Optimizing the care of patients with Tricuspid valve endocarditis related to intravenous drug abuse (IVDA) thorough interdepartmental and interhospital collaboration

1. Project Lead/Key Contact (name, email & phone number)

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2. Key Terms specific to this proposal

Term	Definition
Opioid Use Disorder (OUD)	A problematic pattern of opioid use that leads to severe impairment or distress and must include at least two of the following - loss of control, social impairment, tolerance, or withdrawal.
Medication Assisted Treatment (MAT)	Refers to the medications used for the treatment of OUD. The most commonly used medications are buprenorphine (commonly known as suboxone) or methadone
Induction	The process of transitioning from a standard opioid to MAT. This includes a period of monitored withdraw before the initiation of MAT at a medically appropriate time – typically 12-24 hours after the last dose of an opioid
Infective Endocarditis (IE)	Endocarditis due to an infectious organism
CTS	UNC Cardiothoracic Surgery Team
Pain Psychologist	Expert in helping individuals cope with the thoughts, feelings, and behaviors that accompany chronic pain; can diagnose and treat co-occurring mental health and substance abuse concerns
Waiver training	Physicians require 8-hours of training to apply to the DEA for a waiver to prescribe buprenorphine for the treatment of OUD
Peer Support Specialist	An individual who was lived experience in recovery and had extensive training communication, motivational interviewing, and the various treatment options (MAT).

3. What do you hope to gain in terms of professional development by participating in the Improvement Scholars Program?

Quality Improvement (QI) and Patient Safety have been a passion of mine for many years now. I assisted in the creation of a QI and Patient Safety Fellowship for residents and fellows and underwent training in Lean and Six Sigma methodologies while at Johns Hopkins from 2012-2014. I completed additional training in Patient Safety while at Duke from 2014-2016 and have been active in QI and Patient Safety work at UNC since arriving in 2016, including completing a UNC Yellow belt, UNC Purple belt, TeamSTEPPS Master Training and obtaining CPPS (Certified Profession in Patient Safety) status.

While I do have substantial prior formal QI training, I have learned over the years that fostering professional connections, having the ability to successfully build and lead a team and developing positive relationship with mentors, sponsors and senior leaders within the institution at which one works, is as important, if not more so, than having the technical skills to complete a project. Participation in the IHQI Scholars Program will help me further build these connections, learn from and grow with my colleagues, and develop the team building and leadership skills I need to be successful in this work in

the long-term. Further, this project will allow me to dive deeply into the work and gain a deeper understanding of the technical skills needed to tackle challenging problems and create meaningful and lasting change. Specifically, I am hoping for coaching and training on how to more accurately determine when to employ specific QI tools and how to develop and enact successful sustainment plans. Additionally, gaining the skills to present and publish improvement results successfully and more efficiently would be immensely beneficial as this is currently an area where I need further experience.

4. **Which UNC HCS improvement priority will your project address?**

This project will address several UNC HCS improvement priorities, including mortality reduction, reducing readmissions, improving transitions of care, reducing ED utilization, improved access to (outpatient addiction) care.

5. **What are you trying to accomplish? What is the problem or gap in the quality you seek to improve? What is the specific patient population your project will impact?**

Currently, there is a gap in the way we provide care to patients with Tricuspid valve (TV) infective endocarditis related to intravenous drug abuse (IVDA). As are the trends nationally, annual hospitalization rates in North Carolina for IE related to intravenous drug use are rising. Between 2010 and 2015, North Carolina reported a twelve-fold increase in hospitalizations in this patient population. Data from Asher et al. revealed these patients are primarily insured by Medicaid (38%) or uninsured (35%), have longer LOS (median 27 vs. 17 days) with higher median charges ($250,994 vs. $198,764). Further, it is well described in the literature that sustained abstinence is unlikely without the use of MAT. According to Chutupe et al., patients with opioid use disorder who were treated with detoxification alone had a less than 20% rate of abstinence at 30-days.

In the current state at UNC, there is no systematic approach to screen for OUD in this patient population, to provide addiction and psychologically focused treatment and counseling, to initiate MAT in the inpatient setting, or a standard approach harm reduction. Additionally, a collaborative approach to care between medical and surgical teams does not currently exist. This leads to extended hospital stays, stagnant patient flow through the health system, and poor patient outcomes. This project would see to improve the delivery of care for patients with TV-IE related to IVDA through structured approach to screening for OUD, efficient transfer to a medical team at UNC Hillsborough once post-surgical needs have been met at UNC Chapel Hill, counseling on and initiation of MAT before discharge, utilization of harm reduction techniques, post-operative and pain and psychologic counseling, referral to outpatient addiction care and development of a pathway for early discharge with home IV antibiotics in low-risk, qualified patients. Additionally, this project will seek to create a roadmap for care that can be spread to other conditions associated with OUD, including, but not limited to, osteomyelitis, spinal and epidural abscesses and acute cases of hepatitis and HIV related IVDA.

To best understand the gap in quality from the patient's perspective is to understand how meaningful and life-changing this type of care can be when done well. The following is a direct quote from a patient with OUD who was transitioned to MAT at Hillsborough and then successfully connected with outpatient addiction care,

"I started at …clinic today. thank you so much for hooking me up with them they are so great. It was like I was talking to family. Still sober from alcohol and opiates since the night I checked in with you guys. thank you so much for taking the time to help me. I will never forget what you guys done for me. Yal saved my life. "

6. **How will you know if you have improved?**

Our project aims to create a structured, multidisciplinary, efficient, and patient-centered approach to the care of patients with TV IE related to IVDA. Critical aspects of the project will include developing a standardized process around screening for and treatment of OUD, structured implementation of harm reduction strategies, linkage to outpatient care and more efficient patient flow. In the current state, there exists no standardized approach to any of the elements above. Success will be defined as the creation of a new model of care where compliance with process measures is consistently achieved leading to improved patient outcomes and reduced cost of care. Given the overall numbers of patients admitted with TV IE related IVDA is low in comparison to other diagnoses – such as COPD or heart failure – our team will need to maintain short intervals between data abstractions efforts in order to implement changes in a rapid cycle fashion.

Component 1: Develop standard work for pre-operative care. This includes creating a standard process for evaluation by a Peer Support specialist, focused screening for OUD and discussion of addiction treatment and development of patient education materials on the care pathway

- Sample process measurements: % patients evaluated by a Peer support specialist pre-operatively: % screened for OUD pre-operatively

Component 2: Develop a streamlined pathway for the transition of care once the post-operative course is complete. This includes developing standard workaround communication of completion of post-operative recovery pathway, the transition of care communication expectations and patient flow between hospital campuses

- Sample outcome measurement: reduction in average chapel post-operative LOS to < 10 days
- Sample balancing measure: % back transfers to Chapel Hill

Component 3: Develop a structured approach to the delivery of addiction-focused care including providing MAT, provision of addiction, pain and psychological counseling and structure approach to harm reduction

- Sample process measures: % patients prescribed MAT before discharge, % patients screened for infectious complications of IVDA, % patients prescribed naloxone at discharge, % patients evaluated and counseled by Pain Psychology and Psychiatry.
- Sample outcome measures: Reduction in 1-year valve re-do rates to < 20%, Reduction in 30-day post-discharge healthcare utilization related to ongoing OUD

Component 4: Use data on the patient's perspective of the inpatient induction process and barriers to retention in addiction treatment after discharge to drive rapid PDSA cycles. This data will be obtained by administration of patient surveys both after completion of the inpatient induction process and at 30-45 days post-discharge (Appendix B). This data

will also be collected by our collaborators at Duke to enhance efficient acquisition of feedback on the process and identification of barriers to retention in outpatient MAT treatment as well as enhance the potential for publication. IRB application for collection of survey data has been completed, and the creation of a RedCaps database is in process.

- Sample process measure: % patients completing a post-induction survey, % patients completing a post-discharge survey within 30-45 days of discharge
- Sample outcome measure: % patient retention in outpatient addiction treatment 30-days post-discharge.

Component 5: Develop a pathway for early discharge with home IV antibiotics for low-risk patients. As this component of the project will have to be developed from the ground up, proposed process measures do not exist at this time but are a goal of the later stages of this project.

MEASURES TABLE:

Measure Name	Measure Type	Nationally Endorsed?	Measure Calculation	Measure Exclusion	Data Source	Measure Target	Collection Frequency
% of patients with TV infective Endocarditis (IE) screened for Opioid use disorder (OUD) pre-operatively	Process	Yes, USPTF	Numerator: # patients admitted with TV infective Endocarditis (IE) screened for OUD Denominator: # patients admitted with TV infective Endocarditis (IE)	Patients with endocarditis of other valves Patients with non-infective TV endocarditis (marantic)	EHR	80%	Monthly
% of patients with TV Endocarditis related to OUD (IE-OUD) seen by Peer support specialist (PSS)	Process	No	Numerator: # patients admitted with TV IE-OUD seen by PSS Denominator: # patients admitted with TV IE-OUD	A patient who declines evaluation by PSS	EHR	70%	Monthly
% of patients with TV IE-OUD administered buprenorphine or methadone before discharge	Process	No	Numerator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge Denominator: total # patients admitted with TV IE-OUF	*opting not to exclude patients who refuse treatment as that will be gauged as a "failure" in our process and will require RCA	EHR	70%	Bi-weekly
% of patients with TV IE-OUD undergoing induction who complete post-induction survey within 72 hrs of induction	Process	No	Numerator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge who completed a survey	Patients who refuse survey participation	Paper Data collection form with data entered into RedCaps database	75%	Bi-weekly

Measure Name	Measure Type	Nationally Endorsed?	Measure Calculation	Measure Exclusion	Data Source	Measure Target	Collection Frequency
			Denominator: total # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge				
% of patients with TV IE-OUE evaluated and counseled by pain psychologist prior to discharge	process	No	Numerator: # patients admitted with TV IE-OUD seen by pain psychologist for at least 1 visit Denominator: # patients admitted with TV IE-OUD	Patients who refuse intervention	EHR	80%	Bi-weekly
% of patients with TV IE-OUD evaluated by psychiatry prior to discharge	process	No	Numerator: # patients admitted with TV IE-OUD and with concurrent psychiatric illness seen by a psychiatrist before discharge Denominator: # patients admitted with TV IE-OUD and with concurrent psychiatric illness	Patients who refuse intervention Patients without a concurrent psychiatric illness	EHR	70%	Bi-weekly
% of patients with TV IE-OUD referred to outpatient MAT clinic	process	No	Numerator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge who received a referral for outpatient MAT Denominator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge	Patients who refuse outpatient MAT	EHR	80%	Bi-weekly
% of patients with TV IE-OUD undergoing inpatient induction who complete survey between 30-45 days post-discharge	Process		Numerator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge who complete a follow-up survey between 30-45 days post-discharge Denominator: # patients admitted with TV IE-OUD	Patients who participated in an initial survey but refused consent to participate in a follow-up survey	A telephone survey with data entered into RedCaps database	50%	Monthly

Measure Name	Measure Type	Nationally Endorsed?	Measure Calculation	Measure Exclusion	Data Source	Measure Target	Collection Frequency
			administered buprenorphine or methadone for at least 48 hours before discharge who are now at least 45 days post-discharge				
% of patients with TV ID-OUD remaining in outpatient MAT treatment at 30-days post-discharge	Outcome	No	Numerator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge and who received a referral for outpatient MAT and remained in treatment at 30-days post-discharge Denominator: # patients admitted with TV IE-OUD administered buprenorphine or methadone for at least 48 hours before discharge and who received a referral for outpatient MAT	Patients who refused referral for outpatient MAT Patients who cannot be contacted despite 3 separate attempts	Telephone survey	40%	Monthly
% of patients with TV IE-OUD screened for HIV during admission	Process	Yes, the European Monitoring Center for Drugs and Drug Addiction (EMCDDA)	Numerator: # patients admitted with TV IE-OUD screened for HIV Denominator: # patients admitted with TV IE-OUD	Patients with screening results available that are < 6 months old	EHR	90%	Monthly
% of patients with TV IE-OUD screened for Hepatitis B during admission	Process	Yes, EMCDDA	Numerator: # patients admitted with TV IE-OUD screen for Hep B Denominator: # patients admitted with TV IE-OUD	Patients with screening results available that are < 6 months old	EHR		Monthly
% of patients with TV IE-OUD screened for Hepatitis C during admission	process	Yes, EMCDDA	Numerator: # patients admitted with TV IE-OUD Denominator: # patients admitted with TV IE-OUD	Patients with screening results available that are < 6 months old	EHR		Monthly
% of patients with TV IE-OUD with negative Hep B Surface Antibodies administered 1st	process	Yes, EMCDDA	Numerator: # patients admitted with TV IE-OUD with negative HBsAg administered at least 1st dose of Hep B vaccination	Patients who refuse vaccination	EHR		Monthly

Measure Name	Measure Type	Nationally Endorsed?	Measure Calculation	Measure Exclusion	Data Source	Measure Target	Collection Frequency
Hepatitis B vaccine during admission			Denominator: # patients admitted with TV IE-OUD				
% of patients with TV IE-OUD prescribed naloxone at or before the time of discharge	process		Numerator: # patients admitted with TV IE-OUD prescribe naloxone at discharge Denominator: # patients admitted with TV IE-OUD	Patients who are reporting already having access to a non-expired naloxone kit	EHR	80%	Monthly
Reduction in average post-operative LOS on CTS service at Chapel Hill for patients with TV IE-OUD	outcome	No	Numerator: Sum of # of days between POD#0 and transfer or discharge for each 30-day review period Denominator: Number of patients undergoing an operation in each 30-day review period	Patients who die Patients requiring take-back surgery for unanticipated complications Elective valve replacement cases	EHR	< 10 days	Monthly
Reduction valve redo surgery rates in the first year post-operatively	outcome	No	Numerator: Patients undergoing repeat TV surgery for IE-OUD within 365 days of original surgery at UNC Denominator: All patients who are 365 days out from initial TV replacement for IE-OUD	Patients completing original or repeat surgery at a hospital other than UNC Chapel Hill Patients undergoing repeat TV replacement for non-infectious reasons	EHR	< 20%	Start at 1-year mark and monitor every 3 months
Reduce 30-day post-discharge UNC readmissions related to ongoing OUD after TV replacement for TV IE-OUD	Outcome	No	Numerator: Patients s/p TV replacement for IE-OUD readmitted to UNC within 30-days of discharge related to overdose, opioid withdraw, uncontrolled pain, new infections related to IVDA or complications related failure to follow prescribed treatment plan attributable to ongoing opioid misuse Denominator: All patients s/p TV replacement for IE-OUD	Patients readmitted to facilities other than a UNC Systems hospital Readmissions for reasons not related to ongoing OUD	EHR	Reduction of 50% compared to baseline (2019 data)	Monthly
Reduce 30-day post-discharge UNC ED	Outcome	No	Numerator: Patients s/p TV replacement for IE-OUD	Patients visiting an ED other than those	EHR	Reduction of 50%	Monthly

Measure Name	Measure Type	Nationally Endorsed?	Measure Calculation	Measure Exclusion	Data Source	Measure Target	Collection Frequency
utilization related to ongoing OUD after TV replacement for TV IE-OUD			readmitted to UNC within 30-days of discharge related to overdose, opioid withdraw, uncontrolled pain, new infections related to IVDA or complications related failure to follow prescribed treatment plan attributable to ongoing opioid misuse Denominator: All patients s/p TV replacement related to IE-OUD	associated with the UNC Systems ED utilization for reasons not related to ongoing OUD		compared to baseline (2019 data)	
% of Transfers back to UNC Chapel Hill to Hillsborough in patients with TV IE-OUD	balancing	No	Numerator: # patients with TV IE-OUD transferred back to Chapel Hill after initial transfer to Hillsborough Denominator: # patients with TV IE-OUD transferred from Chapel Hill to Hillsborough	Patients who were admitted to Hillsborough pre-operatively Patients transferred to Chapel Hill for an indication not related to valve surgery or infection	HER	< 10%	Monthly

7. How has this problem been addressed successfully in other settings?

Numerous other organizations have been successful in addressing OUD in the inpatient setting, and there exist many well-developed guidelines on how to perform successful transitions to buprenorphine in the hospital setting. An excellent example of this is the California based Project SHOUT initiative, that among its abundant useful references available on its website (https://www.chcf.org/project/support-hospital-opioid-use-treatment-project-shout/), provides an easy to follow, protocolized based approach to inductions that can be utilized by even novice physicians (Appendix A, Figure 1). Physicians in Massachusetts (Larochelle et al.) demonstrated a significant decrease in mortality in individuals who were initiated on MAT after surviving an opioid overdose as compared to those who were not (AHR for opioid-related mortality 0.41 and 0.62, for methadone and buprenorphine respectively).

Our own UNC Family Medicine group, led by Dr. Kelly Bossenbroek Fedoriw, has successfully demonstrated the ability to maintain a large cohort of patients on MAT in outpatient setting and has systematically provided waiver training to all their graduating residents and many of their current outpatient faculty – creating an expanding network of providers who can provide outpatient addiction care. Additionally this same group has shown that treatment of outpatients with MAT leads to substantial reductions in healthcare utilization (Appendix A, Figure 3). The UNC ECHO MAT program provides regular access to training, education, and mentorship in the provision of MAT and connects MAT providers across the

state of North Carolina (https://echo.unc.edu/). Additionally, the UNC Internal Medicine group, led by Dr. Claire West, now has a clinic at Panthers Creek which can provide MAT and are actively working on expanding provider capacity to prescribe MAT. Our project team will actively engage with Drs. Bossenbroek and West.

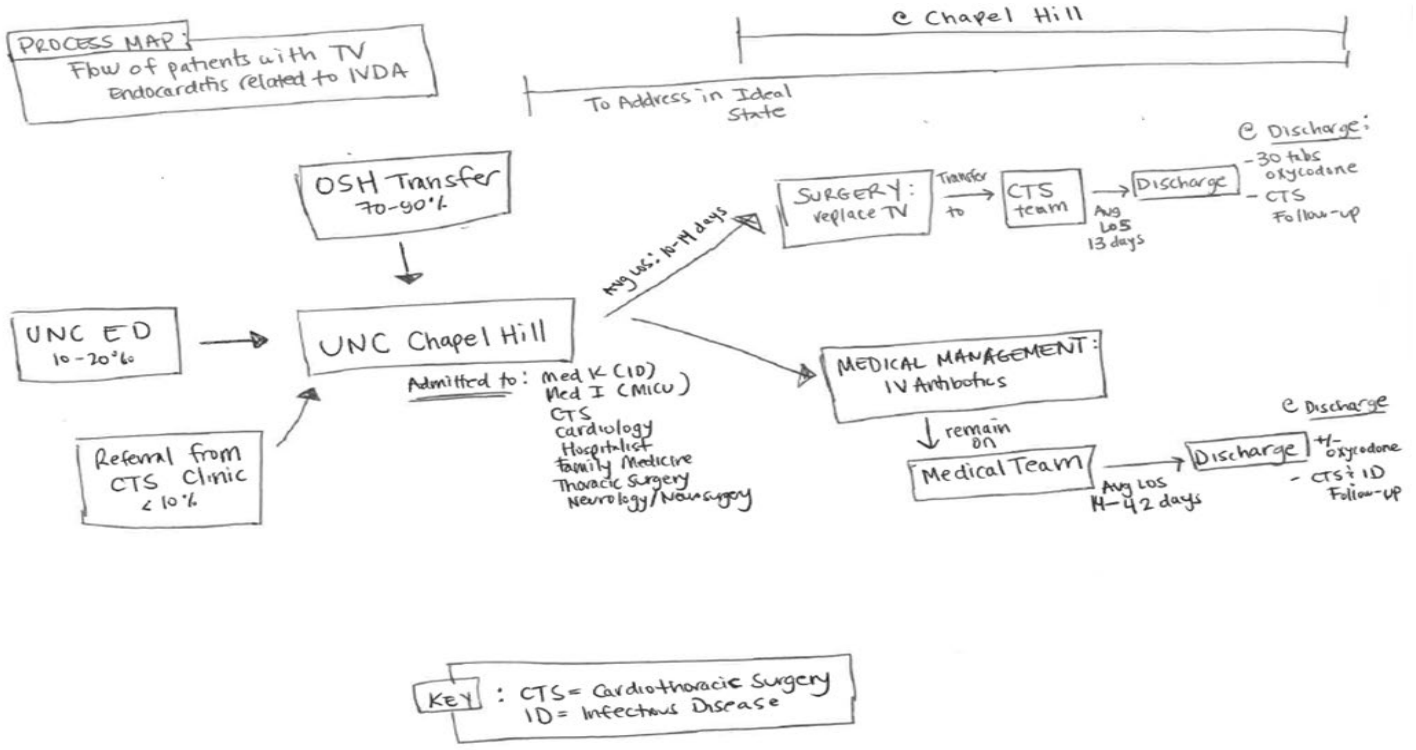
Our neighbors at Duke University have successfully developed collaborations between ID and Home Care agencies to develop pathways for certain low-risk patients with OUD and need for prolonged length IV antibiotics to be discharged with home infusions once certain criteria have been met (Appendix, Figure 2). Over the past 4 months, the Duke team has successfully discharged 7 patients with OUD home with IV antibiotics with estimates of 184 hospital days saved and no instances of treatment failure (data obtained via electronic communication with project lead, Dr. Dana Clifton). Our project team includes an active collaboration at Duke University (Dr. Clifton).

Lastly, since 2019, the a small group of Hillsborough providers have successfully transitioned 18 patients with OUD from opioids to MAT in the inpatient setting at UNC Hillsborough hospital, all of which have been linked to ongoing treatment in the outpatient setting.

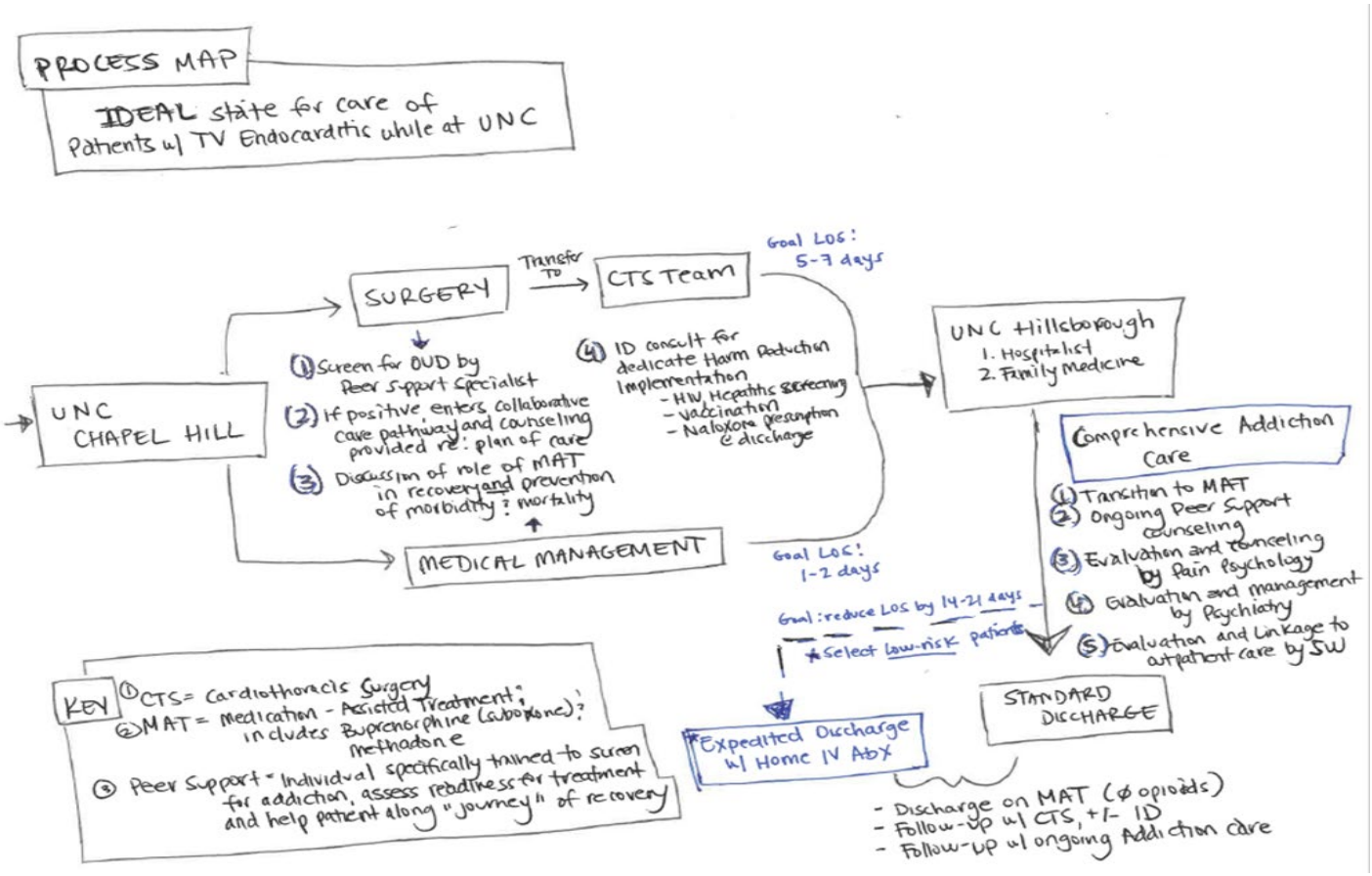
8. **What changes can you make that will result in improvement? How will you test those changes?**

The changes we aim to implement and the proposed process measures have described above in question 6. In order to further assist the review team in understanding the vision of the project, a visual representation of the current and ideal state processes are provided below.

CURRENT STATE:



IDEAL STATE



9. **What aspects of the cost of care and unwarranted care variation will your project address?** (1/2 page)

The ability to reduce both the cost of care and unwarranted care variation is a significant strength of this proposal. The current state is that there exists wide variation in the care a patient with TV endocarditis related to IVDA receives, a lack of targeted assessment of and treatment for confounding addiction, prolonged LOS on high demand surgical beds and high rates of postoperative utilization of healthcare – all which have significant financial implications.

Rates of infective endocarditis are rising nationally, primarily driven by increasing injection drug use related to the opioid epidemic. In 2017 in the US, 17% of hospitalizations for infective endocarditis were related to IVDA. UNC specific data is even more alarming. During a 12 month period (Jan 2018-Dec 2019), 95.5% of TV endocarditis cases seen at UNC

were related to injection drug use (Appendix, Table 1). The average LOS at Chapel Hill on the Cardiothoracic surgery service was 27 days, the 30-day readmission rate was 22.7%, and the re-do valve surgery rate was an astonishing 45%, with most of these repeat surgery occurring within a year of the initial surgery **(**Appendix A, Table 2**).** None of those patients were started on MAT before discharge from the hospital. The estimated cost of care over the past 22 months for patients with TV endocarditis related to IVDA is $6.8 million (average $271,000/case). Most of these cases lack an active payor source. Theoretical models using the concept of the lost opportunity of revenue due to prolonged LOS have calculated a potential cost savings of 2.5 million during this period (using typical CABG LOS of 5 days and per case revenue of $25,000) if patient post-operative patient flow could be improved.

The use of MAT in patients with OUD has shown to reduce the cost of care both nationally and locally at UNC. The UNC Family medicine program was able to show a 69% reduction in ED utilization and a substantial reduction in inpatient admissions in patients with OUD after initiation of MAT (Appendix, Figure 3).

Our project aims to both improve patient flow through the UNC system, which will increase revenue and standardize the appropriate to addiction care in this population, which will result in a reduction in healthcare utilization and mortality.

10. Improvement team: names, roles and QI experience (if any) of each team member

Core Team members

- Dr. Clare Mock – Project Lead
    - Dr. Mock has extensive training in QI, including Lean and Six Sigma training and Johns Hopkins, completion of Yellow and Purple Belt training at UNC. Additionally, she has provided mentorship on a prior IHQI Scholars project (Antibiotic time outs). Dr. Mock will provide project oversight and guidance as well as provide QI mentorship to several project team members – Drs Stern and Baca-Atlas.
- Dr. Peggy McNaull – Project Sponsor and Liaison to Opioid Stewardship Steering Committee.
    - Dr. McNaull is the Associate CMO for Quality and Safety and the Chair of the Opioid Stewardship Committee and has extensive training in QI and a long track record of leading highly successful QI projects. She has been an integral member of this project team from the onset and has committed to removing implementation barriers that might arise. Dr. McNaull will also serve as the direct link between this project and the Opioid Stewardship Committee.
- Dr. Lavinia Kolarzyk – Quality Improvement leadership, project mentorship to Dr. Mock
    - Dr. Kolarzyk is the current Chief of Cardiac Anesthesia. She has extensive training in QI and has previously completed a highly successful IHQI Scholars project. She has been instrumental in leveraging data to build a compelling financial case and creating a partnership between project members and executive leadership. She is also committed to providing QI and project mentorship to the project leader, Dr. Mock.
- Megan Randall, NP – Cardiothoracic Surgery Team lead

    - Will act as lead between other project members and CTS surgeons and is a content expert surrounding patient flow and current gaps in care. Will help the team develop practical, achievable solutions to address current and future process gaps. Additionally, she will aid in the creation and delivery plan for patient care path education materials
- Drs. John Ikonomidis and Paul Tessman – Cardiothoracic Surgery content experts
    - Both are practicing Cardiothoracic Surgeons. Dr. Ikonomidis is the current Chief of the Division. They will serve as content experts on TV endocarditis related to IVDA and aid in the development of practical and achievable pre- and post-operative care workflows.
- Dr. Robyn Jordan – Addiction Medicine content expert, Outpatient MAT support
    - Dr. Robyn Jordan has provided both content expertise in addiction care and provided unrestricted access to outpatient MAT care for uninsured patients. Through her tireless work, Dr. Joran has developed a "Hub and spoke model" in which she can accept patients who are started on MAT while inpatient at UNC Hillsborough, work to stabilize those patients further and link them to treatment options closer to their home communities once funding sources have been obtained.
- Dr. Irinia Phillips – Chronic Pain Anesthesiologist with extensive experience and expertise in MAT
    - Dr. Phillips will aid in the development of standard work for transitioning to MAT in the post-operative setting. Dr. Phillips has several years of experience in providing MAT in the inpatient setting in her role as an addiction specialist at a prior institution.
- Dr. Baca-Atlas – Addiction Medicine content expert, Family Medicine Liaison.
    - Dr. Baca-Atlas is an addiction medicine specialist with extensive experience in the delivery of MAT and care for patients with OUD. He will not only serve as a content expert but assist in expanding the depth of providers trained on how to administer MAT in the inpatient setting and will partner with Dr. Schranz and others to develop a pathway for early discharge to home with IV antibiotics for low-risk patients. He will also act as a bridge between this project team and the Department of Family Medicine, who is transitioning to the Hillsboroug campus in July. Dr. Baca-Atlas is interested in growing his QI skills and has requested mentorship from Dr. Mock during this project.
- Dr. Asher Schranz – Infectious disease and Harm reduction specialist.
    - Dr. Schranz is a content expert in evidence-based harm reduction techniques for patients with IVDA. He is already actively working on a pilot project to systematically address OUD in patients on 6BT and will use lessons he has learned to improve the implementation of this project. Dr. Schranz has a keen interest in improving his QI skills and has previously applied to the IHQI Scholars Program.
- Dr. Babette Stern – Hospitalist and Hillsborough Transition lead.
    - Dr. Stern will serve as the lead on developing stand work around the transition to Hillsborough hospital. Dr. Stern is interested in growing his QI skills and has requested mentorship from Dr. Mock during this project.
- Greyson Bowen – Peer Support specialist

    - Mr. Bowen will provide direct patient care including screening all patients with TV IE for OUD and providing addiction support and counseling to patients at both UNC Chapel Hill and Hillsborough Campuses
- Amy Goetzinger, Ph.D. – Pain Psychology content expert
    - Dr. Goetzinger is a practicing UNC pain psychologist with expertise in patients with OUD. She will provide evaluation and counseling of patients with OUD at UNC Hillsborough Hospital.
- Kevin Corbin – Patient Logistics Center liaison
    - Mr. Corbin is a senior leader at UNC will serve as the liaison between this project team and the PLC and will also help the team explore alternative avenues for reducing hospital length of stay.
- Laquinta Perry-James, M.Div., MSW, LCSW – lead for CM/SW at Hillsborough
    - Ms. Perry-James has prior experience in coordination of care for patients with OUD during her time as an SW at Wakebrook and will assist the SW/CM at UNC Hillsborough in successfully connecting patients with outpatient MAT.
- Caroline Ornelas, BSN, RN, CRRN, SCRN – Performance Improvement Patient Safety Quality Coach
    - Caroline is a PIPS coach who is highly trained in QI techniques. She has actively participated in the pre-work for this project thorough data collection and analysis and will continue to lend her QI expertise to the project team members moving forward.

Adjunct Team Members

- Dr. Dana Clifton – Liaison to Duke OUD treatment efforts
    - Dr. Clifton is a practicing Duke Hospitalist and is the project lead for Duke COMET (Caring for patients with Opioid Misuse through Evidence-based Treatment). COMET has been highly successful in initiating MAT to inpatients with OUD, creating outpatient MAT referral networks, and reducing LOS for inpatients with OUD. Our project team will partner with the COMET team to collect patient data on the induction process and retention in outpatient treatment to help drive rapid cycle improvements for both groups.
- Dr. Kelly Bossenbroek Fedoriw – leader for Family Medicine outpatient MAT program
    - Dr. Bossenbroek Fedoriw is an Associate Professor in Family Medicine and a Director of the UNC ECHO for MAT program that provides training for a physician on MAT. Our project team will partner with Dr. Bossenbroek to form deeper referral networks for inpatients to obtain outpatient MAT.
- Dr. Claire West – leader for Internal Medicine outpatient MAT program
    - Dr. West is the Medical Director of the UNC Internal Medicine Clinic at Panther Creek and leads the MAT program at this site. Our project team will partner with Dr. West to form deeper referral networks for inpatients to obtain outpatient MAT.
- Haywood Rhodes, PharmD – Hillsborough Pharmacy Liaison
    - Will help coordinate pharmacist education on MAT and will act as a partner for developing naloxone kit education to patients and staff

- Krista Wells, RN – Liaison to Hillsborough Nursing staff
    - Mrs. Wells is the Nurse Educator at UNC Hillsborough
- Jenny Bui, MS4 – Project support
    - Ms. Bui has provided project support through the creation and analysis of the original TV endocarditis data sets. She plans to continue to provide project support for the improvement team.
- John Hudson – Liaison to Perioperative service
    - Mr. Hudson is the VP of Perioperative Surgical Services and has expressed strong support for this project. Mr. Hudson can facilitate the removal of implementation barriers and provide access to additional resources given his status as an executive leader.

11. Improvement facilitators and barriers: Describe the QI leadership, QI culture, capability for improvement, and motivation to change within the unit/department. How does the proposed project align with institutional and/or departmental goals?

This project alights with institutional goals of mortality reduction, reducing readmissions, improving transitions of care, reducing ED utilization, improved access to (outpatient addiction) care. In regard to the QI culture, capability for improvement, and motivation to change - the amount of enthusiasm and volunteerism surrounding this project has been overwhelming and humbling. There is a palpable excitement from every member of this project team around improving care for patients with OUD, a traditionally underserved population at UNC Chapel Hill and Hillsborough Campuses. The sentiment around this project is well-summarized by a comment made by John Hudson, VP of Perioperative Services at a recent project team meeting, "To see these different groups, working together to put patients first and do 'the right thing' has been inspiring. This is how patient care is supposed to be but often do not."

While there exists strong QI leadership involved and a supportive QI culture, given the overwhelming interest from numerous individuals in collaborating on this project and the multiple avenues in which this project aims to improve the care process, the need for formal project management support is paramount. A project manager would be vital to ensuring the accurate and timely collection and review of data, coordinating the number of multiple project components, and facilitation of regular PDSA cycles.

12. Sustainability plan: Describe the plan for sustaining the improvement and conducting ongoing improvement after the end of the project

Sustainment, as with most QI efforts, will be one of the most challenging aspects of these projects. Already, the formation of and work to date from this project, has created a more in-depth understanding among leaders in multiple departments that a significant gap exists in care currently being provided to inpatients with OUD. This awareness is already fostering improved knowledge, increasing training opportunities, and enhanced collaboration within the institution – all of which will outlast the life of the project.

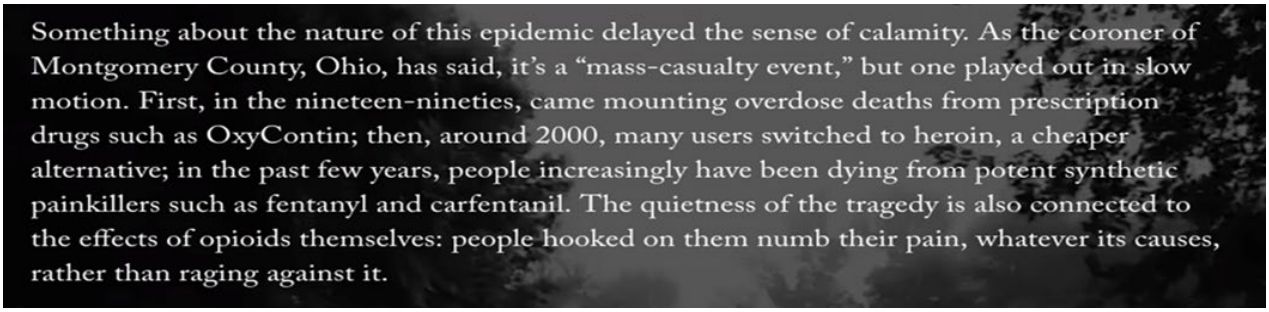
The work from this project will permanently expand the pool of inpatient providers able to treat and manage hospitalized patients with OUD as well as the outpatient MAT provider referral network available to patients with OUD seeking ongoing care after discharge. This project will create a sustained implementation of harm reduction through the creation of a structural approach to harm reduction and facilitate adherence thorough the development of templated OUD specific documentation that identifies and recommends guideline-based practices (HIV and hepatitis screening, appropriate vaccinations). Additionally, if this project were successful, this would provide support for the creation of a funded Addiction Consult Service that significantly improves access to care and MAT for patients with OUD on services.

13. Implementation Timeline (1 page)

Task	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Create a Formal Process Map for current and ideal states	x											
Create a streamlined transfer process from Chapel Hill to Hillsborough		x	x									
Develop a workflow for pre- and post-operative Peer support counseling		x	x									
Strengthen referral relationships with key outpatient MAT providers					x	x	x					
Developed streamlined referral pathways to multiple providers for patients with TV IE-OUD							x	x	x	x		
Develop standardized consult notes for provider use when performing initial patient evaluation for OUD and readiness for MAT		x	x									
Develop consensus with key stakeholders around the benefits of an early post-operative transition to MAT (10-14 days)	x	x	x									
Based on consensus recommendations, develop standard work around MAT induction in the post-operative setting			x	x	x							
Work with ID and pharmacy to develop a plan		x	x	x								

for consistent implementation of harm reduction techniques (screening, vaccination, naloxone prescription and administration education) and standard EPIC documentation format (dotphrase)												
Engage with key stakeholders to develop patient education materials regarding care pathway	x	x	x									
Develop strategy for consistent delivery of care pathway education materials to patients preoperative			x	x								
Perform (inpatient) post-induction and 30-day post-discharge patient surveys		x	x	x	x	x	x	x	x	x	x	x
Review the effectiveness of the process with key stakeholders (PDSA cycles)			x	x	x		x		x		x	
Develop standard workaround referral of all patients with TV IE-OUD to pain psychologist at Hillsborough		x	x	x								
Develop standard workaround referral of patients with TV IE-OUD and concurrent psychiatric illness for psychiatry evaluation at Hillsborough			x	x	x							
Expand the pool of providers comfortable and proficient with the inpatient induction process (“Train the trainer”)					x	x	x	x	x	x	x	x
Education for Hillsborough nursing and pharmacy staff regarding appropriate suboxone administration techniques		x	x	x								

Work with ID and OPAT to develop consensus guidelines for early discharge with home IV antibiotics and partnerships with Home Healthcare groups			x	x	x	x						
Implement a process for early discharge with home IV antibiotics and assess the efficacy							x	x	x	x	x	x
Present to IHQI												x
Additional Sub-project aims to consider pending successful completion of the above tasks												
Consider the development of alternative patient flow pathways for use when capacity constraints exist at Hillsborough					x	x	x					
Consider education for Hillsborough nursing staff on the “Recovery Model” of patient care							x	x	x			
Consider developing a central line “wrapping” protocol to reduce tampering									x	x	x	
Consider partnering with ID/Epidemiology to develop guidelines for subpopulations that do not require central line placement										x	x	x
Consider the development of harm reduction EPIC order set that includes recommended screening, vaccination recommendations, and outpatient naloxone kit prescription							x	x	x			



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Chutuape MA, Jasinski DR, Fingerhood MI, Stitzer ML. *One-, three-, and six-month outcomes after brief inpatient opioid detoxification*. Am J Drug Alcohol Abuse. 2001 Feb;27(1):19-44

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Project SHOUT: https://www.chcf.org/project/support-hospital-opioid-use-treatment-project-shout/

UNC Echo**:** https://echo.unc.edu/

APPENDIX A: Figures and Tables

Figure 1

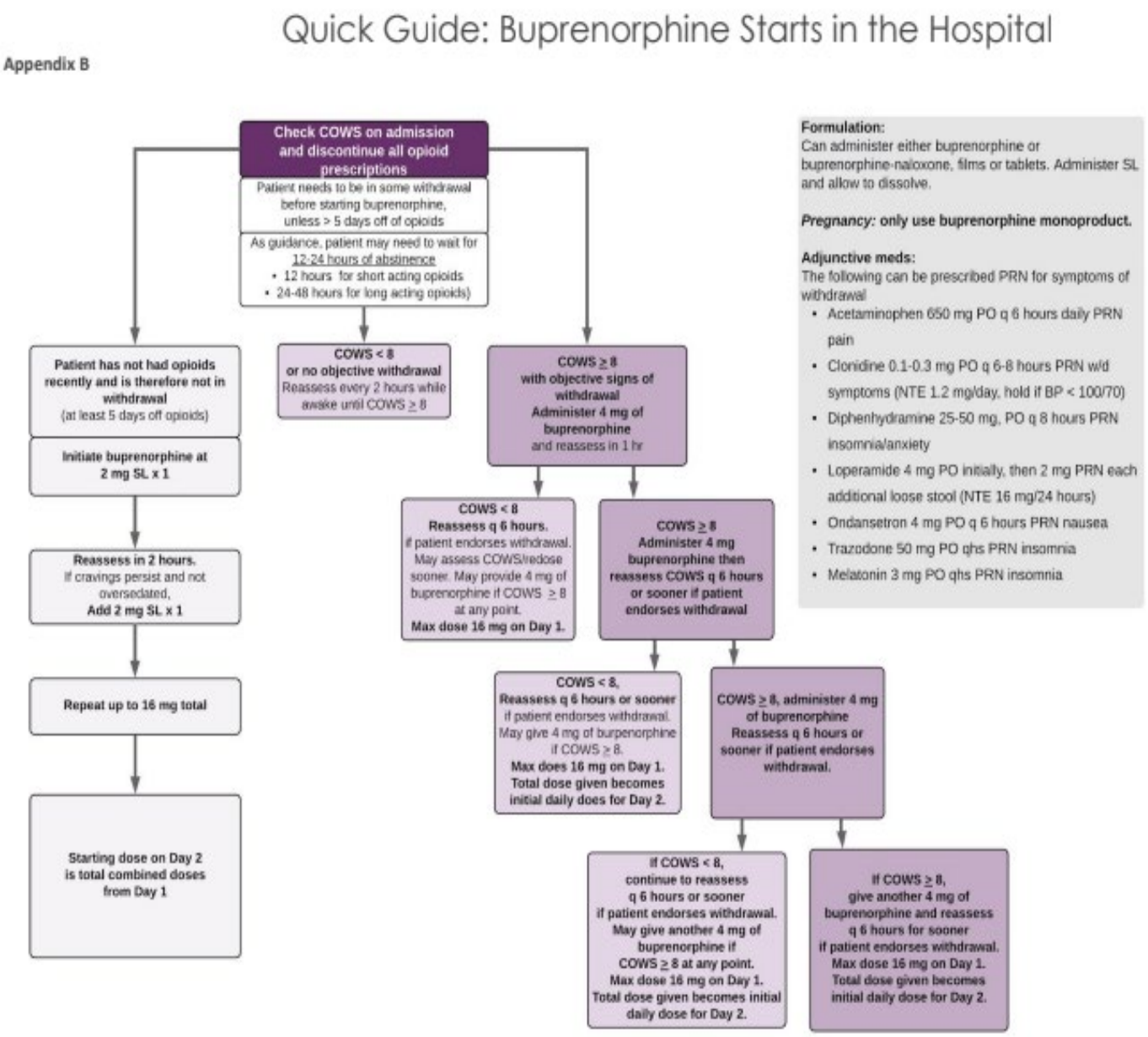


Figure 2

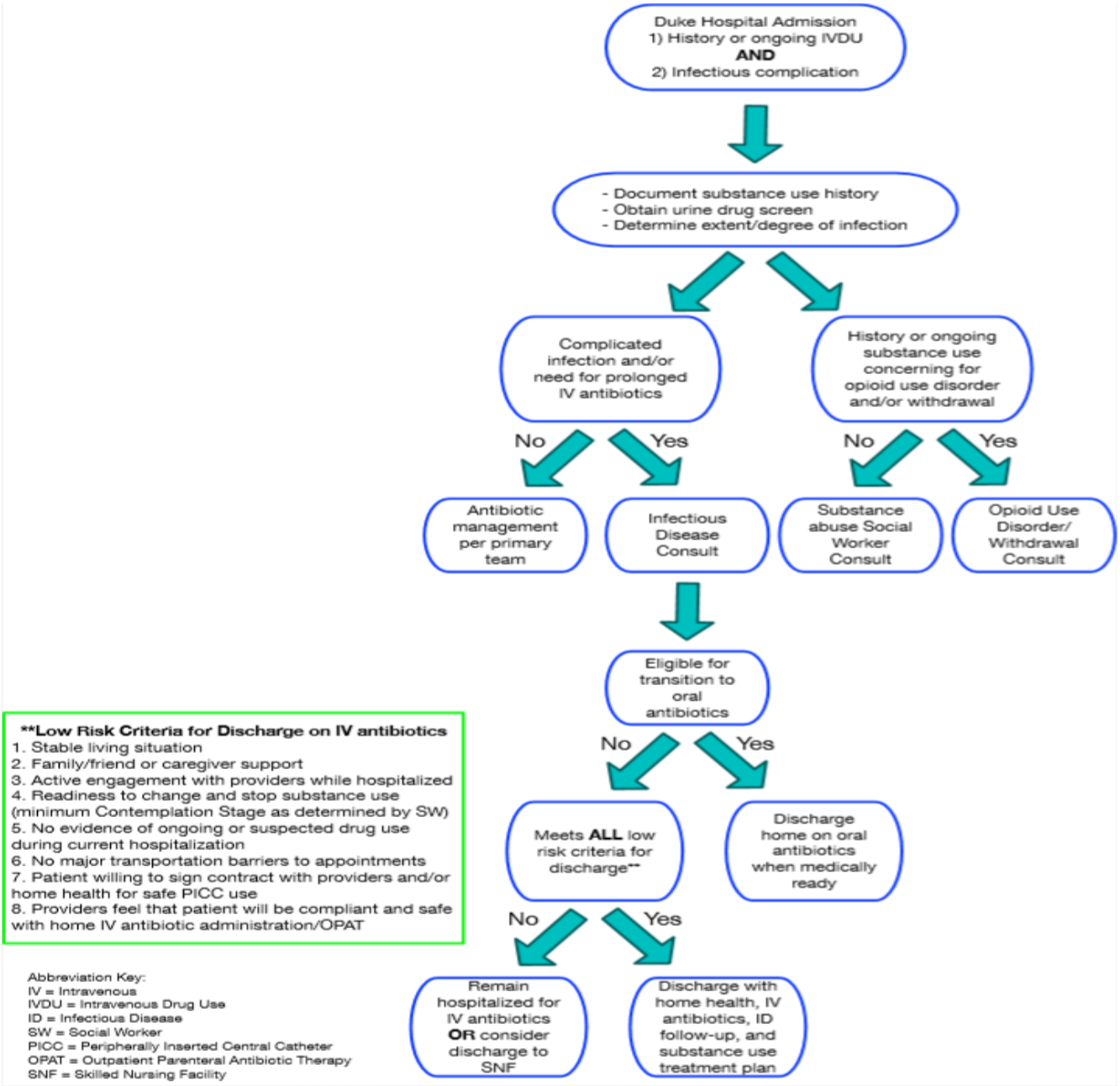
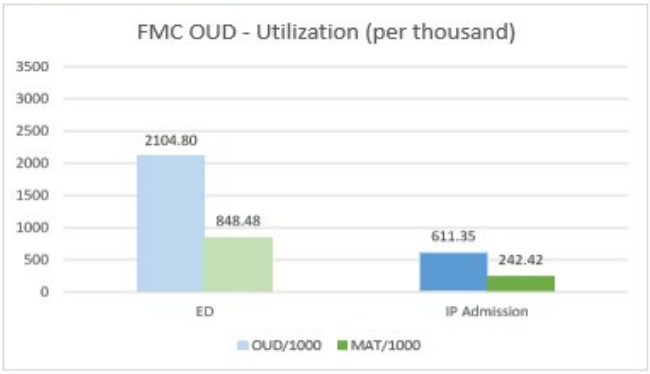
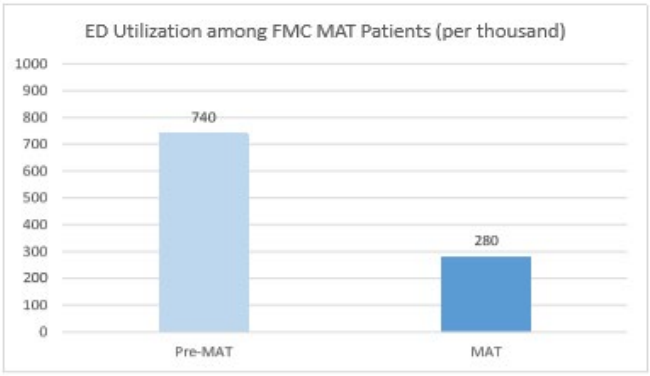
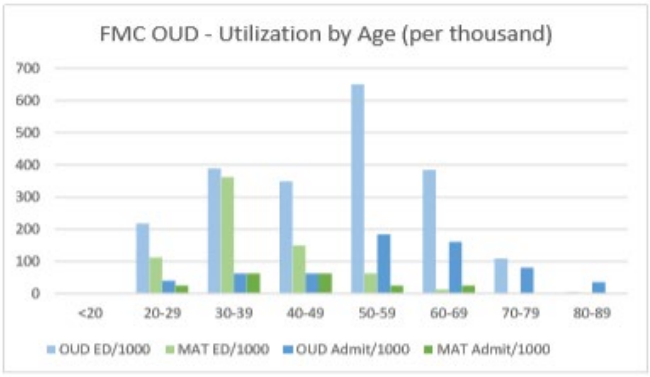

Duke Hospital Admission
1) History or ongoing IVDU
AND
2) Infectious complication
- Document substance use history
- Obtain urine drug screen
- Determine extent/degree of infection
Complicated infection and/or need for prolonged IV antibiotics
History or ongoing substance use concerning for opioid use disorder and/or withdrawal
No
Yes
No
Yes
Antibiotic management per primary team
Infectious Disease Consult
Substance abuse Social Worker Consult
Opioid Use Disorder/ Withdrawal Consult
Eligible for transition to oral antibiotics
No
Yes
Meets ALL low risk criteria for discharge**
Discharge home on oral antibiotics when medically ready
No
Yes
Remain hospitalized for IV antibiotics OR consider discharge to SNF
Discharge with home health, IV antibiotics, ID follow-up, and substance use treatment plan
**Low Risk Criteria for Discharge on IV antibiotics
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 (minimum Contemplation Stage as determined by SW)
5. No evidence of ongoing or suspected drug use during current hospitalization
6. No major transportation barriers to appointments
7. Patient willing to sign contract with providers and/or home health for safe PICC use
8. Providers feel that patient will be compliant and safe with home IV antibiotic administration/OPAT
Abbreviation Key:
IV = Intravenous
IVDU = Intravenous Drug Use
ID = Infectious Disease
SW = Social Worker
PICC = Peripherally Inserted Central Catheter
OPAT = Outpatient Parenteral Antibiotic Therapy
SNF = Skilled Nursing Facility

Figure 3

UNC HEALTH CARE FAMILY MEDICINE







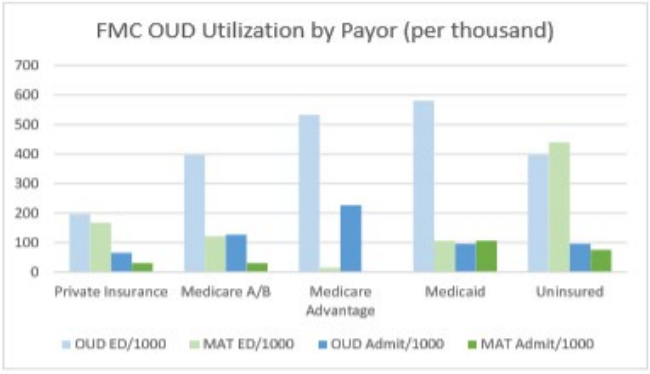


Table 1

UNC SCHOOL OF MEDICINE

Table 1. Patient characteristics

	Injection Drug-Use Related IE (n= 22)	Non-Injection Drug-Use Related IE (n= 3)
Age, median (IQR)	31 (25.3, 39.5)	61.7 (52.5,75.5)
Gender, n (%)		
Male	7 (32.8%)	0 (0%)
Female	15 (68.2%)	3 (100%)
Race, n (%)		
White	19 (86.4%)	3 (100%)
Black	2 (9.1%)	0 (0%)
Hispanic	1 (4.5%)	0 (0%)
Comorbid Conditions, n (%)		
Hepatitis C	18 (81.8%)	1 (33%)
Immunosuppression	4 (18.2%)	1 (33%)
Systolic Congestive Heart Failure	3 (13.6%)	1 (33%)
Opioid Drug Use	21 (95.5%)	0 (0%)

Table 2

UNC SCHOOL OF MEDICINE

Table 2. Operative characteristics

	Injection Drug-Use Related IE (n= 22)	Non-Injection Drug-Use Related IE (n= 3)
Total Units of Blood Transfusion, mean	2.3	3
Overall Length of Stay, median (IQR), days	27 (17, 36.25)	21 (19.5, 26)
Interval from Admission to Surgery, median (IQR), days	14 (7.75, 21)	10 (8.5, 10.5)
Readmission within 30-days, n (%)	5 (22.7%)	1 (33%)
Re-do valve surgery for endocarditis, n (%)	10 (45%)	0 (0%)
Time between valve operations, median (IQR), days	286 (261.75, 452.25)	----

APPENDIX B: Patient Surveys

In-hospital Suboxone Induction Questionnaire

Disclaimer:

The purpose of this research is to understand the patient's perspective on the inpatient induction process so we can learn how to make this process better. **Induction** is a term that refers to the process of starting on Suboxone (buprenorphine/naloxone) therapy. This process starts when you stop taking all other opioids and ends when you are on a stable dose of Suboxone (buprenorphine/naloxone).

You are invited to participate because you are undergoing induction in the hospital. Your participation in this study is entirely voluntary. If you decide not to participate in this study, that decision will in no way negatively affect the care you receive. This study involves you filling out this paper survey now and, if you consent, receiving a phone call after discharge. Each part of the process will take approximately 5 minutes or less. We will do our best to keep your information confidential. All data will be stored in a password protected electronic format. This paper form will be shredded after data input into the secure electronic site. The results of this survey will be used for scholarly purposes.

1. Date of Survey completion: _____

2. What illicit drug(s) or non-prescribed pain medication(s) did you take before the hospitalization and how much did you use daily?

---

3. Did you experience any symptoms of withdrawal during induction?
   _____ Yes
   _____ No

4. How many **hours** after stopping opioids – either those taken before admission to the hospital or those prescribed to you while in the hospital (includes: heroin, methadone, suboxone, oxycodone, Oxycotin, morphine, fentanyl and others) - did it take to start experiencing symptoms of withdrawal?
   _____ < 1 hour
   _____ 1-3 hours
   _____ 4-6 hours
   _____ 7-9 hours
   _____ 10-12
   _____ > 12 hours
   _____ I did not experience withdraw

5. If you did experience withdrawal symptoms, which ones? Check all that apply
   _____ Anxiety
   _____ Pain
   _____ Nausea and/or vomiting
   _____ Diarrhea
   _____ Cramping
   _____ Restlessness

_____ Agitation
_____ I did not experience any withdrawal symptoms

6. How distressing were the following symptoms (Scale 1 being no distress, 5 being moderate distress, and 10 being the worst distress you have ever experienced, NA being Not Applicable)?

Anxiety:	1	2	3	4	5	6	7	8	9	10	NA
Pain:	1	2	3	4	5	6	7	8	9	10	NA
Nausea or Vomiting:	1	2	3	4	5	6	7	8	9	10	NA
Diarrhea:	1	2	3	4	5	6	7	8	9	10	NA
Cramping:	1	2	3	4	5	6	7	8	9	10	NA
Restlessness:	1	2	3	4	5	6	7	8	9	10	NA
Agitation:	1	2	3	4	5	6	7	8	9	10	NA

7. Did you receive medications to help relieve any of these symptoms?
   _____ Yes
   _____ No
   _____ Unsure

8. What symptoms did you receive medication for? Check all that apply.
   _____ Anxiety
   _____ Pain
   _____ Nausea and/or vomiting
   _____ Diarrhea
   _____ Cramping
   _____ Restlessness
   _____ Agitation
   _____ I don't know what symptom(s) the medication was/were for

9. What medication(s) were most helpful for your withdrawal symptoms. Check all that apply and, if you know the name, circle the individual medication you received that was most effective within each group of medications. Generic name listed first, brand name in parentheses
   _____ Nausea medicine - promethazine (Phenergan), ondansetron (Zofran), prochlorperazine (Compazine), metoclopramide (Reglan)
   _____ Non-opioid pain medications - acetaminophen (Tylenol), Ibuprofen (naproxen)
   _____ Agitation medicine - Clonidine
   _____ Diarrhea medicine - loperamide (Imodium)
   _____ GI cramp/upset medicine - dicyclomine (Bentyl)
   _____ Muscle cramp medicine – cyclobenzaprine (Flexeril), diazepam (Valium), methocarbamol (Robaxin), tizanidine (Zanaflex), baclofen (Lioresal)
   _____ Anxiety medicine – hydroxyzine (Atarax)
   _____ Sleep medicine – Trazodone (Desyrel), melatonin
   _____ Other medication: _____

10. If you received medications to help with these symptoms, did you ask for these medications, or were the medications offered?
    _____ I asked for these medications
    _____ The medications were offered

_____ I did not ask for medications and none were offered
_____ I don't remember

11. Please rate your level of agreement with the following statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think that the first dose of Suboxone worsened my withdrawal symtpoms.					
I think my first dose of Suboxone was effective at relieving my withdrawal symptoms.					
I think that my second dose of Suboxone was given at an appropriate time.					
I think that the staff had adequate knowledge to address my substance use.					
I feel that my substance use caused hospital staff to treat me differently.					
I have good quality of life .					
I am well connected to family and friends.					

12. Do you have any thoughts or feedback about the process?

13. May we have your consent to call you after discharge to learn about how you are doing in terms of your recovery process? If your answer is yes, please provide contact information

_____ Yes. The best way to reach me is: _____
_____ No

For the research team:

Did the patient have assistance filling out this survey? ___ Yes ____ No

Suboxone Induction Follow-up Questionnaire

Disclaimer (to be read to the patient):

The purpose of this research is to understand your experience after discharge. You are invited to participate because you underwent induction in the hospital. Your participation in this study is entirely voluntary. This study involves you answering several questions about your experience after discharge. This will take approximately 5 minutes or less. We will do our best to keep your information confidential. All data will be stored in a password protected electronic format. The paper form we are recording your answers on will be shredded after data input into the secure electronic site. The results of this survey will be used for scholarly purposes.

1. Did you experience any barriers or difficulties when establishing with a Suboxone or methadone provider outside the hospital?

_____ Yes
_____ No

If so, what were these difficulties?

2. Please list any suggestions you have on how we can help with the transition to a Suboxone or methadone provider outside the hospital.

3. Please list any suggestions you have for improving your hospital experience when you started Suboxone.

4. Are you still in treatment?

____ Yes
____ No

If you relapsed, why do you think you relapsed?

*Would you consider starting treatment again?

_____ Yes*
_____ No
_____ Not sure

*If patient answers yes, provide the following resource:
SAMHSA's National Help-line: **1-800-662-HELP (4357) or** www.samhsa.gov/find-help/national-helpline

5. What is your current pain level? (1 being no pain, 5 moderate pain, and 10 being the worst pain you have ever experienced, NA being Not Applicable): 1 2 3 4 5 6 7 8 9 10 NA

7. How much are you paying for Suboxone or methadone weekly?

8. Please rate your level of agreement with the following statements

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think Suboxone or methadone has improved my pain.					
I have cravings for the substance I previously took.					
I have made gains in enployment since starting Suboxone or methadone.					
I have good quality of life.					
I am well connected to family and friends.					
The cost of Suboxone or methadone is preventing me from continuing treatment.					

8. Did you use any illicit substances or any substances that were not prescribed to you by a doctor **while** you were in the hospital?

_____ Yes
_____ No
_____ Prefer not to say

If yes, what did you use?

If yes, did you use any of those substances AFTER you were started on Suboxone in the hospital?

If yes, which ones?

9. Do you have any additional thoughts or feedback about your experience?

UNC SCHOOL OF MEDICINE

David Hemsey, MD

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Chief, Division of Hospital Medicine
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January 28, 2020

Dear IHQI Scholars Program Selection Committee,

I am writing to give my strongest support for Dr. Clare Mock's UNC IHQI Scholars Proposal: "Optimizing the care of patients with Tricuspid valve endocarditis related to intravenous drug abuse (IVDA) thorough interdepartmental and interhospital collaboration." The field of Hospital Medicine provides a unique perspective on the challenges to deliver high-quality, timely, cost effective care and our faculty have been leaders at UNC in the continual improvement efforts towards this goal. Members from our Division of Hospital Medicine have a strong history of success with IHQI Scholars program, with previous projects in central line placement safety, appropriate use of VTE prophylaxis and evidence-based standardization of care in syncope. I am certain that Dr. Mock will continue that tradition of excellence in the program.

From the beginning of her career, Dr. Mock has shown a commitment and dedication to Quality Improvement and Patient Safety. Prior to coming to UNC, she pursued education in QI methodology, including Green Belt Lean Six Sigma training at Johns Hopkins Hospital and Patient Safety Certification at Duke University. Since her joining our faculty in 2016 as the Quality Improvement and Patient Safety leader at Hillsborough, she has continued this pursuit, both with efforts to develop new skills as well as engagement on multiple projects. To name just a few examples, she has been involved in a Purple Belt project in Discharge Medication Reconciliation, supported a previous IHQI Scholars Program on antibiotic stewardship, undergone TeamSTEPPS Master Training at Duke, become a Certified Professional in Patient Safety (CPPS) and received Human Factors Engineering Training at Johns Hopkins Hospital. Completing the IHQI Scholars Program would further advance her QI team leadership skills and improve her ability to determine how and when to apply a particular QI strategy to address the problem at hand.

The proposal seeks to improve the care for an important and growing group of patients with opioid use disorder (OUD) and is a further development of work already begun by Dr. Mock in the past 2 years. A comprehensive model of care for this patient population did not exist prior to 2018 and patients with OUD discharged from UNC Hillsborough were not initiated on medication-assisted therapy (MAT) despite many receiving prolonged courses of IV antibiotics at that campus. Seeing the need, she engaged numerous disciplines and created partnerships with Addiction Medicine, Anesthesiology, Pain Psychology, Case Management, Infectious Disease and Psychiatry to create alignment and a collaborative care pathway. To date, the team has started 20 patients on MAT and connected them with ongoing addiction care after discharge. The proposed project would similarly engage the Cardiothoracic Surgery and Anesthesia teams in an effort to more comprehensively treat those patients with OUD requiring valve surgery, where relapse is associated with especially high morbidity and

mortality. In addition, it could also create a model that can be applied to additional patient populations and potentially other UNC sites.

As Division Chief for UNC Hospital Medicine, I will ensure that Dr. Mock will have time and support to attend required quality improvement training, conduct the improvement project, and monitor and report on project progress. We look forward to working closely with the project team to ensure success of this important work.

Sincerely,

David F. Hemsey, MD
Chief, Division of Hospital Medicine

UNC
SCHOOL OF MEDICINE

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01/30/2020

Dear IHQI Scholars Selection Committee,

I am writing to you to express my strong support as the project sponsor for the IHQI proposal: "Optimizing the care of patients with Tricuspid valve endocarditis related to intravenous drug abuse (IVDA) thorough interdepartmental and interhospital collaboration". As the Associate Chief Medication Officer for Quality and Safety, and leader of the Systems Opioid Stewardship initiative, I feel this project both aligns with my work and numerous hospital and systems priorities. By focused efforts on treating addiction in this high risk population, this project will reduce the amount of opiates prescribed at discharge and ultimately reduce opioid related deaths. This goal is paramount given the crisis we are facing in North Carolina – In 2017, North Carolina had a rate of opioid-related overdose deaths of 19.8 per 100,000 persons, while the national average was 14.6. This project also aims to reduce overall ED and health-care utilization, including readmissions, as well as to improve key hospital flow metrics including reducing LOS in high-demand surgical bed space, utilize the strengths of different facilities in order to provide the right care in the right place and reducing overall cost of care by reduction of repeat valve replacement surgeries.

Additionally, I am impressed with the interdisciplinary collaboration of this efforts. In academic medicine we tend to work in silos and this projects aims to break down traditional barriers between specialties and put the patient at the center of care. If this project is successful, as I fully expect it will be, it will provide a model for collaborative, patient centered care that can be expanded to other patient populations. In my role as project sponsor, I feel fully capable of and committed to providing mentorship and can aid in removing implementation barriers on behalf of the project team.

Although the strong merits and potential for this project alone warrant strong consideration for IHQI support, an additional factor to consider is the strength of the projected leader. Clare Mock has shown a commitment to Quality Improvement and Patient Safety during her short time at UNC and is passionate about continuing along this career path. She has completed both yellow and purple belt trainings at UNC, serves on numerous Quality and Safety related committees – including MCIC, Mortality Review, and Patient Safety Subcommittee and chairs both the Quality and Safety committees at Hillsborough. Additionally, she is committed to introducing other to quality and safety to others and providing mentorship as demonstrated by regularly participating in the PEQS (Physician Engagement in Quality and Safety) course, providing mentorship to a previous IHQI Project leader (Dr. Zach Willis, "Antibiotic Time-outs") and to several resident led projects at Hillsborough. While she does already have substantial QI training, she and I both believe participation in this program would significantly improve her QI skills related to project leadership and teambuilding and would deepen her understanding of the appropriate application of QI tools and techniques.

Sincerely,

Peggy McNaull MD

Peggy McNaull, MD
Associate Chief Medical Officer, Quality and Safety, UNC Hospitals
Vice Chair, Patient Safety Quality Improvement, Anesthesiology
Professor of Anesthesiology and Pediatrics
The University of North Carolina at Chapel Hill