Standardized Data File - Appendix 2
Measure Specifications

Version 2020

Updated 10/5/2021

Appendix 2 Table of Contents

Measure Abbreviation

AKI-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

Percentage of cases that the baseline creatinine increases more than 1.5 times within 7 postoperative days or the baseline creatinine level increases by = 0.3 mg/dL within 48 hours postoperatively.

Inclusions

All anesthetic cases.

Exclusions

- ASA 5 & 6
- Patients with pre-existing renal (stage 4 or 5) failure based upon BSA-Indexed EGFR < 30 mL/min/1.73m^2
- Patients undergoing procedures affecting kidneys
    - Urologic surgery on kidney/ureter – CPT 00862, 00864, 00870, 00872, 00873, 00865, 00908, 00910, 00912, 00914, 00916, 00918, 00860, 00942 o
    - Renal & Liver Transplants – CPT 00868, 00796
- Non-Operative Procedures:
    - Obstetric Non-Operative Procedures – CPT 01958
    - Labor Epidurals as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
    - Pain Procedures – CPT 01991, 01992, 01996
    - Procedure Type: ECT
- Patients where a creatinine lab is not available within 7 postoperative days.
- Patients that do not have a baseline creatinine within 60 days preoperatively.
- For patients with more than one case in a 7-day period, the first case will be excluded if apostop creatinine is not documented for that first case. For example, a patient that has surgery twice in a 7-day period, the first surgery is excluded if a creatinine is not drawn in between cases.
- Case duration less than 45 minutes. See ‘Other Measure Build Details’ for Case Duration algorithm.
- Cases where the ‘Anesthesia End Time’ precedes ‘Anesthesia Start Time’ will be excluded and marked 'invalid'

Success

1. The creatinine level does not go above 1.5x the baseline creatinine within 7 days post-op
2. The creatinine level does not increase by ≥ 0.3 mg/dL obtained within 48 hours after anesthesia end.

Other Measure Build Details

Only valid creatinine values (≥0.2 mg/dL and ≤25.00 mg/dL) used. Method for calculating EGFR dependent on age and availability of patient race data:

Adult patients >18 years old:

- Sites with race data: CKD-EPI EGFR = 141 x min(Scr/κ, 1)α x max(Scr/κ, 1)-1.209 x (0.993)Age x (1.018 if female) x (1.159 if black)
    - Scr indicates the serum creatinine in mg/DL
    - κ = 0.7 for females, 0.9 for males; for missing gender data, assume female
    - α = -0.329 for females, -0.411 for males; for missing gender data, assume female
    - Age = age in years
    - min indicates the minimum of Scr/κ or 1
    - max indicates the maximum of Scr/κ or 1

Risk of progression to CKD is available per case in the 'Measure Case Report Tool'. Further details available here.

Responsible Provider

1. The provider signed in during the case when the BP 01 measure failed (it is possible to have more than one provider).
2. If there is no failure for the BP 01 measure, then the responsible provider is the provider signed in the longest.

Threshold

≤10%

MPOG Concept IDs Required

Creatinine Lab Concept ID

- 5002 Formal lab - Creatinine, Serum/Plasma

Ht/Wt MPOG Concept IDs

- 70257 Physical Exam - Height (cm)
- 70258 Physical Exam - Height (in)
- 70264 Physical Exam - Weight (kg)
- 70265 Physical Exam - Weight (lb)

Race MPOG Concept IDs modified

- 4000 Unknown Race
- 4001 Hispanic, White
- 4002 Hispanic, Black
- 4003 Hispanic, Color Unknown
- 4004 Black, not of Hispanic Origin

- 4005 White, not of Hispanic Origin
- 4006 American Indian or Alaska Native
- 4007 Asian or Pacific Islander
- 4008 Bi or Multi Racial
- 4009 Middle Eastern
- 4050 Other Race Not Listed
- 18117 Column Mapping - AIMS_Race_Text

Phenotypes Used

- AKI - Risk of Progression to CKD (requires login)
- Case Duration
- DiagnosesCleaned (No phenotype browser page)
- Measure: BP-01
- PrimaryProvider
- Total blood administered as PRBC, Derived (ml)
- Total Colloid Administered, Raw (ml)
- Total Crystalloid Administered, Raw (ml)
- Total Estimated Blood Loss (EBL)
- Vasopressor Infusion
- VasopressorBolus (requires login)

Rationale

Acute kidney injury is a serious complication following non-cardiac surgery and is associated with an increased risk of in-hospital mortality. The development of AKI is known to increase patient care demands, accounting for 20% of intensive care unit (ICU) admissions, and significantly increasing hospital cost, length of stay, and mortality. Definitions and classification schema for AKI vary across current literature; most commonly, these include the Risk/Injury/Failure/Loss/End-stage (RIFLE), Acute Kidney Injury Network (AKIN), and Kidney Disease-Improving Global Outcomes (KDIGO) criteria. This measure most closely aligns with KDIGO AKI criteria, with exceptions of: a) not considering postoperative urine output or renal replacement therapy components of the definition (data are commonly unavailable); b) not considering cases in which a ≥ 0.3 mg/dL increase in serum creatinine level occurred greater than 48 hours but less than 7 days postoperative.

Risk Adjustment

To evaluate provider-level risk adjustment we will calculate the observed to expected outcomes ratio (O/E). The O/E is calculated using a logistic regression model and predicts (given a set list of dependent patient and hospital level variables) the expected probability of having a kidney injury. We adjust for surgery risk score, emergent procedures, ASA, gender, age, body mass index, laboratory values, and teaching versus private hospital. Patient specific comorbidities are evaluated as well.

References

1. Abelha FJ, Botelho M, Fernandes V, Barros H. Determinants of postoperative acute kidney injury. Critical care (London, England). 2009;13(3):R79
2. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute renal failure - definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Critical care (London, England). Aug 2004;8(4):R204-212.

3. James, Matthew T., Neesh Pannu, Brenda R. Hemmelgarn, Peter C. Austin, Zhi Tan, Eric McArthur, Braden J. Manns, et al. 2017. “Derivation and External Validation of Prediction Models for Advanced Chronic Kidney Disease Following Acute Kidney Injury.” *JAMA: The Journal of the American Medical Association* 318 (18): 1787–97.

Measure Abbreviation
BP-01

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases where intraoperative hypotension (MAP < 55 mmHg) was sustained for less than 20 minutes.

Measure Time Period
Intraoperative. See 'Other Measure Build Details' for more information

Inclusions
All patients requiring general anesthesia or monitored anesthesia care (MAC).

Exclusions
- Patients < 18 years old
- ASA 5 and 6 cases
- Baseline MAP < 60 mmHG (Highest MAP documented in preop under MPOG concepts 71120, 70211, 70212)
- Daily Hospital Management for Epidural (CPT: 01996)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals as determined by the MPOG 'Obsteric Anesthesia Type' phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
- Obstetric Non-Operative Procedures with procedure text: "Labor Epidural"
- Organ Harvest (CPT:01990
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- CABG without pump (CPT: 00566)
- Heart Transplant (CPT: 00580)
- Liver Transplants (see ProcedureTypeTransplantLiver phenotype)
- Lung Transplants (see ProcedureTypeTransplantLung phenotype)
- Unlisted Anesthesia Procedures (CPT: 01999)

- Cases where the ‘Measure End Time’ precedes ‘Measure Start Time’ will be excluded and marked 'invalid'

Success

- MAP <55mmHG that does not exceed cumulative time of 20 minutes **OR**
- MAP >55mmHG throughout case length.

Other Measure Build Details

- BP 01 measures the cumulative time of Mean Arterial Pressure (MAP) <55mmHG for a given case and provider. BP 01 includes non-invasive and invasive blood pressure monitoring captured using automated and manually entered physiologic data.
- Instances where there are two blood pressure monitoring methods, the higher MAP will be used to determine measure compliance.
- Artifact readings will be identified and removed from final measurement calculation. Artifact processing: if systolic and diastolic blood pressures are present, the values must be at least 5 mmHg apart; otherwise the values will be excluded. MAP values less than 10 are excluded.
- Each incidence of MAP <55 will attribute the responsible provider for a max of 5 minutes
- To determine how many minutes the last BP documented accounts for, the difference between it the “Measure End Time” algorithm is used (see page 3). As with the duration of other BPs, this duration is also capped at 5 minutes.

Algorithm for determining Measure Start/End Times:

***Measure Start Time**:*

First Blood Pressure Reading after the latest of these 3 times:

1. First documented Anesthesia Start time.
2. First documented Patient in Room time.
3. First documented Data Capture Start time.

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, 'Cesarean Delivery Start Time' is used as the 'Measure Start Time'

Measure End Time:

1. Patient Out of Room. If not available,
2. Data Capture End. If not available,
3. Anesthesia End.

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, the latest 'data capture end' is used as the 'Measure End Time' when appropriate (all other cases use logic from 'Data Capture End' phenotype)

Responsible Provider

All providers for a given case whose individual cumulative MAP < 55mmHG exceeds the 20 minute timeframe

Threshold

90%

MPOG Concept IDs Required

3011	BP Sys Invasive Unspecified Site 1	**3040**	BP Mean Arterial Line (Invasive, Peripheral)
3012	BP Dias Invasive Unspecified Site 1	**3041**	BP Sys Invasive Unspecified Site 2
3013	BP Mean Invasive Unspecified Site 1	**3042**	BP Dias Invasive Unspecified Site 2
3015	BP Sys Non-invasive	**3043**	BP Mean Invasive Unspecified Site 2
3020	BP Dias Non-invasive	**3046**	BP Sys Invasive Unspecified Site 3
3025	BP Mean Non-invasive	**3047**	BP Dias Invasive Unspecified Site 3
3026	BP Sys Invasive Unspecified Site 4	**3048**	BP Mean Invasive Unspecified Site 3
3027	BP Dias Invasive Unspecified Site 4	**3475**	BP Sys Invasive Unspecified Site 5
3028	BP Mean Invasive Unspecified Site 4	**3476**	BP Dias Invasive Unspecified Site 5
3030	BP Sys Arterial Line (Invasive, Peripheral)	**3477**	BP Mean Invasive Unspecified Site 5
3035	BP Dias Arterial Line (Invasive, Peripheral)	**3041**	BP Sys Invasive Unspecified Site 2

Data Diagnostics Affected

- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with Invasive Blood Pressure
- Percentage of Cases with Non-invasive Blood Pressure
- Percentage of Cases with Physiologic Observations
- Percentage of Physiologic Rows that are Machine Captured
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Left Bound (requires login)
- Anesthesia Right Bound (requires login)
- Baseline Blood Pressure - Mean
- Blood Pressure Observations
- Cesarean Delivery Start Time for Conversions
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Liver Transplant
- Procedure Type: Lung Transplant
- Procedure Type: Non-Operative

Rationale

Intraoperative hypotension is associated with compromised organ perfusion and puts patients at risk for post-operative mortality, cardiac adverse events (CAEs), acute kidney injury, and stroke. Multiple studies

have demonstrated the association of a decreased mean arterial pressure and postoperative morbidity and mortality. One retrospective review included 33,000 non-cardiac surgical patients and determined that a mean arterial pressure less than 55mmHG predicted CAEs and adverse renal-related outcomes[6]. This was confirmed by a distinct investigation of 5000 patients using invasive blood pressure measurement[5].

Risk Adjustment

Not Applicable

References

1. Bijker JB, Persoon S, Peelen LM, Moons KG, Kalkman CJ, Kappelle LJ, van Klei WA. Intraoperative hypotension and perioperative ischemic stroke after general surgery: a nested case-control study.
2. Anesthesiology. 2012 Mar 116(3): 658-64. doi: 10.1097/ALN.0b013e3182472320. PMID: 22277949
3. Bijker JB, van Klei WA, Vergouwe Y, Eleveld DJ, van Wolfswinkel L, Moons KG, Kalkman CJ. Intraoperative hypotension and 1-year mortality after noncardiac surgery.
4. Anesthesiology. 2009 Dec 111(6): 1217-26. doi: 10.1097/ALN.0b013e3181c14930. PMID: 19934864
5. Sun LY, Wijeysundera DN, Tait GA, Beattie WS. Association of Intraoperative Hypotension with Acute Kidney Injury after Elective Noncardiac Surgery Anesthesiology. 2015 Sep123(3): 515-23. doi: 10.1097/ALN.0000000000000765. PMID: 26181335
6. Walsh M, Devereaux PJ, Garg AX, Kurz A, Turan A, Rodseth RN et al. Relationship between intraoperative mean arterial pressure and clinical outcomes after noncardiac surgery: Toward an empirical definition of hypotension. Anesthesiology 2013; 119:507-515. Doi: 10.1097/ALN.0b013e318a10e26. PMID: 23835589.

Measure Abbreviation
BP-02

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases where gaps greater than 10 minutes in blood pressure monitoring are avoided.

Measure Time Period
Intraoperative. See ‘Other Measure Build Details’ for more information

Inclusions
All patients receiving anesthesia care by an anesthesiology provider, regardless of primary anesthesia technique.

Exclusions
- ASA 5 and 6.
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals as determined by the MPOG 'Obsteric Anesthesia Type' phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
- Diagnostic Procedures (CPT: 01922)
- MRI Rooms (Rooms tagged as Radiology-MRI)
- MRI with procedure text:
    - MRI
    - MR Head
    - MR Brain
    - MR Chest
    - MR Torso
    - MR Abdomen
    - MR Lumbar
    - MR Spine
    - MR Knee
    - MR Femur
    - MR Abdomen
    - OFFSITE - RADIOLOGY PROCEDURE

- Cases where the ‘Measure End Time’ precedes ‘Measure Start Time’ will be excluded and marked 'invalid'

Success

Blood pressure monitoring with ≤10-minute gap in measurement interval.

Other Measure Build Details

BP 02 measures the avoidance of blood pressure monitoring gaps greater than ten minutes. Timely blood pressure readings are an essential component of anesthesia vigilance. A measurement gap will be recorded for cases that have greater than ten minutes between consecutive blood pressure readings. The measure will capture non-invasive and invasive BP measurements.

Algorithm for determining Measure Start/End Times:

***Measure Start Time**:*

First Blood Pressure Reading after the latest of these 3 times:

1. First documented Anesthesia Start time.
2. First documented Patient in Room time.
3. First documented Data Capture Start time.

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, 'Cesarean Delivery Start Time' is used as the 'Measure Start Time'

Measure End Time:

1. Patient Out of Room. If not available,
2. Data Capture End. If not available,
3. Anesthesia End

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, the latest 'data capture end' is used as the 'Measure End Time' when appropriate (all other cases use logic from 'Data Capture End' phenotype)

Responsible Provider

Individual signed into case at the 11^{th} minute of identified measurement gap. Providers signed in for ≤ 10 minutes from the measure start time will be excluded.

Threshold

90%

MPOG Concept IDs Required

3011	BP Sys Invasive Unspecified Site 1	**3040**	BP Mean Arterial Line (Invasive, Peripheral)
3012	BP Dias Invasive Unspecified Site 1	**3041**	BP Sys Invasive Unspecified Site 2
3013	BP Mean Invasive Unspecified Site 1	**3042**	BP Dias Invasive Unspecified Site 2
3015	BP Sys Non-invasive	**3043**	BP Mean Invasive Unspecified Site 2

3020	BP Dias Non-invasive	**3046**	BP Sys Invasive Unspecified Site 3
3025	BP Mean Non-invasive	**3047**	BP Dias Invasive Unspecified Site 3
3026	BP Sys Invasive Unspecified Site 4	**3048**	BP Mean Invasive Unspecified Site 3
3027	BP Dias Invasive Unspecified Site 4	**3475**	BP Sys Invasive Unspecified Site 5
3028	BP Mean Invasive Unspecified Site 4	**3476**	BP Dias Invasive Unspecified Site 5
3030	BP Sys Arterial Line (Invasive, Peripheral)	**3477**	BP Mean Invasive Unspecified Site 5
3035	BP Dias Arterial Line (Invasive, Peripheral)	**3041**	BP Sys Invasive Unspecified Site 2

Data Diagnostics Affected

- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with Invasive Blood Pressure
- Percentage of Cases with Non-invasive Blood Pressure
- Percentage of Cases with Physiologic Observations
- Percentage of Physiologic Rows that are Machine Captured
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Left Bound (requires login)
- Anesthesia Right Bound (requires login)
- ASA Class
- Blood Pressure Observations
- Cesarean Delivery Start Time for Conversions
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: MRI
- Procedure Type: Non-Operative

Rationale

The American Society of Anesthesiologist (ASA) standards for basic anesthetic monitoring includes an evaluation of blood pressure at least every five minutes in an effort to ensure adequate circulatory function during anesthesia. A retrospective study including 130,000 general anesthesia cases confirmed that blood pressure gaps greater than six and ten minutes are associated with a higher incidence of a patient transitioning into hypotension, leading to an increased risk of developing kidney or myocardial injury postoperatively. Extenuating circumstances where BP is not quantitatively measured every five minutes should be documented in the patient's medical record.1-3

Hypotension is strongly associated with mortality, acute kidney injury, and myocardial ischemia. The avoidance of hypotension requires the timely and frequent measurement of blood pressure.

Risk Adjustment

Not applicable

References

1. Standards and Practice Parameters Committee. (2012). American Society of Anesthesiologists. Standards for basic anesthetic monitoring.
2. Kruger GH, Shanks A, Kheterpal S, et al. Influence of non-invasive blood pressure measurement intervals on the occurrence of intra-operative hypotension. Journal of clinical monitoring and computing. 2018;32(4):699-705.
3. Anesthesiologists. ASo. Standards for basic anesthetic monitoring. In: Anesthesiologists ASo, ed. Vol 4.2.22015.
4. Bartels K, Esper SA, Thiele RH. Blood Pressure Monitoring for the Anesthesiologist: A Practical Review. Anesthesia and analgesia. 2016;122(6):1866-1879.

Measure Abbreviation
BP-03

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases where intraoperative hypotension (MAP < 65 mmHg) was sustained for less than 15 minutes

Measure Time Period
Intraoperative. See ‘Other Measure Build Details’ for more information

Inclusions
All patients requiring anesthesia, general, neuraxial, monitored anesthesia care (MAC), or regional.

Exclusions
- Patients < 18 years old
- ASA 5 and 6 cases
- Baseline MAP < 65 mmHG (Highest MAP documented under MPOG concepts 71120, 70211, 70212)
- Daily Hospital Management for Epidural (CPT: 01996)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals as determined by the MPOG 'Obsteric Anesthesia Type' phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
- Organ Harvest (CPT:01990)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- CABG without pump (CPT: 00566)
- Heart Transplant (CPT: 00580)
- Liver Transplants
- Lung Transplants
- Unlisted Anesthesia Procedures (CPT: 01999)
- Cases where the ‘Measure End Time’ precedes ‘Measure Start Time’ will be excluded and marked 'invalid'

Success

- MAP <65mmHG that does not exceed cumulative time of 15 minutes OR
- MAP >65mmHG throughout case length.

Other Measure Build Details

- BP 03 measures the cumulative time of Mean Arterial Pressure (MAP) <65mmHG for a given case and provider. BP 03 includes non-invasive and invasive blood pressure monitoring captured using automated and manually entered physiologic data.
- Instances where there are two blood pressure monitoring methods, the higher MAP will be used to determine measure compliance.
- Artifact readings will be identified and removed from final measurement calculation. Artifact processing: if systolic and diastolic blood pressures are present, the values must be at least 5 mmHg apart; otherwise the values will be excluded. MAP values less than 10 are excluded.
- Each incidence of MAP <65 will attribute the responsible provider for a max of 5 minutes
- To determine how many minutes the last BP documented accounts for, the difference between the time of the blood pressure and the “Measure End Time” algorithm is used. As with the duration of other BPs, this duration is also capped at 5 minutes.

Measure Start Time*:*

First Blood Pressure Reading after the latest of these 3 times:

1. First documented Anesthesia Start time.
2. First documented Patient in Room time.
3. First documented Data Capture Start time.

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, 'Cesarean Delivery Start Time' is used as the 'Measure Start Time'

Measure End Time:

1. Patient Out of Room. If not available,
2. Data Capture End. If not available,
3. Anesthesia End.

* For labor epidurals which convert to cesarean deliveries where the procedures are combined under one case ID, the latest 'data capture end' is used as the 'Measure End Time' when appropriate (all other cases use logic from 'Data Capture End' phenotype)

Responsible Provider

All providers for a given case whose individual cumulative MAP < 65mmHG exceeds the 15-minute timeframe.

Threshold

90%

MPOG Concept IDs Required

3011	BP Sys Invasive Unspecified Site 1	**3040**	BP Mean Arterial Line (Invasive, Peripheral)

3012	BP Dias Invasive Unspecified Site 1	**3041**	BP Sys Invasive Unspecified Site 2
3013	BP Mean Invasive Unspecified Site 1	**3042**	BP Dias Invasive Unspecified Site 2
3015	BP Sys Non-invasive	**3043**	BP Mean Invasive Unspecified Site 2
3020	BP Dias Non-invasive	**3046**	BP Sys Invasive Unspecified Site 3
3025	BP Mean Non-invasive	**3047**	BP Dias Invasive Unspecified Site 3
3026	BP Sys Invasive Unspecified Site 4	**3048**	BP Mean Invasive Unspecified Site 3
3027	BP Dias Invasive Unspecified Site 4	**3475**	BP Sys Invasive Unspecified Site 5
3028	BP Mean Invasive Unspecified Site 4	**3476**	BP Dias Invasive Unspecified Site 5
3030	BP Sys Arterial Line (Invasive, Peripheral)	**3477**	BP Mean Invasive Unspecified Site 5
3035	BP Dias Arterial Line (Invasive, Peripheral)	**3041**	BP Sys Invasive Unspecified Site 2

Data Diagnostics Affected

- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with Invasive Blood Pressure
- Percentage of Cases with Non-invasive Blood Pressure
- Percentage of Cases with Physiologic Observations
- Percentage of Physiologic Rows that are Machine Captured
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Left Bound (requires login)
- Anesthesia Right Bound (requires login)
- Baseline Blood Pressure - Mean
- Blood Pressure Observations
- Cesarean Delivery Start Time for Conversions
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Liver Transplant
- Procedure Type: Lung Transplant
- Procedure Type: Non-Operative

Rationale

Intraoperative hypotension (MAP < 65mmHg) is associated with compromised organ perfusion and puts patients at risk for post-operative mortality, cardiac adverse events (CAEs) and acute kidney injury (AKI). Multiple studies have addressed the impact of hypotension on patient outcomes and generally show less CAEs, AKI, and death by maintaining a MAP above 60-70mmHg.[1,2] One retrospective cohort analysis, including 57,315 non-cardiac surgical patients, demonstrated a MAP of less than 65mmHg was associated with a higher incidence of myocardial and kidney injury and the duration of low MAP significantly increases the odds of the aforementioned outcomes.[3] Furthermore, a retrospective review including 33,330 non-cardiac surgical patients determined that a MAP less than 65mmHg for any duration was associated with similar adverse outcomes[4]

Risk Adjustment

Not applicable.

References

1. Sessler DI, Bloomstone JA, Aronson S, et al. Perioperative Quality Initiative consensus statement on intraoperative blood pressure, risk and outcomes for elective surgery. *British journal of anaesthesia.* 2019;122(5):563-574.
2. Sessler DI, Khanna AK. Perioperative myocardial injury and the contribution of hypotension. *Intensive care medicine.* 2018;44(6):811-822.
3. Salmasi V, Maheshwari K, Yang D, et al. Relationship between Intraoperative Hypotension, Defined by Either Reduction from Baseline or Absolute Thresholds, and Acute Kidney and Myocardial Injury after Noncardiac Surgery: A Retrospective Cohort Analysis. *Anesthesiology.* 2017;126(1):47-65.
4. Walsh M, Devereaux PJ, Garg AX, et al. Relationship between intraoperative mean arterial pressure and clinical outcomes after noncardiac surgery: toward an empirical definition of hypotension. *Anesthesiology.* 2013;119(3):507-515.

Measure Abbreviation

FLUID-01-C

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cardiac cases in which colloids were not administered intraoperatively.

Measure Time Period

Anesthesia Start to Anesthesia End

Inclusions

All patients undergoing general anesthetics, spinals, and epidurals AND documentation of a cardiac case indicated by one of the following:

- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)

- An intraoperative note with one of the following MPOG concepts:
    - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
    - 50409 Cardiopulmonary bypass terminated
    - 50410 Cardiopulmonary bypass initiated (full)
    - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
    - 50417 Cardiopulmonary bypass -- Access cannula removed note
    - 50714 Cardiopulmonary bypass - Bypass start / stop event
- Cases performed by cardiac surgical service: MPOG concept 80005.

Exclusions

Exclusions:

- Non-cardiac cases
- ASA 5 and 6 cases
- ≥ 2L EBL

- ≥ 4 units PRBC transfusion
- Patients that are in prone position for more than 4 hours
- Patients that are in Trendelenburg position for more than 4 hours
- Patients with ascites

Success

Colloids are not administered during the case.

Other Measure Build Details

- The purpose of this measure is to identify the use of colloids for patients that likely do not need them in the cardiac surgery patient population. It is the expectation that providers will uphold the ASA's Choosing Wisely program by avoiding colloids and using crystalloid instead when appropriate.
- Measure Start/End Time is defined as Anesthesia Start to Anesthesia End.

Responsible Provider

The provider signed in at the time of the colloid administration.

Threshold

None

MPOG Concept IDs Required

Colloid MPOG Concepts		**Patient Position MPOG Concepts**		**Patient Dx MPOG Concepts**	
10017	Albumin 25%	**50136**	Positioning- Patient Position	**10500**	Ascites
10018	Albumin 5%	**50137**	Positioning- Patient positioned in left lateral decubitus position	**Estimated Blood Loss MPOG Concept**	
10557	Albumin 20%	**50818**	Patient positioned in right lateral decubitus position	**10499**	EBL
10458	Hetastarch	**Blood Administration MPOG Concepts**			
10459	Pentastarch	**10489**	Packed Red Blood Cells-Autologous		
10601	Hydroxyethyl Starch 130/0.4 6% in 0.9% Saline (Voluven)	**10490**	Packed Red Blood Cells-Homologous		

10605	Hydroxyethyl Starch 6% in Lactated Solution (Hextend)	**10616**	Packed Red Blood Cells-Unknown Type

Data Diagnostics Affected

- Percentage of Cases with any Fluid Recording
- Percentage of Fluids with a Meaningful Fluid Mapping
- Percentage of Cases with Colloids Administered

Phenotypes Used

- ASA Class
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Non-Operative
- ProcedureTypeCardiac
- ProcedureTypeIVF
- ProneOrTrendelenburg (requires login)
- Total Estimated Blood Loss (EBL)
- Units Transfused

Rationale

There is a lack of consistent evidence to suggest improved survival with the use of colloids as compared to crystalloids in the surgical population. Because colloids are more expensive than crystalloids, it is recommended that anesthesia providers avoid the use of colloids in most instances.

Risk Adjustment

Not applicable

References

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Measure Abbreviation

FLUID-01-NC

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of non-cardiac cases in which colloids were not administered intraoperatively.

Measure Time Period

Anesthesia Start to Anesthesia End

Inclusions

- All patients undergoing general anesthetics, spinals, and epidurals.

Exclusions

- ASA 5 and 6 cases
- ≥2L EBL
- ≥ 4 units PRBC transfusion
- Patients that are in prone position for more than 4 hours
- Patients that are in Trendelenburg position for more than 4 hours
- Patients with ascites
- In Vitro Fertilization- Egg Retrieval cases (Surgical CPT: 58970, 58974, 58976)
- In Vitro Fertilization- Egg Retrieval Rooms (Rooms tagged as IVF-Only)
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Any cardiac case with an intraoperative note mapped to one of the following MPOG Concepts:
    - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
    - 50409 Cardiopulmonary bypass terminated
    - 50410 Cardiopulmonary bypass initiated (full)
    - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
    - 50417 Cardiopulmonary bypass -- Access cannula removed note

    - 50714 Cardiopulmonary bypass - Bypass start / stop event
- Cases performed by cardiac surgical service: MPOG concept 80005.

Success

Colloids are not administered during the case.

Other Measure Build Details

- The purpose of this measure is to identify the use of colloids for patients that likely do not need them in the **non-cardiac** surgery patient population. It is the expectation that providers will uphold the ASA's Choosing Wisely program by avoiding colloids and using crystalloid instead when appropriate.
- Measure Start/End Time is defined as Anesthesia Start to Anesthesia End.

Responsible Provider

The provider signed in at the time of the colloid administration.

Threshold

None

MPOG Concept IDs Required

Colloid MPOG Concepts		**Patient Position MPOG Concepts**		**Patient Dx MPOG Concepts**	
10017	Albumin 25%	**50136**	Positioning- Patient Position	**10500**	Ascites
10018	Albumin 5%	**50137**	Positioning- Patient positioned in left lateral decubitus position	**Estimated Blood Loss MPOG Concept**	
10557	Albumin 20%	**50818**	Patient positioned in right lateral decubitus position	**10499**	EBL
10458	Hetastarch	**Blood Administration MPOG Concepts**			
10459	Pentastarch	**10489**	Packed Red Blood Cells-Autologous		
10601	Hydroxyethyl Starch 130/0.4 6% in 0.9% Saline (Voluven)	**10490**	Packed Red Blood Cells-Homologous		
10605	Hydroxyethyl Starch 6% in Lactated Solution (Hextend)	**10616**	Packed Red Blood Cells-Unknown Type		

Data Diagnostics Affected

- Percentage of Cases with any Fluid Recording
- Percentage of Fluids with a Meaningful Fluid Mapping
- Percentage of Cases with Colloids Administered

Phenotypes Used

- ASA Class
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Non-Operative
- ProcedureTypeCardiac
- ProcedureTypeIVF
- ProneOrTrendelenburg (requires login)
- Total Estimated Blood Loss (EBL)
- Units Transfused

Rationale

There is a lack of consistent evidence to suggest improved survival with the use of colloids as compared to crystalloids in the surgical population. Because colloids are more expensive than crystalloids, it is recommended that anesthesia providers avoid the use of colloids in most instances. Evidence to support the use of hydroxyethyl starch to prevent ovarian hyperstimulation syndrome for In Vitro Fertilization cases has been published and these cases will be excluded.

Risk Adjustment

Not applicable.

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Measure Abbreviation
MED-01

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Outcome

Description
Percentage of cases that required the use of nalaxone or flumazenil for medication overdose.

Measure Time Period
Anesthesia Start to Anesthesia End

Inclusions
All cases in which opioids or benzodiazepines were administered during the intraoperative period.

Exclusions
- ASA 5 and 6 cases
- Patients not given opioids or benzodiazepines during the intraoperative period
- Cases where naloxone or flumazenil is administered before the first dose of opioid/benzodiazepine
- Patients that are still intubated at anesthesia end
- Procedure Type: ECT

Success
Administration of naloxone or flumazenil was not required for the case.

Special Considerations: If naloxone was given as an infusion AND as a bolus, the case is flagged due to the bolus. If naloxone is only given as an infusion, then the case is still evaluated for flumazenil. Patients receiving naloxone as in infusion indicate naloxone is being infused for pruritus for neuraxial technique.

Other Measure Build Details
MED 01 is an outcome measure that identifies intraoperative medication overdose by monitoring the administration of opioids and/or benzodiazepines and the administration of their reversals: flumanzenil and naloxone. Flumazenil is given for benzodiazepine overdose. Nalaxone is given for opioid overdose. The time period for this measure is Anesthesia Start to Anesthesia End. PACU time is not included currently.

Algorithm for determining Case Duration:

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End.

Responsible Provider

The provider who is signed in for the longest portion of the case between Case Start and Case End. See 'Other Measure Build Details' section of this specification to view the algorithm used for determining case duration.

Threshold

=5%

MPOG Concept IDs Required

Opioid MPOG Concept IDs		**Benzodiazepine MPOG Concept IDs**		**Reversal Medication MPOG Concept IDs**	
10306	Morphine	**10301**	Midazolam	10191	Flumazenil
10186	Fentanyl	**10154**	Diazepam	10312	Naloxone
10219	Hydromorphone				
10414	Sufentanil				

Data Diagnostics Affected

- Percentage of Cases with Bolus Medications
- Percentage of Cases with an Intubation Note
- Percentage of Cases with an Extubation Note
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Technique: General
- ASA Class
- MeasureStartingList (requires login)
- PrimaryProvider
- Procedure Type: ECT

Rationale

Opioid and/or benzodiazepine administration can lead to respiratory depression, brain damage, and even death. Judicious use of opioids for patients that have planned extubation at end of case can avoid use of reversal agents and their side effects. For patients not meeting extubation requirements due to opioids or benzodiazepines, waiting until the effects wear off is preferable to reversal administration.

Risk Adjustment

Not applicable

References

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Measure Abbreviation

GLU-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with perioperative glucose > 200 mg/dL with administration of insulin or glucose recheck within 90 minutes of original glucose measurement.

Measure Time Period

Intraoperative

Inclusions

- All patients with glucose level greater than 200 mg/dL between Anesthesia Start and Anesthesia End
- Patients with ***and*** without diagnosis of diabetes

Exclusions

- ASA 5 and 6 cases
- Patients < 12 years of age.
- Glucose measurements > 200 mg/dL within 90 minutes before Anesthesia End
- Outpatient cases with Anesthesia Start to Anesthesia end time less than 4 hours long
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success

- Administration of insulin within 90 minutes (either IV or sub Q routes) or
- Recheck of glucose level within 90 minutes

Other Measure Build Details

- Percentage of intraoperative glucose labs with perioperative glucose >200 with administration of insulin or glucose recheck within 90 minutes of original glucose measurement for the time period

between Anesthesia Start and Anesthesia End.

- For this quality measure, we selected a relatively high threshold glucose level (greater than 200 mg/dL) to alleviate concerns that patients undergoing general anesthetics are at risk of overtreatment and hypoglycemia.
- If two blood glucose levels are documented in the same minute, the lower blood glucose will be considered for this measure

Responsible Provider

The provider signed in at the first glucose recheck or first administration of insulin. If neither occurred, then the responsible provider is the one signed in 90 minutes after the high glucose measurement.

Threshold

90%

MPOG Concept IDs Required

Insulin MPOG Concept IDs		**Glucose MPOG Concept IDs**	
10229	Insulin Aspart	**3361**	POC- Glucose (Fingerstick)
10230	Insulin Glargine	**3362**	POC- Glucose (Unspecified Source)
10231	Insulin Novolin	**3405**	POC- Blood Gas-Glucose
10232	Insulin NPH	**5003**	Formal Lab-Glucose, Serum/Plasma
10233	Insulin Regular	**5036**	Formal Lab-Blood Gas, Glucose
10659	Insulin-Unspecified		

Data Diagnostics Affected

- Percentage of Cases with Insulin Administration Mapped Correctly
- Percentage of Cases with POC Glucose Labs
- Percentage of Cases with a Lab Drawn during Anesthesia
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Fluids with a Meaningful Fluid Mapping

Phenotypes Used

- Admission Type

- Anesthesia CPT (Measures)
- ASA Class
- Glucose Observations Perioperative
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- PACU Start Time
- Procedure Type: Non-Operative

Rationale

Surgical and anesthetic stress increases hyperglycemia incidence in both diabetics and non-diabetics.[3] Perioperative hyperglycemia is mediated by the release of proinflammatory cytokines (e.g., TNF-alpha and IL-6) and elevated concentrations of catecholamines, growth hormone, glucagon, and glucocorticoids.[4] These mediators induce metabolic alterations in carbohydrate balance that alter peripheral glucose uptake and utilization, increase gluconeogenesis, depress glycogenesis, and induce glucose intolerance and insulin resistance. Hyperglycemia can also be drug induced (administration of steroids).

Acute hyperglycemia in the perioperative period is known to increase the incidence of wound infections, overall mortality, length of stay, acute kidney injury, and delayed wound healing. [2,5,7, 8-12] Use of insulin to correct perioperative hyperglycemia decreases the risk of hospital complications and mortality in cardiac and general surgery patients.[6, 12] The American Association of Clinical Endocrinologists and American Diabetes Association recommend a treatment threshold of 180 mg/dL in critically ill hospitalized patients and a preprandial blood glucose goal of 140 mg/dL in non-critically hospitalized ill patients.[13] Patients undergoing anesthesia who are subject to tight glucose control are at greater risk of hypoglycemia as the effects of anesthesia can mask the symptoms of hypoglycemia and current methods of treatment and monitoring put patients at risk of overcorrection.[1] A relatively high threshold glucose level (greater than 200 mg/dL) is used for this measure to alleviate concerns that patients undergoing general anesthetics are at risk of overtreatment and hypoglycemia.[1] Blood glucose may be rechecked in one hour.

Risk Adjustment

Not applicable

References

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111 (6): 1378–87.

Measure Abbreviation
GLU-02

Measure Type
Process

Description
Percentage of cases with perioperative glucose < 60 with administration of dextrose containing solution or glucose recheck within 90 minutes of original glucose measurement

Measure Time Period
Intraoperative

Inclusions
- All patients with glucose level less than 60 mg/dL between Anesthesia Start and Anesthesia End
- Patients with ***and*** without diagnosis of diabetes

Exclusions
- ASA 5 and 6 cases
- Glucose measurements < 60 mg/dL within 90 minutes before Anesthesia End
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success
- Administration of dextrose containing solution within 90 minutes (IV) **OR**
- Recheck of glucose level within 90 minutes

Other Measure Build Details
- Percentage of intraoperative glucose labs with perioperative glucose <60 with administration of dextrose containing solution or glucose recheck within 90 minutes of original glucose measurement for the time period between Anesthesia Start and Anesthesia End.

Responsible Provider
The provider signed in at the first glucose recheck or first administration of dextrose. If neither occurred, then the responsible provider is the one signed in 90 minutes after the low glucose measurement.

Threshold

90%

MPOG Concept IDs Required

Dextrose MPOG Concept IDs		Glucose MPOG Concept IDs	
10152	Dextrose	**3361**	POC- Glucose (Fingerstick)
10153	Dextrose 50%	**3362**	POC- Glucose (Unspecified Source)
10460	Dextrose / Water 5%	**3405**	POC- Blood Gas-Glucose
10461	Dextrose / Lactated Ringers 5%	**5003**	Formal Lab-Glucose, Serum/Plasma
10462	Dextrose / Water 10%	**5036**	Formal Lab-Blood Gas, Glucose
10465	Dextrose / Saline 5% / 0.225%		
10466	Dextrose / Saline 5% / 0.45%		
10467	Dextrose / Saline 5% / 0.9%		
10468	Dextrose / Saline w/KCl 5%/ 0.45% + 20 MEQ/L		
10469	Dextrose / Saline w/KCl 5%/ 0.9% + 20 MEQ/L		
10470	Dextrose / Saline 10% / 0.45%		
10539	Dextrose 10% w/ Lactated Ringers		
10548	Plasmalyte 148 w/ Dextrose 5%		
10558	Dextrose / Saline w/KCl 5%/ 0.225% + 20 MEQ/L		

10559	Dextrose / Saline w/KCl 5%/ 0.45% + 40 MEQ/L
10588	Dextrose / Saline w/KCl 10%/ 0.225% + 20 MEQ/L
10594	Dextrose / Saline w/KCl 5%/ 0.45% + 10MEQ/L
10602	Dextrose / Saline 10% / 0.225%
10471	Total Parenteral Nutrition
10530	Peripheral Parenteral Nutrition
10796	Glucose Chew Tablet
10797	Glucose Gel 40%

Data Diagnostics Affected

- Percentage of Cases with Insulin Administration Mapped Correctly
- Percentage of Cases with POC Glucose Labs
- Percentage of Cases with a Lab Drawn during Anesthesia
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Fluids with a Meaningful Fluid Mapping

Phenotypes Used

- Anesthesia CPT (Measures)
- ASA Class
- Glucose Observations Perioperative
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: Non-Operative

Rationale

The American Diabetes Association uses an outpatient hypoglycemia definition of <70 mg/dL[6,7]. Severe hypoglycemia in inpatients is considered <40mg/dL[6]. Acute hypoglycemia in the perioperative period can lead to inadequate supply of glucose to the brain, resulting in seizures, permanent brain damage, and death. In hospitalized diabetic patients, hypoglycemia has been associated with increased length of stay and mortality.[5] The risk of negative sequelae related to hypoglycemia is reduced with early recognition and treatment of mild to moderate hypoglycemia (40-69mg/dL)[6,8,9]. The common signs/symptoms of hypoglycemia are masked by general anesthesia, making vigilance and quick treatment especially important.[1] Fasting patients with or without diabetes and diabetic patients treated with oral glycemic agents or insulin are at increased risk of perioperative hypoglycemia.[2-3]

Perioperative hypoglycemia is a rare event typically caused by the following: [4]

1. Insulin overdose, either by patient taking higher than normal doses on the morning of surgery or by providers giving more insulin than necessary
2. Septic or circulatory shock

3. Failure to monitor

Risk Adjustment

Not applicable

References

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Measure Abbreviation

GLU-03

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with perioperative glucose > 200 mg/dL with administration of insulin or glucose recheck within 90 minutes of original glucose measurement.

Measure Time Period

Preop through PACU (see 'Other Measure Build Details' for more information)

Inclusions

- All patients with glucose level greater than 200 mg/dL
- Patients with ***and*** without diagnosis of diabetes

Exclusions

- ASA 5 and 6 cases
- Patients < 12 years of age.
- Glucose measurements > 200 mg/dL within 90 minutes before measure end (see 'Other Measure Build Details' for more information)
- Outpatient cases with Anesthesia Start to Anesthesia end time less than 4 hours long
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success

- Administration of insulin within 90 minutes (either IV or sub Q routes) or
- Recheck of glucose level within 90 minutes

Other Measure Build Details

- Percentage of glucose labs with perioperative glucose >200 with administration of insulin or glucose

recheck within 90 minutes of original glucose measurement for the time period encompassing preop to PACU.

- If two blood glucose levels are documented in the same minute, the lower blood glucose will be considered for this measure
- Measure start time is determined by MPOG Phenotype 'Preop Start Time'
- Meaure end time is determined by MPOG Phenotype 'PACU End Time'

Responsible Provider

Preop Time Period (preop start through anesthesia start): The first provider signed into the case

Intraop Time Period: The provider signed in at the first glucose recheck or first administration of insulin. If neither occurred, then the responsible provider is the one signed in 90 minutes after the high glucose measurement.

Postop Time Period (anesthesia end through PACU End): The last providers signed into the case

Threshold

90%

MPOG Concept IDs Required

Insulin MPOG Concept IDs		**Glucose MPOG Concept IDs**	
10229	Insulin Aspart	**3361**	POC- Glucose (Fingerstick)
10230	Insulin Glargine	**3362**	POC- Glucose (Unspecified Source)
10231	Insulin Novolin	**3405**	POC- Blood Gas-Glucose
10232	Insulin NPH	**5003**	Formal Lab-Glucose, Serum/Plasma
10233	Insulin Regular	**5036**	Formal Lab-Blood Gas, Glucose
10659	Insulin-Unspecified		
10752	Insulin Lispro	**10796**	Glucose Chew Tablet
10788	Insulin Detemir	**10797**	Glucose Gel 40%

Data Diagnostics Affected

- Percentage of Cases with Insulin Administration Mapped Correctly
- Percentage of Cases with POC Glucose Labs
- Percentage of Cases with a Lab Drawn during Anesthesia
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Fluids with a Meaningful Fluid Mapping

Phenotypes Used

- Admission Type
- Anesthesia CPT (Measures)
- ASA Class
- EndingProvider (No phenotype browser page)
- Glucose Observations Perioperative
- Measure Staff Sign Ins Extended (requires login)
- Obstetric Anesthesia Type
- PACU Start Time
- Starting Provider

Rationale

Surgical and anesthetic stress increases hyperglycemia incidence in both diabetics and non-diabetics.[3] Perioperative hyperglycemia is mediated by the release of proinflammatory cytokines (e.g., TNF-alpha and IL-6) and elevated concentrations of catecholamines, growth hormone, glucagon, and glucocorticoids.[4] These mediators induce metabolic alterations in carbohydrate balance that alter peripheral glucose uptake and utilization, increase gluconeogenesis, depress glycogenesis, and induce glucose intolerance and insulin resistance. Hyperglycemia can also be drug induced (administration of steroids).

Acute hyperglycemia in the perioperative period is known to increase the incidence of wound infections, overall mortality, length of stay, acute kidney injury, and delayed wound healing. [2,5,7, 8-12] Use of insulin to correct perioperative hyperglycemia decreases the risk of hospital complications and mortality in cardiac and general surgery patients.[6, 12] The American Association of Clinical Endocrinologists and American Diabetes Association recommend a treatment threshold of 180 mg/dL in critically ill hospitalized patients and a preprandial blood glucose goal of 140 mg/dL in non-critically hospitalized ill patients.[13] Patients undergoing anesthesia who are subject to tight glucose control are at greater risk of hypoglycemia as the effects of anesthesia can mask the symptoms of hypoglycemia and current methods of treatment and monitoring put patients at risk of overcorrection.[1] A relatively high threshold glucose level (greater than 200 mg/dL) is used for this measure to alleviate concerns that patients undergoing general anesthetics are at risk of overtreatment and hypoglycemia.[1] Blood glucose may be rechecked in one hour.

Risk Adjustment

Not applicable

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Measure Abbreviation

GLU-04

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with perioperative glucose <60 with administration of glucose or dextrose containing solution or glucose recheck within 90 minutes of original glucose measurement.

Measure Time Period

Preop through PACU (see 'Other Measure Build Details' for more information)

Inclusions

- All patients with glucose level less than 60 mg/dL
- Patients with ***and*** without diagnosis of diabetes

Exclusions

- ASA 5 and 6 cases
- Glucose measurements < 60 mg/dL within 90 minutes before measure end ('See Other Measure Build Details' for more information)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success

- Administration of glucose or dextrose containing solution within 90 minutes (IV)

OR

- Recheck of glucose level within 90 minutes

Other Measure Build Details

- Measure start time is determined by MPOG Phenotype 'Preop Start Time'
- Meaure end time is determined by MPOG Phenotype 'PACU End Time"

Responsible Provider

Preop Time Period (preop start through anesthesia start): The first provider signed into the case

Intraop Time Period: The provider signed in at the first glucose recheck or first administration of insulin. If neither occurred, then the responsible provider is the one signed in 90 minutes after the high glucose measurement.

Postop Time Period (anesthesia end through PACU End): The last providers signed into the case

Threshold

90%

MPOG Concept IDs Required

Dextrose MPOG Concept IDs		**Glucose MPOG Concept IDs**	
10152	Dextrose	**3361**	POC- Glucose (Fingerstick)
10153	Dextrose 50%	**3362**	POC- Glucose (Unspecified Source)
10460	Dextrose / Water 5%	**3405**	POC- Blood Gas-Glucose
10461	Dextrose / Lactated Ringers 5%	**5003**	Formal Lab-Glucose, Serum/Plasma
10462	Dextrose / Water 10%	**5036**	Formal Lab-Blood Gas, Glucose
10465	Dextrose / Saline 5% / 0.225%		
10466	Dextrose / Saline 5% / 0.45%		
10467	Dextrose / Saline 5% / 0.9%		
10468	Dextrose / Saline w/KCl 5%/ 0.45% + 20 MEQ/L		
10469	Dextrose / Saline w/KCl 5%/ 0.9% + 20 MEQ/L		

10470	Dextrose / Saline 10% / 0.45%
10539	Dextrose 10% w/ Lactated Ringers
10548	Plasmalyte 148 w/ Dextrose 5%
10558	Dextrose / Saline w/KCl 5%/ 0.225% + 20 MEQ/L
10559	Dextrose / Saline w/KCl 5%/ 0.45% + 40 MEQ/L
10588	Dextrose / Saline w/KCl 10%/ 0.225% + 20 MEQ/L
10594	Dextrose / Saline w/KCl 5%/ 0.45% + 10MEQ/L
10602	Dextrose / Saline 10% / 0.225%
10471	Total Parenteral Nutrition
10530	Peripheral Parenteral Nutrition
10777	Dextrose / Saline w/KCl 10% / 0.225% + 10MEQ/L
10778	Dextrose / Saline w/ KCl 10% / 0.45% + 10MEQ/L
10783	Dextrose / Saline 12.5% / 0.45%
10784	Dextrose / Water 25%
10785	Dextrose / Water 12.5%
10787	Dextrose / Water 3%
10780	Dextrose / Saline w/KCl 5% / 0.225% + 10MEQ/L
10781	Dextrose / Saline w/KCl 10% / 0.9% + 10MEQ/L
10786	Dextrose / Water 15%
10782	Dextrose / Saline w/KCl 5%/ 0.9% + 10 MEQ/L
10260	Dextrose / Sodium Acetate 10% / 19.5 MEQ
10613	Dextrose / Sodium Chloride 5% / 0.3%
10614	Dextrose / Sodium Chloride / Potassium Chloride 10% / 0.225% / 1.5 MEQ

10615	Dextrose / Sodium Chloride / Potassium Chloride 5% / 0.45% / 1.5 MEQ
10622	Dextrose / Saline 10% / 0.9%
10623	Dextrose 25%
10647	Dextrose / Saline w/ KCL 5% / 0.9% + 40 MEQ/L
10667	Dextrose / Saline 12.5% / 0.225%
10672	Dextrose 10% / Unspecified Solution
10673	Heparin w/ Dextrose Solution
10674	Dextrose / Saline w/KCL 10% / 0.9% + 20 mEQ/L
10676	Dextrose 5% / Unspecified Solution
10715	Dextrose / Saline 12.5% / 0.9%
10723	Dextrose / Water w/ KCL 5% / 10mEQ/L
10724	Dextrose / Saline w/KCL 5% / 30 mEQ/L
10725	Dextrose 20%
10734	Dextrose / Sodium Acetate / Magnesium Sulfate 10% / 80mEQ / 10mEQ/L
10782	Dextrose / Saline w/ KCL 5% / 0.9% + 10mEQ
10786	Dextrose / Water 15%
10204	GLUCAGON
10796	Glucose Chew Tablet
10797	Glucose Gel 40%

Data Diagnostics Affected

- Percentage of Cases with Insulin Administration Mapped Correctly
- Percentage of Cases with POC Glucose Labs
- Percentage of Cases with a Lab Drawn during Anesthesia
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Medications with a Meaningful Medication Mapping

- Percentage of Fluids with a Meaningful Fluid Mapping

Phenotypes Used

- Anesthesia CPT (Measures)
- ASA Class
- EndingProvider (No phenotype browser page)
- Glucose Observations Perioperative
- Measure Staff Sign Ins Extended (requires login)
- Obstetric Anesthesia Type
- Starting Provider

Rationale

The American Diabetes Association uses an outpatient hypoglycemia definition of <70 mg/dL[6,7]. Severe hypoglycemia in inpatients is considered <40mg/dL[6]. Acute hypoglycemia in the perioperative period can lead to inadequate supply of glucose to the brain, resulting in seizures, permanent brain damage, and death. In hospitalized diabetic patients, hypoglycemia has been associated with increased length of stay and mortality.[5] The risk of negative sequelae related to hypoglycemia is reduced with early recognition and treatment of mild to moderate hypoglycemia (40-69mg/dL)[6,8,9]. The common signs/symptoms of hypoglycemia are masked by general anesthesia, making vigilance and quick treatment especially important.[1] Fasting patients with or without diabetes and diabetic patients treated with oral glycemic agents or insulin are at increased risk of perioperative hypoglycemia.[2-3]

Perioperative hypoglycemia is a rare event typically caused by the following: [4]

1. Insulin overdose, either by patient taking higher than normal doses on the morning of surgery or by providers giving more insulin than necessary
2. Septic or circulatory shock
3. Failure to monitor

Risk Adjustment

Not applicable

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Measure Abbreviation

GLU-05

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with a blood glucose >200 mg/dL with documentation of insulin treatment

Measure Time Period

Preop start through PACU end

Inclusions

- All patients with a documented blood glucose level greater than 200 mg/dL between Preop Start and PACU End
- Patients with and without diagnosis of diabetes

Exclusions

- ASA 5 and 6 cases
- Patients < 12 years of age.
- Glucose measurements > 200 mg/dL within 90 minutes before measure end
- Outpatient cases with Anesthesia Start to Anesthesia end time less than 4 hours long
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Documented blood glucose <200 within 90 minutes of a blood glucose >200 mg/dL excludes the glucose >200mg/dL
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success

Administration of insulin within 90 minutes of blood glucose >200 mg/dL

Other Measure Build Details

Start Time - Preop Start as determined by MPOG Preop Start Time Phenotype

End Time - PACU End as determined by MPOG PACU End Time Phenotype

- Each blood glucose is evaluated separately. One instance of untreated blood glucose >200mg/dL will flag the case
- If a blood glucose is >200 mg/dL and any blood glucose within 90 minutes is <200 mg/dL, then the initial blood glucose will be excluded; the case will be excluded if no additional blood glucose values >200mg/dL are documented on the case
- If a blood glucose is >200 mg/dL and an insulin administration occurs within 90 minutes and there are no additional blood glucose values >200 mg/dL through PACU end, the case will pass.
- If blood glucose is >200 mg/dL and there is no insulin treatment within 90 minutes or documentation of a blood glucose <200mg/dL, the case will be flagged.
- Active infusion of an insulin drip at the time of high glucose will count as treatment for this measure. If no end time is available for an insulin infusion, the 'measure end time' will be considered the insulin infusion end time
- Sites not contributing preop and PACU data are not eligible to participate in this measure

Responsible Provider

Preop Time Period (preop start through anesthesia start): The first provider signed into the case

Intraop Time Period: The provider signed in at the first glucose recheck or first administration of insulin. If neither occurred, then the responsible provider is the one signed in 90 minutes after the high glucose measurement.

Postop Time Period (anesthesia end through PACU End): The last providers signed into the case

Threshold

90%

MPOG Concept IDs Required

Insulin MPOG Concept IDs		**Glucose MPOG Concept IDs**	
10229	**Insulin Aspart**	**3361**	**POC- Glucose (Fingerstick)**
10230	**Insulin Glargine**	**3362**	**POC- Glucose (Unspecified Source)**
10231	**Insulin Novolin**	**3405**	**POC- Blood Gas-Glucose**
10232	**Insulin NPH**	**5003**	**Formal Lab-Glucose, Serum/Plasma**

10233	**Insulin Regular**	**5036**	**Formal Lab-Blood Gas, Glucose**
10659	**Insulin- Unspecified**		
10752	**Insulin- Lispro?**		

Data Diagnostics Affected

- Percentage of Cases with Insulin Administration Mapped Correctly
- Percentage of Cases with POC Glucose Labs
- Percentage of Cases with a Lab Drawn during Anesthesia
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Fluids with a Meaningful Fluid Mapping

Phenotypes Used

- Admission Type
- Anesthesia CPT (Measures)
- ASA Class
- EndingProvider (No phenotype browser page)
- Glucose Observations Perioperative
- Measure Staff Sign Ins Extended (requires login)
- Obstetric Anesthesia Type
- Starting Provider

Rationale

Surgical and anesthetic stress increases hyperglycemia incidence in both diabetics and non-diabetics.[3,22] Perioperative hyperglycemia is mediated by the release of proinflammatory cytokines (e.g., TNF-alpha and IL-6) and elevated concentrations of catecholamines, growth hormone, glucagon, and glucocorticoids.[4] These mediators induce metabolic alterations in carbohydrate balance that alter peripheral glucose uptake and utilization, increase gluconeogenesis, depress glycogenesis, and induce glucose intolerance and insulin resistance. Hyperglycemia can also be drug induced (administration of steroids).

Acute hyperglycemia in the perioperative period is known to increase the incidence of wound infections, overall mortality, length of stay, acute kidney injury, and delayed wound healing. [2,5,7, 8-12] Use of insulin to correct perioperative hyperglycemia decreases the risk of hospital complications and mortality in cardiac and general surgery patients.[6, 12] The American Association of Clinical Endocrinologists and American Diabetes Association recommend a treatment threshold of 180 mg/dL in critically ill hospitalized patients and a preprandial blood glucose goal of 140 mg/dL in non-critically hospitalized ill patients.[13] The Society for Ambulatory Anesthesia, American Association of Clinical Endocrinologists, The Society for Thoracic Surgery, and the Joint British Diabetes Society also recommend blood glucose management <180 mg/dL.[14, 15,16, 17, 18] The ADA 2019 guidelines call for perioperative blood glucose ranges from 80-180mg/dL..[19] Patients undergoing anesthesia are at risk of hypoglycemia as the effects of anesthesia can mask the symptoms of hypoglycemia; however, conventional glucose targets of <180 mg/dL have not been associated with significant risk of hypoglycemia.[1,20,21] Frequent blood glucose monitoring after insulin administration is recommended. Intraoperative glucose levels should be checked every 2 hours or more frequent and insulin infusions should be monitored at least hourly.[3] A relatively high threshold glucose level (greater than 200 mg/dL) is used for this measure to alleviate concerns that patients undergoing general anesthetics are at risk of overtreatment and hypoglycemia.[1]

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Measure Abbreviation

CARD-02

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

Percentage of cases with elevated postoperative Troponin levels or documentation of perioperative myocardial injury.

Measure Time Period

Anesthesia End to 72 hours after Anesthesia End

Inclusions

All anesthetic cases.

Exclusions

- ASA 5 and 6 cases.
- Outpatient cases.
- Troponin I ≥ 0.01 ng/mL (or Troponin T ≥ 0.02 ng/mL) within 42 days prior to anesthesia start.*
- Pacemaker insertions (CPT: 00530)
- Cardiac Ablation (CPT: 00537)
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and < 1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG without pump (CPT: 00566)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Testing of cardioversion or defibrillator functions (CPT: 00534)
- Cardiac catheterization (CPT: 01920)

*Rationale for excluding patient with troponin elevation within 42 days prior to date of surgery is based upon ACC/AHA guidelines recommending a delay in elective surgery for 6 weeks following myocardial infarction.[4]

Success

In cases with Troponin I or Troponin T value(s) available within 72 hours after anesthesia end, all values must be less than or equal to the following:

- Troponin I (ctnl) ≤ 600 ng/L
- Troponin I (ctnl) ≤ 0.6 ng/mL
- Troponin T (hs-cTnT) ≤ 91 ng/L
- Troponin T (hs-cTnT) ≤ 91 pg/mL
- Troponin T (hs-cTnT) ≤ .091 ng/mL

If no Troponin I (or Troponin T) values are available within 72 hours after anesthesia end and there is no documentation of perioperative myocardial injury (MPOG Concepts: 90201, 90202), the case will not be flagged (ie we presume no myocardial injury).

Other Measure Build Details

- CARD 02 is an outcome measure that identifies patients that had elevated troponin levels (Troponin I > 0.6, Troponin T > 0.091) within 72 hours postoperatively.
- If another case starts within 72 hours, then the time window ends at anesthesia start of the subsequent case.
- For the preoperative Troponin I exclusion, cases with preoperative Troponin I values with 'less than (<)' included in the result will be included up to '<0.31.' For example, preoperative Troponin I levels that are resulted as '<0.02' will be included for the measure. However, a preoperative Troponin I value of 0.02 will be excluded. The rationale for this is each pathology department determines the lower bound for detecting Troponin I levels accurately. This is standardized to the health system but is not standard across all participating sites.
- For sites that use high sensitivity troponin T, although kinetics are different for Trop T and Trop I, cardiologists at The University of Michigan have shared that a hs-Trop T measurement of 30 pg/ml roughly correlates with the initial detectable level of Trop I (just above 0.1 ng/ml). An hs-Trop T of 140 pg/ml roughly correlates with a current Trop I value of 1.0 ng/ml. Using those endpoints in the slope intercept formula (y = mx + b), a Trop I value of .6 ng/ml roughly correlates to a hs-Trop T of .091 ng/ml
    - *y = .00818x + 17.78*
    - *0.6 = .00818(x) + 17.78*
    - *x = 90.9 pg/mL or .091 ng/mL*

Algorithm for determining Case Duration:

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End.

Responsible Provider

Providers assigned to patient for the longest duration of the case unless there are providers responsible for flagging BP 01 during case. In that case, BP 01 attribution takes precedence over longest duration. See 'Other Measure Build Details' section of this specification to view the algorithm used for determining case duration.

Threshold

≤5%

MPOG Concept IDs Required

Troponin MPOG Concept ID		**Myocardial Injury MPOG Concept IDs**	
5011	Formal lab – Cardiac Troponin I (cTnI ng/mL)	**90201**	CPOM measure Cardiac Arrest
3396	Formal lab – Cardiac Troponin I (cTnI ng/L)	**90202**	CPOM measure Myocardial Ischemia
3397	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT ng/mL)		
3392	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT ng/L)		
3401	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT pg/mL)		

Data Diagnostics Affected

- Percentage of Cases with Postoperative Troponin (Postoperative Troponin)
- Percentage of Cases with Professional Fee Procedure Codes (Pro Fee Procedures)
- Percentage of CPT Codes from Anesthesia Professional Fee Billing that are actually Anesthesia Codes (Anesthesia Codes)
- Percentage of Cases with a Meaningful Admission Type Mapping (Admission Type Mapping)
- Percentage of Cases with ASA Status (Cases with ASA Status)

Phenotypes Used

- Admission Type

- Measure: BP-01
- PrimaryProvider

Rationale

Postoperative myocardial infarction within 72 hours (as defined by a Troponin I level >3.6 times the 99th percentile upper reference limit, usually no greater than 1.00 ng/mL)[1,2] is associated with a significantly increased risk of 30-day mortality. Furthermore, any amount of postoperative myocardial injury (as defined by a Troponin I level > 0.03 ng/mL) is an independent predictor of 30-day mortality.[3] Preventing myocardial infarction is an important anesthetic goal.

Risk Adjustment

To evaluate provider-level risk adjustment we will calculate the observed to expected outcomes ratio (O/E). The O/E is calculated using a logistic regression model and predicts (given a set list of dependent patient and hospital level variables) the expected probability of having an elevated Troponin I level. We adjust for surgery risk score, emergent procedures, ASA, gender, age, body mass index, laboratory values, and teaching versus private hospital. Patient specific comorbidities are evaluated as well.

References

1. Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD. Third universal definition of myocardial infarction. *Global Heart.* 2012;7(4):275-295.
2. Devereaux PJ, Xavier D, Pogue J, et al. Characteristics and short-term prognosis of perioperative myocardial infarction in patients undergoing noncardiac surgery: a cohort study. Annals of internal medicine. 2011;154(8):523-528.
3. Botto F, Alonso-Coello P, Chan MT, et al. Myocardial injury after noncardiac surgery: a large, international, prospective cohort study establishing diagnostic criteria, characteristics, predictors, and 30-day outcomes. *Anesthesiology.* 2014;120(3):564-578.
4. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery. *Journal of nuclear cardiology: official publication of the American Society of Nuclear Cardiology.* 2015;22(1):162-215.

Measure Abbreviation

CARD-03

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

Percentage of *high cardiac risk* cases with significantly elevated postoperative troponin levels.

Inclusions

- All high-risk surgeries* **OR**
- All anesthetic cases performed on patients with history of ischemic heart disease, congestive heart failure, cerebrovascular disease, diabetes requiring preoperative insulin, or chronic kidney disease (baseline Cr > 2.0 mg/dL).**

* High-risk surgeries include intraperitoneal, intrathoracic, or suprainguinal vascular procedures, as adapted from the Revised Cardiac Risk Index (RCRI) and identified by Anesthesia CPT codes:

High Risk Surgery Type	Anesthesia CPT Codes
Intraperitoneal	00730, 00754, 00756, 00790, 00792, 00794, 00796, 00797, 00840, 00844, 00846, 00848, 00851, 00866, 01140
Intrathoracic	00500, 00539, 00540, 00541, 00542, 00546, 00548, 00625, 00626, 01636,
Suprainguinal Vascular	00216, 00350, 00670, 00770, 00880, 00882, 01650, 01652, 01654, 01656, 01770, 01772, 01925, 01926

** Comorbidities posing high cardiac risk are adapted from the Revised Cardiac Risk Index (RCRI) and are identified by Elixhauser Comorbidity Index variables (congestive heart failure, diabetes), preoperative lab values (baseline serum creatinine), or comorbidity-specific ICD-9/10 codes (ischemic heart disease, cerebrovascular disease):

Comorbidity	Specific Diagnostic Criteria
Congestive heart failure	Elixhauser Comorbidity – Congestive Heart Failure: https://collations.mpogresearch.org/Detail.aspx?name=Comorbidity%20-%20Congestive%20Heart%20Failure

Diabetes	Elixhauser Comorbidity – Diabetes (uncomplicated): https://collations.mpogresearch.org/Detail.aspx?name=Comorbidity%20-%20Diabetes%20(uncomplicated) OR Elixhauser Comorbidity – Diabetes (complicated): https://collations.mpogresearch.org/Detail.aspx?name=Comorbidity%20-%20Diabetes%20(complicated)
Ischemic Heart Disease	MPOG Phenotype – Coronary Artery Disease: https://collations.mpogresearch.org/Detail.aspx?name=Coronary%20Artery%20Disease
Cerebrovascular Disease	MPOG Phenotype – Cerebrovascular Disease: https://collations.mpogresearch.org/Detail.aspx?name=Cerebrovascular%20Disease
Chronic Kidney Disease	Most recent serum creatinine within 60 days > 2.0 mg/dL

Exclusions

- ASA 5 and 6 cases.
- Outpatient cases
- Troponin I > 0.01 ng/mL within 42 days prior to anesthesia start***
- Pacemaker insertions (CPT: 00530)
- Cardiac Ablation (CPT: 00537)
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump < 1 year old (CPT: 00561)
- Cardiac surgery with pump (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG without pump (CPT: 00566)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Testing of cardioversion or defibrillator functions (CPT: 00534)
- Cardiac catheterization (CPT: 01920)

*** Rationale for excluding patient with troponin elevation within 42 days prior to date of surgery is based upon ACC/AHA guidelines recommending a delay in elective surgery for 6 weeks following myocardial infarction.

Success

In cases with Troponin I or Troponin T value(s) available within 72 hours after anesthesia end, all values

must be less than or equal to the following:

- Troponin I (ctnl) ≤ 600 ng/L
- Troponin I (ctnl) ≤ 0.6 ng/mL
- Troponin T (hs-cTnT) ≤ 84 ng/L
- Troponin T (hs-cTnT) ≤ 84 pg/L
- Troponin T (hs-cTnT) ≤ 0.084 ng/mL

If no Troponin I (or Troponin T) values are available within 72 hours after anesthesia end and there is no documentation of perioperative myocardial injury (MPOG Concepts: 90201, 90202), the case will not be flagged (ie we presume no myocardial injury).

Other Measure Build Details

- CARD 03 is an outcome measure that identifies high cardiac risk patients that have severely elevated troponin levels within 72 hours postoperatively.
- If another case starts within 72 hours, then the time window ends at anesthesia start of the subsequent case.
- For the preoperative Troponin I exclusion, cases with preoperative Troponin I values with 'less than (<)' included in the result will be included up to '<0.31.' For example, preoperative Troponin I levels that are resulted as '<0.02' will be included for the measure. However, a preoperative Troponin I value of 0.02 will be excluded. The rationale for this is each pathology department determines the lower bound for detecting Troponin I levels accurately. This is standardized to the health system but is not standard across all participating sites.
- For sites that use high sensitivity troponin T, although kinetics are different for Trop T and Trop I, a hs-Trop T measurement of 30 pg/ml roughly correlates with the initial detectable level of Trop I (just above 0.1 ng/ml). An hs-Trop T of 140 pg/ml roughly correlates with a current Trop I value of 1.0 ng/ml. Using those endpoints, a Trop I value of .6 ng/ml roughly correlates to a hs-Trop T of .84 pg/ml.

Responsible Provider

Providers assigned to patient longest duration of case unless there are providers who failed BP 01 (sustained MAP < 55 mmHg) during case. In that case, BP 01 failure takes precedence over longest duration.

Method for determining Responsible Provider:

1. Provider(s) who failed BP 01. If not applicable,
2. Provider(s) signed into the case for the longest duration.

Threshold

=5%

MPOG Concept IDs Required

Troponin MPOG Concept ID	Myocardial Injury MPOG Concept IDs	Creatinine MPOG Concept ID

5011	Formal lab – Cardiac Troponin I (cTnI ng/mL)	**90201**	CPOM measure Cardiac Arrest	**5002**	Formal lab – Creatinine, Serum/Plasma
3396	Formal lab – Cardiac Troponin I (cTnI ng/L)	**90202**	CPOM measure Myocardial Ischemia		
3397	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT ng/mL)				
3392	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT ng/L)				
3401	Formal lab – High-sensitivity Cardiac Troponin T (hs-cTnT pg/mL)				

Data Diagnostics Affected

- Percentage of Cases with Postoperative Troponin (Postoperative Troponin)
- Percentage of Cases with Professional Fee Procedure Codes (Pro Fee Procedures)
- Percentage of CPT Codes from Anesthesia Professional Fee Billing that are actually Anesthesia Codes (Anesthesia Codes)
- Percentage of Cases with a Meaningful Admission Type Mapping (Admission Type Mapping)
- Percentage of Cases with ASA Status (Cases with ASA Status)

Phenotypes Used

- Admission Type
- ComorbidityMpogCerebrovascularDisease (No phenotype browser page)
- Elixhauser Comorbidity - Congestive Heart Failure
- Elixhauser Comorbidity - Diabetes (Complicated)
- Elixhauser Comorbidity - Diabetes (Uncomplicated)
- Measure: BP-01
- MPOG Comorbidity - Coronary Artery Disease
- PrimaryProvider

Rationale

Preventing myocardial infarction is an important anesthetic goal. Protecting against this outcome is particularly relevant among patients with comorbid conditions or undergoing surgeries at high risk of major adverse cardiac events.

Troponin I levels are accurate markers of myocardial infarction. Postoperative myocardial injury within 72 hours (as defined by a Troponin I level >2x the 99th percentile upper reference limit) is associated with a significantly increased risk of 30-day mortality. Furthermore, any amount of postoperative myocardial injury (as defined by a Troponin I level > 0.03 ng/mL) is an independent predictor of 30-day mortality. Adjusted

relative risk of death was 4.2 for patients with Troponin I ≥ 0.60 ng/mL.

Risk Adjustment

To evaluate provider-level risk adjustment we will calculate the observed to expected outcomes ratio (O/E). The O/E is calculated using a logistic regression model and predicts (given a set list of dependent patient and hospital level variables) the expected probability of having an elevated Troponin I level. We adjust for surgery risk score, emergent procedures, ASA, gender, age, body mass index, laboratory values, and teaching versus private hospital. Patient specific comorbidities are evaluated as well.

References

1. Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD. Third universal definition of myocardial infarction. Global Heart. 2012;7(4):275-295.
2. Devereaux PJ, Xavier D, Pogue J, et al. Characteristics and short-term prognosis of perioperative myocardial infarction in patients undergoing noncardiac surgery: a cohort study. Annals of internal medicine. 2011;154(8):523-528.
3. Botto F, Alonso-Coello P, Chan MT, et al. Myocardial injury after noncardiac surgery: a large, international, prospective cohort study establishing diagnostic criteria, characteristics, predictors, and 30-day outcomes. Anesthesiology. 2014;120(3):564-578.
4. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery. Journal of nuclear cardiology: official publication of the American Society of Nuclear Cardiology. 2015;22(1):162-215.
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6. Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining Comorbidities in ICD-9-CM and ICD-10 administrative data. Med Care. 2005 Nov; 43(11): 1130-9.

Measure Abbreviation

NMB-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with a documented Train of Four (TOF) after last dose of non-depolarizing neuromuscular blocker.

Measure Time Period

Anesthesia Start to Earliest Extubation

Inclusions

All patients that have received either by bolus or infusion a non-depolarizing neuromuscular blocker (NMB) AND were extubated post-operatively or in the PACU. The following NMBs are included:

- Atracurium
- Cisatracurium
- Pancuronium
- Rocuronium
- Vecuronium

Exclusions

- ASA 5 and 6 cases.
- Patients that were not extubated in the immediate post-operative period.
- Patients not given NMBs.
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Any cardiac case with an intraoperative note mapped to one of the following MPOG Concepts:
    - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
    - 50409 Cardiopulmonary bypass terminated
    - 50410 Cardiopulmonary bypass initiated (full)

- 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
- 50417 Cardiopulmonary bypass -- Access cannula removed note
- 50714 Cardiopulmonary bypass - Bypass start / stop event

- Cases performed by cardiac surgical service: MPOG concept 80005.

Success

Documentation of a Train of Four count (1, 2, 3, or 4), sustained tetany, or TOF ratio provided by acceleromyography AFTER last dose or stopping of infusion of neuromuscular blocker and before earliest extubation. Note: A Train of Four value of '0' is accepted for cases in which Sugammadex is administered for reversal.

Other Measure Build Details

Responsible Provider

The provider signed in at time of earliest extubation.

Threshold

90%

MPOG Concept IDs Required

Neuromuscular Blocker Medications		**Extubation**		**Train of Four**	
10043	Atracurium	**50127**	Intubation Extubated Awake or Deep	**3033**	Train-of-four objective count (acceleromyography, electromyography, other)
10129	Cisatracurium	**50202**	Emergence- Patient Extubated	**3330**	Train-of-four (Subjective assessment)
10344	Pancuronium	**50145**	Airway – Laryngeal mask airway removed (deep or awake)	**3485**	Train-of-four (Acceleromyography)
10393	Rocuronium				
10446	Vecuronium				

Data Diagnostics Affected

- Percentage of Cases with a Non-Depolarizing NMB Administration

- Percentage of Cases with an Extubation Note
- Percentage of Cases with a Train of Four Observation
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Time

Phenotypes Used

- ASA Class
- Extubation Times
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Non-Operative
- ProcedureTypeCardiac
- Train Of Four Values

Rationale

Postoperative residual neuromuscular blockade can lead to significant complications. Several studies have found associations between the use of neuromuscular blockade agents (NMBA) and residual neuromuscular blockade in the recovery room. Adverse postoperative respiratory outcomes are even more frequent when patients receive NMBA and reversal agents are not used. A mainstay of residual blockade prevention continues to be monitoring to allow for detection, and use of reversal agents like neostigmine and Sugammadex. Due to variability in duration of muscle relaxants, even in defasciculating doses, we recommend that TOF is monitored when any non-depolarizing neuromuscular blockers are administered.

Risk Adjustment

Not Applicable

References

1. Beecher HK, Todd DP. A study of the deaths associated with anesthesia and surgery: based on a study of 599, 548 anesthesias in ten institutions 1948-1952, inclusive. Ann Surg 1954; 140:2-35.
2. Brull SJ, Murphy GS. Residual neuromuscular block: lessons unlearned. Part II: methods to reduce the risk of residual weakness. Anesth Analg. 2010. 111(1): 129-40.
3. Grosse-Sundrup M, Henneman JP, Sandberg WS, Bateman BT, Uribe JV, Nguyen NT, Ehrenfeld JM, Martinez EA, Kurth T, Eikermann M. Intermediate acting non-depolarizing neuromuscular blocking agents and risk of postoperative respiratory complications: prospective propensity score matched cohort study. BMJ 2012; 345:e6329
4. Harrison GG. Death attributable to anaesthesia. A 10-year survey (1967-1976). Br J Anaesth 1978; 50:1041-6.
5. Lien CA, Kopman AF. Current recommendations for monitoring depth of neuromuscular blockade. Curr Opin Anesthesiol. 2014; 27(6): 616-622.
6. Lunn JN, Hunter AR, Scott DB. Anaesthesia-related surgical mortality. Anaesthesia 1983; 38:1090-6.
7. Pedersen T, Viby-Mogensen J, Ringsted C. Anaesthetic practice and postoperative pulmonary complications. Acta Anaesthesiol Scand 1992; 36:812-8.

Measure Abbreviation

NMB-02

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Administration of Neostigmine, Sugammadex, and/or Edrophonium before extubation for cases with non-depolarizing neuromuscular blockade.

Measure Time Period

Anesthesia Start to Earliest Extubation

Inclusions

All patients that have received either by bolus or infusion a non-depolarizing neuromuscular blocker (NMB) AND were extubated post-operatively. The following NMBs were included:

- Atracurium
- Cisatracurium
- Pancuronium
- Rocuronium
- Vecuronium

Exclusions

- ASA 5 and 6 cases.
- Patients that were not extubated in the immediate post-operative period.
- Patients not given NMBs.
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Cases where patients (age > 12) received defasciculating doses of
    - Vecuronium ≤ 1mg
    - Cisatracurium ≤ 2mg
    - Rocuronium ≤ 10 mg

- Cases performed by cardiac surgical service: MPOG concept 80005.
- Any cardiac case with an intraoperative note mapped to one of the following MPOG Concepts:
    - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
    - 50409 Cardiopulmonary bypass terminated
    - 50410 Cardiopulmonary bypass initiated (full)
    - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
    - 50417 Cardiopulmonary bypass -- Access cannula removed note
    - 50714 Cardiopulmonary bypass - Bypass start / stop event

Success

Documentation of neostigmine, Sugammadex, and/or edrophonium before earliest extubation.

OR

A period of greater than 3 hours exists between last dose of non-depolarizing medication and extubation for patients ≥ 12 years old.

OR

A period of greater than 2 hours exists between last dose of non-depolarizing medication and extubation for patients <12 years old.

OR

An acceleromyography ratio of ≥ 0.9 documented after last dose of NMB and before earliest extubation.

Other Measure Build Details

Responsible Provider

The provider(s) signed in at time of earliest extubation.

Threshold

90%

MPOG Concept IDs Required

Neuromuscular Blocker Medications		**Reversal Agents**		**Extubation**		**Train of Four**	
10043	Atracurium	**10170**	Edrophonium	**50127**	Intubation Extubated Awake or Deep	**3485**	Train-of-four (Acceleromyography)
10129	Cisatracurium	**10315**	Neostigmine	**50202**	Emergence-Patient Extubated		

10344	Pancuronium	**10739**	Sugammadex	**50145**	Airway – Laryngeal mask airway removed (deep or awake)
10393	Rocuronium				
10446	Vecuronium				

Data Diagnostics Affected

- Percentage of Cases with a Non-Depolarizing NMB Administration
- Percentage of Cases with an Extubation Note
- Percentage of Cases with Neuromuscular Blocker Reversal Agents Administered
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- ASA Class
- Extubation Times
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Procedure Type: Non-Operative
- ProcedureTypeCardiac

Rationale

Postoperative residual neuromuscular blockade can lead to significant complications.[1,2] Several studies have found associations between the use of neuromuscular blockade agents (NMBA) and residual neuromuscular blockade in the recovery room. Adverse postoperative respiratory outcomes are even more frequent when patients receive NMBA and reversal agents are not used. A mainstay of residual blockade prevention continues to be monitoring to allow for detection, and use of reversal agents like neostigmine and sugammadex.[3-5] Due to variability in duration of muscle relaxants, even in defasciculating doses, we recommend that TOF is monitored when any non-depolarizing neuromuscular blockers are administered.

References

1. McLean DJ, Diaz-Gil D, Farhan HN, Ladha KS, Kurth T, Eikermann M. Dose-dependent Association between Intermediate-acting Neuromuscular-blocking Agents and Postoperative Respiratory Complications. *Anesthesiology.* 2015;122(6):1201-1213.
2. Murphy GS, Szokol JW, Avram MJ, et al. Residual Neuromuscular Block in the Elderly: Incidence and Clinical Implications. *Anesthesiology.* 2015;123(6):1322-1336.
3. Brull SJ, Murphy GS. Residual neuromuscular block: lessons unlearned. Part II: methods to reduce the risk of residual weakness. *Anesthesia and analgesia.* 2010;111(1):129-140.
4. Bulka CM, Terekhov MA, Martin BJ, Dmochowski RR, Hayes RM, Ehrenfeld JM. Nondepolarizing Neuromuscular Blocking Agents, Reversal, and Risk of Postoperative Pneumonia. *Anesthesiology.* 2016;125(4):647-655.

5. Lien CA, Kopman AF. Current recommendations for monitoring depth of neuromuscular blockade. *Current opinion in anaesthesiology.* 2014;27(6):616-622.

Measure Abbreviation

PONV-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of patients, aged 18 years and older, who undergo a procedure under an inhalational general anesthetic, AND who have three or more risk factors for post-operative nausea and vomiting (PONV), who receive combination therapy consisting of at least two prophylactic pharmacologic antiemetic agents of different classes preoperatively or intraoperatively.

The purpose of this process of care measure is to reduce the incidence of postoperative nausea and vomiting in adult surgical patients.

Measure Time Period

4 hours before Anesthesia Start to PACU start

Inclusions

- All patients, aged 18 years and older, who undergo any procedure including surgical, therapeutic, or diagnostic under an **inhalational general anesthetic between Anesthesia Start and Anesthesia End**, AND who have **three or more risk factors for PONV.**
    - PONV Risk Factors:
        - Female gender
        - History of PONV
        - History of motion sickness
        - Non-smoker
        - Intended administration of opioids for post-operative analgesia. This includes use of opioids given intraoperatively and whose effects extend into the post anesthesia care unit (PACU) or post-operative period, or opioids given in the PACU, or opioids given after discharge from the PACU.

Exclusions

- Patients <18 years old.
- Patients transferred directly to the ICU
- Liver Transplants (see ProcedureTypeTransplantLiver phenotype)
- Lung Transplants (see ProcedureTypeTransplantLung phenotype)

- Procedures (by CPT): 00452, 00561, 00562, 00563, 00567, 00622, 00634, 01916, 01920, 01922, 01953, 01958, 01960, 01990, 01991, 01992, 01996, 01999
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Invalid cases where Measure End results prior to Measure Start

Success

Patient receives combination therapy consisting of at least two prophylactic pharmacologic anti-emetic agents of different classes preoperatively or intraoperatively

Anti-emetic therapy: The recommended first- and second-line classes of pharmacologic anti-emetics for PONV prophylaxis in patients at moderate to severe risk of PONV include (but are not limited to):

- NK-1 Receptor Antagonists
- 5-Hydroxytryptamine (5-HT3) Receptor Antagonists
- Glucocorticoids
- Phenothiazines
- Phenylethylamines
- Butyrophenones
- Antihistamines
- Anticholinergics

Note: In addition, propofol infusion is accepted as one of the antiemetic options for this measure. The foregoing list of medications/drug names is based on clinical guidelines and other evidence. The specified drugs were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs may not be current. Physicians and other health care professionals should refer to the FDA's web site page entitled "Drug Safety Communications" for up-to-date drug recall and alert information when prescribing medications.

Other Measure Build Details

- Values for flows and gases will be assessed and considered artifact if less than the following ranges and the patient did not receive any other inhalational general anesthetics greater than these ranges:
  - Nitrous Oxide Flows: <0.2 L/min
  - Isoflurane Insp %: <0.2%
  - Sevoflurane Insp %: <0.5%
  - Desflurane Insp %: <0.5%
  - Nitrous Oxide Insp % <15%
- If smoking status is not documented, patient is assumed to be a non-smoker and therefore is assigned at least one risk factor.
- This measure requires CPT codes to be transferred to the MPOG database for cases to be included. Those sites participating with this measure must have current pro fee procedure data in the MPOG Central database- refer to the flow diagram on page 10 of this specification for more details.
- **Algorithm for determining Measure End Time:**
  - Recovery Room In Date/Time. If not available then,
  - Phase I Recovery Room In Date/Time. If not available then,
  - Phase II Recovery Room In Date/Time. If not available then,
  - Patient out of Room. If not available then,
  - Data Capture End. If not available then,

- Anesthesia End.

Responsible Provider

Provider(s) signed in at Induction End.

Method for determining Responsible Provider:

1. Provider signed in at Anesthesia Induction End. If not available then,
2. Provider signed in at Anesthesia Induction Begin. If not available then,
3. Provider signed in at Procedure Start. If not available then,
4. Provider signed in at Patient in Room. If not available then,
5. Provider signed in Anesthesia Start.

Threshold

90%

MPOG Concept IDs Required

General Inhalational Anesthetic MPOG Concept IDs	
3297	Enflurane Exp %
3298	Enflurane Insp %
3006	Isoflurane actual consumption (ml)
3007	Desflurane actual consumption (ml)
3260	Isoflurane Exp %
3265	Isoflurane Insp%
3280	Desflurane Exp %
3285	Desflurane Insp %
50420	Cardiopulmonary bypass – Isoflurane vaporizer turned on
3008	Sevoflurane actual consumption (ml)
3270	Sevoflurane Exp %
3275	Sevoflurane Insp %
3503	Sevoflurane (mmHg)
3250	Nitrous Insp %
3255	Nitrous Exp %

Antiemetic MPOG Concept IDs (by class)	
Class: 5-Hydroxytryptamine (5-HT3) Receptor Antagonists	
10335	Ondansetron
10164	Dolasetron
10208	Granisetron
10711	Palonosetron
Anticholinergics	
10400	Scopolamine Patch
10399	Scopolamine
11040	Butylscopolamine
Antiemetic MPOG Concept IDs (by class)- Continued	
Antihistamines	
10257	Dimenhydrinate
10160	Diphenhydramine
10635	Meclizine
Butyrophenones	
10169	Droperidol
10210	Haloperidol
Neurokinin-1 Receptor Agonists	
10035	Aprepitant
10719	Fosaprepitant
Phenothiazines	
10374	Promethazine
10373	Prochlorperazine
Steroids	
10147	Dexamethasone
10296	Methylprednisolone
Prokinetic	
10297	Metoclopramide

Other	
10377	Propofol (Infusion only)
PONV Medical Reason Exclusion MPOG Concept ID	
50046	Medical Performance Exclusion-PONV
PONV Risk Factor- Smoking Status MPOG Concept IDs:	
70128	History- Social History- Tobacco
71100	History- Social History- Tobacco Details Pack Years
71110	History- Social History- Tobacco details Current vs Past
PONV Risk Factor- History of PONV/Motion Sickness MPOG Concept IDs:	
70225	Assessment and Plan - Comments
70302	Assessment and Plan- Anesthetic Consideration
70338	General- PONV Risk Factors
70339	General- PONV Risk Total Score
70080	General- Previous Anesthetic Problem
70102	Misc- Motion Sickness
PONV Risk Factor- Intended Administration of Opioids for Postop Analgesia MPOG Concept IDs:	
70234	Assessment and Plan – Postop Pain Management
10008	Bupivacaine w/ Hydromorphone 0.1% / Unspecified
10020	Alfentanil
10077	Bupivacaine w/ Fentanyl 0.0625% / 3 mcg/mL
10079	Bupivacaine w/ Fentanyl 0.08% / 2 mcg/mL
10080	Bupivacaine w/ Fentanyl 0.125% / 2 mcg/mL

10081	Bupivacaine w/ Fentanyl 0.125% / 3 mcg/mL
10082	Bupivacaine w/ Hydromorphone 0.0625% / 5 mcg/mL
10083	Bupivacaine w/ Hydromorphone 0.0625% / 10 mcg/mL
10103	Bupivacaine w/ Fentanyl 0.125% / 5 mcg/mL
10186	Fentanyl
10187	Fentanyl / Midazolam 40mcg/mL / 200mcg/mL
10219	Hydromorphone
10258	Bupivacaine w/ Hydromorphone 0.05% / 3 mcg/mL
10279	Meperidine
10290	Methadone
10306	Morphine
10341	Oxycodone
10408	Bupivacaine w/ Fentanyl 0.0625% / 5 mcg/mL
10414	Sufentanil
10439	Bupivacaine w/ Sufentanil w/ Epinephrine 100 mg / 100 mcg / 0.42 mg
10475	Bupivacaine w/ Hydromorphone 0.125% / 5 mcg/mL
10476	Bupivacaine w/ Hydromorphone 0.125% / 10 mcg/mL
10478	Lidocaine w/ Hydromorphone 2% / 10 mcg/mL
10479	Lidocaine w/ Fentanyl w/ Epinephrine w/ Bicarbonate 2% / 5 mcg/mL / 1:200,000
10481	Oxycodone / Acetaminophen 5 mg / 325 mg
10482	Hydrocodone / Acetaminophen 5 mg / 325 mg
10483	Hydrocodone / Acetaminophen 7.5 mg / 500 mg
10486	Bupivacaine w/ Fentanyl 0.5% / 3 mcg/mL
10488	Bupivacaine w/ Fentanyl 0.5% / 10 mcg/mL
10518	Bupivacaine w/ Hydromorphone 0.5% / 10 mcg/mL
10519	Bupivacaine w/ Fentanyl 0.05% / 3 mcg/mL
10522	Bupivacaine w/ Morphine 0.75% / 0.2 mg
10534	Bupivacaine w/ Fentanyl 0.0625% / 2 mcg/mL
10536	Bupivacaine w/ Fentanyl 0.0625% / 10 mcg/mL

10554	Bupivacaine w/ Fentanyl 0.1% / 2 mcg/mL
10583	Bupivacaine w/ Fentanyl 0.0625% / 4 mcg/mL
10584	Bupivacaine w/ Fentanyl 0.0625% / 10 mcg/mL
10585	Bupivacaine w/ Fentanyl 0.125% / 4 mcg/mL
10597	Propofol w/ Alfentanil 10 mg/mL + 50 mcg/mL
10603	Bupivacaine w/ Hydromorphone 0.05% / 10 mcg/mL
10611	Bupivacaine w/ Fentanyl w/ Epinephrine 37.5 mg / 750 mcg / 0.125 mg
10620	Bupivacaine w/ Fentanyl 0.125% / 10 mcg/mL
10633	Ropivacaine w/ Fentanyl 0.125% 2 mcg/mL
10642	Bupivacaine w/ Fentanyl 0.01% / 4 mcg/mL
10643	Bupivacaine w/ Fentanyl 0.25% / 4 mcg/mL
10644	Bupivacaine w/ Fentanyl 0.25% / 2 mcg/mL
10646	Bupivacaine w/ Hydromorphone 0.125% / 20 mcg/mL
10648	Bupivacaine w/ Hydromorphone 0.1% / 20 mcg/mL
10654	Bupivacaine w/ Fentanyl 0.167% / 16.67 mcg/mL
10669	Bupivacaine w/ Fentanyl 0.25% / 10 mcg/mL
11120	Bupivacaine w/ Fentanyl 0.05% / 5 mcg/mL
11130	Bupivacaine w/ Fentanyl 0.25% / 2.5 mcg/mL
11140	Bupivacaine w/ Fentanyl 0.05% / 2 mcg/mL

Data Diagnostics Affected

- Percentage of Cases with Professional Fee Procedure Codes
- Percentage of Cases with Antiemetic Medications
- Percentage of Cases in which the Patient has a known Gender
- Percentage of Intraoperative Notes with a Meaningful Note Mapping
- Percentage of Preoperative Notes with a Meaningful Type Mapping

Phenotypes Used

- Induction End
- Induction Start
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Motion Sickness History Classification
- Nitrous Oxide Used (New) (requires login)
- Obstetric Anesthesia Type

- PACU Start Time
- Patient In Room Date/Time
- PONV History Classification
- Postoperative Destination
- Procedure Type: Liver Transplant
- Procedure Type: Lung Transplant
- Procedure Type: Non-Operative
- Smoking Notes (requires login)
- Surgery Start Date/Time

Rationale

Postoperative nausea and vomiting (PONV) is a common and unpleasant outcome of anesthesia care that can lead to other complications, lengthening the patient's recovery period after surgery[1]. Effective management of PONV leads to optimal patient outcomes and comfort during the postoperative period.[2] The Apfel score is one of the most common risk predictors for PONV and is based on 4 variables: female gender, nonsmoking status, history of PONV or motion sickness and postoperative opioid administration. The presence of each additional risk factor increases a patients risk of PONV by twenty percent.[3] Although including a prophylactic anti-emetic administration protocol that considers such risk factors has shown to reduce the incidence of PONV, there is high variability in this outcome.[4-7]

References

1. Gillmann HJ, Wasilenko S, Zuger J, et al. Standardised electronic algorithms for monitoring prophylaxis of postoperative nausea and vomiting. *Archives of medical science : AMS.* 2019;15(2):408-415.
2. Collins AS. Postoperative nausea and vomiting in adults: implications for critical care. *Critical care nurse.* 2011;31(6):36-45.
3. Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. *Anesthesia and analgesia.* 2014;118(1):85-113.
4. Schraag S, Pradelli L, Alsaleh AJO, et al. Propofol vs. inhalational agents to maintain general anaesthesia in ambulatory and in-patient surgery: a systematic review and meta-analysis. *BMC anesthesiology.* 2018;18(1):162.
5. Gan TJ, Ginsberg B, Grant AP, Glass PS. Double-blind, randomized comparison of ondansetron and intraoperative propofol to prevent postoperative nausea and vomiting. *Anesthesiology.* 1996;85(5):1036-1042.
6. De Oliveira GS, Jr., Castro-Alves LJ, Chang R, Yaghmour E, McCarthy RJ. Systemic metoclopramide to prevent postoperative nausea and vomiting: a meta-analysis without Fujii's studies. *British journal of anaesthesia.* 2012;109(5):688-697.

Measure Abbreviation
PONV-02

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of patients aged 3 through 17 years of age, who undergo a procedure under general anesthesia in which an inhalational anesthetic is used for maintenance AND who have two or more risk factors for post-operative vomiting (POV), who receive combination therapy consisting of at least two prophylactic pharmacologic anti-emetic agents of different classes preoperatively and/or intraoperatively.

The purpose of this process of care measure is to reduce the incidence of postoperative nausea and vomiting in pediatric patients.

Measure Time Period
Preop through Recovery Room In

Inclusions
All patients, age 3 through 17 years of age, who undergo any procedure under general anesthesia in which an **inhalational general anesthetic between Anesthesia Start and Anesthesia End** is used for maintenance AND who have **two or more risk factors for POV.**

POV Risk Factors:

- Age ≥ 3 years
- History of POV or Post-Operative Nausea and Vomiting (PONV) in patient, parent or sibling
- Strabismus surgery (Indicated by CPT: 00140 or procedure text listed as ‘strab’ ‘eye’ ‘ocular’ or ‘lacrimal’)
- Surgery ≥ 30 minutes

Exclusions
- Patients < 3 or > 17 years old.
- Patients transferred directly to the ICU
- Liver Transplants (see ProcedureTypeTransplantLiver phenotype)
- Lung Transplants (see ProcedureTypeTransplantLung phenotype)
- Procedures on the Neck (CPT 00326)
- Intrathoracic Procedures (CPT 00561)

- Procedures on the Lower Abdomen (CPT 00834)
- Labor Epidurals (CPT 01967)
- Endoscopy (CPT 00740, 00810)
- Obturator neurectomy (CPT 01180, 01190)
- Shoulder cast application (CPT 01682)
- Obstetric Non-Operative Procedures with procedure text: “Labor Epidural”
- Cases in which an inhalation anesthetic is used only for induction

Success

Patient receives combination therapy consisting of at least two prophylactic pharmacologic anti-emetic agents of different classes preoperatively or intraoperatively

Anti-emetic therapy: The recommended pharmacologic anti-emetics for PONV prophylaxis in pediatric patients at risk for moderate to severe PONV include (but may not limited to):

- 5-Hydroxytryptamine (5-HT3) Receptor Antagonists (Recommended as the first choice for prophylaxis for POV in children)
- Glucocorticoids
- Anticholinergics
- Antihistamines
- Butyrophenones
- Phenothiazines
- Phenylethylamines
- NK-1 Receptor Antagonists

Note: In addition, propofol infusion is accepted as one of the antiemetic options for this measure. The foregoing list of medications/drug names is based on clinical guidelines and other evidence. The specified drugs were selected based on the strength of evidence for their clinical effectiveness. This list of selected drugs may not be current. Physicians and other health care professionals should refer to the FDA’s web site page entitled “Drug Safety Communications” for up-to-date drug recall and alert information when prescribing medications.

Other Measure Build Details

- For a case to be included for the PONV 02 measure, the patient must have received inhalational general anesthetic for ***maintenance*** purposes AND have two or more risk factors for POV. This measure determines ***maintenance*** as any inhalational general anesthetic administered after procedure start (MPOG Concept 50006).
- Values for flows and gases will be assessed and considered artifact if less than the following ranges and the patient did not receive any other inhalational general anesthetics greater than these ranges:
    - Nitrous Oxide Flows: <0.2 L/min
    - Isoflurane Insp %: <0.2%
    - Sevoflurane Insp %: <0.5%
    - Desflurane Insp %: <0.5%
    - Nitrous Oxide Insp % <15%
- All anesthetic gas values prior to Procedure Start are excluded. If no Procedure start, Induction End is used.
- This measure requires CPT codes to be transferred to the MPOG database for cases to be included. Those sites participating with this measure must have current pro fee procedure data in the MPOG

Central database- refer to the flow diagram on page 7 of this specification for more details.

Algorithm for determining Measure End Time:

1. Recovery Room In Date/Time. If not available then,
2. Phase I Recovery Room In Date/Time. If not available then,
3. Phase II Recovery Room In Date/Time. If not available then,
4. Patient out of Room. If not available then,
5. Data Capture End. If not available then,
6. Anesthesia End.

Algorithm for determining Case Length:

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Start. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. LMA Removal Time. If not available, then
3. Procedure End. If not available, then
4. Patient Out of Room. If not available, then
5. Anesthesia End

Responsible Provider

Provider(s) signed in at Induction End.

Method for determining Responsible Provider:

1. Provider signed in at Anesthesia Induction End. If not available then,
2. Provider signed in at Anesthesia Induction Begin. If not available then,
3. Provider signed in at Procedure Start. If not available then,
4. Provider signed in at Patient in Room. If not available then,
5. Provider signed in Anesthesia Start.

Threshold

90%

MPOG Concept IDs Required

General Inhalational Anesthetic MPOG Concept IDs	
3297	Enflurane Exp %
3298	Enflurane Insp %
3006	Isoflurane actual consumption (ml)

3007	Desflurane actual consumption (ml)
3260	Isoflurane Exp %
3265	Isoflurane Insp%
3280	Desflurane Exp %
3285	Desflurane Insp %
50420	Cardiopulmonary bypass – Isoflurane vaporizer turned on
3008	Sevoflurane actual consumption (ml)
3270	Sevoflurane Exp %
3275	Sevoflurane Insp %
3503	Sevoflurane (mmHg)
3250	Nitrous Insp %
3255	Nitrous Exp %
Antiemetic MPOG Concept IDs (by class)	
Class: 5-Hydroxytryptamine (5-HT3) Receptor Antagonists	
10335	Ondansetron
10164	Dolasetron
10208	Granisetron
10711	Palonosetron
Anticholinergics	
10400	Scopolamine Patch
10399	Scopoloamine
11040	Butylscopolamine
Antihistamines	
10257	Dimenhydrinate
10160	Diphenhydramine
10635	Meclizine
Butyrophenones	
10169	Droperidol
10210	Haloperidol

Neurokinin-1 Receptor Agonists	
10035	Aprepitant
10719	Fosaprepitant
Phenothiazines	
10374	Promethazine
10373	Prochlorperazine
Steroids	
10147	Dexamethasone
10296	Methylprednisolone
Prokinetic	
10297	Metoclopramide
10377	Propofol (Infusion only)
PONV Medical Reason Exclusion MPOG Concept ID	
50046	Medical Performance Exclusion - PONV
PONV Risk Factor- History of PONV/Motion Sickness MPOG Concept IDs:	
70225	Assessment and Plan - Comments
70302	Assessment and Plan - Anesthetic Consideration
70338	General - PONV Risk Factors
70339	General - PONV Risk Total Score
70080	General - Previous Anesthetic Problem

Data Diagnostics Affected

- Percentage of Cases with Professional Fee Procedure Codes
- Percentage of Cases with Antiemetic Medications
- Percentage of Intraoperative Notes with a Meaningful Note Mapping
- Percentage of Preoperative Notes with a Meaningful Type Mapping

Phenotypes Used

- Extubation Times
- Induction End
- Induction Start

- Is Valid Case (requires login)
- Location Tags
- Measure Staff Sign Ins (requires login)
- Patient In Room Date/Time
- Patient Out Of Room Date/Time
- PONV History Classification
- Postoperative Destination
- Procedure Type: Labor Epidural (requires login)
- Procedure Type: Liver Transplant
- Procedure Type: Lung Transplant
- Procedure Type: Non-Operative
- Surgery End
- Surgery Start Date/Time

Rationale

Postoperative nausea and vomiting (PONV) is a common and unpleasant outcome of anesthesia care that can lead to other complications, lengthening the patient's recovery period after surgery[2]. Effective management of PONV leads to optimal patient outcomes and comfort during the postoperative period.[3] Combination therapy that includes two prophylactic pharmacologic anti-emetic agents of different classes is most effective when managing PONV in children.[4,5]

A separate PONV risk model should be considered for pediatric patients as many proven risk factors for adults are difficult to assess or do not apply to children.[6] The independent PONV risk factors identified for pediatrics include duration of surgery greater than 30 minutes, age greater than 3 years old, positive history of PONV (individual and/or immediate family) and strabismus surgery.[6] Although including a prophylactic anti-emetic administration protocol that considers such risk factors has shown to reduce the incidence of PONV, there is high variability in this outcome.[7,8]

References

1. Gan TJ, Meyer TA, Apfel CC, et al. Society for Ambulatory Anesthesia guidelines for the management of postoperative nausea and vomiting. *Anesthesia and analgesia.* 2007;105(6):1615-1628, table of contents.
2. Gillmann HJ, Wasilenko S, Zuger J, et al. Standardised electronic algorithms for monitoring prophylaxis of postoperative nausea and vomiting. *Archives of medical science : AMS.* 2019;15(2):408-415.
3. Collins AS. Postoperative nausea and vomiting in adults: implications for critical care. *Critical care nurse.* 2011;31(6):36-45.
4. Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. *Anesthesia and analgesia.* 2014;118(1):85-113.
5. Shen YD, Chen CY, Wu CH, Cherng YG, Tam KW. Dexamethasone, ondansetron, and their combination and postoperative nausea and vomiting in children undergoing strabismus surgery: a meta-analysis of randomized controlled trials. *Paediatric anaesthesia.* 2014;24(5):490-498.
6. Eberhart LH, Geldner G, Kranke P, et al. The development and validation of a risk score to predict the probability of postoperative vomiting in pediatric patients. *Anesthesia and analgesia.* 2004;99(6):1630-1637, table of contents.
7. De Oliveira GS, Jr., Castro-Alves LJ, Chang R, Yaghmour E, McCarthy RJ. Systemic metoclopramide to prevent postoperative nausea and vomiting: a meta-analysis without Fujii's studies. *British journal of anaesthesia.* 2012;109(5):688-697.

8. Schraag S, Pradelli L, Alsaleh AJO, et al. Propofol vs. inhalational agents to maintain general anaesthesia in ambulatory and in-patient surgery: a systematic review and meta-analysis. *BMC anesthesiology.* 2018;18(1):162.

Measure Abbreviation

PONV-03

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

PONV 03: Percentage of patients, regardless of age, who undergo a procedure and have a documented nausea/emesis occurrence OR receive a rescue antiemetic in the immediate postoperative period.

PONV 03b: Percentage of patients, regardless of age who undergo a procedure and have a documented nausea/emesis occurrence with or without receiving an antiemetic in the immediate postoperative period.

Measure Time Period

Recovery Room In through 6 hours after Anesthesia End

Inclusions

- All patients, regardless of age, who undergo any procedure including surgical, therapeutic, or diagnostic requiring care by anesthesia providers.
- C-section cases (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'cesarean section' , 'cesarean hysterectomy' and 'Conversion (cesarean delivery portion)')

Exclusions

- Patients transferred directly to the ICU
- Organ Harvest (CPT: 01990)
- Liver Transplants (see ProcedureTypeTransplantLiver phenotype)
- Lung Transplants (see ProcedureTypeTransplantLung phenotype)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Invalid cases where Measure End results prior to Measure Start

Success

Patient does not report nausea, have an emesis event or receive an antiemetic during the immediate postoperative period.

Other Measure Build Details

Algorithm for determining Measure Start Time:

1. Recovery Room In Date/Time. If not available then,
2. Phase I Recovery Room In Date/Time. If not available then,
3. Phase II Recovery Room In Date/Time. If not available then,
4. Patient out of Room. If not available then,
5. Data Capture End. If not available then,
6. Anesthesia End.

*If Patient out of Room is used as Measure Start, the measure will begin 1 minute after Measure Start time.

Algorithm for determining Case Duration:

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End

Responsible Provider

All providers for a given case who are signed in ≥ 40 minutes. If a given case is ≤ 60 minutes, all providers are responsible.

Threshold

10%

MPOG Concept IDs Required

Antiemetic MPOG Concept IDs (by class)	
Class: 5-Hydroxytryptamine (5-HT3) Receptor Antagonists	
10335	Ondansetron
10164	Dolasetron
10208	Granisetron
10711	Palonosetron
Antihistamines	
10257	Dimenhydrinate

10160	Diphenhydramine
Butyrophenones	
10169	Droperidol
10210	Haloperidol
Neurokinin-1 Receptor Agonists	
10035	Aprepitant
10719	Fosaprepitant
Phenothiazines	
10374	Promethazine
10373	Prochlorperazine
Prokinetic	
10297	Metoclopramide
PONV Outcomes MPOG Concept IDs:	
50227	GI – Symptoms
50636	Misc - Patient Vomiting
50219	Emesis Occurrence
10503	Emesis
90010	PONV Assessment
90371	Postoperative Nausea and/or Vomiting
90009	PONV Interventions
Measure Start MPOG Concept IDs	
50008	AACD Patient Out of Room Date/Time
50010	AACD Recovery Room In Date/Time
50066	Phase I Recovery Room In Date/Time
50068	Phase II Recovery Room In Date/Time
50379	Monitoring - Automated Physiologic Data Capture Stopped

Data Diagnostics Affected

- Percentage of Cases with Professional Fee Procedure Codes
- Percentage of Cases with Antiemetic Medications
- Percentage of Cases in which the Patient has a known Gender
- Percentage of Intraoperative Notes with a Meaningful Note Mapping
- Percentage of Preoperative Notes with a Meaningful Type Mapping

Phenotypes Used

- Case Duration
- Measure: PONV-01
- Measure: PONV-02 (PEDS)
- PONVReportedNotes (No phenotype browser page)
- Sex

Rationale

Postoperative nausea and vomiting (PONV) is a common and unpleasant outcome of anesthesia care that can lead to other complications, lengthening the patient's recovery period after surgery. Effective management of PONV leads to optimal patient outcomes and comfort during the postoperative period. The Apfel score is one of the most common risk predictors for PONV and is based on 4 variables: female gender, non-smoking status, history of PONV or motion sickness and postoperative opioid administration. The presence of each additional risk factor increases a patient's risk of PONV by twenty percent. Although including a prophylactic anti-emetic administration protocol that considers such risk factors has shown to reduce the incidence of PONV, there is high variability in this outcome. For the purpose of this measure, PONV is defined as administering any rescue medication (antiemetic MPOG Concepts in table below) or documentation of nausea or vomiting in the immediate postoperative period.

Risk Adjustment

Not applicable

References

1. Gillmann HJ, Wasilenko S, Zuger J, et al. Standardised electronic algorithms for monitoring prophylaxis of postoperative nausea and vomiting. Archives of medical science : AMS. 2019;15(2):408-415.
2. Collins AS. Postoperative nausea and vomiting in adults: implications for critical care. Critical care nurse. 2011;31(6):36-45.
3. Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. Anesthesia and analgesia. 2014;118(1):85-113.
4. Schraag S, Pradelli L, Alsaleh AJO, et al. Propofol vs. inhalational agents to maintain general anaesthesia in ambulatory and in-patient surgery: a systematic review and meta-analysis. BMC anesthesiology. 2018;18(1):162.
5. Gan TJ, Ginsberg B, Grant AP, Glass PS. Double-blind, randomized comparison of ondansetron and intraoperative propofol to prevent postoperative nausea and vomiting. Anesthesiology. 1996;85(5):1036-1042.
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7. Mascha EJ, Gan TJ, Vetter TR. Quality Improvement Interventions Associated With Improved Postoperative Nausea and Vomiting: Separating the Signal From the Noise. Anesthesia and analgesia. 2019;128(5):847-849.

Measure Abbreviation
PUL-01

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases with median tidal volumes less than 10ml/kg.

Measure Time Period
Case start to Case End (see other measure build details)

Inclusions
Patients undergoing endotracheal intubation.

Exclusions
- ASA 5 and 6 cases
- Patients < 12 years of age
- Patients <20kg.
- Patients ≥ 18 years old with a height <121.9cm (48 in) OR >213.4cm (84 in)
- Patients 12-17 years old with a height <91.4cm (36 in) or >213.4cm (84 in)
- Cases where Epoprostenol is administered as an inhalational agent
- Cases without a documented sex
- Cases without a documented height
- Cases in which patients are mechanically ventilated for less than 45 cumulative minutes.
- One lung ventilation procedures as indicated by intraoperative notes or note details mapped to one of the following MPOG concepts:
    - 50501: Thoracic: Single-lung ventilation
    - 50202: Thoracic: Single-lung ventilation, side detail

Success
Median tidal volume < 10 ml/ kg predicted body weight for the time period between Case Start and Case End

Other Measure Build Details

- For a given case, this measure will exclude periods when patients are not under positive pressure ventilation (as defined by Peak Inspiratory Pressure – Positive End Expiratory Pressure ≤ 6).
    - Peak Inspiratory Pressure determined by values mapped to MPOG Concept 3185. If no PIP documented, PIP is considered null and tidal volume is included.
    - PEEP will be determined using values associated with the following variables:
        1. Use Measured PEEP (MPOG Concept: 3210). If not documented,
        2. Use Set PEEP (MPOG Concept: 3212). If not documented,
        3. Assume PEEP = 0.
- For a case to be included for the PUL-01 measure, it must have at least 45 valid values of actual tidal volume or set tidal volume
- In determining median tidal volume, if any value greater than two (2) is documented, it is assumed that tidal volume is documented in milliliters (mL). If all values are less than two (2), tidal volume is assumed to be measured in liters (L).
- For patients ≥18 years old with height>121.9cm (48 in) but <213.4cm (84 in), the following equation is used to determine Predicted Body Weight. For patients less than 5 feet, 5 feet (152.4 cm) will be used for the IBW formula:
    - Male patients: 50kg + 0.91kg * (height in cm - 152.4)
    - Female patients: 45.5kg + 0.91kg * (height in cm - 152.4)
- For patients 12-17 years old and height > 91.4cm (36 in) but <213.4cm (84 in), the McLaren Method is used to determine Predicted Body Weight. The McLaren Method is the most commonly used method to determine PBW in children and uses growth charts to determine IBW by identifying the 50th percentile height for age, then using that height to determine 50th percentile weight. This weight is the patient's Predicted Body Weight (PBW).[7]
- "Actual tidal volume" trumps "set tidal volume" if there are at least 45 valid "actual tidal volume" measurements. If there are no values for "actual tidal volume", "set tidal volume" is used.

Algorithm for determining Case Duration

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End.

Responsible Provider

Provider signed in for largest portion of case. See 'Other Measure Build Details' section of this specification to view the algorithm used for determining case duration.

Method for determining Responsible Provider:

In the event that two or more providers in the same class are signed in for the same duration, all providers signed in for the longest duration will be attributed.

Threshold

90%

MPOG Concept IDs Required

Endotracheal Tube		**Tidal Volume**		**One-Lung Ventilation**		**Predicted Body Weight**	
50121	Intubation Endotracheal Tube Stylet Used	**3190**	Tidal Volume Actual	**50501**	Thoracic-Single lung ventilation	**70257**	Physical Exam-Height (cm)
50122	Intubation Endotracheal Tube Size	**3192**	Tidal Volume Set	**50202**	Thoracic-Single lung ventilation side detail	**70258**	Physical Exam-Height (in)
50123	Intubation Endotracheal Tube Type	**3185**	Peak Inspiratory Pressure	**Intraoperative Medication**		**Administration**	
50124	Intubation Endotracheal Tube Secured Mechanism	**3210**	Positive End Expiratory Pressure-Measured	**10473**	Epoprostenol	**2006**	Inhalational
50125	Intubation Endotracheal Tube Secured Distance	**3212**	Positive End Expiratory Pressure-Set				
50126	Intubation Endotracheal Tube Secured Reference Point						
50202	Emergence-Patient Extubated						
50205	Intubation Tube Note						
50671	Intubation-endotracheal tube in situ						

Data Diagnostics Affected

- Percentage of Cases with Any Physiologic Observation
- Percentage of Physiologic Observations with a Meaningful Type Mapping

- Percentage of Cases with a Tidal Volume Observation
- Percentage of Cases with Patient Height
- Percentage of Cases with Patient Weight
- Percentage of Cases with an Intubation Note
- Percentage of Cases with a Meaningful Admission Type Mapping
- Percentage of Cases with Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Technique: General
- ASA Class
- Ideal Body Weight
- MeasureStartingList (requires login)
- PrimaryProvider
- Tidal Volume Actual (Median)
- Tidal Volume Set (Median)
- Ventilation During Intraop
- Weight (kg)

Rationale

The use of lung protective ventilation techniques (low tidal volumes and positive end-expiratory pressure) should be part of standard anesthetic practice for most cases that require positive pressure ventilation. Several randomized controlled trials, as well as a meta-analysis in 2015 describe the benefit with low vs high tidal volume techniques.[1-6]

References

1. Brower RG, Matthay MA, Morris A, Schoenfeld D, Thompson BT, Wheeler A. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *The New England journal of medicine.* 2000;342(18):1301-1308.
2. Fernandez-Perez ER, Keegan MT, Brown DR, Hubmayr RD, Gajic O. Intraoperative tidal volume as a risk factor for respiratory failure after pneumonectomy. *Anesthesiology.* 2006;105(1):14-18.
3. Futier E, Constantin JM, Paugam-Burtz C, et al. A trial of intraoperative low-tidal-volume ventilation in abdominal surgery. *The New England journal of medicine.* 2013;369(5):428-437.
4. Guldner A, Kiss T, Serpa Neto A, et al. Intraoperative protective mechanical ventilation for prevention of postoperative pulmonary complications: a comprehensive review of the role of tidal volume, positive end-expiratory pressure, and lung recruitment maneuvers. *Anesthesiology.* 2015;123(3):692-713.
5. Serpa Neto A, Hemmes SN, Barbas CS, et al. Protective versus Conventional Ventilation for Surgery: A Systematic Review and Individual Patient Data Meta-analysis. *Anesthesiology.* 2015;123(1):66-78.
6. Severgnini P, Selmo G, Lanza C, et al. Protective mechanical ventilation during general anesthesia for open abdominal surgery improves postoperative pulmonary function. *Anesthesiology.* 2013;118(6):1307-1321.
7. Phillips S, Edlbeck A, Kirby M, Goday P. Ideal body weight in children. *Nutrition in clinical practice : official publication of the American Society for Parenteral and Enteral Nutrition.* 2007;22(2):240-245.

Measure Abbreviation
PUL-02

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases with median tidal volumes less than or equal to 8 ml/kg.

Measure Time Period
Case Start to Case End (see other measure build details)

Inclusions
Patients undergoing endotracheal intubation.

Exclusions
- ASA 5 and 6 cases
- Patients < 12 years of age
- Patients <20kg.
- Patients ≥ 18 years old with a height <121.9cm (48 in) OR >213.4cm (84 in)
- Patients 12-17 years old with a height <91.4cm (36 in) or >213.4cm (84 in)
- Cases where Epoprostenol is administered as an inhalational agent
- Cases without a documented sex
- Cases without a documented height
- Cases in which patients are mechanically ventilated for less than 45 cumulative minutes.
- One lung ventilation procedures as indicated by intraoperative notes or note details mapped to one of the following MPOG concepts:
    - 50501: Thoracic: Single-lung ventilation
    - 50202: Thoracic: Single-lung ventilation, side detail

Success
Median tidal volume ≤ 8 ml/ kg predicted body weight for the time period between Case Start and Case End.

Other Measure Build Details

- For a given case, this measure will exclude periods when patients are not under positive pressure ventilation (as defined by Peak Inspiratory Pressure – Positive End Expiratory Pressure ≤ 6).
    - Peak Inspiratory Pressure determined by values mapped to MPOG Concept 3185. If no PIP documented, PIP is considered null and tidal volume is included.
    - PEEP will be determined using values associated with the following variables:
        1. Use Measured PEEP (MPOG Concept: 3210). If not documented,
        2. Use Set PEEP (MPOG Concept: 3212). If not documented,
        3. Assume PEEP = 0.
- For a case to be included for the PUL-01 measure, it must have at least 45 valid values of actual tidal volume or set tidal volume
- In determining median tidal volume, if any value greater than two (2) is documented, it is assumed that tidal volume is documented in milliliters (mL). If all values are less than two (2), tidal volume is assumed to be measured in liters (L).
- For patients ≥18 years old with height>121.9cm (48 in) but <213.4cm (84 in), the following equation is used to determine Predicted Body Weight. For patients less than 5 feet, 5 feet (152.4 cm) will be used for the IBW formula:
    - Male patients: 50kg + 0.91kg * (height in cm - 152.4)
    - Female patients: 45.5kg + 0.91kg * (height in cm - 152.4)
- For patients 12-17 years old and height > 91.4cm (36 in) but <213.4cm (84 in), the McLaren Method is used to determine Predicted Body Weight. The McLaren Method is the most commonly used method to determine PBW in children and uses growth charts to determine IBW by identifying the 50th percentile height for age, then using that height to determine 50th percentile weight. This weight is the patient's Predicted Body Weight (PBW).[7]
- "Actual tidal volume" trumps "set tidal volume" if there are at least 45 valid "actual tidal volume" measurements. If there are no values for "actual tidal volume", "set tidal volume" is used.

Algorithm for determining Case Duration

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End.

Responsible Provider

Provider signed in for largest portion of case. See 'Other Measure Build Details' section of this specification to view the algorithm used for determining case duration.

Method for determining Responsible Provider:

In the event that two or more providers in the same class are signed in for the same duration, all providers signed in for the longest duration will be attributed.

Threshold

90%

MPOG Concept IDs Required

Endotracheal Tube		**Tidal Volume**		**One-Lung Ventilation**		**Predicted Body Weight**	
50121	Intubation Endotracheal Tube Stylet Used	**3190**	Tidal Volume Actual	**50501**	Thoracic-Single lung ventilation	**70257**	Physical Exam-Height (cm)
50122	Intubation Endotracheal Tube Size	**3192**	Tidal Volume Set	**50202**	Thoracic-Single lung ventilation side detail	**70258**	Physical Exam-Height (in)
50123	Intubation Endotracheal Tube Type	**3185**	Peak Inspiratory Pressure	**Intraoperative Medication**		**Administration**	
50124	Intubation Endotracheal Tube Secured Mechanism	**3210**	Positive End Expiratory Pressure-Measured	**10473**	Epoprostenol	**2006**	Inhalational
50125	Intubation Endotracheal Tube Secured Distance	**3212**	Positive End Expiratory Pressure- Set				
50126	Intubation Endotracheal Tube Secured Reference Point						
50202	Emergence-Patient Extubated						
50205	Intubation Tube Note						
50671	Intubation-endotracheal tube in situ						

Data Diagnostics Affected

- Percentage of Cases with Any Physiologic Observation

- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with a Tidal Volume Observation
- Percentage of Cases with Patient Height
- Percentage of Cases with Patient Weight
- Percentage of Cases with an Intubation Note
- Percentage of Cases with a Meaningful Admission Type Mapping
- Percentage of Cases with Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia Technique: General
- ASA Class
- Ideal Body Weight
- MeasureStartingList (requires login)
- PrimaryProvider
- Tidal Volume Actual (Median)
- Tidal Volume Set (Median)
- Ventilation During Intraop
- Weight (kg)

Rationale

The use of lung protective ventilation techniques (low tidal volumes and positive end-expiratory pressure) should be part of standard anesthetic practice for most cases that require positive pressure ventilation. Several randomized controlled trials, as well as a meta-analysis in 2015 describe the benefit with low vs high tidal volume techniques.[1-6]

References

1. Brower RG, Matthay MA, Morris A, Schoenfeld D, Thompson BT, Wheeler A. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *The New England journal of medicine.* 2000;342(18):1301-1308.
2. Fernandez-Perez ER, Keegan MT, Brown DR, Hubmayr RD, Gajic O. Intraoperative tidal volume as a risk factor for respiratory failure after pneumonectomy. *Anesthesiology.* 2006;105(1):14-18.
3. Futier E, Constantin JM, Paugam-Burtz C, et al. A trial of intraoperative low-tidal-volume ventilation in abdominal surgery. *The New England journal of medicine.* 2013;369(5):428-437.
4. Guldner A, Kiss T, Serpa Neto A, et al. Intraoperative protective mechanical ventilation for prevention of postoperative pulmonary complications: a comprehensive review of the role of tidal volume, positive end-expiratory pressure, and lung recruitment maneuvers. *Anesthesiology.* 2015;123(3):692-713.
5. Serpa Neto A, Hemmes SN, Barbas CS, et al. Protective versus Conventional Ventilation for Surgery: A Systematic Review and Individual Patient Data Meta-analysis. *Anesthesiology.* 2015;123(1):66-78.
6. Severgnini P, Selmo G, Lanza C, et al. Protective mechanical ventilation during general anesthesia for open abdominal surgery improves postoperative pulmonary function. *Anesthesiology.* 2013;118(6):1307-1321.
7. Phillips S, Edlbeck A, Kirby M, Goday P. Ideal body weight in children. *Nutrition in clinical practice : official publication of the American Society for Parenteral and Enteral Nutrition.* 2007;22(2):240-245.

Measure Abbreviation

PUL-03

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases in which Positive End Expiratory Pressure (PEEP) is used for patients undergoing mechanical ventilation during anesthesia. PUL 03 will determine if PEEP was administered (as defined by median PEEP ≥ 2) and also analyze distribution of PEEP levels:

- No PEEP (<2 cm H_2O)
- Low PEEP (2-4 cm H_2O)
- Moderate PEEP (≥ 4 to < 8 cm H_2O)
- High PEEP (≥8 cm H_2O)

Measure Time Period

Case start to case end (see other measure build details)

Inclusions

Patients undergoing endotracheal intubation.

Exclusions

- ASA 5 and 6 cases
- Patients <20kg.
- Cases in which patients are mechanically ventilated for less than 45 cumulative minutes.
- One lung ventilation procedures as indicated by intraoperative notes or note details mapped to one of the following MPOG concepts:
    - 50501: Thoracic: Single-lung ventilation
    - 50202: Thoracic: Single-lung ventilation, side detail

Success

Median PEEP ≥ 2 cm H_2O (Assuming values less than 2 cm H_2O is equivalent to no PEEP administered) for the time period between Case Start and Case End.

Other Measure Build Details

- If no weight is recorded, the case is included.
- For a case to be included, there must be at least 45 cumulative minutes of actual tidal volume or 45 minutes of set tidal volume (if actual is not present).
    - For a given case, this measure will exclude periods when patients are not under positive pressure ventilation (as defined by peak inspiratory pressure – positive end expiratory pressure of ≤ 6).
        - Peak Inspiratory Pressure determined by values mapped to MPOG Concept 3185.
        - PEEP will be determined using values associated with the following variables:
            1. Use Measured PEEP (MPOG Concept: 3210). If not documented,
            2. Use Set PEEP (MPOG Concept: 3212). If not documented,
            3. Assume PEEP = 0.
- Median PEEP will be determined using values associated with the following variables:
    1. Use Measured PEEP. If not documented,
    2. Use Set PEEP. If not documented,
    3. Determine no PEEP data available.
- PEEP values before case start, after case end, and during periods where PIP - PEEP ≤ 6 are not included in calculating the median.

Algorithm for determining Measure Start/End Times:

Measure Start Time*:*

Case Start

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Measure End Time:

Case End

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End

Responsible Provider

This measure is informational only. Attribution not yet determined by the MPOG Quality Committee.

Threshold

Informational

MPOG Concept IDs Required

Endotracheal Tube	PEEP, PIP, and TV	One Lung Ventilation

50121	Intubation Endotracheal Tube Stylet Used	**3210**	Positive End Expiratory Pressure- Measured	**50501**	Thoracic- Single lung ventilation
50122	Intubation Endotracheal Tube Size	**3212**	Positive End Expiratory Pressure- Set	**50202**	Thoracic- Single lung ventilation side detail
50123	Intubation Endotracheal Tube Type	**3185**	Peak Inspiratory Pressure		
50124	Intubation Endotracheal Tube Secured Mechanism	**3190**	Tidal Volume Actual		
50125	Intubation Endotracheal Tube Secured Distance	**3192**	Tidal Volume Set		
50126	Intubation Endotracheal Tube Secured Reference Point				
50202	Emergence- Patient Extubated				
50205	Intubation Tube Note				
50671	Intubation - endotracheal tube in situ				

Data Diagnostics Affected

- Percentage of Cases with Any Physiologic Observation
- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with a PEEP Observation
- Percentage of Cases with an Intubation Note
- Percentage of Cases with Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Age (Years)
- Anesthesia Technique: General
- ASA Class
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- PEEP Actual Median
- PEEP Set Median
- Procedure Type: Non-Operative
- Tidal Volume Actual (Median)
- Tidal Volume Set (Median)
- Ventilation During Intraop
- Weight (kg)

Rationale

The use of lung protective ventilation techniques (low tidal volumes and positive end expiratory pressure) should be part of standard anesthetic practice for most cases that require positive pressure ventilation. Several randomized controlled trials, as well as a meta-analysis in 2015 describe the benefit with low vs high tidal volume techniques and use of PEEP.[1-6] Unfortunately, there is not enough evidence to suggest specific PEEP levels. Therefore, specific threshold indicators will not be defined for PUL 03 initially.

References

1. Fernandez-Perez ER, Keegan MT, Brown DR, Hubmayr RD, Gajic O. Intraoperative tidal volume as a risk factor for respiratory failure after pneumonectomy. *Anesthesiology.* 2006;105(1):14-18.
2. Futier E, Constantin JM, Paugam-Burtz C, et al. A trial of intraoperative low-tidal-volume ventilation in abdominal surgery. *The New England journal of medicine.* 2013;369(5):428-437.
3. Guldner A, Kiss T, Serpa Neto A, et al. Intraoperative protective mechanical ventilation for prevention of postoperative pulmonary complications: a comprehensive review of the role of tidal volume, positive end-expiratory pressure, and lung recruitment maneuvers. *Anesthesiology.* 2015;123(3):692-713.
4. Serpa Neto A, Hemmes SN, Barbas CS, et al. Protective versus Conventional Ventilation for Surgery: A Systematic Review and Individual Patient Data Meta-analysis. *Anesthesiology.* 2015;123(1):66-78.
5. Severgnini P, Selmo G, Lanza C, et al. Protective mechanical ventilation during general anesthesia for open abdominal surgery improves postoperative pulmonary function. Anesthesiology. 2013;118(6):1307-1321.

Measure Abbreviation

PAIN-01-Peds

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of patients < 18 years old who undergo a surgical or therapeutic procedure and receive a non-opioid adjunct preoperatively or intraoperatively.

Measure Time Period

Preop Start to Anesthesia End

Inclusions

Patients < 18 years old who undergo any procedure including surgical, therapeutic, or diagnostic requiring care by anesthesia providers.

Exclusions

- Patients ≥ 18 years of age
- ASA 5 and 6
- Cardiac Surgery (CPT: 00560, 00561, 00562, 00563, 00566, 00567, 00580)
- Obstetric Procedures
- Radiology Procedures
- Procedure Type: ECT
- Non-operative procedures
    - Otoscopy (00124)
    - Central Line Placement (00532)
    - Lumbar Puncture (00635)
    - Endoscopy Procedures (00731, 00732, 00740, 00810, 00811, 00812, 00813)
    - Other (01990, 01991, 01992, 01999)
        - Rooms tagged as 'Other - offsite anesthesia'
        - Cases with procedure text 'ABR Testing' (without any additional procedures listed)
- Patients who remained intubated postoperatively (see 'other measure build details')
- Spinal, Combined Spinal/Epidural or Unknown Anesthesia Technique: Neuraxial

Success

At least one non-opioid adjunct (medication, regional block, caudal, or epidural) was administered to the patient during the preoperative or intraoperative period.

Other Measure Build Details

- Local anesthetic is captured through medications documented with a route mapped to *'Local infiltration'* or '*intradermal*' with medication text including %caine%. Intraop notes mapped to *'Misc - Local Infiltration of surgical site by surgical team'* are also considered.
- Systemic lidocaine administered via IV **infusion** is considered as an alternative to regional anesthesia techniques.
- Intramuscular route only valid if used for Ketorolac
- Dexamethasone given alone is not considered a non-opioid adjunct for this measure, because of use for PONV prophylaxis

Algorithm for determining patients who remained intubated postoperatively:

1. Was the patient transported to PACU? If Yes, Include. If No, then
2. Was ExtubationTime prior to Anesthesia End? If Yes, Include. If No or missing, then,
3. Was *'Emergence - ETT in place, patient manually ventilated' (ID 50380)* documented between procedure end and anesthesia end? If no, Include. If Yes, exclude.

Scenario	**Non-Opioid** (Medication)	**Neuraxial (Caudal, Epidural, Spinal)**	**Regional Bloc**
A	Yes	Yes	Yes
B	Yes	Yes	No
C	Yes	No	No
D	No	No	No
E	No	No	Yes
F	No	Spinal/CSE/Unknown	No
F2	No	Caudal	No
F3	No	Epidural	No
F4	No	Neuraxial-Multiple	No
G	No	Yes	Yes

Responsible Provider

Any provider signed into the case between Anesthesia Start and Anesthesia End

Threshold

None

MPOG Concept IDs Required

MPOG Concept ID	Concept Description
Route	
2001	Intravenous
2003	Intramuscular (*Ketorolac only)
2008	Oral
2009	Nasal
2023	Enteric Tube
2012	Rectal
LOCAL ANESTHETIC	
2007	Local Infiltration (route)
2027	Intradermal (must contain text '-caine')
50626	Misc - Local Infiltration of surgical site by surgical team
ACETAMINOPHEN	
10007	Acetaminophen
10009	Acetaminophen / Butalbital / Caffeine
10041	Aspirin / Acetaminophen / Caffeine
NSAIDS	
10040	Aspirin
10222	Ibuprofen
10747	Naproxen
10116	Celecoxib
KETOROLAC	
10239	Ketorolac
KETAMINE	
10238	Ketamine
10453	PROPOFOL W/ KETAMINE 10 MG/ML + 1 MG/ML
10572	PROPOFOL W/ KETAMINE 10MG/ML + UNSPECIFIED KETAMINE
10577	PROPOFOL W/ KETAMINE 10 MG/ML + 0.5 MG/ML
10578	PROPOFOL W/ KETAMINE 10 MG/ML + 1.5 MG/ML
10579	PROPOFOL W/ KETAMINE 10 MG/ML + 2 MG/ML
OTHER	

10149	Dexmedetomidine
10199	Gabapentin
10570	Pregabalin
10132	Clonidine
10180	Esmolol (*Infusion only)
10705	Magnesium
LIDOCAINE (IV Infusion only)	
10477	LIDOCAINE
10589	LIDOCAINE 0.4%
10247	LIDOCAINE 0.5%
10248	LIDOCAINE 1%
10249	LIDOCAINE 1.5%
10250	LIDOCAINE 2%
10691	LIDOCAINE 2% W/ BICARBONATE
10251	LIDOCAINE 3%
10252	LIDOCAINE 4%
REGIONAL BLOCK	
Value Code: 1-22	Peripheral Nerve Blocks
NEURAXIAL ANESTHESIA	
Value Code: 4	Caudal
Value Code: 2	Epidural
Value Code: 6	Neuraxial - Multiple Types Listed
Value Code: 1,3,5	Spinal, Combined Spinal/Epidural, Neuraxial - Unknown
PACU PAIN SCORE	
3086	Pain Score (Generic)
3087	Pain Score (FLACC)
3088	Pain Score (Visual Analog Scale)
3089	Pain Score (Faces)

Phenotypes Used

- Anesthesia CPT (Measures)
- Anesthesia Technique: Neuraxial
- Anesthesia Technique: Peripheral Nerve Block

- ASA Class
- Extubation Times
- Is Valid Case (requires login)
- LMA Removal Times
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- PACU End Time
- PACU Start Time
- Postoperative Destination
- Preop Start Time
- Procedure Type: Non-Operative
- xRetiredx Anesthesia Technique: Spinal (requires login)

Rationale

Multimodal pain management in children during the perioperative time frame can decrease postoperative pain, improve clinical outcomes, and patient satisfaction after surgery. Opioids hold a prominent role in acute pain management yet carry significant risk of perioperative complications including postoperative nausea and vomiting (PONV), respiratory depression, and increased recovery time after surgery. The American Society of Anesthesiologists (ASA) and Society for Pediatric Anesthesia (SPA) have published guidelines and recommendations which endorse the routine use of multimodal analgesia whenever possible to reduce opioid administration and its side effects. Current evidence supports the use of opioid sparing analgesics in pediatric surgical populations that act through different mechanisms. This list includes (but is not limited to) acetaminophen, NSAIDs, dexamethasone, ketamine, clonidine, and dexmedetomidine.

Risk Adjustment

Not Applicable

References

1. American Society of Anesthesiologists Task Force on Acute Pain Management. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology*. 2012;116(2):248-273.
2. Cravero JP, Agarwal R, Berde C, et al. The Society for Pediatric Anesthesia recommendations for the use of opioids in children during the perioperative period. *Paediatr Anaesth*. 2019;29(6):547-571.
3. Franz AM, Dahl JP, Huang H, et al. The development of an opioid sparing anesthesia protocol for pediatric ambulatory tonsillectomy and adenotonsillectomy surgery-A quality improvement project. *Paediatr Anaesth*. 2019;29(7):682-689.
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Measure Abbreviation
PAIN-02

Measure Type
Process

Description
Percentage of patients ≥ 18 years old who undergo a surgical or therapeutic procedure and receive a non-opioid adjunct preoperatively and/or intraoperatively.

Measure Time Period
Preop Start to Anesthesia End

Inclusions
Patients ≥ 18 years old who undergo any procedure including surgical, therapeutic, or diagnostic requiring care by anesthesia providers.

Exclusions
- Patients < 18 years of age
- ASA 5 and 6
- Cardiac Surgery (CPT: 00560, 00561, 00562, 00563, 00566, 00567, 00580)
- Obstetric Procedures
- Radiology Procedures
- Procedure Type: ECT
- Non-operative procedures
    - Otoscopy (00124)
    - Central Line Placement (00532)
    - Lumbar Puncture (00635)
    - Endoscopy Procedures (00731, 00732, 00740, 00810, 00811, 00812, 00813)
    - Other (01990, 01991, 01992, 01999)
        - Rooms tagged as 'Other - offsite anesthesia'
        - Cases with procedure text 'ABR Testing' (without any additional procedures listed)
- Eye Procedures (CPT: 00103, 00140, 00142, 00144, 00147, 00148)
- Patients who remained intubated postoperatively

Success
At least one non-opioid adjunct (medication, regional block, neuraxial block, or local injection) was administered to the patient during the measure time period.

Other Measure Build Details
Local anesthetic is captured through medications documented with a route mapped to *'Local infiltration'* or

'intradermal' with medication text including %caine%. Intraop notes mapped to *'Misc - Local Infiltration of surgical site by surgical team'* are also considered.

Dexamethasone given alone is not considered a non-opioid adjunct to prevent multiple false positives that may skew measure performance.

Algorithm for determining patients who remained intubated postoperatively:

1. Was the patient transported to PACU? If Yes, Include. If No, then
2. Was extubation time prior to Anesthesia End? If Yes, Include. If No or missing, then,
3. Was MPOG concept 50380 *'Emergence - ETT in place, patient manually ventilated'* documented between procedure end and anesthesia end? If Yes, exclude. If no, Include.

Responsible Provider

Any provider signed into the case between Anesthesia Start and Anesthesia End

Threshold

None

MPOG Concept IDs Required

MPOG Concept ID	Concept Description
ROUTE	
2001	Intravenous
2008	Oral
2009	Nasal
2023	Enteric Tube
LOCAL ANESTHETIC	
2007	Local Infiltration (route)
2027	Intradermal (must contain text '-caine')
50626	Misc - Local Infiltration of surgical site by surgical team
ACETAMINOPHEN	
10007	Acetaminophen
NSAIDS	
10222	Ibuprofen
10747	Naproxen
10116	Celecoxib
KETOROLAC	

10239	Ketorolac
KETAMINE	
10238	Ketamine
10453	PROPOFOL W/ KETAMINE 10 MG/ML + 1 MG/ML
10572	PROPOFOL W/ KETAMINE 10MG/ML + UNSPECIFIED KETAMINE
10577	PROPOFOL W/ KETAMINE 10 MG/ML + 0.5 MG/ML
10578	PROPOFOL W/ KETAMINE 10 MG/ML + 1.5 MG/ML
10579	PROPOFOL W/ KETAMINE 10 MG/ML + 2 MG/ML
OTHER	
10132	Clonidine
10149	Dexmedetomidine
REGIONAL BLOCK	
Value Code: 1-22	Peripheral Nerve Blocks
NEURAXIAL ANESTHESIA	
Value Code: 1-6	Spinal, Epidural, and Caudal
PACU PAIN SCORE (information only)	
3086	Pain Score (Generic)
3087	Pain Score (FLACC)
3088	Pain Score (Visual Analog Scale)
3089	Pain Score (Faces)

Phenotypes Used

- Anesthesia CPT (Measures)
- Anesthesia Technique: Neuraxial
- Anesthesia Technique: Peripheral Nerve Block
- ASA Class
- Extubation Times
- Is Valid Case (requires login)
- LMA Removal Times
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- PACU End Time
- PACU Start Time
- Postoperative Destination
- Preop Start Time
- Procedure Type: Non-Operative
- xRetiredx Anesthesia Technique: Spinal (requires login)

Rationale

Effective pain management during the perioperative time frame can decrease postoperative pain, improve patient outcomes after surgery. Opioids hold a prominent role in acute pain management yet carry significant risk of perioperative complications including postoperative nausea and vomiting (PONV), respiratory depression, and increased recovery time after surgery. The American Society of Anesthesiologists (ASA) has published guidelines and recommendations which endorse the routine use of multimodal analgesia whenever possible. Current evidence supports the use of opioid sparing analgesics in adult surgical populations that act through different mechanisms. This list includes (but is not limited to) acetaminophen, NSAIDs, ketamine, and clonidine.

Risk Adjustment

NA

References

1. American Society of Anesthesiologists Task Force on Acute Pain Management. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology*. 2012;116(2):248-273.
2. Kharasch ED, David Clark J, Kheterpal S. Perioperative GabapentinoidsDeflating the Bubble. *Anesthesiology*. Published online June 26, 2020. doi:10.1097/ALN.0000000000003394
3. Kharasch ED, David Clark J. Opioid-free Anesthesia: Time to Regain Our Balance. *Anesthesiology*. 2021;134(4):509-514. doi:10.1097/aln.0000000000003705

Measure Abbreviation

SUS-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with mean fresh gas flow (FGF) equal to, or less than 3L/min, during administration of halogenated hydrocarbons and/or nitrous oxide.

SUS01 measures Fresh Gas Flow (FGF) during administration of halogenated hydrocarbons and/or nitrous oxide, as an indirect measure of anesthetic gas waste. For a given case, this measure will include the maintenance period of anesthesia, defined as the time between placement of an endotracheal tube or supraglottic airway and removal of the endotracheal tube or supraglottic airway. This measure will exclude pre-oxygenation (before placement of the airway device) and emergence defined as the time when the fraction of inspired halogenated hydrocarbons and nitrous oxide is 0.

Measure Time Period

Patient Intubated to Patient Extubated

Inclusions

Patients administered halogenated hydrocarbons and/or nitrous oxide, for greater than or equal to 30 minutes from placement of the airway device to removal of the airway device.

Exclusions

- Cases in which halogenated hydrocarbons and nitrous oxide are NOT used
- Cases with maintenance period < 30 minutes
- Cases with >20% of Fresh Gas Flow values manually entered during the case (automated capture of FGF required)
- Cases in which nitric oxide is administered.

Success

Mean FGF equal to, or less than 3L/minute when inspired halogenated hydrocarbons is >0.2%, or nitrous oxide FGF >0.2L/min, during the maintenance period of anesthesia.

Other Measure Build Details

- If Fresh Gas Flow Total (MPOG Concept ID: 3214) is documented for the case, this concept will be used to determine success in the setting of halogenated agents or nitrous oxide use.
- If Fresh Gas Flow Total (MPOG Concept ID: 3214) is not documented for the case, MPOG will calculate Fresh Gas Flow: Flows Oxygen (ID: 3215) + Flows Air (ID: 3220) + Flows Nitrous Oxide (ID: 3225)
- If there are no fresh gas flows documented on the case or the variables are mapped to the incorrect MPOG concept, the case will be excluded. There must be fresh gas flows documented for 80% of the total time the inspired agent is running to be included (minute-by-minute flow values).
- There must be at least 30 minutes of Nitrous Oxide flow >0L ***or*** inspired halogenated hydrocarbons >0% during the maintenance period. Maintenance period is defined as measure start to measure end. **See Appendix A** for diagram.
- Of the total number of minutes of gas flows documented, at least 80% of the Fresh Gas Flow values must be machine data captured for the case to be included. Any manually entered fresh gas flow or agent values will be included in the calculation of mean FGF if this threshold is met and the case is included.
- If there is a gap in documentation for fresh gas flow values, each value is valid for up to one minute.
- When calculating the mean Fresh Gas Flow, the sum of all flows will be added and divided by the total number of minutes that have a documented gas flow. If there are 30 cumulative minutes of halogenated gas documented, but only 24 minutes of fresh gas flow, the mean will be calculated using the 24 minutes of fresh gas flow. **See Appendix B** for diagrams depicting how fresh gas flow is calculated within the maintenance period.
- If multiple flow values for oxygen (3215), air (3220), and Nitrous Oxide (3225) occur at different second intervals in the same minute, all values will be aligned to the beginning of the minute and the one documented first will be used. For example, if 1 L/min of oxygen flow was documented at 13:02:30 and 2 L/min of air flow was documented at 13:02:32, both would be assigned 13:02 as the documented time and the total FGF would equal 3 L/min for that minute.
- Values for flows and gases will be assessed and considered artifact if inside the following ranges:
    - Nitrous Oxide Flows: <0.2 L/min
    - Isoflurane Insp %: <0.2%
    - Sevoflurane Insp %: <0.5%
    - Desflurane Insp %: <0.5%
    - Nitrous Oxide Insp % <15%

Algorithm for determining measure start and end:

Measure Start:

1. Placement of endotracheal tube, or supraglottic airway (LMA, COPA), if not available, then
2. Anesthesia Induction End, If not available, then
3. Anesthesia Induction Start. If not available, then
4. Procedure Start. If not available, then
5. Patient in Room. If not available, then
6. Anesthesia Start

Measure End:

1. Patient extubated (see Extubation Time Phenotype) or removal of supraglottic airway (see LMA Removal Time Phenotype). If not available, then
2. Procedure End. If not available
3. Patient Out of Room. If not available, then

4. Anesthesia End.

Responsible Provider

All providers signed in for at least 30 minutes during the time when halogenated agent or nitrous oxide are documented.

Method for determining Responsible Provider:

All providers signed in while patients are administered halogenated hydrocarbons, and/or nitrous oxide, for more than, or equal to, 30 minutes from placement of the airway device to removal of the airway device. See 'Other Measure Build Details' section for algorithm for determining measure start and end times.

Threshold

90%

MPOG Concept IDs Required

Gas Flow MPOG Concepts		**Halogenated Agent/Nitrous Oxide**	
3214	Fresh Gas Flow Total (L/min)	**3275**	Sevoflurane Insp %
3225	Flows Nitrous Oxide (L/min)	**3265**	Isoflurane Insp %
3220	Flows Air (L/min)	**3285**	Desflurane Insp %
3215	Flows Oxygen (L/min)	**3250**	Nitrous Insp %

Intubation MPOG Concepts		**LMA MPOG Concepts**	
50695	Categorized Note - Intubation	**50209**	LMA Placement Note
50117	Intubation/Airway - Approach	**50141**	Airway - LMA Type
50205	Intubation Tube Note	**50142**	Airway - LMA Size
50121	Intubation ETT Stylet Used	**50143**	Airway - LMA Placement Difficulty
50122	Intubation ETT Size	**50144**	Airway - LMA Placement Technique
50123	Intubation ETT Type		
50124	Intubation ETT Secured Distance		

50125	Intubation ETT Secured Reference Point

Data Diagnostics Affected

- Percentage of Cases with Any Physiologic Observations
- Percentage of Physiologic Rows that are Machine Captured
- Percentage of Physiologic Observations with a Meaningful Type Mapping

Phenotypes Used

- Age (Years)
- Anesthesia Technique: General
- Extubation Times
- Induction End
- Induction Start
- Is Valid Case (requires login)
- LMA Removal Times
- Measure Staff Sign Ins (requires login)
- Patient In Room Date/Time
- Patient Out Of Room Date/Time
- Procedure Type: Non-Operative
- Surgery End
- Surgery Start Date/Time

Rationale

Halogenated agents and nitrous oxide leaking or vented into the atmosphere are environmental pollutants. Reducing fresh gas flows can reduce cost of anesthesia without compromising patient care.

References

1. Sherman J, McGain F. Environmental sustainability in anesthesia: pollution prevention and patient safety. Adv Anesth. 2016;34:47-61.
2. Feldman JM. Managing fresh gas flow to reduce environmental contamination. Anesth Analg. 2012;114:1093-1101.
3. Eisenkraft JB, McGregor DG. Waste anesthetic gases and scavenging systems. In: Ehrenwerth J, Eisenkraft JB, Berry JM, eds. Anesthesia Equipment: Principles and Applications. 2nd ed. Philadelphia, PA: Saunders; 2013:139-145.
4. Ek M, Tjus K. Destruction of Medical N O in Sweden, Greenhouse Gases - Capturing, Utilization and Reduction. Liu G, ed. InTech. 2012. www.intechopen.com/?books/?greenhouse-gases-capturing-utilization-and-reduction/?destruction-ofmedical-n2o-in-sweden. Accessed March 1, 2017.
5. Barwise JA, Lancaster LJ, Michaels D, et al. Technical communication: an initial evaluation of a novel anesthetic scavenging interface. Anesth Analg. 2011;113:1064-1067.
6. American Society of Anesthesiologists' Task Force on Environmental Sustainability Committee on Equipment and Facilities. Greening the operating room. http://www.asahq.org/resources/resources-from-asacommittees/environmental-sustainability. Accessed March 1, 2017.

Measure Abbreviation

TEMP-01

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases that active warming was administered by the anesthesia provider.

Measure Time Period

Anesthesia Start to Patient Extubated

Inclusions

Cases with general or neuraxial anesthetic technique.

Exclusions

- ASA 5 and 6 cases
- Diagnostic Procedures (CPT: 01922)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- MRI Rooms (Rooms tagged as Radiology-MRI)
- MRI with procedure text:
    - MRI
    - MR Head
    - MR Brain
    - MR Chest
    - MR Torso
    - MR Abdomen
    - MR Lumbar
    - MR Spine
    - MR Knee
    - MR Femur
    - MR Abdomen
    - OFFSITE - RADIOLOGY PROCEDURE
- Cases less than 60 minutes between Case Start and Case End.

- Algorithm for determining Case Length:
  - *Case Start*
  1. Anesthesia Induction End. If not available, then
  2. Anesthesia Induction Begin. If not available, then
  3. Procedure Start. If not available, then
  4. Patient in Room. If not available, then
  5. Anesthesia Start
  - *Case End*
  1. Patient Extubated. If not available, then
  2. Procedure End. If not available, then
  3. Patient Out of Room. If not available, then
  4. Anesthesia End
- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'

Success

- Cases with documentation of an active warming device applied **OR**
- Cases with at least one temperature greater than or equal to 36.0°C within the 30 minutes before case end.
  - *Case End*
  1. Patient Extubated. If not available, then
  2. Procedure End. If not available, then
  3. Patient Out of Room. If not available, then
  4. Anesthesia End
- Other considerations:
  - For patients undergoing cesarean section fluid warmer is accepted as an active warming device.
    - These cases are determined by the MPOG Obstetric Anesthesia Type Phenotype. Included results:
      - 'Conversion (Cesarean Delivery and Labor Epidural Combined)'
      - 'Cesarean Delivery'
      - 'Conversion (Cesarean Delivery Portion)'

Other Measure Build Details

- Artifact algorithm:
  - Less than 32.0°C (89.6F)
  - Greater than 40.0°C (104.0F)
  - Any minute-to-minute jumps >0.5°C equivalent.
    - Example: 0.125°C /15s, 0.25°C / 30s, 1°C / 2mins
  - Conversion from F to C: F=32 +9/5 (°C)
- If temperature site not present in physiologic concept, refer to intraop notes.
- This measure uses the WarmingMethodClasification and WarmingMethodNotes phenotypes, which are not time bound

The active warming (TEMP 01) measure will identify the percentage of cases in which an active warming device was applied between Case Start and Case End or the patient maintained a temperature above 36.0°C without active warming. In the event that the provider opts to not use an active warming device, the case will meet the measure requirements if at least one temperature is greater than or equal to 36.0°C

within 30 minutes before extubation.

Active Warming includes:

- Convective warming: forced air
- Conductive warming: circulating water mattress, resistive heating electrical blankets
- Endovascular warming, using a heat exchanging catheter (very rarely used)
- Radiant heaters

Passive Warming interventions (NOT active warming):

- Increasing ambient room temperature
- Thermal insulators such as blankets
- Fluid warmer (except for cesarean section)

Responsible Provider

Provider present at induction end.

Threshold

90%

MPOG Concept IDs Required

Temperature MPOG Concept IDs		**Case Time MPOG Concept IDs**	
3050	Temp 1-Unspecified Site	**50002**	AACD Anesthesia Start Date/Time
3051	Temp 2-Unspecified Site	**50003**	AACD Patient in Room Date/Time
3052	Temp 1-Monitoring Site	**50004**	AACD Induction Start Date/Time
3053	Temp 2-Monitoring Site	**50005**	AACD Induction End Date/Time
3031	Temperature-Temporal Artery	**50006**	AACD Procedure Start Date/Time
3054	Temperature-Skin	**50007**	AACD Procedure Finish Date/Time
3055	Temperature-Esophageal	**50008**	AACD Patient out of room Date/Time

3056	Temperature- Blood
3057	Temperature- Tympanic
3058	Temperature- Bladder
3059	Temperature- Nasopharyngeal
3060	Temperature- Axillary
3061	Temperature- Rectal
3062	Temperature- Myocardial
3533	Temperature Route
50191	Monitoring- Temperature Probe Placed
50192	Monitoring- Temperature Probe Location/Type
Warming Method Concept IDs	
50138	Patient Warming Method- Convective Warmer
50320	Warming Attempts- Warm Room
50321	Warming Attempts- Convective Warmer
50322	Warming Attempts- Warm Blanket
50323	Warming Attempts- Radiant Heaters
50324	Warming Attempts- Fluid Warmer
50325	Warming Attempts- Warmer or blankets location detail

50009	AACD Anesthesia End Date/Time
Extubation MPOG Concept IDs	
50127	Intubation Extubated Awake or Deep
50145	Laryngeal Mask Airway removed Deep or Awake
50202	Emergence- Patient Extubated

Data Diagnostics Affected

- Percentage of Cases with a Temperature Observation
- Percentage of Cases with an Extubation Note
- Percentage of Cases with Anesthesia Induction End Documented

- Percentage of General and Neuraxial Cases with Warming Method Specified

Phenotypes Used

- Anesthesia Technique: Neuraxial
- ASA Class
- Case Start
- Extubation Times
- Is Valid Case (requires login)
- LMA Removal Times
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Patient Out Of Room Date/Time
- Procedure Type: MRI
- Procedure Type: Non-Operative
- Surgery End
- Warming Method Classification

Rationale

General and neuraxial anesthesia causes vasodilation thus redistributing body heat from the core to peripheries. This redistribution can cause hypothermia. Core temperatures outside the normal range pose significant risks to patients. Pediatric patients are more likely to develop perioperative hypothermia due to a high surface area to weight ratio and inability to regulate their own temperature.[1] Published research has correlated impaired wound healing, adverse cardiac events, altered drug metabolism, and coagulopathies with unplanned perioperative hypothermia. These adverse outcomes resulted in prolonged hospital stays and increased healthcare expenditures. Active warming techniques provide the best results for reducing cutaneous heat loss and preventing hypothermia.[2-7]

Risk Adjustment

Not applicable.

References

1. Carpenter L, Baysinger CL. Maintaining perioperative normothermia in the patient undergoing cesarean delivery. *Obstetrical & gynecological survey.* 2012;67(7):436-446.

2. Horn EP, Schroeder F, Gottschalk A, et al. Active warming during cesarean delivery. *Anesthesia and analgesia.* 2002;94(2):409-414, table of contents.

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4. Kim P, Taghon T, Fetzer M, Tobias JD. Perioperative hypothermia in the pediatric population: a quality improvement project. *American journal of medical quality : the official journal of the American College of Medical Quality.* 2013;28(5):400-406.

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6. Sessler DI. Temperature monitoring and perioperative thermoregulation. *Anesthesiology.*

2008;109(2):318-338.

7. Sun Z, Honar H, Sessler DI, et al. Intraoperative core temperature patterns, transfusion requirement, and hospital duration in patients warmed with forced air. *Anesthesiology.* 2015;122(2):276-285.

Measure Abbreviation

TEMP-02

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Process

Description

Percentage of cases with increased risk of hypothermia that the anesthesia provider documented at least one core temperature intraoperatively for any patient receiving a general anesthetic.

Measure Time Period

Anesthesia Start to Patient out of Room

Inclusions

All surgical patients receiving general anesthesia

Exclusions

- ASA 5 and 6 cases
- Cases with neuraxial anesthesia as the primary technique
- Cases with regional anesthesia as the primary technique
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- MRI Procedures (as determined by the MPOG 'Procedure Type: MRI' phenotype)
- Cases ≤30 minutes between Case Start and Case End.
- Invalid cases where Measure End results prior to Measure Start

Success

Cases with at least one core temperature documented between Anesthesia Start and Patient out of Room. If not available then, Anesthesia End.

Other Measure Build Details

Core or Near Core Temperature Monitoring Includes:

- Pulmonary Artery Temperature
- Distal Esophageal Temperature
- Nasopharyngeal Temperature
- Tympanic Membrane Temperature
- Bladder Temperature
- Rectal Temperature
- Axillary Temperature (arm must be at patient side)
- Oral Temperature
- Zero-Flux Thermometer Temperature

Peripheral Temperatures (not compliant):

- Skin Temperature
- Temporal Artery Temperature

Artifact algorithm:

- Less than 32.0°C (89.6F)
- Greater than 40.0°C (104.0F)
- Any minute-to-minute jumps >0.5°C equivalent.
    - Example: 0.125°C /15s, 0.25°C / 30s, 1°C / 2mins
- Conversion from F to C: F=32 +9/5 (°C)

Note: If temperature site is not present in physiologic concept, will refer to intraop notes.

*Algorithm for determining Case Length:

Case Start

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End

Responsible Provider

Provider present at induction end.

Threshold

90%

MPOG Concept IDs Required

Temperature MPOG Concept IDs	Case Time MPOG Concept IDs

3031	Temperature- Temporal Artery	**50002**	AACD Anesthesia Start Date/Time
3050	Temp 1- Unspecified Site	**50003**	AACD Patient in Room Date/Time
3051	Temp 2- Unspecified Site	**50004**	AACD Induction Start Date/Time
3052	Temp 1- Monitoring Site	**50005**	AACD Induction End Date/Time
3053	Temp 2- Monitoring Site	**50006**	AACD Procedure Start Date/Time
3054	Temperature- Skin	**50007**	AACD Procedure Finish Date/Time
3055	Temperature- Esophageal	**50008**	AACD Patient out of room Date/Time
3056	Temperature- Blood	**50009**	AACD Anesthesia End Date/Time
3057	Temperature- Tympanic		
3058	Temperature- Bladder		
3059	Temperature- Nasopharyngeal		
3060	Temperature- Axillary		
3061	Temperature- Rectal		
3062	Temperature - Myocardial		
3533	Temperature Route		
50191	Monitoring- Temperature Probe Placed		
50192	Monitoring- Temperature Probe Location/Type		
50174	Postoperative Vital Signs		

Data Diagnostics Affected

- Percentage of Cases with a Temperature Observation
- Percentage of Cases with an Extubation Note
- Percentage of Cases with Anesthesia Induction End Documented
- Percentage of Cases with Temperature Location Documented

Phenotypes Used

- ASA Class

- Case Duration
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: MRI
- Procedure Type: Non-Operative

Rationale

General and neuraxial anesthesia causes vasodilation thus redistributing body heat from the core to peripheries. This redistribution can cause hypothermia. Core temperatures outside the normal range pose significant risks to patients. Pediatric patients are more likely to develop perioperative hypothermia due to a high surface area to weight ratio and inability to regulate their own temperature.[1] Published research has correlated impaired wound healing, adverse cardiac events, altered drug metabolism, and coagulopathies with unplanned perioperative hypothermia. These adverse outcomes resulted in prolonged hospital stays and increased healthcare expenditures. The mortality rate is almost 20% higher only monitoring skin temperature rather than a core temperature for those who experience malignant hyperthermia during surgery.[2] Core temperature measurements are less variable than skin temperature measurements and more accurately represent body temperature.[3-5]

Risk Adjustment

Not applicable.

References

1. Kim P, Taghon T, Fetzer M, Tobias JD. Perioperative hypothermia in the pediatric population: a quality improvement project. *American journal of medical quality : the official journal of the American College of Medical Quality.* 2013;28(5):400-406.

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3. Sun Z, Honar H, Sessler DI, et al. Intraoperative core temperature patterns, transfusion requirement, and hospital duration in patients warmed with forced air. *Anesthesiology.* 2015;122(2):276-285.

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Measure Abbreviation

TEMP-03

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

Percentage of patients, regardless of age, who undergo surgical or therapeutic procedures under general or neuraxial anesthesia of 60 minutes duration or longer for whom no body temperature was greater than or equal to 36 degrees Celsius (or 96.8 degrees Fahrenheit) recorded within the 30 minutes immediately before or the 15 minutes immediately after anesthesia end time

Measure Time Period

Case Start to Case End

Inclusions

- All patients, regardless of age, who undergo surgical or therapeutic procedures under general or neuraxial anesthesia of 60 minutes duration or longer.

Exclusions

- Cases <60 minutes duration between anesthesia start and anesthesia end.
- MAC cases
- Peripheral Nerve Block only cases
- Radical clavicle or scapula surgery (CPT: 00452)
- Thoracolumbar sympathectomy (CPT: 00622)
- Lumbar chemonucleolysis (CPT: 00634)
- Diagnostic arteriography/venography (CPT: 01916)
- Organ harvest (CPT: 01990)
- Anesthesia for diagnostic or therapeutic nerve blocks/injections (CPT: 01991, 01992)
- Other anesthesia procedure (CPT: 01999)
- Cardiac surgery (CPT: 00561, 00562, 00563, 00566, 00567, 00580, 01920)
- Acute Pain Management (CPT: 01996)
- Obstetric Non-Operative Procedures (CPT: 01958)
- Labor Epidurals (as determined by the MPOG 'Obstetric Anesthesia Type' Phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)')
- Cases with an intraoperative note mapped to intentional hypothermia (MPOG concept: 50037)

- Emergency cases (MPOG concepts: 70142 or 515)
- Invalid cases where Measure End results prior to Measure Start

Success

At least one body temperature measurement equal to or greater than 36 degrees Celsius (or 96.8 degrees Fahrenheit) achieved within the 30 minutes immediately before or the 15 minutes immediately after anesthesia end time. This measure is expressed as an outcome or inverse measure, where a lower score means success.

Other Measure Build Details

Temperature documented in within the postop vital sign note in the anesthetic record or temperatures documented and mapped to the temperature physiologic concepts are acceptable sources for this measure. Conversion from F to C: F=32 +9/5 (°C)

For sites that do not contribute PACU data to ASPIRE, this measure will only capture data documented by the anesthesia provider on the intraoperative anesthetic record.

Artifact algorithm:

- Less than 32.0°C (89.6F)
- Greater than 40.0°C (104.0F)
- Any minute-to-minute jumps >0.5°C equivalent.
    - Example: 0.125°C /15s, 0.25°C / 30s, 1°C / 2mins

Algorithm for determining Case Duration:

Case Start:

1. Anesthesia Induction End. If not available, then
2. Anesthesia Induction Begin. If not available, then
3. Procedure Start. If not available, then
4. Patient in Room. If not available, then
5. Anesthesia Start

Case End:

1. Patient Extubated. If not available, then
2. Procedure End. If not available, then
3. Patient Out of Room. If not available, then
4. Anesthesia End.

Responsible Provider

Provider present for longest duration of the case per staff role. See ‘Other Measure Build Details’ section of this specification to view the algorithm used for determining case duration.

In the event that two or more providers in the same class are signed in for the same duration, all providers signed in for the longest duration will be attributed.

Threshold

<10%

MPOG Concept IDs Required

Temperature MPOG Concept IDs		Exclusion MPOG Concept IDs	
3050	Temp 1-Unspecified Site	**50037**	Intentional hypothermia
3051	Temp 2-Unspecified Site	**70142**	Assessment and Plan-Emergent Status
3052	Temp 1-Monitoring Site		
3053	Temp 2-Monitoring Site		
3031	Temperature-Temporal Artery		
3054	Temperature- Skin		
3055	Temperature-Esophageal		
3056	Temperature-Blood		
3057	Temperature-Tympanic		
3058	Temperature-Bladder		
3059	Temperature-Nasopharyngeal		
3060	Temperature-Axillary		
3061	Temperature-Rectal		
50174	Postoperative vital signs		

Data Diagnostics Affected

- Cases with a Temperature Observation
- Cases with Staff Tracking
- Staff Role Mapping
- Staff Sign-Ins are Timed

Phenotypes Used

- Anesthesia CPT (Measures)

- Anesthesia Technique: Neuraxial
- Case Duration
- Emergency Status (ASA Class) Yes/No
- Intentional Hypothermia (requires login)
- MeasureStartingList (requires login)
- Obstetric Anesthesia Type
- PrimaryProvider

Rationale

Perioperative hypothermia is defined as a core temperature less than 36 degrees Celsius by both the National Institute of Health and Clinical Excellence and the American Heart Association.[1,2] It is not uncommon for a patient's core temperature to drop during surgery due to anesthetic induced peripheral vasodilation, exposure of skin during the surgical prep or impaired heat distribution. Pediatric patients are more likely to develop perioperative hypothermia due to a high surface area to weight ratio, minimal subcutaneous fat and inability to regulate their own temperature.[3] Perioperative hypothermia can result in multiple adverse effects including surgical site infections, cardiovascular events, impaired wound healing and increased hospital length of stay. Such adverse effects are prevented through maintenance of normothermia intraoperatively.[4-9]

Risk Adjustment

Not applicable.

References

1. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *Journal of the American College of Cardiology.* 2014;64(22):e77-137.

2. National Collaborating Centre for N, Supportive C. National Institute for Health and Clinical Excellence: Guidance. *The Management of Inadvertent Perioperative Hypothermia in Adults*. London: Royal College of Nursing (UK)National Collaborating Centre for Nursing and Supportive Care.; 2008.

3. Kim P, Taghon T, Fetzer M, Tobias JD. Perioperative hypothermia in the pediatric population: a quality improvement project. *American journal of medical quality : the official journal of the American College of Medical Quality.* 2013;28(5):400-406.

4. Sessler DI. Temperature monitoring and perioperative thermoregulation. *Anesthesiology.* 2008;109(2):318-338.

5. Sun Z, Honar H, Sessler DI, et al. Intraoperative core temperature patterns, transfusion requirement, and hospital duration in patients warmed with forced air. *Anesthesiology.* 2015;122(2):276-285.

6. Carpenter L, Baysinger CL. Maintaining perioperative normothermia in the patient undergoing cesarean delivery. *Obstetrical & gynecological survey.* 2012;67(7):436-446.

7. Insler SR, Sessler DI. Perioperative thermoregulation and temperature monitoring. *Anesthesiology clinics.* 2006;24(4):823-837.

8. Horn EP, Schroeder F, Gottschalk A, et al. Active warming during cesarean delivery. *Anesthesia and analgesia.* 2002;94(2):409-414, table of contents.

9. Yi J, Liang H, Song R, Xia H, Huang Y. Maintaining intraoperative normothermia reduces blood loss in patients undergoing major operations: a pilot randomized controlled clinical trial. *BMC anesthesiology.* 2018;18(1):126.

Measure Abbreviation
TRAN-01

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases with a blood transfusion that have a hemoglobin or hematocrit value documented prior to transfusion.

Measure Time Period
Up to 36 hours prior to the first transfusion during the case

Inclusions
All surgical patients receiving anesthetics who receive a transfusion of red blood cells.

Exclusions
- Massive Transfusion: Transfusion of 4 or more units of blood; 4 hours before Anesthesia Start to Anesthesia End.
    - Note for sites that document transfusions in ml instead of units: ASPIRE will default to 350ml/unit.
- EBL ≥ 2000 ml
- Patients < 2 years of age
- Patients <12 years old undergoing a cardiac procedure (CPT: 00560, 00561, 00562, 00563, 00567, 00580).
- Patients <12 years old where either transfused PRBC or EBL was greater than 30cc/kg.
- Burn cases (CPT Codes 01951, 01952, 01953)
- ASA 5 & 6
- Labor Epidurals as determined by the MPOG 'Obsteric Anesthesia Type' phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
- Obstetric Non-Operative Procedures - CPT 01958
- Exclude patients with an EBL > 1500cc during cesarean section as determined by MPOG 'Obstetric Anesthesia Type' phenotype results:
    - 'Cesarean Delivery'
    - 'Cesarean Hysterectomy'
    - 'Conversion (Cesarean Delivery portion)'

    - ‘Conversion (Cesarean Hysterectomy portion)’
    - 'Conversion (Labor Epidural and Cesarean Delivery Combined)'
- Exclude patients with a HR>110, SBP<85, DBP<45, or O2Sat <95% during cesarean section as determined by MPOG ‘Obstetric Anesthesia Type’ phenotype results:
    - ‘Cesarean Delivery’
    - ‘Cesarean Hysterectomy’
    - ‘Conversion (Cesarean Delivery portion)’
    - ‘Conversion (Cesarean Hysterectomy portion)’
    - 'Conversion (Labor Epidural and Cesarean Delivery Combined)'
- Exclude postpartum hemorrhage cases (ICD-10 code: O72.0, O72.1, O72.2, O72.3)
- Cases where the ‘Measure End Time’ precedes ‘Measure Start Time’ will be excluded and marked 'invalid'

Success

- Documentation of hemoglobin and/or hematocrit prior to blood transfusion
- Considerations:
    - For the first unit of transfusion, a hemoglobin or hematocrit of any value should be checked in a time period of 0 to 90 minutes before the transfusion, or the most recent documented hemoglobin or hematocrit of less than 8/24 should be within 36 hours of the transfusion.
    - If the last hemoglobin or hematocrit drawn before the first transfusion is ≤ 5/16, a second unit could be administered without rechecking hemoglobin/hematocrit.
    - If multiple units are administered, documentation of a hemoglobin or hematocrit value must be present within 90 minutes before each administration.
    - **For pediatric cases (patients < 12 years old):** Pre-transfusion hemoglobin/hematocrit required before the first unit and an additional recheck after 15cc/kg of PRBCs have been administered.
    - **For cardiopulmonary bypass cases,** all transfusions administered between cardiopulmonary bypass start and end will not be included for determining measure results for the case.

Other Measure Build Details

- Cardiopulmonary bypass (CPB) start/end times defined as follows:
    - Measure will first determine CPB start and end times using the first time associated with one of the following notes and the last time associated with one of the following notes:
        - 50047 Perfusion – Retrograde Arterial Prime/Venous Antegrade Prime Performed (Yes/No)
        - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
        - 50401 Cardiopulmonary bypass vent on - note
        - 50402 Cardiopulmonary bypass vent off - note
        - 50403 Cardiopulmonary bypass vent on detail
        - 50404 Cardiopulmonary bypass vent off detail
        - 50405 Cardiopulmonary bypass rewarm - note
        - 50407 Cardiopulmonary bypass systemic cooling initiated
        - 50409 Cardiopulmonary bypass (full/partial/left-heart) terminated
        - 50410 Cardiopulmonary bypass initiated (full/partial/left-heart)
        - 50411 Cardiopulmonary bypass -- ventilator turned off
        - 50412 Cardiopulmonary bypass -- perfusion start
        - 50413 Cardiopulmonary bypass -- perfusion end

        - 50415 Cardiopulmonary bypass -- aortic crossclamp off
        - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
        - 50417 Cardiopulmonary bypass -- Access cannula removed note
        - 50419 Cardiopulmonary bypass -- Aortic crossclamp removal requiring therapy
        - 50420 Cardiopulmonary bypass -- Isoflurane vaporizer turned on
        - 50421 Cardiopulmonary bypass -- Arterial cannula inserted note
        - 50422 Cardiopulmonary bypass -- Arterial cannula insertion site detail
        - 50424 Cardiopulmonary bypass -- Blood pressure lowered note
        - 50425 Cardiopulmonary bypass -- Blood pressure lowered therapy detail
        - 50426 Cardiopulmonary bypass -- Ice off head
        - 50427 Cardiopulmonary bypass -- Ice on head
        - 50428 Cardiopulmonary bypass - cardioplegia start
        - 50429 Cardiopulmonary bypass - cardioplegia stop
        - 50647 Cardiopulmonary bypass - Aprotinin test dose performed
        - 50714 Cardiopulmonary bypass - Full/partial/left-heart bypass start / stop event
        - 50766 Cardiopulmonary bypass -- Circulatory arrest start
        - 50767 Cardiopulmonary bypass -- Circulatory arrest stop
    - Finally, if there are no intraoperative notes available, the measure will review physiologic data mapped to the following variables to determine start and end times as follows:
        - At least one of these two cardiac indictors are met:
            - Systolic Blood Pressure (MPOG Concept: 3030) - Diastolic Blood Pressure (MPOG Concept: 3035) < 20 or Pulse (MPOG Concept: 3005) ≤ 5
        - At least one of these two pulmonary indicators are met:
            - Respiratory Rate (MPOG Concept: 3580) ≤ 2 or End Tidal CO2 (MPOG Concepts: 3235, 3236) ≤ 5
- Transfusion is defined as:
    - Packed Red Blood Cells-Autologous, Homologous, Unknown Type
    - Whole Blood-Homologous, Unknown Type
    - Categorized Note- Blood Products
- Hematocrit/hemoglobin are defined as**:**
    - POC - Blood gas-Hct measured, Hemoglobin
    - POC – Hematocrit spun
    - POC – Coulter counter – Hematocrit, Hemoglobin
    - Formal lab – Hematocrit, Hemoglobin
    - Formal lab - Blood gas - Hct measured, Hemoglobin

Responsible Provider

Provider(s) who administered blood product

Threshold

90%

MPOG Concept IDs Required

Blood Product MPOG Concept IDs	Point of Care Testing MPOG Concept IDs	Formal Lab MPOG Concept IDs	EBL MPOG Concept ID

10489	Packed Red Blood Cells- Autologous	**3415**	POC-Blood gas-Hct measured	**5005**	Formal lab-Hemoglobin	**10499**	EBL
10490	Packed Red Blood Cells- Homologous	**3435**	POC- hematocrit spun	**5006**	Formal lab-Hematocrit		
10492	Whole Blood-Homologous	**3440**	POC- Coulter counter-Hemoglobin	**5038**	Formal lab-Blood gas- Hct measured		
10616	Packed Red Blood Cells- Unknown Type	**3450**	POC- Coulter counter-Hematocrit	**5080**	Formal lab-Blood gas-Hemoglobin		
10617	Whole Blood-Unknown Type	**5081**	POC- Blood gas-Hemoglobin				
10618	Categorized Note-Blood Products						

Data Diagnostics Affected

- Percentage of Inpatient Cases with Documented Blood Loss
- Percentage of Cases with Documented Blood Transfusions
- Percentage of Fluids with a Meaningful Fluid Mapping
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Cases with a Lab Drawn During Anesthesia
- Percentage of Cases with Point of Care Hematocrit Labs
- Percentage of Cases with Point of Care Hemoglobin Labs
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia CPT (Measures)
- ASA Class
- Cardiopulmonary Bypass End
- Cardiopulmonary Bypass Start
- DiagnosesCleaned (No phenotype browser page)
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: Non-Operative
- Total Estimated Blood Loss (EBL)
- Weight (kg)

Rationale

The American Association of Blood Banks (AABB) recommends a transfusion threshold of hemoglobin concentration less than or equal to 8 g/dL or when patient is symptomatic (chest pain, orthostatic hypotension, tachcardia unresponsive to fluid resuscitation, or congestive heart failure).[1,2] Furthermore,

blood transfusions in non-cardiac surgery have been associated with increased risk of 30-day mortality and morbidity.[3]

Although the literature is not conclusive on the exact hemoglobin concentration that requires transfusion, the evidence is clear that use of fewer RBC transfusions reduces cost and risk for adverse effects of transfusion, and that transfusion for hemoglobin values greater than 10 g/dL is usually not indicated.

TRAN 01 is a process measure focused on measuring hemoglobin or hematocrit prior to transfusion. The rationale for this measure is that the decision to transfuse should include knowledge of the hemoglobin value before administration of blood. Because the literature is not absolutely conclusive on a specific hemoglobin threshold for transfusion, TRAN 01 does not include the actual hemoglobin value as part of the measure.

Risk Adjustment

Not applicable

References

1. Carson JL, Grossman BJ, Kleinman S, et al. Red blood cell transfusion: a clinical practice guideline from the AABB*. *Annals of internal medicine.* 2012;157(1):49-58.

2. Carson JL, Guyatt G, Heddle NM, et al. Clinical Practice Guidelines From the AABB: Red Blood Cell Transfusion Thresholds and Storage. *Jama.* 2016;316(19):2025-2035.

3. Glance LG, Dick AW, Mukamel DB, et al. Association between intraoperative blood transfusion and mortality and morbidity in patients undergoing noncardiac surgery. *Anesthesiology.* 2011;114(2):283-292.

Measure Abbreviation

TRAN-02

Data Collection Method

This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type

Outcome

Description

Percentage of cases with a post transfusion hemoglobin or hematocrit value greater than or equal to 10 g/dL or 30%.

Measure Time Period

90 minutes before the last intraoperative transfusion to 18 hours after Anesthesia End

Inclusions

Any patient that receives a red blood cell transfusion. Transfusion is defined as packed red blood cells or whole blood. See MPOG Concept IDs below for complete list.

Exclusions

- Patients < 2 years of age
- Patients <21 years old undergoing a cardiac procedure (CPT: 00560, 00561, 00562, 00563, 00567, 00580)
- Pediatric cases (<12 years old) where either the transfused PRBC or EBL was greater than 30cc/kg.
- ASA 5 & 6
- EBL ≥ 2000ml
- Massive Transfusion: Transfusion of 4 or more units of blood; 4 hours before Anesthesia Start to Anesthesia End
    - Note for sites that document transfusions in ml instead of units: ASPIRE will default to 350ml/unit.
- Labor Epidurals as determined by the MPOG 'Obsteric Anesthesia Type' phenotype results 'Labor Epidural' and 'Conversion (Labor Epidural Portion)'
- Obstetric Non-Operative Procedures – CPT 01958
- Exclude patients with an EBL > 1500cc during cesarean section as determined by MPOG 'Obstetric Anesthesia Type' phenotype results:
    - 'Cesarean Delivery'
    - 'Cesarean Hysterectomy'
    - 'Conversion (Cesarean Delivery portion)'

    - ‘Conversion (Cesarean Hysterectomy portion)’
    - 'Conversion (Labor Epidural and Cesarean Delivery Combined)'
- Exclude patients with a HR>110, SBP<85, DBP<45, or O2Sat <95% during cesarean section as determined by MPOG ‘Obstetric Anesthesia Type’ phenotype results:
    - ‘Cesarean Delivery’
    - ‘Cesarean Hysterectomy’
    - ‘Conversion (Cesarean Delivery portion)’
    - ‘Conversion (Cesarean Hysterectomy portion)’
    - 'Conversion (Labor Epidural and Cesarean Delivery Combined)'
- Exclude postpartum hemorrhage cases (ICD-10 code: O72.0, O72.1, O72.2, O72.3)
- Cases where the ‘Measure End Time’ precedes ‘Measure Start Time’ will be excluded and marked 'invalid'

Success

- Hematocrit value documented as less than or equal to 30% and/or hemoglobin value documented as less than or equal 10 g/dL **OR**
- No hematocrit or hemoglobin checked within 18 hours of anesthesia end.

Other Measure Build Details

- Considerations:
    - All hemoglobin/hematocrit lab values drawn after the last transfusion and within 18 hours after anesthesia end will be evaluated. If the lowest of these values is ≤10g/dL or ≤30%, the case will pass.
    - If the hemoglobin or hematocrit at the time of the last transfusion (within 90 minutes before) is less than or equal to 8/24, the case will pass.

Responsible Provider

Individual who administered the transfusion

Threshold

<10%

MPOG Concept IDs Required

Blood Product MPOG Concept IDs		**Point of Care Testing MPOG Concept IDs**		**Formal Lab MPOG Concept IDs**		**EBL MPOG Concept ID**	
10489	Packed Red Blood Cells-Autologous	**3415**	POC-Blood gas-Hct measured	**5005**	Formal lab-Hemoglobin	**10499**	EBL
10490	Packed Red Blood Cells-Homologous	**3435**	POC-hematocrit spun	**5006**	Formal lab-Hematocrit		

10492	Whole Blood-Homologous	**3440**	POC- Coulter counter-Hemoglobin	**5038**	Formal lab-Blood gas- Hct measured
10616	Packed Red Blood Cells- Unknown Type	**3450**	POC- Coulter counter-Hematocrit	**5080**	Formal lab-Blood gas-Hemoglobin
10617	Whole Blood-Unknown Type	**5081**	POC- Blood gas-Hemoglobin		
10618	Categorized Note-Blood Products				

Data Diagnostics Affected

- Percentage of Inpatient Cases with Documented Blood Loss
- Percentage of Cases with Documented Blood Transfusions
- Percentage of Fluids with a Meaningful Fluid Mapping
- Percentage of Labs Mapped to a Meaningful Lab Mapping
- Percentage of Cases with a Lab Drawn During Anesthesia
- Percentage of Cases with Point of Care Hematocrit Labs
- Percentage of Cases with Point of Care Hemoglobin Labs
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

Phenotypes Used

- Anesthesia CPT (Measures)
- ASA Class
- DiagnosesCleaned (No phenotype browser page)
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: Non-Operative
- Total Estimated Blood Loss (EBL)
- Weight (kg)

Rationale

The American Association of Blood Banks (AABB) recommends a transfusion threshold of hemoglobin concentration less than or equal to 8 g/dL or when patient is symptomatic (chest pain, orthostatic hypotension, tachycardia unresponsive to fluid resuscitation, or congestive heart failure).[1,2] Furthermore, blood transfusions in non-cardiac surgery have been associated with increased risk of 30-day mortality and morbidity.[3,4]

Although the literature is not conclusive on the exact hemoglobin concentration that requires transfusion, the evidence is clear that use of fewer RBC transfusions reduces cost and risk for adverse effects of transfusion, and that transfusion to hemoglobin value greater than 10 g/dL or hematocrit greater than 30 is almost always not indicated.[5] TRAN 02 is an outcome measure examining the number of patients who may have received more blood than necessary.

Risk Adjustment

Not applicable

References

1. Carson JL, Grossman BJ, Kleinman S, et al. Red blood cell transfusion: a clinical practice guideline from the AABB*. *Annals of internal medicine.* 2012;157(1):49-58.

2. Carson JL, Guyatt G, Heddle NM, et al. Clinical Practice Guidelines From the AABB: Red Blood Cell Transfusion Thresholds and Storage. *Jama.* 2016;316(19):2025-2035.

3. Glance LG, Dick AW, Mukamel DB, et al. Association between intraoperative blood transfusion and mortality and morbidity in patients undergoing noncardiac surgery. *Anesthesiology.* 2011;114(2):283-292.

4. Napolitano LM, Kurek S, Luchette FA, et al. Clinical practice guideline: red blood cell transfusion in adult trauma and critical care. *The Journal of trauma.* 2009;67(6):1439-1442.

5. Practice guidelines for perioperative blood management: an updated report by the American Society of Anesthesiologists Task Force on Perioperative Blood Management*. *Anesthesiology.* 2015;122(2):241-275.

Measure Abbreviation
ABX-01

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cesarean deliveries with documentation of antibiotic administration initiated within one hour before surgical incision

Measure Time Period
60 minutes prior to Surgical Incision through Surgical Incision

Inclusions
- Elective, urgent, or emergent cesarean delivery (Determined using the MPOG Obstetric Anesthesia Type phenotype)
- Patients undergoing cesarean section with hysterectomy (As determined by the MPOG Obstetric Anesthesia Type phenotype)

Exclusions
- Obstetric Non-Operative Procedures (Determined using the MPOG Obstetric Anesthesia Type phenotype)
- Cesarean delivery with documentation of infection prior to incision and mapped to one of the following MPOG concepts:
    - 50181 Compliance- Prophylactic Antibiotic Variance Note
    - 50182 Compliance- Prophylactic Antibiotic Variance Note Detail

Success
Documentation of at least one antibiotic administration within one hour of surgical incision. See ‘Other Measure Build Details’ for emergency cases and antibiotic timing exceptions.

Other Measure Build Details
Measure Start Time:

1. 60 minutes before measure end time (see below). For Vancomycin, 120 minutes before measure end time.

Measure End Time:

1. 50235 Surgical Incision Time (latest if multiple available), if not available then
2. 50006 AACD Procedure Start Date/Time (latest if multiple available).

- For cases without a documented surgical incision time or procedure start time, the case will be flagged for review.
- For cases with more than one Surgical Incision Time (50235) documented, the latest time will be used. If there is no surgical incision time documented, AACD Procedure Start Date/Time (50006) will be used. If there is more than one procedure start time, the latest procedure start time will be used.

Acceptable Antibiotics and Associated Timing:

Antibiotic	MPOG Concept	Appropriate Start Time
Azithromycin	10048	Within 60 minutes before incision/procedure start through Anesthesia End
Cefazolin	10107	Within 60 minutes before incision
Cefepime	10108	Within 60 minutes before incision
Cefotaxime	10109	Within 60 minutes before incision
Cefotetan	10110	Within 60 minutes before incision
Cefoxitin	10111	Within 60 minutes before incision
Ceftriaxone	10114	Within 60 minutes before incision
Cefuroxime	10115	Within 60 minutes before incision
Clindamycin	10131	Within 60 minutes before incision
Gentamicin	10202	Within 60 minutes before incision
Vancomycin	10444	Within 120 minutes before incision

*Any of these antibiotics administered within the timeframe will result in success for this measure focused on antibiotic timing, rather than selection.

- If one of the appropriate antibiotics listed in the table above was given as a bolus in the appropriate time frame, the case will pass and any additional antibiotic infusions will not be considered.
- If only one antibiotic is administered for the case and is documented with infusion start and end times, the following logic will be applied:
    - If the infusion start time ***or*** infusion end time is within 60 minutes before incision (120 minutes for vancomycin), the case will pass. If the infusion is still running at the time of incision, the case will pass.
    - If the infusion started after or at the same time as incision, the case will be flagged as 'antibiotic administered late' unless the case is an emergency case. See last bullet point below for details regarding emergency cases.
    - Exception: If azithromycin is started or ends within 60 minutes before incision through anesthesia end, the case will pass.
    - Measures will assigned the following results:

    - Passed - Antibiotic administered on time
    - Flagged - Antibiotic not administered on time
    - Flagged - Prophylactic antibiotic administered (Not documented in MAR)
    - Flagged - Antibiotic not ordered/indicated per surgeon
    - Flagged - Incision/procedure start time documented: No
    - Flagged - Antibiotic administered too late
    - Flagged - Antibiotic administered too early
    - Flagged - Not administered for medical reasons
    - Excluded - Scheduled antibiotics/documented infection
- Measure will only look for the prophylactic variance note (50181 or 50182) to be documented if an antibiotic is not documented within the measure time frame.
- For cases with documentation indicating 'prophylactic antibiotic administered' (concept ID: 50181 or 50182 or 50622) but the antibiotic(s) administration with dose, route, and time are not documented in the electronic medication administration record will be flagged for review.
- Cases will be flagged for review if there is documentation that an antibiotic was not ordered or there is documentation that the antibiotic is 'not indicated.'
- For emergency cases, success is determined by documentation of any of the listed antibiotics initiated between 60 minutes before procedure start and anesthesia end. For patients requiring vancomycin, the measure time period for emergency cases is 120 minutes before procedure start and anesthesia end.

Responsible Provider

All anesthesia providers signed in at the time of incision. If surgical incision time is not documented (50235) then providers signed in at the procedure start time (50006) will be attributed. If procedure start time (50006) is not documented, then providers signed in at anesthesia start (50002) will be attributed.

Threshold

90%

MPOG Concept IDs Required

- 50235 Surgical Incision Time
- 50006 AACD Procedure Date/Time
- 10048 Azithromycin
- 10107 Cefazolin
- 10108 Cefepime
- 10109 Cefotaxime
- 10110 Cefotetan
- 10111 Cefoxitin
- 10114 Ceftriaxone
- 10115 Cefuroxime
- 10202 Gentamicin
- 10131 Clindamycin
- 10444 Vancomycin
- 50181 Compliance- Prophylactic Antibiotic Variance Note

- 50182 Compliance- Prophylactic Antibiotic Variance Note Detail
- 50622 Compliance- Antibiotic Started
- 70233 Assessment and Plan - ASA Physical Status
- 70142 Assessment and Plan - Emergent Status
- 515 Surgical Admission Type - Emergency

Data Diagnostics Affected

- Percentage of Cases with Professional Fee Anesthesia Codes
- Percentage of Cases with an Antibiotic Administration
- Percentage of Cases with any Intraoperative Notes
- Percentage of Cases with a Meaningful Note Mapping
- Percentage of Cases Marked as Emergent

Phenotypes Used

- ABX Notes (requires login)
- Age (Years)
- ASA Class
- Emergency Status (ASA Class) Yes/No
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: Non-Operative

Rationale

Postpartum infections, including endometritis and surgical site infections are common after cesarean deliveries.[1] Smaill & Hofmeyr conducted a large meta-analysis reviewing 81 randomized trials including 11,937 women undergoing elective or nonelective cesarean delivery.[6] The analysis concluded that antimicrobial prophylaxis was associated with reduction in fever, endometritis, urinary tract infection, SSI, and serious infection.[6] Historically, antibiotic prophylaxis was administered after cord clamping during cesarean delivery. However, recent studies suggest that prophylaxis should be administered before surgical incision to decrease the risk of maternal complications with no change in neonatal outcomes.[3,5] Further, the antibiotic should be infused before incision in order to achieve peak antimicrobial concentrations in the tissue at the time of incision.[1-2] Both the American College of Obstetricians and Gynecologists and the American Academy of Pediatrics support the use of single dose prophylaxis administered within 60 minutes before cesarean delivery to prevent maternal infectious morbidity.[4]

Risk Adjustment

Not applicable.

References

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Measure Abbreviation
BP 04-OB

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnosis data. This measure is explicitly not based on provider self-attestation.

Measure Type
Process

Description
Percentage of cases with systolic blood pressure <90mmHg for less than or equal to 5 minutes during the time from spinal placement to delivery.

Measure Time Period
Spinal placement to neonate delivery

Inclusions
All cesarean deliveries (as determined using the MPOG Obstetric Anesthesia Type phenotype) with neuraxial anesthesia only (as determined by the Anesthesia Technique-Neuraxial MPOG Phenotype

Exclusions
- Cesarean delivery patients undergoing general anesthesia- determined using Anesthesia Technique-Neuraxial MPOG phenotype
- Patients undergoing cesarean section with hysterectomy (as determined by the MPOG Obstetric Anesthesia Type Phenotype)
- Emergency cesarean delivery with diagnosis of placental abruption (ICD-10: O45*)
- Rupture of uterus (spontaneous) before onset of labor (ICD-10: O71.0)
- Newborn affected by intrauterine blood loss from ruptured cord (ICD-10: P50.1)
- Abnormal uterine or vaginal bleeding, unspecified (ICD-10: N93.9)
- Placenta previa with hemorrhage, third trimester (ICD-10: O44.13)
- Hemorrhage from placenta previa, antepartum condition or complication (ICD-10: 641.13)
- Hemorrhage from placenta previa, delivered, with or without mention of antepartum condition (ICD-10: 641.11)
- ICD-10 Codes associated with the case and documented from 7 days before to 30 days after the case are considered

Success
SBP <90mmHg for less than or equal to 5 minutes during the time period of spinal placement to delivery

Other Measure Build Details

Measure Start Time:

1. For scheduled cesarean delivery cases (as determined by the Obstetric Anesthesia Type phenotype): Will use Neuraxial Start Time (phenotype)
    1. If Neuraxial Start Time is earlier than 'Anesthesia Start', will use 'Anesthesia Start'
2. For labor epidural cases that are converted to cesarean delivery and are documented as a single case (as determined by the Obstetric Anesthesia Type phenotype): Will use the Cesarean Delivery Start Time for Conversion Cases (phenotype)
3. For labor epidural cases that are converted to cesarean delivery and documented as two separate cases (as determined by the Obstetric Anesthesia Type phenotype): Will use the Cesarean Delivery Start Time for Conversion Cases (phenotype)

Measure End Time (limited to concepts between 'anesthesia start' and 'anesthesia end'):

1. Delivery of Neonate 2 (50189), if not available
2. Delivery of Neonate (50358), if not available,
3. Oxytocin (10343) Administration Start Time (bolus or infusion), if not available,
4. Obstetrics - Uterine Incision (50357), if not available,
5. AACD Anesthesia End Date/Time (50009)

- Cases where the 'Measure End Time' precedes 'Measure Start Time' will be excluded and marked 'invalid'
- **Multiple blood pressures:** Instances where there are two blood pressure monitoring methods, the higher MAP will be used to determine measure compliance.
- **Artifact:** Artifact readings will be identified and removed from final measurement calculation. Artifact processing: if systolic and diastolic blood pressures are present, the values must be at least 5 mmHg apart; otherwise the values will be excluded. MAP values less than 10 are excluded.
- Each incidence of hypotension will count for a max of 5 minutes or until 'Measure End' (whichever is sooner) if there is a gap in blood pressure measurement
- Use Oxytocin administration start time as determined by oxytocin documented on the case within the measure time period.

Responsible Provider

Not applicable- departmental measure only

Threshold

90%

MPOG Concept IDs Required

- 3011 BP Sys Invasive Unspecified Site 1
- 3012 BP Dias Invasive Unspecified Site 1
- 3013 BP Mean Invasive Unspecified Site 1
- 3015 BP Sys Non-invasive
- 3020 BP Dias Non-invasive
- 3025 BP Mean Non-invasive

- 3026 BP Sys Invasive Unspecified Site 4
- 3027 BP Dias Invasive Unspecified Site 4
- 3028 BP Mean Invasive Unspecified Site 4
- 3030 BP Sys Arterial Line (Invasive, Peripheral)
- 3035 BP Dias Arterial Line (Invasive, Peripheral)
- 3040 BP Mean Arterial Line (Invasive, Peripheral)
- 3041 BP Sys Invasive Unspecified Site 2
- 3042 BP Dias Invasive Unspecified Site 2
- 3043 BP Mean Invasive Unspecified Site 2
- 3046 BP Sys Invasive Unspecified Site 3
- 3047 BP Dias Invasive Unspecified Site 3
- 3475 BP Sys Invasive Unspecified Site 5
- 3476 BP Dias Invasive Unspecified Site 5
- 3477 BP Mean Invasive Unspecified Site 5
- 3041 Sys Invasive Unspecified Site 2
- 50009 AACD Anesthesia End Date/Time
- 50358 Delivery of Neonate
- 50189 Delivery of Neonate 2
- 10343 Oxytocin
- 50357 Obstetrics- Uterine Incision

Data Diagnostics Affected

- Percentage of cases with a neuraxial note
- Percentage of Physiologic Observations with a Meaningful Type Mapping
- Percentage of Cases with Invasive Blood Pressure
- Percentage of Cases with Non-invasive Blood Pressure
- Percentage of Cases with Physiologic Observations

Phenotypes Used

- Age (Years)
- Blood Pressure Observations
- Cesarean Delivery Start Time for Conversions
- DiagnosesCleaned (No phenotype browser page)
- MeasureStartingList (requires login)
- Obstetric Neuraxial Anesthesia Start Time

Rationale

Neuraxial anesthesia is widely used for cesarean delivery and is associated with lower mortality and morbidity when compared to general anesthesia.[5,8,10] Though overall morbidity is lower, neuraxial anesthesia can lead to maternal hypotension which has been cited as a common maternal complication during cesarean delivery.[5-11] Hypotension can cause fetal acidosis and maternal nausea and vomiting.[2,10,12] Prolonged hypotension can result in organ ischemia, uteroplacental hypoperfusion, loss of consciousness, and cardiovascular collapse.[2,8] Techniques currently used to prevent hypotension related to spinal placement include intravenous fluid prehydration, vasopressor infusions, and less commonly physical methods such as leg elevation and compression stockings.[2,5,8,10,11]

In a Cochrane review of 126 studies including 9565 patients, 94 of the studies defined hypotension as a maternal systolic blood pressure below 80% of baseline recording, absolute value of less than 90 or 100

mmHg, or some combination thereof.[2] Patients experiencing severe preeclampsia may be at lower risk of hypotension (but higher risk of other complications) as compared to healthy parturients.[1] Nonetheless, hypotension and low placental perfusion remain a risk for the preeclamptic patient undergoing neuraxial anesthesia, necessitating the same level of vigilance as for non pre-eclamptic patients.[3,7]

Risk Adjustment

N/a

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Measure Abbreviation
GA 01-OB

Data Collection Method
This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

Measure Type
Outcome

Description
Percentage of cesarean delivery cases where general anesthesia was used

Measure Time Period
Anesthesia Start to Anesthesia End

Inclusions
- Cesarean Delivery cases as determined by the "Obstetric Anesthesia Type" Phenotype. Phenotype results included:
  - Cesarean Delivery
  - Conversion (Cesarean Delivery Portion)
  - Conversion (Labor epidural and cesarean delivery combined)

Exclusions
- Cesarean Hysterectomies as determined by the "Obstetric Anesthesia Type" Phenotype
- Non-cesarean delivery cases

Success
Cesarean delivery completed without use of general anesthesia

Other Measure Build Details
Measure Start Time: Anesthesia Start

Measure End Time: Anesthesia End

- Use of general anesthesia is determined by the 'Anesthesia Technique: General' phenotype
- Cases where 'measure end' precedes 'measure start' will be excluded from the measure

Responsible Provider

n/a, departmental only measure

Threshold

n/a, Informational only

MPOG Concept IDs Required

See concepts included in the 'Obstetric Anesthesia Type' phenotype and 'Anesthesia Technique: General' phenotypes

Phenotypes Used

- Age (Years)
- Anesthesia Technique: Neuraxial
- Is Valid Case (requires login)
- Measure Staff Sign Ins (requires login)
- Obstetric Anesthesia Type
- Procedure Type: Non-Operative

Rationale

General anesthesia is used in roughly 5% of elective cesarean deliveries and 14-20% of emergent cesarean deliveries.[1,2] Mothers who receive neuraxial anesthesia report less pain on the day of surgery, show less gastrointestinal stasis, fevers, and coughing on post op day 2, and show earlier mobility and breastfeeding onset than those who receive general anesthesia.[3] Mothers who receive general anesthesia during cesarean delivery may also be at increased risk of severe postpartum depression as compared to those who receive neuraxial anesthesia.[4]

Risk Adjustment

n/a

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