
CBE ID

4360

Title

CVD Risk Assessment Measure - Proportion of pregnant/postpartum patients who receive CVD Risk Assessment with a standardized tool.

Project

Initial Recognition and Management

Endorsement Status

Not Endorsed

E&M Committee Rationale/Justification

Not Endorsed due to No Consensus

Is Under Review

No

Previous Endorsement Cycle

Spring 2024

Steward

University of California, Irvine

1.0 New or Maintenance

New

1.3 Electronic Clinical Quality Measure (eCQM)

No

1.6 Measure Description

The University of California, Irvine (UCI) implemented and tested a CVD risk assessment tool that immediately identifies patients who are at increased risk for CVD or developing CVD. This tool can be integrated into the electronic health record (EHR) system.

The population includes all patients who have a prenatal or postpartum visit at a healthcare facility or hospital network office; this includes pregnant and postpartum minors. The denominator in the CVD Risk Assessment Measure is all patients seen for pregnancy or postpartum care at a healthcare facility or hospital network. A hospital network includes Labor and Delivery (L&D), outpatient care in hospitals or at affiliated clinics, and private providers contracted with hospitals for delivery. The measure excludes patients who have another reason

for visiting a clinic [not prenatal or postpartum care] and have a positive pregnancy test but plan to terminate the pregnancy or seek prenatal services elsewhere.

This measure determines the percentage of pregnant or postpartum patients at a given clinic who were assessed for CVD risk with a standardized tool, such as the CVD risk assessment algorithm developed by the California Maternal Quality Care Collaborative (CMQCC). The aim is to perform CVD risk assessment using a standardized tool on all (100 %) eligible pregnant/postpartum patients. All patients should be assessed for CVD risk at least once during their pregnancy and, if needed, additional times when new symptoms present during the pregnancy and/or postpartum period. A threshold has still to be determined (“at least xxx % of patients who received risk assessment”). The measure can be calculated on a quarterly or annual basis.

1.7 Composite Measure

No

1.7 Measure Type

Process

1.8 Level of Analysis

Clinician: Group/Practice, Clinician: Individual

1.9 Care Setting

Birth Center, Clinician Office/Clinic, Emergency Department, Hospital: Inpatient, Hospital: Outpatient, Urgent Care - Ambulatory

1.10 Measure Rationale

Cardiovascular disease (CVD) is a leading cause of maternal mortality in the United States, responsible for over one-third of pregnancy-related deaths. Misdiagnosis of CVD is expected due to similar symptoms caused by pregnancy. Hence, it is crucial to identify pregnant and postpartum people at risk for CVD disease and/or with previously unknown CVD with a standardized risk assessment. Monitoring of these patients and timely interventions contribute to the prevention and mitigation of CVD-related complications and mortality. The proposed measure will allow clinicians to gauge the extent to which they use a standardized tool in their clinic practice and inform interventions to encourage its use.

1.11 Measure Webpage

<https://sites.uci.edu/cvdriskassessmentmeasures/>

1.13 Data Dictionary

Not attached. I attest that all information will be provided where codes and/or value sets are needed (1.14a - 1.15c).

1.13a Attach Data Dictionary

[CPT-ICD 10 CodeBook_0.xlsx](#)

1.14 Numerator

The percentage of all pregnant and postpartum patients who received a CVD risk assessment with a standardized tool

1.14a Numerator Details

Pregnant and postpartum patients who receive risk assessment for CVD risk via a standardized risk assessment tool. Currently the only available tool is that developed by the California Maternal Quality Care Collaborative (CMQCC). A completed CVD risk assessment using the tool will have a calculated risk score and clinician signature (group E “Cardiovascular Screening Completed” in the CPT-ICD 10 Code Book). Patients receive CVD risk assessed at their first or the subsequent contact with the provider for pregnancy-related care (prenatal visit, L&D, postpartum visit). The measure can be calculated quarterly or annually. For the complete list of CVD confirmation CPT codes, refer to the Excel attachment “CPT – ICD 10 Code Book.”

1.15 Denominator

All patients receiving prenatal care and postpartum care at a given clinic, hospital, healthcare network, or private practice (group B “Pregnant and Postpartum Office Visit” in the CPT-ICD 10 Code Book). Any person who is receiving antepartum or postpartum care in a healthcare system should undergo risk assessment.

1.15a Denominator Details

Any patient who is pregnant or postpartum who attends a pregnant or postpartum clinic visit at any participating site should undergo a risk assessment.

Patients (a) who have an office visit for prenatal or postpartum care at the intervention site (regardless of gestational age or prior prenatal care at other sites), (b) Any age (including pregnant and postpartum minors), (c) Outpatient OB visit at the hospital or in affiliated clinics; Labor and Delivery including private providers contracting with the hospital for delivery. The measure can be calculated annually or quarterly, depending on the patient volume.

1.15b Denominator Exclusions

Patients who have a reason other than ongoing pregnancy care for visiting the clinic (Group C).

1.15c Denominator Exclusions Details

Patients who have another reason for visiting the clinic [not prenatal or postpartum care] and have a positive pregnancy test but have not established the clinic as OB provider (plan to terminate the pregnancy or seek prenatal services elsewhere).

1.16 Type of Score

Rate/proportion

1.17 Measure Score Interpretation

Better performance = Higher score

1.18 Calculation of Measure Score

Denominator: All patients who have an outpatient or inpatient visit for pregnancy, labor and delivery, or postpartum care receive a risk assessment for CVD at the first or subsequent encounter with the health care system or clinic. The measure can be calculated for clinician group/practices and individual clinicians regardless of their patient volume (Group A Pregnancy episode, Group B prenatal or postpartum office visit in codebook, and Group C Exclusion Criteria for Risk Assessment)

Numerator: The numerator for this measure is patients who receive a score to be at risk for CVD using a validated tool. If a patient is found to be at risk, the algorithm provides the clinician with a set of potential referrals for tests and cardiovascular consults (a sidebar with a Smartset in the electronic health record or a handout). (Group E: Cardiovascular Risk Assessment Completed)

Measure Reporting: The data on individual patients can be aggregated by the EHR reporting system and be requested by the medical director on a regular basis for the site and quality improvement activities.

Time and Period of Data: Depending on the patient volume, the measure can be calculated on an annual or a quarterly basis for public reporting purposes.

Data extraction for public reporting purposes: The IT department extracts the number of eligible patients (Medical Record Number, visit date, denominator) and the number of patients who received a risk assessment (Date risk assessment was completed, numerator).

1.19 Measure Stratification Details

While not part of the measure, facilities may decide to extract data by subgroups, such as clinic site, clinician, race/ethnicity of mother, insurance, gestational age, date of birth of infant (to identify whether the assessment was completed during pregnancy or postpartum).

1.20 Types of Data Sources

Electronic Health Records, Paper Patient Medical Records

1.25 Data Source Details

The California Maternal Quality Care Collaborative (CMQCC) developed a CVD risk assessment tool that guides stratification and initial evaluation of symptomatic or high-risk pregnant or postpartum patients. This is currently (May 2024) the only standardized tool to identify pregnant and postpartum patients who are at risk for CVD. The acceptability of the tool is further strengthened by the support it has received from ACOG, and its inclusion in the CVD bundle by the Alliance for Innovation for Maternal Health.

The tool is integrated into EPIC and Cerner electronic health records, and all data can be retrieved from the EHR. For facilities that do not have electronic health record systems or patient volumes to warrant the inclusion of the tool in the EHR system, the tool can be administered on a hardcopy and the score calculated manually. Facilities who administer the tool manually, can monitor follow up of patients with positive risk assessment in an excel file.

1.26 Minimum Sample Size

N/A

2.1 Attach Logic Model

[Conceptual Framework_0.pdf](#)

2.2 Evidence of Measure Importance

Cardiovascular disease (CVD) is the leading cause of maternal mortality in the United States, accounting for over one-third of all pregnancy-related deaths.¹ *Peripartum cardiomyopathy (PPCM) constitutes the largest group among CVD-related deaths. **Twenty-four percent** of ALL CVD pregnancy-related deaths (and 31% of cardiomyopathy deaths) were determined to be **potentially preventable**.*² CVD also accounts for many-fold higher maternal morbidity, a longer length of hospital stays, intensive care unit (ICU) admissions, and future pregnancy risks.³ Racial/ethnic disparities in pregnancy-related mortality have also been well established.^{4, 5} African American patients exhibit 3-12 times higher mortality^{1, 6, 7} as they are more likely to have pre-existing CVD,³ hypertensive disorders of pregnancy^{3, 5} and peripartum cardiomyopathy (PPCM)^{5, 8} when compared to patients from other racial /ethnic groups. The diagnostic challenge lies in the similarity between pregnancy-induced hemodynamic symptoms and those of CVD, leading to frequent misdiagnoses. A structured, standardized CVD risk assessment tool is imperative. Such an assessment, particularly during the maiden encounter with an obstetrics provider, promises to diminish CVD-related morbidity and mortality rates.

CVD risk factors like high blood pressure or comorbidities lead to the development of CVD later in life, including but not limited to preeclampsia, hypertensive disorders, and metabolic disorders.⁹ There is a need to establish standardized CVD risk assessment tools to triage pregnant and postpartum patients and provide options for appropriate follow-up. This population-wide risk assessment is likely to reduce CVD-related morbidity and mortality, particularly among African American patients. Use of this measure improves the accurate diagnosis of heart failure rather

than attributing symptoms of persistent cough and shortness of breath, and bilateral infiltrates on chest X-ray to pneumonia or pregnancy.

Pregnant and postpartum patients who die from CVD represent the most extreme consequence of missed or delayed recognition of CVD. Accordingly, any triage algorithm should be able to detect the most serious cases and not return a ‘false negative’ assessment in a patient with underlying CVD. To assess how well the triage algorithm would have identified pregnant and postpartum patients with the most need of further work-up, the authors compared the 64 cardiovascular disease deaths identified by CA-PAMR for 2002-2006, using the seven critical risks and abnormalities, including heart rate, systolic blood pressure, respiration rate, oxygen saturation, tachypnea, cough, and wheezing. The analysis found that the use of the algorithm would have identified 56 out of 64 (88%) cases of CVD.¹ The proportion of patients identified increased to 93% when the authors restricted comparison to the 60 cases of patients who were symptomatic or had sufficient documentation with which to compare to the algorithm.¹

To address these issues, CMQCC, together with the California Department of Public Health: Maternal, Child and Adolescent Health Division, published the *Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum* Toolkit in 2017.² The California Maternal Quality Care Collaborative (CMQCC) developed a CVD risk assessment algorithm, that guides stratification and initial clinical evaluation of symptomatic or high-risk pregnant or postpartum patients. The toolkit includes a risk assessment algorithm, which guides the stratification and initial evaluation of symptomatic or high-risk pregnant or postpartum patients. The algorithm risk stratifies patients using 18 parameters, including the patient’s history, abnormal symptoms, vital signs, and physical examination findings to identify patients who warrant further cardiac workup. The CMQCC tool is based on the clinical presentation and quality improvement opportunities identified in CVD related maternal deaths and was implemented and evaluated at major hospital systems.^{2,10}

Reports using the CMQCC cardiovascular risk assessment algorithm and other methodologies using physical examination and electrocardiograms as screening tests for CVD detection in pregnant patients have been published to identify pregnant patients at increased risk of CVD.

¹¹⁻¹⁴ Most of the existing literature focuses on postpartum CVD risk assessment in patients with adverse pregnancy outcomes as a surrogate for future CVD.¹⁵

The CMQCC Cardiovascular Disease in Pregnancy toolkit also includes resources for providers, infographics for patients on signs and symptoms of CVD, future CVD risk and long-term health issues, contraception options, and planning a pregnancy with known CVD. The toolkit also includes a discussion on racial and ethnic disparities in CVD prevention and diagnosis.

National professional organizations call for the need to standardize CVD risk assessment during pregnancy and the postpartum period. The consensus statement of the American Heart indicates that screening pregnant people for cardiac conditions in all care settings is a key step to lowering CVD-related maternal mortality.¹⁶ Earlier recognition of a previously unknown CVD or a timely diagnosis of pregnancy-associated cardiomyopathy is bound to improve maternal and fetal outcomes.¹⁶

The Alliance for Innovation on Maternal Health Cardiac Conditions in Obstetrical Care includes the CMQCC CVD Assessment Algorithm for Pregnant and Postpartum Patients in the Cardiac Conditions in Obstetrical Care Bundle (COCC).⁶ In the bundle, cardiac conditions refer to disorders of the cardiovascular system that may impact maternal health. Such disorders may include congenital heart disease or acquired heart disease, including but not limited to cardiac valve disorders, cardiomyopathies, arrhythmias, coronary artery disease, pulmonary hypertension, and aortic dissection despite limitations, recognized as an emerging best practice and an important tool for assessing symptoms and risk in a standardized way.

The American College of Obstetricians and Gynecologists (ACOG) recently endorsed the California (CA) cardiovascular disease (CVD) risk assessment algorithm for pregnant and postpartum patients. We believe our empirical validity analysis (described in the validity section) also adds important evidence supporting this measure's endorsement by PMQ.

1. Creanga AA, Syverson C, Seed K, Callaghan WM. Pregnancy-Related Mortality in the United States, 2011–2013. *Obstet Gynecol*. 2017;130(2):366–373. doi:10.1097/AOG.0000000000002114.
2. Hameed AB, Foster E, Main EK, Khandelwal A, Lawton ES. Cardiovascular Disease Assessment in Pregnant and Postpartum Women | California Maternal Quality Care Collaborative. Cardiovascular Disease in Pregnancy Toolkit. Published November 2017. Accessed June 14, 2019. <https://www.cmqcc.org/resource/cardiovascular-disease-assessment-pregna...>
3. Fraser A, Nelson SM, Macdonald-Wallis C, et al. Associations of pregnancy complications with calculated cardiovascular disease risk and cardiovascular risk factors in middle age: the Avon Longitudinal Study of Parents and Children. *Circulation*. 2012;125(11):1367–1380. doi:10.1161/CIRCULATIONAHA.111.044784
4. Say L, Pattinson RC, Gülmezoglu AM. WHO systematic review of maternal morbidity and mortality: the prevalence of severe acute maternal morbidity (near miss). *Reprod Health*. 2004;1(1). doi:10.1186/1742-4755-1-3.
5. Petersen EE, Davis NL, Goodman D, et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. *MMWR Morb Mortal Wkly Rep*. 2019; 68:762–765. doi:10.15585/mmwr.mm6835a3.
6. Hameed AB, Lawton ES, McCain CL, et al. Pregnancy-related cardiovascular deaths in California: beyond peripartum cardiomyopathy. *Am J Obstet Gynecol*. 2015;213(3):379.e1–379.e10. doi:10.1016/j.ajog.2015.05.008.

7. Gentry MB, Dias JK, Luis A, Patel R, Thornton J, Reed GL. African-American Women Have a Higher Risk for Developing Peripartum Cardiomyopathy. *J Am Coll Cardiol*. 2010;55(7):654-659. doi:10.1016/j.jacc.2009.09.043.
8. Hunter S, Robson SC. Adaptation of the maternal heart in pregnancy. *Br Heart J*. 1992;68(6):540-543. doi:10.1136/hrt.68.12.540.
9. Cusimano MC, Pudwell J, Roddy M, Cho CKJ, Smith GN. The maternal health clinic: an initiative for cardiovascular risk identification in women with pregnancy-related complications. *American Journal of Obstetrics and Gynecology*. 2014;210(5):438.e1-9. doi:<https://doi.org/10.1016/j.ajog.2013.12.001>
10. Hameed AB, Tarsa M, Graves CR, et al. Cardiovascular Risk Assessment as a Quality Measure in the Pregnancy and Postpartum Period. *JACC Adv*. 2023;2(1):100176-100176. doi:<https://doi.org/10.1016/j.jacadv.2022.100176>
11. Black A, Gute J, Kindschuh A. Implementing a Cardiovascular Screening Tool for High-Risk Pregnant Women in a Hospital Setting. *Nurs Womens Health*. 2022;26(1). doi:10.1016/j.nwh.2021.11.001
12. Blumenthal EA, Crosland BA, Senderoff D, et al. California Cardiovascular Screening Tool: Findings from Initial Implementation. *AJP Rep*. 2020;10(4). doi:10.1055/s-0040-1718382
13. Dinarti LK, Nurdianti DS, Hartopo AB, et al. The screening of heart disease by cardiac auscultation and electrocardiography examination in pregnant women in Puskesmas Tegalrejo, Yogyakarta, Indonesia. *Journal of Community Empowerment for Health*. 2021;4(3). doi:10.22146/jcoemph.64970
14. Adedinsewo DA, Johnson PW, Douglass EJ, et al. Detecting cardiomyopathies in pregnancy and the postpartum period with an electrocardiogram-based deep learning model. *European Heart Journal - Digital Health*. 2021;2(4). doi:10.1093/ehjdh/ztab078
15. Gladstone R, Pudwell J, Pal R, Smith G. Referral to Cardiology Following Postpartum Cardiovascular Risk Screening. *Journal of Obstetrics and Gynaecology Canada*. 2019;41(5). doi:10.1016/j.jogc.2019.02.182
16. Hameed AB, Haddock A, Wolfe DS, et al. Alliance for Innovation on Maternal Health: Consensus Bundle on Cardiac Conditions in Obstetric Care. *Obstetrics and Gynecology*. 2023;141(2). doi:10.1097/AOG.0000000000005048

2.3 Anticipated Impact

If implemented, the measure has the potential to impact the early identification of risk factors associated with CVD during pregnancy and postpartum stages for birthing people. In doing so, this will decrease maternal mortality as more than half of the serious cardiac complications are preventable in women with cardiac disease. Screening for CVD risk factors, including age, hypertension, diabetes, and obesity is a key component in the efforts to minimize adverse pregnancy events and can lower the healthcare costs associated with these events, reducing the economic burden. Furthermore, CDC data reveals that annually, Americans experience 1.5 million heart attacks and strokes, costing over \$320 billion in healthcare and lost productivity, with projections indicating a surge to \$818 billion by 2030, and lost productivity costs reaching \$275 billion.

2.4 Performance Gap

N/A

2.5 Health Care Quality Landscape

People with undiagnosed unknown CVD and those with CVD index diagnosis during their pregnancy usually present in a similar manner with symptoms and abnormal vital signs, however, may not be diagnosed in time to receive guideline recommended medical care. Healthcare providers may not suspect CVD when evaluating pregnant or postpartum patients with symptoms that may signify an underlying diagnosis of CVD. There is a need to establish a standardized CVD risk assessment tool to triage pregnant and postpartum patients and provide standardized options of appropriate follow-up. Our measure is used for standardized identification of individuals with suspected disease, or suspected high risk for disease. A CVD risk assessment distinguishes patients with a high probability of disease by analyzing several variables indicated by the algorithm.

For cardiovascular risk assessment and follow-up in pregnant and postpartum women, a reliable clinical screening approach that monitors the hospital and clinician performance is lacking. Timely identification of women at risk of CVD and follow-up may improve maternal health outcomes, i.e., maternal morbidity and mortality and lifetime onset of CVD.

2.6 Meaningfulness to Target Population

The measure performance of three hospital networks were reviewed with the co-investigators during virtual co-investigator meetings. Each site co-investigators individually contacted medical directors and/or clinicians with low CVD risk assessment rates to identify any implementation barriers. In addition, UCI conducted semi-structured interviews with five clinicians at each site (n=15) in May 2021 to elicit the value of the measure and barriers to follow up of the measure. The aggregate data presented in the measure facilitated the identification of system problems, such as need to obtain insurance approval for procedures, scheduling timely appointments, and patient logistics to keep health appointments (childcare, transportation, taking time off from work). Overall, clinicians appreciated the ability to monitor their performance and get a benchmark of their peer's performance.

We formed a 14-member Technical Expert Panel (TEP) representing diverse stakeholders (Measure Developers, Clinical Content - Cardiology, Clinical Content - OB/GYN/MFM, Clinical IT, Patient Representatives). TEP members met virtually every 2-3 months and provided input on the individual elements of the algorithm, the integration of the algorithm in the EHR, and discussed additional clinical criteria such as the appropriate BNP cutoff. The TEP members agreed that:

1. There should not be any upper or lower age limit (so adolescent pregnancies and women with IVF are included).
2. Private providers who contract with the hospital for L&D services can be included in the

denominator.

3. How to calculate the measure if the algorithm was administered more than once during a pregnancy episode.

Furthermore, we conducted 10 in-depth interviews to gauge patients' firsthand experiences with the CVD screening tool. We recruited a purposive sample of 10 patients from Montefiore Medical Center, New York, and University of California, Irvine who had received a positive risk assessment score. Patients were seen at different clinics (high risk, general obstetric, family medicine) and presented a range of demographic variables, and comorbidities. Three of the ten participants identified as Black, seven identified as Hispanic and three participants preferred the interview in Spanish. The interviews highlighted several themes:

- Respondents were oblivious of the relationship between pregnancy and cardiovascular health risk. Heart disease was typically associated with older age.
- The main reactions to the news of being at risk for CVD were fear and surprise; especially patients who already kept a balanced diet and were physically active had not thought that they might be at risk.
- Participants wanted to know more how the CVD risk could impact their baby.
- Empathic provider communications and the feeling that providers know what to do were important than the facts themselves at the time of the clinical encounter. However, patients would have liked to have more written or digital information so that they can process the news at home.
- All patients were eager to address modifiable behaviors. Some were expecting to get guidance by the clinicians while others had already changed their diet, increased physical activity and stress-reducing activities to improve their mental health and manage their blood pressure at the time of the interview.

The thematic analysis of the interviews suggested that the risk assessment was accepted by patients and effective in initiating provider patient communication about lifestyle risk and resulting changes to reduce CVD risk factors. These data were used to develop a semi-structured interview that will recruit 80 patients on similar themes to provide data on a larger sample. Results are not yet published.

As a result of the qualitative patient interviews, we recruited three additional patients with lived CVD experience to our TEP. These TEP patient representatives stressed the importance of patient support groups in helping pregnant and postpartum people at CVD risk to improve cardiovascular health. The TEP members provided crucial input in expanding the patient education resources on UCI's CVD website and provided input in the dissemination of the quality measure.

3.1 Contributions Towards Closing Care Gaps

This measure, which focuses on cardiovascular disease (CVD) risk assessment during pregnancy and postpartum, directly contributes to the advancement of health equity by standardizing CVD risk assessment and follow-up across racial/ethnic groups. There are significant disparities in the prevalence and treatment of CVD among pregnant/postpartum patients, which are largely due to systemic racism and implicit provider bias. These disparities impact low-income, Black, Native American, Latinx, and Asian/Pacific Islander communities. Targeting a significant healthcare disparity: the high risk of mortality among Black birthing people due to pre-existing CVD, hypertensive disorders of pregnancy (HDP), and peripartum cardiomyopathy (PPCM). Studies have found that black women are not monitored as carefully as white women, and their complaints are often dismissed.¹ Data consistently show that Black birthing individuals have a 3-12 times higher risk of mortality compared to those from other racial/ethnic groups, marking them as the racial-ethnic group with the highest pregnancy-related mortality ratio. Additionally, Pacific Islanders, Native American and Alaskan Islanders (AN/AI) have an increased risk of maternal mortality when compared to non-Hispanic white women.² In fact, since 1999, AN/AI has had the largest increase maternal mortality. Furthermore, low-income birthing individuals, regardless of their racial or ethnic background, face elevated risks of post-delivery complications, including hospitalization, readmission, and emergency department visits within 90 days of delivery.³

1. Louis JM, Menard MK, Gee RE. Racial and Ethnic Disparities in Maternal Morbidity and Mortality. *Obstetrics & Gynecology*. 2015;125(3):690-694.
doi:<https://doi.org/10.1097/aog.0000000000000704>
2. Fleszar LG, Bryant AS, Johnson CO, et al. Trends in State-Level Maternal Mortality by Racial and Ethnic Group in the United States. *JAMA*. 2023;330(1):52-61.
doi:<https://doi.org/10.1001/jama.2023.9043>
3. Howell EA, Zeitlin J. Improving hospital quality to reduce disparities in severe maternal morbidity and mortality. *Seminars in Perinatology*. 2017;41(5):266-272.
doi:10.1053/j.semperi.2017.04.002

4.1 Feasibility Assessment

The feasibility of implementing the measure is high given the required data can be extracted from the electronic health record system (for automatized risk score calculation) or documented on paper form (for manual risk score calculation). The primary changes needed to implement the measure revolve around integration of the risk assessment in the clinic flow. For example, in clinics where medical assistants did the pre-screen, clinicians may not have been informed that the patient has a positive score, was not always have been discussed with the providers.

4.3 Feasibility Informed Final Measure

There were no changes in specifications. All the data needed to calculate the measure is available in the electronic health record (EHR).

4.4 Proprietary Information

Proprietary measure or components (e.g., risk model, codes), without fees

4.4a Fees, Licensing, or Other Requirements

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THE CVD RISK ASSESSMENT MEASURE AND SPECIFICATIONS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND.

5.1.1 Data Used for Testing

Electronic health records of all pregnant and postpartum patients from the University of California, Irvine (1,500 deliveries per year), University of California, San Diego (3,000 births per year), and University of Tennessee Medical Center (11,000 deliveries per year) includes data from September 2020 to February. The tool is integrated into EPIC and Cerner electronic health records. UTenn implemented a feasible system to administer the tool manually was implemented for clinics that were not connected to its Cerner EHR system.

5.1.2 Differences in Data

None

5.1.3 Characteristics of Measured Entities

Our measure was tested at geographically and ethnically diverse hospital networks:

Initial Users:

- University of California, Irvine/UC Irvine Health (UCI Health), lead agency, 1,500 births annually
- University of California, San Diego/UC San Diego Health (UCSD Health) 3,000 births annually
- University of Tennessee/ St. Thomas Health, Tennessee (UTenn), 11,000 births annually

In 2022 two additional networks implemented the tool and transferred data to UCI for measure calculation. Data on these networks are not yet included in the present submission

- Albert Einstein College/Montefiore Medical Center, New York(MMC), 5,000 annually
- University of Missouri, Kansas City/St. Luke's Health System, Kansas City, 5,000 annually

The hospital networks UCI and UCSD are located in Southern California and UTenn in Tennessee. They include regional Level 3 birthing centers with the full scope of inpatient and outpatient hospital services and affiliated community and private medical clinics. All hospitals have Obstetrics/Gynecology (OB/GYN) residency training programs, a high volume of Medicaid patients, and a diverse racial/ethnic demographic mixture. The information on the measure is used for staff training at other additional sites that have adopted the measure, such as Albert Einstein College and the University of Missouri.

5.1.4 Characteristics of Units of the Eligible Population

Data was collected on the number and descriptive characteristics of patients who received a CVD risk assessment compared to the total number of patients from September 2020 to February 2022. This data was collected from three hospital networks, including the University of California, Irvine Health System, the University of California, San Diego Health System, and the University of Tennessee Health System. Each hospital network includes affiliated clinics, outpatient facilities, and private practices that administer cardiovascular disease (CVD) risk assessments. The three hospital network assessments were on 31,309 assessments during the time. Below is a comprehensive analysis that reveals the demographic characteristics and variations in patient profiles across these diverse healthcare networks.

A total of 2,611 patients in the UCI Health System received a CVD risk assessment, representing

54.4% of all patients. Patient ages ranged from under 20 years old (2.0%), 20 to 29 years old (40.1%), 30-39 years old (50.9%), and 40 or older (7.4%). Regarding race, 4.1% were Black, 68.3% were White, 14.4% were AAPI, and 13.5% were categorized as Others. Regarding ethnicity, 57.0% were Hispanic, and 43.0% were non-Hispanic. The insurance breakdown included 52.7% with public insurance, 34.1% with private insurance, and 13.5% with unknown insurance status. The timing of assessments revealed that 37.3% occurred during prenatal care, and 63.0% took place postpartum.

During the specified period in the UCSD Health System, out of 5,985 patients, 4,285 patients underwent a CVD risk assessment, accounting for 71.6% of the patient population. The age distribution was as follows: 0.9% of patients were below the age of 20, 32.9% were between the ages of 20-29, 59.2% were between the ages of 30-39, and 6.8% were 40 years old or above. The racial distribution was 5.9% Black, 51.5% White, 12.2% AAPI, and 30.3% Other. In terms of ethnicity, 29.8% of patients were identified as Hispanic, and 70.1% were non-Hispanic. With regards to insurance coverage, 32.6% had public insurance, 51.6% had private insurance, and 15.6% had unknown insurance status. In terms of the timing of assessments, 32.5% were conducted prenatally while 67.4% were done postpartum.

Finally, in the UTenn Health System, all 22,713 patients received CVD risk assessments during the specified period. Age-wise, 5.1% were under 20, 48.5% were aged 20-29, 43.3% were 30-39, and 3.1% were 40 or older. Regarding race, 14.8% were Black, 60.6% were White, 1.7% were AAPI, and 22.8% were categorized as Others. Regarding ethnicity, 17.4% were Hispanic, and 80.1% were non-Hispanic. The insurance breakdown included 26.4% with public insurance, 72.0% with private insurance, 1.4% with self-pay, and 0.2% with unknown insurance status. The timing of assessments showed 41.9% during prenatal care and 58.1% during postpartum.

5.2.1 Level(s) of Reliability Testing Conducted

Person or encounter level (i.e., data element) (e.g., inter-abstractor reliability), Accountable entity level (i.e., measure score) (e.g., signal-to-noise analysis)

5.2.2 Method(s) of Reliability Testing

We used signal-to-noise analysis. The signal in this case is the proportion of the variability in measured performance that can be explained by real differences in performance. A reliability of zero implies that all the variability in a measure is attributable to measurement errors. Reliability of one implies that all the variability is attributable to real differences in performance.

We eliminated clinics with a relatively large sample size (Denominator, or n) that could have a disproportionate influence. Then excluded if $n > 75^{\text{th}} \text{ percentile} + 1.5 * (\text{interquartile range})$.

- Calculate the 25th at 75th percentile of n across the 23 clinics.
 - 25th percentile: 95
 - 75th percentile: 846

- interquartile range: 748
- 75th percentile+1.5*(interquartile range) =1968
- VLI WOMENS HEALTH SVCS (n=2724), ST Midtown (n=13627), and ST Rutherford (n=7746) are removed for the purpose of the parameter estimation.

Next, we used empirical Bayes shrinkage with n^2 weighting to estimate the signal and noise variances as outlined in Section 5. of Morris¹:

$$\hat{A} = \sigma^2_{(\text{provider-to-provider})}$$

$$S_i^2 = \sigma^2_{\text{error}}$$

Then we calculated using $\text{Reliability} = (\sigma^2_{(\text{provider-to-provider})}) / (\sigma^2_{(\text{provider-to-provider})} + \sigma^2_{\text{error}})$ for each clinic.

As most of the patients received, EKG or echo as follow-up procedure, we assessed this as the primary outcome. We reviewed 1,399 patients that underwent CVD risk stratification using the CMQCC algorithm over an 18-month period at a the UCI network. We reviewed the rate of abnormal EKG or echo, defined as abnormal cardiac structure and/or function, among patients who were determined to be at increased risk for CVD. Of 29 patients identified to be at increased risk, 20 received follow-up testing with EKG or echo within 60 days of the risk assessment. Over half (65%) of the patients were found to have underlying EKG or echo abnormality. Abnormal cardiovascular testing results included findings such as sinus tachycardia (HR > 100 bpm), conduction delays, Wolff Parkinson-White syndrome, left ventricular hypertrophy/diastolic dysfunction, and chamber dilation. Using these results as a surrogate for CVD, the CMQCC risk assessment tool identified 13 cases of previously undiagnosed cardiovascular dysfunction in the study population.

5.2.3 Reliability Testing Results

Signal to Noise (SNR)

k : 20

A (Signal Variance): 0.0655

SD : 0.2558

$b\text{-hat}$ (Mean): 0.714

$V\text{-bar}$: 0.000230

Median Reliability: 0.992

Min SNR: 0.839

Max SNR: 1.000

Patient Encounter Level

Kappa: 1.0

5.2.4 Interpretation of Reliability Results

The Signal-to-Noise (SNR) reliability ratio was calculated for 20 entities. The range of SNR reliability is 0.839 to 1, and the median is 0.992. A reliability close of 1 implies that all the variability is attributable to real differences in performance. Our results demonstrate consistent and dependable results across different levels of testing, supporting the proposed quality measure's reliability.

Table 2. Accountable Entity Level Reliability Testing Results by Denominator, Target Population Size

Accountable Entity-Level Reliability Testing Results													
	Overall	Minimum	Decile_1	Decile_2	Decile_3	Decile_4	Decile_5	Decile_6	Decile_7	Decile_8	Decile_9	Decile_10	Maximum
Reliability	0.992	0.839	0.914	0.961	0.972	0.983	0.991	0.993	0.995	0.996	0.999	1.000	1.000
Mean Performance Score	58.9%	37.5%	64.2%	73.9%	43.2%	29.8%	88.7%	48.2%	68.3%	50.7%	72.4%	50.0%	100%
N of Entities	20	1	2	2	2	2	2	2	2	2	2	2	2
N of Persons / Encounters / Episodes	7212	16	27	102	197	199	263	744	1089	1558	1276	1657	1657

5.3.1 Level(s) of Validity Testing Conducted

Accountable entity level (i.e., measure score) (e.g., criterion validity)

5.3.3 Method(s) of Validity Testing

Face validity: We reviewed the measure specifications with the Technical Expert Panel, which unanimously agreed that the measure assesses the quality of CVD risk assessment. Case report evaluations were used to assess whether the cardiovascular risk variable is consistent with a CVD diagnosis.

Empirical Validity Testing: Sensitivity, specificity, positive predictive, and negative predictive values were calculated to assess the measure’s performance. The CVD risk assessment measure and the percent of confirmed CVD cases were calculated for 23 entities. We hypothesized them to be positively correlated. Pearson Correlation Coefficient (r) was calculated to test the correlation between the measure and the % of confirmed CVD cases. The Pearson chi-square test p<0.0001 indicates that measure 1 rates in different clinics are significantly different.

To estimate the evidence, UCI Health built a cohort of all obstetric patients seen at UCI Medical Center for the period from September 2020 to March 2024. Patients with known CVD at first prenatal or obstetric visit were excluded from the analysis. Of the remaining cohort of 10,860

pregnant and postpartum patients, a total of 5,902 patients (54.3%) had a risk assessment ("screened," follow-up and monitoring based on risk assessment results and clinician discretion) compared to 4,958 patients who did not receive a risk assessment ("unscreened", follow up and monitoring based on clinician discretion).

We found that the yield for patients who were screened with the algorithm was significantly higher. Screened patients had a significantly higher percentage of follow-up tests with abnormal test results (52%) than unscreened patients (42%) (Chi-square test p-value<0.0001). These differences remained to be significantly different when controlling for race/ethnicity, insurance status, and age.

Among patients who were referred for follow-up tests, screened patients were twice as likely to have a comorbidity (diabetes, hypertension, obesity) than patients in the unscreened group (28.8% vs. 14.1%) .

Among the group of **patients with a risk assessment**, we compared patients who had a positive risk assessment (RA+) with those with a negative risk assessment (RA-). RA+ patients were significantly more likely to have an abnormal follow-up test result than RA- patients (Chi-square test p-value<0.0001).

Previously unknown CVD diagnosis: RA+ patients were significantly more likely to be identified with previously unknown CVD diagnosis than RA- patients (Fisher's exact test p-value<0.0001).

5.3.4 Validity Testing Results

Empiric Validity: The $r=0.424$ (p-value=0.0437)

Face Validity: 100%

5.3.4a Attach Additional Validity Testing Results

[Empirical Validity.pdf](#)

5.3.5 Interpretation of Validity Results

Empiric Validity: The $r=0.424$ (p-value=0.0437) shows that the CVD risk assessment measure and percent of confirmed CVD cases have a moderate positive correlation with a statistically significant p-value. This supports an inference of validity for the measure because measure

performance correlates with actual confirmed CVD cases.

Additional testing on the yield of the tool demonstrates that the risk assessment effectively identifies a higher proportion of patients with abnormal follow-up test results (EKG, echocardiogram, etc.) than the proportion of patients who were not screened; thereby leading to higher efficiency of identifying patients in need of CVD monitoring during their pregnancy and avoidance of unnecessary tests.

5.3.2 Type of Accountable Entity Level Validity Testing Conducted (derived)

Empirical validity testing at the accountable entity-level (e.g., criterion validity, construct validity, known groups analysis)

5.4.1 Methods Used to Address Risk Factors

No risk adjustment or stratification

6.1.1 Current Status

Not in use

6.1.2 Current or Planned Use(s)

Payment Program, Quality Improvement with Benchmarking (external benchmarking to multiple organizations), Other

6.1.2a Other Current or Planned Use

The Cardiovascular Disease (CVD) Risk Assessment Measure - Proportion of Pregnant/Postpartum Patients that Receive CVD Risk Assessment with a Standardized Instrument) was included in the 2024 CMS Merit-based Incentive Payment (MIPS) Value Pathways (MVPs).

6.2.1 Actions of Measured Entities to Improve Performance

Hospital networks can use the measure to identify clinics or individual clinicians with low risk assessment rates. To enhance performance on this measure, entities must prioritize comprehensive clinician training, proactive leadership involvement, and the structured onboarding of new medical residents. Additionally, integrating the measure into the orientation of incoming residents and new hires, supported by mentorship from experienced clinicians, ensures its consistent application in the future. In addition to identifying clinics with low performance, clinics can review whether certain patient groups are less likely to be tested and monitored for CVD risk (minorities, postpartum patients or patients entering late prenatal care), in which case corrective action steps could be unconscious bias training or changes in clinic flow.

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