Shoulder dystocia: an Evidence-Based approach

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Summary

Shoulder Dystocia (SD) is the nightmare of obstetricians. Despite its low incidence, SD still represents a huge risk of morbidity for both the mother and fetus. Even though several studies showed the existence of both major and minor risk factors that may complicate a delivery, SD remains an unpreventable and unpredictable obstetric emergency. When it occurs, SD is difficult to manage due to the fact that there are not univocal algorithms for its management.
Nevertheless, even if it is appropriately managed, SD is one of the most litigated cause in obstetrics, because it is frequently associated with permanent birth-related injuries and mother complications.
All the physicians should be prepared to manage this obstetric emergency by attending periodic training, even if SD is difficult to teach for its rare occurrence and because in clinical practice it is often handled by experienced obstetricians.
The purpose of this study is to review the literature concerning the everlasting problems of SD: identification of risk factors for the early detection of delivery at high risk of SD and a systematic management of this terrifying obstetric emergency in order to avoid the subsequent health, medico-legal and economic complications.

Key words: shoulder Dystocia, obstetric disaster, operative delivery

Introduction

Most often an unpredictable and unpreventable obstetric emergency, Shoulder Dystocia (SD) continues to evoke terror and fear among physicians, nurse midwives and other healthcare providers (1,2). SD is defined as a delivery that requires additional obstetric manoeuvres to release the shoulders after gentle downward traction has failed. SD occurs when either the anterior or, less commonly, the posterior fetal shoulder impacts on the maternal symphysis or sacral promontory (3). Typically SD is heralded by the classic "turtle sign": after the fetal head is delivered, it retracts back tightly against the maternal perineum (4). In order to objectively define SD, Spong and colleagues (5) proposed defining shoulder dystocia as a "prolonged head-to-body delivery time (eg, more than 60 seconds) and/or the necessitated use of ancillary obstetric maneuvers". The 60-second interval was selected because, in their study, it was approximately two standard deviations above the mean value for head-to-body time for uncomplicated deliveries. Despite this recommendation, SD remains an entity without a clear definition (6).
Differences in reported rates are partly because of clinical variation in describing SD, the patient population studied and because milder forms may be over-diagnosed or under-diagnosed (1). The reported incidence ranges from 0,6% to 3% among vaginal deliveries of fetuses in the vertex presentation, but there can be a high perinatal mortality and morbidity even when SD is managed appropriately (7,8). Failure of the shoulder to delivery spontaneously places both the pregnant woman and fetus at high risk for permanent birth-related injury (1). Brachial plexus injuries are one of the most important fetal complications of SD, complicating 4–16% of such deliveries (7). This appears to be independent of operator experience (3). Most cases resolve without permanent disability, with fewer than 10% resulting in permanent brachial plexus dysfunction (9). In the UK, neonatal brachial plexus injury is the single most common cause for litigation related to SD (3), while SD is among the four most common causes of medical litigation (10) and has been estimated to account for up to 11% of obstetric claims.
Although it is recognised that not all brachial plexus injuries are due to excess traction and some brachial plexus injuries are not associated with clinically evident SD (11), good risk management requires that steps should be taken to address the possible prediction, prevention and management of SD, with good record-keeping standards throughout (12).Since the inception of the NHS Litigation Authority in 1995 it has received around 555 claims, in relation to SD, with an approximate value of £ 189.4 million.

Risk factors

It has been widely demonstrated that there are several risk factors associated with SD (Table 1) (3,6,13), even if it's still a largely unpredictable and unpreventable event because accurate methods for identifying which fetuses will experience this complication do not exist (Grade B of Recommendation) (1,3).
Proposed definitions for macrosomia include cases where the infant is large for its gestational age (greater than the 90th percentile for a given gestational age) or weighs more than a specific cut-off limit-most commonly 4000g or 4500g (6). A recent study stated that macrosomia (birth weight 3.5 kg or more) is the only reliable predictor of SD compared with diabetes and instrumental delivery (14). The overall incidence of SD varies based on fetal weight, occurring in 0,6 to 1,4 percent of all infants with a birth weight of 2500 g to 4000 g, increasing to a rate of 5 to 9 percent among the fetuses weighting 4.000 to 4.500 g born in mothers without diabetes (13). While several investigators proposed different Ultra-Sounds measurements to predict macrosomia and alert for a SD [Abdominal Circumference >350mm (15), Newborn Shoulder Width (16), 3D U-S weight estimation (17)], based upon level A Evidence ACOG states that "the diagnosis of fetal Macrosomia is imprecise"; nevertheless, ACOG supports the use of the 4.500 g cut-off to diagnose macrosomia because, at this weight, sharp increases are seen in risks of morbidity for infants an mother (18). The usefulness of U-S for prediction of macrosomia is further limited by the fact that fetal weight prediction is less accurate at higher birth weights (6); moreover, the third-trimester US scans have a sensitivity of just 60% for macrosomia (over 4.5 kg) (19).
SD it's more common in infants born to women with diabetes (20-22). Diabetes mellitus confers a risk of SD six times that of the normal population (23), and in births in which the SD is made, the risk of adverse neonatal outcome is higher when maternal diabetes is present (24). McFarland and colleagues (25) report that macrosomic infants of diabetic mothers are characterized by larger shoulder and extremity circumferences, decreased head-to-shoulder ratio, higher body fat, and thicker upper-extremity skin folds compared with non-diabetic control infants of similar birth weight and birth length. Whatever the cause of the increased risk of SD in this population, intensive treatment of diabetes reduces the risk of macrosomia and shoulder dystocia (26,6).
Maternal obesity is associated with macrosomia and, thus, obese woman are at high risk for SD (1). Similarly, prolonged pregnancies also increase the risk of macrosomia and therefore SD (6); advanced maternal age is associated with increasing incidences of coexisting medical desease, such as diabetes and obesity (6). Multiparous women are, on average, older and heavier than primigravida women. They are therefore more likely to have larger babies and are more likely to have or develop diabetes. In addition, multiparous women are more likely than primiparous women to have precipitous labors (second stage of labor < 15 minutes), that increase the risk for SD (27).
A history of SD is variable associated with a recurrence rate that differs among the different studies. A recent study (28) showed that about 12% of parturients with a history of SD have a recurrent Dystocia in the subsequent pregnancy, with a risk of about 1 in 8 (OR, 8.25; 95% CI). Overland & Co. (29) reported instead a recurrence risk of 7,3% in the second delivery highlighting that, however, the offspring birthweight was by far the most important risk factor. Either caesarean section or vaginal delivery is appropriate after a previous SD; the decision should be made by the woman and her carers (3). However, the true incidence may remain unknown because physicians and patients often choose not to attempt a trial of labor when there is a history of a complicated delivery or an injured infant (1).
In conclusion, with regards to excessive weight gain, prolonged pregnancy, advanced maternal age, male fetal gender, oxytocin augmentation, multipary and epidural anesthesia it is unclear whether their relationships with SD is an independent entity or a result of confounding variables (1,6). In each case, risk factors can be identified, but their predictive value is not high enough to be useful in a clinical setting (1,8). Therefore, SD cannot be predicted with sufficient accuracy to allow universal screening (30).

Table 1 - Risk factors for shoulder dystocia[3,6,12]

Maternal-Fetal (Pre-labour)	Itrapartum
Macrosomia	Prolonged active phase of first-stage labor
Diabetes (Gestational or Mellitus)	Prolonged second-stage labor
Maternal BMI > 30 kg/m2	Assisted vaginal delivery (forceps or vacuum)
Short stature	Oxytocin augmentation
Previous SD	Secondary arrest
Abnormal Pelvic Anatomy	Unappropriate Manoeuvres (fundal pressure)
Post-dates pregnancy	Epidural anesthesia
Advanced maternal age	
Male gender	
Induction of labour	

BMI, body mass index; SD, shoulder dystocia

Neonatal sequel – Maternal Sequel

Failure of the shoulder to delivery spontaneously places both the pregnant woman and fetus at high risk for permanent birth-related injury (Table 2) (13). The fetal and maternal morbidity increases with the number of manoeuvres employed to resolve SD (31). The most common complication for the parturient are haemorrhage and IV-degree perineal tears (32). Other maternal complications that have been reported include vaginal and cervical lacerations, and bladder atony (4). It should be noted that "heroic" measures, such as the Zavanelli maneuver and symphysiotomy, are often associated with significant risk of maternal morbidity (33,34).

The Brachial Plexus Injury (BPI: Erb-Duschenne's: damage to C5-C6 nerve roots; Klumpke's pulsy: damage to C8-T1 nerve roots) (35) are one of the most important and serious fetal complications of SD (3). Most cases resolve without permanent disability, with fewer than 10% resulting in permanent brachial plexus dysfunction (9). Reports of BPI during deliveries complicated by SD vary from 4% to 40% (6). Despite other studies (7,36), Suneet P Chauhan & Co. (37) comparing SD with and without BPI demonstrated that, among those with and without concomitant fractures, there is a significantly increased risk of BPI if three or more maneuvers are used rather than two or fewer. In conclusion, not only does the rate of SD and BPI following it occur at significantly different rates, the management differs too. Compared with two maneuvers or fewer, there is an increased risk of BPI if three or more maneuvers are used to relieve SD.

Although SD and disimpaction maneuvers historically have been blamed for the etiology of these palsies, BPI may occur in utero (38). Possible mechanisms of intrauterine injury include the endogenous propulsive forces of labor, in utero positioning of the fetus, failure of the shoulders to rotate, abnormal intrauterine pressures arising from uterine anomalies (such as fibroids, intrauterine septum, bicornuate uterus); all this conditions may also contribute to etiology of BPI (6,13,36). In fact, whether excessive traction applied at the time of delivery can cause injury the brachial plexus (6), on the other side not all injuries are due to excess traction by the accoucheur (39) and there is now a significant body of evidence that maternal propulsive force may contribute to some of these injuries (3). Moreover data suggest that a substantial minority of BPI are not associated with clinical evident SD (1,3,6), while a 4% of BPI occur after a Cesarean Delivery (40-42). Moreover, performance of electromyeolography soon after delivery (within 24–48 hours) can help determine the timing of BPI. Electromyelographic evidence of muscular denervation normally requires 10 to 14 days to develop. Its finding in the early neonatal period, therefore, strongly suggests an insult predating delivery (6).

Finally, other common morbidities from SD include fractures of the clavicle and humerus, which typically heal without deformities (13). Some severe cases of SD may result in hypoxic-ischemic encephalopathy and even death (1).

Antepartum-Prevention

As stated above, SD is a largely unpredictable and unpreventable event (Evidence level III, RCOG) (3). Anyway, in patients with a history of SD, estimated fetal weight, gestational age, maternal glucose intolerance, and the severity of the prior neonatal injury should be evaluated and the risks and benefits of Cesarean Delivery (CD) discussed with the patient [level C Recommendation, ACOG (1)].

Studies regarding Induction of Labor (IOL) are divided into three categories: IOL for macrosomia in nondiabetic patients, IOL for macrosomia in diabetic patients, and IOL for prevention of macrosomia in diabetics (6).

There is no evidence to support induction of labour in women without diabetes at term where the fetus is thought to be macrosomic (Grade A of Recommendation, RCOG) (3). The RCOG also affirms that elective caesarean section is not recommended to reduce the potential morbidity for pregnancies complicated by suspected fetal macrosomia without maternal diabetes mellitus (Grade C of Recommendation) (3). A study using a decision analysis model estimated an additional 2.345 CD would be required-at a cost of $ 4.9 million annually- to prevent only none permanent BPI resulting from SD if all fetuses suspected of weighting 4.000 g or more underwent CD (35). Although the diagnosis of fetal macrosomia is imprecise, planned CD to prevent SD may be considered for suspected fetal macrosomia with estimated fetal weights exceeding 5.000 g in women without diabetes and 4.500 g in women with diabetes (Level C of Recommendation, ACOG) (1).

IOL in women without diabetes for the sole indication of suspected macrosomia do not improve either maternal or fetal outcome (3) and it's not effective in decreasing the occurrence of SD or decreasing the rate of CD (43). ACOG states upon a level B of Recommendation that

Table 2 - Complications of SD[12]

Maternal	Fetal
Post-partum Hemorrhage	Brachial plexus palsy
III- or IV-degree episiotomy or laceration	Fetal death
Symphyseal separation or diathesis, with ora without transient femoral neuropaty	Fetal hypoxia, with or without permanent neurologic damage
Recto-vaginal fistula	Clavicle and humerus fractures
Uterine rupture	

"Elective IOL or elective CD for all women suspected of carrying a fetus with macrosomia is not appropriate" due to the fact that US is not an accurate predictor of macrosomia (1). Herbst & Co. (44), in a cost-effective analysis for the management of infants with an estimated fetal weight of 4500 g, suggested that expectant treatment is the most cost-effective approach to treatment of the fetus with suspected macrosomia in nondiabetic patients. In women with diabetes, adequate maternal glucose control should be maintained near physiologic level before conception and throughout pregnancy to decrease the likelihood of spontaneous abruption, fetal malformation, fetal macrosomia, intrauterine death and neonatal morbidity (level B of Recommendation, ACOG) (45). Early delivery may be indicated in some patients with vasculopathy, nephropathy, poor glucose control or a prior stillbirth. In contrast patients with well-controlled diabetes may be allowed to progress to their expected date to delivery as long as antenatal testing remains reassuring (43). However "expectant management beyond the estimated due date is generally not recommended" and in order to prevent birth injury, CD may be considered if the estimated fetal weight is grater then 4.500 g in women with diabetes (40) (level B of Recommendation) (45).

Intrapartum management

Timely management of SD requires prompt recognition. Excessive force must not be applied to the fetal head or neck, and fundal pressure must be avoided, because these activities are unlikely to free the impaction and may cause injury to the infant and mother (36,10).
The attendant health-carer should routinely observe for (Evidence level IV, RCOG) (3):
- difficulty with delivery of the face and chin;
- the head remaining tightly applied to the vulva or even retracting ("turtle sign");
- failure of restitution of the fetal head;
- failure of the shoulders to descend.

At this point, one of the major concerns is: How much time can elapse without risking fetal hypoxic injury? (6). When a SD occurs, umbilical cord compression between the fetal body and the maternal pelvis is a potential danger (13). Insult to the fetus from hypoxia results from compression of the neck and central venous congestion, as well as compression of the umbilical cord, reduces placental intervillous flow from prolonged increased intrauterine pressure, and secondary fetal bradycardia (47). Many studies tried to focalize the importance and relationship among SD, BPI and neonatal brain injury with mean umelical artery pH (48,49), head-to-body delivey interval and fetal acid-base balance (48), head–to-body interval and low Apgar (50). The fifth CESDI report on SD identified that 47% of the babies died within 5 minutes of the head being delivered (51). It is important, therefore, to manage the problem as efficiently as possible but also carefully: efficiently so as to avoid hypoxia acidosis, carefully so as to avoid unnecessary trauma (Evidence level III, RCOG) (3). For this reasons, SD should me managed systematically.
A clinical tool that offers a structural frame work for the management of SD is the HELPERR mnemonic from Advanced Life Support in Obstetrics (52):
H: call for help
E: evaluate episiotomy
L: legs (the McRoberts' manoeuvre)
P: soprapubic pressure
E: enter manoeuvres (internal rotation)
R: remove the posterior arm
R: roll the patient (all-fours position)
If SD is anticipated some pre-emptive preparation may help (Evidence level IV, RCOG) (3). Key personnel can be alerted, and the patient and her family can be educated about the steps that will be taken in the event of a difficult delivery. The patient's bladder should be emptied, and the delivery room cleared of unnecessary clutter to make room for additional personnel and equipment (13). Several clinicians are used to employ certain "shoulder precautions" (6). A Cochrane study (3) showed that there are no clear findings to support or refute the use of prophylactic manoeuvres to prevent SD (because it's not demonstrated weather altering maternal posture or applying external pressure to the mother's pelvis before birth helps the baby's shoulders pass through the birth canal). Moreover, the use of the McRoberts' manoeuvre compared with the lithotomy position, with the bed "broken down" such that the patient's buttocks are at the end of the bed (47), before clinical diagnosis of SD does not appear to reduce the traction force on the fetal head during vaginal delivery in multiparous women (54,55). Therefore its use cannot be recommended to prevent shoulder dystocia (Evidence level Ib, RCOG) (3).
Regarding to a systematic approach in the management of SD, the HELPERR mnemonic is designed to do one of three things (52): increase the functional size of the bony pelvis through flattening of the lumbar lordosis and cephalad rotation of the symphysis (i.e., the McRoberts maneuver); decrease the bisacromial diameter (i.e., the breadth of the shoulders) of the fetus through application of soprapubic pressure (i.e., internal pressure on the posterior aspect of the impacted shoulder); or change the relationship of the bisacromial diameter within the bony pelvis through internal rotation maneuvers. Clinical judgment always should guide the progression of procedures used (13). In any case fundal pressure should not be used for the treatment of SD because it could worsen the impaction, with subsequential risk of fetus or mother injury (56) (grade C of Recommendation, RCOG) (3,1).
H: after recognition of SD, extra-help should be immediately called, including further midwifery assistance, an expert obstetrician, a paediatric resuscitation team and an anaesthetist. Maternal pushing should be discouraged, as this may lead to further impaction of the shoulders, thereby exacerbating the situation. The woman should be manoeuvred to bring the buttocks to the edge of the bed. (Evidence level IV, RCOG) (3).
E: the SD is primary problem of bone impaction, so episiotomy alone should not release this situation (13,52). Due to effectiveness of McRoberts' manoeuvre and soprapubic pressure in resolving SD, the Managing Obstetric Emergencies and Trauma (MOET) Group suggests a selective approach, reserving episiotomy only to facilitate manoeuvres such as delivery of the posterior arm or internal rotation of the shoulders (57) (Evidence level IV, RCOG) (3). Thus, episiotomy is not necessary for all cases of SD (grade B of Recommendation, RCOG) (3).
L: McRoberts' manoeuvre is the single most effective in-

tervention and should be performed first (grade B of Recommendation, RCOG) (3). This maneuver involves hyperflexion of the maternal thighs against the abdomen. In this condition does not change the actual dimension of the maternal pelvis. Rather, the maneuver straightens the sacrum relative to the lumbar spine, allowing cephalic rotation of the symphysis pubis sliding over the fetal shoulder (58). These motions push the posterior shoulder over the sacral promontory, allowing it to fall into the hollow of the sacrum, and rotate the symphysis over the impacted shoulder (13). This position reduce delivery forces for endogenous load (maternal force) and for exogenous loads (clinician applied) (59) and increase the uterine pressure and amplitude of contractions (60). The success of McRoberts' manoeuvre in resolving SD (used either alone or in association with soprapubic pressure) is reported between 42% and 90% (3,6). The McRoberts' manoeuvre has a low rate of complication, therefore its performance is a reasonable initial approach (level C of Recommendation, ACOG) (1). Nevertheless, the investigators still recommend caution against overly continued and aggressive hyperflexion and abduction of the maternal thighs onto the abdomen (6) because this situation is often associated with increased traction that may lead to increase risk of BPI (36).

P: soprapubic pressure employed together with McRoberts' manoeuvre improve the success rate (grade C of Recommendation, RCOG) (3). It reduces the bisacromal diameter and rotates the anterior shoulder into the oblique pelvic diameter, The shoulder is then free to split underneath the symphisis pubis while continuing routine traction (61). The soprapubic pressure (Rubin I manoeuvre) should be applayed in a downward and lateral motion in order to push the posterior aspect of the anterior shoulder towards the fetal chest (grade C of Recommendation, RCOG) (1). Initially, the pressure can be continuous, but if delivery is not accomplished, a rocking motion is recommended to dislodge the shoulder from behind the pubic symphysis (13), but there's no clear difference in efficiency between these two movemetns (3).

If these simple manoeuvres fail, then there is choice to be made between the all-faour-position and internal manipulation, such as delivery of posterior arm and internal rotation (Evidence level III, RCOG); the individual circumstances, the clinical judgment and experience should guide the accoucheur in decide their order (3).

Continuing in the explanation of the HELPERR mnemonic from ALSO, they suggest the following order:

E: as previously stated, the decision to perform an episiotomy or procto-episiotomy must be based upon clinical circumstances, such as a narrow vaginal fourchette in a primigravid patient or the need to perform fetal manipulation (62). Delivery of the fetal shoulders may be facilitated by rotation into an oblique diameter or by a full 180-degree rotation of the fetal trunk (63,64) (Evidence level III, RCOG) (3). At times, it is necessary to push the fetus up into the pelvis slightly to accomplish the manoeuvres.

In the Rubin II manoeuvre, the accoucheurs hand is inserted into the vagina and with two fingers digital pressure is applied to the posterior aspect of the anterior shoulder pushing it towards the fetal chest. This rotates the shoulders forward into the more favourable oblique diameter. This motion will adduct the fetal shoulder, rotating it forward into the more favourable oblique diameter.

If the Rubin II manoeuvre is unsuccessful, the Woods corkscrew manoeuvre may be attempted.While maintaining the pressure of the Rubin II manoeuvre, the physician introduces the second hand and places two fingers on the anterior aspect of the fetal posterior shoulder, applying gentle upward pressure to move the posterior shoulder into the oblique diameter. This motion creates a more effective rotation, and downward traction should be continued during these rotational maneuvers. If this movement is unsuccessful, continue rotation through 180° and attempt delivery.

If the Rubin II or Woods corkscrew maneuvers fail, the reverse Woods corkscrew maneuver may be tried. In this maneuver, the physician's fingers are placed on the back of the posterior shoulder of the fetus: thus, the rotation of the fetus is in the opposite direction as in the Woods corkscrew or Rubin II maneuvers. This maneuver adducts the fetal posterior shoulder in an attempt to rotate the shoulders out of the impacted position and into an oblique plane for delivery (13).

R: delivery may also be facilitated by delivery of posterior arm (Evidence level III, RCOG) (3). The Jacquimier manoeuvre effectively reduce of 20% the bisacromial diameter (6), allowing the fetus to drop into the sacral hollow, freeing the impaction of the anterior shoulder under the symphysis (52). To perform the maneuver, pressure should be applied by the delivering provider at the antecubital fossa to flex the fetal forearm. The arm is subsequently swept out over the infant's chest and delivered over the perineum (6). The fetal trunk will either follow directly or the arm can be used to rotate the fetal trunk to facilitate delivery (3). This manoeuvre may be indicated particularly when the mother is large (65) (Evidence level III, RCOG) (3), although grasping and pulling directly on the fetal arm and applying pressure onto the midhumeral shaft may cause humeral fracture (66), even though these injuries typically heal without any long-term morbidity (47).

R: the "all-fours" position exploits the effects of gravity and increases space in the hollow of the sacrum to facilitate delivery of the posterior shoulder and arm (67). Moving the laboring patient to her hands and knees is often sufficient to the shoulder to dislodge (52). Once the patient is repositioned, the physician provides gentle downward traction to deliver the posterior shoulder with the aid of gravity. The all-fours position is compatible with all intravaginal manipulations for SD, which can then be reattempted in this new position (13). For a slim mobile woman without epidural anaesthesia and with a single midwifery attendant, the all-fours position is probably the most appropriate (Evidence level III, RCOG) (3).

If the manoeuvres described above in the HELPERR mnemonic are unsuccessful, several techniques have been described as "last-resort" (52) or third-line manoeuvres (3). These includes:

- Cleidotomy (deliberate clavicle fracture): applying upward digital pressure on the mid-portion of the fetal clavicle decreases the bisacromial diameter but increases significantly the risk of BPI and pulmonary vasculature (6);
- Zavanelli manoeuvre (cephalic replacement followed by CD): may be most appropriate for rare bilateral SD (Evidence level III, RCOG) (3) unresponsive to more commonly used manoeuvre; is associated with a signif-

icantly increased risk of fetal morbidity and mortality and of maternal morbidity (1);
- Symphysiotomy (intentional division of the fibrous cartilage of the symphysis under local anesthetic): there is a high incidence of serious maternal morbidity and poor neonatal outcome (Evidence level III, RCOG) (3);
- Hysterotomy (Cesarian section under general anesthesia): transabdominal rotation of the shoulder with vaginal delivery or cephalic replacement and abdominal delivery;
- General anesthesia (musculo-skeletal or uterine relaxation).

Post-partum Management: (Training)

After delivery, the birth attendants should be alert to the possibility of postpartum haemorrhage and third- and fourth-degree perineal tears (3). In case of BPI, independently of the etiology, the care of newborn should involve a multidisciplinary approach including pediatrics, pediatric neurology, physical therapy, and possible referral to a brachial pleuxus injury center. The care plan should be clearly communicated with the parents (6).
As previously stated, although its low incidence SD is one of the most cause of medical litigation. For this reason accurate documentation of a difficult and potentially traumatic delivery is essential (3). Following all complicated deliveries, measurements of umbilical cord blood gases must be obtained, a discussion with the patient and family must be held, and the events of the delivery must be documented by all care-team members involved (6). Parents are usually traumatized by the events and they deserve complete, immediate, and accurate information regarding the delivery, the maneuvers used, and the rationale behind management (47).
The sixth CESDI annual report highlighted inadequate documentation in obstetrics, with potential medico-legal consequences (15).
It is important to record:
• the time of delivery of the head
• the direction the head is facing after restitution
• the manoeuvres performed, their timing and sequence
• the time of delivery of the body
• the staff in attendance and the time they arrived
• the condition of the baby (Apgar score)
• umbilical cord blood acid-base measurements.
It is particularly important to document the position of the fetal head at delivery as this permits identification of the anterior and posterior shoulders during the delivery. Unfortunately, some publications have noted incomplete documentation in the majority of SD deliveries; a legal case with inadequate documentation can be difficult to defend (6).

Conclusion

In conclusion, despite its infrequent occurrence, all healthcare providers attending pregnancies must be prepared with a high level of awareness and training to handle vaginal deliveries complicated by SD (2,10,51). Annual skill drills, including SD, are recommended jointly by both the RCM and the RCOG (69) (Evidence Level IV, RCOG) (3). For this reason a team-oriented approach is necessary for the management of SD (6).
A formalized activation system, good leadership and good organization of team members, with each member well trained in the management of obstetric emergencies, helps facilitate a smooth delivery of the fetus (47). While it's difficult to demonstrate a benefit of training (70) and the optimal frequency of the reharsal (3), same Authors (71,72) demonstrated that a simulation-training scenario, also with maniquin, improves the overall performance in the management of SD, such as timeliness of manoeuvres, reduction in head-to-body delivery duration and maximum applied delivery force (Evidence level III, RCOG) (3).
Key factors in successfully managing of SD include constant preparedness, a team approach and appropriate documentation (6). Future directions include further research on accurate prediction of risk factors for SD and periodically skill-drills.

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