Adverse Outcome Index Quarterly Monitoring Report

NPIC ID: SA1   Q4 2015 – Q1 2019

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 communication⁴.

The introduction of ICD-10 coding in October 2015 required a review of the entire AOI algorithm. Each measure has been updated to ensure alignment with code changes, as well as quality improvement initiatives in Maternal Child Health, and feedback from the field regarding opportunities to make the AOI more responsive to variations in case mix across hospital populations.

NPIC worked extensively with Susan Mann, MD, one of the original AOI developers, to refine and update the algorithm to Version 4.0.1. This report reflects a quarterly monitoring period since the initiation of ICD-10 Coding.

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

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.)*

*Note: Due to the limitations of using an administrative data set (the mother and the baby data are not linked), we can only determine the number of patients with an adverse event, not the number of deliveries with an adverse event. This may result in an overstatement in the number of deliveries with adverse events if there are cases where a mother and linked baby each had events.*
II. DATA SUBMISSION AND DISCUSSION

Your AOI report covers the quarterly monitoring period 10/01/15 - 03/31/19 and reflects data files, containing 18,371 perinatal discharges, submitted to NPIC.

The source file for this quarter was submitted in the NPIC format for the above period. There were no problems noted with the data.

Note: some hospitals submit copies of state database files, in lieu of programming to our NPIC layout specifications. If a hospital does not include numeric gestational age in their data file, then gestational age is calculated for the inborns with missing information using the logic described in the Appendix at the end of this report.

Please take note of the following:

- The neonatal death, in Q1 2016, was reviewed by the Director of Women’s and Children’s Services and was removed from the indicator due to a congenital anomaly that was not originally coded on the record.
- The maternal death, in Q4 2018, was reviewed by the Director of Women’s and Children’s Services and remains in the indicator.
- There is variability in the “Admission to NICU of Neonate” metric. (i.e., the range is from 8 cases to 26 cases, with 17 cases currently in Q1 2019; the average is 14).

III. TABLE AND GRAPH DISPLAYS

Table 1: Displays a quarter-by-quarter count of cases by adverse event, along with the count of total deliveries, and the average counts for the quarterly monitoring period.

Table 2: Displays your hospital’s AOI, WAOS and SI quarterly rates, along with the average rates for the quarterly monitoring period, the NPIC comparative rate, and the target benchmark.

Note: The NPIC comparative rate reflects quarterly monitoring data from 22 NPIC member hospitals that have received AOI reports for the CY 2018 time period. The target benchmark reflects data from 6 of these 22 hospitals. These six hospitals were selected as part of the target benchmark group, because they were in the top performance quartile for the WAOS score.
Graphs 1 - 3: Show a graphic display of each index by quarter, as well as the average rate for your hospital for the quarterly monitoring period. Each data point includes a vertical error bar that represents the margin of error (90% confidence interval). The graph includes a horizontal dashed line that represents the target benchmark value and a dashed dotted line that represents the NPIC comparative rate. If the error bar crosses the horizontal lines representing the target benchmark and/or the NPIC comparative rate, the data point is not significantly different from the line value it crosses. If the error bar does not cross the horizontal lines, the data point is significantly different (higher or lower) than the target benchmark and/or the NPIC comparative rate. These graphs also include a trend line when there are four or more quarters of data, with the analysis of the trend noted in the box on the lower right of each of the three graphs.

IV. RESULTS OF THE ANALYSIS FOR YOUR HOSPITAL

The AOI reflects the overall rate of cases with an adverse event.

- Your quarterly monitoring average rate is lower than the NPIC comparative rate and higher than the target benchmark rate.
- This rate is significantly different from (higher than) the target benchmark.
- Your trend indicates no significant change.

The WAOS reflects the severity of adverse events relative to all deliveries.

- Your quarterly monitoring average rate is lower than the NPIC comparative rate and higher than the target benchmark rate.
- This rate is significantly different from (higher than) the target benchmark.
- Your trend indicates no significant change.

The SI reflects the severity of the events relative to all cases with an adverse event.

- Your quarterly monitoring average rate is higher than both the NPIC comparative rate and the target benchmark rate.
- This rate is significantly different from (higher than) the target benchmark.
- Your trend indicates no significant change.
This report reflects Version 4.0.1 of the AOI algorithm. The algorithm logic, and the specific codes associated with each type of adverse event, is available in the Appendix.

Note: These data represent one way to interpret the findings from your hospital. Each hospital must determine meaningful goals for their own institution.

Review of the counts of each measure (Table 1) will clarify the data that are contributing to your hospital’s AOI, WAOS and SI quarterly rates.

We strongly encourage case review to verify the accuracy of the AOI metrics and to identify 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 hospital’s NPIC Liaison, via email: mservices@npic.org

V. 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.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Deliveries</td>
<td>663</td>
<td>610</td>
<td>636</td>
<td>681</td>
<td>680</td>
<td>634</td>
<td>649</td>
<td>723</td>
<td>594</td>
<td>623</td>
<td>667</td>
<td>704</td>
<td>593</td>
<td>619</td>
<td>648</td>
</tr>
<tr>
<td>Total Inborns</td>
<td>675</td>
<td>625</td>
<td>665</td>
<td>700</td>
<td>698</td>
<td>648</td>
<td>659</td>
<td>737</td>
<td>617</td>
<td>623</td>
<td>682</td>
<td>701</td>
<td>612</td>
<td>653</td>
<td>664</td>
</tr>
<tr>
<td>In-hospital Maternal Death</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>In-hospital Neonatal Death, ≥ 2500 grams and ≥ 37 weeks gestation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Uterine Rupture During Labor</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Maternal Intensive Care</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Birth Trauma</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unanticipated Operative Procedure</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Admission to NICU, Neonate ≥ 2500 grams and ≥ 37 Weeks Gestation, for &gt; 1 day</td>
<td>13</td>
<td>9</td>
<td>11</td>
<td>16</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>26</td>
<td>22</td>
<td>10</td>
<td>19</td>
<td>16</td>
<td>11</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>APGAR 5 &lt; 7, Inborn Neonate, ≥ 2500 grams and ≥ 37 Weeks Gestation</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Maternal Blood Transfusion</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4th Degree Perineal Laceration</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total Adverse Events</td>
<td>39</td>
<td>24</td>
<td>28</td>
<td>31</td>
<td>19</td>
<td>17</td>
<td>18</td>
<td>44</td>
<td>28</td>
<td>23</td>
<td>32</td>
<td>33</td>
<td>28</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>Total Patients with one or more Adverse Events</td>
<td>37</td>
<td>22</td>
<td>25</td>
<td>27</td>
<td>17</td>
<td>15</td>
<td>17</td>
<td>35</td>
<td>26</td>
<td>21</td>
<td>31</td>
<td>31</td>
<td>26</td>
<td>21</td>
<td>25</td>
</tr>
</tbody>
</table>
## Table 2: Indices by Quarter

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Outcome Index (AOI)</td>
<td>0.056</td>
<td>0.036</td>
<td>0.039</td>
<td>0.040</td>
<td>0.025</td>
<td>0.024</td>
<td>0.026</td>
<td>0.048</td>
<td>0.044</td>
<td>0.034</td>
<td>0.044</td>
<td>0.044</td>
<td>0.034</td>
<td>0.039</td>
<td>0.041</td>
<td>0.029</td>
<td></td>
</tr>
<tr>
<td>Weighted Adverse Outcome Score (WAOS)</td>
<td>1.75</td>
<td>1.27</td>
<td>1.29</td>
<td>1.67</td>
<td>0.80</td>
<td>0.85</td>
<td>0.83</td>
<td>1.94</td>
<td>1.66</td>
<td>1.32</td>
<td>1.57</td>
<td>1.66</td>
<td>2.62</td>
<td>1.30</td>
<td>1.47</td>
<td>1.50</td>
<td>0.93</td>
</tr>
<tr>
<td>Severity Index (SI)</td>
<td>31.35</td>
<td>35.23</td>
<td>32.80</td>
<td>42.22</td>
<td>32.06</td>
<td>36.00</td>
<td>31.76</td>
<td>40.00</td>
<td>37.88</td>
<td>39.05</td>
<td>33.71</td>
<td>37.74</td>
<td>59.81</td>
<td>38.33</td>
<td>37.71</td>
<td>35.81</td>
<td>32.71</td>
</tr>
</tbody>
</table>

*NPIC Comparative Rate Range:
AOI: 0.025 - 0.076
WAOS:0.78 - 2.95
SI: 29.33 - 43.93

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
The Adverse Outcome Index (AOI):
(Number of Patients with an adverse event divided by the total number of deliveries)

NPIC ID: SA1

Error Bars represent Margin of Error (90% Confidence Interval).
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).*
The Severity Index (SI)
(Total weights of all adverse events divided by the total number of patients with an adverse event)

NPIC ID: SA1
APPENDIX: Adverse Outcome Index (AOI) Algorithm (V4.0.1)

The ICD-10 code tables used to determine each indicator count for the Adverse Outcome Index are available on the NPIC website.

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: 540-542, 560 (Appendix M.1.1)

**Inborns:** All neonates born in your hospital (Appendix 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 Gestation (Case Weight: 400)**
Inclusions: Inborns with birthweight³ ≥ 2500 grams and ≥ 37 weeks gestation³ with discharge disposition of died within 28 days of birth

**Exclusions:** Cases with congenital anomalies and other disorders (Appendix 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 AIM Severe Maternal Morbidity (SMM) diagnosis and/or procedure codes (Appendix 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 (Appendix M.3.1) or any AIM SMM diagnosis code(s) with Present on Admission (POA) indicator = Y

Birth Trauma {Case Weight: 60}

Inclusions: Inborns with birthweight ≥ 2500 grams and ≥ 37 weeks gestation with TJC PC-06 severe birth trauma diagnosis codes (Appendix B.3.1)

Exclusions: Cases with osteogenesis imperfecta (Appendix B.3.1)

Unanticipated Operative Procedure {Case Weight: 40}

Inclusions: Deliveries with unanticipated operative procedure codes (Appendix 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) (Appendix M.4.1)

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

Inclusions: Inborns with birthweight ≥ 2500 grams and ≥ 37 weeks gestation; 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 (Appendix B.2.1) or neonatal drug/alcohol exposure (Appendix B.5.1)

APGAR 5 < 7 {Case Weight: 25}

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

Exclusions: Cases with congenital anomalies and other disorders (Appendix B.2.1) or neonatal drug/alcohol exposure (Appendix B.5.1)
Maternal Blood Transfusion {Case Weight: 20}

**Inclusions:** Deliveries with AIM Severe Maternal Morbidity (SMM) blood transfusion procedure codes *(Appendix M.5.1)*; OR
- additional select code for transfusion of non-blood products *(Appendix 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 *(Appendix M.6.1)*

**Exclusions:** Cases with shoulder dystocia *(Appendix 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