

Appendix 1.

Institutions involved in the Consortium include, in alphabetical order: Baystate Medical Center, Springfield, MA; Cedars-Sinai Medical Center Burnes Allen Research Center, Los Angeles, CA; Christiana Care Health System, Newark, DE; Georgetown University Hospital , MedStar Health, Washington, DC; Indiana University Clarian Health, Indianapolis, IN; Intermountain Healthcare and the University of Utah, Salt Lake City, Utah; Maimonides Medical Center, Brooklyn, NY; MetroHealth Medical Center, Cleveland, OH.; Summa Health System, Akron City Hospital, Akron, OH; The EMMES Corporation, Rockville MD (Data Coordinating Center); University of Illinois at Chicago, Chicago, IL; University of Miami, Miami, FL; and University of Texas Health Science Center at Houston, Houston, Texas.

Appendix 2. Characteristics Overall and by EBL			
Characteristic	Overall N=228,438	EBL N=152,279	
		EBL ≥1,000 mL	EBL <1,000 mL
		N=7,279	N=145,000
Mode of delivery, overall			
Vaginal	162,448 (71.1)	654 (8.9)	108,218 (74.6)
Cesarean	65,990 (28.8)	6,625 (91.0)	36,782 (25.3)
Mode of delivery, by subtype			
Vaginal	146,073 (63.9)	558 (7.6)	97,381 (67.1)
Operative	10,698 (4.6)	71 (0.9)	6,600 (4.5)
Vaginal birth after cesarean	5,677 (2.4)	25 (0.3)	4,237 (2.9)
Primary cesarean	39,577 (17.3)	4,303 (59.1)	22,011 (15.1)
Repeat cesarean	26,413 (11.5)	2,322 (31.9)	14,771 (10.1)
Socio-demographic variables			
Age, mean (SD), years	27.6 (6.19)	29.2 (6.60)	27.5 (6.29)
Age, median (IQR), years	29 (24, 30)	30 (25, 35)	27 (23, 32)
Missing n (%)	323 (0.1%)	3 (0.1%)	272 (0.1%)
Race			
White	113,224 (51.7)	3,078 (44.4)	69,410 (49.9)
Black	51,392 (23.5)	2,347 (33.8)	37,131 (26.7)
Latina	39,716 (18.1)	1,048 (15.1)	22,522 (16.2)
Asian	9,345 (4.3)	316 (4.5)	6,876 (4.9)
Other	5,400 (2.5)	142 (2.0)	2,953 (2.1)
Missing n (%)	9,361 (4.0)	119 (4.4)	6337 (4.2)
Region			
West	68,712 (30.0)	803 (11.0)	37,109 (25.5)
Midwest	34,683 (15.1)	1,824 (25.0)	30,793 (21.2)
South	69,268 (30.3)	2,822 (38.7)	44,080 (30.4)
Northeast	55,775 (24.4)	1,830 (25.1)	33,018 (22.7)
Missing n (%)	0 (--)	0 (--)	0 (--)
Academic hospital	130,205 (57.0)	3,591 (49.3)	72,987 (50.3)
Missing n (%)	0 (--)	0 (--)	0 (--)
Delivery year			
2002	7,357 (3.2)	455 (6.2)	6,385 (4.4)
2003	9,649 (4.2)	590 (8.1)	8,613 (5.9)
2004	15,576 (6.8)	755 (10.3)	13,331 (9.2)
2005	63,680 (32.0)	1,814 (24.9)	37,056 (25.5)
2006	73,154 (32.0)	2,071 (28.4)	43,625 (30.0)
2007	58,671 (25.6)	1,575 (21.6)	35,670 (24.6)
2008	292 (0.1)	3 (0.1)	278 (0.1)

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Missing n (%)	59 (0)	0 (–)	44 (0.0)
Pre-pregnancy body mass index (BMI)			
Mean (SD), kg/m ²	25.4 (6.25)	29.0 (8.55)	25.4 (6.28)
Median (IQR), kg/m ²	23.9 (21.0, 28.2)	26.8 (22.5, 33.6)	23.8 (21.0, 28.2)
Missing n (%)	76,818 (33.6)	1,257 (46.5)	59,110 (39.5)
Pre-pregnancy weight			
Mean (SD), kg	68.0 (17.6)	77.4 (24.4)	67.8 (17.6)
Median (IQR), kg	63.5 (56.2, 75.8)	70.7 (58.9, 90.2)	63.5 (55.8, 75.7)
Missing n (%)	67,294 (29.4)	1,239 (45.8)	57,721 (38.5)
Admission weight			
Mean (SD), kg	82.5 (17.9)	92.2 (23.7)	82.3 (17.8)
Median (IQR), kg	79.3 (70.0, 91.1)	87.9 (75.0, 104.3)	78.9 (69.9, 91.1)
Missing n (%)	35,984 (15.7)	624 (23.0)	30,212 (20.1)
Tobacco use	15,247 (6.6)	499 (6.8)	9,889 (6.8)
Missing n (%)	0 (–)	0 (–)	0 (–)
Illicit drug use	4,725 (2.0)	220 (3.1)	3,337 (2.4)
Missing n (%)	22,544 (9.8%)	84 (3.1)	6,526 (4.3)
Maternal comorbidities			
Pre-gestational diabetes	5,305 (2.3)	495 (6.8)	3,747 (2.5)
Missing n (%)	0 (–)	0 (–)	0 (–)
Gestational diabetes	11,999 (5.2)	700 (9.6)	7,223 (4.9)
Missing n (%)	0 (–)	0 (–)	0 (–)
Chronic hypertension	7,690 (3.3)	467 (6.4)	4,073 (2.8)
Missing n (%)	0 (–)	0 (–)	0 (–)
Gestational hypertension	6,286 (2.7)	257 (3.5)	3,589 (2.4)
Missing n (%)	0 (–)	0 (–)	0 (–)
Heart disease	3,481 (1.5)	176 (2.4)	2,170 (1.5)
Missing n (%)	0 (–)	0 (–)	0 (–)
Thyroid disease	5,583 (2.5)	232 (3.2)	3,301 (2.3)
Missing n (%)	7,878 (3.4)	84 (3.1)	6,526 (4.3)
Renal disease	1,856 (0.8)	98 (1.3)	1,574 (1.0)
Missing n (%)	0 (–)	0 (–)	0 (–)
Asthma	17,490 (7.6)	775 (10.6)	11,996 (8.2)
Missing n (%)	0 (–)	0 (–)	0 (–)
Anemia diagnosis	23,057 (10.4)	1,900 (26.9)	16,157 (11.6)
Missing n (%)	7,877 (3.4)	84 (3.1)	6,526 (4.3)
Depression	9,850 (4.3)	494 (6.7)	6,956 (4.8)
Missing n (%)	0 (–)	0 (–)	0 (–)
Gastrointestinal disease	2,592 (1.1)	95 (1.3)	1,342 (0.9)
Missing n (%)	0 (–)	0 (–)	0 (–)
Active seizure disorder	210 (0.1)	21 (0.3)	160 (0.1)
Missing n (%)	24,679 (10.8)	122 (4.5)	6,214 (4.1)
History of seizure disorder	1,528 (0.7)	99 (1.4)	1,077 (0.7)
Missing n (%)	22,544 (9.8)	84 (3.1)	6,526 (4.3)
Obstetrical characteristics			
Parity			
Mean (SD)	1.1 (1.36)	1.1 (1.38)	1.1 (1.37)
Median (IQR)	1 (0, 2)	1 (0, 2)	1 (0, 2)
Missing n (%)	0 (–)	0 (–)	0 (–)
Assisted reproductive technology	1,101 (0.9)	123 (2.8)	607 (0.8)

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	Missing n (%)	107,479 (47.0)	1,216 (44.9)	72,745 (48.6)
Multiple gestation				
Twins		4,840 (2.1)	768 (10.5)	2,670 (1.8)
Higher order		213 (0.0)	69 (0.9)	87 (0.0)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Breech presentation		11,647 (5.1)	1,170 (16.0)	5,923 (4.0)
	Missing n (%)	0 (--)	0 (--)	0 (--)
History of prior preterm birth		17,017 (7.6)	788 (10.8)	11,811 (8.1)
	Missing n (%)	5,436 (2.3)	1 (--)	131 (0.1)
Polyhydramnios		885 (0.4)	82 (1.2)	509 (0.3)
	Missing n (%)	14,169 (6.2)	356 (13.1)	13,022 (8.7)
Macrosomia		1,858 (1.5)	222 (3.2)	1,191 (1.5)
	Missing n (%)	102,247 (44.7)	153 (5.6)	70,424 (47.0)
Pregnancy complications				
Prior cesarean delivery		31,321 (14.5)	2,270 (31.8)	18,403 (13.2)
	Missing n (%)	13,219 (5.7)	66 (2.4)	5,638 (3.7)
Mild preeclampsia		7,457 (3.2)	483 (6.6)	5,127 (3.5)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Severe preeclampsia		3,772 (1.6)	278 (3.8)	2,363 (1.6)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Superimposed preeclampsia		1,971 (0.8)	151 (2.0)	1,064 (0.7)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Eclampsia		326 (0.1)	21 (0.3)	219 (0.1)
	Missing n (%)	15,614 (6.8)	316 (11.6)	13,328 (8.9)
Fetal death		1,145 (0.5)	69 (0.9)	436 (0.3)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Group B streptococcus colonization		40,207 (17.6)	1,236 (16.9)	27,736 (19.1)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Intrapartum magnesium sulfate		8,763 (4.3)	708 (10.0)	6,648 (4.8)
	Missing n (%)	26,136 (11.4)	84 (3.1)	6,526 (4.3)
Placental abruption		3,794 (1.6)	431 (5.9)	2,316 (1.6)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Fetal growth restriction		2,678 (1.2)	105 (1.6)	1,719 (1.3)
	Missing n (%)	15,626 (6.8)	318 (11.7)	13,334 (8.9)
Large for gestational age, antepartum diagnosis		2,031 (1.4)	203 (3.5)	1,127 (1.1)
	Missing n (%)	84,338 (36.9)	627 (23.2)	50,937 (34.0)
Antenatal steroids		5,945 (4.0)	388 (9.5)	3,447 (3.7)
	Missing n (%)	82,507 (36.1)	1,104 (40.8)	56,141 (37.5)
Antepartum bleeding in third trimester		3,088 (1.7)	213 (3.9)	2,192 (2.1)
	Missing n (%)	49,410 (21.6)	767 (28.3)	45,372 (30.3)
Placenta previa		1,647 (0.7)	357 (4.9)	738 (0.5)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Placenta accreta		138 (0.0)	69 (1.2)	51 (0.0)
	Missing n (%)	82,335 (36.0)	767 (28.3)	45,372 (30.3)
Threatened preterm birth antepartum		7,880 (3.4)	366 (5.0)	4,367 (3.0)
	Missing n (%)	0 (--)	0 (--)	0 (--)
Antepartum hospital admission		17,500 (7.6)	429 (13.2)	8,620 (11.3)
	Missing n (%)	84,603 (37.0)	1,378 (50.9)	71,627 (47.8)
Gestational age at delivery, weeks				

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Mean (SD)	38.2 (2.47)	37.2 (3.50)	38.2 (2.43)
Median (IQR)	39 (38, 40)	38 (36, 39)	39 (38, 40)
Missing n (%)	0 (--)	0 (--)	0 (--)
Characteristics on L&D admission			
Temperature (F)			
Mean (SD)	98.0 (0.81)	98.1 (0.89)	98.0 (0.80)
Missing n (%)	47,977 (21.0)	682 (25.2)	30,097 (20.1)
Systolic blood pressure			
Mean (SD)	124.1 (14.89)	125.6 (16.81)	123.9 (14.73)
Missing n (%)	52,766 (23.0)	618 (22.8)	34,530 (23.0)
Diastolic blood pressure			
Mean (SD)	74.3 (11.6)	74.0 (13.07)	74.1 (11.76)
Missing n (%)		617 (22.8)	34,549 (23.0)
Trial of labor	192,074 (84.0)	3,684 (50.6)	124,529 (85.9)
Missing n (%)	0 (--)	0 (--)	0 (--)
Spontaneous labor	122,673 (53.7)	2,412 (33.1)	80,749 (55.6)
Missing n (%)	0 (--)	0 (--)	0 (--)
Premature rupture of membranes	16,219 (7.1)	620 (8.5)	11,768 (8.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Chorioamnionitis on admission	1,527 (1.0)	157 (2.6)	886 (0.9)
Missing n (%)	83,009 (36.3)	515 (19.0)	50,343 (33.6)

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Appendix 3. Characteristics Overall and by Time Period			
Characteristic	Overall N=228,438	Comparison between two time periods (2002-2006 vs. 2007-2008) for temporal validation N=152,232*	
		2002-2006 N=114,695	2007-2008 N=37,537
Estimated blood loss (EBL)			
EBL ≥1,000 mL	--	5,685 (5.0)	1,589 (4.2)
EBL <1,000 mL		109,010 (95.0)	35,948 (95.8)
Mode of delivery, overall			
Vaginal	162,448 (71.1)	81,892 (71.5)	26,851 (71.5)
Cesarean	65,990 (28.8)	32,713 (28.5)	10,686 (28.5)
Mode of delivery, by subtype			
Vaginal	146,073 (63.9)	73,848 (64.4)	24,055 (64.1)
Operative	10,698 (4.6)	4,944 (4.3)	1,726 (4.6)
Vaginal birth after cesarean	5,677 (2.4)	3,190 (2.8)	1,070 (2.9)
Primary cesarean	39,577 (17.3)	20,028 (17.5)	6,282 (16.7)
Repeat cesarean	26,413 (11.5)	12,685 (11.1)	4,404 (11.7)
Socio-demographic variables			
Age, mean (SD), years	27.6 (6.19)	27.6 (6.33)	27.5 (6.28)
Age, median (IQR), years	29 (24, 30)	27 (23, 32)	27 (23, 32)
Missing n (%)	323 (0.1)	233 (0.2)	41 (0.1)
Race			
White	113,224 (51.7)	53,670 (48.9)	18,806 (52.1)
Black	51,392 (23.5)	29,914 (27.3)	9,541 (26.4)
Latina	39,716 (18.1)	18,382 (16.8)	5,187 (14.4)
Asian	9,345 (4.3)	5,325 (4.9)	1,865 (5.2)
Other	5,400 (2.5)	2,414 (2.2)	680 (1.9)
Missing n (%)	9,361 (4.0)	4,990 (4.4)	1,458 (3.9)
Region			
West	68,712 (30.0)	26,590 (23.2)	11,322 (30.2)
Midwest	34,683 (15.1)	23,044 (20.1)	9,571 (25.5)
South	69,268 (30.3)	36,870 (32.2)	9,987 (26.6)
Northeast	55,775 (24.4)	28,191 (24.6)	6,657 (17.7)
Missing n (%)	0 (--)	0 (--)	0 (--)
Academic hospital	130,205 (57.0)	57,584 (50.2)	18,959 (50.5)
Missing n (%)	0 (--)	0 (--)	0 (--)
Pre-pregnancy body mass index (BMI)			
Mean (SD), kg/m ²	25.4 (6.25)	25.5 (6.42)	25.6 (6.45)
Median (IQR), kg/m ²	23.9 (21.0, 28.2)	23.9 (21.0, 28.3)	23.9 (21.1, 28.5)
Missing n (%)	76,818 (33.6)	46,979 (40.9)	13,357 (35.6)
Pre-pregnancy weight			
Mean (SD), kg	68.0 (17.6)	68.2 (18.0)	68.3 (18.1)
Median (IQR), kg	63.5 (56.2, 75.8)	63.5 (56.2, 76.6)	63.5 (56.2, 77.0)
Missing n (%)	67,294 (29.4)	45,881 (40.0)	13,049 (34.7)

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Admission weight			
Mean (SD), kg	82.5 (17.9)	82.8 (18.3)	82.7 (18.2)
Median (IQR), kg	79.3 (70.0, 91.1)	79.4 (70.0, 91.6)	79.4 (69.9, 91.6)
Missing n (%)	35,984 (15.7)	22,256 (19.4)	8,566 (22.8)
Tobacco use	15,247 (6.6)	7,751 (6.8)	2,637 (7.0)
Missing n (%)	0 (--)	0 (--)	0 (--)
Illicit drug use	4,725 (2.0)	2,698 (2.4)	858 (2.3)
Missing n (%)	22,544 (9.8)	4,864 (4.2)	1,746 (4.7)
Maternal comorbidities			
Pre-gestational diabetes	5,305 (2.3)	3,410 (3.0)	832 (2.2)
Missing n (%)	0 (--)	0 (--)	0 (--)
Gestational diabetes	11,999 (5.2)	6,044 (5.3)	1,877 (5.0)
Missing n (%)	0 (--)	0 (--)	0 (--)
Chronic hypertension	7,690 (3.3)	3,366 (2.9)	1,173 (3.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Gestational hypertension	6,286 (2.7)	2,964 (2.6)	881 (2.4)
Missing n (%)	0 (--)	0 (--)	0 (--)
Heart disease	3,481 (1.5)	1,785 (1.6)	561 (1.5)
Missing n (%)	0 (--)	0 (--)	0 (--)
Thyroid disease	5,583 (2.5)	2,637 (2.4)	896 (2.5)
Missing n (%)	7,878 (3.4)	4,864 (4.2)	1,746 (4.7)
Renal disease	1,856 (0.8)	1,259 (1.1)	413 (1.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Asthma	17,490 (7.6)	9,729 (8.5)	3,041 (8.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Anemia diagnosis	23,057 (10.4)	12,938 (11.3)	5,114 (13.6)
Missing n (%)	7,877 (3.4)	4,864 (4.2)	1,746 (4.6)
Depression	9,850 (4.3)	5,225 (4.6)	2,224 (5.9)
Missing n (%)	0 (--)	0 (--)	0 (--)
Gastrointestinal disease	2,592 (1.1)	1,031 (0.9)	406 (1.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Active seizure disorder	210 (0.1)	144 (0.1)	37 (0.1)
Missing n (%)	24,679 (10.8)	2,677 (2.3)	3,659 (9.8)
History of seizure disorder	1,528 (0.7)	889 (0.8)	287 (0.8)
Missing n (%)	22,544 (9.8)	4,864 (4.2)	1,746 (4.7)
Obstetrical characteristics			
Parity			
Mean (SD)	1.1 (1.36)	1.1 (1.37)	1.2 (1.37)
Median (IQR)	1 (0, 2)	1 (0, 2)	1 (0, 2)
Missing n (%)	0 (--)	0 (--)	0 (--)
Assisted reproductive technology	1,101 (0.9)	547 (0.5)	183 (0.5)
Missing n (%)	107,479 (47.0)	55,449 (48.3)	18,512 (49.3)
Multiple gestation			
Twins	4,840 (2.1)	2,650 (2.3)	782 (2.1)
Higher order	213 (0.0)	131 (0.1)	25 (0.1)
Missing n (%)	0 (--)	0 (--)	0 (--)
Breech presentation	11,647 (5.1)	6,123 (5.3)	1,863 (5.0)
Missing n (%)	0 (--)	0 (--)	0 (--)
History of prior preterm birth	17,017 (7.6)	9,416 (8.2)	3,181 (8.5)
Missing n (%)	5,436 (2.3)	83 (0.1)	49 (0.1)

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Polyhydramnios	885 (0.4)	468 (0.4)	123 (0.3)
Missing n (%)	14,169 (6.2)	7,560 (6.6)	5,818 (15.5)
Macrosomia	1,858 (1.5)	1,069 (0.9)	344 (0.9)
Missing n (%)	102,247 (44.7)	53,835 (46.9)	16,713 (44.5)
Pregnancy complications			
Prior cesarean delivery	31,321 (14.5)	15,441 (13.5)	5,226 (13.9)
Missing n (%)	13,219 (5.7)	3,613 (3.2)	2,083 (5.6)
Mild preeclampsia	7,457 (3.2)	4,237 (3.7)	1,371 (3.7)
Missing n (%)	0 (--)	0 (--)	0 (--)
Severe preeclampsia	3,772 (1.6)	1,909 (1.7)	731 (2.0)
Missing n (%)	0 (--)	0 (--)	0 (--)
Superimposed preeclampsia	1,971 (0.8)	912 (0.8)	302 (0.8)
Missing n (%)	0 (--)	0 (--)	0 (--)
Eclampsia	326 (0.1)	183 (0.2)	57 (0.2)
Missing n (%)	15,614 (6.8)	9,741 (8.5)	3,903 (10.4)
Fetal death	1,145 (0.5)	559 (0.5)	168 (0.5)
Missing n (%)	0 (--)	0 (--)	0 (--)
Group B streptococcus colonization	40,207 (17.6)	21,533 (18.8)	7,432 (19.8)
Missing n (%)	0 (--)	0 (--)	0 (--)
Intrapartum magnesium sulfate	8,763 (4.3)	5,489 (4.8)	1,864 (5.0)
Missing n (%)	26,136 (11.4)	4,864 (4.2)	1,746 (4.7)
Placental abruption	3,794 (1.6)	2,095 (1.8)	652 (1.7)
Missing n (%)	0 (--)	0 (--)	0 (--)
Fetal growth restriction	2,678 (1.2)	1,451 (1.3)	373 (1.0)
Missing n (%)	15,626 (6.8)	9,747 (8.5)	3,905 (10.4)
Large for gestational age, antepartum diagnosis	2,031 (1.4)	1,073 (0.9)	257 (0.7)
Missing n (%)	84,338 (36.9)	36,337 (31.7)	15,227 (40.5)
Antenatal steroids	5,945 (4.0)	2,762 (2.4)	1,073 (2.9)
Missing n (%)	82,507 (36.1)	47,303 (41.2)	9,942 (26.5)
Antepartum bleeding in third trimester	3,088 (1.7)	1,836 (1.6)	569 (1.5)
Missing n (%)	49,410 (21.6)	36,293 (31.6)	9,846 (26.2)
Placenta previa	1,647 (0.7)	859 (0.8)	235 (0.6)
Missing n (%)	0 (--)	0 (--)	0 (--)
Placenta accreta	138 (0.0)	97 (0.1)	23 (0.1)
Missing n (%)	82,335 (36.0)	36,293 (31.6)	9,846 (26.2)
Threatened preterm birth antepartum	7,880 (3.4)	3,798 (3.3)	935 (2.5)
Missing n (%)	0 (--)	0 (--)	0 (--)
Antepartum hospital admission	17,500 (7.6)	7,424 (6.5)	1,625 (4.3)
Missing n (%)	84,603 (37.0)	55,696 (48.6)	17,264 (46.0)
Gestational age at delivery, weeks			
Mean (SD)	38.2 (2.47)	38.1 (2.53)	38.2 (2.41)
Median (IQR)	39 (38, 40)	39 (38, 40)	39 (38, 40)
Missing n (%)	0 (--)	0 (--)	0 (--)
Characteristics on L&D admission			
Temperature (F)			
Mean (SD)	98.0 (0.81)	98.0 (0.81)	98.0 (0.79)
Missing n (%)	47,977 (21.0)	23,172 (20.2)	7,606 (20.3)
Systolic blood pressure			
Mean (SD)	124.1 (14.89)	124.1 (14.83)	124.0 (14.9)

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Missing n (%)	52,766 (23.0)	25,885 (22.6)	9,263 (23.0)
Diastolic blood pressure			
Mean (SD)	74.3 (11.6)	74.1 (11.9)	74.3 (11.6)
Missing n (%)	52,800 (23.1)	25,898 (22.6)	9,268 (24.7)
Trial of labor	192,074 (84.0)	96,533 (84.1)	31,636 (84.2)
Missing n (%)	0 (--)	0 (--)	0 (--)
Spontaneous labor	122,673 (53.7)	63,154 (55.1)	19,973 (53.2)
Missing n (%)	0 (--)	0 (--)	0 (--)
Premature rupture of membranes	16,219 (7.1)	9,369 (8.1)	3,017 (8.0)
Missing n (%)	0 (--)	0 (--)	0 (--)
Chorioamnionitis on admission	1,527 (1.0)	841 (0.8)	202 (0.7)
Missing n (%)	83,009 (36.3)	19,858 (19.8)	10,220 (32.9)
*N if 47 less than the final study cohort as 47 participants were missing year of delivery.			

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Appendix 4. Frequency of postpartum hemorrhage overall and by mode of delivery			
Overall	Overall	Vaginal delivery	Cesarean delivery
Mean EBL (SD), ml¹	444.6 (2327.10)	315.0 (226.80)	769.9 (4,326.84)
Median EBL (IQR), ml¹	350.0 (300, 600)	300.0 (250, 350)	700.0 (600, 800)
Primary outcome			
EBL ≥1,000 ml¹			
N	7,279/152,279	654/108,872	6,625/43,407
% (95% CI)	4.7 (4.67 to 4.88)	0.6 (0.55 to 0.64)	15.2 (14.92 to 15.60)
¹ EBL data available from 9 of 12 sites: 152,279/228,438 (66.7%). Abbreviations: EBL (estimated blood loss), SD (standard deviation), IQR (interquartile range), CI (confidence interval).			

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Appendix 5. Variables Included in Statistical and Machine Learning Models				
	2 statistical models		2 machine learning models	
Variable	Lasso Regression	Logistic Regression	Extreme Gradient Boosted	Random Forest
Age	X	X	X	X
Pre-pregnancy weight	X		X	X
Pre-pregnancy BMI		X	X	X
Admission weight		X	X	X
Chronic hypertension		X	X	X
Parity		X	X	X
Anemia	X		X	X
Assisted reproductive technology	X	X	X	X
Breech presentation	X	X	X	X
Fetal macrosomia	X	X	X	X
Preeclampsia without severe features	X	X	X	X
Placental abruption	X	X	X	X
Small for gestational age, antenatal diagnosis	X	X	X	X
Large for gestational age, antenatal diagnosis	X	X	X	X
Antepartum vaginal bleeding	X	X	X	X
Placenta accreta	X	X	X	X
Gestational age at delivery	X	X	X	X
Admission systolic blood pressure	X	X	X	X
Trial of labor	X	X	X	X
Chorioamnionitis on admission	X	X	X	X
Insurance status	X	X		X
Maternal race	X	X	X	X
Gestational diabetes	X		X	X
Seizure disorder	X	X	X	X
Multiple gestation	X		X	X
Polyhydramnios	X		X	X
History of prior cesarean delivery	X		X	X
Preeclampsia with severe features	X		X	X
Antenatal steroids	X	X	X	X
Placenta previa	X	X	X	X
Threatened preterm labor	X	X	X	X
Admission temperature	X		X	X

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Admission diastolic blood pressure	X	X	X	X
Spontaneous labor	X	X	X	X
Education status	X		X	X
Prior antepartum hospitalization		X	X	X
Admission temperature		X		
Premature rupture of membranes		X	X	X
Marital status		X	X	X
Tobacco use			X	X
Drug use			X	X
Non-gestational diabetes			X	X
Gestational hypertension			X	X
Heart disease			X	X
Thyroid disease			X	X
Renal disease			X	X
Asthma			X	X
Depression			X	X
Gastrointestinal disease			X	X
History of seizures			X	X
History of prior preterm birth			X	X
Superimposed preeclampsia			X	
Ecclampsia			X	X
Fetal demise			X	X
Maternal GBS colonization			X	X
Magnesium sulfate			X	X

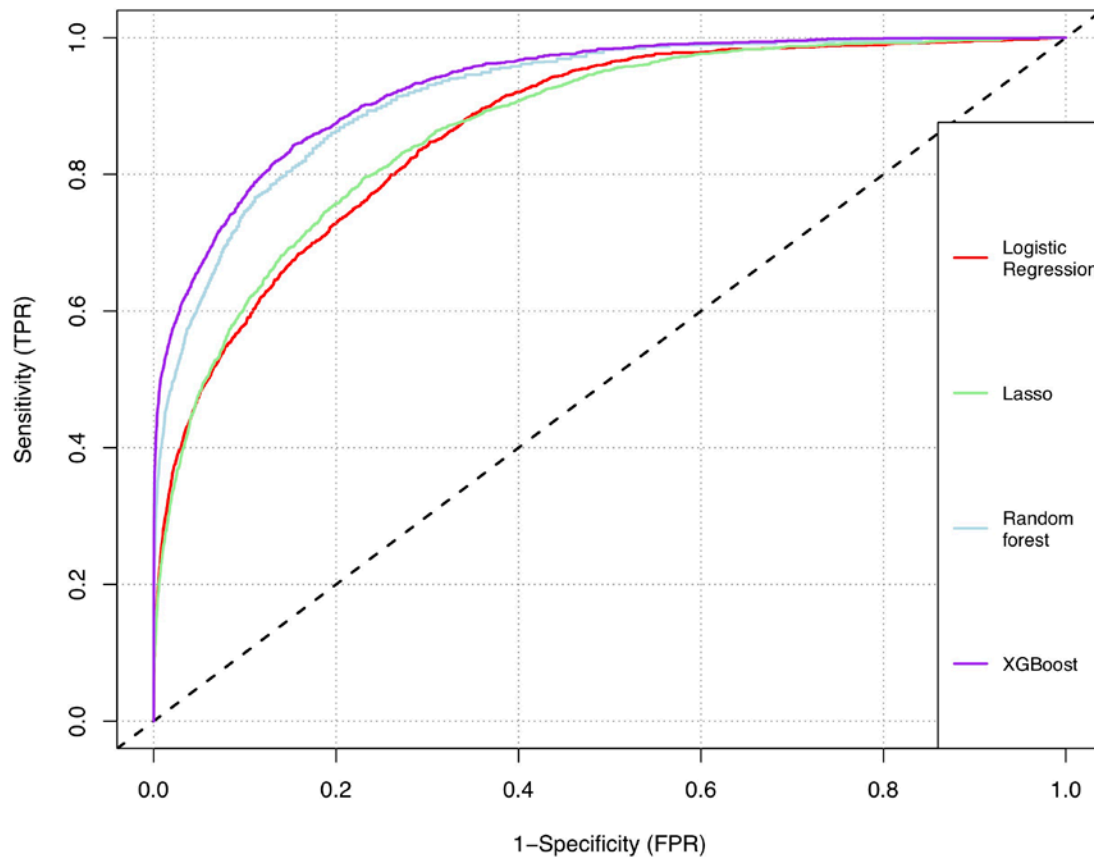
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Appendix 6. Receiver operating characteristic curves of postpartum hemorrhage using two machine learning and two statistical models. Lasso, logistic regression with lasso regularization; XGBoost, extreme gradient boosting.

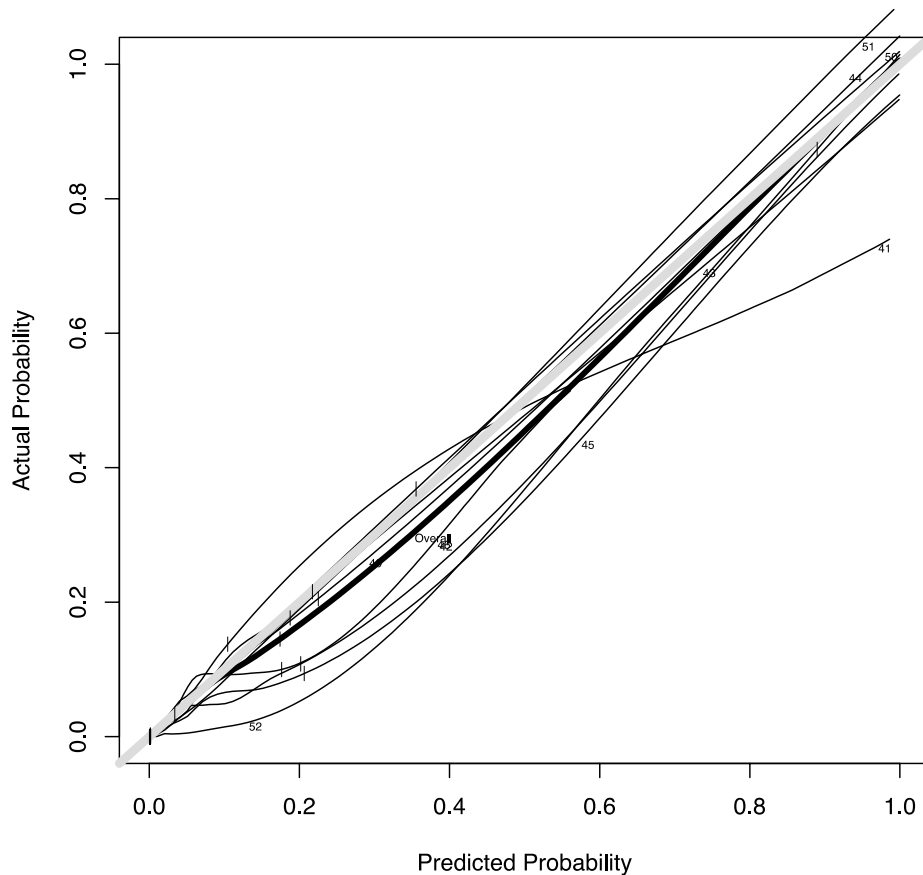


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Appendix 7. Calibration curve demonstrating the Extreme Gradient Boosting model's performance of predicting postpartum hemorrhage by hospital site. The figure demonstrates the variation in gradient boosted model performance at each site in the cohort. The *grey line* indicates perfect agreement between the predicted probability of the model and the actual probability. Each *thin black line* labelled by a number is the calibration of the model in women from a single site. The *thicker black line* is the overall model calibration in the total cohort. The model overpredicts the actual risk at some sites when predicted probabilities are less than approximately 0.5. At site 41, the model underpredicts actual risk above 0.5.



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