Published in final edited form as:

Am J Perinatol. 2018 February ; 35(3): 247–253. doi:10.1055/s-0037-1606641.

The association of decision-to-incision time for cesarean delivery with maternal and neonatal outcomes

William A. Grobman, MD, MBA, Jennifer Bailit, M.D., Grecio Sandoval, M.A., Uma M. Reddy, M.D., M.P.H., Ronald J. Wapner, M.D., Michael W. Varner, M.D., John M. Thorp Jr., M.D., Steve N. Caritis, M.D., Mona Prasad, D.O., M.D., Alan T. N. Tita, M.D., Ph.D., George Saade, M.D., Yoram Sorokin, M.D., Dwight J. Rouse, M.D., Sean C. Blackwell, M.D., and Jorge E. Tolosa, M.D., M.S.C.E for the *Eunice Kennedy Shriver* National Institute of Child Health and Network Human Development Maternal-Fetal Medicine Units (MFMU)*

Northwestern University, Chicago, IL (W.A.G.); MetroHealth Medical Center-Case Western Reserve University, Cleveland, OH (J.B.); George Washington University Biostatistics Center, Washington, DC (G.S.); *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, Bethesda, MD (U.M.R.); Columbia University, New York, NY (R.J.W.); University of Utah Health Sciences Center, Salt Lake City, UT (M.W.V.); University of North Carolina at Chapel Hill, Chapel Hill, NC (J.M.T.); University of Pittsburgh, Pittsburgh, PA (S.N.C.); The Ohio State University, Columbus, OH (M.P.); University of Alabama at Birmingham, Birmingham, AL (A.T.N.T.); University of Texas Medical Branch, Galveston, TX (G.S.); Wayne State University, Detroit, MI (Y.S.); Brown University, Providence, RI (D.J.R.); University of Texas Health Science Center at Houston-Children's Memorial Hermann Hospital, Houston, TX (S.C.B.); Oregon Health & Science University, Portland, OR (J.E.T.)

Abstract

Objective—To estimate whether the decision-to-incision (DTI) time for cesarean delivery (CD) is associated with differences in maternal and neonatal outcomes.

Methods—This analysis is of data from women at 25 US medical centers with a term, singleton, cephalic non-anomalous gestation and no prior CD, who underwent an intrapartum CD. Perinatal and maternal outcomes associated with DTI intervals of 15 minutes, 16–30 minutes, and > 30 minutes were compared.

Results—Among 3,482 eligible women, median DTI times were 46 and 27 minutes for arrest and fetal indications for CD, respectively ($p < 0.01$). Women with a fetal indication whose DTI interval was > 30 minutes had similar odds to the referent group (DTI of 16–30 minutes) for the adverse neonatal and maternal composites (odds ratio (OR) 0.83, 95% confidence interval (CI) 0.40–1.71; OR 0.89, 95% CI 0.63 – 1.27). For arrest disorders, the odds of the adverse neonatal composite were lower among women with a DTI of > 30 minutes (OR 0.25, 95% CI 0.08 – 0.77), and the adverse maternal composite was no different (OR 1.15, 95% CI 0.81 – 1.63).

Conclusion—In this analysis, DTI times longer than 30 minutes were not associated with worse maternal or neonatal outcomes.

*See Appendix for a list of other members of the NICHD MFMU Network

As the focus on patient safety has become more pervasive, there has been increasing use of quality indicators in obstetrics.¹ One indicator that has potential value is the rapidity with which a health care team can respond to a patient need. An example of such a measure is the “door-to-needle time” for individuals with a stroke in need of thrombolysis.² The value of this measure has been supported by evidence that individuals treated within a targeted time frame have better outcomes.^{3,4}

In obstetrics, a time-to-treatment measure that has been used as an assessment of the adequacy of health care delivery is the time from decision to incision for cesarean delivery (i.e., the decision-to-incision (DTI) time). Specifically, a 30-minute DTI frequently has been used as a benchmark to indicate whether an intrapartum cesarean delivery was performed in a timely fashion.⁵ However, in contrast to the “door-to-needle” measure, there are little data to support that either the women or the neonates delivered within this targeted time frame have better outcomes. Instead, this standard was based on data from surveyed hospitals throughout the United States that were queried about the minimal time requirement to initiate cesarean delivery in their facility.⁶ The studies that have been done in an effort to assess this standard and the association of DTI times with obstetric outcomes have had limitations including single-center or small populations,^{6–10} the mixture of a wide variety of cesarean indications (including arrest disorders and non-reassuring fetal status),^{6–10} and uncertainty regarding actual decision times for the intrapartum cesarean delivery.^{10,11}

The Assessment of Perinatal Excellence study (APEX) was a multi-site observational study of over 100,000 women in which trained research personnel abstracted detailed labor data, including decision and incision times.¹² The objective of the present analysis was to use this detailed dataset to estimate whether a DTI time within 30 minutes – or some other time interval – was associated with differences in maternal or neonatal outcomes.

Methods

This was a secondary analysis of the APEX study, an observational cohort of 115,502 women and their neonates who were born in 25 medical centers of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units (MFMU) Network. Between 2008 and 2011, detailed information regarding patient characteristics, intrapartum events, and pregnancy outcomes were collected on all deliveries at these hospitals on randomly selected days representing one third of deliveries over the study period. Included in the abstraction were the decision and incision times for cesarean delivery, as well as detailed information on the intrapartum course and indications for women undergoing cesarean delivery. With regard to decision time, the abstractors were directed to find and record the date and time in the medical record when it was first recorded that the decision to proceed with a cesarean had been made. After all centers obtained institutional review board approval under a waiver of informed consent, charts were abstracted by trained and certified research personnel. Full details of the technique of data collection have been described previously.¹²

Women were considered eligible for this analysis if they had a term singleton non-anomalous gestation in the cephalic presentation and no prior cesarean delivery, intended to

labor in the current pregnancy (e.g., did not have the indications for cesarean such as HIV, active herpes, placenta previa, or prior myomectomy), and subsequently underwent an intrapartum cesarean delivery. Women were excluded if they presented to labor and delivery with non-reassuring fetal status, as it could not be known for what duration of time the non-reassuring status had existed (i.e., it could not be known at what time a decision for cesarean would have been made if the patient had been observed prior to the onset of non-reassuring fetal status). Similarly, women were excluded from analysis if the indication for cesarean was an abruption or cord prolapse, as these two indications were felt to be so emergent that assessment of longer DTI times was considered both to lack clinical meaning and to inextricably confound the association with neonatal outcome. Lastly, data from women in whom either the time for decision for cesarean or incision at cesarean was lacking in the medical record, or in whom the DTI time was so long as to be unlikely in actuality (defined as greater than 3 hours) were not included in analysis.

For the analysis, women were stratified according to whether the primary indication for the intrapartum cesarean was an arrest or fetal (i.e., non-reassuring fetal status) disorder. An adverse neonatal composite outcome was used as the primary outcome, and was determined to have been present if any of the following occurred: arterial umbilical cord pH < 7.0, 5-minute Apgar < 5, hypoxic ischemic encephalopathy (HIE), seizures, or death. An adverse maternal outcome also was established, and determined to be present when any one of the following occurred: diagnosis of post-partum hemorrhage (PPH), estimated blood loss > 1000cc, blood transfusion, endometritis, wound infection or separation, operative injury, or hysterectomy.

The frequencies of cesarean deliveries in specified DTI time intervals for the sample were determined. For the initial analysis, DTI times were grouped according to *a priori* categorizations: 15 minutes, 16–30 minutes, and > 30 minutes. Characteristics of women who delivered within these different time intervals were compared, as were the adverse neonatal and maternal outcomes. Comparisons of continuous data were performed using the Wilcoxon test, while those of categorical data were performed with the chi-square test. Odds ratios and 95% confidence intervals were estimated for the composite outcomes; exact methods were used for comparisons involving sparse data. SAS software was used for the analyses. All tests were two-tailed and $P < .05$ was used to define statistical significance. No imputation for missing data was performed.

Results

Data on 115,502 women were abstracted for the APEX study. Once inclusion and exclusion criteria were applied, 3,907 women underwent intrapartum cesarean delivery of a vertex fetus at term, of whom 3,482 (89%) had the requisite data available for analysis (Figure 1). Characteristics of the study population are provided in Table 1. Fifty-nine percent ($n = 2,069$) and 41% ($n = 1,413$) of the study sample underwent a cesarean for arrest and fetal indications, respectively.

The median DTI times were 46 minutes (interquartile range 34 – 66) for women with arrest indications and 27 minutes (interquartile range 16 – 40) for women with fetal indications for

cesarean delivery ($p<0.01$). Although this median time was shorter for women undergoing cesarean delivery for fetal indications, a substantial proportion in both groups (83% for arrest indications and 41% for fetal indications) had DTI times that exceeded 30 minutes. In order to aid in clinical translation, DTI times were grouped in 15 to 30 minute intervals; the frequency of cesarean deliveries in these pre-specified time intervals are presented in Table 2.

The frequencies of the adverse composite neonatal and maternal outcomes, as well as of individual outcomes contributing to the composite outcomes, for each DTI time interval (i.e., 15 minutes, 16–30 minutes, and > 30 minutes) stratified by indication for cesarean, are presented in Table 3. Given the low frequency of individual outcomes, odds ratios and 95% confidence intervals, using the 16–30 minute interval as the referent category, are presented only for the composite outcomes (Table 4). Even after stratification by indication for cesarean, DTI time that exceeded 30 minutes was not associated with worse outcome compared with DTI time between 16 and 30 minutes. Conversely, for women with an arrest indication, neonates delivered after a longer DTI had a lower composite morbidity and for women with a fetal indication, neonates delivered after a shorter DTI had a higher composite morbidity.

Comment

In this analysis, we have demonstrated that a substantial portion of women who underwent intrapartum cesarean have a DTI time that exceeded 30 minutes. This is evident regardless of whether their cesarean was for arrest or fetal indications. Moreover, we could not demonstrate that longer DTI times were associated with worse maternal or neonatal outcomes.

This analysis supports and extends the findings of prior studies regarding DTI intervals for cesarean delivery. For example, Tolcher et al, based on summary data from a systematic review and meta-analysis of such studies, concluded that 40% of incisions were performed more than 30 minutes after the decision to proceed with intrapartum cesarean delivery had been made.¹⁰ Those investigators also concluded – as had prior individual studies – that the 30-minute interval was not clearly shown to be associated with neonatal morbidity. Indeed, neonates delivered within 30 minutes had worse 5-minute Apgar scores and umbilical artery pH levels; even after analysis was restricted to the most emergent cases, no difference in neonatal outcome was seen based on differences in DTI interval.

Although many analyses have evaluated the DTI times in association with neonatal outcomes, comparatively little study has been devoted to the maternal consequences of shorter DTI intervals. Some investigators have postulated that particularly rapid approaches to surgery could increase morbidity for the mother. Moroz and colleagues, for example, studied incision-to-decision times among women who were undergoing a trial of labor after cesarean and found that particularly short times (i.e., 2 minutes) were associated with an increased risk of maternal complications.¹³ In contrast, in the analysis by Bloom et al., maternal complications did not appear to increase at DTI times of more than 30 minutes.¹¹

This manuscript extends the prior findings to a large and demographically diverse population that was from geographically disparate centers and whose intrapartum circumstances were well characterized. Prior studies often have grouped studies with widely different indications, including overtly emergent ones (e.g., cord prolapse) with less emergent ones (e.g., less emergent non-reassuring fetal status or arrest of dilation), or have been unable to characterize accurately the indication for cesarean.^{6–10} Accordingly, one reason prior studies may have not found associations between DTI and neonatal outcomes is the potential for confounding by indication; namely, that the cesareans in which the fetus is at greatest risk are done the most rapidly, thereby leading to shorter cesareans being associated with worse outcomes. In this study, we excluded women with the most overtly emergent cesareans, and due to chart abstraction by trained personnel, were able to accurately determine the DTI as well as the indication for cesarean. Also, we did not adjust for demographic factors that are not actual confounding factors, such as body mass index, but are more likely on the causal pathway; adjusting for these may cause collider bias and obscure an association with DTI time and outcome that might exist. Nevertheless, we also were unable to find that exceeding the 30-minute interval was associated with worse outcomes, or that any interval in particular served well as an evidence-based demarcation of best care.

Although one could claim that it must always be better to do cesareans more quickly, there are dangers with the reflexive use of 30 minutes as a standard unsupported by evidence, in that potential maternal risks as well as other unintended consequences may be incurred in any setting, given that resources such as operating rooms are not infinitely expandable and events occur unpredictably. Accordingly, the best outcomes are more likely to be obtained by prudent triage rather than a universal standard.

Acknowledgments

The project described was supported by grants from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) [HD21410, HD27869, HD27915, HD27917, HD34116, HD34208, HD36801, HD40500, HD40512, HD40544, HD40545, HD40560, HD40485, HD53097, HD53118] and the *National Center for Research Resources* [UL1 RR024989; 5UL1 RR025764]. Comments and views of the authors do not necessarily represent views of the NICHD.

The authors thank Cynthia Milluzzi, R.N. and Joan Moss, R.N.C., M.S.N. for protocol development and coordination between clinical research centers; and Elizabeth Thom, Ph.D., Madeline M. Rice, Ph.D., Brian M. Mercer, M.D. and Catherine Y. Spong, M.D. for protocol development and oversight.

References

1. Arora KS, Shields LE, Grobman WA, D'Alton ME, Lappen JR, Mercer BM. Triggers, bundles, protocols, and checklists--what every maternal care provider needs to know. *Am J Obstet Gynecol*. 2016; 214:444–51. [PubMed: 26478105]
2. Zinkstok SM, Beenen LF, Luitse JS, Majoie CB, Nederkoorn PJ, Roos YB. Thrombolysis in Stroke within 30 Minutes: Results of the Acute Brain Care Intervention Study. *PLoS One*. 2016; 11:e0166668. [PubMed: 27861540]
3. Gumbinger C, Reuter B, Stock C, et al. Time to treatment with recombinant tissue plasminogen activator and outcome of stroke in clinical practice: retrospective analysis of hospital quality assurance data with comparison with results from randomised clinical trials. *BMJ*. May 30;348:g3429.

4. Saver JL, Fonarow GC, Smith EE, et al. Time to treatment with intravenous tissue plasminogen activator and outcome from acute ischemic stroke. *JAMA*. 2013; 309:2480–2488. [PubMed: 23780461]
5. American College of Obstetrics and Gynecologists Committee on Professional Standards. Standards for obstetric-gynecologic services. 7. Washington, DC: 1989.
6. Nasrallah FK, Harirah HM, Vadhera R, Jain V, Franklin LT, Hankins GV. The 30-minute decision-to-incision interval for emergency cesarean delivery: Fact or fiction? *Am J Perinatol*. 2004; 21:63–8. [PubMed: 15017468]
7. Chauhan SP, Roach H, Naef RW II, Magann EF, Morrison JC, Martin JN Jr. Cesarean section for suspected fetal distress. Does the decision-incision time make a difference? *J Reprod Med*. 1997; 42:347–52. [PubMed: 9219122]
8. de Regt RH, Marks K, Joseph DL, Malmgren JA. Time from decision to incision for cesarean deliveries at a community hospital. *Obstet Gynecol*. 2009; 113:625–9. [PubMed: 19300326]
9. Spain JE, Tuuli M, Stout MJ, et al. Time from uterine incision to delivery and hypoxic neonatal outcomes. *Am J Perinatol*. 2015; 32:497–502. [PubMed: 25539409]
10. Tolcher MC, Johnson RL, El-Nashar SA, West CP. Decision-to-incision time and neonatal outcomes. *Obstet Gynecol*. 2014; 123:536–48. [PubMed: 24499762]
11. Bloom SL, Leveno KJ, Spong CY, et al. Decision-to-incision times and maternal and infant outcomes. *Obstet Gynecol*. 2006; 108:6–11. [PubMed: 16816049]
12. Bailit JL, Grobman WA, Rice MM, et al. Risk-adjusted models for adverse obstetric outcomes and variation in risk-adjusted outcomes across hospitals. *Am J Obstet Gynecol*. 2013; 209:446.e1–446.e30. [PubMed: 23891630]
13. Moroz L, DiNapoli M, D’Alton M, et al. Surgical speed and risk for maternal operative morbidity in emergent repeat cesarean delivery. *Am J Obstet Gynecol*. 2015; 213:584.e1–6. [PubMed: 26144412]

Appendix

In addition to the authors, other members of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network are as follows:

Northwestern University, Chicago, IL – G. Mallett, M. Ramos-Brinson, A. Roy, L. Stein, P. Campbell, C. Collins, N. Jackson, M. Dinsmoor (NorthShore University HealthSystem), J. Senka (NorthShore University HealthSystem), K. Paychek (NorthShore University HealthSystem), A. Peaceman

Columbia University, New York, NY – M. Talucci, M. Zylfijaj, Z. Reid (Drexel U.), R. Leed (Drexel U.), J. Benson (Christiana H.), S. Forester (Christiana H.), C. Kitto (Christiana H.), S. Davis (St. Peter’s UH.), M. Falk (St. Peter’s UH.), C. Perez (St. Peter’s UH.)

University of Utah Health Sciences Center, Salt Lake City, UT – K. Hill, A. Sowles, J. Postma (LDS Hospital), S. Alexander (LDS Hospital), G. Andersen (LDS Hospital), V. Scott (McKay-Dee), V. Morby (McKay-Dee), K. Jolley (UVRMC), J. Miller (UVRMC), B. Berg (UVRMC)

University of North Carolina at Chapel Hill, Chapel Hill, NC – K. Dorman, J. Mitchell, E. Kaluta, K. Clark (WakeMed), K. Spicer (WakeMed), S. Timlin (Rex), K. Wilson (Rex)

University of Texas Southwestern Medical Center, Dallas, TX – L. Moseley, M. Santillan, J. Price, K. Buentipo, V. Bludau, T. Thomas, L. Fay, C. Melton, J. Kingsbery, R. Benezue

University of Pittsburgh, Pittsburgh, PA – H. Simhan, M. Bickus, D. Fischer, T. Kamon (deceased), D. DeAngelis

Case Western Reserve University-MetroHealth Medical Center, Cleveland, OH – B. Mercer, C. Milluzzi, W. Dalton, T. Dotson, P. McDonald, C. Brezine, A. McGrail

The Ohio State University, Columbus, OH – C. Latimer, L. Guzzo (St. Ann's), F. Johnson, L. Gerwig (St. Ann's), S. Fyffe, D. Loux (St. Ann's), S. Frantz, D. Cline, S. Wylie, J. Iams

University of Alabama at Birmingham, Birmingham, AL – M. Wallace, A. Northen, J. Grant, C. Colquitt, D. Rouse, W. Andrews

University of Texas Medical Branch, Galveston, TX – J. Moss, A. Salazar, A. Acosta, G. Hankins

Wayne State University, Detroit, MI – N. Hauff, L. Palmer, P. Lockhart, D. Driscoll, L. Wynn, C. Sudz, D. Dengate, C. Girard, S. Field

Brown University, Providence, RI – P. Breault, F. Smith, N. Annunziata, D. Allard, J. Silva, M. Gamage, J. Hunt, J. Tillinghast, N. Corcoran, M. Jimenez

The University of Texas Health Science Center at Houston-Children's Memorial Hermann Hospital, Houston, TX – F. Ortiz, P. Givens, B. Rech, C. Moran, M. Hutchinson, Z. Spears, C. Carreno, B. Heaps, G. Zamora

Oregon Health & Science University, Portland, OR – J. Seguin, M. Rincon, J. Snyder, C. Farrar, E. Lairson, C. Bonino, W. Smith (Kaiser Permanente), K. Beach (Kaiser Permanente), S. Van Dyke (Kaiser Permanente), S. Butcher (Kaiser Permanente)

The George Washington University Biostatistics Center, Washington, D.C. – E. Thom, M. Rice, Y. Zhao, P. McGee, V. Momirova, R. Palugod, B. Reamer, M. Larsen

Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, MD – C. Spong, S. Tolivaia

MFMU Network Steering Committee Chair (Medical University of South Carolina, Charleston, SC) – J. P. Van Dorsten, M.D.

Figure 1.

Flow diagram of the study population

EGA = estimated gestational age; DTI = decision-to-interval time

Table 1

Characteristics of the study population

n = 3482	
Age (years)	
< 20	157 (4.5)
20 – 24.9	675 (19.4)
24.9 – 29.9	907 (26.0)
30 – 34.9	943 (27.1)
35	800 (23.0)
Race/ethnicity	
Non-Hispanic white	1325 (38.1)
Non-Hispanic black	1028 (29.5)
Hispanic	741 (21.3)
Asian	183 (5.3)
Other	205 (5.9)
Body mass index (kg/m ²) *	
< 25	178 (5.2)
25 – 29.9	933 (27.2)
30 – 34.9	1122 (32.7)
35 – 39.9	659 (19.2)
40	543 (15.8)
Nulliparous	2078 (59.7)
Insurance status *	
Medicaid	1417 (41.0)
Commercial	1747 (50.5)
Self-pay	292 (8.4)
Indication for cesarean	
Arrest disorder	2069 (59.4)
Non-reassuring fetal status	1413 (40.6)

All data presented as n (%)

* 47 and 26 cases with missing body mass index and insurance status data, respectively

Table 2

Frequency of decision-to-incision times stratified by indication for cesarean delivery

	Arrest disorder (n = 2069)	Fetal indication (n = 1413)
15 minutes	1.7	24.2
16–30 minutes	14.8	34.5
30–45 minutes	33.2	21.7
45–60 minutes	20.3	10.0
60–90 minutes	16.8	6.2
90 – 120 minutes	6.6	2.3
> 120 minutes	6.5	1.2

All data presented as %

Table 3

Neonatal and maternal outcomes by decision-to-incision time stratified by indication for cesarean

	Arrest disorder				Fetal indication			
	15 min (n=36)	16–30 min (n=306)	>30 min (n=1727)	15 vs. 16–30 p	15 min (n=342)	16–30 min (n=487)	>30 min (n=584)	15 vs. 16–30 p
Neonatal outcomes								
Composite	0 (0.0)	7 (2.3)	10 (0.6)	1.00	23 (6.7)	15 (3.1)	15 (2.6)	0.02
pH < 7.0 *	0 (0.0)	2 (0.7)	3 (0.2)	1.00	17 (5.0)	11 (2.3)	9 (1.5)	0.05
Apgar < 5 at 5 minutes *	0 (0.0)	3 (1.0)	4 (0.2)	1.00	6 (1.8)	3 (0.6)	5 (0.9)	0.17
HIE *	0 (0.0)	1 (0.3)	7 (0.4)	1.00	5 (1.5)	4 (0.8)	2 (0.3)	0.50
Seizures *	0 (0.0)	0 (0.0)	0 (0.0)	-	3 (0.9)	1 (0.2)	2 (0.3)	0.31
Death *	0 (0.0)	1 (0.3)	0 (0.0)	1.00	0 (0.0)	1 (0.2)	0 (0.0)	1.00
NICU admission	2 (5.6)	36 (11.8)	167 (9.7)	0.40	67 (19.6)	79 (16.2)	91 (15.6)	0.23
Ventilator	1 (2.8)	4 (1.3)	12 (0.7)	0.43	10 (2.9)	8 (1.6)	9 (1.5)	0.23
Hypotension with pressor support	0 (0.0)	1 (0.3)	4 (0.2)	1.00	6 (1.8)	5 (1.0)	5 (0.9)	0.38
Maternal outcomes								
Composite	3 (8.3)	42 (13.7)	267 (15.5)	0.60	55 (16.1)	69 (14.2)	75 (12.8)	0.49
EBL > 1000cc **	2 (5.6)	33 (10.8)	208 (12.0)	0.56	43 (12.6)	51 (10.5)	58 (9.9)	0.37
Postpartum hemorrhage **	2 (5.6)	19 (6.2)	109 (6.3)	1.00	31 (9.1)	34 (7.0)	21 (3.6)	0.29
Blood transfusion **	1 (2.8)	14 (4.6)	54 (3.1)	1.00	13 (3.8)	24 (4.9)	11 (1.9)	0.50
Endometritis **	1 (2.8)	11 (3.6)	33 (1.9)	1.00	5 (1.5)	7 (1.4)	12 (2.1)	1.00
Wound complication **	0 (0.0)	1 (0.3)	11 (0.6)	1.00	2 (0.6)	2 (0.4)	4 (0.7)	1.00
Operative injury **	0 (0.0)	0 (0.0)	2 (0.1)	-	3 (0.9)	1 (0.2)	0 (0.0)	0.31
Hysterectomy **	0 (0.0)	0 (0.0)	3 (0.2)	-	0 (0.0)	0 (0.0)	1 (0.2)	-

All data presented as n (%)

* components of neonatal adverse composite outcome;

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

components of maternal adverse composite outcome
wound complication = cellulitis, separation; operative injury = injury to ureter, bowel, bladder;
p-values calculated using exact methods.

Unadjusted odds ratios and 95% confidence intervals for adverse composite outcomes by decision-to-incision time stratified by indication for cesarean

Table 4

	Arrest disorder			Fetal indication		
	15 min (n=36)	16–30 min (n=306)	>30 min (n=1727)	15 min (n=342)	16–30 min (n=487)	>30 min (n=584)
ANC	0.00 (0.00 – 4.60) *	1.0	0.25 (0.08 – 0.77) *	2.27 (1.17 – 4.42)	1.0	0.83 (0.40 – 1.71)
AMC	0.57 (0.11 – 1.95) *	1.0	1.15 (0.81 – 1.63)	1.16 (0.79 – 1.71)	1.0	0.89 (0.63 – 1.27)

All data presented as odds ratio (95% confidence interval), p-value.

ANC = adverse neonatal composite; AMC = adverse maternal composite;

* Estimated using exact methods