

V10.4 Special Report: Maternal Hemorrhage

I. Literature Overview of Topic

Maternal mortality is a global concern and led to the establishment of the United Nations Millennium Goal # 5 to improve maternal health by reducing maternal mortality rates by 75% by 2015. (United Nations, 2000¹). Obstetric complications, including hemorrhage, contribute to a significant number of maternal deaths. Postpartum hemorrhage (PPH) is the most common cause of obstetric hemorrhage and accounts for 30% of all maternal deaths (Kahn, Wojdyla, Say, Gulmezoglu & Van Look, 2006²). While most of the deaths occur in developing countries, a review of trends in postpartum hemorrhage in selected developed countries by the International Postpartum Hemorrhage Collaborative Group revealed an increase in PPH in Australia, Canada, the UK, and the USA with increasing rates of severe adverse outcomes (Knight et al, 2009³).

While postpartum hemorrhage leads to a significant maternal mortality rate, any episode of hemorrhage during the antenatal period is cause of concern for maternal/fetal well-being. Causes of hemorrhage in the antepartum setting include ectopic pregnancy, complications of abortion, placenta previa, abruption of the placenta, and placenta accreta, increta or percreta. Preeclampsia, eclampsia, placental abruption and retention of a dead fetus can cause disseminated intravascular clotting (DIC), resulting in severe hemorrhaging (Miller, Lester & Hensleigh, 2004⁴). In a study by Jilani, Shaikh, Siddiqui and Siddiqui (2010⁵), repeated cesarean sections, maternal age and high parity were identified as risk factors for development of placenta previa. Placenta previa is one of the leading causes of vaginal bleeding in the last two trimesters. Ongoing monitoring of hemorrhage risk/incidence is essential given the trend of increasing cesarean section rates, increased maternal age for pregnancy and multiple pregnancies associated with assisted reproductive technologies. A study by Gargano et al (2010⁶) concluded that multiple clinical and subclinical placental hemorrhages are associated with preterm delivery. An important factor to note is that increased Body Mass Index (BMI) has been linked as a risk factor for hemorrhage (Robinson, O'Connell, Joseph & McLeod, 2005⁷). Given the rising obesity rates in the US population, this risk factor may likely increase.

Labor induction may increase overall labor time and possibly increase the potential for PPH. (Knight et al, 2010⁸). The most common cause of PPH is uterine atony. Additional causes of hemorrhage in the postpartum period include abnormal placentation, birth trauma, uterine rupture, retained placental tissue and coagulation abnormalities (Burtelow, Riley, Druzin, Fontaine, Viele & Goodnough, 2007⁹). In 2007 the World Health Organization set up guidelines to help prevent PPH. Active management of the third stage of labor was seen as a key component in the guidelines in helping to decrease incidence of PPH. The need for emergency obstetrical response teams to massive hemorrhage were identified in the report. Burtelow et al (2007¹⁰) describe the implementation of a massive transfusion protocol for labor and delivery at their institution and discuss successful management of three cases.

Postpartum hemorrhage is defined in the US as vaginal bleeding in excess of 500mL after vaginal delivery and in excess of 1000 mL after cesarean delivery (Knight, 2010¹¹). The accuracy in blood loss estimates is frequently discussed and often seen as underestimated by obstetricians (Maslovitz, Barkai,

Lessing, Ziv & Many, 2008¹²). These researchers conducted a prospective study using simulation to improve accuracy of postpartum blood loss estimates. Fifty obstetrical teams participated with eight in the intervention group. Participants identified the main method of estimating blood loss was instinct followed by estimates by team members and assessment of hemodynamic status. Non-intervention groups underestimated blood loss by 49% while the intervention group underestimated by 32%. The study suggested that during care of a hemorrhaging patient, estimating blood loss at periodic intervals may improve accuracy. A study by James et al (2008¹³) found a diagnosis of anemia in hospitalized women with obstetrical bleeding was associated with a 9- fold increase in blood transfusions, longer length of stay and a 50% higher average total cost per hospital day.

In summary, the need to monitor antepartum and postpartum hemorrhage is essential in order to identify trends in occurrence and risk factors and determine effectiveness of treatment. Adequate management of hemorrhage during childbearing will improve outcomes in maternal mortality and morbidity and improve the goal of delivering a healthy, full term infant.

II. Description of the Tables and Graphs

The **V10.4 Special Report: Maternal Hemorrhage** provides you with an analysis of antepartum and postpartum hemorrhage. The tables in the analysis display calendar year 2010 data for your hospital compared to the NPIC/QAS subgroup and database averages.

Table 1: Coded Maternal Hemorrhage displays total deliveries and the count of numerator/denominator cases and rates with upper and lower confidence intervals, for total deliveries with hemorrhage codes on the NPIC/QAS data submission. Deliveries coded with maternal hemorrhage are also subdivided into **Antepartum hemorrhage** and **Postpartum hemorrhage**.

Antepartum hemorrhage includes the following codes: **(641.0x)** placenta previa without hemorrhage, **(641.1x)** hemorrhage from placenta previa, **(641.2x)** premature separation of placenta, **(641.3x)** antepartum hemorrhage associated with coagulation defects, **(641.8x)** other antepartum hemorrhage, and **(641.9x)** unspecified antepartum hemorrhage. **Postpartum hemorrhage** includes codes **(666.0x)** third stage hemorrhage, **(666.1x)** other immediate postpartum hemorrhage, **(666.2x)** delayed and secondary postpartum hemorrhage, and procedure code **(39.98)** control of hemorrhage, not otherwise specified. The table displays the count of cases for each code as a percent of the total cases in the category (antepartum or postpartum hemorrhage).

Table 2: Coded Maternal Hemorrhage by Type of Transfusion displays blood transfusions for deliveries with antepartum or postpartum hemorrhage by type of transfusion. *Please note, NPIC/QAS identifies patients with blood transfusions by the presence of procedure code (99.0x), transfusion of blood and blood components, on the data submission file. It is our understanding that use of the transfusion codes is considered "optional" and therefore not all hospitals use the transfusion codes. For hospitals that choose not to code blood transfusions, the NPIC/QAS data submission format contains a "Blood Transfusion Indicator" field that can be used to flag patients with transfusions; transfusion data can also be submitted on a supplemental file.*

In each hemorrhage category the table displays the count of numerator/denominator cases and rates with upper and lower confidence intervals for the following types of coded transfusion: **(99.03)** other transfusion of whole blood, **(99.04)** transfusion of packed cells, **(99.05)** transfusion of platelets, **(99.06)** transfusion of coagulation factors, **(99.08)** transfusion of blood expander, and all other transfusion codes (includes **(99.00)** perioperative autologous transfusion of whole blood or blood components, **(99.01)** exchange transfusion, **(99.02)** transfusion of previous collected autologous blood, **(99.07)** transfusion of other serum, **(99.09)** transfusion of other substance). A separate row displays cases *only* identified by the transfusion indicator flag. The table also displays the count of cases for each type of transfusion as a percent of the total cases in the category (antepartum or postpartum hemorrhage) and the total cases transfused for both categories combined.

Table 3: Maternal Outcomes/Complications displays the average length of stay (ALOS) and percent of cases with a length of stay greater than five days by type of delivery as well as the rates of delivery complications/outcomes by hemorrhage category: anemia (**648.2x, 285.1x**), hysterectomy (**68.3-7, 68.9**), D&C (**69.02**), renal failure (**669.3x**), respiratory failure (**518.5, 518.81, 518.82, 799.1**), coagulopathy (**286.9, 666.3x-postpartum only**), sepsis (**670.2x, 995.91, 995.92**), mechanical ventilation > 4 days (**96.72**), maternal mortality(during delivery admission) and discharge status other than home/home under home health or died. The Table includes the count of numerator/denominator cases and rates with upper and lower confidence intervals for your hospital compared to your subgroup average and the database average.

Graph 1: Antepartum Hemorrhage Rate and Graph 2: Postpartum Hemorrhage Rate displays the rate of antepartum or postpartum hemorrhage as a percent of total deliveries for your hospital and the hospitals in your subgroup. The graphs also display the upper and lower confidence intervals for each hospital, the subgroup average, and the database average.

Graph 3: Antepartum Hemorrhage Trend: 2006-2010 and Graph 4: Postpartum Hemorrhage Trend: 2006-2010 displays your hospital's antepartum and postpartum hemorrhage rates for 2006-2010 compared to the NPIC/QAS Trend Database, a subgroup of 50 member hospitals that have participated in the NPIC/QAS database for the same 5 year period. Below each graph is a table which includes all the data displayed for the trend analysis period; the trend database average; the hospital rate with upper and lower confidence intervals and the hospital's count of the numerator and denominator cases for each year. The graphs also display the percent change in the rate for your hospital and the trend database average rate for the trend period. The trendlines indicate whether there is a significant upward or downward trend in the rate, or if it is stable over time.

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III. References

- ¹ United Nations. (2000). Millennium Goals. Retrieved from <http://www.un.org/millenniumgoals>
- ² Khan, K.S., Wojdyla, D., Say, L., Gulmezoglu, A.M. & Van Look, PFA. (2006). WHO analysis of causes of maternal death: a systematic review. *The Lancet*, 367, 1066-1074
- ³ Knight, M., Callaghan, W., Berg, C., Alexander, S., Bouvier-Colle, M., Ford, J.,... Walker, J. (2009). Trends in postpartum hemorrhage in high resource countries: a review and recommendations from the International Postpartum Hemorrhage Collaborative Group. *BMC Pregnancy and Childbirth*, 9:55. Retrieved from <http://www.biomedcentral.com/1471-2393/9/55>
- ⁴ Miller, S., Lester, H. & Hensleigh, P. (2004). Prevention and treatment of postpartum hemorrhage: new advances for low-resource settings. *Journal of Midwifery & Women's Health*, 49(4), 283-92.
- ⁵ Jillani, K., Shaikh, F., Siddiqui, S. & Siddiqui, M. (2010). Repeated cesarean sections: A risk factor for rising rate of placenta previa. *Gynaecology and Obstetrics*, 16(3), 409-412.
- ⁶ Gargano, J., Holzman, C., Senagore, P., Reuss, M.L., Pathak, D., Williams, M. & Fisher, R. (2010, March). Evidence of placental hemorrhage and preterm delivery. *BJOG*, 117(4), 445-455. doi:10.1111/j.1471-0528.2009.02472.x
- ⁷ Robinson, H.E., O'Connell, C.M., Joseph, K.S. & McLeod, N.L. (2005) Maternal outcomes in pregnancies complicated by obesity. *Obstetrics and Gynecology*, 106(6), 1357-1364
- ⁸ Ibid. Knight, M.
- ⁹ Burtelow, M., Riley, E., Druzin, M., Fontaine, M., Viele, M & Goodnough, L. (2007, September). How we treat: management of life-threatening primary postpartum hemorrhage with a standardized massive transfusion protocol. *Transfusion*, 47, 1564-1572.
- ¹⁰ Ibid. Burtelow, M.
- ¹¹ Ibid. Knight, M.
- ¹² Maslovitz, S., Barkai, G., Lessing, J., Ziv, A. & Many, A. (2008) Improved accuracy of postpartum blood loss estimation as assessed by simulation. *Acta Obstetrica et Gynecologica*, 87, 929-934.
- ¹³ James, A., Patel, S., Watson, W., Zaidi, Q., Mangione, A. & Goss, T. (2008). An assessment of medical resource utilization and hospitalization cost associated with a diagnosis of anemia in women with obstetrical bleeding in the United States. *Journal of Women's Health*, 17(8), 1279-1284.

**V10.4 Special Hemorrhage Analysis
Table 1: Coded Maternal Hemorrhage**

NPIC ID: SAMPLE	Numerator	Denominator	Hospital	LCI	UCI	Subgroup Average	Database Average
Total Deliveries			2,853			4,117	4,379
Total Deliveries with Coded Hemorrhage	198	2,853	6.9%	6.0%	7.9%	6.1%	5.5%
Antepartum hemorrhage, abruptio placentae, and placenta previa (641.xx)							
641.0x - Placenta previa without hemorrhage	4	77	5.2%	1.4%	12.8%	17.3%	17.8%
641.1x - Hemorrhage from placenta previa	11	77	14.3%	7.4%	24.1%	15.5%	16.0%
641.2x - Premature separation of placenta	57	77	74.0%	62.8%	83.4%	58.4%	55.6%
641.3x - Antepartum hemorrhage associated with coagulation defects	0	77	0.0%	0.0%	3.8%	0.3%	0.2%
641.8x - Other antepartum hemorrhage	3	77	3.9%	0.8%	11.0%	3.0%	2.8%
641.9x - Unspecified antepartum hemorrhage	4	77	5.2%	1.4%	12.8%	8.7%	10.3%
Subtotal Antepartum Hemorrhage Codes	79	77	102.6%	102.6%	101.3%	103.2%	102.7%
Postpartum Hemorrhage (666.0x - 666.2x or procedure code 39.98)							
666.0x - Third-stage hemorrhage	15	128	11.7%	6.7%	18.6%	8.8%	10.5%
666.1x - Other immediate postpartum hemorrhage	101	128	78.9%	70.8%	85.6%	83.8%	81.5%
666.2x - Delayed and secondary postpartum hemorrhage	11	128	8.6%	4.4%	14.9%	8.1%	8.4%
39.98 - Hemorrhage control NOS	1	128	0.8%	0.0%	4.3%	1.0%	0.9%
Subtotal Postpartum Hemorrhage Codes	128	128	100.0%	97.7%	100.0%	101.7%	101.3%

V10.4 Special Hemorrhage Analysis
Table 2: Coded Maternal Hemorrhage by Type of Coded Transfusion

NPIC ID: SAMPLE	Numerator	Denominator	Hospital	LCI	UCI	Subgroup Average	Database Average
Antepartum hemorrhage, abruptio placentae, and placenta previa (641.xx)	77	2,853	2.7%	2.1%	3.4%	2.6%	2.2%
99.03 Other transfusion of whole blood	0	77	0.0%	0.0%	3.8%	0.0%	0.1%
99.04 Transfusion of packed cells	8	77	10.4%	4.6%	19.4%	9.8%	10.3%
99.05 Transfusion of platelets	0	77	0.0%	0.0%	3.8%	1.0%	0.8%
99.06 Transfusion of coagulation factors	0	77	0.0%	0.0%	3.8%	0.1%	0.1%
99.08 Transfusion of blood expander	0	77	0.0%	0.0%	3.8%	0.0%	0.0%
All other Transfusion codes*	0	77	0.0%	0.0%	3.8%	0.0%	0.3%
Blood transfusion indicator only (excludes cases with blood transfusion codes)	0	77	0.0%	0.0%	3.8%	5.6%	1.4%
Subtotal Transfusion Codes	8	77	10.4%	4.6%	19.4%	10.8%	11.5%
Subtotal Cases Transfused (includes coded and flagged transfusion cases)	8	77	10.4%	4.6%	19.4%	10.8%	11.0%
Postpartum Hemorrhage (666.0x-666.2x or procedure code 39.98)	128	2,853	4.5%	3.8%	5.3%	3.8%	3.5%
99.03 Other transfusion of whole blood	0	128	0.0%	0.0%	2.3%	0.3%	0.2%
99.04 Transfusion of packed cells	19	128	14.8%	9.2%	22.2%	15.7%	17.3%
99.05 Transfusion of platelets	0	128	0.0%	0.0%	2.3%	0.8%	0.7%
99.06 Transfusion of coagulation factors	0	128	0.0%	0.0%	2.3%	0.0%	0.1%
99.08 Transfusion of blood expander	0	128	0.0%	0.0%	2.3%	0.0%	0.0%
All other Transfusion codes*	2	128	1.6%	0.2%	5.5%	0.2%	0.1%
Blood transfusion indicator only (excludes cases with blood transfusion codes)	0	128	0.0%	0.0%	2.3%	5.7%	1.4%
Subtotal Transfusion Codes	21	128	16.4%	10.5%	24.0%	17.0%	18.4%
Subtotal Cases Transfused (includes coded and flagged transfusion cases)	21	128	16.4%	10.5%	24.0%	16.5%	17.8%
Total Transfusion Codes	29	198	14.6%	10.0%	20.4%	11.9%	12.9%
Total Cases Transfused (includes cases with antepartum and/or postpartum hemorrhage codes as well as flagged cases)	25	198	12.6%	8.3%	18.1%	11.3%	11.5%

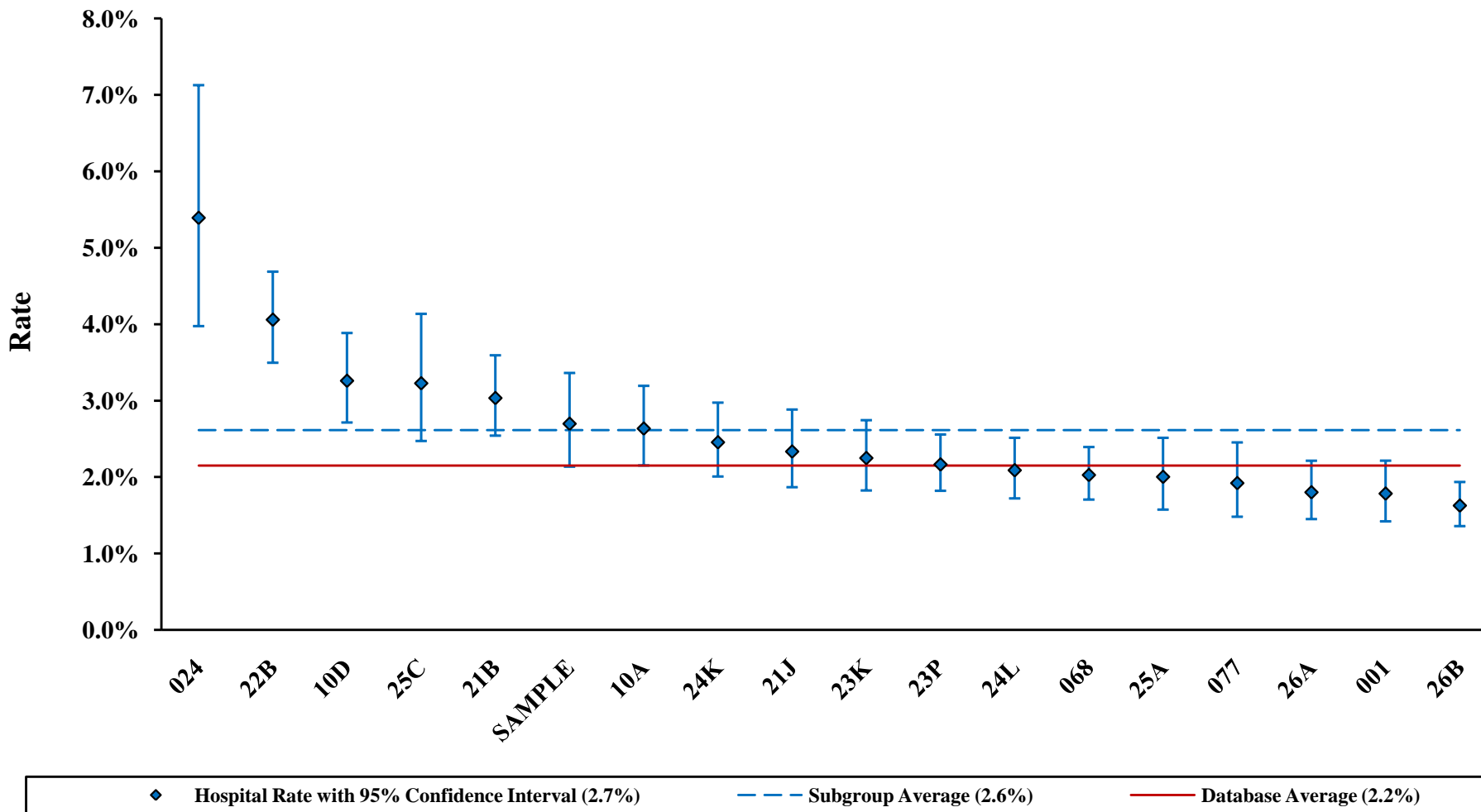
V10.4 Special Hemorrhage Analysis
Table 3: Other Maternal Outcomes/Complications

NPIC ID: SAMPLE	Numerator	Denominator	Hospital	LCI	UCI	Subgroup Average	Database Average
Antepartum hemorrhage, abruptio placentae, and placenta previa (641.xx)	77	2,853	2.7%	2.1%	3.4%	2.6%	2.2%
Vaginal Deliveries	35	77	45.5%	34.1%	57.2%	39.0%	32.6%
ALOS			5.9			4.5	3.8
% with LOS > 5 days	4	77	5.2%	1.4%	12.8%	5.4%	3.4%
C-section Deliveries	42	77	54.5%	42.8%	65.9%	61.0%	67.4%
ALOS			11.8			7.8	6.7
% with LOS > 5 days	17	77	22.1%	13.4%	33.0%	18.8%	15.6%
Selected Complications (ranked by Database Average in descending order)							
Anemia (648.2x, 285.1x)	13	77	16.9%	9.3%	27.1%	22.2%	23.5%
Hysterectomy (68.3-7, 68.9)	2	77	2.6%	0.3%	9.1%	4.1%	2.4%
D & C (69.02)	1	77	1.3%	0.0%	7.0%	0.6%	0.6%
Respiratory failure (518.5, 518.81, 518.82, 799.1)	0	77	0.0%	0.0%	3.8%	0.7%	0.6%
Discharge disposition other than home/home under home health/died	0	77	0.0%	0.0%	3.8%	0.4%	0.4%
Coagulopathy (286.9)	0	77	0.0%	0.0%	3.8%	0.3%	0.2%
Renal failure (669.3x)	0	77	0.0%	0.0%	3.8%	0.3%	0.2%
Sepsis (670.2x, 995.91, 995.92)	0	77	0.0%	0.0%	3.8%	0.1%	0.2%
Mechanical ventilation > 4 days (96.72)	0	77	0.0%	0.0%	3.8%	0.0%	0.1%
Maternal mortality (during delivery admission)	0	77	0.0%	0.0%	3.8%	0.0%	0.0%
Subtotal selected complications	16	77					
Subtotal cases with selected complications	14	77	18.2%	10.3%	28.6%	25.1%	25.6%

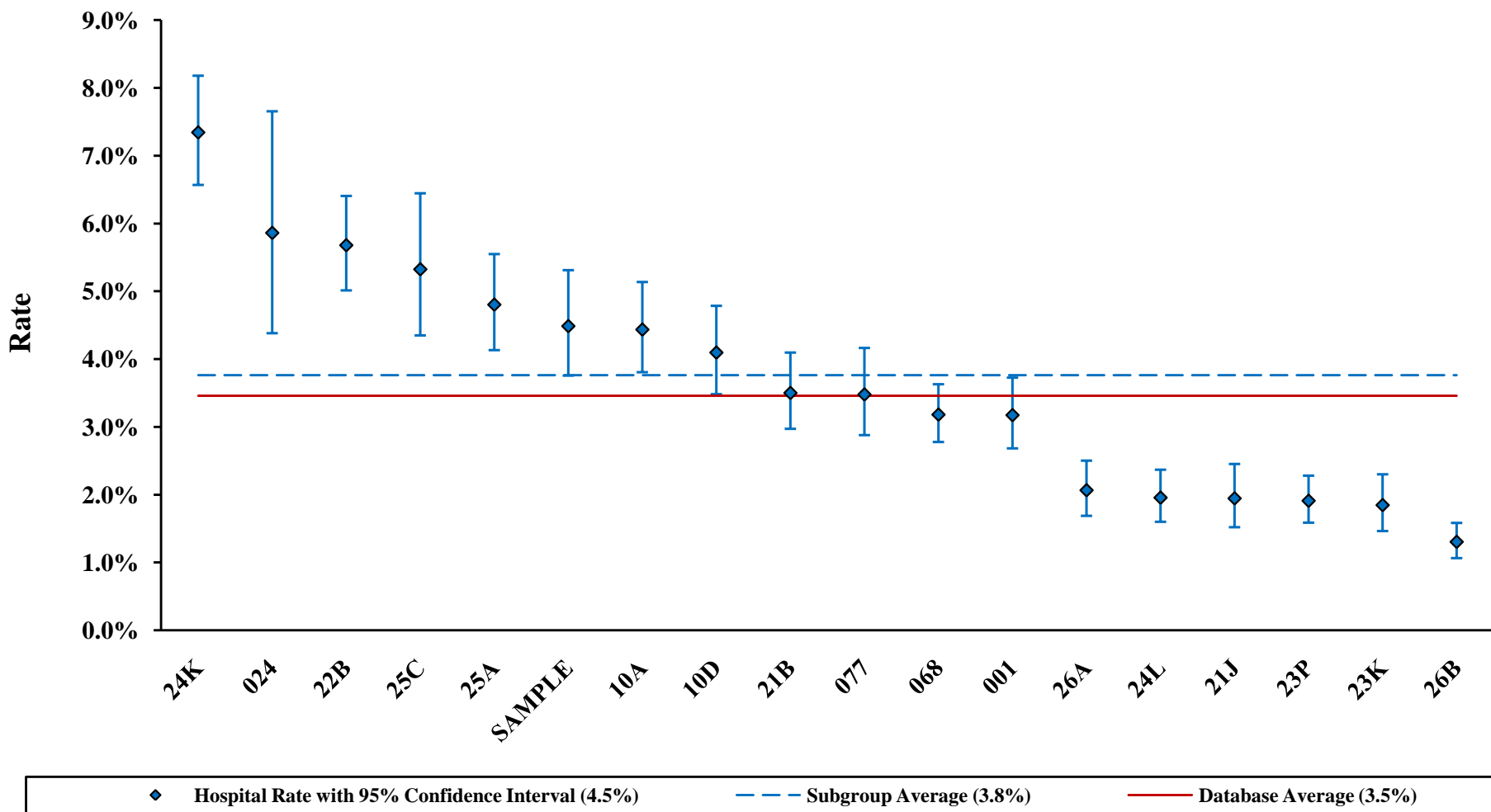
V10.4 Special Hemorrhage Analysis
Table 3: Other Maternal Outcomes/Complications

NPIC ID: SAMPLE	Numerator	Denominator	Hospital	LCI	UCI	Subgroup Average	Database Average
Postpartum Hemorrhage (666.0x-666.2x or procedure code 39.98)	128	2,853	4.5%	3.8%	5.3%	3.8%	3.5%
Vaginal Deliveries	96	128	75.0%	66.6%	82.2%	72.8%	72.7%
ALOS			2.9			2.9	2.9
% with LOS > 5 days	5	128	3.9%	1.3%	8.9%	3.3%	2.9%
C-section Deliveries	32	128	25.0%	17.8%	33.4%	27.2%	27.3%
ALOS			5.6			5.4	5.1
% with LOS > 5 days	9	128	7.0%	3.3%	12.9%	5.8%	4.4%
Selected Complications (ranked by Database Average in descending order)							
Anemia (648.2x, 285.1x)	30	128	23.4%	16.4%	31.7%	34.3%	34.2%
D & C (69.02)	8	128	6.3%	2.7%	11.9%	4.3%	6.3%
Hysterectomy (68.3-7, 68.9)	6	128	4.7%	1.7%	9.9%	3.2%	2.5%
Coagulopathy (666.3x, 286.9)	2	128	1.6%	0.2%	5.5%	2.2%	1.8%
Respiratory failure (518.5, 518.81, 518.82, 799.1)	0	128	0.0%	0.0%	2.3%	0.6%	0.5%
Discharge disposition other than home/home under home health/died	0	128	0.0%	0.0%	2.3%	0.4%	0.3%
Renal failure (669.3x)	0	128	0.0%	0.0%	2.3%	0.4%	0.2%
Sepsis (670.2x, 995.91, 995.92)	0	128	0.0%	0.0%	2.3%	0.2%	0.2%
Maternal mortality (during delivery admission)	0	128	0.0%	0.0%	2.3%	0.0%	0.0%
Mechanical ventilation > 4 days (96.72)	0	128	0.0%	0.0%	2.3%	0.0%	0.0%
Subtotal selected complications	46	128					
Subtotal cases with selected complications	39	128	30.5%	22.6%	39.2%	38.8%	39.0%
Total selected complications	62	198					
Total cases with selected complications	47	198	23.7%	18.0%	30.3%	31.7%	32.3%

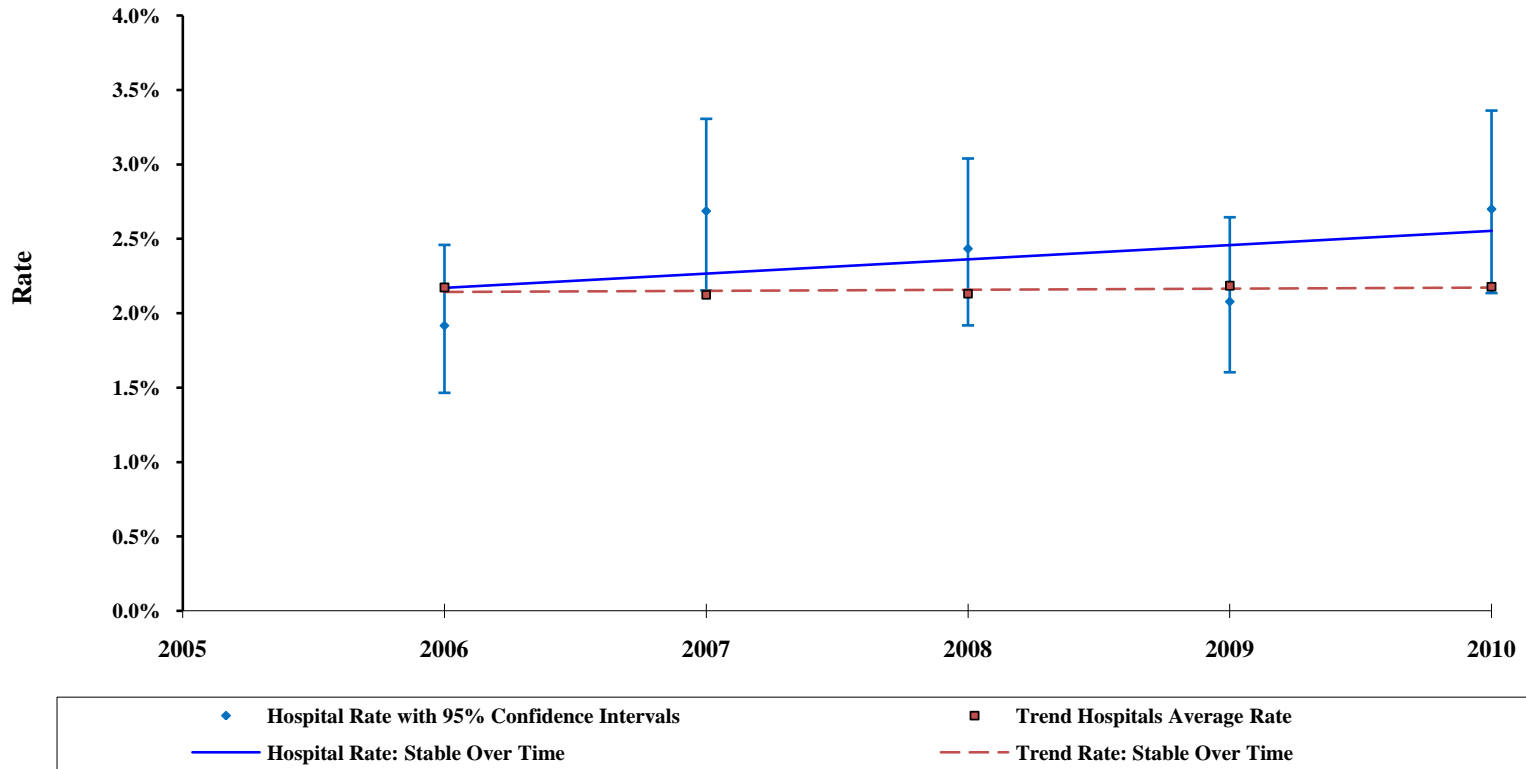
Graph 1: Antepartum Hemorrhage Rate
NPIC ID: SAMPLE



Graph 2: Postpartum Hemorrhage Rate
NPIC ID: SAMPLE

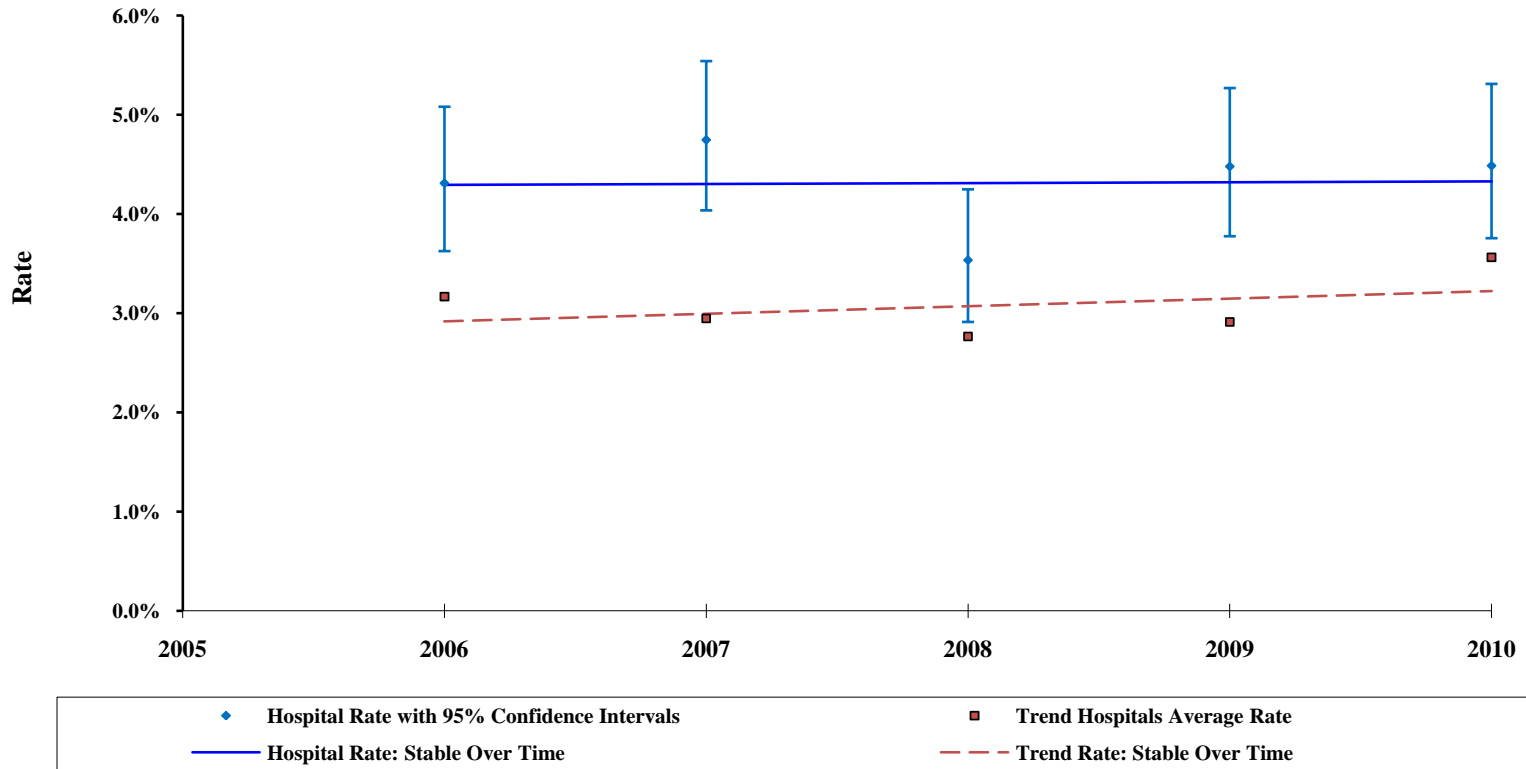


Graph 3: Antepartum Hemorrhage Analysis 2006-2010 with Trendlines
NPIC ID: SAMPLE



	2006	2007	2008	2009	2010	Pct Change 06 - 10
Trend Rate	2.2%	2.1%	2.1%	2.2%	2.2%	0.2%
Hospital Rate	1.9%	2.7%	2.4%	2.1%	2.7%	40.9%
Hospital Numerator	60	86	75	64	77	
Hospital Denominator	3132	3202	3083	3081	2853	
Lower CI	1.5%	2.2%	1.9%	1.6%	2.1%	
Upper CI	2.5%	3.3%	3.0%	2.6%	3.4%	

Graph 4: Postpartum Hemorrhage Analysis 2006-2010 with Trendlines
NPIC ID: SAMPLE



	2006	2007	2008	2009	2010	Pct Change 06 - 10
Trend Rate	3.2%	2.9%	2.8%	2.9%	3.6%	12.5%
Hospital Rate	4.3%	4.7%	3.5%	4.5%	4.5%	4.1%
Hospital Numerator	135	152	109	138	128	
Hospital Denominator	3132	3202	3083	3081	2853	
Lower CI	3.6%	4.0%	2.9%	3.8%	3.8%	
Upper CI	5.1%	5.5%	4.2%	5.3%	5.3%	