

Adherence to the 30-minute rule in emergency caesarean deliveries due to foetal distress at Pelonomi Tertiary Hospital, Bloemfontein, South Africa

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Abstract

Foetal distress is potentially life threatening, requiring an emergency caesarean delivery to forestall potential harm or death of the foetus. The American Congress of Obstetricians and Gynecologists recommended that the time from decision to emergency caesarean delivery should not exceed 30 minutes. The objective of this study was to determine whether the 30-minute rule was adhered to at Pelonomi Tertiary Hospital and to investigate the association between decision-to-incision interval and outcome of the newborn and mother. This cohort analytical study comprised 33 mothers who underwent emergency caesarean deliveries after foetal distress was diagnosed. Data were collected on time of diagnosis, start/stop time of caesarean delivery, outcome of mother and newborn and 5-minute APGAR score. Five (15.6%) of the 32 recorded decision-to-incision intervals fell within the 30-minute limit. Of the 33 neonates, two died. One mother experienced complication, but all mothers survived. The median interval in the newborns who survived was 92.5 minutes (25-850 minutes) and in the newborns who died 47.5 minutes (30-65 minutes). The study showed that the 30-minute rule in obstetrics is not adhered to, however, this did not have a direct negative effect on the outcome of the neonates or mothers.

Keywords: emergency; foetal distress; caesarean delivery; 30-minute rule; obstetrics

Introduction

Foetal distress is a potentially life-threatening intra-uterine state of a foetus, requiring an emergency caesarean delivery to forestall potential harm or death of the foetus (Leung and Lao, 2013). More than 25 years ago, the American Congress of Obstetricians and Gynecologists, and the American Academy of Pediatrics, recommended that the time from decision to performing the emergency caesarean delivery should not exceed 30 minutes; this is known as the '30-minute rule' (Nageotte and Vander Wal, 2012). Commonly used terms related to the 30-minute rule in audits and research are 'decision-to-incision' and 'decision-to-delivery' (Leung and Lao, 2013).

Studies have been conducted on the practicality and effectiveness of the 30-minute rule. In an extreme life-threatening indication in a foetus and/or mother, a 'crash' emergency caesarean delivery may be indicated, and keeping to the 30-minute rule becomes essential, as any delay may result in

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deteriorating outcome (Leung and Lao, 2013; Tolcher et al, 2014). In a retrospective analysis performed by Hillemanns et al (2005), all 109 ‘crash’ emergency caesarean deliveries were performed within the expected decision-to-delivery interval, demonstrating that the 30-minute rule is achievable. Leung and Lao (2013) reported that the bradycardia-to-delivery interval was significantly associated with arterial pH and base excess in life-threatening foetal conditions. MacKenzie and Cooke (2002) found that neonates born within one hour of the decision tended to be more acidemic than those born later, irrespective of the indication for delivery. This seems to imply that a rule of less than 60 minutes, rather than 30 minutes should be strived for.

However, many studies (Helmy et al, 2002; Bloom et al, 2006; Nageotte and Vander Wal, 2012; Rabinerson and Glezerman, 2011) have not found any scientific basis for the 30-minute rule. Research showed that neonatal outcomes were not negatively affected when the decision-to-incision or decision-to-delivery interval exceeded 30 minutes. There are also concerns that physicians may be unfairly exposed to medicolegal claims when they are unable to comply with the 30-minute rule (Bloom et al, 2006; Rabinerson and Glezerman, 2011). Hence, the aim of the study was to measure the time taken to initiate an emergency caesarean delivery on mothers at Pelonomi Tertiary Hospital in Bloemfontein, South Africa, once the diagnosis of foetal distress was made. In doing, so this study hoped also to establish the existence of a possible relationship between the decision-to-incision interval and the resultant outcome on the mother and newborn.

Methods

Study design, setting, population and sampling strategy

This was a cohort-analytical study. Pelonomi Tertiary Hospital is a health facility providing services to the Free State as well as surrounding areas. There is one dedicated functional maternity theatre where caesarean deliveries are performed. On average, 200 caesarean deliveries are performed per month. It was estimated that half or more of these were emergency caesarean deliveries due to foetal distress. The intended sample size was 300 emergency caesarean deliveries over a three-month period. However, due to logistical difficulties with the data collection forms being completed by either the nurse or doctor involved in the procedure, the sample size was reduced to 33 patients over the same study period (October 2014 to December 2014). The sample comprised mothers who underwent emergency caesarean deliveries after foetal distress was diagnosed. This sample included cases diagnosed at Pelonomi Tertiary Hospital as well as cases referred from other hospitals in the Free State, Eastern Cape and Lesotho.

Data collection

The researchers designed a data form to collect the time foetal distress was diagnosed, start (first incision) and stop (closing of incision) time of emergency caesarean delivery, outcome of mother and newborn, and the newborn’s APGAR assessment score at 5 minutes. The assessment includes appearance, pulse rate, reflex irritability, muscle tone and respiratory effort, and has a maximum score of 10, with a score of 7 or above indicating good health (NIH U.S. National Library of Medicine, 2012). The data form was completed by either the surgeon or nurse involved in the procedure. The completed forms were placed in a box provided.

Pilot study

A two-week pilot study was conducted in August 2014 to test the data collection procedures. Of the expected 25 cases of foetal distress, data forms for nine cases were completed. The data form was modified to include the time taken to complete the caesarean delivery and the 1-minute APGAR score. Data collected during the pilot study were included in the analysis.

Data analysis

The data analysis was conducted by the Department of Biostatistics, Faculty of Health Sciences, University of the Free State. Numerical variables were summarised by means, standard deviations or percentiles (based on data distribution) and categorical variables by frequencies and percentages.

Ethical considerations

The study was approved by the Ethics Committee of the Faculty of Health Sciences, University of the Free State. Permission to conduct the study was obtained from the Head, Free State Department of Health. No personal detail or hospital file numbers were captured on the data form.

Results

Only five (15.6%) of the 32 recorded decision-to-incision intervals fell within the 30-minute time limit (Fig. 1).

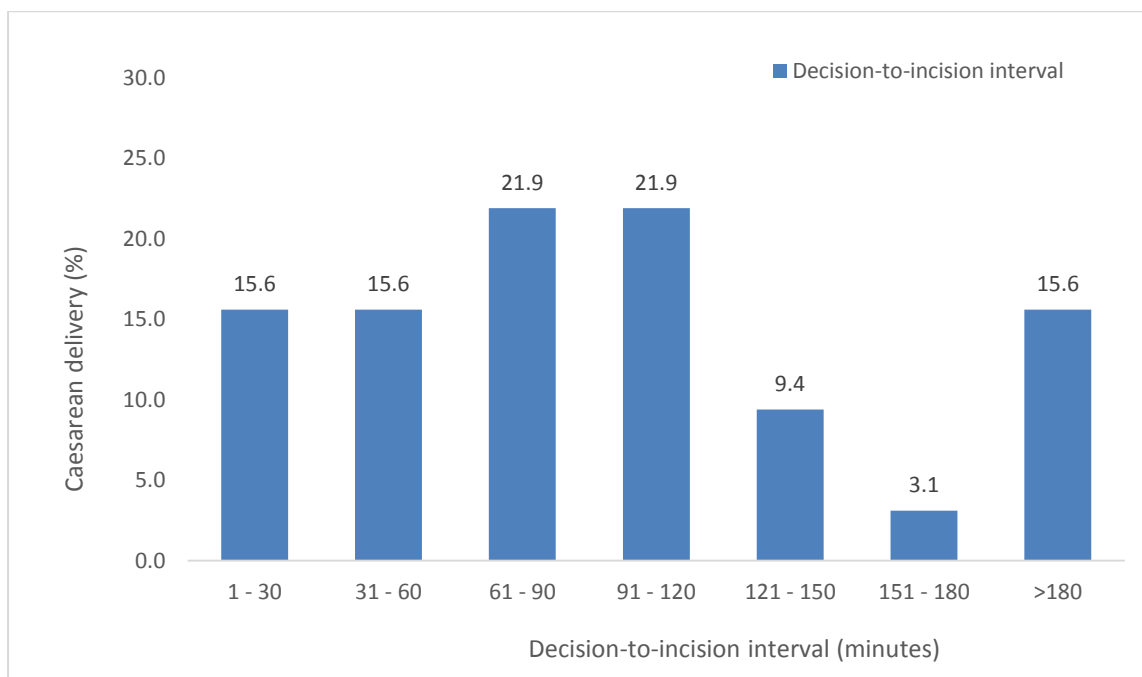


Figure 1: Decision-to-incision intervals for newborns delivered via emergency caesarean delivery due to foetal distress ($n = 32$).

The highest percentage ($n = 14$; 43.9%) of the decision-to-incision intervals were between 61 and 120 minutes. The median time for the intervals was 87.5 minutes. Five (15.6%) emergency caesarean deliveries were performed more than 180 minutes after foetal distress diagnosis.

Of the 33 newborns delivered via emergency caesarean delivery due to foetal distress, 31 (93.9%) survived. One (3.0%) of the 33 mothers experienced complications during the procedure, but survived. Most ($n = 24$; 77.4%) of the surviving newborns had an APGAR score of 7 or above, while four (12.9%) scored 5 or 6. APGAR scores for three (9.7%) newborns were not recorded.

The median decision-to-incision interval in the newborns who survived was 92.5 minutes (range 25 to 850 minutes), whereas the decision-to-incision interval in the newborns who did not survive was 47.5 minutes (range 30 to 65 minutes). Of the five procedures done within 30 minutes, one infant died, compared to one infant of the 27 procedures done after 30 minutes.

More than half ($n = 17$; 53.1%) of the 32 recorded procedures were completed within 30 minutes, while 13 (40.6%) took between 30 minutes to an hour. Two (6.3%) caesarean deliveries took longer than an hour. The mean and median time for the duration of the caesarean deliveries were 38 and 30 minutes, respectively.

Discussion

Only 15.6% of emergency caesarean deliveries were performed according to the 30-minute rule. This is supported by several studies that found that delivery within 30 minutes is seldom achieved (MacKenzie and Cooke, 2002; Bloom et al, 2006; Nageotte and Vander Wal, 2012; Tolcher et al, 2014; Rabinerson and Glezerman, 2011). The study done by Helmy et al (2002) also suggests that a universal standard of 100% in 30 minutes is unrealistic. They recommend that 40 minutes for the decision-to-delivery interval is more realistic, and can be achieved in more than 90% of emergency caesarean deliveries. In contrast, Nasrallah et al (2004) found that the interval was achievable, but noted that the 30-minute rule did not seem to improve neonatal or worsen maternal outcomes.

Our results show that the median decision-to-incision interval was 87.5 minutes. This is higher than reported by MacKenzie and Cooke (2002) who reported an average of 42.9 minutes; but lower than the results reported by Harfouche et al (2015) who reported an average of 1.69 hours. An audit done by O'Dwyer and Fawcus (2013) on emergency caesarean deliveries at an urban obstetric unit in Cape Town found that the decision-to-delivery times ranged between 75 to 120 minutes. The 2011 RCOG's National Institute for Health and Clinical Excellence guideline on urgency of a caesarean delivery recommended that category 2 caesarean deliveries (maternal or foetal compromised, but not in immediate life-threatening) to be carried out, in most situations, within 75 mins of making the decision (Leung and Lao, 2013).

Almost 60% of the emergency caesarean delivery cases were performed between 31 and 120 minutes. MacKenzie and Cooke (2002) found no evidence to indicate that an interval up to 120 minutes was detrimental to the newborn, unless the delivery was a 'crash' caesarean delivery. This ties in with our study results as most of the newborns had a good outcome according to their APGAR scores.

O'Dwyer et al (2013) listed excessive work load as a possible reason for delays in the decision-to-delivery interval. Harfouche et al (2015) found delays were mainly due to occupied operating theatre or delayed transfer from the labour ward. Maternity staff at Pelonomi Tertiary Hospital verbally gave possible reasons for the extended decision-to-incision interval, noting that foetal distress cases are not operated on a 'first-come first-serve' basis, as per standard operating procedure. Instead, patients are triaged and the more critical cases are operated on first. Leung and Lao (2013) stated that a crucial point in managing the 30-minute rule is to differentiate and select the life-threatening cases, where delivery by emergency caesarean delivery should be expedited from cases that are less urgent.

It was found that the duration of the actual surgical procedure was relatively short. Most of the procedures were completed within 30 minutes. This implies that the doctors performing the caesarean deliveries understood the importance of operating timeously, and were able to do so successfully. This supports the idea that the cases that waited long before commencement of the caesarean deliveries were perhaps not as critical.

Study limitations

The study did not take into account whether mothers were diagnosed with foetal distress in the ward, or diagnosis was already made by the referring hospital. In both instances this would have impacted on which patient to triage and the outcome. Patients who are referred, depending on the distance, could take one to two hours before arrival, which would mean that they had been long in distress as opposed to those diagnosed in the ward. The mothers' demographic details as well as their antenatal and perinatal health status were not considered. The perinatal outcome of the newborns was not assessed, as only the APGAR scores were recorded.

The clinical accuracy of the foetal distress diagnosis was not confirmed. Foetal distress is not an easy diagnosis to make, and it is possible that there could have been misdiagnosed cases in our study. In the event of a misdiagnosis, a positive outcome of a newborn and mother with a decision-to-incision interval of more than 30 minutes may not accurately reflect the situation. The study did not determine the real causes for the delay in initiating emergency caesarean deliveries. A small sample size was also a limitation.

Conclusion

In this case series, the 30-minute rule in obstetrics seems to be impractical, especially considering that Pelonomi Tertiary Hospital has only one dedicated functional maternity theatre where caesarean deliveries are performed. The most practical solution to this problem would be to find out the real problems in diagnosing foetal distress and reasons for delayed appropriate intervention at both referring and referral hospital(s). This highlights future areas of research which could assist hospital management in understanding the 'bottlenecks' in the healthcare system delivery in maternity care.

Even though incision-to-decision interval of 84.4% of the emergency caesarean deliveries were more than 30 minutes, all mothers and almost all of the newborns survived. Of the two newborns who died, one had an incision-to-decision interval of 65 minutes. As the reasons for the two newborns' deaths were not captured, it is unknown whether a delay in the incision-to-decision interval resulted in or contributed to the death.

The researchers recommend further studies to investigate the reasons for the delays. It is imperative that regular data collection and audits be performed at Pelonomi Tertiary Hospital to ensure that the outcomes of the mothers and newborns remain good. A decline in outcome can alert the team that urgent corrective and preventative measures are needed to.

Acknowledgements

The authors would like to thank Dr M. Mngomezulu, Ms M.N. Magau, Ms C.C. Mlandu and the theatre staff at Pelonomi Tertiary Hospital for assisting with the research project, and the physicians who took part in completing the data forms. Ms T. Mulder, medical editor, School of Medicine, University of the Free State, for technical and editorial preparation of the manuscript.

References

Bloom, S. L., Leveno, K. J., Spong, C. Y., Gilbert, S., Hauth, J. C., Landon, M. B., Varner, M. W., Moawad, A. H., Caritis, S. N., Harper, M., Wapner, R. J., Sorokin, Y., Miodovnik, M., O'sullivan, M. J., Sibai, B. M., Langer, O., & Gabbe, S. G. (2006). Decision-to-incision times and maternal and

infant outcomes. *Obstetrics and Gynecology*, 108(1), 6-11.
<http://dx.doi.org/10.1097/01.AOG.0000224693.07785.14>

Harfouche, M., Hosseinipour, M., Kaliti, S., & Wilkinson, J. (2015). Quality indicators and outcomes of emergency caesarean deliveries at a district-level maternity hospital. *African Journal of Reproductive Health*, 19(3), 61-67.

Helmy, W. H., Jolaoso, A. S., Ifatureti, O. O., Afify, S. A., & Jones, M. H. (2002). The decision-to-delivery interval for emergency caesarean section: is 30 minutes a realistic target? *British Journal of Obstetrics and Gynaecology*, 109(5), 505-508. <http://dx.doi.org/10.1111/j.1471-0528.2002.00491.x>

Hillemanns, P., Strauss, A., Hasbargen, U., Schulze, A., Genzel-Boroviczeny, O., Weninger, E., & Hepp, H. (2005). Crash emergency cesarean section: decision-to-delivery interval under 30 min and its effect on Apgar and umbilical artery pH. *Archives of Gynecology and Obstetrics*, 273(3), 161-165. <http://dx.doi.org/10.1007/s00404-005-0045-7>

Leung, T. Y., & Lao, T. T. (2013). Timing of caesarean section according to urgency. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 27(2), 251-267. <http://dx.doi.org/10.1016/j.bpobgyn.2012.09.005>

MacKenzie, I. Z., & Cooke, I. (2002). What is a reasonable time from decision-to-delivery by caesarean section? Evidence from 415 deliveries. *British Journal of Obstetrics and Gynaecology*, 109(5), 498-504. <http://dx.doi.org/10.1111/j.1471-0528.2002.01323.x>

Nageotte, M. P., & Vander Wal, B. (2012). Achievement of the 30-minute standard in obstetrics—can it be done? *American Journal of Obstetrics and Gynecology*, 206, 104-107. <http://dx.doi.org/10.1016/j.ajog.2011.09.008>

Nasrallah, F. K., Harirah, H. M., Vadhera, R., Jain, V., Franklin, L. T., & Hankins, G. D. (2004). The 30-minute decision-to-incision interval for emergency cesarean delivery: fact or fiction? *American Journal of Perinatology*, 21(2), 63-68. <http://dx.doi.org/10.1055/s-2004-820513>

NIH U.S. National Library of Medicine. Medical Encyclopedia. (2012). Apgar score. Maryland: NIH U.S. National Library of Medicine. MedlinePlus. Retrieved June 5, 2016 from <http://www.nlm.nih.gov/medlineplus/ency/article/003402.htm>

O'Dwyer S, Fawcus S. (2013). An audit of decision-to-delivery times for emergency caesarean section in a busy urban obstetric unit in South Africa. Poster session presented at: RCOG World Congress 2013. Liverpool, UK. Retrieved June 15, 2016 from <http://www.epostersonline.com/rcog2013/?q=node/1416>

Rabinerson, D., & Glezerman, M. (2011). [The “30 minute rule” – always applicable?]. *Harefuah*, 150(4), 346-348, 419. [Article in Hebrew]

Tolcher, M. C., Johnson, R. L., El-Nashar, S., & West, C. P. (2014). Decision-to-incision time and neonatal outcomes: a systematic review and meta-analysis. *Obstetrics and Gynecology*, 123(3), 536-548. <http://dx.doi.org/10.1097/AOG.0000000000000132>