



## ORIGINAL RESEARCH

# Implementation of a comprehensive hospitalist-led initiative to improve care for patients with opioid use disorder

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## Abstract

**Background:** As opioid-related hospitalizations rise, hospitals must be prepared to evaluate and treat patients with opioid use disorder (OUD). We implemented a hospitalist-led program, Project Caring for patients with Opioid Misuse through Evidence-based Treatment (COMET) to address gaps in care for hospitalized patients with OUD.

**Objective:** Implement evidence-based treatment for inpatients with OUD and refer to postdischarge care.

**Design, Setting, and Participants:** Project COMET launched in July 2019 at Duke University Hospital (DUH), an academic medical center in Durham, NC.

**Intervention, Main Outcomes, and Measures:** We engaged key stakeholders, performed a needs assessment, and secured health system funding. We developed protocols to standardize OUD treatment and employed a social worker to facilitate postdischarge care. Electronic health records were utilized for data analysis.

**Results:** COMET evaluated 512 patients for OUD during their index hospitalization from July 1, 2019 through June 30, 2021. Seventy-one percent of patients received medication for OUD (MOUD) during admission. Of those who received buprenorphine during admission, 64% received a discharge prescription. Of those who received methadone during admission, 83% of eligible patients were connected to a methadone clinic. Among all patients at DUH with OUD, MOUD use during hospitalization and at discharge increased in the post-COMET period compared to the pre-COMET period ( $p < .001$  for both).

**Conclusion:** Our program is one of the first to demonstrate successful implementation of a hospitalist-led, comprehensive approach to caring for hospitalized patients with OUD and can serve as an example to other institutions seeking to implement life-saving, evidence-based treatment in this population.

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## INTRODUCTION

The opioid epidemic remains a substantial public health crisis in the United States. Drug overdose deaths are increasing at an alarming rate, with 91,799 deaths reported in 2020, representing a 31% increase in the age-adjusted rate from the previous year.<sup>1</sup> Most drug overdose deaths (75%) involve an opioid.<sup>1</sup> With a recent estimate that one in nine hospitalizations involve a substance use disorder (SUD) or alcohol use disorder<sup>2</sup> as well as an increase in opioid use disorder (OUD) hospitalizations over time,<sup>3</sup> hospitalists are at the forefront in caring for these patients.

Despite strong evidence that medication for OUD (MOUD) is a cost-effective treatment<sup>4</sup> that reduces mortality,<sup>5-7</sup> providers frequently fail to address SUD during hospitalization.<sup>8,9</sup> Barriers to addressing SUD include a lack of knowledge in managing withdrawal and pain and negative attitudes toward those with SUD.<sup>10,11</sup> Additionally, there can be confusion surrounding the legal ramifications of prescribing MOUD. While providers can treat hospitalized patients with MOUD with a primary medical or surgical condition other than addiction, the US Drug Enforcement Administration (DEA) requires an X-Waiver to prescribe buprenorphine at discharge.<sup>12</sup> Recent changes to the law in 2021 allow providers to apply for an exemption from the associated training requirement, but an X-Waiver is still required for discharge prescribing.<sup>13</sup>

Interventions to address and manage SUD in the hospital, including treatment with medication and linkage to outpatient care, have been shown to be successful.<sup>14-17</sup> A small body of literature describes programs led by addiction medicine providers,<sup>14,15,17</sup> but less has been published about SUD treatment led by generalists, most of which focus exclusively on buprenorphine for OUD.<sup>18,19</sup> Comprehensive MOUD treatment options, including methadone, buprenorphine, and naltrexone, are needed in all health care settings.<sup>20</sup> Hospital-based providers must be equipped to treat patients with OUD with a range of evidence-based medications.<sup>21</sup>

In 2019, we launched a multidisciplinary, hospitalist-led initiative called Project Caring for patients with Opioid Misuse through Evidence-based Treatment (COMET) with the aim of improving care for hospitalized patients with OUD. We describe implementation of our program and the population of patients evaluated in the first 2 years. Our program can serve as a model for hospitals and hospital-based providers seeking to more comprehensively address OUD among their patients.

## METHODS

We use the Revised Standards for Quality Improvement Reporting Excellence (SQUIRE) 2.0 guidelines to report our findings.<sup>22</sup>

### Context

Duke University Hospital is a quaternary academic medical center in Durham, NC with 969 inpatient beds at the time COMET started in

July 2019. Before COMET, our hospital did not have an addiction consult service or any support structures in place to provide MOUD.

### Program development

We incorporated input from a multidisciplinary group of stakeholders to inform program design, including: pharmacy, nursing, infectious disease, psychiatry, pain management, and community-based providers. We performed a needs assessment by evaluating data from hospitalized patients who inject drugs, reviewed the literature, and connected with other hospitals with OUD treatment programs. Funding was secured from health system leadership with the expectation that COMET would improve the quality of care for patients with OUD through evidence-based treatment and facilitate transition to continued care postdischarge. We hypothesized that these quality improvements, including improved discharge planning for those on long-term intravenous antibiotics, would reduce length of stay for COMET patients and potentially generate cost savings for the health system. Funding supported clinical time for the COMET providers and social worker, and administrative time for COMET leadership.

### Program description

Project COMET, launched on July 1, 2019, is an OUD consult service led by a team of hospitalists with DEA X-waivers. The service is staffed by a hospitalist 7 days/week and a social worker 5 days/week, from 8 a.m. to 5 p.m. Providers from any service can order an electronic consult for COMET to see an adult patient with confirmed or suspected OUD. In addition, patients with OUD may be assigned directly to COMET as part of their primary medicine service. COMET assesses each patient for OUD and opioid withdrawal. Patients diagnosed with OUD using the Diagnostic and Statistic Manual of Mental Disorders, 5th edition, criteria<sup>23</sup> or opioid withdrawal are offered medication and connection to outpatient care at discharge.

### Data sources and analysis

To evaluate the program, we used quantitative methods to measure process and clinical outcomes over time with data from the Electronic Health Record (EHR). We analyzed data for the index hospitalization for patients who had a COMET consult from July 1, 2019 to June 30, 2021. We also included patients on the COMET primary medicine service with an OUD diagnosis in the 12 months prior to or during the index hospitalization, as these patients would not have a consult order.

We analyzed COMET patient demographics, diagnoses, and medication administration in the 12-month period before the index hospitalization, during admission, and at discharge. We also evaluated all hospitalized patients with a diagnosis of OUD by the International

Classification of Diseases, 10th Revision (ICD-10) during their hospitalization by quarter, including before and after COMET launch. Differences in MOUD prescribing in the pre-COMET period (July 1, 2017 to June 30, 2019) were compared with the post-COMET period (July 1, 2019 to June 30, 2021) using two-sample *T*-tests assuming equal variance. Statistical significance was defined as  $p < .05$ .

Since methadone cannot be prescribed for OUD at discharge, we conducted a manual chart review of COMET patients who received methadone during hospitalization to determine if those eligible were connected to a methadone clinic at discharge.

This study was determined exempt from review by the Duke University Institutional Review Board (IRB). Data analyzed during the study are available from the corresponding author on reasonable request, approval from Duke IRB, and an executed data use agreement.

## RESULTS

### Program implementation

We recruited 14 hospitalists interested in caring for patients with OUD by emailing our hospital medicine list serve, describing the program's design and focus on improving care for patients with OUD. COMET providers were required to complete the DEA-X waiver training and participate in an orientation prior to starting. Assigned provider shifts counted as part of their clinical time. A social worker was hired to work with patients to assess stages of change, conduct motivational interviewing, evaluate and address social determinants of health, and collaborate with community-based treatment centers to coordinate postdischarge care.

We designed and implemented an order set for prescribing buprenorphine, standardized templates for documenting OUD diagnosis and opioid withdrawal, and embedded a consult request into the EHR. We collaborated with infectious disease providers to develop eligibility criteria for outpatient parenteral antibiotic therapy (Appendix A). Following program launch, we realized the need to standardize our approach for methadone use, and subsequently developed a clinical protocol for methadone initiation. After review of the literature, discussion with other institutions, and protocol development, we subsequently expanded to incorporate the evaluation and treatment of pregnant women with OUD (Figure 1).

### COMET population

In the first 2 years of project COMET (July 1, 2019 through June 30, 2021), 512 patients were evaluated for OUD during their index hospitalization. Overall, COMET patient volumes increased steadily over time (Figure 2). Fifty-seven percent of patients identified as male, 60% as White, 31% as Black, and less than 1% as Hispanic. Median age was 40 years. Less than half (41%) of patients were from Durham County, where our hospital is located. Most patients had

Medicaid, Medicare, or other government insurance (60%) with almost one-third of patients (31%) uninsured or with unknown insurance type (Table 1).

Eighty-eight percent of patients evaluated by the COMET team had a diagnosis of OUD in the 12 months prior to or during admission. Most patients had pain (84%) and/or a psychiatric (63%) comorbid diagnosis. Infectious complications from injection drug use were common, with 59% of patients having one or more infections diagnosed in the 12 months prior to or during admission (Table 1). Sixty-three patients (12%) died during the first 2 years of our program.

### Medication for OUD

The proportion of all hospitalized patients with an OUD diagnosis receiving MOUD during admission increased significantly from 36% in the pre-COMET period to 57% in the post-COMET period ( $p < .001$ ). The proportions of patients who were prescribed buprenorphine and naloxone at discharge also increased significantly from 2% to 20% ( $p < .001$ ) and 2% to 26% ( $p < .001$ ), respectively (Figure 3).

Among COMET patients, 71% received MOUD during their index hospitalization with 57% receiving buprenorphine (including buprenorphine-naloxone and buprenorphine monoprod), 17% receiving methadone, and 3% receiving both. Very few patients received naltrexone (less than 1%). More than three quarters (81%) of patients received antibiotics during hospitalization and 79% received prescription opioids. Median length of stay (LOS) was 9 days.

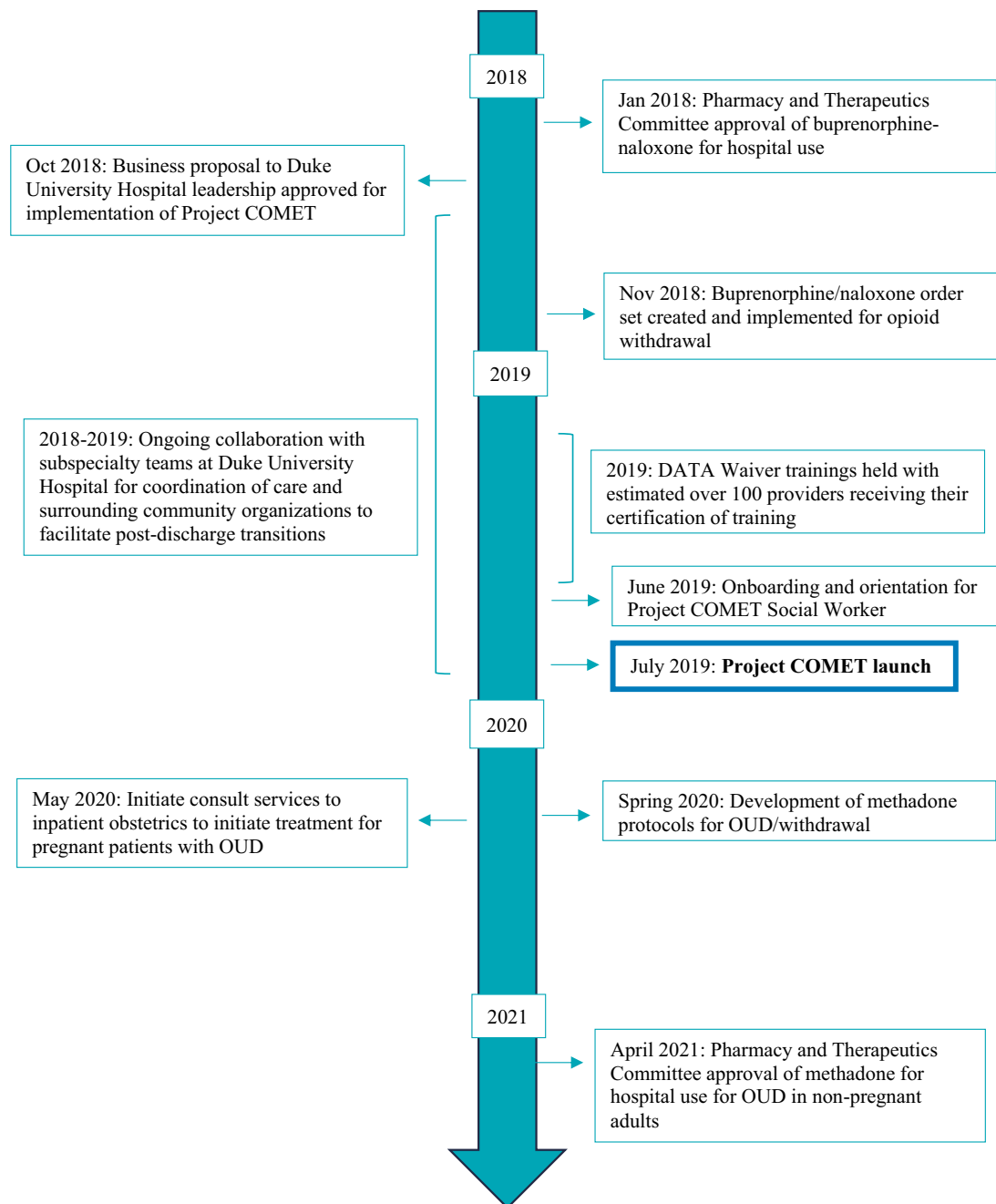
### Discharge

Of the 512 COMET patients, 79% discharged home, 13% discharged to another institution, and less than 7% self-directed discharge before completing medical treatment (also known as discharged against medical advice or AMA) (Appendix B).

Of the 292 COMET patients who received buprenorphine during admission, 64% received a buprenorphine prescription at discharge. Of the 86 patients administered methadone during admission, 53 (62%) were connected to a methadone clinic postdischarge. Manual chart review determined that 83% of eligible patients (53 of 64) who received methadone during admission were connected to a methadone clinic postdischarge. Noneligible patients included: those who switched to buprenorphine prior to discharge, died during hospitalization, or received methadone for pain and not OUD. Very few patients (less than 1%) received naltrexone at discharge. Just over half of patients (53%) received a naloxone prescription at discharge.

### Challenges

Due to increased awareness of our service and worsening of the opioid epidemic, the volume of patients evaluated by COMET increased steadily over time (Figure 2). To meet the demands of



**FIGURE 1** Timeline for development of and implementation of Project COMET. COMET, Caring for patients with Opioid Misuse through Evidence-based Treatment; OUD, opioid use disorder.

higher consult volumes, we transitioned our hybrid model to a consult-only model and dissolved our small primary medicine service of patients with OUD.

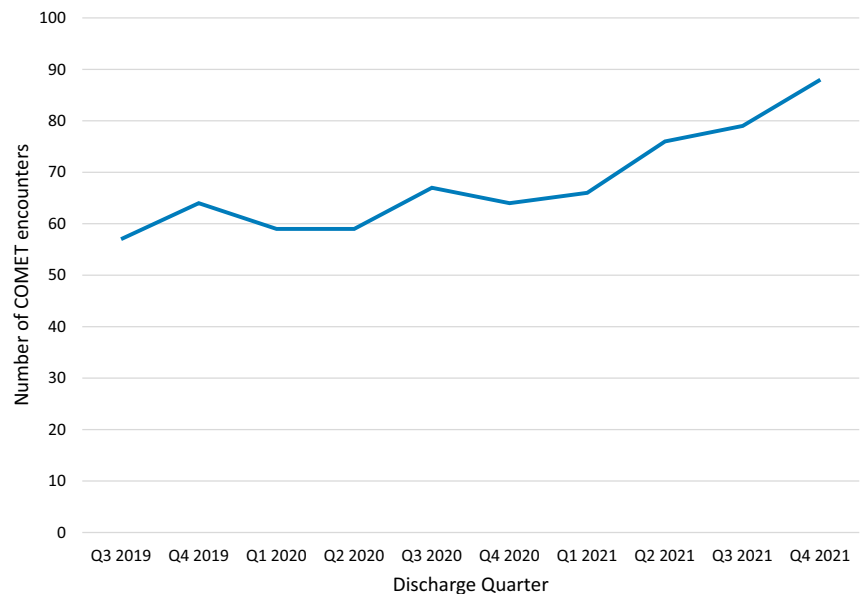
We encountered challenges in targeting earlier discharges. Due to the COVID-19 pandemic, local skilled nursing facilities and residential treatment centers faced staffing issues and strained capacity, which sometimes delayed discharges. More than half of COMET patients lived outside of Durham and nearly one third were uninsured or with unknown insurance, creating difficulties in identifying outpatient OUD treatment centers for postdischarge care

(Table 1). A more complete list of challenges can be found in Appendix C.

## DISCUSSION

In the first 2 years of the COMET program, the proportion of all hospitalized patients with OUD who received MOUD during admission and/or at discharge increased significantly. At discharge, over 60% of COMET patients who received buprenorphine during

**FIGURE 2** Caring for Patients with Opioid Misuse through Evidence-based Treatment (COMET) patient volume, by discharge quarter.



admission received a bridging prescription and over 80% of eligible COMET patients who received methadone during admission were connected to an outpatient clinic. This marks a profound advancement in care for patients with OUD at our institution. The design of our program can be applied at other institutions with hospitalist-led care, thereby expanding access to evidence-based treatment for inpatients with OUD.

Prior research has primarily focused on inpatient addiction specialist care for those with SUD, including OUD.<sup>14,15,17</sup> Nonaddiction specialist care has focused on the use of buprenorphine for OUD,<sup>18,19</sup> and apart from a recent commentary evaluating a small number of inpatients treated with buprenorphine or methadone,<sup>25</sup> there is scant literature on more comprehensive hospital-based OUD care led by generalists. These studies report significant variability in MOUD administration during admission and at discharge, ranging from 24% to 83% following intervention or program implementation.<sup>14,18,19</sup> Although the majority of MOUD prescribed in our hospital was buprenorphine, our team considered all available medications and a substantial proportion of patients received methadone. Methadone may be a better option for some patients, as it is associated with increased retention in care and treatment participation compared to buprenorphine.<sup>26,27</sup> A very small proportion of COMET patients received oral naltrexone during admission. Naltrexone initiation requires medically supervised withdrawal and a prolonged period without opioids, including other forms of MOUD,<sup>20</sup> making it challenging to prescribe to hospitalized patients with significant pain and/or recent opioid use. Naltrexone remains an option for postdischarge care but may be less suitable for an acute hospital setting. Offering patients options for OUD treatment is an important component of a patient-centered approach and is crucial for ongoing engagement in care.

Although we did not specifically evaluate characteristics of the patients who did not receive MOUD, we speculate that a variety of factors may have contributed. Some patients referred to us did not

meet criteria for OUD and thus were not eligible for MOUD. Others declined MOUD, self-directed their discharge, required ongoing full opioid agonists, were unable to access MOUD postdischarge, and/or may have received MOUD in a subsequent hospitalization. This presents an opportunity for improvement by offering more extensive support and harm reduction services to those who declined MOUD or self-directed their discharge. Further investigation is needed to better understand reasons for not receiving medication, and to increase MOUD administration in eligible patients, given the significant mortality benefits.<sup>5-7</sup>

The majority of patients admitted with OUD (63%) had a comorbid psychiatric diagnosis, highlighting the importance of mental health treatment in this population. Pain was also a common diagnosis. Treatment of acute pain in the context of underlying OUD can be complex, as providers may mistakenly believe that MOUD provides adequate analgesia, which potentially results in undertreatment of pain.<sup>28</sup> Current evidence supports continuing MOUD with buprenorphine or methadone and using additional opioid and non-opioid analgesia to address acute and perioperative pain.<sup>29,30</sup>

Unsurprisingly, we found a high rate of infectious diagnoses associated with injection drug use. HIV prevalence among COMET patients was approximately 10 times higher (3%) than the national HIV prevalence (0.32%).<sup>31</sup> Hepatitis C virus (HCV) prevalence was more than 30 times higher (32%) than the estimated HCV prevalence (1%)<sup>32</sup> and similar to an estimated HCV prevalence among those who inject drugs (31%).<sup>33</sup> Frequent and routine HIV and hepatitis screening in patients with OUD is important as well as promoting harm reduction for infection prevention.

The COMET program serves a population of patients who are at higher risk for self-directed discharge. National data show that 1.5% of all hospitalizations end in self-directed, or AMA, discharge.<sup>34</sup> COMET patients self-directed discharge more frequently (<7%), though fairly comparable to prior literature for those with

**TABLE 1** Characteristics of patients evaluated by the COMET team

Characteristics of COMET patients	N	%
Age (median)	40	
Male <sup>a</sup>	290	57
Race <sup>b</sup>		
Black	160	31
Other <sup>c</sup>	46	9
White	306	60
Hispanic ethnicity	<10	<1
County of residence		
Durham	209	41
Adjacent to Durham (Granville, Wake, Chatham, Orange, Person)	97	19
Other	167	33
Out of state	39	8
Insurance <sup>d</sup>		
Medicare or Medicaid or other government programs <sup>e</sup>	307	60
Commercial	47	9
Unknown or uninsured	161	31
Clinical diagnoses in 12 months prior to and including index hospitalization <sup>f</sup>		
Opioid use disorder	452	88
Psychiatric illness <sup>g</sup>	322	63
Endocarditis, osteomyelitis, cellulitis, bacteremia/septicemia,	239	47
Hepatitis C	162	32
HIV	14	3
Pain <sup>h</sup>	428	84
Liver disease	154	30
Renal dysfunction	61	12
Cancer	19	4

Abbreviation: COMET, Caring for patients with Opioid Misuse through Evidence-based Treatment.

<sup>a</sup>The remainder of patients are a combination of females and other where <10 are considered other.

<sup>b</sup>Self-reported.

<sup>c</sup>Other includes patients with unknown or multiple races.

<sup>d</sup>Some patients have coverage by multiple payors.

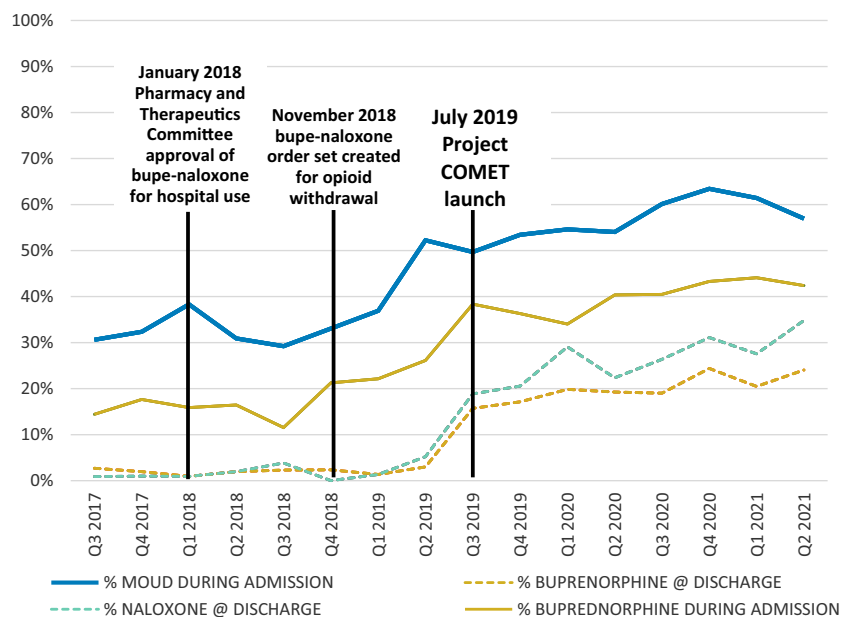
<sup>e</sup>Other government includes but not limited to: Federal Employee Program, Tricare, Veteran's Affairs, Jail/Correction Facilities.

<sup>f</sup>Clinical diagnosis concepts were defined using ICD-10 code lists, which were adapted from published groupings such as CMS' Chronic Conditions Data Warehouse, AHRQ's Clinical Classification System, NIH's Value Set Authority Center, and published papers.

<sup>g</sup>Includes: anxiety, schizophrenia, psychosis, bipolar disorder, depression.

<sup>h</sup>Pain was defined using a combination of code lists developed by experts in the field outside of Duke, with customization by our project team. The input sources included a paper by Tian et al.<sup>24</sup> for chronic pain, CMS' Chronic Condition Warehouse (CCW) grouper for fibromyalgia, chronic pain and fatigue, and AHRQ's Clinical Classification System (CCW) groupers for musculoskeletal pain, low back pain, nervous system pain and pain syndrome, nonspecific chest pain, abdominal pain, abdominal pain and other digestive and abdominal signs and symptoms, and headache including migraine.

**FIGURE 3** Medication for OUD (MOUD) and naloxone prescribing for all hospitalized patients with OUD at DUH, Comparison of pre-COMET to post-COMET, 2017–2021. Bupre-naloxone, buprenorphine-naloxone; COMET, Caring for patients with Opioid Misuse through Evidence-based Treatment; OUD, opioid use disorder.



opioid-related conditions (6%).<sup>35</sup> Undertreated withdrawal, uncontrolled pain, and stigmatization contribute to self-directed discharge among those with SUD.<sup>36</sup> More work is needed to better understand and prevent self-directed discharges, given the association with higher readmission rates and mortality.<sup>34,37</sup>

Just over half of our patients received a naloxone prescription at discharge. Among those who were not prescribed naloxone, we speculate that some patients already had naloxone (from a prescription outside our health system or from a harm reduction organization), were not prescribed naloxone because they self-directed discharge, did not meet criteria for OUD or naloxone prescription was cost-prohibitive. In order to improve naloxone prescribing, COMET providers have now taken primary responsibility for prescribing naloxone at discharge for consult patients, rather than relying on the primary team to follow our recommendations. We hope to incorporate future strategies for ensuring that all hospitalized patients with OUD receive this life-saving treatment, including automating naloxone prescribing, and/or distributing naloxone free of charge.

Varied geographic location and lack of adequate insurance coverage created unexpected challenges in referring patients to outpatient OUD treatment at discharge. Since most of our patients were not from our surrounding county, we needed to create a far-reaching referral system with numerous outpatient treatment options to ensure follow-up care as close to the patient's home as possible. We also encountered challenges in connecting to outpatient care due to lack of adequate insurance. These difficulties in making referrals are not unique to our health care system, but underscore the importance of having a dedicated team member to facilitate OUD treatment postdischarge. We hypothesize that subsidized postdischarge care closer to home may increase the likelihood of retention in treatment. Future evaluations of our program will explore the results of these connections to treatment, as they are a crucial component of sustained recovery and harm reduction.

Our study used EHR data from a single academic medical center which presents some limitations. MOUD and naloxone treatment may have been underestimated as they exclude treatment outside

our health system. Mortality data is obtained from providers as well as state and national databases. Due to verification processes, there is a lag time before data is entered into the EHR. In reviewing data for all patients with OUD at our hospital, we utilized ICD-10 codes for the diagnosis of OUD, which has been shown to have limitations and inaccuracies<sup>38,39</sup> and thus may not have reflected the true population of hospitalized patients with OUD.

Future next steps for the COMET program to improve care for hospitalized patients with OUD include implementation of a more standardized and comprehensive approach to harm reduction education for patients and providers as well as advocating for free distribution of fentanyl test strips and naloxone. Ongoing development of a low dose buprenorphine initiation protocol and expanding components of the COMET program to other hospitals within our health system may allow treatment of more eligible patients. We hope to further evaluate the impact of the COMET program on LOS and readmissions as our program continues.

Medication should be the standard of care for patients with OUD and should be available in all health care settings, regardless of the availability of addiction medicine specialists. Kennedy et al.<sup>40</sup> recently showed that patients with OUD who initiated buprenorphine in the hospital were significantly more likely to stay in outpatient treatment for a longer duration. With removal of the training requirement to prescribe buprenorphine, it is now even easier for hospitalists to obtain a DEA-X Waiver.<sup>13</sup> Hospitalists can and should offer MOUD for inpatients as a routine part of medical care. COMET is one of the first initiatives demonstrating successful implementation of a comprehensive, multidisciplinary program led by hospitalists to improve care for hospitalized patients with OUD. Even without dedicated addiction services, evidence-based treatment can be applied in a practical, integrated fashion in a hospital setting. Our program can serve as an example to a wide range of hospitals seeking to implement life-saving, evidence-based care for patients with OUD.

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## CONFLICTS OF INTEREST

Sudha R. Raman receives grant funding from GlaxoSmithKline and the US Food and Drug Administration. The remaining authors declare no conflicts of interest.

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## APPENDIX A

See Table A1

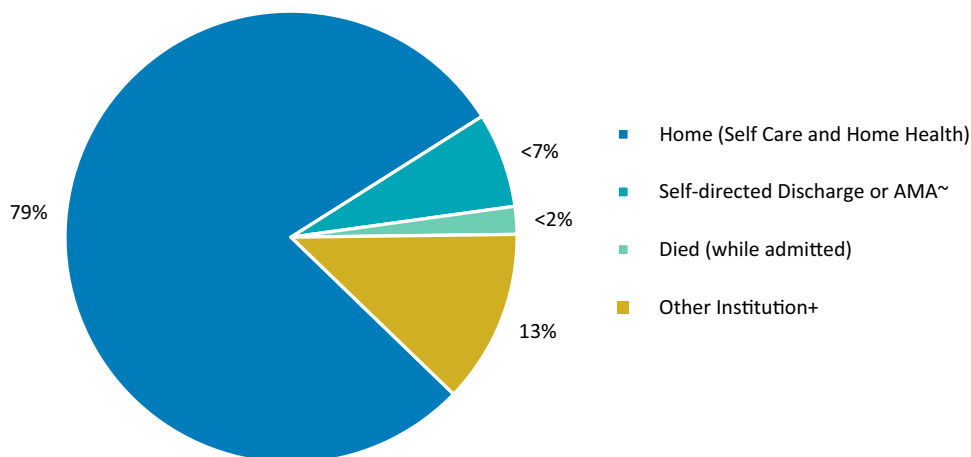
**TABLE A1** Criteria for outpatient parenteral antibiotic therapy (OPAT) in patients who inject drugs

1. Stable living situation
2. Family/friend or caregiver support
3. Active engagement with providers while hospitalized
4. Readiness to change and stop substance use (based on social worker evaluation, minimum contemplation stage)
5. No evidence of ongoing drug use during current hospitalization
6. No major transportation barriers to appointments
7. Patient willing to commit with providers and home health team for safe peripherally inserted central catheter use
8. All providers feel patient will be compliant with OPAT

Must meet all criteria to qualify for discharge home.

## APPENDIX B

See Figure B1



**FIGURE B1** Discharge status of index hospitalization of patients evaluated by the Caring for patients with Opioid Misuse through Evidence-based Treatment (COMET) team. AMA~ is against medical advice. +Other Institution includes: psychiatric institution, skilled nursing facility, other acute care hospital, rehabilitation, and hospice.

## APPENDIX C

Major successes and challenges of the Caring for patients with Opioid Misuse through Evidence-based Treatment (COMET) program, July 2019 through June 2021

Successes	Factors	
Program development and implementation	<ul style="list-style-type: none"> <li>-Health system leadership support</li> <li>-Hospital providers interested in obtaining DEA-X Waiver and caring for this population</li> <li>-Dedicated leadership time to develop and implement program</li> <li>-Collaboration and involvement of multidisciplinary key stakeholders</li> <li>-Community partnerships created for transition of care to outpatient setting</li> </ul>	
Increase in medication for OUD (MOUD) use during admission and at discharge	<ul style="list-style-type: none"> <li>-Full-time service including hospitalist physician and social worker</li> <li>-Smaller cohort of hospitalists with opioid use disorder (OUD)-specific knowledge and expertise</li> <li>-Standardized protocols and order sets with regular review of the literature</li> </ul>	
Challenges	Factors	Potential solutions
Naloxone prescription at discharge	<ul style="list-style-type: none"> <li>-Cost and insurance coverage are frequent barriers</li> <li>-Primary team does not always follow COMET consult recommendations to write for a naloxone prescription at discharge</li> </ul>	<ul style="list-style-type: none"> <li>→ need funding to distribute naloxone at time of discharge (hospital sponsorship, external grants)</li> <li>→ COMET providers now writing naloxone prescription themselves</li> </ul>
Targeting earlier discharges	<ul style="list-style-type: none"> <li>-Partnerships with skilled nursing facilities strained by COVID-19 pandemic</li> <li>-Transition to higher levels of outpatient care, such as intensive rehabilitation treatment programs, difficult due to financial barriers and COVID-19 pandemic</li> <li>-Complicated or delayed discharges for uninsured/underinsured patients or those from varied geographic locations</li> </ul>	<ul style="list-style-type: none"> <li>→ ongoing work needed to reestablish partnerships as COVID-19 pandemic hopefully continues to abate</li> <li>→ demonstrates need for social worker or case manager to facilitate postdischarge transition of care</li> <li>→ expansion of Medicaid and/or further financial support for uninsured/underinsured patients to access outpatient OUD care (insert onto next line)→ expansion of outpatient OUD programs throughout North Carolina</li> </ul>