

Adverse Outcome Index Quarterly Monitoring Report

NPIC ID: SA1 Q1 2018 – Q4 2021

INTRODUCTION

The Adverse Outcome Index (AOI) Report is designed to measure the volume and magnitude of ten adverse events that may occur during the delivery process and could potentially expose an obstetrical team to malpractice liability. These events were selected by the original developers because they were deemed definable, and possibly modifiable, through improved team training and communication¹.

I. AOI EVENTS AND DESCRIPTION OF INDICES

Each type of event has a severity weight associated with it, and there are three indices calculated from the count and weight of the events occurring at your facility.

WEIGHTS FOR ADVERSE OUTCOMES

| | | | |
|---|-----|--|----|
| In-hospital Maternal Death* | 750 | Unanticipated Operative Procedure | 40 |
| In-hospital Neonatal Death \geq 2500 grams and \geq 37 Weeks Gestation* | 400 | Admission to NICU of Neonate Birthweight \geq 2500 grams and \geq 37 Weeks Gestational Age for > 1 Day | 35 |
| Uterine Rupture During Labor | 100 | APGAR 5 < 7 | 25 |
| Maternal Intensive Care | 65 | Maternal Blood Transfusion | 20 |
| Birth Trauma | 60 | 4th Degree Perineal Laceration | 5 |

**In-hospital Maternal Deaths and In-hospital Neonatal Deaths \geq 2500 grams and \geq 37 Weeks Gestation events are reviewed and confirmed by the hospital.*

THE ADVERSE OUTCOME INDEX (AOI): The number of patients with one or more identified adverse events, divided by the total number of deliveries.

THE WEIGHTED ADVERSE OUTCOME SCORE (WAOS): The total weights of all the adverse events, divided by the total number of deliveries.

THE SEVERITY INDEX (SI): The total weights of all the adverse events, divided by the number of patients with an adverse event. *(Note: each delivery is only counted once, but each event is counted.)*

II. DATA SUBMISSION

Overall Reporting Period: 01/01/18 - 12/31/21 **Total Deliveries for the Period:** 10,457 **Total Inborns for the Period:** 10,701

III. REPORT ANALYSIS FOR YOUR HOSPITAL

The following data represent one way to interpret the findings from your hospital. Each hospital must determine meaningful goals for their own institution. The event counts in Table 1 will help to provide a better understanding of the data contributing to your hospital's AOI, WAOS and SI quarterly rates. We strongly encourage hospitals to review AOI cases to ensure the accuracy of AOI metrics and to identify any underlying processes that increase the likelihood of errors. **We would be happy to provide a list of cases for your review, upon request.**

Case list requests or questions regarding this report may be directed to your NPIC Client Services Team Member, via email:

ClientServices@npic.org

Table 1: Count of Adverse Events by Indicator - Displays a quarter-by-quarter count of cases by an adverse event, the reporting period average count, and the count of deliveries by quarter.

Note: Due to the limitations of using an administrative data set with separate (non-linked) mother and baby records, we can only determine the number of patients with an adverse event for reporting. This may result in an overstatement of the actual number of deliveries with adverse events if there are cases where a mother and her baby each had events.

Q4 2021 Events to Note:

- The total count of Adverse Events decreased from 31 in Q3 2021 to 29 in Q4 2021. Hospital's overall reporting average = 33.
- The total patients with one or more Adverse Events decreased from 27 in Q3 2021 to 26 in Q4 2021. Hospital's overall reporting average = 30.
- The "Uterine Rupture During Labor" indicator cases this quarter (1) remained the same from Q3 2021. Hospital's overall reporting average=0. *(Severity weight = 100)*
- The "Maternal Intensive Care" indicator cases decreased from 3 in Q3 2021 to 1 this quarter. This decrease in cases is contributing to the hospital's lower SI rate in Q4 2021. Hospital's overall reporting average =1. *(Severity weight =65)*



- The “Admission to NICU” indicator cases increased from 7 in Q3 2021 to 11 this quarter. Hospital’s overall reporting average =19. (Severity weight =35)
- The “APGAR 5<7” indicator cases decreased from 9 in Q3 2021 to 3 this quarter. Hospital’s overall reporting average =3. (Severity weight =25)

Table 2: Indices by Quarter - Displays hospital AOI, WAOS, and SI quarterly rates, the average rates for the reporting period, the NPIC Comparative Rate¹, and the Target Benchmark².

- The AOI rate increased 32% from 0.026 in Q3 2021 to 0.034 in Q4 2021. The overall reporting period average is 0.047.
- The WAOS rate increased 14% from 1.14 in Q3 2021 to 1.30 in Q4 2021. The overall reporting period average is 1.96.
- The SI rate decreased 14% from 44.07 in Q3 2021 to 38.08 in Q4 2021. The overall reporting period average is 41.46.

Note: The decline in deliveries in Q4 2021 is contributing to the increase in AOI and WAOS rates this quarter.

¹**NPIC (Comparative) Rate:** Hospitals participating in AOI reporting for CY 2020 = 26 Hospitals
Comparison Group academic status and characteristics can be found in the Appendix at the end of the report.

²**Target Benchmark:** A subset of comparative rate hospitals with WAOS scores in the top quartile = 7 Hospitals

Graphs 1- 3: Display each index by quarter, including the average rate for the reporting period, confidence intervals for each data point, NPIC Comparative rate, and Target Benchmark rate.

Confidence Interval: Vertical error bars representing the margin of error (90% confidence interval) for each data point.

- **Not Significantly Different:** Data points with error bars that cross the horizontal Target Benchmark or the NPIC Comparative rate,
- **Significantly Different (higher or lower):** Data points with error bars that do not cross the horizontal Target Benchmark or the NPIC Comparative rate.

- **Hospital Trend:** Trend lines with significance are displayed when the reporting period includes four or more quarters of data.
- . - . **NPIC (Comparative) Rate:** Dashed dotted horizontal line
- - - **Target Benchmark:** Dashed horizontal line

Graph 1: Adverse Outcome Index (AOI) - Reflects the overall rate of cases with an adverse event.

- **The average rate of 0.047** is below the NPIC Comparative Rate (0.048) and significantly higher than the Target Benchmark(0.028).
- The trend indicates no significant change.



Graph 2: Weighted Adverse Outcome Score (WAOS) - Reflects the severity of adverse events relative to all deliveries.

- **The average rate of 1.96** is above the NPIC Comparative Rate (1.70) and significantly higher than the Target Benchmark (0.90).
- The trend indicates no significant change.

Graph 3: Severity Index (SI) - Reflects the severity of the events relative to all cases with an adverse event.

- **The average rate of 41.46** is above the NPIC Comparative Rate (35.05) and significantly higher than the Target Benchmark (33.16).
- The trend indicates no significant change.

The Version 4.0.1 algorithm logic, and the specific codes associated with each type of adverse event, are available in the Definitions section.

IV. ACKNOWLEDGEMENT

The AOI Report was developed by the National Perinatal Information Center (NPIC) in conjunction with the Team Performance Plus (TPP™) Training Program.

The specific measures profiled in this report were developed, beginning in 2001, by a panel of experts from the American College of Obstetrics and Gynecology (ACOG), the Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN), The Society for Obstetric Anesthesia and Perinatology (SOAP), the Armed Forces Institute of Pathology (AFIP), the US Navy Bureau of Medicine and Surgery (BUMed), the Office of the Surgeon General - US Army, TRICARE Management Activity (the US military health system), and participants from the hospitals selected for a team training study co-sponsored by the Department of Defense, the Risk Management Foundation of the Harvard Medical Institutions, and the Beth Israel Deaconess Medical Center Obstetrics/Gynecology Foundation.

The types of events, and the weights associated with them, were developed by this panel of experts through a rigorous consensus process to determine appropriate “weights”. For example, it was agreed that “maternal death” should have the highest severity weight (750); the sum of the weights of all other events is equal to the severity weight for maternal death.

¹Nielson, P., Goldman, M., Mann, S., Shapiro, D., Marcus, R., Pratt, S., Greenberg, P., McNamee, P., Salisbury, M., Birnbach, D., Gluck, P., Pearlman, M., King, H., Tornberg, D., & Sachs, B. Effects of Teamwork Training on Adverse Outcomes and Process of Care in Labor and Delivery: A Randomized Controlled Trial. American College of Obstetrics & Gynecology. 2007; 109 (1): 48 – 55.



ADVERSE OUTCOME INDEX (AOI) REPORT

Table 1: Count of Adverse Events by Indicator

| NPIC ID: SA1 | Q1 2018 | Q2 2018 | Q3 2018 | Q4 2018 | Q1 2019 | Q2 2019 | Q3 2019 | Q4 2019 | Q1 2020 | Q2 2020 | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 | Q4 2021 | Avg. For Period |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|
| Total Deliveries | 623 | 667 | 704 | 593 | 619 | 650 | 640 | 596 | 642 | 571 | 672 | 570 | 512 | 589 | 1046 | 763 | 654 |
| Total Inborns | 623 | 682 | 701 | 612 | 653 | 649 | 641 | 615 | 663 | 600 | 675 | 588 | 523 | 606 | 1071 | 799 | 669 |
| In-hospital Maternal Death | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| In-hospital Neonatal Death, ≥ 2500 grams and ≥ 37 weeks gestation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Uterine Rupture During Labor | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| Maternal Intensive Care | 1 | 3 | 1 | 1 | 0 | 0 | 3 | 3 | 1 | 0 | 0 | 2 | 0 | 2 | 3 | 1 | 1 |
| Birth Trauma | 2 | 1 | 2 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 1 | 3 | 2 | 2 | 1 |
| Unanticipated Operative Procedure | 4 | 1 | 4 | 5 | 2 | 6 | 3 | 4 | 4 | 1 | 3 | 3 | 1 | 2 | 7 | 5 | 3 |
| Admission to NICU, Neonate ≥ 2500 grams and ≥ 37 Weeks Gestation, for > 1 day | 10 | 19 | 16 | 11 | 17 | 30 | 20 | 19 | 21 | 24 | 29 | 17 | 23 | 24 | 7 | 11 | 19 |
| APGAR 5 < 7, Inborn Neonate, ≥ 2500 grams and ≥ 37 Weeks Gestation | 4 | 1 | 3 | 5 | 2 | 3 | 3 | 4 | 2 | 2 | 2 | 2 | 4 | 6 | 9 | 3 | 3 |
| Maternal Blood Transfusion | 1 | 4 | 4 | 3 | 1 | 3 | 1 | 2 | 2 | 3 | 6 | 3 | 0 | 5 | 1 | 1 | 3 |
| 4th Degree Perineal Laceration | 1 | 4 | 2 | 3 | 0 | 1 | 1 | 2 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | 5 | 2 |
| Total Adverse Events | 23 | 33 | 33 | 30 | 23 | 43 | 31 | 36 | 30 | 31 | 42 | 32 | 31 | 46 | 31 | 29 | 33 |
| Total Patients with one or more Adverse Events | 21 | 32 | 31 | 27 | 21 | 40 | 29 | 31 | 29 | 29 | 40 | 29 | 28 | 42 | 27 | 26 | 30 |



ADVERSE OUTCOME INDEX (AOI) REPORT

Table 2: Indices by Quarter

| NPIC ID: SA1 | Q1 2018 | Q2 2018 | Q3 2018 | Q4 2018 | Q1 2019 | Q2 2019 | Q3 2019 | Q4 2019 | Q1 2020 | Q2 2020 | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 | Q4 2021 | Avg. for Period | NPIC Rate* | Target Benchmark |
|---------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----------------|------------|------------------|
| Adverse Outcome Index (AOI) | 0.034 | 0.048 | 0.044 | 0.046 | 0.034 | 0.062 | 0.045 | 0.052 | 0.045 | 0.051 | 0.060 | 0.051 | 0.055 | 0.071 | 0.026 | 0.034 | 0.047 | 0.048 | 0.028 |
| Weighted Adverse Outcome Score (WAOS) | 1.32 | 1.63 | 1.66 | 2.80 | 1.30 | 2.20 | 1.74 | 2.16 | 1.64 | 1.74 | 2.04 | 3.39 | 1.98 | 3.38 | 1.14 | 1.30 | 1.96 | 1.70 | 0.90 |
| Severity Index (SI) | 39.05 | 33.91 | 37.74 | 61.48 | 38.33 | 35.75 | 38.45 | 41.61 | 36.21 | 34.31 | 34.25 | 66.55 | 36.25 | 47.38 | 44.07 | 38.08 | 41.46 | 35.05 | 33.16 |

***NPIC Comparative Rate Range:**

AOI: 0.021 - 0.080

WAOS: 0.71 - 2.96

SI: 26.40 - 43.73

Adverse Outcome Index (AOI) -- Number of patients with an adverse event divided by total number of deliveries

Weighted Adverse Outcome Score (WAOS) -- Total weights of all adverse events divided by total number of deliveries

Severity Index (SI) -- Total weights of all adverse events divided by number of patients with an adverse event

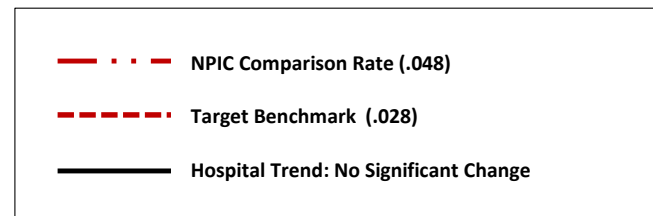
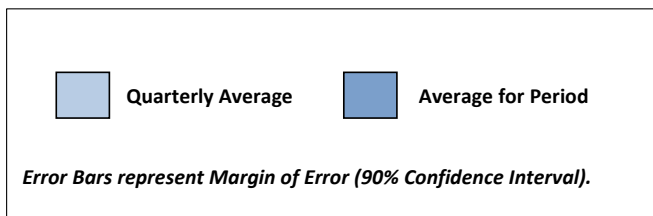
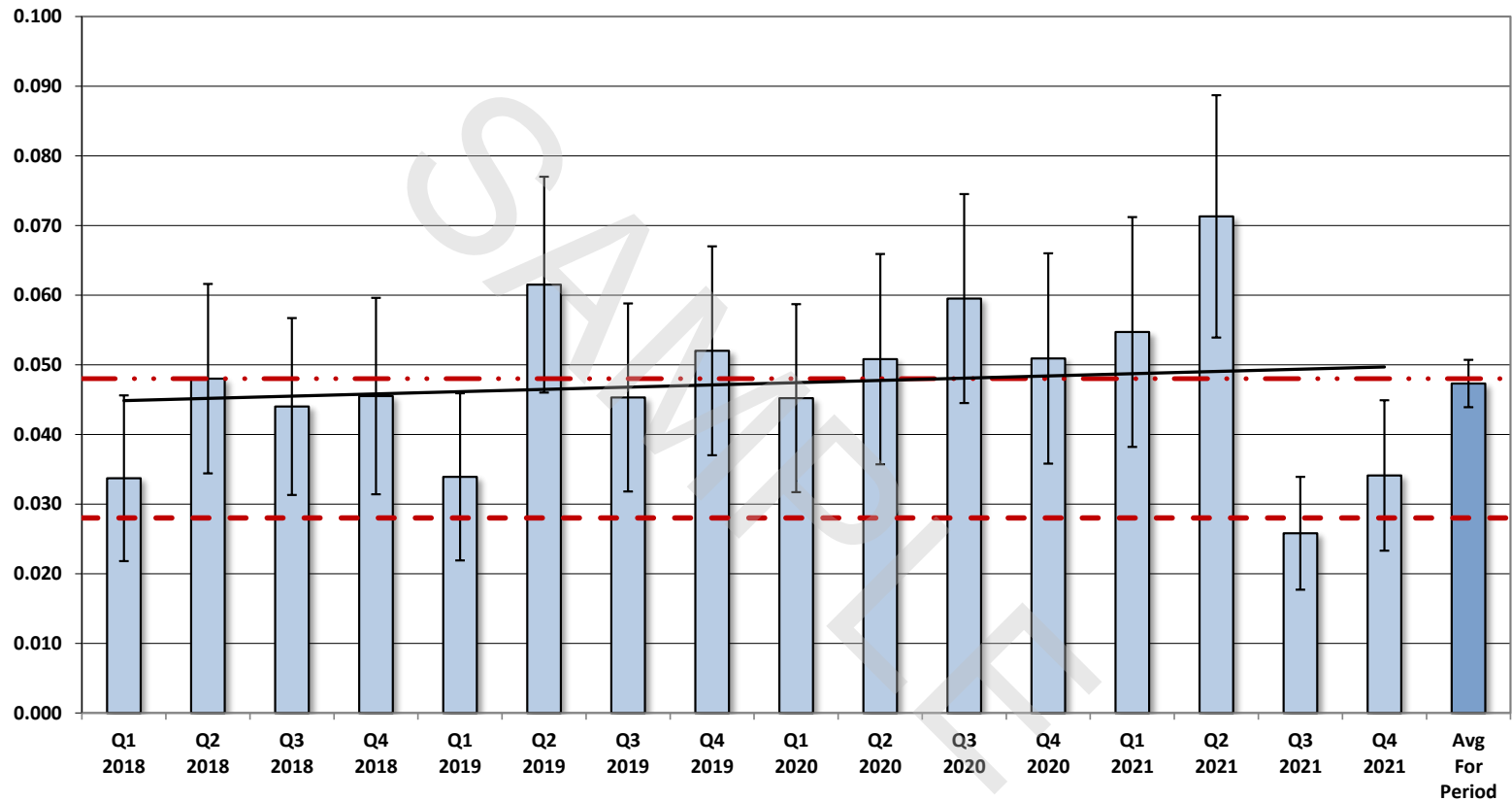


ADVERSE OUTCOME INDEX (AOI) REPORT

The Adverse Outcome Index (AOI):

(Number of Patients with an adverse event divided by the total number of deliveries)

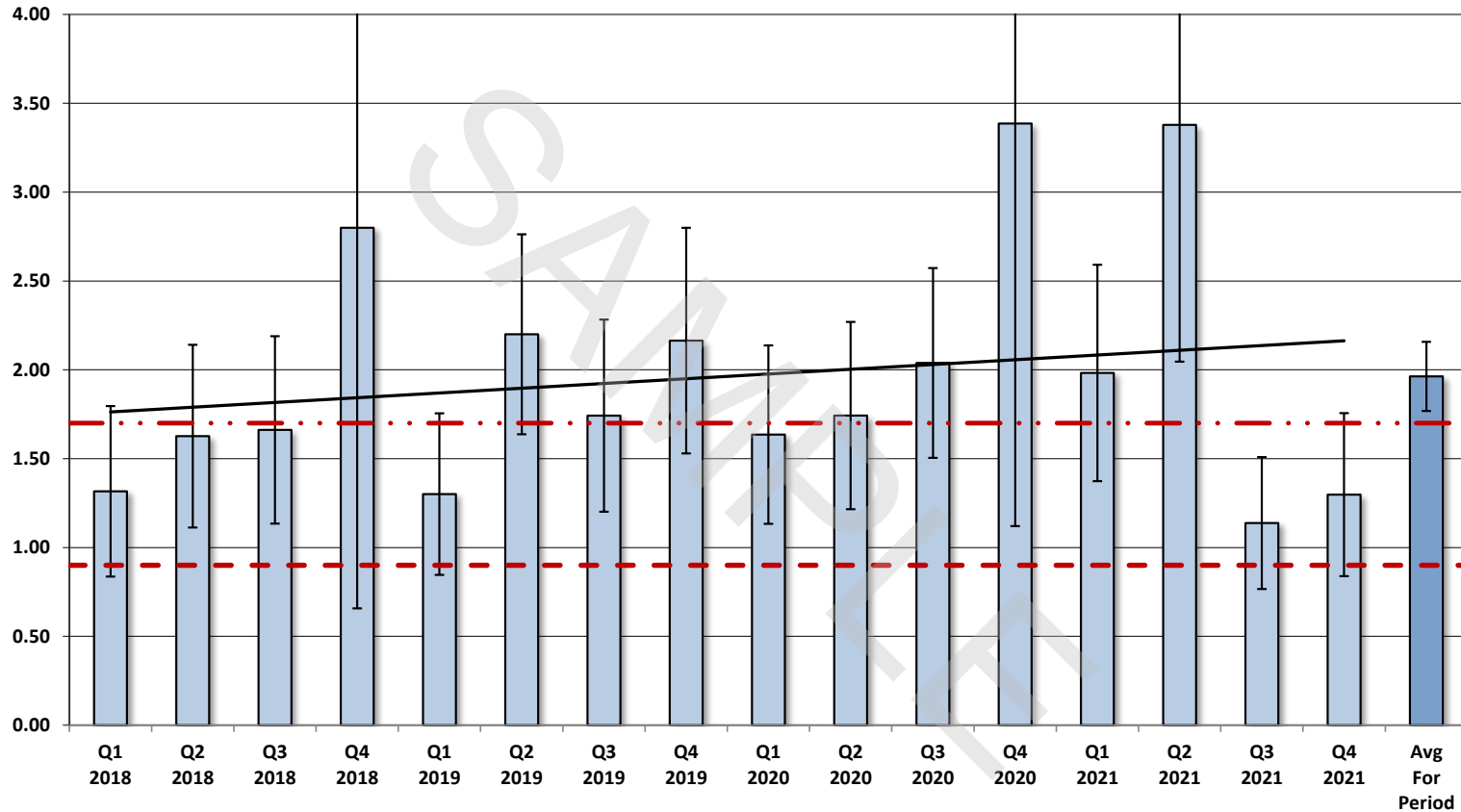
NPIC ID: SA1



ADVERSE OUTCOME INDEX (AOI) REPORT

The Weighted Adverse Outcome Score (WAOS):
(Total weights of all adverse events divided by the total number of deliveries)

NPIC ID: SA1



Quarterly Average
 Average for Period

Error Bars represent Margin of Error (90% Confidence Interval).

NPIC Comparison Rate (1.70)

Target Benchmark (0.90)

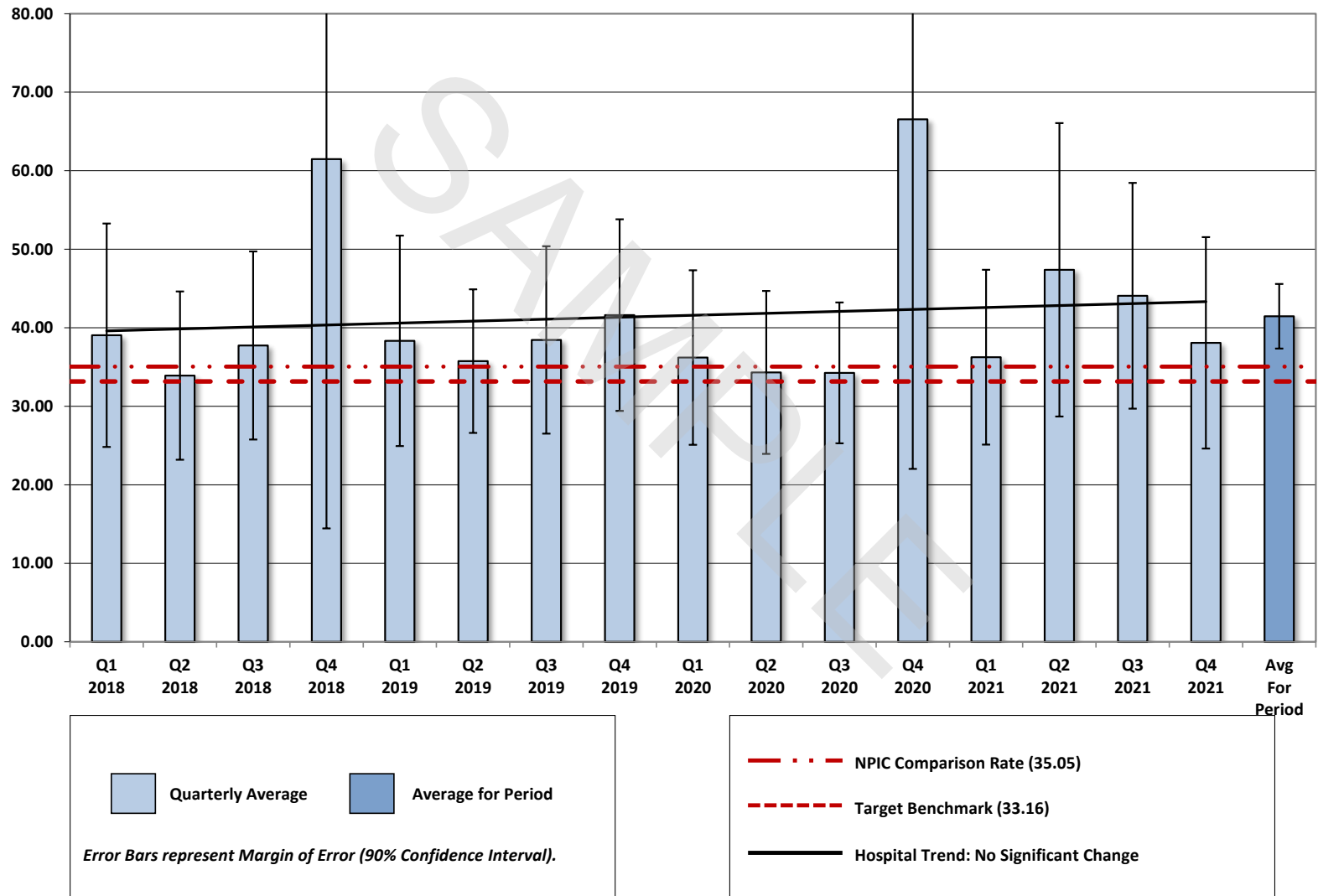
Hospital Trend: No Significant Change

ADVERSE OUTCOME INDEX (AOI) REPORT

The Severity Index (SI)

(Total weights of all adverse events divided by the total number of patients with an adverse event)

NPIC ID: SA1



Adverse Outcome Index (AOI) Algorithm (V4.0.1)

Definitions and ICD-10 Code Tables

The ICD-10 code tables used to determine each indicator count for the Adverse Outcome Index: [AOI Code Tables \(effective 10/01/2021\)](#)

Event Populations

Deliveries: Cases assigned to any of the following MS DRGs: 768, 796-798, 805-807, 783-788, or ≥ 981 with an ICD-10-PCS delivery code, and also assigned to any of the following APR-DRGs: 539-542, 560 (*Code Table M.1.1*)

Inborns: All neonates born in your hospital (*Code Table B.1.1*)

Event Definitions

In-hospital Maternal Death {Case Weight: 750}

Deliveries and discharge disposition = died

Exclusions: None

In-hospital Neonatal Death ≥ 2500 grams and ≥ 37 weeks Gestation² {Case Weight: 400}

Inclusions: Inborns with birthweight¹ ≥ 2500 grams and ≥ 37 weeks gestation² with discharge disposition of died **within 28 days of birth**

Exclusions: Cases with congenital anomalies and other disorders (*Code Table B.2.1*)

Uterine Rupture During Labor {Case Weight: 100}

Inclusions: Deliveries with diagnosis code O71.1 (rupture of uterus during labor) in the **primary, first** or **second diagnosis** code position only

Exclusions: None



Maternal Intensive Care {Case Weight: 65}

Inclusions: Deliveries with [AIM³ Severe Maternal Morbidity \(SMM\) diagnosis and/or procedure codes](#) (Code Table M.3.1) **OR** Deliveries with the NPIC Blood Transfusion Indicator = 1 on submitted file; **AND**

- with an ICU day or charge **OR**
- discharged to another hospital (UB04 disp=02)

Exclusions: Cases with placental disorders (Code Table M.3.1) or any AIM SMM diagnosis code(s) with Present on Admission (POA)⁴ indicator = Y

Birth Trauma {Case Weight: 60}

Inclusions: Inborns with birthweight¹ ≥ 2500 grams and ≥ 37 weeks gestation² with TJC PC-06⁵ severe birth trauma diagnosis codes (Code Table B.3.1)

Exclusions: Cases with osteogenesis imperfecta (Code Table B.3.1)

Unanticipated Operative Procedure {Case Weight: 40}

Inclusions: Deliveries with unanticipated operative procedure codes (Code Table M.4.1) in the **first** or **second procedure** field

Exclusions: Cases with placental disorders or cervical cancers; Also excludes hysterectomy cases with an ICU day or charge or discharged to another hospital (UB04 disp=02) (Code Table M.4.1)

Admission to NICU of Neonate Birthweight¹ ≥ 2500 grams and ≥ 37 weeks Gestational Age² (GA) for > 1 day {Case Weight: 35}

Inclusions: Inborns with birthweight¹ ≥ 2500 grams and ≥ 37 weeks gestation²; **AND**

- NICU admission within one day of birth for greater than one day; **OR**
- transferred to another hospital (UB04 disp=02 or =05) within one day of birth

Exclusions: Cases with congenital anomalies and other disorders (Code Table B.2.1) or neonatal drug/alcohol exposure (Code Table B.5.1)

APGAR 5 < 7 {Case Weight: 25}

Inclusions: Inborns with birthweight¹ ≥ 2500 grams and ≥ 37 weeks completed gestation²; APGAR 5 < 7

Exclusions: Cases with congenital anomalies and other disorders (Code Table B.2.1) or neonatal drug/alcohol exposure (Code Table B.5.1)

Maternal Blood Transfusion {Case Weight: 20}

Inclusions: Deliveries with [AIM Severe Maternal Morbidity \(SMM\) blood transfusion procedure codes](#) (Code Table M.5.1); OR

- additional select code for transfusion of non-blood products (Code Table M.5.1); OR
- NPIC Blood Transfusion Indicator = 1 on submitted file

Exclusions: Delivery cases that are included in the “Maternal Intensive Care” event (see definition above).

4th Degree Perineal Laceration {Case Weight: 5}

Inclusions: Deliveries with fourth degree perineal laceration diagnosis code (Code Table M.6.1)

Exclusions: Cases with shoulder dystocia (Code Table M.6.1)

¹ Birthweight is determined by numeric value or ICD-10-CM coding

² Gestational Age is determined by numeric value or ICD-10-CM coding. Cases missing gestational age information default to ≥ 37 weeks if birthweight is ≥ 2000 grams.

³ Alliance for Innovation on Maternal Health (AIM)

⁴ Present on Admission (POA) indicator Y = diagnosis was present at time of inpatient admission

⁵ [The Joint Commission PC-06 measure](#): Unexpected Complications in Term Newborns

APPENDIX:
Adverse Outcome Index (AOI) CY 2020 Comparison Group (n = 26)

| AOI OVERALL | | | |
|-------------|--------------|---------------|---------------------|
| | NPIC Rate | Range | Target Benchmark |
| AOI | 0.048 | 0.021 - 0.080 | 0.028 |
| WAOS | 1.70 | 0.71 - 2.96 | 0.90 |
| SI | 35.05 | 26.40 - 43.73 | 33.16 |

| Academic Breakdown | | | | | | | |
|--------------------|--------------|---------------|---------------------|-----------------------|--------------|---------------|---------------------|
| Academic (n = 16) | | | | Non-Academic (n = 10) | | | |
| | NPIC Rate | Range | Target Benchmark | | NPIC Rate | Range | Target Benchmark |
| AOI | 0.056 | 0.027 - 0.080 | 0.045 | AOI | 0.036 | 0.021 - 0.064 | 0.027 |
| WAOS | 1.98 | 0.71 - 2.96 | 1.25 | WAOS | 1.25 | 0.74 - 2.24 | 0.86 |
| SI | 35.00 | 26.40 - 43.73 | 28.05 | SI | 35.12 | 31.66 - 39.76 | 33.15 |

| Hospital Characteristics | | | | | |
|-----------------------------|--------------|---------|-----------------------|-------|---------|
| | Count | Percent | | Count | Percent |
| OB Level | | | Neonatal Level | | |
| Regional | 14 | 53.8% | Level IV | 9 | 34.6% |
| Level III | 5 | 19.2% | Level III | 12 | 46.2% |
| Level II | 5 | 19.2% | Level II | 5 | 19.2% |
| Level I | 2 | 7.7% | Level I | 0 | 0.0% |
| Birth Volume | | | Region | | |
| < 2001 | 6 | 23.1% | East North Central | 4 | 15.4% |
| 2001-3000 | 6 | 23.1% | East South Central | 2 | 7.7% |
| 3001-4000 | 6 | 23.1% | Mid Atlantic | 4 | 15.4% |
| 4001-5000 | 2 | 7.7% | New England | 5 | 19.2% |
| 5001-6000 | 1 | 3.8% | Pacific | 1 | 3.8% |
| 6001-7000 | 0 | 0.0% | South Atlantic | 7 | 26.9% |
| >7000 | 5 | 19.2% | West North Central | 3 | 11.5% |
| Average Birth Volume | 4,053 | | | | |