Summary of Sepsis Technical Expert Panel (TEP) Evaluation of Measures

Patient Safety Measure Development and Maintenance

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Centers for Medicare & Medicaid Services (CMS)
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Project

Patient Safety Measure Development and Maintenance
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Task & Deliverable

Chapter 4: Quality Measure Development and Reevaluation
Deliverable 4.3 Summary of TEP Evaluation of Measures
Sepsis

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The materials presented in this document do not represent final measure specifications for the Sepsis outcome measure

Background

The Centers for Medicare & Medicaid Services (CMS) has contracted with IMPAQ International to develop and maintain patient safety measures of hospital harm for implementation in CMS programs. The contract name is Measure & Instrument Development and Support (MIDS) Patient Safety Measure Development and Maintenance. The contract number is 75FCMC18D0027. As part of its measure development process, IMPAQ convenes groups of stakeholders and experts who contribute direction and thoughtful input to the measure developer during measure development and maintenance.

IMPAQ is obtaining expert and stakeholder input to inform the development of a sepsis outcome measure. This report summarizes the feedback and recommendations made by the Technical Expert Panel (TEP) during the meetings to discuss the sepsis outcome measure. The report will be updated to include feedback and recommendations from future meetings as they occur.

Measure Development Project Team

The Patient Safety Measure Development and Maintenance project team is comprised of staff from IMPAQ, UC Davis, and Kennell & Associates. Presenters and moderators for this TEP meeting were Dr. Christian Sandrock and Dr. Patrick Romano of UC Davis.

Dr. Christian Sandrock, MD, MPH, is a practicing physician at UC Davis Health and a clinical subject matter expert (SME) for the project team on sepsis. Dr. Patrick Romano, MD, MPH, leads the measure development task for the project.

A full list of the staff supporting this work is listed in **Appendix B.**

Overview of the Technical Expert Panel

In alignment with the CMS Measures Management System Blueprint, the project team convened a Technical Expert Panel (TEP) to provide guidance on the development of a sepsis outcome measure. The role of the TEP is to provide guidance on key methodological and clinical decisions. The Sepsis TEP is comprised of 17 individuals representing a variety of viewpoints and backgrounds, including experience in critical care, acute care, and emergency care as well as expertise in sepsis morbidity and mortality, electronic health record (EHR) systems, quality improvement, and risk adjustment. Two TEP members represent patient/caregiver perspectives. The full TEP membership is listed in **Appendix A**. In addition to the TEP, the project team convened an additional group of experts for a Technical Advisory Group (TAG) to further inform the TEP and the measure developer on specific relevant topics for the measure development process.

TEP Purpose & Objectives

The TEP is comprised of individuals with knowledge of sepsis morbidity and mortality. The overarching goals of the TEP are to provide information, support, feedback, and perspective to the IMPAQ team on the development, specification, testing maintenance, re-evaluation, and implementation of a sepsis outcome measure for possible future use in CMS programs. The TEP's role is to provide input and advice to the measure developer on the information gathering, measure development, testing, maintenance and re-evaluation of a sepsis outcome measure.

The TEP will:

Review pre-meeting materials and provide written feedback

Discuss feedback and revisions during virtual meetings along with other relevant topics

Review and comment on meeting minutes and associated post-meeting documents along with any follow-up action items

TAG Purpose & Objectives

The TAG is comprised of individuals with knowledge of sepsis morbidity and mortality as well as measure development including risk adjustment methodologies. The TAG's role is to provide input to the measure developer and the TEP for consideration in the discussions throughout the measure development process.

Technical Expert Panel Meeting #3

October 05, 2021 3:00 PM ET

Summary of Presentation

The IMPAQ team convened the third TEP meeting to review previous recommendations and decisions from the TEP and CMS regarding measure development, discuss key points related to risk-adjustment and potential risk-adjustment variables, and solicit TEP input on these issues. Prior to the meeting, the IMPAQ team provided the TEP members with the presentation slide deck and background materials for review and preparation for discussion. During the meeting, the TEP members introduced themselves and shared any new personal disclosures. The TEP then engaged in discussion around the topics as presented by the IMPAQ team, including possible risk-adjustment variables based on claims-based factors and EHR-derived vital signs, treatment factors, and laboratory values, as well as handling of patients with COVID-19 and other viral or fungal infections.

Attendance:

TEP Members: Ian Barbash, Sara Cosgrove, Michael Klompas, Tiffany Osborn, Robert Panzer, Patricia Posa, Gregory Schmidt, Maureen Seckel, Sean Townsend, Donald Yealy, Sameer Kadri (non-voting[1]), Cristin Mount (non-voting), Shelley Magill (federal observing[2]), Anthony Fiore (federal observing)

Not Present: Rosie Bartel, Marisha Burden, Steven Coffee, David Classen, Jean Prohl

TAG Members: Emily Aaronson, Isbelia Briceno, Sarah Doernberg, Mohamad Fakih, Stephen Goins, Tatiana Ledneva, Mitchell Levy, Denise Morse, Kathleen Rauch, Chanu Rhee

Not Present: Avery Tung

CMS: Annese Abdullah-Mclaughlin, Jacob Quinton

IMPAQ: Kendall Hall, Mia Nievera, Anna Michie, Hannah Klein, Leah Dillard, Stacie Schilling, Bo Feng, Michelle Lefebvre, Katie Magoulick

Kennell: Allison Russo, Christina Superina, Courtney Colahan

UC Davis: Patrick Romano, Christian Sandrock, Garth Utter, Monika Ray, Meghan Weyrich

[1] Non-voting members are included in the discussion, but do not vote due to conflicts with their other work.

[2] Federal observing members are included on the TEP for knowledge sharing purposes across federal agencies, but do not provide guidance to the measure developer and do not vote with the TEP.

Summary of TEP Discussion

1. **Previous Recommendations and Decisions:** Christian Sandrock reviewed the TEP input from the first two TEP meetings, including developing a 30-day risk-adjusted mortality outcome measure focused on community-acquired "severe sepsis" with mortality attributed to the first hospital in a transfer sequence. The measure will be broadly aligned with the SEP-1 bundle and will use Medicare inpatient and ED claims supplemented with electronic clinical data from the EHR.

    a. **Additional Expert Input:** One of the experts raised concerns not just around the accuracy of ICD-10-CM codes for sepsis but their subjectivity and variability.

        i. Patrick Romano said that our testing phase will include a comparative evaluation to determine what we would miss if we relied entirely on markers of physician behavior (i.e., information about the timing of antibiotic administration and timing of cultures) versus what we would miss if we relied entirely on the ICD-10-CM coded diagnosis.

2. **Risk Adjustment:** Patrick Romano summarized how previous cohort studies and clinical trials have stratified or adjusted for sepsis severity at presentation. He also reviewed how existing claims-based measures (PSI 04) adjust for sepsis and how the Biomedical Advanced Research and Development Authority (BARDA) has used claims data to explore the epidemiology of sepsis. Finally, Patrick Romano reviewed the risk adjustment approach used in the NYSDOH sepsis hospital mortality measure, including relevant time windows and analytic considerations.

    a. **TEP Input:** Patrick Romano opened up a discussion on risk-adjustment and asked colleagues from NYSDOH to share their recent experience with their risk-adjusted measure

        i. Robert Panzer shared that NYSDOH is shifting to an electronic system for data extraction, similar to the CMS measure under discussion.

            1. Kathy Rauch said that the first mandatory submission deadline was in September 2021 and that included sepsis cases back to December 2020.

2. Patrick Romano asked whether the NYSDOH will be able to link the EHR extracted data with the hospital claims data (i.e., NY SPARCS).

3. Robert Panzer confirmed that the submitted data are already a combination of those two sources.

4. **Expert Input:** The NYSDOH team elaborated on the issue with multiple sepsis admissions and related considerations when choosing not to use a hierarchical model. The team confirmed that they've been rolling out the electronic data collection over several years and have undergone several "research" phases and are likely still some time away from public reporting (of electronically extracted data).

ii. Sara Cosgrove raised the issue of attributing organ dysfunction to the sepsis episode versus pre-existing comorbid conditions. She discussed work the TREWS (Targeted, Real-Time Early Warning System – an automated sepsis trigger tool) team has done to increase the accuracy of the EHR data.

    1. Patrick Romano said that we've had separate conversations with one of the lead developers (Suchi Saria) about their decision rules (for example, certain indicators of organ dysfunction would apply only if the patient doesn't have certain comorbid conditions that could trigger those same indicators).

iii. Ian Barbash noted the issue of missing lactate and the significance of lactate. He shared that his research has found that whether lactate is checked is often a marker of the clinician's level of concern about the patient, and this assessment is not necessarily reflected in other structured data in the health record. He has identified a relationship where the highest mortality rate is among patients with a high lactate, an intermediate mortality rate is observed among patients where the lactate is checked but is normal, and the lowest mortality rate among patients in whom lactate is not checked.

1. Patrick Romano said that another approach would be to impute a normal value for each missing lactate (essentially using a category for missing lactate as an indicator of reverse severity) and asked for comments on that approach.

2. Don Yealy said that this approach was how his team imputed missing ABG values in their work for the pneumonia severity index. They treated missing ABG as a normal value, and then performed sensitivity analyses around it instead of creating an alternative imputation approach.

3. Sameer Kadri and one other expert agreed with this approach and said that it aligns with the "non-randomness" that Ian Barbash noted.

iv. Patrick Romano asked for the TEPs input regarding the time windows used in the NYSDOH measure, as well as the time windows in the SOFA measure.

1. Ian Barbash thought that using SOFA score within 24 hours of hospital admission is fairly reasonable for defining community-acquired sepsis.

2. Don Yealy said that time-zero is not so much about illness onset but when was sepsis both present and actionable; arrival at the hospital or ED may not always be the correct timepoint.

3. Mitchell Levy said that patients who show up in the ED may not yet meet the definition of severe sepsis or sepsis and that using a time-zero that is triage time (which is effectively what New York State uses) is fraught with a lot of controversy.

4. Tiffany Osborn shared that they've implemented a prompt asking physicians whether they now think the patient is infected and this helps to establish a time-zero. If a patient comes in and the physician is not sure whether they have an intraabdominal infection or viral gastritis, the physician is able to say that sepsis is unclear at this point in time; the prompt comes up again later

when there is more information in the chart and the physician has another opportunity to determine whether this is sepsis or not.

a. Patrick Romano noted that there would not be any way to operationalize this on a national level for a measure at this time but that we can use structured fields in the EHR to think through the logic process.

5. Robert Panzer said that New York originally gathered several times and analyzed the data using different times, but there was a concern about gamesmanship if they declared an official time-zero (e.g., people being registered but not triaged).

6. Sara Doernberg asked where the T-24h blood culture and antibiotic administration data would come from if we are tethering the time window to arrival or admission.

a. Patrick Romano explained that when patients arrive by ambulance or helicopter in critical condition, often blood is obtained before the patient is actually registered and before the encounter officially begins so we need to allow a little backwards time to account for that.

v. Tiffany Osborn asked for additional clarification about the need to account for this timing in a mortality outcome measure or whether this has evolved into a combined process and outcome measure.

1. Patrick Romano confirmed that this is a pure outcome measure, and explained the need to be sure we are not adjusting for things that reflect the process of care because we rely on the difference between observed and expected outcomes to represent the quality domain – so in this case, the expected outcome reflects the severity of the patient when they present to the hospital. Patients often develop characteristics reflecting their initial state of sepsis on a delayed basis (after they present to the hospital), so this indicates that we cannot rely entirely on the first set of values.

2. Sean Townsend noted the challenge of identifying any later of presentation of sepsis using laboratory values; he could not identify any laboratory marker that could be used to distinguish evolving sepsis (present at arrival) from time-zero for later sepsis.

    a. Patrick Romano said that creatinine is one example where the initial creatinine doesn't reflect the organ dysfunction already occurring and the creatinine bumps up 24-48 hours later.

    b. Tiffany Osborne said that isn't necessarily true and asked whether we are conflating diagnosis and diagnostics with risk-adjustment.

    c. Patrick Romano said that there is inherently some conflation because any variable that is used to define whether the patient is in the denominator or not can also be used for risk adjustment. For example, any of the SOFA variables that would be used to define whether the patient actually has sepsis can also be used as prognostic markers once you've decided that patient has sepsis.

3. Sean Townsend asked whether we are using these time points as an indication at which we should obtain lab values for risk adjustment around that activity, because that is a marker that the clinician has identified a sepsis patient or a possible sepsis patient.

    a. Patrick Romano said that we think the vast majority of these patients are coming through the ED and so the arrival at the ED would define the time window. However, if the situation previously discussed – patients who do not meet sepsis criteria when they first present but do several hours later – is common then it might be reasonable to take an alternative approach.

    b. Don Yealy noted that preventing an infection from becoming sepsis or septic shock is completely different

than changing the trajectory and outcomes for people who have some form of sepsis at presentation, and that we may not be able to draw observations and inferences from the original treatment trials regarding patients who qualified as having severe sepsis or septic shock.

4. Maureen Seckel asked whether we should use the APACHE score, which uses the most deranged value in the first 24 hours.

    a. Patrick Romano said that is a possible approach, and asked whether there is any concern that the most deranged value may reflect mistreatment or undertreatment in the ED.

    b. Robert Panzer thought that a 24-hour window is too long.

5. Patricia Posa asked for confirmation that we are trying to decide when the patient meets sepsis criteria (which is where the antibiotic use and blood culture time window is used) so that we can then take the data around that time for risk adjustment.

    a. Patrick Romano confirmed and noted that the focus is on the window for ascertaining risk factors.

    b. Patricia Posa agreed that 24 hours is too late because there could be treatment effects (or lack of treatment effects).

    c. Sean Townsend agreed and said that a 24-hour window doesn't make sense if timely treatment matters.

6. Patrick Romano asked the TEP to suggest a more appropriate time window and whether the time windows should be different for vital signs versus laboratory parameters.

    a. Sean Townsend raised concerns about how to get away from using the first set of lab values, especially if this is primarily an ED population.

b. Tiffany Osborn said that part of the benefit of the TREWS model was that the risk assessment tool was based upon information available at presentation instead of treatment or inpatient evolution.

7. Patrick Romano noted convergence around the idea of using the initial vital signs and the first measured set of lab values, as long as those lab values are within a defined time window (6-12 hours).

    a. Ian Barbash, Patricia Posa and Christin Mount agreed.

    b. Tiffany Osborn noted that we need to also consider interactions (e.g., between age, lactate, comorbidities).

    c. Patrick Romano said that we will explore those during the analytic stage.

8. Garth Utter asked whether there are concerns regarding the quality of the data if only one value is used and noted that this may be more problematic with vital signs than with labs.

9. Sameer Kadri asked how we would handle patients with delayed recognition of sepsis (i.e., whether we would not count patients whose labs were drawn at hour 7, if we are assuming a 6-hour window based on time of lab draw).

    a. Michael Klompas agreed that patients presenting with initially normal findings is a common scenario.

    b. Patrick Romano noted that the TEP has expressed a lot of concern about the ambiguity when a patient's condition worsens after presentation and whether that is due to neglect or the natural evolution of their underlying illness. Based on the discussion, if the patient did not meet SOFA criteria (organ dysfunction) in the first 6 hours, then they would be excluded from the measure.

10. Patrick Romano asked for additional feedback regarding exclusion of patients who do not meet SOFA criteria (organ dysfunction) within the first 6 hours.

    a. Ian Barbash thought it made sense to use the same time window for establishing the numerator population as well as for risk adjustment, thereby excluding these patients.

    b. Sameer Kadri asked whether we can do sensitivity analyses of 6 hours versus 12 hours to see how many people would be missed with a 6-hour window.

    c. Ian Barbash agreed and suggested that we look at whether hospital rankings change when the time window is altered.

11. Sarah Doernberg noted that this approach focuses on community-onset sepsis and excludes community-acquired sepsis that presents after admission.

    a. Patrick Romano agreed that patients who present with a urinary tract infection or pneumonia but are not treated effectively and become septic under observation, would be considered a different cohort.

    b. Michael Klompas asked, and Patrick Romano confirmed, that this cohort would not be captured by the measure.

12. Patrick Romano asked for TEP input regarding how to handle patients with co-occurring sepsis and COVID-19 (exclusion versus risk-adjustment)

    a. Sarah Doernberg and Patricia Posa agree with excluding viral and fungal sepsis.

    b. Sarah Doernberg noted that including viral infections might lead to inappropriate antimicrobial use.

    c. Sara Cosgrove favors excluding COVID-19 and other viruses since they are often identified in the ED with rapid

testing and are likely not to respond to bundle elements but did not agree that candidemia should be handled the same way.

d. Tiffany Osborn agreed that if the etiology is viral then the patient should be excluded and agreed with previous comments about not encouraging antibiotics when they may not be necessary. Tiffany Osborn noted that candidemia and fungal infections can be difficult to diagnose within the first 6 hours of presentation and that it makes sense to focus on bacterial infections (while not excluding fungal infections that present similarly).

e. Patrick Romano said that the team will explore this question of viral versus fungal etiologies further using available data.

f. Sameer Kadri noted that a pandemic-mediated influx of patients with viral infections can disrupt process of care and the usual care of non-COVID septic patients. He raised concerns that including COVID-19 patients would also introduce ambiguity around the affected processes of care that may not be the hospital's fault.

g. Tiffany Osborn agreed with Sameer Kadri.

h. Patrick Romano noted that the team is exploring some of the spillover effects that Sameer Kadri and Tiffany Osborn described.

13. **Expert Input:**

a. The NYSDOH team said that they did not want to exclude cases based on missing lactate and chose a compromise by applying this imputation. The NYSDOH team is planning to explore the relationship observed by Ian Barbash in their data. The NYSDOH team confirmed that they have not

used any process measures or treatment protocols in their risk-adjustment models.

b. One expert thought that we don't necessarily need to focus on when time-zero is for sepsis onset since we decided to focus on community-acquired sepsis, and you can anchor the time to arrival at the hospital or the ED. He did note that using a 24-hour time window may be controversial, as SOFA scores (organ dysfunction) over such a broad time window arguably reflect inadequate care for certain conditions, such as hypotension. This problem could even apply to creatinine and other laboratory markers. This expert also suggested using the initial vital signs and first measured lab values (so long as they are measured within a certain number of hours). This expert felt that 6 hours is a reasonable time window for labs, if we are basing the time window around the time of lab draw and not the time of lab result. This expert also agreed with TEP suggestions to explore the impact of altering time windows not only on ascertainment of sepsis, but also on hospital rankings. This expert raised concerns about aligning so closely with the SEP-1 process measure and noted that the goal of a risk-adjusted outcome measure should be to catalyze better global hospital care encompassing initial early care in the ED and effective daily management during the inpatient stay.

c. Another expert raised concerns about narrowing the population too much by excluding patients with COVID-19 and potentially missing a large portion of the population.

Summary of TEP Preference Polling Results

The TEP members were asked to indicate their preference on three questions. The results of the preference polling are as follows:

Exhibit 1: TEP Preference Polling Results

Preference Polling Question	TEP Preference Polling Results
Do you agree with our recommendation to include claims-based demographic (age, sex), pre-existing comorbidity, and primary site/source of infection factors in risk-adjustment?	91% Yes (10 votes) 0% No (0 votes) 9% Maybe (1 vote)
Do you agree with our recommendation to include EHR-derived vital signs (systolic BP/MAP, temperature, HR, RR) and treatment factors (vasopressors, mechanical ventilation) at presentation to the Emergency Department, supplemented by key SIRS-related or SOFA-related laboratory values (WBC/band count, platelet count, creatinine, INR, bilirubin, PaO2/FiO2), in risk-adjustment?	90% Yes (9 votes) 0% No (0 votes) 10% Maybe (1 vote)
Do you agree with our recommendation to exclude all patients with COVID-19 and other confirmed viral or fungal infections from the proposed measure?	NA – the measure development team will analytically explore the question of viral versus fungal infections before bringing this to a TEP vote.

Conclusions and Next Steps

Following the TEP meeting, the MIDS Patient Safety team produced the meeting summary report. IMPAQ plans to collect availability for the fourth TEP meeting in the coming weeks, aiming for Spring 2022 to hold the next TEP meeting. During the fourth TEP meeting, IMPAQ plans to review the draft measure specifications and measure testing plan, as well as summarize findings for some of the analytic questions arising out of the third TEP meeting (i.e., sensitivity analyses around time windows, viral versus fungal infections).

Appendix A: TEP Composition List

Name, Credentials, and Professional Role	Organizational Affiliation, City, State	Conflict of Interest Disclosure
Ian Barbash, MD, MS Physician Researcher	University of Pittsburgh; UPMC Health System Pittsburgh, PA	AHRQ Grant
Rosie Bartel, MA Patient Advisor & Advocate	PFA network Chilton, WI	None
Marisha Burden, MD, FACP, SFHM Division Head of Hospital Medicine, Academic Hospitalist	Society of Hospital Medicine; University of Colorado School of Medicine Denver, CO	None
David Classen, MD, MS Professor of Medicine and Infectious Diseases	University of Utah School of Medicine, VA SLC, Pascal Metrics Salt Lake City, UT	None
Steven Coffee, Lt Col, USAF, MA, EMCQSL Patient & Family Caregiver	MedStar Georgetown University Hospital Patient and Family Advisory Council for Quality and Safety Woodbridge, VA	None
Sara Cosgrove, MD, MS Professor, Department of Medicine, Division of Infectious Diseases	The Society for Healthcare Epidemiology of America Baltimore, MD	None
Michael Klompas, MD, MPH, FIDSA, FSHEA Infectious Disease Specialist, Hospital Epidemiologist, Professor of Population Medicine	Brigham & Women's (ID), Harvard Boston, MA	CDC project on sepsis definitions
Tiffany Osborn, MD, MPH, FCCM, FACEP, FAAEM Director: Barnes-Jewish Hospital Sepsis Quality Improvement; Physician Champion: BJC System Sepsis Quality Improvement	Barnes-Jewish Children's Hospital System St. Louis, MO	BJH Foundation Grant; Advisory Board for Inflammatix, Becker Medical, and Viven Health
Robert Panzer, MD Chief Quality Officer, U of R Medical Center & Strong Memorial Hospital, Associate VP for Patient Care Quality and Safety	University of Rochester Medical Center Rochester, NY	None

Name, Credentials, and Professional Role	Organizational Affiliation, City, State	Conflict of Interest Disclosure
Patricia Posa, RN, BSN, MSA, CCRN-K, FAAN Quality and Patient Safety Program Manager	Michigan Medicine; University of Michigan Ann Arbor, MI	None
Jean Proehl, RN, MN, CEN, CPEN, TCRN, FAEN, FAAN Emergency Clinical Nurse Specialist	Emergency Nurses Association Cornish, NH	None
Gregory Schmidt, MD, FCCP Professor, Associate CMO, Associate Chief Quality Officer	University of Iowa Hospitals Iowa City, IA	Author for UpToDate
Maureen Seckel, RN, APRN, MSN, ACNS-BC, CCNS, CCRN, FCNS, FCCM Clinical Nurse Specialist Critical Care and Sepsis Coordinator	Christiana Care Newark, DE	None
Sean Townsend, MD Vice President Quality and Safety, CMS Measure Steward for SEP-1	California Pacific Medical Center – Sutter Health, San Francisco, CA	Sep-1 Measure Steward
Donald Yealy, MD Professor and Chair of Emergency Medicine	University of Pittsburgh; UPMC Pittsburgh, PA	NHLBI grant
Sameer Kadri, MD, MS, FIDSA Head, Clinical Epidemiology Section; Associate Professor of M (Adjunct), USUHS ***Non- Voting Member***	Critical Care Medicine Department, NIH Clinical Center Bethesda, MD	None
Cristin Mount, MD, FACP, COL, USA Deputy Commander Medical Services ***Non- Voting Member***	Madigan Army Medical Center Tacoma, WA	None
Runa Gokhale, MD, MPH Medical Officer, Division of Healthcare Quality Promotion ***Federal Observing Member***	Centers for Disease Control and Prevention Atlanta, GA	None
Anthony Fiore, MD, MPH Chief of the Epidemiology Research and Innovations Branch, Division of Healthcare Quality Promotion ***Federal Observing Member***	Centers for Disease Control and Prevention Atlanta, GA	None

Appendix B: Project Staff

IMPAQ Team	
Name	**Role**
Kendall Hall, MD, MS	Project Director
Anna Michie, MHS, PMP	Project Manager
Mia Nievera, MSN, RN	eCQM Lead
Stacie Schilling, MPH	NQF Lead
Bo Feng, PhD	NQF SME
Michelle Lefebvre	eCQM SME
Katie Magoulick	eCQM SME
Hannah Klein, PMP	TEP Lead
Leah Dillard	TEP Meeting Coordination & Support
Kennell Team	
Name	**Role**
Allison Russo, DrPH, MPH	Information Gathering Lead
Christina Superina, MPP	Project Manager
Sarah Irie	Team Member
Courtney Colahan	Team Member
UC Davis Team	
Name	**Role**
Patrick Romano, MD, MPH	PSI Measure Development Lead
Christian Sandrock, MD, MPH	Clinical SME
Garth Utter, MD, MSc	Clinical SME
Daniel Tancredi, PhD	Statistical SME
Guibo Xing, PhD	Measure Testing Lead
Monika Ray, PhD	Computer Science SME
Meghan Weyrich, MPH	Project Manager