hospitals. *J Hosp Med*. 2014;9(2):73-81.
5. Calcaterra SL, Yamashita TE, Min SJ, Keniston A, Frank JW, Binswanger IA. Opioid prescribing at hospital discharge contributes to chronic opioid use. *J Gen Intern Med*. 2015;31(5):478-485.
6. Jena AB, Goldman D, Karaca-Mandic P. Hospital prescribing of opioids to medicare neneficiaries. *JAMA Intern Med*. 2016;176(7):990-997.
7. Mosher HJ, Hofmeyer B, Hadlandsmyth K, Richardson KK, Lund BC. Predictors of long-term opioid use after opioid initiation at discharge from medical and surgical hospitalizations. *JHM*. Accepted for Publication November 11, 2017.
8. Weiss AJ, Elixhauser A. Overview of hospital stays in the United States, 2012. HCUP Statistical Brief #180. 2014. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb180-Hospitalizations-United-States-2012.pdf. Accessed June 29, 2015.
9. Barnett ML, Olenski AR, Jena AB. Opioid-prescribing patterns of emergency physicians and risk of long-term use. *N Engl J Med*. 2017;376(7):663-673.
10. Aronson JK. Balanced prescribing. *Br J Clin Pharmacol*. 2006;62(6):629-632.
11. IOM (Institute of Medicine). 2011. Clinical practice guidelines we can trust. Washington, DC: The National Academies Press.
12. Shekelle PG, Ortiz E, Rhodes S, et al. Validity of the agency for healthcare research and quality clinical practice guidelines: How quickly do guidelines become outdated? *JAMA*. 2001;286(12):1461-1467.
13. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. *CMAJ*. 2010;182(18):E839-E842.
14. Brouwers MC, Kho ME, Browman GP, et al. Development of the AGREE II, part 1: performance, usefulness and areas for improvement. *CMAJ*. 2010;182(10):1045-1052.
15. Brouwers MC, Kho ME, Browman GP, et al. Development of the AGREE II, part 2: Assessment of validity of items and tools to support application. *CMAJ*. 2010;182(10):E472-E478.
16. Hegmann KT, Weiss MS, Bowden K, et al. ACOEM practice guidelines: opioids for treatment of acute, subacute, chronic, and postoperative pain. *J Occup Environ Med*. 2014;56(12):e143-e159.
17. Washington State Agency Medical Directors' Group. Interagency Guideline on Prescribing Opioids for Pain. http://www.agencymeddirectors.wa.gov/Files/2015AMDGOpioidGuideline.pdf. Accessed December 5, 2017.
18. Cantrill SV, Brown MD, Carlisle RJ, et al. Clinical policy: critical issues in the prescribing of opioids for adult patients in the emergency department. *Ann Emerg Med*. 2012;60(4):499-525.
19. National Institute for Healthcare Excellence. Controlled drugs: Safe use and management. https://www.nice.org.uk/guidance/ng46/chapter/Recommendations. Accessed December 5, 2017.
20. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology*. 2012;116(2):248-273.
21. Apfelbaum JL, Silverstein JH, Chung FF, et al. Practice guidelines for postanesthetic care: an updated report by the American Society of Anesthesiologists Task Force on Postanesthetic Care. *Anesthesiology*. 2013;118(2):291-307.
22. Barr J, Fraser GL, Puntillo K, et al. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Crit Care Med*. 2013;41(1):263-306.

Improving the Safety of Opioid Use for Acute Noncancer Pain in Hospitalized Adults: A Consensus Statement From the Society of Hospital Medicine

Shoshana J. Herzig, MD, MPH[1,2]*, Hilary J. Mosher, MD[3,4], Susan L. Calcaterra, MD, MPH[5,6], Anupam B. Jena, MD, PhD[2,7], Teryl K. Nuckols, MD[8]

[1]Department of Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts; [2]Harvard Medical School, Boston, Massachusetts; [3]The Comprehensive Access and Delivery Research and Evaluation Center at the Iowa City Veterans Affairs Healthcare System, Iowa City, Iowa; [4]Department of Internal Medicine, Carver College of Medicine, University of Iowa, Iowa City, Iowa; [5]Department of Medicine, Denver Health Medical Center, Denver, Colorado; [6]Department of Medicine, Division of General Internal Medicine, University of Colorado, Aurora, Colorado; [7]Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts; [8]Division of General Internal Medicine, Cedars-Sinai Medical Center, Los Angeles, California.

Hospital-based clinicians frequently treat acute, noncancer pain. Although opioids may be beneficial in this setting, the benefits must be balanced with the risks of adverse events, including inadvertent overdose and prolonged opioid use, physical dependence, or development of opioid use disorder. In an era of epidemic opioid use and related harms, the Society of Hospital Medicine (SHM) convened a working group to develop a consensus statement on opioid use for adults hospitalized with acute, noncancer pain, outside of the palliative, end-of-life, and intensive care settings. The guidance is intended for clinicians practicing medicine in the inpatient setting (eg, hospitalists, primary care physicians, family physicians, nurse practitioners, and physician assistants). To develop the Consensus Statement, the working group conducted a systematic review of relevant guidelines, composed a draft Statement based on extracted recommendations, and obtained feedback from external experts in hospital-based opioid prescribing, SHM members, the SHM Patient-Family Advisory Council, other professional societies, and peer-reviewers. The iterative development process resulted in a final Consensus Statement consisting of 16 recommendations covering 1) whether to use opioids in the hospital, 2) how to improve the safety of opioid use during hospitalization, and 3) how to improve the safety of opioid prescribing at hospital discharge. As most guideline recommendations from which the Consensus Statement was derived were based on expert opinion alone, the working group identified key issues for future research to support evidence-based practice. *Journal of Hospital Medicine* 2018;13:263-271. © 2018 Society of Hospital Medicine

Since the initial reports of an emerging opioid epidemic in the early 2000s, intense focus on improving opioid prescribing in outpatient settings has culminated in new guidelines for chronic pain.[1,2] Although opioid stewardship in the setting of chronic pain is of paramount importance in curbing the ongoing epidemic, long-term prescription opioid use often begins with treatment of acute pain.[1] In addition to differences in recommended management strategies for acute and chronic pain, there are unique aspects and challenges to pain management in the acute-care setting.

Opioids are commonly used for the treatment of acute pain in hospitalized patients, often at high doses.[3] Recent reports highlight that hospital use of opioids impacts downstream use.[4-6] Additionally, opioid prescribing practices vary between hospital-based providers and hospitals,[3,7] highlighting the need for prescribing standards and guidance. To our knowledge, there are no existing guidelines for improving the safety of opioid use in hospitalized patients outside of the intensive care or immediate perioperative settings.

The Society of Hospital Medicine (SHM) convened a working group to systematically review existing guidelines and develop a consensus statement to assist clinicians in safe opioid use for acute, noncancer pain in hospitalized adults.

CONSENSUS STATEMENT PURPOSE AND SCOPE

The purpose of this Consensus Statement is to present clinical recommendations on the safe use of opioids for the treatment of acute, noncancer pain in hospitalized adults. The guidance is intended for clinicians practicing medicine in the inpatient setting (eg, hospitalists, primary care physicians, family physicians, nurse practitioners, and physician assistants) and is intended to apply to hospitalized adults with acute, noncancer pain (ie, pain that typically lasts <3 months or during the period of normal tissue healing) outside of the palliative, end-of-life, and intensive care settings.

***Address for correspondence:** Shoshana J. Herzig, MD, MPH, Beth Israel Deaconess Medical Center, 330 Brookline Ave, CO-1309, Boston, MA 02215; Telephone: (617) 754-1413; Fax: (617) 754-1440

Received: December 28, 2017; **Revised**: February 23, 2018; **Accepted:** March 5, 2018

2018 Society of Hospital Medicine DOI 10.12788/jhm.2980

TABLE 1. **Topics for which Recommendations Were Extracted From Existing Guidelines**

1. Deciding when to use opioids, nonopioid medications, and non-medication based pain management modalities
2. Best practices in screening/monitoring/education prior to prescribing an opioid and/or during treatment
3. Opioid selection considerations, including selection of dose, duration, and route of administration
4. Strategies to minimize the risk of opioid-related adverse events
5. Safe practices on discharge

CONSENSUS STATEMENT DEVELOPMENT

Our working group included experts in opioid use in the hospital setting, defined by 1) engagement in the clinical practice of hospital medicine and 2) involvement in clinical research related to usage patterns and clinical outcomes of opioid use in hospitalized patients (see Appendix Table 1). The SHM provided administrative assistance with the project and funded the in-person working group meeting, but it had no role in formulating the recommendations. The SHM Board of Directors provided approval of the Consensus Statement without modification.

An overview of the sequential steps in the Consensus Statement development process is described below; details of the methods and results can be found in the Appendix (eMethods).

Performing the Systematic Review

The methods and the results of the systematic review of existing guidelines on the management of acute pain from which the Consensus Statement is derived are described in a companion article. We extracted recommendations from each guideline related to the topics in Table 1 and used these recommendations to inform the Consensus Statement.

Drafting the Consensus Statement

After performing the systematic review, the working group drafted and iteratively revised a set of recommendations using a variation of the Delphi Method[8] to identify consensus among group members.

External Review

Following agreement on a draft set of recommendations, we obtained feedback from external groups, including 1) individuals involved in the SHM's Reducing Adverse Drug Events Related to Opioids (RADEO) initiative, including those involved in the development of the implementation guide and site leads for the Mentored Implementation program, 2) SHM members, SHM Patient-Family Advisory Council (PFAC) members, and leaders of other relevant professional societies, and 3) peer-reviewers at the Journal of Hospital Medicine.

RESULTS

The process described above resulted in 16 recommendations (Table 2). These recommendations are intended only as guides and may not be applicable to all patients and clinical situations, even within our stated scope. Clinicians should use their judgment regarding whether and how to apply these recommendations to individual patients. Because the state of knowledge is constantly evolving, this Consensus Statement should be considered automatically withdrawn 5 years after publication, or once an update has been issued.

Deciding Whether to Use Opioids During Hospitalization

1. *SHM recommends that clinicians limit the use of opioids to patients with 1) severe pain or 2) moderate pain that has not responded to nonopioid therapy, or where nonopioid therapy is contraindicated or anticipated to be ineffective.*

Opioids are associated with several well-recognized risks ranging from mild to severe, including nausea, constipation, urinary retention, falls, delirium, sedation, physical dependence, addiction, respiratory depression, and death. Given these risks, the risk-to-benefit ratio is generally not favorable at lower levels of pain severity. Furthermore, for most painful conditions, including those causing severe pain, nonopioid analgesics, including acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs), have been demonstrated to be equally or more effective with less risk of harm than opioids.[9-13] Clinicians should consider drug–drug and drug–disease associations when deciding between these different therapies and make a determination in each patient regarding whether the benefits outweigh the risks. Often, drug–disease interactions do not represent absolute contraindications, and risks can be mitigated by adhering to dosage limits and, with respect to NSAIDs, 1) monitoring renal function, 2) monitoring volume status in patients with congestive heart failure, and 3) considering a selective cyclooxygenase-2 (COX-2) inhibitor rather than a nonselective NSAID or pairing the NSAID with an acid-suppressive medication in patients with a history of peptic ulcer disease or at elevated risk for gastroduodenal disease. For these reasons, a trial of nonopioid therapy (including pharmacologic and nonpharmacologic modalities) should always be considered before using opioids for pain of any severity. This does not imply that a trial of nonopioid therapy must be performed in all patients, but rather, that the likelihood of benefit and associated risks of opioid and nonopioid therapy should be considered for all patients in determining the best initial management strategy.

2. *SHM recommends that clinicians use extra caution when administering opioids to patients with risk factors for opioid-related adverse events.*

Several factors have been consistently demonstrated to increase the risk of opioid-related adverse events–most impor-

TABLE 2. **Society of Hospital Medicine Recommendations on Improving the Safety of Opioid Use for Acute Noncancer Pain in Hospitalized Adults Outside of Intensive Care, Palliative Care, and End-of-Life Care**

Deciding Whether to Use Opioids During Hospitalization:
Limit the use of opioids to patients with 1) severe pain or 2) moderate pain that has not responded to nonopioid therapy, or where nonopioid therapy is contraindicated or anticipated to be ineffective.
Use extra caution when administering opioids to patients with risk factors for opioid-related adverse events.
Review the information contained in the prescription drug monitoring program (PDMP) database to inform decision-making around opioid therapy.
Educate patients and families or caregivers about potential risks and side effects of opioid therapy as well as alternative pharmacologic and nonpharmacologic therapies for managing pain.
Once a Decision Has Been Made to Use Opioids During Hospitalization:
Use the lowest effective opioid dose for the shortest duration possible.
Use immediate-release opioid formulations and avoid initiation of long-acting or extended-release formulations (including transdermal fentanyl) for treatment of acute pain.
Use the oral route of administration whenever possible. Intravenous opioids should be reserved for patients who cannot take food or medications by mouth, patients suspected of gastrointestinal malabsorption, or when immediate pain control and/or rapid dose titration is necessary.
Use an opioid equivalency table or calculator to understand the relative potency of different opioids 1) when initiating opioid therapy, 2) when changing from one route of administration to another, and 3) when changing from one opioid to another. When changing from one opioid to another, clinicians should generally reduce the dose of the new opioid by at least 25%-50% of the calculated equianalgesic dose to account for interindividual variability in the response to opioids as well as possible incomplete cross-tolerance.
Pair opioids with scheduled nonopioid analgesic medications, unless contraindicated, and always consider pairing with nonpharmacologic pain management strategies (ie, multimodal analgesia).
Unless contraindicated, order a bowel regimen to prevent opioid-induced constipation in patients receiving opioids.
Limit co-administration of opioids with other central nervous system depressant medications to the extent possible.
Work with patients and families or caregivers to establish realistic goals and expectations of opioid therapy and the expected course of recovery.
Monitor the response to opioid therapy, including assessment for functional improvement and development of adverse effects.
Prescribing at the Time of Hospital Discharge:
Ask patients about any existing opioid supply at home and account for any such supply when issuing an opioid prescription on discharge.
Prescribe the minimum quantity of opioids anticipated to be necessary based on the expected course and duration of pain that is severe enough to require opioid therapy after hospital discharge.
Ensure that patients and families or caregivers receive information regarding how to minimize the risks of opioid therapy for themselves, their families, and their communities. This includes but is not limited to: 1) how to take their opioids correctly (the planned medications, doses, schedule); 2) that they should take the minimum quantity necessary to achieve tolerable levels of pain and meaningful functional improvement, reducing the dose and/or frequency as pain and function improve; 3) how to safeguard their supply and dispose of any unused supply; 4) that they should avoid agents that may potentiate the sedative effect of opioids, including sleeping medication and alcohol; 5) that they should avoid driving or operating heavy machinery while taking opioids; and 6) that they should seek help if they begin to experience any potential adverse effects, with inclusion of information on early warning signs.

tantly, respiratory depression and overdose–in varied patient populations and settings, including age 65 years and older,[1,14-17] renal insufficiency,[1,14,18] hepatic insufficiency,[1,14] chronic respiratory failure (including chronic obstructive pulmonary disease, sleep apnea, etc.), and receipt of other central nervous system (CNS) depressant medications (including, but not limited to, benzodiazepines).[1,18-20] History of any substance use disorder and psychiatric disorders have been associated with an increased risk for the development of opioid use disorder.[21-24] These factors should be weighed against the benefits when deciding on opioid appropriateness in a given patient. However, identification of these risks should not preclude opioids as part of pain management. When a decision is made to use opioids in patients with these risk factors, clinicians should 1) use a reduced starting dose (generally, at least a 50% reduction in the usual starting dose) and 2) consider closer monitoring for adverse effects (eg, more frequent nursing assessments, capnography, or more frequent outpatient visits).

3. *SHM recommends that clinicians review the information contained in the prescription drug monitoring program (PDMP) database to inform decision-making around opioid therapy.*

Although data on the impact of use of the state PDMP database on prescribing practices or patient outcomes are limited, PDMP use has been advocated by multiple guidelines on acute pain management.[25-27] The PDMP provides information that can be useful in several ways, including 1) confirmation of prior opioid exposure and dosage, which should be used to guide appropriate dosage selection in the hospital, 2) identification of existing controlled substance prescriptions, which should be considered in prescribing decisions in the hospital and on discharge, and 3) identification of signs of aberrant behavior. For example, the identification of controlled substance prescriptions written by multiple different clinicians can facilitate early identification of potential diversion or evolving or existing opioid use disorder

and the opportunity for intervention,[28] which may include referral to support services, initiation of medication-assisted treatment, and/or pain specialist consultation when available. Concerns regarding evolving or existing opioid use disorder should prompt further discussion between the clinician and the patient, both to clarify their understanding of their recent prescription history and to discuss concerns for patient safety related to the increased risk of opioid-related adverse effects (including respiratory depression and overdose) among patients with controlled substance prescriptions written by multiple providers. Although such concerns should not automatically preclude the use of opioids for acute pain in the hospital setting, they should be considered in the assessment of whether the benefits of opioid therapy outweigh the risks for a given patient.

4. *SHM recommends that clinicians educate patients and families or caregivers about the potential risks and side effects of opioid therapy as well as alternative pharmacologic and nonpharmacologic therapies for managing pain.*

Patients are often unaware of the risks of opioid therapy (see Consensus Statement 1 for key risks),[29] or that there are often equally effective alternative therapies. As with any therapy associated with substantial risk, clinicians should discuss these risks with patients and/or caregivers at the outset of therapy, as well as the potential benefits of nonopioid pharmacologic and nonpharmacologic therapies for managing pain. Patients should be informed that they may request nonopioid therapy in lieu of opioids, even for severe pain.

Once a Decision Has Been Made to Use Opioids During Hospitalization

5. *SHM recommends that clinicians use the lowest effective opioid dose for the shortest duration possible.*

Higher opioid doses are associated with an increased incidence of opioid-related adverse events, particularly overdose, in studies of both inpatient and outpatient populations.[1,17,19,30,31] Studies in the inpatient and outpatient settings consistently demonstrate that risk increases with dosage.[19,30,31] Clinicians should reduce the usual starting dose by at least 50% among patients with conditions that increase susceptibility to opioid-related adverse events (see Consensus Statement 2). The ongoing need for opioids should be re-assessed regularly-at least daily-during the hospitalization, with attempts at tapering as healing occurs and/or pain and function improve.

6. *SHM recommends that clinicians use immediate-release opioid formulations and avoid initiation of long-acting or extended-release formulations (including transdermal fentanyl) for treatment of acute pain.*

Studies in outpatient settings demonstrate that the use of long-acting opioids is associated with greater risk for overdose–especially in opioid-naïve patients–and long-term use.[32,33] Further, hospitalized patients frequently have fluctuating renal function and rapidly changing pain levels. We therefore recommend that initiation of long-acting opioids be avoided for the treatment of acute, noncancer pain in hospitalized medical patients. It is important to note that although we recommend avoiding initiation of long-acting opioids for the treatment of acute, noncancer pain, there are circumstances outside of the scope of this Consensus Statement for which initiation of long-acting opioids may be indicated, including the treatment of opioid withdrawal. We also do not recommend discontinuation of long-acting or extended-release opioids in patients who are taking these medications for chronic pain at the time of hospital admission (unless there are concerns regarding adverse effects or drug–disease interactions).

7. *SHM recommends that clinicians use the oral route of administration whenever possible. Intravenous opioids should be reserved for patients who cannot take food or medications by mouth, patients suspected of gastrointestinal malabsorption, or when immediate pain control and/or rapid dose titration is necessary.*

Intravenous opioid administration is associated with an increased risk of side effects, adverse events, and medication errors.[34-36] Additionally, studies demonstrate that in general, the addiction potential of medications is greater the more rapid the onset of action (the onset of action is 5–10 min for intravenous and 15–30 minutes for oral administration).[37,38] Furthermore, the duration of action is greater for oral compared to that of intravenous administration, potentially allowing for more consistent pain relief and less frequent administrations. As such, intravenous administration should be reserved for situations when oral administration is not possible or likely to be ineffective, or when immediate pain control and/or rapid titration is necessary.

8. *SHM recommends that clinicians use an opioid equivalency table or calculator to understand the relative potency of different opioids 1) when initiating opioid therapy, 2) when changing from one route of administration to another, and 3) when changing from one opioid to another. When changing from one opioid to another, clinicians should generally reduce the dose of the new opioid by at least 25%–50% of the calculated equianalgesic dose to account for interindividual variability in the response to opioids as well as possible incomplete cross-tolerance.*

Most errors causing preventable adverse drug events in hospitals occur at the ordering stage.[39,40] Clinicians are often unaware of the potency of different types of opioids relative to each other or to morphine (ie, morphine equivalent dose), which can lead to inadvertent overdose when initiating therapy with nonmorphine opioids and when converting from one opioid to another. To facilitate safe opioid use, we recommend that clinicians use

one of several available opioid equivalency tables or calculators to better understand the relative potencies of opioids and to inform both starting dose calculations and conversions between opioids and routes of administration. When converting from one opioid to another, we caution clinicians to reduce the dose of the new opioid by at least 25%–50% of the calculated equianalgesic dose to account for interindividual variability in the response to opioids and the potential for incomplete cross-tolerance, wherein tolerance to a currently administered opioid does not extend completely to other opioids. Clinicians should use extreme caution when performing conversions to and from methadone and consider consultation with a hospital pharmacist or a pain management specialist, when available, to assist with conversion decisions and calculations.

9. *SHM recommends that clinicians pair opioids with scheduled nonopioid analgesic medications, unless contraindicated, and always consider pairing with nonpharmacologic pain management strategies (ie, multimodal analgesia).*

Concurrent receipt of opioids and nonopioid analgesic medications (including acetaminophen, NSAIDs, and gabapentin or pregabalin, depending on the underlying pathophysiology of the pain) has been demonstrated to reduce total opioid requirements and improve pain management.[41,42] Clinicians should be familiar with contraindications and maximum dosage recommendations for each of these adjunctive nonopioid medications. We recommend separate orders for each, rather than using drug formulations that combine opioids and nonopioid analgesics in the same pill, due to the risk of inadvertently exceeding the maximum recommended doses of the nonopioid analgesic (particularly acetaminophen) with combination products. We recommend that nonopioid analgesics be ordered at a scheduled frequency, rather than as needed, to facilitate consistent administration that is not dependent on opioid administration. Topical agents, including lidocaine and capsaicin, should also be considered. Nonpharmacologic pain management strategies can include procedure-based (eg, regional and local anesthesia) and nonprocedure-based therapies depending on the underlying condition and institutional availability. Although few studies have assessed the benefit of nonpharmacologic, nonprocedure-based therapies for the treatment of acute pain in hospitalized patients, the lack of harm associated with their use argues for their adoption. Simple nonpharmacologic therapies that can usually be provided to patients in any hospital setting include music therapy, cold or hot packs, chaplain or social work visits (possibly including mindfulness training),[43] and physical therapy, among others.

10. *SHM recommends that, unless contraindicated, clinicians order a bowel regimen to prevent opioid-induced constipation in patients receiving opioids.*

Constipation is a common adverse effect of opioid therapy and results from the activation of mu opioid receptors in the colon, resulting in decreased peristalsis. Hospitalized patients are already prone to constipation due to their often-limited physical mobility. To mitigate this complication, we recommend the administration of a bowel regimen to all hospitalized medical patients receiving opioid therapy, provided the patient is not having diarrhea. Given the mechanism of opioid-induced constipation, stimulant laxatives (eg, senna, bisacodyl) have been recommended for this purpose.[44] Osmotic laxatives (eg, polyethylene glycol, lactulose) have demonstrated efficacy for the treatment of constipation more generally (ie, not necessarily opioid-induced constipation). Stool softeners, although frequently used in the inpatient setting, are not recommended due to limited and conflicting evidence for efficacy in prevention or treatment of constipation.[45] Bowel movements should be tracked during hospitalization, and the bowel regimen modified accordingly.

11. *SHM recommends that clinicians limit co-administration of opioids with other central nervous system depressant medications to the extent possible.*

This combination has been demonstrated to increase the risk of opioid-related adverse events in multiple settings of care, including during hospitalization.[1,18,19] Although benzodiazepines have received the most attention in this respect, other medications with CNS depressant properties may also increase the risk, including, but not limited to, nonbenzodiazepine sedative-hypnotics (eg, zolpidem, zaleplon, zopiclone), muscle relaxants, sedating antidepressants, antipsychotics, and antihistamines.[18,19,46] For some patients, the combination will be unavoidable, and we do not suggest routine discontinuation of longstanding medications that preexisted hospitalization, given the risks of withdrawal and/or worsening of the underlying condition for which these medications are prescribed. Rather, clinicians should carefully consider the necessity of each medication class with input from the patient's outpatient providers, taper the frequency and/or the dose of CNS depressants when appropriate and feasible, and avoid new coprescriptions to the extent possible, both during hospitalization and on hospital discharge.

12. *SHM recommends that clinicians work with patients and families or caregivers to establish realistic goals and expectations of opioid therapy and the expected course of recovery.*

Discussing expectations at the start of therapy is important to facilitate a clear understanding of how meaningful improvement will be defined and measured during the hospitalization and how long the patient is anticipated to require opioid therapy. Meaningful improvement should be defined to include improvement in both pain and function. Clinicians should discuss with patients 1) that the goal of opioid therapy is tolerability of pain such that meaningful improvement in function can be achieved and 2) that a decrease in pain intensity in the absence of improved function is not

considered meaningful improvement in most situations and should prompt reevaluation of the appropriateness of continued opioid therapy as well as close follow-up with a clinician following hospital discharge. Discussions regarding the expected course of recovery should include that acute pain is expected to resolve as the underlying medical condition improves and that although pain may persist beyond the hospitalization, pain that is severe enough to require opioids will often be resolved or almost resolved by the time of hospital discharge.

13. *SHM recommends that clinicians monitor the response to opioid therapy, including assessment for functional improvement and development of adverse effects.*

Pain severity and function should be assessed at least daily, and improvement in reported pain severity without improvement in function over several days should, in most circumstances, prompt reconsideration of ongoing opioid therapy and reconsideration of the underlying etiology of pain. Although hospital-specific functional measures in the setting of acute pain have not yet been validated, we suggest that such measures and goals should be individualized based on preexisting function and may include the ability to sit up or move in bed, move to a chair, work with physical therapy, or ambulate in the hallway. Protocols for the assessment for adverse effects are not well established. Because sedation typically precedes respiratory depression, it is generally recommended that patients are evaluated (eg, by nursing staff) for sedation after each opioid administration (10–20 minutes for intravenous and 30–60 minutes for oral administration based on the time-to-peak effect). Whether certain patients may benefit from more intensive respiratory monitoring, such as pulse oximetry or capnography, is an area of active investigation and not yet established.

Prescribing at the Time of Hospital Discharge

14. *SHM recommends that clinicians ask patients about any existing opioid supply at home and account for any such supply when issuing an opioid prescription on discharge.*

Even in the setting of acute pain, patients may have previously received an opioid prescription from an outpatient clinician prior to hospitalization. Unused prescription opioids create the possibility of both overdose (when patients take multiple opioids concurrently, intentionally or inadvertently) and diversion (many adults with prescription opioid misuse obtained their opioids from a friend or a relative who may or may not have known that this occurred[47]). The PDMP database can provide information related to the potential existence of any prior opioid supplies, which should be confirmed with the patient and considered when providing a new prescription on hospital discharge. Information on proper disposal should be provided if use of the preexisting opioid is no longer intended.

15. *SHM recommends that clinicians prescribe the minimum quantity of opioids anticipated to be necessary based on the expected course and duration of pain that is severe enough to require opioid therapy after hospital discharge.*

For many patients, the condition causing their acute pain will be mostly or completely resolved by the time of hospital discharge. When pain is still present at the time of discharge, most pain can be completely managed with nonopioid therapies. For those with ongoing pain that is severe enough to require opioids after hospital discharge, decisions regarding the duration of therapy should be made on a case-by-case basis; generally, however, provision of a 3- to 5-day supply will be sufficient, and provision of more than a 7-day supply of opioids should generally be avoided for several reasons. These include 1) acute pain lasting longer than 7 days after appropriate treatment of any existing underlying conditions should prompt re-evaluation of the working diagnosis and/or reconsideration of the management approach, 2) receiving higher intensity opioid therapy (including longer courses) in the setting of acute pain has been associated with an increased risk of long-term disability and long-term opioid use,[33,48,49] and 3) unused opioids create the possibility of intentional or unintentional opioid diversion (see Consensus Statement 14).[47] Accordingly, clinicians should attempt to arrange an outpatient follow-up appointment for re-evaluation within 7 days, rather than providing an extended opioid prescription on hospital discharge. In situations where this is not feasible, and pain that is severe enough to require opioids is expected to persist longer than 7 days, an extended prescription may be indicated. However, some states have begun enacting legislation to limit the duration of first-time opioid prescriptions, typically using a 5-to-7 day supply as an upper limit; clinicians should be aware of and adhere to individual state laws governing their practice.

16. *SHM recommends that clinicians ensure that patients and families or caregivers receive information regarding how to minimize the risks of opioid therapy for themselves, their families, and their communities. This includes but is not limited to 1) how to take their opioids correctly (the planned medications, doses, schedule); 2) that they should take the minimum quantity necessary to achieve tolerable levels of pain and meaningful functional improvement, reducing the dose and/or frequency as pain and function improve; 3) how to safeguard their supply and dispose of any unused supply; 4) that they should avoid agents that may potentiate the sedative effect of opioids, including sleeping medication and alcohol; 5) that they should avoid driving or operating heavy machinery while taking opioids; and 6) that they should seek help if they begin to experience any potential adverse effects, with inclusion of information on early warning signs.*

Clear and concise patient instructions on home opioid dosing and administration will limit opioid-related adverse events and dosing errors upon hospital discharge. Each of these recommendations derive from one or more of the existing guidelines and reflect the transfer of responsibility for safe opioid use practices that occurs as patients transition from a closely monitored inpatient setting to the more self-regulated home environment.

DISCUSSION AND AREAS FOR FUTURE RESEARCH

This Consensus Statement reflects a synthesis of the key recommendations from a systematic review of existing guidelines on acute pain management, adapted for a hospital-specific scope of practice. Despite a paucity of data on the comparative effectiveness of different management strategies for acute pain, several areas of expert consensus emerged across existing guidelines, which were felt to be relevant and applicable to the hospital setting. The objective of these recommendations is to provide information that can be used to inform and support opioid-related management decisions for acute pain by clinicians practicing medicine in the inpatient setting.

Although these recommendations are not intended to apply to the immediate perioperative setting (ie, care in the postanesthesia care unit), many of the recommendations in the existing guidelines upon which this Consensus Statement was based were intended for the postoperative setting, and, as others have noted, recommendations in this setting are mostly comparable to those for treating acute pain more generally.[27] Those interested in pain management in the postoperative setting specifically may wish to review the recent guidelines released by the American Pain Society,[50] the content of which is in close alignment with our Consensus Statement.

Several important issues were raised during the extensive external feedback process undertaken as part of the development of this Consensus Statement. Although many issues were incorporated into the recommendations, there were several suggestions for which we felt the evidence base was not sufficient to allow a clear or valid recommendation to be made. For example, several reviewers requested endorsement of specific patient education tools and opioid equivalency calculators. In the absence of tools specifically validated for this purpose, we felt that the evidence was insufficient to make specific recommendations. Validating such tools for use in the inpatient setting should be an area of future investigation. In the meantime, we note that there are several existing and widely available resources for both patient education (ie, opioid information sheets, including opioid risks, safe containment and disposal, and safe use practices) and opioid equivalency calculations that clinicians and hospitals can adapt for their purposes.

Several individuals suggested recommendations on communication with outpatient continuity providers around opioid management decisions during hospitalization and on discharge. Although we believe that it is of paramount importance for outpatient providers to be aware of and have input into these decisions, the optimal timing and the method for such communication are unclear and likely to be institution-specific depending on the availability and integration of electronic records across care settings. We recommend that clinicians use their judgment as to the best format and timing for assuring that outpatient physicians are aware of and have input into these important management decisions with downstream consequences.

Concerns were also raised about the time required to complete the recommended practices and the importance of emphasizing the need for a team-based approach in this realm. We agree wholeheartedly with this sentiment and believe that many of the recommended practices can and should be automated and/or shared across the care team. For example, PDMPs allow prescribers to appoint delegates to check the PDMP on their behalf. Additionally, we suggest that hospitals work to develop systems to assist care teams with performance of these tasks in a standardized and streamlined manner (eg, integrating access to the PDMP and opioid equivalency tables within the electronic health record and developing standard patient educational handouts). Provision of written materials on opioid risks, side effects, and safety practices may be helpful in facilitating consistent messaging and efficient workflow for members of the care team.

Finally, the working group carefully considered whether to include a recommendation regarding naloxone prescribing at the time of hospital discharge. The provision of naloxone kits to laypersons through Overdose Education and Naloxone Distribution Programs has been shown to reduce opioid overdose deaths[51,52] and hospitalizations[53,54] and is both safe and cost-effective.[55] The Centers for Disease Control and Preventionrecommend that clinicians "consider offering naloxone to patients with a history of overdose, a current or past substance use disorder, receipt of ≥50 mg of morphine equivalents per day or concurrent benzodiazepine use."[1] However, these recommendations are intended for patients on chronic opioid therapy; presently, no clear evidence exists to guide decisions about the benefits and costs associated with prescribing naloxone in the setting of short-term opioid therapy for acute pain. Further research in this area is warranted.

The greatest limitation of this Consensus Statement is the lack of high-quality studies informing most of the recommendations in the guidelines upon which our Consensus Statement was based. The majority of recommendations in the existing guidelines were based on expert opinion alone. Additional research is necessary before evidence-based recommendations can be formulated.

Accordingly, the working group identified several key areas for future research, in addition to those noted above. First, ongoing efforts to develop and evaluate the effectiveness of nonopioid and nonpharmacologic management strategies for acute pain in hospitalized patients are necessary. Second, studies identifying the risk factors for opioid-related adverse events in hospitalized patients would help inform management decisions and allow deployment of resources and specialized monitoring strategies to patients at heightened risk. The working group also noted the need for research investi-

gating the impact of PDMP use on management decisions and downstream outcomes among hospitalized patients. Finally, conversations around pain management and concerns related to aberrant behaviors are often challenging in the hospital setting owing to the brief, high-intensity nature of the care and the lack of a longstanding therapeutic alliance. There is a great need to develop strategies and language to facilitate these conversations.

In conclusion, until more high-quality evidence becomes available, clinicians can use the recommendations contained in this Consensus Statement along with their clinical judgment and consultation with pharmacists, interventional pain specialists, and other staff (eg, social work, nursing) to help facilitate consistent, high-quality care across providers and hospitals. We believe that doing so will help increase the appropriateness of opioid therapy, minimize adverse events, facilitate shared decision-making, and foster stronger therapeutic alliances at the outset of the hospitalization for patients suffering from acute pain.

ACKNOWLEDGMENTS

The authors would like to acknowledge and thank Kevin Vuernick, Jenna Goldstein, Meghan Mallouk, and Chris Frost, MD, from the SHM for their facilitation of this project and dedication to this purpose.

The authors would also like to thank the many individuals who provided comments on the draft recommendations, including the participants in the SHM RADEO program; the SHM members; the representatives of specialty societies, including the American Academy of Family Physicians, the American College of Physicians, the American Hospital Association, the American Society of Addiction Medicine, the American Society of Anesthesiologists, the American Society of Health-System Pharmacists, the Society of Critical Care Medicine, and the Society of General Internal Medicine; and the representatives of patient advocacy groups, including SHM PFAC, Regions Hospital Patient and Family Advisory Committee, Patient and Family Centered Care Council of St. Louis Children's Hospital, Missouri Family Partnership, and Parent and Family Care.

Disclosures: Dr. Herzig reports receiving compensation from the Society of Hospital Medicine for her editorial role at the Journal of Hospital Medicine (unrelated to the present work). Dr. Jena reports receiving consulting fees from Pfizer, Inc., Hill Rom Services, Inc., Bristol Myers Squibb, Novartis Pharmaceuticals, Vertex Pharmaceuticals, and Precision Health Economics, a consultancy to the life sciences industry (all unrelated to the present work). None of the other authors have any conflicts of interest to disclose.

Funding: The Society of Hospital Medicine (SHM) provided administrative assistance with the project and funded the in-person working group meeting but had no role in or influence on developing the content of the recommendations themselves. The SHM Board of Directors provided approval to submit the manuscript for publication without modification. Dr. Herzig was funded by grant number K23AG042459 from the National Institute on Aging. Dr. Mosher was supported in part by the Department of Veterans Affairs Office of Academic Affiliations and Office of Research and Development and Health Services Research and Development Service (HSR&D) through the Comprehensive Access and Delivery Research and Evaluation Center (CIN 13-412). None of the funding agencies had involvement in any aspect of the study, including design, conduct, and reporting of the study.

References

1. Dowell D, Haegerich TM, Chou R. CDC Guideline for prescribing opioids for chronic pain-United States. *JAMA*. 2016;315(15):1624-1645.
2. United States Department of Veterans Affairs and Department of Defense. VA/DoD Clinical Practice Guideline for Opioid Therapy for Chronic Pain. https://www.healthquality.va.gov/guidelines/Pain/cot/. Accessed December 4, 2017.
3. Herzig SJ, Rothberg MB, Cheung M, Ngo LH, Marcantonio ER. Opioid utilization and opioid-related adverse events in nonsurgical patients in US hospitals. *J Hosp Med*. 2014;9(2):73-81.
4. Calcaterra SL, Yamashita TE, Min SJ, Keniston A, Frank JW, Binswanger IA. Opioid prescribing at hospital discharge contributes to chronic opioid use. *J Gen Intern Med*. 2015;31(5):478-485.
5. Jena AB, Goldman D, Karaca-Mandic P. Hospital prescribing of opioids to medicare beneficiaries. *JAMA Intern Med*. 2016;176(7):990-997.
6. Mosher, HJ, B Hofmeyer, K Hadlandsmyth, KK Richardson, BC Lund. Predictors of long-term opioid use after opioid initiation at discharge from medical and surgical hospitalizations. *J Hosp Med*. 2018;13(4):XXX-XXX.
7. Barnett ML, Olenski AR, Jena AB. Opioid-prescribing patterns of emergency physicians and risk of long-term use. *N Engl J Med*. 2017;376(7):663-673.
8. Jones J, Hunter D. Consensus methods for medical and health services research. *BMJ*. 1995;311(7001):376-380.
9. Chang AK, Bijur PE, Esses D, Barnaby DP, Baer J. Effect of a single dose of oral opioid and nonopioid analgesics on acute extremity pain in the emergency department: a randomized clinical trial. *JAMA*. 2017;318(17):1661-1667.
10. Moore RA, Derry S, Aldington D, Wiffen PJ. Single dose oral analgesics for acute postoperative pain in adults-an overview of Cochrane reviews. *Cochrane Database Syst Rev*. 2015;28(9):CD008659.
11. Moore RA, Derry S, Aldington D, Wiffen PJ. Adverse events associated with single dose oral analgesics for acute postoperative pain in adults-an overview of Cochrane reviews. *Cochrane Database Syst Rev*. 2015 Oct 13;(10):CD011407.
12. Holdgate A, Pollock T. Nonsteroidal anti-inflammatory drugs (NSAIDs) versus opioids for acute renal colic. *Cochrane Database Syst Rev*. 2005 Apr 18;(2):CD004137.
13. Jones P, Dalziel SR, Lamdin R, Miles-Chan JL, Frampton C. Oral non-steroidal anti-inflammatory drugs versus other oral analgesic agents for acute soft tissue injury. *Cochrane Database Syst Rev*. 2015 Jul 1;(7):CD007789.
14. Smith H, Bruckenthal P. Implications of opioid analgesia for medically complicated patients. *Drugs Aging* 2010;27(5):417-433.
15. Kessler ER, Shah M, S KG, Raju A. Cost and quality implications of opioid-based postsurgical pain control using administrative claims data from a large health system: opioid-related adverse events and their impact on clinical and economic outcomes. *Pharmacotherapy* 2013;33(4):383-391.
16. Minkowitz HS, Gruschkus SK, Shah M, Raju A. Adverse drug events among patients receiving postsurgical opioids in a large health system: risk factors and outcomes. *Am J Health Syst Pharm*. 2014;71(18):1556-1565.
17. Oderda G. Challenges in the management of acute postsurgical pain. *Pharmacotherapy* 2012;32(9):6S-11S.
18. Pawasauskas J, Stevens B, Youssef R, Kelley M. Predictors of naloxone use for respiratory depression and oversedation in hospitalized adults. *Am J Health Syst Pharm*. 2014;71(9):746-750.
19. Weingarten TN, Herasevich V, McGlinch MC, et al. Predictors of delayed postoperative respiratory depression assessed from naloxone administration. *Anesth Analg* 2015;121(2):422-429.
20. Calcaterra S, Glanz J, Binswanger IA. National trends in pharmaceutical opioid related overdose deaths compared to other substance related overdose deaths: 1999-2009. *Drug Alcohol Depend*. 2013;131(3):263-270.
21. Boscarino JA, Rukstalis M, Hoffman SN, et al. Risk factors for drug dependence among out-patients on opioid therapy in a large US health-care system. *Addiction* 2010;105(10):1776-1782.
22. Reid MC, Engles-Horton LL, Weber MB, Kerns RD, Rogers EL, O'Connor PG. Use of opioid medications for chronic noncancer pain syndromes in primary care. *J Gen Intern Med*. 2002;17(3):173-179.
23. Hall AJ, Logan JE, Toblin RL, et al. Patterns of abuse among unintentional pharmaceutical overdose fatalities. *JAMA*. 2008;300(22):2613-2620.
24. Hasegawa K, Brown DF, Tsugawa Y, Camargo CA, Jr. Epidemiology of emergency department visits for opioid overdose: a population-based study. *Mayo Clin Proc*. 2014;89(4):462-471.
25. Washington State Agency Medical Directors' Group. Interagency guideline on prescribing opioids for pain. http://www.agencymeddirectors.wa.gov/Files/2015AMDGOpioidGuideline.pdf. Accessed November 29, 2017.
26. Cantrill SV, Brown MD, Carlisle RJ, et al. Clinical policy: Critical issues in the prescribing of opioids for adult patients in the emergency department. *Ann Emerg Med*. 2012;60(4):499-525.
27. Hegmann KT, Weiss MS, Bowden K, et al. ACOEM practice guidelines: Opi-

oids for treatment of acute, subacute, chronic, and postoperative pain. *J Occup Environ Med*. 2014;56(12):e143-e159.
28. Jena AB, Goldman D, Weaver L, Karaca-Mandic P. Opioid prescribing by multiple providers in Medicare: retrospective observational study of insurance claims. *BMJ*. 2014;348:g1393.
29. Conrardy M, Lank P, Cameron KA, et al. Emergency department patient perspectives on the risk of addiction to prescription opioids. *Pain Med*. 2015;17(1):114-121.
30. Oderda GM, Said Q, Evans RS, et al. Opioid-related adverse drug events in surgical hospitalizations: impact on costs and length of stay. *Ann Pharmacother*. 2007;41(3):400-406.
31. Weingarten TN, Chong EY, Schroeder DR, Sprung J. Predictors and outcomes following naloxone administration during Phase I anesthesia recovery. *J Anesth*. 2016;30(1):116-122.
32. Miller M, Barber CW, Leatherman S, et al. Prescription opioid duration of action and the risk of unintentional overdose among patients receiving opioid therapy. *JAMA Intern Med*. 2015;175(4):608-615.
33. Deyo RA, Hallvik SE, Hildebran C, et al. Association between initial opioid prescribing patterns and subsequent long-term use among opioid-naive patients: a statewide retrospective cohort study. *J Gen Intern Med*. 2017;32(1):21-27.
34. Overdyk F, Dahan A, Roozekrans M, van der Schrier R, Aarts L, Niesters M. Opioid-induced respiratory depression in the acute care setting: a compendium of case reports. *Pain Manag*. 2014;4(4):317-325.
35. Wang Y, Sands LP, Vaurio L, Mullen EA, Leung JM. The effects of postoperative pain and its management on postoperative cognitive dysfunction. *Am J Geriatr Psychiatry*. 2007;15(1):50-59.
36. Daoust R, Paquet J, Lavigne G, Piette E, Chauny JM. Impact of age, sex and route of administration on adverse events after opioid treatment in the emergency department: a retrospective study. *Pain Res Manag*. 2015;20(1):23-28.
37. Al-Qadheeb NS, O'Connor HH, White AC, et al. Antipsychotic prescribing patterns, and the factors and outcomes associated with their use, among patients requiring prolonged mechanical ventilation in the long-term acute care hospital setting. *Ann Pharmacother*. 2013;47(2):181-188.
38. Compton WM, Volkow ND. Abuse of prescription drugs and the risk of addiction. *Drug Alcohol Depend*. 2006;83(1):S4-S7.
39. Bates DW, Cullen DJ, Laird N, et al. Incidence of adverse drug events and potential adverse drug events. Implications for prevention. ADE Prevention Study Group. *JAMA*. 1995;274(1):29-34.
40. Davies ED, Schneider F, Childs S, et al. A prevalence study of errors in opioid prescribing in a large teaching hospital. *Int J Clin Pract*. 2011;65(9):923-929.
41. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology* 2012;116:248-273.
42. Hah J, Mackey SC, Schmidt P, et al. Effect of perioperative gabapentin on postoperative pain resolution and opioid cessation in a mixed surgical cohort: a randomized clinical trial [published online ahead of print December 13, 2017]. *JAMA Surg*. doi: 10.1001/jamasurg.2017.4915
43. Garland EL, Baker AK, Larsen P, et al. Randomized controlled trial of brief mindfulness training and hypnotic suggestion for acute pain relief in the hospital setting. *J Gen Intern Med*. 2017;32(10):1106-1113.
44. Wheeler M, Oderda GM, Ashburn MA, Lipman AG. Adverse events associated with postoperative opioid analgesia: a systematic review. *J Pain*. 2002;3(3):159-180.
45. Ramkumar D, Rao SS. Efficacy and safety of traditional medical therapies for chronic constipation: systematic review. *Am J Gastroenterol*. 2005;100(4):936-971.
46. Abrahamsson T, Berge J, Ojehagen A, Hakansson A. Benzodiazepine, z-drug and pregabalin prescriptions and mortality among patients in opioid maintenance treatment-A nation-wide register-based open cohort study. *Drug Alcohol Depend*. 2017;174:58-64.
47. Han B, Compton WM, Blanco C, Crane E, Lee J, Jones CM. Prescription opioid use, misuse, and use disorders in U.S. adults: 2015 national survey on drug use and health. *Ann Intern Med*. 2017;167(5):293-301.
48. Franklin GM, Stover BD, Turner JA, Fulton-Kehoe D, Wickizer TM. Early opioid prescription and subsequent disability among workers with back injuries: the Disability Risk Identification Study Cohort. *Spine* 2008;33(2):199-204.
49. Webster BS, Verma SK, Gatchel RJ. Relationship between early opioid prescribing for acute occupational low back pain and disability duration, medical costs, subsequent surgery and late opioid use. Spine 2007;32(19):2127-2132.
50. Chou R, Gordon DB, de Leon-Casasola OA, et al. Management of postoperative pain: a clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain*. 2016;17(2):131-157.
51. McDonald R, Strang J. Are take-home naloxone programmes effective? Systematic review utilizing application of the Bradford Hill criteria. *Addiction* 2016;111(7):1177-1187.
52. Mueller SR, Walley AY, Calcaterra SL, Glanz JM, Binswanger IA. A review of opioid overdose prevention and naloxone prescribing: implications for translating community programming into clinical practice. *Substance abuse* 2015;36(2):240-253.
53. Walley AY, Xuan Z, Hackman HH, et al. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. *BMJ*. 2013;346:f174.
54. Wheeler E, Jones TS, Gilbert MK, Davidson PJ. Opioid overdose prevention programs providing naloxone to laypersons-United States, 2014. *MMWR*. 2015;64(23):631-635.
55. Coffin PO, Sullivan SD. COst-effectiveness of distributing naloxone to heroin users for lay overdose reversal. *Ann Intern Med*. 2013;158(1):1-9.

Hospitalist Value in an ACO World

Jing Li, MD, MS[1,2], Mark V. Williams, MD[1,2,3]*

[1]Center for Health Services Research, University of Kentucky; [2]Office for Value & Innovation in Healthcare Delivery, UK HealthCare, Lexington, Kentucky; [3]Division of Hospital Medicine, University of Kentucky, Lexington, Kentucky.

The accountable care organization (ACO) concept is advocated as a promising value-based payment model that could successfully realign the current payment system to financially reward improvements in quality and efficiency. Focusing on the care of hospitalized patients and controlling a substantive portion of variable hospital expenses, hospitalists are poised to play an essential role in system-level transformational change to achieve clinical integration. Especially through hospital and health system quality improvement (QI) initiatives, hospitalists can directly impact and share accountability for measures ranging from care coordination to implementation of evidence-based care and the patient and family caregiver experience. Regardless of political terrain, financial constraints in healthcare will foster continued efforts to promote formation of ACOs that aim to deliver coordinated, evidence-based, and patient-centered care. Hospitalists possess the clinical experience of caring for complex patients with multiple comorbidities and the QI skills needed to lead efforts in this new ACO era. *Journal of Hospital Medicine* 2018;13:272-276. © Society of Hospital Medicine

The accountable care organization (ACO) concept, elucidated in 2006 as the development of partnerships between hospitals and physicians to coordinate and deliver efficient care,[1] seeks to remove existing barriers to improving value.[2] Some advocate this concept as a promising payment model that could successfully realign the current payment system to financially reward improvements in quality and efficiency that bend the cost curve.[3,4] Hospitalists fit well with this philosophy. As the fastest growing medical specialty in the history of American medicine, from a couple of thousand hospitalists in the mid-1990s to more than 50,000, the remarkable progression of hospitalists has ostensibly been driven partially by hospitals' efforts to improve the value equation through enhanced efficiency in inpatient care. Importantly, hospitalists probably provide care for more than half of all hospitalized Medicare beneficiaries and increasingly patients in skilled nursing facilities (ie, SNFists).[5] Along with primary care physicians, hospitalists thus represent an essential group of physicians needed to transform care delivery.

RAPID GROWTH AND THE FUTURE OF ACOS

When the Affordable Care Act (ACA) established the Medicare Shared Savings Program (MSSP), ACOs leaped from being an intellectual concept[1,2] into a pragmatic health system strategy.[3,4] Following Medicare, various private health insurance plans and some state Medicaid programs entered into contracts with groups of healthcare providers (hospitals, physicians, or health systems) to serve as ACOs for their insured enrollees.[6] Leavitt Partners' ACO tracking database showed that the number of ACOs increased from 157 in March of 2012 to 782 in December of 2015.[7]

Until recently, the federal government's commitment to having 50% of total Medicare spending via value-based payment models by 2018, coupled with endorsement from state Medicaid programs and commercial insurers, demonstrated strong support for continuation of ACOs. Unexpectedly on August 15, 2017, the Centers for *Medicare* & Medicaid Services (CMS) outlined a plan in its proposed rulemaking to cancel the Episode Payment Models and the Cardiac Rehabilitation incentive payment model, which were scheduled to commence on January 1, 2018. CMS also plans to scale back the mandatory Comprehensive Care for Joint Replacement (CCJR) bundled payment model from 67 selected geographic areas to 34. Although this proposed rulemaking created some equipoise in the healthcare industry regarding the future of value-based reimbursement approaches, cost containment and improved efficiency remain as major focuses of the federal government's healthcare effort. Notably, CMS offers providers that are newly excluded from the CCJR model the opportunity to voluntarily participate in the program and is expected to increase opportunities for providers to participate in voluntary rather than large-scale mandatory episode payment model initiatives. In 2018, the agency also plans to develop new voluntary bundled payment models that will meet criteria to be considered an advanced alternative payment model for Quality Payment Program purposes.

Importantly, the value-based reimbursement movement was well underway before ACA legislation. Through ACA health

***Address for correspondence**: Mark V. Williams, MD, Director, Center for Health Services Research, Professor & Vice Chair, Department of Internal Medicine, University of Kentucky, 740 South Limestone, Kentucky Clinic J525, Lexington, KY 40536-0284; Telephone: (859) 218-1039; E-mail: mark.will@uky.edu

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

Received: September 21, 2017; **Revised:** January 8, 2018; **Accepted:** February 4, 2018

2018 Society of Hospital Medicine DOI 10.12788/jhm.2965

TABLE 1. **Hospitalists Contribution to ACO Success**

Role	ACO Impact
Clinician	Deliver evidence-based practices and de-implement unnecessary services
	Coordinate care among primary care providers and specialists, and between hospital and post-acute care
	Manage complex high-risk populations and promote teamwork
Quality Improvement Expert	Become ACO knowledge expert and advocate system-level transformation to value-based care
	Promote change culture in the organization
	Initiate and lead quality improvement projects to ensure the hospital performs well on quality metrics, including 30-day readmissions, hospital acquired conditions, and patient satisfaction.
Informatics	Lead data sharing among inpatient and other settings
	Facilitate data collection and infrastructure
	Develop and implement clinical decision support tools for ACO needs
Administrator	Drive culture change and system-level transformation
	Invest capital in infrastructure development

reform, value-based reimbursement efforts were expanded through ACOs, bundled payments, value-based purchasing, the CMS Innovation Center and other initiatives. With health systems having an overflowing plate of activities, a wait-and-see attitude might seem reasonable at first. However, being unprepared for the inevitable shift to value-based reimbursement and reduced fee-for-service revenue places an organization at risk. A successful ACO requires system-level transformation, especially cultural and structural changes to achieve clinical integration. Being embedded in health system delivery, hospitalists can help shape a team-oriented culture and foster success in value-based payment models. This requires hospitalists to take a more active role in assessing and striking a balance between high-quality, cost-efficient care and financial risk inherent in ACO models.

WHAT HOSPITALISTS NEED TO KNOW ABOUT ACOS

The key to hospitalists fulfilling their value creation potential and becoming enablers for ACO success lies in developing a thorough understanding of the aspects of an ACO that promote efficient and effective care, while accounting for financial factors. Fundamentally, the ACO concept combines provider payment and delivery system reforms. Specifically, the definition of an ACO contains 3 factors: (1) a *local healthcare organization* (eg, hospital or multispecialty group of physicians) with a related set of providers that (2) can be *held accountable* for the cost and quality of care delivered to (3) a *defined population*. While the notion of accountability is not new, the locus of accountability is changed in the ACO model—emphasizing accountability at the level of actual care delivery with documentation of quality and cost outcomes. The ACO approach aims to address multiple, frequent, and recurring problems, including lack of financial incentives to improve quality and reduce cost, as well as the negative consequences of a pay-for-volume system—uncoordinated and fragmented care, overutilization of unnecessary tests and treatments, and poor patient experience all manifested as unwarranted geographic variation in practice patterns, clinical outcomes, and health spending. Participants in an ACO are rewarded financially if they can slow the growth of their patients' healthcare costs while maintaining or improving the quality of care delivered. To succeed in this ACO world, hospitalists must assume greater prudence in the use of healthcare services while improving (or at a minimum, maintaining) patient outcomes, thus excising avoidable waste across the continuum of care.

More than half of ACOs include a hospital.[8] However, whether hospital-led ACOs possess an advantage remains to be elucidated. Early reports indicated that physician-led ACOs saved more money.[9,10] However, others argue that hospitals[11] are better capitalized, have greater capacity for data sharing, and possess economies of scale that allow them to invest in more advanced technology, such as predictive modeling and/or simulation software. Such analytics can identify high-cost patients (ie, multiple comorbidities), super utilizers and populations lacking care, allowing ACOs to implement preventive measures to reduce unnecessary utilization. Recently released CMS MSSP 2016 performance data[12] showed that nearly half (45%) of physician-only ACOs earned shared savings, whereas 23% of ACOs that include hospitals earned shared savings. However, among all the ACOs that achieved savings, ACO entities that include hospitals generated the highest amount of shared savings (eg, Advocate, Hackensack Alliance, Cleveland Clinic, and AMITA Health). Notably, hospital-led ACOs tend to have much larger beneficiary populations than physician-led ACOs, which may create a scenario of higher risk but higher potential reward.

HOW HOSPITALISTS CONTRIBUTE VALUE TO ACO SUCCESS

The emphasis on value over volume inherent in the development of ACOs occurs through employing care strategies implemented through changes in policies, and eventual structural and cultural changes. These changes require participating

organizations to possess certain key competencies, including the following: 1) leadership that facilitates change; 2) organizational culture of teamwork; 3) collaborative relationships among providers; 4) information technology infrastructure for population management and care coordination; 5) infrastructure for monitoring, managing, and reporting quality; 6) ability to manage financial risk; 7) ability to receive and distribute payments or savings; and 8) resources for patient education and support.[2,3,13-16] Table 1 summarizes the broad range of roles that hospitalists can serve in delivering care to ACO populations.[17-19]

Hospitalists' active pursuit of nonclinical training and selection for administrative positions demonstrate their proclivity to provide these competencies. In addition to full-time clinician hospitalists, who can directly influence the delivery of high-value care to patients, hospitalists serve many other roles in hospitals and each can contribute differently based on their specialized expertise. Examples include the success of the Society of Hospital Medicine's Leadership Academy; the acknowledged expertise of hospitalists in quality improvement (QI), informatics, teamwork, patient experience, care coordination and utilization; and advancement of hospitalists to senior leadership positions (eg, CQO, CMO, CEO). Given that nearly a third of healthcare expenditures are for hospital care,[20] hospitalists are in a unique position to foster ACO competencies while impacting the quality of care episodes associated with an index hospital stay.

Importantly, hospitalists cannot act as gatekeepers to restrict care. Managed care organizations and health maintenance organizations use of this approach in the 1990s to limit access to services in order to reduce costs led to unacceptable outcomes and numerous malpractice lawsuits. ACOs should aspire to deliver the most cost-effective high-quality care, and their performance should be monitored to ensure that they provide recommended services and timely access. The Medicare ACO contract holds the provider accountable for meeting 34 different quality measures (Supplemental Table 1), and hospitalists can influence outcomes for the majority. Especially through hospital and health system QI initiatives, hospitalists can directly impact and share accountability for measures ranging from care coordination to implementation of evidence-based care (eg, ACE inhibitors and beta blockers for heart failure) to patient and family caregiver experience.

Aligned with Medicare ACO quality measures, 5 high-impact target areas were identified for ACOs[21]: (1) Prevention and wellness; (2) Chronic conditions/care management; (3) Reduced hospitalizations; (4) Care transitions across the fragmented system; and (5) Multispecialty care coordination of complex patients. One essential element of a successful ACO is the ability to implement evidence-based medical guidelines and/or practices across the continuum of care for selected targeted initiatives. Optimizing care coordination/continuum requires team-based care, and hospitalists already routinely collaborate with nurses, social workers, case managers, pharmacists, and other stakeholders such as dieticians and physical therapists on inpatient care. Hospitalists are also experienced in facilitating communication and improving integration and coordination efficiencies among primary care providers and specialists, and between hospital care and post-acute care, as they coordinate post-hospital care and follow-up. This provides an opportunity to lead health system care coordination efforts, especially for complex and/or high-risk patients.[22,23] CMS MSSP 2016 performance data[12] showed that ACOs achieving shared savings had a decline in inpatient expenditures and utilization across several facility types (hospital, SNF, rehabilitation, long term). Postacute care management is critical to earning shared savings; SNF and Home Health expenditures fell by 18.3% and 9.7%, respectively, on average. We believe that hospitalists can have more influence over these cost areas by influencing treatment of hospitalized patients in a timely manner, discharge coordination, and selection of appropriate disposition locations. Hospitalists also play an integral role in ensuring the hospital performs well on quality metrics, including 30-day readmissions, hospital acquired conditions, and patient satisfaction. Examples below document the effectiveness of hospitalists in this new ACO era.

Care Transitions/Coordination

Before the Hospital Readmission Reduction Program (HRRP) delineated in the ACA, hospitalists developed Project BOOST (Better Outcomes by Optimizing Care Transitions) to improve hospital discharge care transition. The evidence-based foundation of this project led CMS to list Project BOOST as an example program that can reduce readmissions.[24] Through the dissemination and mentored implementation of Project BOOST to over 200 hospitals across the United States,[25] hospitalists contributed to the marked reduction in hospital readmission occurring since 2010.[26] Although hospital medicine began as a practice specific to the hospital setting, hospitalists' skills generated growing demand for them in postacute facilities. SNF residents commonly come from hospitals postdischarge and suffer from multiple comorbidities and limitations in activities of daily living. Not surprisingly, SNF residents experience high rates of rehospitalizations.[27] Hospitalists can serve as a bridge between hospitals and SNFs and optimize this transition process to yield improved outcomes. Industry experts endorse this approach.[28] A recent study demonstrated a significant reduction in readmissions in 1 SNF (32.3% to 16.1%, odds ratio = 0.403, $P < .001$), by having a hospitalist-led team follow patients discharged from the hospital.[29]

Chronic Conditions Management/High-Risk Patients

Interest in patients with multiple chronic comorbidities and social issues intensifies as healthcare systems focus limited resources on these high-risk patients to prevent the unnecessary use of costly services.[30,31] As health systems assume financial risk for health outcomes and costs of designated patient groups, they undertake efforts to understand the population they serve. Such efforts aim to identify patients with established high utilization patterns (or those at risk for high utilization). This knowledge enables targeted actions to provide

access, treatment, and preventive interventions to avoid unneeded emergency and hospital services. Hospitalists commonly care for these patients and are positioned to lead the implementation of patient risk assessment and stratification, develop patient-centered care models across care settings, and act as a liaison with primary care. For frail elderly and seriously ill patients, the integration of hospitalists into palliative care provides several opportunities for improving the quality of care at the end of life.[32] As patients and their family caregivers commonly do not address goals of care until faced with a life-threatening condition in the hospital, hospitalists represent ideal primary palliative care physicians to initiate these conversations.[33] A hospitalist communicating with a patient and/or their family caregiver about alleviating symptoms and clarifying patients' preferences for care often yields decreases in ineffective healthcare utilization and better patient outcomes. The hospitalists' ability to communicate with other providers within the hospital setting also allows them to better coordinate interdisciplinary care and prevent unnecessary and ineffective treatments and procedures.

De-Implementation/Waste Reduction

The largest inefficiencies in healthcare noted in the National Academy of Medicine report, *Demanding Value from Our Health Care* (2012), are failure to deliver known beneficial therapies or providing unnecessary or nonevidenced based services that do not improve outcomes, but come with associated risk and cost.[34] "De-implementation" of unnecessary diagnostic tests or ineffective or even harmful treatments by hospitalists represents a significant opportunity to reduce costs while maintaining or even improving the quality of care. The Society of Hospital Medicine joined the *Choosing Wisely*® campaign and made 5 recommendations in adult care as an explicit starting point for eliminating waste in the hospital in 2013.[35] Since then, hospitalists have participated in multiple successful efforts to address overutilization of care; some published results include the following:

- decreased frequency of unnecessary common labs through a multifaceted hospitalist QI intervention;[36]
- reduced length of stay and cost by appropriate use of telemetry;[37] and
- reduced unnecessary radiology testing by providing physicians with individualized audit and feedback reports.[38]

CONCLUSION

Hundreds of ACOs now exist across the US, formed by a variety of providers including hospitals, physician groups, and integrated delivery systems. Provider groups range in size from primary care-focused physician groups with a handful of offices to large, multistate integrated delivery systems with dozens of hospitals and hundreds of office locations. Evaluations of ACO outcomes reveal mixed results.[9,39-53] Admittedly, assessments attempting to compare the magnitude of savings across ACO models are difficult given the variation in size, variability in specific efforts to influence utilization, and substantial turnover among participating beneficiaries.[54] Nonetheless, a newly published Office of Inspector General report[55] showed that most Medicare ACOs reduced spending and improved care quality (82% of the individual quality measures) over the first 3 years of the program, and savings increased with duration of an ACO program. The report also noted that considerable time and managerial resources are required to implement changes to improve quality and lower costs. While the political terrain ostensibly supports value-based care and the need to diminish the proportion of our nation's gross domestic product dedicated to healthcare, health systems are navigating an environment that still largely rewards volume. Hospitalists may be ideal facilitators for this transitional period as they possess the clinical experience caring for complex patients with multiple comorbidities and quality improvement skills to lead efforts in this new ACO era.

Disclosures: The authors have nothing to disclose.

References

1. Fisher ES, Staiger DO, Bynum JP, Gottlieb DJ. Creating accountable care organizations: the extended hospital medical staff. *Health Aff(Project Hope).* 2007;26(1):w44-w57.
2. Fisher ES, McClellan MB, Bertko J, et al. Fostering accountable health care: moving forward in medicare. *Health Aff(Project Hope).* 2009;28(2):w219-w231.
3. McClellan M, McKethan AN, Lewis JL, Roski J, Fisher ES. A national strategy to put accountable care into practice. *Health Aff(Project Hope).* 2010;29(5):982-990.
4. Berwick DM. Making good on ACOs' promise--the final rule for the Medicare shared savings program. *N Engl J Med.* 2011;365(19):1753-1756.
5. Kuo YF, Sharma G, Freeman JL, Goodwin JS. Growth in the care of older patients by hospitalists in the United States. *N Engl J Med.* 2009;360(11):1102-1112.
6. Kennedy K. Health Care Providers Embracing Cost-saving Groups. USA Today, July 24, 2011.
7. Leavitt Partners. Available at http://leavittpartners.com, April 2016.
8. Colla CH, Lewis VA, Tierney E, Muhlestein DB. Hospitals Participating In ACOs Tend To Be Large And Urban, Allowing Access To Capital And Data. *Health Aff(Millwood).* 2016;35(3):431-439.
9. McWilliams JM, Hatfield LA, Chernew ME, Landon BE, Schwartz AL. Early Performance of Accountable Care Organizations in Medicare. *N Engl J Med.* 2016;374(24):2357-2366.
10. Muhlestein D, Saunders R, McClellan M. Medicare Accountable Care Organization Results For 2015: The Journey To Better Quality And Lower Costs Continues. In. *Health Affairs Blog.* Bethesda, MD 2016.
11. Chernew ME. New Health Care Symposium: Building An ACO---What Services Do You Need And How Are Physicians Impacted? In *Health Affairs Blog.* Bethesda, MD 2016.
12. Centers for Medicare & Medicaid Services. Performance Year 2016 Quality Performance and Financial Reconciliation Results for ACOs with 2012-2016 Start Dates. Available at https://strategichealthcare.net/wp-content/uploads/2017/10/CMS-Slides-on-ACOs.pdf. 2017.
13. Shortell SM, Casalino LP. Implementing qualifications criteria and technical assistance for accountable care organizations. *JAMA.* 2010;303(17):1747-1748.
14. Shortell SM, Casalino LP, Fisher ES. How the center for Medicare and Medicaid innovation should test accountable care organizations. *Health Aff (Project Hope).* 2010;29(7):1293-1298.
15. Medicare Payment Advisory Commission. Accountable Care Organizations Payment Systems October 2015. Available at http://www.medpac.gov/documents/payment-basics/accountable-care-organization-payment-systems-15.pdf?sfvrsn=0.
16. American Hospital Association. 2010 Committee on Research. *AHA Research Synthesis Report: Accountable Care Organization.*
17. D'Aunno T, Broffman L, Sparer M, Kumar SR. Factors That Distinguish High-Performing Accountable Care Organizations in the Medicare Shared Savings Program. *Health Serv. Res.* 2016.
18. Peiris D, Phipps-Taylor MC, Stachowski CA, et al. ACOs Holding Commercial

Contracts Are Larger And More Efficient Than Noncommercial ACOs. *Health Aff (Project Hope).* 2016;35(10):1849-1856.
19. Ouayogode MH, Colla CH, Lewis VA. Determinants of success in Shared Savings Programs: An analysis of ACO and market characteristics. *Healthcare (Amsterdam, Netherlands).* 2017;5(1-2):53-61.
20. National Center for Health Statistics. Health, United States, 2016: With Chartbook on Long-term Trends in Health. In: Hyattsville, MD.2017.
21. Gbemudu JN. Larson BK, Van Citters AD, Kreindler SA, Nelson EC, Shortell SM, Fisher ES. Norton Healthcare: A Strong Payer–Provider Partnership for the Journey to Accountable Care. January 2012. Available at http://www.commonwealthfund.org/~/media/files/publications/case-study/2012/jan/1574_gbemudu_norton_case-study_01_12_2012.pdf.
22. O'Leary KJ, Haviley C, Slade ME, Shah HM, Lee J, Williams MV. Improving teamwork: impact of structured interdisciplinary rounds on a hospitalist unit. *J Hosp Med.* 2011;6(2):88-93.
23. Hansen LO, Greenwald JL, Budnitz T, et al. Project BOOST: effectiveness of a multihospital effort to reduce rehospitalization. *J. Hosp. Med..* 2013;8(8):421-427.
24. Centers for Medicare and Medicaid Services. Solicitation for Applications: Community-based Care Transitions Program. Available at https://innovation.cms.gov/Files/Migrated-Medicare-Demonstration-x/CCTP-Solicitation.pdf. September 7, 2017.
25. Li J, Hinami K, Hansen LO, Maynard G, Budnitz T, Williams MV. The physician mentored implementation model: a promising quality improvement framework for health care change. *Acad Med.* 2015;90(3):303-310.
26. Williams MV, Li J, Hansen LO, et al. Project BOOST implementation: lessons learned. *South Med J.* 2014;107(7):455-465.
27. Ouslander JG, Lamb G, Perloe M, et al. Potentially avoidable hospitalizations of nursing home residents: frequency, causes, and costs: [see editorial comments by Drs. Jean F. Wyman and William R. Hazzard, pp 760-761]. *J Am Geriatr Soc.* 2010;58(4):627-635.
28. Pittman D. SNFs: New Turf for Hospitalists? 2013. Available at https://www.medpagetoday.com/hospitalbasedmedicine/hospitalists/39401.
29. Petigara S, Krishnamurthy M, Livert D. Necessity is the mother of invention: an innovative hospitalist-resident initiative for improving quality and reducing readmissions from skilled nursing facilities. *J Community Hosp Intern Med Perspect.* 2017;7(2):66-69.
30. Silow-Carroll S, Edwards J. *Early Adopters of the Accountable Care Model: A Field Report on Improvements in Health Care Delivery.* New York, NY: The Commonwealth Fund;March 2013.
31. Hasselman D. *Super-Utilizer Summit: Common Themes from Innovative Complex Care Management Programs.* Hamilton, NJ: Center for Health Care Strategies;October 2013.
32. Wald HL, Glasheen JJ, Guerrasio J, Youngwerth JM, Cumbler EU. Evaluation of a hospitalist-run acute care for the elderly service. *J Hosp Med.* 2011;6(6):313-321.
33. Quill TE, Abernethy AP. Generalist plus specialist palliative care--creating a more sustainable model. *N Engl J Med.* 2013;368(13):1173-1175.
34. O'Kane M, Buto K, Alteras T, et. al. Demanding Value from Our Health Care: Motivating Patient Action to Reduce Waste in Health Care. *Institute of Medicine of the National Academies.* July 2012. https://nam.edu/wp-content/uploads/2015/06/VSRT-DemandingValue.pdf. Accessed Accessed June 18, 2017.
35. Bulger J, Nickel W, Messler J, et al. Choosing wisely in adult hospital medicine: five opportunities for improved healthcare value. *J Hosp Med.* 2013;8(9):486-492.
36. Corson AH, Fan VS, White T, et al. A multifaceted hospitalist quality improvement intervention: Decreased frequency of common labs. *J Hosp Med.* 2015;10(6):390-395.
37. Svec D, Ahuja N, Evans KH, et al. Hospitalist intervention for appropriate use of telemetry reduces length of stay and cost. *J Hosp Med.* 2015;10(9):627-632.
38. Neeman N, Quinn K, Soni K, Mourad M, Sehgal NL. Reducing radiology use on an inpatient medical service: choosing wisely. *JAMA Intern Med.* 2012;172(20):1606-1608.
39. Abrams M, Nuzum R, Zezza M, Ryan J, Kiszla J, Guterman S. The Affordable Care Act's Payment and Delivery System Reforms: A Progress Report at Five Years. Bipartisan Policy Center, May 2015. Available at http://www.commonwealthfund.org/publications/issue-briefs/2015/may/aca-payment-and-delivery-system-reforms-at-5-years.
40. Kocot SL, White R, Katikaneni P, McClellan MB. A More Complete Picture of Pioneer ACO Results. The Brookings Institution, October 13, 2014. Available at http://www.brookings.edu/blogs/up-front/posts/2014/10/09-pioneer-aco-results-mcclellan/#recent_rr/
41. Blumenthal D, Abrams M, Nuzum R. The Affordable Care Act at 5 Years. *N Engl J Med.* 2015;372(25):2451-2458.
42. Colla CH, Lewis VA, Kao LS, O'Malley AJ, Chang CH, Fisher ES. Association Between Medicare Accountable Care Organization Implementation and Spending Among Clinically Vulnerable Beneficiaries. *JAMA Intern Med.* 2016;176(8):1167-1175.
43. Epstein AM, Jha AK, Orav EJ, et al. Analysis of early accountable care organizations defines patient, structural, cost, and quality-of-care characteristics. *Health Aff (Project Hope).* 2014;33(1):95-102.
44. Fullerton CA, Henke RM, Crable E, Hohlbauch A, Cummings N. The Impact Of Medicare ACOs On Improving Integration And Coordination Of Physical And Behavioral Health Care. *Health Aff (Project Hope).* 2016;35(7):1257-1265.
45. Herrel LA, Norton EC, Hawken SR, Ye Z, Hollenbeck BK, Miller DC. Early impact of Medicare accountable care organizations on cancer surgery outcomes. *Cancer.* 2016;122(17):2739-2746.
46. McConnell KJ, Renfro S, Chan BK, et al. Early Performance in Medicaid Accountable Care Organizations: A Comparison of Oregon and Colorado. *JAMA Intern Med.* 2017;177(4):538-545.
47. Nyweide DJ, Lee W, Cuerdon TT, et al. Association of Pioneer Accountable Care Organizations vs traditional Medicare fee for service with spending, utilization, and patient experience. *JAMA.* 2015;313(21):2152-2161.
48. Rajkumar R, Press MJ, Conway PH. The CMS Innovation Center--a five-year self-assessment. *N Engl J Med.* 2015;372(21):1981-1983.
49. Rose S, Zaslavsky AM, McWilliams JM. Variation In Accountable Care Organization Spending And Sensitivity To Risk Adjustment: Implications For Benchmarking. *Health affairs (Project Hope).* 2016;35(3):440-448.
50. Shortell SM, Poon BY, Ramsay PP, et al. A Multilevel Analysis of Patient Engagement and Patient-Reported Outcomes in Primary Care Practices of Accountable Care Organizations. *J Gen Intern Med.* 2017;32(6):640-647.
51. Winblad U, Mor V, McHugh JP, Rahman M. ACO-Affiliated Hospitals Reduced Rehospitalizations From Skilled Nursing Facilities Faster Than Other Hospitals. *Health Aff (Project Hope).* 2017;36(1):67-73.
52. Zhang Y, Caines KJ, Powers CA. Evaluating the Effects of Pioneer Accountable Care Organizations on Medicare Part D Drug Spending and Utilization. *Med Care.* 2017;55(5):470-475.
53. Muhlestein D. Medicare ACOs: Mixed Initial Results and Cautious Optimism. Health Affairs Blog, February 4, 2014. Available at http://healthaffairs.org/blog/2014/02/04/medicare-acos-mixed-initial-results-and-cautious-optimism/.
54. Hsu J, Price M, Vogeli C, et al. Bending The Spending Curve By Altering Care Delivery Patterns: The Role Of Care Management Within A Pioneer ACO. *Health Aff (Project Hope).* 2017;36(5):876-884.
55. Medicare Shared Savings Program Accountable Care Organizations Have Shown Potential For Reducing Spending And Improving Quality. Office of Inspector General;August 2017.

Things We Do for No Reason: Hospitalization for the Evaluation of Patients with Low-Risk Chest Pain

Christopher A. Caulfield, MD*, John R. Stephens, MD

Department of Internal Medicine, Division of Hospital Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

The "Things We Do for No Reason" (TWDFNR) series reviews practices that have become common parts of hospital care but may provide little value to our patients. Practices reviewed in the TWDFNR series do not represent "black and white" conclusions or clinical practice standards, but are meant as a starting place for research and active discussions among hospitalists and patients. We invite you to be part of that discussion.

Chest pain is one of the most common complaints among patients presenting to the emergency department. Moreover, at least 30% of patients who present with chest pain are admitted for observation, and >70% of those admitted with chest pain undergo cardiac stress testing (CST) during hospitalization. Several clinical risk prediction models have validated evaluation processes for managing patients with chest pain, helping to identify those at a low risk of major adverse cardiac events. Among these, the Thrombolysis in Myocardial Infarction or HEART score can identify patients safe to be discharged with outpatient CST within 72 h. It is unnecessary to hospitalize all low-risk patients for cardiac testing because it may expose them to needless risk and avoidable care costs, with little additional benefit.

CLINICAL SCENARIO

A 60-year-old man with a history of osteoarthritis and depression presented to our emergency department (ED) with a 1-month history of left-sided chest pain that was present both at rest and exertion. There were no aggravating or relieving factors for the pain and no associated shortness of breath, diaphoresis, nausea, or lightheadedness. He smoked a half pack of cigarettes daily for 5 years in his twenties. The patient was taking aspirin 81 mg daily and paroxetine 40 mg daily, which he had been taking for 10 years. There was a family history of coronary artery disease in his mother, father, and sister. On examination, he was afebrile, with a blood pressure of 138/78 mm Hg and a heart rate of 62 beats/min; he appeared well, with no abnormal cardiopulmonary findings. Investigation revealed a normal initial troponin I level (<0.034 mg/mL) and normal electrocardiogram (ECG) with normal sinus rhythm (75 beats/min), normal axis, no ST changes, and no Q waves. He was therefore admitted to the hospital for further evaluation.

BACKGROUND

Each year, >7 million patients visit ED for chest pain in the United States,[1] with approximately 13% diagnosed with acute coronary syndromes (ACSs).[2] Over 30% of patients who present to ED with chest pain are hospitalized for observation, symptom evaluation, and risk stratification.[3] In 2012, the mean Medicare reimbursement cost was $1,741 for in-hospital observation,[4] with up to 70% of admitted patients undergoing cardiac stress testing (CST) before discharge.[5]

WHY YOU MIGHT THINK HOSPITALIZATION IS HELPFUL FOR THE EVALUATION OF LOW-RISK CHEST PAIN

A scientific statement by the American Heart Association in 2010 recommended that patients considered to be at low risk for ACS after initial evaluation (based on presenting symptoms, past history, ECG findings, and initial cardiac biomarkers) should undergo CST within 72 h (preferably within 24 h) of presentation to provoke ischemia or detect anatomic coronary artery disease.[6] Early exercise treadmill testing as part of an accelerated diagnostic pathway can also reduce the length of stays (LOS) in hospital and lower the medical costs.[7] Moreover, when there is noncompliance or poor accessibility, failure to pursue early exercise testing in a hospital could result in a loss of patients to follow-up. Hospitalization for testing through accelerated diagnostic pathways may improve access to care and reduce clinical and legal risks associated with a major adverse cardiac event (MACE).

WHY HOSPITALIZATION FOR THE EVALUATION OF LOW-RISK CHEST PAIN IS UNNECESSARY FOR MANY PATIENTS

Clinical Risk Prediction Models

When a patient initially presents with chest pain, it should be determined if the symptoms are related to ACS or some other diagnosis. Hospitalization is required for patients with ACS but may not be for those without ACS and those with a low risk of inducible ischemia. Clinical risk scores and risk prediction models, such as the Thrombolysis in Myocardial Infarction (TIMI) and HEART scores, have been used in accelerated diagnostic protocols to determine a patient's likelihood of having ACS. Several

***Address for correspondence**: Christopher A. Caulfield, MD, Assistant Professor of Medicine, Division of Hospital Medicine, University of North Carolina School of Medicine, 101 Manning Drive, CB# 7085, Chapel Hill, NC 27599-7085; Telephone: (984) 974-1931; Fax: (984) 974-2216; E-mail: chris_caulfield@med.unc.edu

Published online first February 13, 2018.

Received: May 17, 2017; **Revised**: November 4, 2017; **Accepted**: December 2, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2939

large trials of these clinical risk prediction models have validated the processes for evaluating patients with chest pain.

The TIMI risk score, the most well-known model, assesses risk based on the presence or absence of 7 characteristics (Appendix 1). It should be noted that the patient population studied for initial validation of this model comprised high-risk patients with unstable angina or non-ST elevation myocardial infarction who would benefit from early or urgent invasive therapy.[8] In this population, TIMI scores of 0-1 are associated with low risk, with a 4.7% risk of ACS at 14 days.[8] In another study of patients presenting to ED with undifferentiated chest pain and a TIMI score of zero, the risk of MACE at 30 days was approximately 2%.[9]

The HEART score is also used for patients presenting to ED with undifferentiated chest pain and assesses 5 separate variables scored 0–2 (Appendix 2). The original research gave a score of 2 to a troponin I level greater than twice the upper limit of the normal level,[10] whereas a subsequent validation study gave a score of 2 to a troponin I or T level greater than or equal to 3 times the upper limit of the normal level.[11] Patients are considered at low, intermediate, and high risk based on scores of 0–3, 4–6, and 7–10, respectively.[10,11] Backus et al. performed a prospective randomized trial of 2388 patients who presented to ED with chest pain to validate the HEART score and compare it to the TIMI risk score. The HEART score performed better than the TIMI risk score in low-risk patients, with TIMI scores of 0-1 and HEART scores of 0–3 having a 6-week MACE risk of 2.8% and 1.7%, respectively.[11]

A HEART pathway was developed that combines the HEART score with serial troponin I assays assessed at the time of initial presentation and approximately 3 h later.[12] Mahler et al. randomized 282 patients presenting to ED with chest pain to either the HEART pathway or conventional care. Patients with low-risk HEART scores and an abnormal troponin I level were admitted for cardiology consultation, whereas discharge was recommended for those with low scores and a normal troponin I level. Despite nearly 20% of the study cohort having a history of myocardial infarction, percutaneous coronary intervention, or coronary artery bypass grafting, approximately 40% of patients in the HEART pathway were identified as low risk, increasing early discharge rates by 21.3% and decreasing the average LOS by 12 h. No low-risk patient suffered a MACE within 30 days, and the HEART pathway had a sensitivity and a negative predictive value of approximately 99%.

Costs and Harms of Hospitalization for Cardiac Testing

Hospitalization carries measurable risks.[13,14] Between 2008 and 2013, Weinstock et al. evaluated the outcomes of patients presenting with chest pain who were placed in an observation unit for suspected ACS.[15] Low-risk patients were defined as those with normal ECGs (no ischemic changes), 2 negative troponin tests performed 60–420 min apart (no particular troponin assay specified), and stable vital signs. They identified 7266 patients who were considered to have low risk, among whom 4 (0.06%) had an adverse outcome in the hospital (eg, life-threatening arrhythmia, ST-segment elevation myocardial infarction, cardiac or respiratory arrest, or death); 3 among the 4 patients had a cardiac-related adverse outcome. The overall risk of adverse outcomes due to cardiac causes was 1 in 2422 admissions (0.04%). The authors compared their results with the reported risk of 1 in 164 admissions for preventable adverse events contributing to patient death during routine hospitalization (eg, medication or procedure errors).[14]

Outpatient CST can be reliably and safely performed for patients with chest pain.[16-18] There is no clear evidence that earlier CST leads to improved patient outcomes, and CST in the absence of acute ischemia (or ACS) increases the rates of angiography and revascularization without improvements in the rate of myocardial infarction.[19-21] Given the costs of in-hospital observation[4] and the dubious benefits of providing CST for patients with low-risk chest pain, admitting all patients with low-risk chest pain exposes them to costs and harms with little potential benefit.

WHEN HOSPITALIZATION MAY BE REASONABLE TO EVALUATE LOW-RISK CHEST PAIN

Patients presenting with chest pain with either dynamic ECG changes or an elevated troponin level require hospitalization for further ACS diagnosis and treatment. When ACS cannot be clearly diagnosed at the initial evaluation, healthcare providers should use clinical risk prediction models to stratify patients. Those deemed to be at an intermediate or high risk by these models should be hospitalized for further evaluation, as should those at low risk but for whom access to outpatient follow-up is difficult (eg, those without health insurance).

WHAT YOU SHOULD DO INSTEAD OF HOSPITALIZATION FOR LOW-RISK CHEST PAIN

A complete history and physical examination, along with ECG and cardiac biomarker testing, are required for all patients presenting with chest pain. Validated clinical risk prediction models should then be used to determine the likelihood of a cardiac event. Fanaroff et al. reported that low-risk HEART scores of 0–3 and TIMI scores of 0-1 gave positive likelihood ratios of 0.2 and 0.31, respectively.[22] Using a pre-test probability of 13%, as reported by Bhuiya et al.,[2] the likelihood of ACS or MACE within 6 weeks is 2.9% for patients with low-risk HEART scores and 4.4% for those with low-risk TIMI scores.[22] These risk prediction models allow clinicians to provide a shared decision-making plan with the patient and discuss the risks and benefits of in-hospital versus outpatient cardiac testing, especially among patients with access to appropriate outpatient follow-up.[23] Low-risk patients can be referred for outpatient testing within 72 h, reducing hospitalization-associated costs and harms.

RECOMMENDATIONS

- Patients presenting with chest pain should undergo a complete history taking and physical examination, as well as ECG and cardiac biomarker testing (eg, troponin I level at presentation and approximately 3 h later).

- Clinical risk prediction models, such as TIMI or HEART scores, should then be used to determine the risk of MACE.
- Patients at a low risk may be safely discharged with outpatient CST performed within 72 h.
- Patients at an intermediate or high risk of MACE should be hospitalized for further evaluation, as should those with low-risk chest pain who are unable to attend follow-up for outpatient CST within 72 h.
- Clinicians should provide a shared decision-making plan with each patient, taking care to discuss the risks and benefits of in-hospital versus outpatient CST.

CONCLUSION

The risk of MACE should be assessed in all patients presenting to ED with low-risk chest pain to avoid unnecessary hospitalization that exposes them to potential costs and harms with few additional benefits. If the risk scoring system was applied to the patient described in our original clinical scenario, he would have had a HEART score of 3 (ie, 1 point for a moderately suspicious history, 1 point for the age of 60 years, and 1 point for a positive family history) and a TIMI score of 1 (ie, 1 point for aspirin use within past 7 days). Therefore, he could be stratified as having a low-risk presentation. With a second negative troponin I test at 3 h, discharge from ED with timely outpatient CST within 72 h would be an appropriate management strategy.

Do you think this is a low-value practice? Is this truly a "Thing We Do for No Reason"? Share what you do in your practice and join in the conversation online by retweeting it on Twitter (#TWDFNR) and liking it on Facebook. We invite you to propose ideas for other "Things We Do for No Reason" topics by emailing TWDFNR@hospitalmedicine.org.

Conflicts of Interest: The authors have no conflicts of interest relevant to this article to disclose.

References

1. Centers for Disease Control. National Hospital Ambulatory Medical Care Survey: 2011 Emergency Department Summary Tables. 2011. http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2011_ed_web_tables.pdf. Accessed October 7, 2015.
2. Bhuiya FA, Pitts SR, McCaig LF. Emergency department visits for chest pain and abdominal pain: United States, 1999-2008. *NCHS Data Brief*. 2010;(43):1-8.
3. Cotterill PG, Deb P, Shrank WH, Pines JM. Variation in chest pain emergency department admission rates and acute myocardial infarction and death within 30 days in the Medicare population. *Acad Emerg Med*. 2015;22(8):955-964.
4. Wright S. Hospitals' Use of Observation Stays and Short Inpatient Stays for Medicare Beneficiaries, OEI-02-12-00040. 2013. https://oig.hhs.gov/oei/reports/oei-02-12-00040.pdf. Accessed May 15, 2017.
5. Penumetsa SC, Mallidi J, Friderici JL, Hiser W, Rothberg MB. Outcomes of patients admitted for observation of chest pain. *Arch Inter Med*. 2012;172(11):873-877.
6. Amsterdam EA, Kirk JD, Bluemke DA, et al. Testing of low-risk patients presenting to the emergency department with chest pain: a scientific statement from the American Heart Association. *Circulation*. 2010;122(17):1756-1776.
7. Hutter AM, Jr., Amsterdam EA, Jaffe AS. 31st Bethesda Conference. Emergency Cardiac Care. Task force 2: Acute coronary syndromes: Section 2B--Chest discomfort evaluation in the hospital. *J Am Coll Cardiol*. 2000;35(4):853-862.
8. Antman EM, Cohen M, Bernink PJ, et al. The TIMI risk score for unstable angina/non-ST elevation MI: A method for prognostication and therapeutic decision making. *JAMA*. 2000;284(7):835-842.
9. Pollack CV, Jr., Sites FD, Shofer FS, Sease KL, Hollander JE. Application of the TIMI risk score for unstable angina and non-ST elevation acute coronary syndrome to an unselected emergency department chest pain population. *Acad Emerg Med*. 2006;13(1):13-18.
10. Six AJ, Backus BE, Kelder JC. Chest pain in the emergency room: value of the HEART score. *Neth Heart J*. 2008; 16(6):191-196.
11. Backus BE, Six AJ, Kelder JC, et al. A prospective validation of the HEART score for chest pain patients at the emergency department. *Int J Cardiol*. 2013;168(3):2153-2158.
12. Mahler SA, Riley RF, Hiestand BC, et al. The HEART Pathway randomized trial: identifying emergency department patients with acute chest pain for early discharge. *Circ Cardiovasc Qual Outcomes*. 2015;8(2):195-203.
13. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Inter Med*. 2003;138(3):161-167.
14. James JT. A new, evidence-based estimate of patient harms associated with hospital care. *J Patient Saf*. 2013;9(3):122-128.
15. Weinstock MB, Weingart S, Orth F, et al. Risk for clinically relevant adverse cardiac events in patients with chest pain at hospital admission. *JAMA Intern Med*. 2015;175(7):1207-1212.
16. Meyer MC, Mooney RP, Sekera AK. A critical pathway for patients with acute chest pain and low risk for short-term adverse cardiac events: role of outpatient stress testing. *Ann Emerg Med*. 2006;47(5):427-435.
17. Lai C, Noeller TP, Schmidt K, King P, Emerman CL. Short-term risk after initial observation for chest pain. *J Emerg Med*. 2003;25(4):357-362.
18. Scheuermeyer FX, Innes G, Grafstein E, et al. Safety and efficiency of a chest pain diagnostic algorithm with selective outpatient stress testing for emergency department patients with potential ischemic chest pain. *Ann Emerg Med*. 2012;59(4):256-264 e253.
19. Safavi KC, Li SX, Dharmarajan K, et al. Hospital variation in the use of noninvasive cardiac imaging and its association with downstream testing, interventions, and outcomes. *JAMA Intern Med*. 2014;174(4):546-553.
20. Foy AJ, Liu G, Davidson WR, Jr., Sciamanna C, Leslie DL. Comparative effectiveness of diagnostic testing strategies in emergency department patients with chest pain: an analysis of downstream testing, interventions, and outcomes. *JAMA Intern Med*. 2015; 175(3):428-436.
21. Sandhu AT, Heidenreich PA, Bhattacharya J, Bundorf MK. Cardiovascular testing and clinical outcomes in emergency department patients with chest pain. *JAMA Intern Med*. 2017;177(8):1175-1182.
22. Fanaroff AC, Rymer JA, Goldstein SA, Simel DL, Newby LK. Does this patient with chest pain have acute coronary syndrome?: The Rational Clinical Examination Systematic Review. *JAMA*. 2015;314(18):1955-1965.
23. Hess EP, Hollander JE, Schaffer JT, et al. Shared decision making in patients with low risk chest pain: prospective randomized pragmatic trial. *BMJ*. 2016;355:i6165.

Off Target But Hitting the Mark

The approach to clinical conundrums by an expert clinician is revealed through the presentation of an actual patient's case in an approach typical of a morning report. Similar to patient care, sequential pieces of information are provided to the clinician, who is unfamiliar with the case. The focus is on the thought processes of both the clinical team caring for the patient and the discussant.

This icon represents the patient's case. Each paragraph that follows represents the discussant's thoughts.

Areeba Kara, MD, MS, FACP[1]*, Somnath Mookherjee, MD[2], Warren Gavin, MD[3], Karen McDonough, MD[2]

[1]Inpatient Medicine, Indiana University Health Methodist Hospital, ASPIRE scholar, Division of General Internal Medicine, IU School of Medicine, Indianapolis, Indiana; [2]Division of General Internal Medicine, Department of Medicine, University of Washington School of Medicine, Seattle, Washington; [3]Department of Medicine, Indiana University School of Medicine, Indianapolis, Indiana.

A 32-year-old woman presented to the emergency department (ED) with 3 months of abdominal pain and 1 week of vomiting.

The differential diagnosis of abdominal pain is broad. This presentation could be caused by disorders of the gastrointestinal (GI), gynecologic, urinary, or, less likely, the neuromuscular systems. The presence of vomiting supports a GI cause. Pregnancy should be excluded in any woman of childbearing age presenting with abdominal pain.

Characteristics of the pain, including location, temporal characteristics, severity, and aggravating and alleviating factors, can narrow the differential diagnosis. The past medical history, including prior surgeries, menstrual, and obstetric history, is also critical.

Approximately 3 months prior to presentation, she reported a tick bite that had evolved into a circumferential targetoid rash. Her primary care provider performed serologic testing for Lyme disease, which was negative, and prescribed doxycycline, which she stopped after a week because of nausea and diffuse, achy, and constant abdominal pain. After initial improvement, symptoms recurred a week prior to presentation. The nausea was now associated with intractable vomiting and anorexia. She denied hematemesis or coffee ground emesis. Her abdominal pain intensified and radiated to her back. She lost 10 pounds over the past week. She denied headache, constipation, diarrhea, blood per rectum, melena, dysuria, vaginal discharge, or rash. She reported chills and temperatures up to 37.8°C at home.

***Address for correspondence:** Areeba Kara MD, MS, FACP, IU School of Medicine Methodist Hospital, Noyes Pavilion, E130, 1800 N Capitol Ave, Indianapolis, IN 46202; Telephone: 317-962-2894; Fax: 317-963-5154; E-mail: akara@iuhealth.org

Published online first December 6, 2017.

Received: May 18, 2017; **Revised:** August 24, 2017; **Accepted:** August 24, 2017

She had a history of migraine headaches for which she took ibuprofen occasionally but took no other prescription or over-the-counter medications. She had never smoked, consumed 2 alcoholic beverages a month, and denied illicit drug use. She lived with her boyfriend on a farm in Indiana where she raised chickens, rabbits, and ducks.

The patient dates the onset of nausea and abdominal pain to a course of doxycycline, presumably prescribed for early Lyme disease, which was stopped after only 1 week. GI side effects, including nausea, vomiting, and upper abdominal pain, are common with doxycycline and may account for the early symptoms. However, these symptoms typically resolve promptly with drug discontinuation. Doxycycline may rarely cause esophageal and gastric ulcers, which could explain her symptoms.

Fewer than half of patients with erythema migrans caused by Lyme disease are seropositive at presentation, as there has been insufficient time for antibodies to develop. Lyme disease typically affects the skin, joints, heart, and nervous system and only rarely affects the GI tract. Acute Lyme disease can cause intestinal pseudoobstruction, splenomegaly, and mild hepatitis. Although Lyme disease is unlikely to be the cause of the current symptoms, serologic testing should be repeated and should be positive if the patient now has early disseminated disease.

Patients with Lyme disease are occasionally coinfected with a second organism. *Ixodes scapularis*, the tick that transmits Lyme disease in the Northeast and Midwest, can be coinfected with *Babesia microti*, a red cell parasite. Babesiosis can persist for months and presents with fever, malaise, and many other nonspecific symptoms, including some that this patient has: anorexia, weight loss, abdominal pain, and vomiting.

The history of migraine and intractable vomiting suggests the possibility of cyclic vomiting syndrome. This syndrome is characterized by episodic bouts of vomiting lasting from hours to as long as a week. The vomiting is often accompanied by abdominal pain and occasionally headaches. Episodes are separated by asymptomatic periods that may last months. Cyclic vomiting syndrome can occur at any age but is more

common in children, those with a personal or family history of migraines, and heavy users of cannabis. At least 3 stereotypical episodes are required to make the diagnosis, so a history of prior similar symptoms should be explored.

The differential diagnosis of abdominal pain and vomiting should stay broad until a comprehensive physical exam and initial laboratory tests are performed. Volume status should be assessed by estimating jugular venous pressure and by obtaining supine and standing blood pressure measurements. The abdomen should be examined carefully, and the presence or absence of hepatomegaly, splenomegaly, masses, and ascites should be specifically noted. The presence of bradycardia, oligoarticular arthritis, or neuropathy could provide supporting evidence for Lyme disease. Pregnancy is less likely given the diffuse and persistent nature of the pain but should still be excluded.

On physical examination, she was distressed, writhing on the bed, and appearing comfortable only on her side with her knees flexed. Her temperature was 36.5°C, heart rate 83 beats per minute, respiratory rate 18 breaths per minute, blood pressure 143/77 mmHg, and oxygen saturation 94% while breathing ambient air. Her abdomen was diffusely tender, most markedly in the epigastrium. Abdominal rigidity, rebound tenderness, and costovertebral tenderness were absent. There was no rash; the previously reported targetoid skin lesion was no longer present. The remainder of the exam was normal.

Laboratory evaluation showed a white count of 7900/mm3, hemoglobin 14.3 gm/dL with normocytic indices, and a platelet count of 175,000/mm3. Sodium was 130 mmol/L, potassium was 3.1 mmol/L, bicarbonate 26 mmol/L, blood urea nitrogen 15 mg/dL, creatinine 0.6 mg/dL, and glucose 92 mg/dL. Serum calcium, aspartate aminotransferase, alanine aminotransferase, bilirubin, and lipase were normal. A urine pregnancy test was negative. Urine analysis was negative for nitrites and leukocyte esterase. Abdominal and pelvic computed tomography (CT) scan with intravenous (IV) contrast performed 3 days prior at an outside ED revealed a 3.4 centimeter left ovarian cyst. A subsequent transvaginal ultrasound was negative for cyst torsion and confirmed appropriate placement of an intrauterine device.

The absence of abdominal rigidity and rebound tenderness does not exclude peritonitis. A normal white blood cell count also does not reliably exclude serious intraabdominal pathology. However, the CT scan argues strongly against many common causes of abdominal pain, including appendicitis, diverticulitis, perforated ulcer, intestinal obstruction, and malignancy, assuming the symptoms have not changed since it was performed.

The patient's laboratory studies argue against biliary obstruction, pancreatitis, pregnancy, hypercalcemia, and ongoing urinary tract infection. Patients with functional gallbladder disorders may have normal laboratory and CT findings but typically have recurrent, biliary-colic-type pain. The low serum potassium, a high blood urea nitrogen to creatinine ratio, and a low serum sodium reflect her significant vomiting. The hyponatremia is consistent with the appropriate release of antidiuretic hormone (ADH) in the setting of volume depletion. She should receive isotonic fluids plus potassium in addition to symptomatic treatment of pain and nausea. Given the severity and duration of symptoms, an esophagogastroduodenoscopy (EGD) should be performed to exclude GI mucosal disease, including peptic ulcer disease and gastritis, which may not be evident on the CT scan.

Additional diagnoses should be considered at this point. This patient has exposure to chickens, ducks, rabbits, and ticks as well as reported chills and mild temperature elevation at home. Tularemia, which can be transmitted by tick bites or exposure to infected rabbits, can cause a prolonged illness. Some patients have abdominal pain, anorexia, nausea, and weight loss, although fever is usually more prominent. Tularemia is uncommon and most frequently seen in the south-central part of the United States but has been reported throughout the country. She should be queried regarding additional exposures, including well water to assess her risk for *Campylobacter* infection.

Opiate withdrawal can present with pain and vomiting, but she reports no opiate use and lacks other findings such pupillary dilation or piloerection. Given the prevalence of opiate abuse, however, a toxicology screen should be performed. Hypercalcemia and diabetic ketoacidosis as metabolic causes of abdominal pain have been ruled out by her laboratory values. If no other cause is identified, other metabolic etiologies like Addison disease, familial Mediterranean fever, or porphyria should be considered.

Cyclic vomiting syndrome should still be on the differential. It is a diagnosis of exclusion requiring a history of recurrent, stereotypical episodes, which should be explicitly explored.

The patient was admitted to a medical unit by the hospitalist service and received IV normal saline, parenteral potassium, and IV pantoprazole. She underwent an EGD that revealed minor erosions in the antrum of the stomach. Biopsies were obtained.

Seven hours after the endoscopy, the patient had a brief period of confusion followed by a generalized tonic-clonic seizure lasting 1 minute. A head CT without contrast was negative for any focal abnormality. Repeat laboratory evaluation revealed that serum sodium was 125 mmol/L, and serum glucose was 113 mg/dL. She was transferred to the progressive care unit and received IV levetiracetam.

The endoscopy excluded structural abnormalities of the stomach and duodenum. The patient now has an additional problem, seizure, which needs to be incorporated in the diagnostic reasoning.

Seizures can be caused by the rapid development of severe hyponatremia, with serum sodium levels usually less than 120 mmol/L. Seizures caused by hyponatremia are typically pre-

ceded by headache and lethargy, as the intracellular movement of excess water causes cerebral edema. Hyponatremia is unlikely to be the cause of her seizure but should nevertheless be evaluated with a urine sodium concentration and serum and urine osmolality. If she is euvolemic, the IV fluids should be stopped and her free water intake should be restricted to avoid worsening the hyponatremia, as it is potentially caused by the syndrome of inappropriate ADH (SIADH).

There are many other possible causes for new onset seizures in adults, including brain tumor, head trauma, alcohol withdrawal, medications, and central nervous system infection, including Lyme disease. Lyme serologies should be repeated.

In this patient, it is likely that the seizure is a manifestation of the same illness that is causing her vomiting and abdominal pain. Seizure is not a feature of cyclic vomiting syndrome in adults. It is also not a feature of tularemia, adrenal insufficiency, or opioid withdrawal.

Acute intermittent porphyria (AIP) can cause both abdominal and neurologic problems. Hyponatremia is common during acute attacks, caused by either the inappropriate release of ADH or the appropriate release of the hormone if there is fluid loss. AIP is a rare diagnosis but could explain the uncommon combination of abdominal pain, vomiting, seizure, and hyponatremia. A spot urine porphobilinogen test should be sent to assess for AIP.

Additional laboratory studies were sent. Serum osmolality was 269 mosm/kg with a corresponding urine osmolality of 699 mosm/kg. A random urine sodium was 145 mEq/L. Thyroid stimulating hormone and cosyntropin stimulating testing were normal. IgM and IgG antibodies to *Borrelia burgdorferi* were negative. Urine porphobilinogen was sent. An electroencephalogram did not reveal epileptiform discharges. Magnetic resonance imaging (MRI) of the brain was significant for T2/FLAIR hyperintensity in the cortex and subcortical white matter of the occipital lobes bilaterally. Hypertonic saline and fluid restriction were initiated.

The patient's labs are consistent with SIADH. Excessive ADH release because of volume depletion and consequent hyponatremia should have improved rapidly with the administration of saline. The high urine sodium suggests that she is now volume replete, while the high urine osmolality is consistent with the presence of excessive ADH in the absence of appropriate stimuli. In the context of normal thyroid and adrenal function, the hyponatremia is likely due to the SIADH.

Negative serologic testing for Lyme disease, 3 months after the onset of rash, excludes this diagnosis.

The MRI findings are consistent with posterior reversible encephalopathy syndrome (PRES), a clinicoradiographic syndrome of headache, altered mental status, seizure, and/or vision loss with associated white matter abnormalities of the posterior cerebral hemispheres. PRES has been reported with AIP as well as other disorders, most commonly hypertensive encephalopathy, eclampsia, and immunosuppressive drug use.

The patient's sodium improved with fluid restriction and the administration of hypertonic saline. There was no recurrence of seizure activity. Amlodipine was initiated for blood pressure readings as high as 156/106 mmHg. A hepatobiliary scan revealed a gallbladder ejection fraction of 13%. Biopsies from her endoscopy revealed nonspecific inflammation without the presence of *Helicobacter pylori*. The patient was discharged home 7 days after admission after stabilization of serum sodium, improvement in her abdominal pain, and tolerance of oral intake. A plan was made for outpatient cholecystectomy.

Many causes of abdominal pain have been excluded and the remaining diagnostic possibility, porphyria, is rare. The clinicians have revisited their differential and considered other causes of abdominal pain, including functional gallbladder disorders. However, chronic cholecystitis (or functional gallbladder disorder) is not this patient's primary problem. The diffuse, severe, and constant abdominal pain prior to admission is not typical of biliary pain, and many medical conditions and drugs, including amlodipine, can lead to a positive hepatobiliary scan. Chronic cholecystitis would not explain her seizure.

AIP remains at the top of the differential for this young woman. A urine porphobilinogen has been sent and must be followed up prior to any further workup or surgery.

One week after discharge, the patient's urine porphobilinogen resulted at 172.8 mCmol/ (upper limits of normal 8.8). Sequencing analysis for genes coding the enzymes involved in the synthetic pathway for heme were sent. Hydroxymethylbilane synthase, coproporphyrinogen oxidase, and protoporphyrinogen oxidase mutation assays were all normal. Despite the normal genetic assays, the diagnosis of AIP was made on the basis of the clinical presentation and elevated urine porphobilinogen. The patient was referred to a hematologist and initiated on oral glucose supplements and hematin infusions.

DISCUSSION

Although abdominal pain has a broad differential, the combination of abdominal pain and neurologic or psychiatric symptoms should suggest the possibility of porphyria, especially if symptoms are recurrent or unexplained. The porphyrias are a group of disorders caused by defects in the synthetic pathway of heme, leading to an overproduction and accumulation of precursors. Heme is a component of multiple proteins, including hemoglobin, myoglobin, and the cytochrome P450 enzymes. Although it is synthesized in all tissues, the bone marrow and liver are the organs most actively involved. The porphyrias can be classified according to the primary site of the overproduction and accumulation of heme precursors (liver vs bone marrow). Although there is overlap between the 2 groups, hepatic porphyrias often present with acute neurovisceral symptoms, while the erythropoietic porphyrias often cause cutaneous photosensitivity.[1]

AIP is the most common hepatic porphyria with a prevalence

of 1 in 20,000 in Caucasians of Western European descent.[1] AIP is caused by a defect in the gene that encodes porphobilinogen deaminase, leading to the accumulation of porphobilinogen.[1] The cardinal manifestation is an acute porphyric attack. While the precise mechanisms underlying the symptoms are unknown, the accumulating metabolites may be directly neurotoxic.[2] Attacks are precipitated by factors that induce heme synthesis, including caloric restriction, alcohol, and certain medications, particularly those that upregulate cyP450. The most commonly implicated drugs are anesthetics, antiepileptics, sulfonamides, rifampin, and estrogen and progesterone. Attacks can also be precipitated by changes in endogenous sex hormone levels, like the increase in progesterone seen in the luteal phase of the menstrual cycle, which may account for the higher incidence of symptomatic attacks in women.[3]

Acute attacks of AIP may have a wide variety of presentations; the disease was referred to as the "little imitator" in the early 20th century.[4] The most common symptom is acute, severe abdominal pain, which may mimic an acute abdomen. Because the pain is neuropathic rather than inflammatory, abdominal tenderness, rebound, fever, and leukocytosis are usually absent, as they were in this patient. Abdominal pain is often accompanied by neuropsychiatric symptoms, including sensory and motor neuropathy, anxiety, hallucinations, delirium, and altered level of consciousness. Seizure occurs in 20% of cases. Involvement of the autonomic nervous system causes tachycardia and new onset hypertension in the majority of patients as well as restlessness and tremor. Hyponatremia, mediated by the syndrome of inappropriate ADH secretion, occurs in nearly a third of patients.[5,6] MRI findings consistent with PRES have also been described in AIP.[7]

The diagnosis of AIP is often delayed; diagnosis later in the disease course is associated with a poorer prognosis.[8] Reported intervals between presentation and diagnosis range from several months to as long as 20 years.[9] Associating the use of medications, caloric restriction, or the menstrual cycle with the exacerbation of symptoms or darkening of urine can help prompt an earlier diagnosis.[6]

AIP can be diagnosed by detecting a greater than 5-fold elevation of urinary porphobilinogen excretion in conjunction with the typical symptoms of an acute attack.[5] Renal dysfunction causes urinary excretion of PBG to fall and serum levels to rise.[10] Serum PBG levels should therefore be sent when AIP is suspected in the setting of renal dysfunction. The primary role of genetic testing in a patient who has AIP confirmed clinically and biochemically is to assist in genetic counseling and to identify asymptomatic family members.[11] Genetic testing is not required to confirm the diagnosis and does not help prognosticate. It is unusual that a mutation was not detected in this case, as the current sensitivity of genetic testing is 97% to 100%.[11]

There are 4 principles of management of an acute porphyric attack. First, any precipitating factors such as medications should be stopped. Second, abdominal pain should be treated appropriately with opioids, if necessary. Third, if autonomic dysfunction is present, beta-blockers or clonidine should be given to treat hypertension.[5] Finally, glucose and/or hemin should be administered to downregulate aminolevulinic acid (ALA) synthase by negative feedback. Downregulation of ALA synthase decreases the accumulation of the neurotoxic porphyrin precursors ALA and PBG.5 For patients with mild symptoms, glucose alone (300-500 g/d) may be enough to abort the attack.[12] This can be achieved via a high-carbohydrate diet in those able to tolerate oral intake or via continuous infusions of dextrose containing fluids.[5] For more severe attacks with associated polyneuropathy, respiratory muscle weakness, or seizures, or for attacks that are not resolving, heme preparations dosed at 3 to 4 mg/kg/d for 3 to 4 days are indicated.[5]

The recent diagnosis of acute Lyme disease was a distractor in this presentation. In Lyme endemic areas, patients with erythema migrans are treated based on the clinical presentation rather than serologic testing.[13] Although this patient took only 1 week of doxycycline, testing during this hospitalization showed that she had either been cured early or had not had Lyme disease in the first place. There is no known association between Lyme disease and the porphyrias, and doxycycline is not a common precipitant of AIP attacks.[14] However, the GI side effects of doxycycline may have decreased caloric intake and ultimately provoked the patient's first attack of AIP. The clinicians in this case appropriately avoided the "target" but hit the mark by correctly diagnosing AIP.

KEY POINTS

- Consider AIP in patients with unexplained abdominal pain, especially when accompanied by neuropsychiatric symptoms and autonomic lability.
- Diagnose AIP by sending a urine PBG during a suspected acute attack.
- Treat AIP acutely by removing precipitants, treating abdominal pain, and initiating dextrose-containing fluids and hemin infusions to downregulate ALA synthase.

Acknowledgments

The authors thank the patient who enthusiastically supported the writing of this report.

Disclosures: Warren Gavin, MD has disclosed participation in expert testimony. The authors have no financial or other conflicts of interest to disclose.

References

1. Desnick RJ, Balwani M. The Porphyrias. In: Kasper D, Fauci A, Hauser S, Longo D, Jameson J, Loscalzo J, eds. *Harrison's Principles of Internal Medicine, 19th Edition*. New York: McGraw-Hill; 2015. http://accessmedicine.mhmedical.com.proxy.medlib.uits.iu.edu/content.aspx?bookid=1130&Sectionid=79754263. Accessed June 14, 2016.
2. Bissell DM, Lai JC, Meister RK, Blanc PD. Role of Delta-aminolevulinic Acid in the Symptoms of Acute Porphyria. *Am J Med*. 2015;128(3):313-317.
3. Bonkovsky HL, Guo JT, Hou W, Li T, Narang T, Thapar M. Porphyrin and Heme Metabolism and the Porphyrias. *Compr Physiol*. 2013;3(1):365-401.
4. Crimlisk HL. The little imitator--porphyria: a neuropsychiatric disorder. *J Neurol Neurosurg Psychiatry*. 1997;62(4):319-328.
5. Pischik E, Kauppinen R. An update of clinical management of acute intermittent porphyria. *Appl Clin Genet*. 2015;8:201-214.
6. Ventura P, Cappellini MD, Biolcati G, Guida CC, Rocchi E; Gruppo Italiano Porfiria (GrIP). A challenging diagnosis for potential fatal diseases: recommendations for diagnosing acute porphyrias. *Eur J Intern Med*. 2014;25(6):497-505.

7. Dagens A, Gilhooley MJ. Acute intermittent porphyria leading to posterior reversible encephalopathy syndrome (PRES): a rare cause of abdominal pain and seizures. *BMJ Case Rep*. 2016:bcr2016215350.
8. Pischik E, Bulyanitsa A, Kazakov V, Kauppinen R. Clinical features predictive of a poor prognosis in acute porphyria. *J Neurol*. 2004;251(12):1538-1541.
9. Sack GH. Acute intermittent porphyria. *JAMA*. 1990;264(10):1290-1293.
10. Sardh E, Andersson DEH, Henrichson A, Harper P. Porphyrin precursors and porphyrins in three patients with acute intermittent porphyria and end-stage renal disease under different therapy regimes. *Cell Mol Biol (Noisy-le-grand)*. 2009;55(1):66-71.
11. Whatley SD, Badminton MN. Role of genetic testing in the management of patients with inherited porphyria and their families. *Ann Clin Biochem*. 2013;50(3):204-216.
12. Anderson KE, Bloomer JR, Bonkovsky HL, et al. Recommendations for the diagnosis and treatment of the acute porphyrias. *Ann Intern Med*. 2005;142(6):439-450.
13. Wormser GP, Dattwyler RJ, Shapiro ED, et al. The clinical assessment, treatment, and prevention of lyme disease, human granulocytic anaplasmosis, and babesiosis: clinical practice guidelines by the Infectious Diseases Society of America. *Clin Infect Dis*. 2006;43(9):1089-1134.
14. American Porphyria Foundation. Drug database. http://www.porphyriafoundation.com/drug-database. Accessed July 21, 2017.

Reducing SNF Readmissions: At What Cost?

Robert E. Burke, MD, MS[1]*, S. Ryan Greysen, MD, MHS, MA[2]

[1]*Denver VA Medical Center–Research and Hospital Sections, University of Colorado Medical Center–Medicine, Denver, Colorado;* [2]*Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania.*

The landscape of postacute care in skilled nursing facilities (SNFs) in the United States is evolving. As the population ages, a growing number of elderly persons are being discharged to SNFs at an enormous cost and with clear evidence of disappointing outcomes. The reaction to these trends includes payment reforms that "bundle" hospital and postacute care, act as incentives to discourage SNFs, or penalize SNFs for undesired patient outcomes. Hospitalists are expected to increasingly feel the effect of these reforms.[1]

Thus, hospitals are demonstrating renewed interest in reducing readmissions from SNFs. In this issue of *Journal of Hospital Medicine*, Rosen and colleagues present the results of the Enhanced Care Program (ECP), a multicomponent intervention consisting of 9 nurse practitioners (NPs), a pharmacist, a pharmacy technician, a nurse educator, a program administrator, and a medical director.[2] These providers are deployed to 8 SNFs around a large teaching hospital, providing direct clinical care as well as 24/7 call availability for enrolled patients, robust medication reconciliation, and monthly education for SNF nursing staff. A unique aspect of this model was that individual attending physicians in the associated SNFs could decide whether to enroll their patients in the model; patients not enrolled represented a contemporaneous control cohort. The authors found a nearly 30% reduction in the odds of 30-day readmission (OR 0.71 [0.60–0.85] after adjustment), which was robust to multiple sensitivity analyses, including a propensity-matched cohort comparison. The authors should be commended for working to mitigate these potential confounders, thereby strengthening their conclusions. Such a large reduction in readmissions reflects their high underlying prevalence (23% in the nonintervention cohort).

This report closely follows the evaluation of a similar program at the Cleveland Clinic called Connected Care Model (CCM), in which 4 physicians and 5 NPs or physician assistants provided care, including 24/7 call availability, in 7 associated SNFs.[3] In a retrospective pre-post analysis comparing the 30-day readmission rates of these SNFs with those of others in the network, similar reductions in readmissions were observed. ECP and CCM represent important extensions of a much larger body of evidence, from the Evercare model[4] to the Initiative to Reduce Avoidable Hospitalizations demonstration project, which suggests that adding NPs to nursing homes reduces hospitalizations.[5]

However, several factors have to be considered before disseminating ECP or CCM. First, other promising "proof of concept" quality improvement studies were not efficacious when rigorously tested in nursing homes.[6] Second, these programs are representative of large academic medical centers, which may establish different relationships with different SNFs compared with smaller or less well-resourced hospitals. As the Initiative to Reduce Hospitalizations demonstrated, even a fundamentally similar intervention can have extremely different results depending on the nursing homes involved,[5] and the science behind establishing effective hospital–SNF partnerships is still in its infancy.[7] Third, both studies have significant methodological limitations, including most importantly that they are conducted within SNFs selected to be part of their hospitals' network.

These significant early efforts also present an opportunity to reconsider the underlying assumption of these models: that adding more supervisory clinicians to SNFs is the right approach to reduce hospitalizations. Although adding resources is an attractive "plug and play" solution for many problems in healthcare delivery, placing only 1 NP in each of the 15,583 certified nursing facilities in the United States *would employ fully 10% of the entire NP workforce*. Amid rising concerns about costs related to our aging population, these interventions face substantial headwinds toward becoming the standard of care without demonstrating cost effectiveness. Furthermore, many SNF directors might suggest that hospitals and hospitalists working with them to address fundamental (but much more intransigent) problems in SNFs, such as high staff turnover, low concentration of highly skilled staff (RNs and MDs), regulatory burden, and hospitals using SNFs like stepdown units, could represent a generalizable and sustainable solution.

We realize that this argument is tricky for hospitalists because its underlying logic (care has become too complex, patients are too sick, and dedicated personnel are needed) also played a major role in establishing our existence. One possibility is that like hospitalists, NPs and a growing cadre of "SNFists" will become major drivers of quality improvement, education, and leadership locally at these facilities, thereby leading to sustainable change.[8] Similarly, current conditions may drive recognition that a specific set of skills is required to function effectively in the SNF environment,[9] just as we believe hospitalists need unique skills to excel in today's hospital environment.

Studies such as that of Rosen et al. are valuable for JHM because they prompt us to recognize that we as hospitalists have

***Address for correspondence:** Robert Burke, MD, MS, Denver VA Medical Center, 1055 Clermont Street, Denver, CO 80220; Telephone: 303-393-8020; Fax: 303-393-5199; E-mail: Robert.Burke5@va.gov

Received: February 1, 2018; **Accepted:** February 7, 2018

2018 Society of Hospital Medicine DOI 10.12788/jhm.2970

much to share and learn from nursing homes and the dedicated practitioners who work there. In fact, we argue that few places in the healthcare system are more in need of innovation than hospital–nursing home relationships, and hospitalists do not just have a vested clinical interest; in many ways, we see a mirror of our own development as a "specialty." We encourage hospitals and hospitalists to take up this challenge on behalf of some of the most vulnerable patients in our system during critical times in their care trajectory. As the Commission for Long-Term Care (www.ltccommission.org) wrote in its final report to Congress: "The need is great. The time to act is now."

Disclosures: Dr. Burke is supported by a VA Health Services Research and Development (HSR&D) Career Development Award. All opinions are those of the authors and do not necessarily represent those of the Department of Veterans Affairs. Dr. Greysen has nothing to disclose.

References

1. Burke RE, Cumbler E, Coleman EA, Levy C. Post-acute care reform: Implications and opportunities for hospitalists. *J Hosp Med*. 2017;12(1):46-51. 10.3810/hp.2012.02.958.
2. Rosen BT, Halbert RJ, Hart K, Diniz MA, Isonaka S, Black JT. The enhanced care program: Impact of a care transitions program on 30-day hospital readmissions for patients discharged from an acute care facility to skilled nursing facilities. *J Hosp Med*. 2018;13(4):229-235.
3. Rothberg MB. Impact of a connected care model on 30-day readmission rates from skilled nursing facilities. *J Hosp Med*. 2017;12(4):238-244. 10.12788/jhm.2710.
4. Kane RL, Keckhafer G, Flood S, Bershadsky B, Siadaty MS. The effect of Evercare on hospital use. *J Am Geriatr Soc*. 2003;51(10):1427-1434. 10.1046/j.1532-5415.2003.51461.x.
5. Ingber MJ, Feng Z, Khatutsky G, et al. Initiative to reduce avoidable hospitalizations among nursing facility residents shows promising results. *Health Aff Proj Hope*. 2017;36(3):441-450. 10.1377/hlthaff.2016.1310.
6. Kane RL, Huckfeldt P, Tappen R, et al. Effects of an intervention to reduce hospitalizations from nursing homes: A randomized implementation trial of the INTERACT Program. *JAMA Intern Med*. 2017;177(9):1257-1264. 10.1001/jamainternmed.2017.2657.
7. Lage DE, Rusinak D, Carr D, Grabowski DC, Ackerly DC. Creating a network of high-quality skilled nursing facilities: preliminary data on the postacute care quality improvement experiences of an accountable care organization. *J Am Geriatr Soc*. 2015;63(4):804-808. 10.1111/jgs.13351.
8. Ryskina KL, Polsky D, Werner RM. Physicians and advanced practitioners specializing in nursing home care. *JAMA*. 2017;318(20):2040-2042. 10.1001/jama.2017.13378.
9. Gillespie SM, Levy CR, Katz PR. What exactly is an "SNF-ist?" *JAMA Intern Med*. 2018;178(1):153-154. 10.1001/jamainternmed.2017.7212.

Preparing From the Outside Looking In for Safely Transitioning Pediatric Inpatients to Home

Angela M. Statile, MD, MEd[1,2,*], Ndidi Unaka, MD, MEd[1,2], Katherine A. Auger, MD, MSc[1,2]

[1]*Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio;* [2]*Department of Pediatrics, College of Medicine, University of Cincinnati, Cincinnati, Ohio.*

The transition of children from hospital to home introduces a unique set of challenges to patients and families who may not be well-versed in the healthcare system. In addition to juggling the stress and worry of a sick child, which can inhibit the ability to understand complicated discharge instructions prior to leaving the hospital,[1] caregivers need to navigate the medical system to ensure continued recovery. The responsibility to fill and administer medications, arrange follow up appointments, and determine when to seek care if the child's condition changes are burdens we as healthcare providers expect caregivers to manage but may underestimate how frequently they are reliably completed.[2-4]

In this issue of the *Journal of Hospital Medicine*, the article by Rehm et al.[5] adds to the growing body of evidence highlighting challenges that caregivers of children face upon discharge from the hospital. The multicenter, retrospective study of postdischarge encounters for over 12,000 patients discharged from 4 children's hospitals aimed to evaluate the following: (1) various methods for hospital-initiated postdischarge contact of families, (2) the type and frequency of postdischarge issues, and (3) specific characteristics of pediatric patients most commonly affected by postdischarge issues.

Using standardized questions administered through telephone, text, or e-mail contact, postdischarge issues were identified in 25% of discharges across all hospitals. Notably, there was considerable variation of rates of postdischarge issues among hospitals (from 16% to 62.8%). The hospital with the highest rate of postdischarge issues identified had attending hospitalists calling families after discharge. Thus, postdischarge issues may be most easily identified by providers who are familiar with both the patient and the expected postdischarge care.

Often, postdischarge issues represented events that could be mitigated with intentional planning to better anticipate and address patient and family needs prior to discharge. The vast majority of postdischarge issues identified across all hospitals were related to appointments, accounting for 76.3% of postdischarge issues, which may be attributed to a variety of causes, from inadequate or unclear provider recommendations to difficulty scheduling the appointments. The most common medication postdischarge issue was difficulty filling prescriptions, accounting for 84.8% of the medication issues. "Other" postdischarge issues (12.7%) as reported by caregivers included challenges with understanding discharge instructions and concerns about changes in their child's clinical status. Forty percent of included patients had a chronic care condition. Older children, patients with more medication classes, shorter length of stay, and neuromuscular chronic care conditions had higher odds of postdischarge issues. Although a high proportion of postdischarge issues suggests a systemic problem addressing the needs of patients and families after hospital discharge, these data likely underestimate the magnitude of the problem; as such, the need for improvement may be higher.

Postdischarge challenges faced by families are not unique to pediatrics. Pediatric and adult medical patients face similar rates of challenges after hospital discharge.[6,7] In adults, the preventable nature of unexpected incidents, such as adverse drug events, occur most frequently.[6] The inability to keep appointments and troubleshoot problems by knowing who to contact after discharge also emerged in adult studies as factors that may lead to preventable readmissions.[8] Furthermore, a lack of direct, effective communication between inpatient and outpatient providers has been cited as a driving force behind poor care transitions.[6,9]

Given the prevalence of postdischarge issues after both pediatric and adult hospitalizations, how should hospitalists proceed? Physicians and health systems should explore approaches to better prepare caregivers, perhaps using models akin to the Seamless Transitions and (Re)admissions Network model of enhanced communication, care coordination, and family engagement.[10] Pediatric hospitalists can prepare children for discharge long before departure by delivering medications to patients prior to discharge,[11,12] providing discharge instructions that are clear and readable,[13,14] as well as utilizing admission-discharge teaching nurses,[15] inpatient care managers,[16,17] and pediatric nurse practitioners[18] to aid transition.

While a variety of interventions show promise in securing a successful transition to home from the hospitalist vantage point, a partnership with primary care physicians (PCPs) in our communities is paramount. Though the evidence linking gaps in primary care after discharge and readmission rates remain elusive, effective partnerships with PCPs are important for ensuring discharge plans are carried out, which may ultimately

***Address for correspondence:** Angela M. Statile, MD, MEd, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue MLC 5018, Cincinnati, OH 45229; Telephone: 513-803-3237; Fax: 513-803-9244; E-mail: angela.statile@cchmc.org

Published online first February 2, 2018.

Received: September 20, 2017; **Revised**: November 16, 2017; **Accepted**: November 22, 2017

2018 Society of Hospital Medicine DOI 10.12788/jhm.2935

lead to decreased rates of unanticipated adverse outcomes. Several adult studies note that no single intervention is likely to prevent issues after discharge, but interventions should include high-quality communication with and involvement of community partners.[9,19,20] In practice, providing a high-quality, reliable handoff can be difficult given competing priorities of busy outpatient clinic schedules and inpatient bed capacity concerns, necessitating efficient discharge practices. Some of these challenges are amenable to quality improvement efforts to improve discharge communication.[21] Innovative ideas include collaborating with PCPs earlier in the admission to design the care plan up front, including PCPs in weekly team meetings for patients with chronic care conditions,[16,17] and using telehealth to communicate with PCPs.

Ensuring a safe transition to home is our responsibility as hospitalists, but the solutions to doing so reliably require multifold interventions that build teams within hospitals, innovative outreach to those patients recently discharged to ensure their well-being and mitigate postdischarge issues and broad community programs—including greater access to primary care—to meet our urgent imperative.

Disclosures: The authors declare no conflicts of interest. Dr. Auger's research is funded by the Agency for Healthcare Research and Quality (1K08HS024735).

References

1. Solan LG, Beck AF, Brunswick SA, et al. The Family Perspective on Hospital to Home Transitions: A Qualitative Study. *Pediatrics*. 2015;136(6):e1539-1549.
2. Misky GJ, Wald HL, Coleman EA. Post-hospitalization transitions: Examining the effects of timing of primary care provider follow-up. *J Hosp Med*. 2010;5(7):392-397.
3. Yin HS, Johnson M, Mendelsohn AL, Abrams MA, Sanders LM, Dreyer BP. The health literacy of parents in the United States: a nationally representative study. *Pediatrics*. 2009;124 Suppl 3:S289-298.
4. Glick AF, Farkas JS, Nicholson J, et al. Parental Management of Discharge Instructions: A Systematic Review. *Pediatrics*. 2017. [Epub ahead of print].
5. Rehm KP, Brittan MS, Stephens JR, et al. Issues Identified by Post-Discharge Contact after Pediatric Hospitalization: A Multi-site Study. *J Hosp Med*. 2018;13(4):236-242.
6. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med*. 2003;138(3):161-167.
7. Hansen LO, Greenwald JL, Budnitz T, et al. Project BOOST: effectiveness of a multihospital effort to reduce rehospitalization. *J Hosp Med*. 2013;8(8):421-427.
8. Auerbach AD, Kripalani S, Vasilevskis EE, et al. Preventability and Causes of Readmissions in a National Cohort of General Medicine Patients. *JAMA Intern Med*. 2016;176(4):484-493.
9. Kripalani S, LeFevre F, Phillips CO, Williams MV, Basaviah P, Baker DW. Deficits in communication and information transfer between hospital-based and primary care physicians: implications for patient safety and continuity of care. *JAMA*. 2007;297(8):831-841.
10. Auger KA, Simon TD, Cooperberg D, et al. Summary of STARNet: Seamless Transitions and (Re)admissions Network. *Pediatrics*. 2015;135(1):164-175.
11. Hatoun J, Bair-Merritt M, Cabral H, Moses J. Increasing Medication Possession at Discharge for Patients With Asthma: The Meds-in-Hand Project. *Pediatrics*. 2016;137(3):e20150461.
12. White CM, Statile AM, White DL, et al. Using quality improvement to optimise paediatric discharge efficiency. *BMJ Qual Saf*. 2014;23(5):428-436.
13. Unaka N, Statile A, Jerardi K, et al. Improving the Readability of Pediatric Hospital Medicine Discharge Instructions. *J Hosp Med*. 2017;12(7):551-557.
14. Wu S, Tyler A, Logsdon T, et al. A Quality Improvement Collaborative to Improve the Discharge Process for Hospitalized Children. *Pediatrics*. 2016;138(2).
15. Blankenship JS, Winslow SA. Admission-discharge-teaching nurses: bridging the gap in today's workforce. *J Nurs Adm*. 2003;33(1):11-13.
16. White CM, Thomson JE, Statile AM, et al. Development of a New Care Model for Hospitalized Children With Medical Complexity. *Hosp Pediatr*. 2017;7(7):410-414.
17. Statile AM, Schondelmeyer AC, Thomson JE, et al. Improving Discharge Efficiency in Medically Complex Pediatric Patients. *Pediatrics*. 2016;138(2).
18. Dunn K, Rogers J. Discharge Facilitation: An Innovative PNP Role. *J Pediatr Health Care*. 2016;30(5):499-505.
19. Kripalani S, Jackson AT, Schnipper JL, Coleman EA. Promoting effective transitions of care at hospital discharge: a review of key issues for hospitalists. *J Hosp Med*. 2007;2(5):314-323.
20. Scott AM, Li J, Oyewole-Eletu S, et al. Understanding Facilitators and Barriers to Care Transitions: Insights from Project ACHIEVE Site Visits. *Jt Comm J Qual Patient Saf*. 2017;43(9):433-447.
21. Shen MW, Hershey D, Bergert L, Mallory L, Fisher ES, Cooperberg D. Pediatric hospitalists collaborate to improve timeliness of discharge communication. *Hosp Pediatr*. 2013;3(3):258-265.

DIVISION HEAD OF HOSPITAL MEDICINE

The Henry Ford Medical Group (HFMG), one of the largest multispecialty group practices in the country, is seeking a highly qualified Division Head in its Division of Hospital Medicine. With nearly 30 years of experience in Hospital Medicine, HFMG established a separate Division of Hospital Medicine in 2008, and is the largest Division in the Department of Medicine with over 50 hospitalist faculty serving at three different hospitals.

This is an excellent leadership opportunity with continued professional growth in a strong hospitalist group committed to the development of high quality hospitalists. The Division continues to be a leader in HFHS efforts to promote systemic integration/alignment, clinical excellence, innovation, and value in an accountable care environment.

The successful candidate will be ABIM certified (preference Internal Medicine with a Focused Practice in Hospital Medicine) and have at least 7 years of hospitalist practice experience with progressive proven leadership skills in a large hospitalist program preferably in an integrated healthcare organization. Strong clinical and communication skills are essential. Significant experience with quality and care management initiatives, operational management, as well as medical education are also desired.

Generous group practice benefits are provided including: vacation, CME time/allowance, insurance (life/disability/malpractice), and retirement package. A faculty appointment at Wayne State University School of Medicine is available commensurate with prior experience.

Review of applications will begin immediately
and continue until the position is filled.
Please submit your letter of interest and CV to:

Dr. Kimberly Baker-Genaw, Vice Chair of Medicine,
in c/o Scott Johnson, Senior Physician Recruiter,
at sjohns10@hfhs.org.

Henry Ford HEALTH SYSTEM

Hospitalist Position in Picturesque Bridgton, Maine

Bridgton Hospital, part of the Central Maine Medical Family, seeks BE/BC Internist to join its well-established Hospitalist program. Candidates may choose part-time (7-8 shifts/month) to full-time (15 shifts/month) position. Located 45 miles west of Portland, Bridgton Hospital is located in the beautiful Lakes Region of Maine and boasts a wide array of outdoor activities including boating, kayaking, fishing, and skiing.

Benefits include medical student loan assistance, competitive salary, highly qualified colleagues and excellent quality of life. For more information visit our website at www.bridgtonhospital.org.

Interested candidates should contact Gina Mallozzi, CMMC Physician Recruitment, 300 Main Street, Lewiston, ME 04240; email: MallozGi@cmhc.org; call: 800/445-7431; fax: 207/344-0696.

Bridgton Hospital
The Central Maine Medical Family

Northwestern Medicine®

Lake Forest Hospital
1000 North Westmoreland Road
Lake Forest, Illinois 60045-9989
847.234.5600
nm.org

Join the thriving Hospitalist team at Northwestern Medicine Lake Forest Hospital, now located in a new state-of-the-art facility as of March 2018. We are seeking a physician who is dedicated to exceptional clinical care, quality improvement, and medical education. Here, you will play an integral part of our team in a community hospital.

ABOUT US

Northwestern Medicine Lake Forest Hospital is a community hospital located about 30 miles north of downtown Chicago. Care is provided through the main hospital campus in suburban Lake Forest and an outpatient facility in Grayslake, Ill., which also includes a free-standing emergency room. Lake Forest Hospital is served by a medical staff of more than 700 employed and affiliated physicians, many of whom are also on staff at Northwestern Memorial Hospital. It continues to be recognized by *U.S. News & World Report* as one of the top hospitals in Illinois and Chicago, ranking No. 23 and No. 18 respectively for 2017-18. The hospital also received American Nurses Credentialing Center Magnet® re-designation in 2015, the gold standard for nursing excellence and quality care.

Northwestern Medicine Lake Forest Hospital

Northwestern Medicine is a growing, nationally recognized academic health system that provides world-class care at seven hospitals and more than 100 locations in communities throughout Chicago and the north and west suburbs. Together with Northwestern University Feinberg School of Medicine, we are pushing boundaries in our research labs, training the next generation of physicians and scientists, and pursuing excellence in patient care.

Our vision and values are deeply rooted in the idea that patients come first in all we do. We value building relationships with our patients and their families, listening to their unique needs while providing individualized primary, specialty and hospital-based care. Our recent affiliations and ongoing growth make it possible for us to serve more patients, closer to where they live and work.

Northwestern Memorial HealthCare, a nonprofit organization, is the corporate parent of Northwestern Medicine and all of its entities, including Northwestern Medicine Lake Forest Hospital, Northwestern Memorial Hospital, Northwestern Medicine Central DuPage Hospital, Northwestern Medicine Delnor Hospital, Northwestern Medicine Kishwaukee Hospital, Northwestern Medicine Valley West Hospital and Marianjoy Rehabilitation Hospital, part of Northwestern Medicine.

If you are interested in advancing your career as a Hospitalist with Northwestern Medicine Lake Forest Hospital, please email your CV and cover letter to: LFHMRecruitment@nm.org

HM19 Call for Speaker and Topic Proposals

Help create the HM19 conference by submitting your ideas. Accepting proposals for both didactic and workshop sessions.

Deadline to submit: **April 25, 2018**

www.hospitalmedicine.org/hm19content

shm Society of Hospital Medicine | Empowering hospitalists. Transforming patient care.