

V.14.3 Special Report: Severe Maternal Morbidity

I. Background

This **V14.3 Special Report: Severe Maternal Morbidity** profiles the rate of severe maternal morbidity (SMM) as introduced by Callaghan, et. al, in November 2012¹. Callaghan and his colleagues identified twenty-five severe morbidity indicators based on ICD-9-CM diagnostic codes associated with higher in-hospital mortality. Through a rigorous analysis of 12 years (1998-2009) of administrative data contained in the National Inpatient Sample² they found 493,397 women with severe maternal morbidity out of 49,346,974 delivery hospitalizations over the twelve year period. Most disturbing was that, when reporting rates per 10,000 delivery hospitalization in two year intervals, significant increases were found in 12 of the 25 morbidities and overall they found a 75% increase in delivered mothers with at least one morbidity in 2008/2009 compared to 1998/1999. While there was no significant difference in in-hospital maternal mortality, the most dramatic increase in morbidity rates were for coded shock (+100.7%), blood transfusion (+183.2%), and acute renal failure (+97.3%). Callaghan found the overall rate of delivery hospitalizations coded with at least one SMM to be 129.08 per 10,000 or 1.29% with rates of blood transfusions being the largest contributor (96.38 per 10,000 or .96 %).

The dramatic increase in severe maternal morbidity alarmed many providers and patient safety experts and in 2014 Dr. Mary D'Alton and her colleagues called for the launch of The National Partnership for Maternal Safety³. The Partnership is a collaboration of more than twenty-five associate organizations that are developing a broad-based initiative to reduce maternal death and morbidity through the use of three safety bundles: obstetric hemorrhage, severe hypertension in pregnancy, and peripartum venous thromboembolism. The Partnership is using two major criteria to define SMM:

- Transfusion of 4 or more units of blood (packed cells or whole blood)
- Admission to an intensive care unit or area of close observation

In late 2014, The Council for Patient Safety in Women's Health Care, made up of representatives from the 25 associate Partnership members, received a grant from US Department of Health and Human Services/Maternal Child Health Bureau (MCHB) to organize the Alliance for Innovation in Maternal Health (AIM) to reduce maternal mortality by 1,000 and SMM by 100,000 instances over the next four years. AIM will be looking at hospital specific data on the above criteria as well as population based data using the Callaghan et al. definitions.

II. Description of Tables and Graphs

The tables and graphs in this special report provide clinical data for population based measures of severe maternal morbidity using the 25 indicators profiled in the Callaghan article. The data period displayed is **10/01/2013-09/30/2014**. Due to the low incidence of these events, we elected not to display hospital specific data but to divide hospitals into **academic and non-academic categories** compared to the overall NPIC/QAS database average.

We have run case lists for each hospital having one or more cases coded with a morbidity; please email mervices@npic.org if you would like a list for your hospital.

Table 1: Rate of Morbidity by Type

Table 1 displays the **average** number of deliveries for each of the three categories of members hospitals profiled in this report: academic, non-academic and all. The **average** count and **average** rate of cases with at least one morbidity is also included. Below the solid line, the Table details the average rate for each of the twenty-five types of morbidities by hospital category. As with the Callaghan findings, the rate of blood transfusion accounts for the largest impact on the overall rate.

Table 2: Comparisons of NPIC/QAS Member Trend Data to Callaghan data

Table 2 illustrates the comparison between each set of data presented within the Callaghan article (1998-1999 and 2008-2009) and NPIC/QAS data. NPIC/QAS data are provided, using the CY2013 Trend Database (n=59 hospitals), displaying 2009 and 2013 for the NPIC/QAS Trend Database as a whole then subdivided by Academic and Non-Academic Hospitals. The rate of deliveries with at least one morbidity per year is included, as are the data for the most frequently occurring morbidities.

Questions regarding this analysis should be directed to Sandra Boyle, Director of Data Services (sboyle@npic.org) or Janet Muri, President (jmuri@npic.org) at 401-274-0650.

REFERENCES

1. Callaghan, W.M., Creanga, A.A., Kuklina, E.V. Severe Maternal Morbidity Among Delivery and Postpartum Hospitalization in the United States. *Obstetrics and Gynecology* 2012; 120:5. 1029-1036.
2. www.hcup-us.ahrq.gov/nisoverview.jsp
3. D'Alton, M.E., Main, E.K., Menard, M.K., Levy, B.S. The National Partnership for Maternal Safety, *Obstetrics and Gynecology*, 2014, May; 123 (50:973-7).

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Table 1: Rate by type of morbidity - All Deliveries

	Academic Hospitals (n = 46)	Non-academic Hospitals (n = 39)	Database Average *
Average Deliveries	4,664	3,094	3,936
Average Deliveries coded with one or more morbidities	144	53	101
Rate of Deliveries coded with one or more morbidities	3.5%	1.7%	2.7%
Rate by type of morbidity: Delivered cases			
Renal Failure	0.18%	0.05%	0.12%
Cardiac arrest or ventricular fibrillation	0.01%	0.01%	0.01%
Heart Failure during procedure or surgery	0.23%	0.15%	0.19%
Shock	0.08%	0.06%	0.07%
Sepsis	0.06%	0.03%	0.05%
Disseminated intravascular coagulation	0.43%	0.23%	0.34%
Amniotic fluid embolism	0.00%	0.00%	0.00%
Thrombotic embolism	0.03%	0.02%	0.03%
Puerperal cerebrovascular disorders	0.06%	0.02%	0.04%
Severe anesthesia complications	0.02%	0.02%	0.02%
Pulmonary edema	0.02%	0.01%	0.01%
Adult respiratory distress syndrome	0.12%	0.09%	0.10%
Acute myocardial infarction	0.01%	0.01%	0.01%
Eclampsia	0.06%	0.05%	0.06%
Blood transfusion	2.34%	1.07%	1.75%
Ventilation	0.19%	0.07%	0.13%
Hysterectomy	0.15%	0.07%	0.11%
Sickle cell anemia with crisis	0.03%	0.01%	0.02%
Intracranial injuries	0.00%	0.00%	0.00%
Internal injuries of thorax, abdomen & pelvis	0.01%	0.00%	0.01%
Aneurysm	0.00%	0.00%	0.00%
Operations on heart and pericardium	0.16%	0.11%	0.14%
Cardio monitoring	0.00%	0.00%	0.00%
Temporary tracheostomy	0.00%	0.00%	0.00%
Conversion of cardiac rhythm	0.01%	0.01%	0.01%
In hospital mortality rate	0.01%	0.01%	0.01%

*Excludes 1 hospital that only provides pediatric services.

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Table 2: NPIC/QAS Trend Data Compared to Callaghan et al. Data

	Callaghan		NPIC/QAS Trend Database *			
	1998 - 1999	2008 - 2009	Database CY 2009	Database CY 2013	Academic Hospitals CY 2013	Non-Academic Hospitals CY 2013
Rate of delivery hospitalization with at least one morbidity per year (rate per 10,000)	74	129	198	225	166	58
Rate of most frequently occurring morbidities						
Blood transfusions	34	96	112	143	103	40
Disseminated intravascular coagulation	9	12	31	35	26	9
Heart failure during procedure or surgery	11	10	24	18	14	4
Operations on heart and pericardium	3	5	11	11	8	2
Ventilation	5	6	8	8	6	2
Hysterectomy	7	9	11	14	11	3
Renal failure	2	5	11	13	11	2

* V14.3 NPIC/QAS Trend Database, CY 2009 - CY 2013, n = 59 (38 Academic; 21 Non-Academic). Excludes 1 hospital that only provides pediatric services.

III. Glossary

Comorbidity	ICD 9 Code (s)
Renal Failure	584, 669.3
Cardiac arrest or ventricular fibrillation	427.41, 427.42, 427.5
Heart Failure during procedure or surgery	669.4x, 997.1
Shock	669.1, 785.5x, 995.0, 995.4, 998.0
Sepsis	038.0-038.9, 995.91, 995.92
Disseminated intravascular coagulation	286.6, 286.9, 666.3
Amniotic fluid embolism	673.1
Thrombotic embolism	415.1x, 673.0, 673.2, 673.3, 673.8
Puerperal cerebrovascular disorders	430, 431, 432.x, 433.x, 434.x, 436, 437.x, 671.5, 674.0, 997.2, 999.2
Severe anesthesia complications	668.0, 668.1, 668.2
Pulmonary edema	428.1, 518.4
Adult respiratory distress syndrome	518.5, 518.81, 518.82, 518.84, 799.1
Acute myocardial infarction	410.xx
Eclampsia	642.6x
Blood transfusion	99.00-99.09
Ventilation	93.90, 96.01-96.05, 96.7x
Hysterectomy	68.3-68.9
Sickle cell anemia with crisis	282.62, 282.64, 282.69
Intracranial injuries	800.xx, 801.xx, 803.xx, 804.xx, 851.xx-854.xx
Internal injuries of thorax, abdomen & pelvis	860.xx-869.xx
Aneurysm	441.x
Operations on heart and pericardium	35.xx, 36.xx, 37.xx, 39.xx
Cardio monitoring	89.6x
Temporary tracheostomy	31.1
Conversion of cardiac rhythm	99.6x