



## REVIEW

## Category one caesarean section: A team-based approach

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## S U M M A R Y

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Caesarean delivery rates are rapidly increasing necessitating a concerted effort to manage resources and expedite delivery especially during an emergency. Category-1 Caesarean sections (CS) require a co-ordinated multidisciplinary team-based approach, with good communication, training and locally relevant protocols so as to ensure a speedy and yet safe process for both the mother and the foetus. Controversies surrounding the decision-to-delivery interval and guidelines will be discussed. As an integral part of the team, the anaesthetist is often stressed for time and general anaesthesia is frequently the technique of choice. Recent literature has also suggested alternatives including rapid sequence spinal anaesthesia and epidural extension of existing neuraxial labour analgesia. In-utero resuscitation should also be administered prior to operative delivery.

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## 1. Introduction

The rate of caesarean section (CS) deliveries is rapidly increasing. This is partly due to an improvement in peripartum foetal monitoring and to a decreased threshold for operative intervention. The National Health Service Maternity Statistics reported a rising trend of CS rates in England from 12% in 1990 to 25.5% in 2012/13.<sup>1</sup> This is also reflected in the United States where the CS rate had reached a level of 32.8% in 2012.<sup>2</sup>

To better prioritise resources and manage urgent CS, Lucas et al. developed a 4-point classification system to describe the urgency of CS that was also recommended for use in the UK by the National Institute for Clinical Excellence (NICE). The term category-1 CS refers to the subset of cases where there is an immediate risk and life threatening circumstances for either the mother or foetus and delivery must be undertaken as quickly as possible after the decision.<sup>3</sup> This classification has proved to be reliable despite an inconsistent clinical application amongst different obstetric units.<sup>4</sup> In 2009, Kinsella and Scrutton modified the wording of the urgency classification but failed to show an improvement in the inter-rater reliability.<sup>5</sup> Alternative classifications have been suggested including Dupuis et al. who proposed a novel three-colour code to categorise urgency.<sup>6</sup> The adoption of the colour code was shown to significantly shorten the mean decision-to-delivery interval (DDI).

A UK survey found that 10% of CS performed were classified as category-1 cases<sup>7</sup> and these were associated with a higher morbidity and mortality. There is a 15-fold increased risk of maternal death in category-1 patients compared with category-3.<sup>8</sup> However, it remains controversial whether this increased risk is due to a pre-existing condition or as a direct consequence of the need for the category-1 CS.

Since the premise of category-1 CS delivery is to ensure maternal and foetal well-being with expedited delivery, there has been much discussion on the optimal DDI and its clinical relevance to maternal and foetal outcomes. The balance between ensuring a safe delivery and an expedited one can be difficult and requires a co-ordinated team approach to maintain the safety and health of both the mother and foetus. Good organisation and communication are essential as there are members from many healthcare disciplines involved in this stressful, time-critical situation; hence specific local hospital protocols and training for members of the team may be essential to improve the outcomes of the category-1 CS.

## 2. Evidence supporting a reduction in DDI for category-1 CS

A DDI of 30 min for category-1 CS has been recommended as a standard by the guidelines published by the Royal College of Obstetricians and Gynaecologists, the American College of Obstetricians and Gynaecologists and the Canadian National Consensus Conference.<sup>9</sup> In 2011, NICE guidelines for caesarean section suggested using a 30-min DDI for category-1 CS as an audit standard to measure the performance of an obstetric unit.<sup>10</sup>

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This 30-min standard, however, was established based largely on expert opinions. Most studies found no correlation between DDI and maternal morbidity.<sup>11–14</sup> The evidence on the impact of reduction of DDI on improving neonatal outcome remains even more controversial. There has been mixed evidence from earlier studies with some showing an improvement of foetal outcomes with shortened DDI,<sup>15,16</sup> whilst others showed no improvement or even worsening of umbilical cord blood pH and APGAR scores with faster deliveries.<sup>9,11,17,18</sup> More recent studies on the effect of expedited CS delivery with DDI below or above 30 min did not show any improvement in neonatal outcomes.<sup>12,14,19–21</sup> A recent meta-analysis on DDI for category-1 and category-2 CS did not show any significant association between DDI and adverse foetal outcomes such as the APGAR score <7 or umbilical artery pH < 7.1 for category-1 CS.<sup>22</sup> The apparent lack of correlation between DDI and neonatal outcome seems counter-intuitive. However, compromised foetuses with poor outcomes and foetal acidosis tend to be delivered faster and often have poor outcomes regardless of the DDI.

Obstetric indication for emergency CS delivery is often connected to DDI. In particular, the extent and severity of non-reassuring foetal status are connected to DDI.<sup>23</sup> Therefore, one way to better appreciate the real influence of DDI on neonatal outcome is to consider separately category-1 CS with different indications or degrees of urgency. Leung et al. conducted a retrospective study on emergency CS performed for foetal bradycardia. The cases were categorised into three groups according to the cause of foetal distress: 1) irreversible (e.g. placental abruption, cord prolapse); 2) potentially reversible (e.g. iatrogenic uterine hyperstimulation, hypotension after epidural anaesthesia); 3) unknown. The irreversible group had a median foetal bradycardia-to-delivery interval 5 min shorter and a median DDI 1 min shorter than the other two groups. Furthermore, only within the irreversible group, the cord arterial pH decreased with the bradycardia-to-delivery interval (0.011 per minute), but not DDI.<sup>24</sup> Hence, there is a potential beneficiary effect of a speedy and expedited delivery on neonatal outcomes.

As undue haste to rush to deliver the neonate can increase the frequency and severity of surgical, anaesthetic, and potentially maternal complications,<sup>4</sup> the standard of achieving a 30-min DDI should be used as an audit standard but not a clinical recommendation.<sup>10</sup> It is not always realistic to achieve the 30-min standard in many obstetric centres.<sup>7,11,15,18,19,25</sup> The optimal DDI should be individualised for each case depending on the degree of urgency and as a logical balance between achieving better neonatal outcome and avoiding risks to the mother.

### 3. Team-based approach

An effective team-based approach for category-1 CS can improve the response time whilst ensuring safety for the mother and foetus.

#### 3.1. Teamwork

The obstetric service should have a dedicated team that consists of the obstetrician, anaesthetist, neonatologist and nursing staff (scrub, circulating and anaesthetic nurses). The multidisciplinary team is paramount to achieving a fast response time to operative delivery. Two studies reported that 100% of emergency CS were performed within 30 min at their obstetric units that have a dedicated obstetric team.<sup>9,26</sup> Situational awareness, consisting of the awareness of the clinical situation, team awareness and patient focus, is a vital part of good team-work<sup>27</sup> and should be practiced during training.

Senior and experienced healthcare staff should be involved at every stage of the decision to the end of surgery, especially during

after-office hours emergency CS delivery. A protocol that clearly defines the role of each member of the multidisciplinary team should be established for emergency CS. This would allow different tasks and preparations to be performed simultaneously whenever possible.<sup>4</sup>

A focused departmental protocol or programme can reduce the DDI with outcome improvement. Weiner et al. conducted a before and after study upon a departmental protocol aiming to reduce DDI for non-reassuring foetal status requiring emergency CS delivery. Strategies included documenting precise time intervals, using general anaesthesia for patients without regional anaesthesia, identifying obstacles and producing strategies to overcome them and having a debrief after each case. After implementation of the programme, the mean DDI decreased from 21.7 ± 9.1 min to 12.3 ± 3.8 min ( $p < 0.001$ ), associated with significant reductions in the rates of cord pH ≤ 7.1 and the 5-min Apgar score ≤ 7 ( $p = 0.016$  and  $p = 0.031$  respectively). There was no change in the composite maternal outcome.<sup>13</sup>

#### 3.2. Training

“Teams that work together should also train together, with regular training taking place on the labour ward ...”.<sup>28</sup> National bodies have recommended regular multidisciplinary team obstetric emergency simulation training.<sup>3,29</sup> Simulation training can result in better clinical management and communication skills whilst reducing any anxiety felt by individuals during real-life emergencies.<sup>30</sup> For example, team training in the management of cord prolapse has been shown to result in a significant reduction in mean DDI, an increase in the proportionate use of regional anaesthesia and a non-significant improvement in neonatal outcome measures.<sup>31</sup> Training should promote positive attitudes with constructive criticism and a flattening of hierarchy to encourage all staff to contribute.

This training can be performed at high-fidelity centres or in-house. In-house training offers several advantages including environmental fidelity, staff can become familiar with their own working environment and obstetric units can recognise local obstacles.<sup>30</sup> Courses such as PROMPT (Practical Obstetric Multi-Professional Training) are utilised internationally; this course is now part of mandatory training in 80% of English obstetric units.<sup>32</sup>

#### 3.3. Communication

Communication within the team is crucial to achieving a short DDI whilst avoiding unnecessary risks. Good communication should be fast and clear. A public announcement (PA) system can be used to inform the entire team immediately after a decision for emergency CS has been made. A prospective study adopting an emergency CS protocol involving the PA system demonstrated a short mean DDI of 7.7 min.<sup>26</sup> A classification system tailored to local practice may improve communication on the precise degree of urgency of the CS. Dupuis et al. showed that the introduction of a simple three-colour code to communicate the degree of urgency for CS reduced the mean emergency CS DDI by 8 min ( $p = 0.02$ ) in a French maternity hospital.<sup>6</sup>

Morgan et al. suggested that 87% of emergency CS are predictable,<sup>33</sup> thus when medical or obstetric high-risk patients have been identified, it must be communicated to the team, allowing them to make a plan if the situation deteriorates. This can be achieved by joint handovers and multidisciplinary ward rounds. This enables the planned and quick use of regional anaesthesia as opposed to an emergency general anaesthetic.

Good communication skills with all team members, the woman and her partner are crucial in the category-1 CS situation.

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