This case study will critically analyse the experience of a developing practitioner delivering emergency anaesthetic care in the obstetrics theatre, highlighting potential improvements to patient care, based on the reflective practice of the practitioner. Specifically, this case shows the importance of both clinical and non-technical skills as well as the effect of human factors on care delivery, underlining the importance of effective verbal and non-verbal communication, teamwork, situational awareness, and task management. Skills in leadership, management, problem-solving, interpersonal and reflective practice are crucial to help provide effective, efficient and safe service to patients. Developments in care provision have occurred in practitioner-led multidisciplinary reflection, such as the continued availability of video laryngoscopes in obstetric theatre.

Discussion of a high-risk pregnant mother escalated to category II emergency lower segment caesarean section (LSCS) highlighting perioperative anaesthetic risks associated with an obese parturient. The initial anaesthetic plan consisted of spinal anaesthesia, however, due to failure despite multiple attempts and ongoing foetal distress escalation to a general anaesthetic was sought. This case emphasised the potential for reflective development for the anaesthetist and practitioner, aiming to improve care delivery in future clinical practice.

According to the Nursing and midwifery council (2018), all identifiable data has been altered for privacy and confidentiality, therefore, the patient will be referred to as Sara and her partner as Tom. Sara, a 35-year-old parturient, first pregnancy at a gestational age 40+3, was in spontaneous labour, augmented by Syntocinon infusion. Despite regular contractions, she failed to progress with cardiotocography suggestive of foetal hypoxia. Sara was consented for an emergency caesarean section including a discussion of blood transfusion, if required, by the obstetrician. The anaesthetist consented for spinal anaesthesia and possible general anaesthesia if the spinal anaesthesia were to fail or become unsatisfactory. Sara had no significant medical comorbidities, except for an elevated BMI (40 kg/m2) measured at week 40. Sara reported no known allergies and an uneventful antenatal period. Her ASA grade was 2, due to pregnancy and obesity (Doyle, Goyal and Garmon, 2020).

The multidisciplinary team were informed of the decision to proceed with a category 2 section. National Institute for Health and Care Excellence (NICE) guidance (2021) suggests that in category 2 delivery should occur within 75 minutes of the decision to minimise the risks to the parturient and the neonate. The Team brief was conducted following the World Health Organisation (WHO) surgical safety checklist (2009), where the management concerns were discussed by the surgical, anaesthetic, midwifery, neonatal and theatre team.

The anaesthetic plan consisted of spinal anaesthesia with 0.5% Hyperbaric Bupivacaine and 300mcg of diamorphine; and in case of general anaesthesia, rapid sequence induction (RSI) with cricoid pressure and a size 7.5 cuffed endotracheal tube. The induction agent propofol (2mg/kg dose), the muscle relaxant rocuronium (1mg/kg dose), opioids, fentanyl and morphine to begin post-delivery of the baby. Warm IV Hartmann’s solution (1000ml), IV antibiotics cefuroxime 1.5g, Post-delivery, IV oxytocin 5IU bolus and 40IU infusion were prepared as per the trust policy (NICE, 2021).

Sara and Tom were brought to the theatre by a midwife, where the anaesthetic practitioner introduced himself. The second stage of the WHO checklist (Sign in) was performed by the anaesthetist, anaesthetic practitioner and scrub team, whereby the patient’s identity check was performed, along with a consent form verified using a surgical care pathway, theatre slip, wrist bands and verbally by Sara. Sara looked nervous, prompting the practitioner to start a conversation about her interests which calmed her down (Hamelin *et al*., 2012).

The Anaesthetic practitioner applied standard patient monitoring (Electrocardiogram, blood pressure and saturation probe) as per the Association of Anaesthetists of Great Britain and Ireland (AAGBI) 2021 guidelines. The midwife connected Sara to cardiotocography for continuous foetal monitoring. Sara had a working 16G cannula in her right hand where the fluid (Hartmann’s 1000ml) was connected. The anaesthetic practitioner maintained effective communication between Sara and Tom, reassuring and enhancing their experience while helping the anaesthetist with optimal spinal positioning. Sara cooperated well with positioning after reassurance from the anaesthetic practitioner. Sara was kept in a seated position while the shoulders were relaxed down and the spine curved back loosely to help identify and open up the intervertebral space (Fettes, Jansson and Wildsmith, 2009). Throughout the procedure, Sara and Tom were reassured and kept informed of ongoing events.

The spinal anaesthesia was attempted by the anaesthetic registrar under a strict aseptic technique. The landmarks were identified and local anaesthetic (5mls of 1% lidocaine) was given to numb the targeted area. Despite multiple attempts, using standard (25Gauge,90cm) and longer spinal needles (25Gauge, 115cm) the registrar failed to go into the intrathecal (Subarachnoid) Space. Senior help was sought from the consultant anaesthetist, who made a final attempt using a 25Gauge,115cm needle. This was also unsuccessful due to difficult landmarks. Meanwhile, the anaesthetic practitioner prepared a combined spinal-epidural pack, however, the obstetric team verbalised deterioration of the foetal condition and immediate threat to the fetus with prolonged bradycardia shown on cardiotocography. Therefore, the caesarean section was escalated to category 1B (NICE, 2021), which was communicated to the multidisciplinary team in the theatre by the obstetrician. NICE guidance (2021) suggests in category 1B, delivery of the baby should occur as quickly as possible within 30 minutes of the decision to achieve the best outcome. Hence, the anaesthetist decided to go for general anaesthesia with RSI after discussion with Sara, Tom and the theatre team to expedite the delivery to maintain the safety and wellbeing of Sara and her baby. Tom was escorted to the waiting room by a midwife according to trust protocol. To prevent acid aspiration syndrome Sara was given 30mls of 0.3M sodium citrate orally as antacid prophylaxis at a seated position to reduce the acidity of the gastric contents in the stomach (McGlennan and Mustafa, 2009).

Sara was positioned supine,15 degrees left lateral, aiming to minimise aortocaval compression improving the foetal blood supply (Palmer, 2015). An Oxford pillow was used to obtain an optimal head-up position to enhance the laryngoscope view. Mushambi *et al*., (2015) acknowledge that a head-up position during induction in an obese patient has been suggested as improving the success rate of intubation. Anticipating a difficult intubation, the anaesthetic practitioner contacted the main theatre for a video laryngoscope. All the intubation equipment was checked and prepared (as per AAGBI, 2021 guidance) including two working laryngoscopes (Macintosh 3 & 4), working suction, capnography, bougie, a size 7.5 endotracheal tube, and a size 7 endotracheal tube on standby. Delgado, Ring and Mushambi, (2020) suggest that parturient may develop upper airway conjunction and oedema during the late stage of pregnancy, therefore, sometimes smaller size endotracheal tube may require to secure the airway.

Despite being adequately fasted, RSI with cricoid pressure was chosen according to AAGBI (2021) pre-operative guidance as pregnancy and morbid obesity both can increase the chances of aspiration and Mendelson's syndrome (Salik and Doherty, 2022). Cricoid pressure was applied to minimise the risk of aspiration. However, Salem *et al.,* (2017)’s narrative review reveals that cricoid pressure may not be effective in preventing the risk of aspiration and it can also disrupt the view via laryngoscope if incorrectly applied.

The surgical team scrubbed, prepared and draped Sara to minimise the time between induction and the delivery of the baby. The emergency category 1B time out was completed following WHO and trust guidelines (WHO, 2009). Pre-oxygenation was performed for three minutes with five full breaths using a tight-fitting face mask. 99% end-tidal oxygen level was achieved. Saturation was maintained at 100% throughout the induction minimising the risk of desaturation during induction and intubation. Pre-oxygenation is significantly important in maternity patients since there is high oxygen demand and low oxygen stores (functional residual capacity) due to the gravid uterus compressing the lungs which could be worsened by obesity (Patel and Habib, 2021). Preoxygenation also maximises the time from induction to critical desaturation before the airway is secured (Shah *et al.*, 2016).

Application of cricoid pressure before induction of the anaesthesia was explained to Sara and induction was achieved using IV propofol 200mg, and rocuronium 100mg. According to McGlennan and Mustafa (2009), thiopental used to be a popular induction drug in caesarean sections due to being ultrashort acting for induction. Although propofol has a slightly slower onset of action than thiopental (Shah *et al*., 2017), propofol has various advantages for RSI in obstetric anaesthesia, such as availability, familiarity, reduced risks of medication errors, and greater suppression of airway reflexes (Delgado, Ring and Mushambi, 2020). Propofol is currently the best practice for RSI in pre-calculated doses (Wan *et al*., 2021). Ketamine, due to its slow onset of action is not used in RSI, despite offering more cardiovascular stability, except in haemodynamically unstable patients (Baekgaard *et al*., 2019).

Although for RSI, suxamethonium used to be the gold standard neuromuscular blockade (Fawcett, 2019), rocuronium, a non-depolarising muscle relaxant, was used due to its rapid onset of action, greater than any other non-depolarising neuromuscular blockade such as vecuronium or atracurium when used at the dose >0.6mg/kg and also with significantly fewer side effects when compared to suxamethonium, such as bradycardia, hyperkalaemia etc (Sinclair and Luxton, 2005). The availability of reversal agent sugammadex aided such popularity in facilitating the rapid reversal of the neuromuscular blockade (Sørensen *et al*.,2012).

Intubation was attempted with a size 4 Macintosh laryngoscope blade, but failed, citing a view of only the epiglottis, a high Cormack and Lehane view, grade 3 (Krage *et al.*, 2010). The anaesthetist re-oxygenated Sara using the tight-fitting face mask and 100% saturation was maintained. The anaesthetic practitioner suggested a video laryngoscope to the anaesthetist and connected the LoPro size 4 blade. A second intubation attempt was made using the video laryngoscope with a 7.5 endotracheal tube with stylet, which was successful. The anaesthetist and the practitioner utilised verbal, nonverbal and closed-loop communication such as cuff up, tube misting, bilateral chest movement and the capnography trace on the monitor were verbalised to confirm endotracheal tube position before taking off cricoid pressure (Smith and Mishra, 2010). The endotracheal tube was secured with ties and both eyes were closed and taped with transpore tape. The use of verbal, nonverbal and closed-loop communication improves safety by minimising confusion (Weller, Boyd and Cumin, 2014).

Surgery was commenced immediately, whilst patient monitoring continued. The anaesthetist set the ventilator setting to pressure control – volume guaranteed ventilation. Gad *et al.*, (2019) state this approach is becoming popular to ventilate patients with morbid obesity assisting with the ventilation while reducing the risk of barotrauma and volutrauma. Anaesthesia was maintained using sevoflurane, oxygen and air via a closed circle breathing circuit aiming for an age-related minimum alveolar concentration of 1. According to Roy and Garg, (2002), sevoflurane features a quicker onset time and recovery with minimum cardiovascular effects compared to other commonly used inhalation agents such as desflurane or isoflurane. It also has a lower risk of inducing uterine muscle relaxation, which is directly related to excessive intraoperative or postoperative bleeding (Gambling *et al*., 1995).

The anaesthetist confirmed with Sara if she had taken paracetamol within the last 4 to 6 hours to avoid overdosing and drug toxicity (Grundling and Ribeiro, 2020). As Sara had 500mg of paracetamol 6 hours previously, she was given Iv paracetamol 1g along with the antiemetics, IV ondansetron 8mg and IV dexamethasone 6.6mg. The combination of these antiemetics effectively reduces the risk of nausea and vomiting postoperatively (Bilgen *et al*., 2018). The baby was delivered within 3 minutes of the induction and handed over to the paediatrician. Post-delivery IV Syntocinon 5IU bolus was given, followed by IV Syntocinon 40IU infusion at a rate of 10IU/hour to aid uterine contraction to minimise blood loss. The operating table’s lateral tilt was reversed as requested. Post-delivery IV morphine 10mg and fentanyl 100mcg were titrated for analgesia (NICE, 2021). An antibiotic was requested and IV cefuroxime 1.5g was given to prevent infection (WHO, 2015).

The paediatrician confirmed that the baby was doing well and handed care over to the midwifery team. The antifibrinolytic agent tranexamic acid 1g IV was given upon surgical request to assist in controlling blood loss (Sentilhes *et al*., 2015). Blood loss was estimated as 480mls. As her cardiovascular status was stable throughout, blood transfusion was not required (NICE, 2015). Local anaesthetic infiltration of the wound in the form of 30mls of 0.5% levobupivacaine was given in addition to diclofenac 100mg suppository for post-operative pain management (NICE, 2021). Postoperatively Sara was reversed using IV sugammadex 200mcg since her neuromuscular monitoring was not favourable for reversal with neostigmine (Chambers *et al*., 2010) and extubated fully awake in the theatre. All documentation was completed, including the WHO surgical checklist, inpatient care pathway, cannulation and fluid balance charts in line with local policy (Klein *et al*., 2021). Sara was transferred to recovery for postoperative monitoring.

Obesity is common among 23.1% of the antenatal population in the UK (Denison *et al*., 2018). Along with the physiological and anatomical changes during pregnancy, obesity poses a notable risk to the parturient during the perioperative period (Habib and Lamon, 2016). Since 2003, the confidential enquiry into maternal deaths (CEMD) reports have found a substantial link between maternal obesity and maternal mortality (Patel and Habib, 2021). Sara had a BMI of 40 kg/m2 which is considered class 3 obesity according to the WHO classification (Weir and Jan 2021). It is recommended by the Royal College of Obstetricians and Gynaecologists (2015) that a parturient with a BMI greater than 40 kg/m2 should be preoperatively assessed and a delivery plan documented in detail by a senior anaesthetist (Denison *et al*., 2018).

Patel and Habib, (2021) recommend that neuraxial techniques are considered safer compared to general anaesthesia for obese patients unless contraindicated. Sara had no contraindications for spinal anaesthesia. Despite its rare adverse events, such as permanent nerve damage, spinal haematoma, infections and more frequent post-dural puncture headache, spinal anaesthesia provides very effective analgesia and optimal surgical conditions for caesarean sections while avoiding the need for general anaesthesia (Iddrisu and Khan, 2021). Neuraxial anaesthesia has a fast onset of action, reliable intraoperative and postoperative analgesia and a satisfactory duration of action to cover the average surgical time (Patel and Habib, 2021). Fettes, Jansson and Wildsmith, (2009) suggest that awake patients during the surgery can maintain their patent airway and haemodynamic compromise does not happen if the level of spinal block is optimised with a safe dose of spinal Bupivacaine along with proper patient positioning. Nevertheless, spinal anaesthesia can be technically challenging in obese patients due to anatomical factors, like excessive adipose tissue hindering localisation of the subarachnoid space (Habib and Lamon, 2016). In this case, Sara’s positioning was adjusted and different length needles were used. However, despite all these measures, spinal anaesthesia was unsuccessful. The decision for general anaesthesia was made due to the combined facts of foetal deterioration and failed spinal anaesthesia.

Effective communication among the multidisciplinary team, provided by the team brief, helped to deliver the right information at the right time. This provided a shared knowledge of patient needs in advance allowing for a smooth transition to the change of circumstance and a sense of urgency to deliver the baby with the escalation plan (Doumouras *et al.,* 2016). Teamwork, effective communication, and making decisions on time as well as good situational awareness are essential non-technical skills in an emergency (Toff, 2010). The way the practitioner communicates to the patients has a powerful impact on the delivery of care (Rutherford, Flin and Mitchell, 2012). In this case, Sara and Tom were informed compassionately with respect and a clear commitment to the care. Due to this fact, Sara and Tom both understood the urgency which led to a positive response to the practitioner’s request, resulting in Tom calmly leaving the room with the midwife. This effective communication also made both Sara and Tom feel comfortable and calmer about this potentially distressing situation. Sara was updated and reassured throughout the procedure which helped her to make an informed decision to have a general anaesthetic. The anaesthetic practitioner showed great leadership in delegating tasks appropriately and demonstrated problem-solving skills throughout anticipating the airway risk by organising a video laryngoscope from the main theatre while maintaining a calm and organised atmosphere by communicating effectively with the multidisciplinary team (Smith and Mishra, 2010). The team co-operated well, exchanging information effectively and prioritising tasks based on situational needs and decisions were made using a multidisciplinary approach (Jackson, Hayes and Hinshaw, 2013).

Application of cricoid pressure in RSI was performed to minimise the risk of aspiration, which is high during pregnancy (Soltanifar and Russell, 2011). Sara was positioned ramped to minimise gastro-oesophageal reflux while improving the functional residual capacity (Patel and Habib, 2021). After the first unsuccessful intubation attempt, the video laryngoscope was offered to be used for the second intubation attempt in line with the difficult airway society (DAS) guidelines (Delgado, Ring and Mushambi, 2020). A difficult airway trolley was kept close by. Gentle mask ventilation was administered before the second intubation attempt to re-oxygenate Sara while avoiding gastric insufflation of air, which could increase the risk of gastric reflux (Shippam *et al.,* 2019), however, it would have been prudent to choose a video laryngoscope initially given the patient was high risk, with anticipated difficult airway (Patel and Habib, 2021). These concerns were discussed at the team debriefing to improve the care in the future.

Special attention should be given to the anaesthetic drugs and dosing in obstetric anaesthesia. According to Delgado, Ring and Mushambi, (2020), anaesthetic agents used in current practice including induction drugs, opioids, and neuromuscular blockers have been suggested not to be teratogenic to the foetus. Cook *et al*., (2014) acknowledge that inadequate dosing at induction can cause accidental awareness while overdosing can cause haemodynamic fluctuations and may impede placental blood flow precipitating foetal distress. De Tina and Palanisamy, (2017) suggest opioids and sedative drugs can cross placental circulation and may blunt the foetal response on delivery, therefore, the surgery was expedited by the surgeons and opioids like fentanyl and morphine were delayed until the delivery of the foetus to minimise the risk (Neall, Bampoe and Sultan, 2022).

Sara had 1g of tranexamic acid and as per the WOMEN trial study, the early administration of tranexamic acid 1g reduced the number of maternal mortalities after childbirth by more than 30% (Shakur *et al*., 2017). Sara’s temperature was monitored throughout the surgery and patient warming and fluid warming were applied to prevent hypothermia which would further increase the risk of coagulopathy and bleeding (Klein *et. al.,* 2021).

Safe patient extubation is as important as intubation. Consequently, Sara was positioned head up and extubated once fully awake and once her respiratory mechanics were satisfactory, providing additional safety on minimising pulmonary aspiration and control of the airway as per DAS guidance (Saeed and Lasrado, 2022).

Emergency caesarean section in an obese parturient could inflict clinical dilemma when perioperative care is concerned. All the clinical challenges should be discussed among the theatre team and documented during the team briefing. The team should have a clear idea of planning, preparation, performance and post-procedure care of any high-risk surgical patient. Appropriate planning is imperative considering all the possible consequences in case of primary plan failure. Timely decision making is needed to improve the outcome for both mother and foetus in a safe clinical context. Patient management protocols such as failed spinal block or difficult airway management should be followed to ensure the best care for the patient. During general anaesthesia, a video laryngoscope should be considered as the first plan rather than the conventional Macintosh blades especially in high-risk patients in the obstetric theatre to optimise efficiency. In this case, the best outcome was achieved through the constructive use of non-technical skills in support of technical skills.

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