

Veterinary Technician Program

Assisting with Calvings: the Role of the Veterinary Technician

David R. Smith*, DVM, PhD, DACVPM (Epidemiology); **Douglas Hostetler**, DVM, MS;
Sherry Westphal, BS, LVT

Department of Veterinary and Biomedical Sciences, University of Nebraska-Lincoln, Lincoln, NE 68583-0905

**Corresponding author: Dr. David R. Smith, University of Nebraska-Lincoln, P.O. Box 830905, Lincoln, NE 68583-0905, E-mail: dsmith8@unl.edu*

Abstract

The veterinary technician can be of valuable assistance in difficult calving situations. First, the technician can advise the producer when veterinary care may be needed by knowing predisposing factors to dystocia in the dam and calf and recognizing the signs that indicate a need for birthing assistance. Second, technicians familiar with the uses of obstetric equipment can be prepared to help the veterinarian use them efficiently. Third, technicians with knowledge of common dystocia scenarios and aftercare can help assure an efficient delivery and increase the probability for a successful outcome. Finally, the technician can play a critical role in protecting the health and safety of the people and animals by remaining vigilant for hazards and maintaining sanitation and hygiene.

Résumé

Les techniciens vétérinaires peuvent être d'une aide précieuse dans les situations de vêlages difficile. Premièrement, les techniciens peuvent aviser le producteur quand des soins vétérinaires ou un vêlage assisté sont requis, grâce à leur connaissance des facteurs qui prédisposent à la dystocie chez la mère et son veau et des signes avant-coureurs de celle-ci. Deuxièmement les techniciens familiarisés avec le matériel obstétrique peuvent aider le vétérinaire efficacement dans ses manipulations. Troisièmement, les techniciens qui connaissent les scénarios habituels de dystocie et les soins qui y sont reliés peuvent faciliter le vêlage et accroître les chances qu'il réussisse. Finalement, les techniciens peuvent jouer un rôle critique dans la protection de la santé et de la sécurité des gens et des animaux en restant des assistants attentifs à tout danger et qui maintiennent les mesures sanitaires et hygiéniques appropriées.

Introduction

Eutocia is the normal process of giving birth.⁴ Normal birthing is a complex process that proceeds as a continuum, but is characterized by three stages: Stage 1, initiation of uterine contractions to place the fetus into birthing position; Stage 2, the entry and passage of the fetus through the birth canal; and Stage 3, the passage and elimination of fetal membranes. Dystocia is defined as a difficult birthing process.^{4,7} Dystocia may be immediately life threatening to the dam or her fetus and increases the risk for post-parturient (dam) or post-natal (newborn) diseases.⁷

Dystocia occurs with relative frequency in cattle and often presents as a true veterinary emergency.⁴ Resolving dystocia depends on the veterinarian's ability to efficiently determine and resolve the cause of the dystocia without causing undue damage to the cow or her calf. The veterinary technician can play a crucial role in the successful resolution of bovine dystocia, and the technician's ability to assist the veterinarian during obstetrical procedures is made easier with familiarity of the causes of dystocia, methods to resolve dystocia, recognizing and knowing how to use and care for the tools of obstetrics, and how to work safely in the calving environment.

What Causes Dystocia?

Dystocia may be due to factors of the dam or the calf.^{4,7} Cow factors of dystocia include immaturity, uterine inertia, lack of abdominal pressing, uterine torsion, failure of the cervix to dilate, pelvic shape, metabolic diseases such as milk fever, and abnormal maternal placenta (hydrallantois). Heifers have more dystocia problems than cows because they haven't yet reached mature skeletal size or muscular strength.

Calf factors of dystocia may be abnormal presentation, position, posture, or size of the fetus, abnormalities of the fetal membranes (hydramnios), multiple fetuses, and prolonged gestation. Presentation, position, and size are described relative to the dam. Presentation describes the direction the calf is facing relative to the birth canal (e.g. head first is an anterior presentation; rear first is a posterior presentation). Position describes the rotation of the calf's dorsum on its long axis relative to the cow's pelvis, (e.g. an upside down calf is in a dorso-pubic position; when rolled upright it moves into a dorso-sacral position). Posture describes the position of the head and limbs of the fetus relative to its trunk (e.g. a unilateral shoulder flexion or left or right lateral neck flexion). Fetal-maternal disproportion (a large calf relative to the dimensions of the birth canal) is the most common cause of dystocia in cattle.⁷ Fetal size is a function of genetics, gender (bull calves tend to be larger than heifer calves), and gestation length.

How do you Recognize Dystocia and When Should Clients Call for Help?

Veterinary technicians may find themselves in the position of coaching clients over the phone about when to intervene in a calving, and when they should seek veterinary help. It is often a challenge to recognize dystocia in cattle in a timely fashion because outward signs of dystocia may not be evident and because of the difficulty and potential harm of restraining cattle for repeated examination. Guidelines for how long each stage of labor should take are useful, but not always appropriate. For example, if a calf is malpostured the sooner the correction the better, regardless of waiting the prescribed period of time for Stage 2 of parturition. On the other hand, restraining cattle for an unnecessary obstetric exam may needlessly delay normal calving and could result in needless injury to the cow, her calf, or the people involved.

There may be few signs that a cow has begun the first stage of labor; she may seek seclusion, there may be signs of restlessness with frequent lying down and standing up, and there may be visible signs of colic or contractions. The tail may be held in an elevated position. The first sign of Stage 2 is often the presence of the fluid-filled amniotic membrane; clear signs of abdominal pressing with contractions should be evident. A vaginal examination should be conducted on cattle that have been in Stage 1 over six hours or in Stage 2 for over two hours. Cattle should be examined at any point in time if progress has stopped for 30 minutes to an hour, if the cow has quit trying for over a 15 to 20-minute period, or if there is a visual indication that something could be wrong (e.g. observing toes pointing downward, or only the calf's tail).

Cattle producers should be advised that they should seek veterinary assistance when they: 1) don't know what is wrong; 2) know what is wrong, but either don't know what to do, or recognize it is beyond their abilities; or 3) know what is wrong and what to do about it, but they have been unsuccessful after 30 minutes of trying.⁵ Once the veterinarian has committed to the call, the producer should be advised to not continue their attempts at delivery, and to let the cow rest until the veterinarian arrives.

What Can be Done about Dystocia?

Veterinarians have three primary options to resolve dystocia: 1) attempt vaginal delivery (fetal manipulation and/or forced extraction); 2) surgical delivery (cesarean section); or 3) dismemberment of the calf (fetotomy). In rare circumstances, the best resolution of the dystocia may be humane euthanasia of the cow. Regardless of the method, bovine obstetrics can be exhaustive to the veterinarian. The assisting veterinary technician is invaluable in helping to maintain optimal conditions to reduce the veterinarian's work load and the time involved by anticipating the need for equipment and supplies.

Two important fundamentals of obstetrics are maintaining high standards for hygiene and lubrication. Both are important to avoid post-parturient complications due to trauma or infection. It is much easier to maintain sanitation when the technician is able to keep soap and water readily available, assist the veterinarian with donning obstetrical sleeves and clothing, and keep the perineum washed and rinsed between procedures. Similarly, lubrication of the birth canal is enhanced if the technician is ready with the appropriate lubricant (e.g. methylcellulose or mineral oil).

Obstetrical Equipment and its Care

Veterinarians use a variety of obstetrical tools and supplies depending on the circumstances (Tables 1 and 2). In general, obstetrical tools are specific to vaginal delivery, surgery, or fetotomy, although some items, such as buckets, soap, chains, and handles, may be common to all. It is important for the veterinary technician to recognize the tools, understand their purpose, and to organize them accordingly.

Regardless of the procedure, it is imperative that the tools be sanitary and available at the time they are needed. That means that a system for cleaning, organizing, and storing the equipment must be in place prior to the obstetric call. Obstetrical membranes and fluids are good media for bacterial growth which could result in post-parturient infection, so it is very important that equipment be cleaned and sanitized between

obstetric calls. The equipment is much easier to clean immediately following the obstetric procedure than after membranes and fluids have had a chance to dry. It is essential to clean the fetotome immediately after use; the instrument is exceptionally difficult to clean only a few hours later. After being sanitized, equipment must be dried before packing to prevent rust, packed to prevent contamination, and organized to be found when needed.

Restraint of Cattle during Obstetrical Procedures

Very often the cow will need to be restrained before an obstetric examination is possible, and obstetric calls are notorious for situations which lack adequate facilities for restraint. Livestock chutes are usually poor places for delivering calves; however, if a livestock chute is available, and the cow is adequately ambulatory, it may be helpful to restrain the animal in the chute for the initial vaginal examination and to halter the cow. From there, the cow may be tied low to a post and released from the chute for additional obstetric procedures. Sometimes it is useful to cast the cow with ropes so that the work can be done with the cow in recumbency. Even recumbent cows should be restrained with a halter in case they decide to run off midway through the job. Tranquilizers and general anesthetics are less desirable methods of restraint because they may adversely affect the calf, but sometimes they are essential to relieve the anxiety of a nervous or agitated dam, or when surgery is

indicated. The use of local anesthesia, such as a caudal epidural, is common.

Assisting with Obstetrics

During obstetric calls the technician may be responsible for keeping the site organized and assisting with procedures. Often the location is less than desirable in terms of comfort, space, lighting, and hygiene. The technician is likely to be setting up supplies, placing chains, assisting with traction, handing over tools or materials, threading the fetotome, or making fetotomy cuts, so it is important to know beforehand how to perform these tasks. Items like chains and handles are easily misplaced by the veterinarian or producer, especially at critical moments. This is no time to be on hands and knees rummaging through the bedding looking for a critical lost tool.

Post-natal and Post-parturient Care

Immediately after the dystocia is resolved, there may be a live calf which requires care. The most urgent needs are for resuscitation and acid-base balance correction; later it will be important to address colostrum intake and other aspects of preventive health care. Initially, the calf should be placed in sternal recumbency if it is not up on its own within about five minutes, elevating the neck with the nose and mouth pointing down. Stimulate breathing with a piece of straw inside the nostril; this should elicit a sneeze which will clear

Table 1. Equipment and supplies for obstetric procedures in the bovine.

Protective clothing	Fetal extractor
Obstetrical sleeves	Eye hooks
Obstetrical lubricants	Calf snare
Soap, disinfectant scrub	Scissors and scalpel
Bucket and dipper	Fetotome with wire-threader and brush
Towels	Krey hook
Halters, lariat, casting ropes	OB wire, handles, wire introducer, and cutters
OB chains and handles	Fetotomy knives
Detorsion bar	Buhner needle and umbilical tape

Table 2. Ancillary supplies for obstetric procedures in the bovine.

Epidural and paravertebral needles	Esophageal feeder
Syringes and hypodermic needles	Calcium, magnesium, and dextrose intravenous solutions
2% lidocaine	Clippers (spare battery if necessary), extra blades
Surgical gloves	Surgical drapes
Nasogastric tube and pump	Mineral oil
Sodium bicarbonate, epinephrine, doxapram	
Surgery pack (scissors, hemostats, needle holders, scalpel, and blades)	
Endotracheal tubes, mask, Ambu bag or commercial resuscitator, oxygen source	
Suture and needles (#0 -#2 absorbable and non-absorbable suture, cutting and tapered needles)	

airways. If needed, further suction debris from the nose and mouth. Rub the calf's head and body vigorously with towels. Suspending the calf upside down does not drain airways but rather the abomasum, so the sternal posture is best. Additionally, hanging the calf upside down increases intrathoracic pressure, making breathing more difficult for the calf.⁶ If respiration is still not stimulated, the use of an Ambu bag or commercial calf resuscitator may be in order. When using a mask to resuscitate, manual pressure on the esophagus will help prevent air from entering the abomasum instead of the lungs.¹ Calf resuscitators are equipped with a two-way valve that permits their use for aspiration of fluids as well as for ventilation. They also are volume-controlled to prevent over-inflation of the lungs, so there is a clear advantage; however, their cost may not be practical for your practice. Disinfection of the mask between uses can be accomplished by soaking in a 1:20 v/v bleach solution. Finally, intubation and administration of oxygen to create positive pressure within the lung may be required to initiate respiration. The veterinarian may also choose to use medications for cardiac and respiratory support.²

Once the calf is breathing, ongoing assessment of vital signs is important so the technician may alert the veterinarian to potential problems. It is very common for calves to have difficulty regulating body temperature following dystocia; therefore, monitoring of rectal temperature is a good idea. Normally, a calf should have a temperature of 102-103°F (39-39.5°C) at birth, which will decline over the next hour to 101-102°F (38.5-39°C). A dystocia calf may have a higher than usual temperature at birth, which declines to a greater extent over time.³ If it is necessary to warm the calf, remember to use heating devices with caution and frequent monitoring, and remove them when the calf's temperature reaches a couple degrees lower than optimum because the calf will continue to warm up.³ Navel care can be accomplished according to the veterinarian's protocol. Finally, the technician's duties may extend to ensuring that colostrum is administered, often by esophageal feeder, the amount of which may be determined by the veterinarian.

The dam may also need post-parturient care. She may have metabolic needs for supplemental calcium, magnesium, or dextrose. There may be wounds to attend, such as suturing an episiotomy or incision closure after cesarean section. Post-parturient care should be anticipated and the appropriate supplies stocked in advance.

Safety

The calving environment is often dangerous. Some of the hazards are the cow in dystocia, other cattle in the herd, the equipment used for restraint (e.g. ropes, halters, chutes, and gates), and the equipment used for

obstetrics (e.g. chains, scalpels, and fetal extractor). It is important to evaluate the calving site upon arrival for potential safety hazards, and to continue to re-evaluate safety as the case continues. The veterinary technician is often in a better position to evaluate and recognize potential hazards and protect the safety of themselves, as well as the veterinarian and producer, who may have their attention focused on the immediate task at hand. Periparturient cattle are unpredictable; they may be defensive of their calf, or their mentation may be altered because of metabolic disease (e.g. milk fever, hypomagnesemia, or ketosis). Defensive or alarmed behavior of other cattle in the herd, including bulls, may not be noticed by the veterinarian or the producer because their attention is focused on another problem. Lubricants make floors slippery, and tools like fetal extractors may swing wildly as the cow shifts position. Speak up whenever the situation appears unsafe. An unseen hazard, and one difficult to fully evaluate, is exposure to zoonotic pathogens common to cattle populations like *Salmonella*, shigatoxin-producing *Escherichia coli*, and *Coxiella burnetti*. Assume these pathogens and many other zoonotic pathogens are present and take efforts to clean up well after the job is done.

Conclusion

The veterinary technician can be a valuable resource during obstetrical procedures. To add value, the veterinary technician must understand the causes of dystocia, methods to resolve dystocia, the tools of obstetrics and how to care for them, and how to work safely in the calving environment.

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Appendix 1. Dystocia Scenarios

1) *Routine assisted delivery: Normal presentation, position, and posture with possible mild uterine inertia or maternal exhaustion.*

The first question the technician should ask of the veterinarian is "Will we need an epidural?" Based on

the veterinarian's preference, the amount of maternal straining, the duration of the dystocia, and the position of the fetus, caudal epidural anesthesia or analgesia may be indicated. Some practitioners routinely perform an epidural on all dystocia cases, while others have defined criteria for epidural anesthesia. If caudal epidural anesthesia or analgesia is expected, the initial equipment should include clippers or a razor, scrub and prep solution, an 18-gauge by 1.5-inch needle, a 10-12 cc syringe and the desired anesthetic or analgesic agent. Most veterinarians will prefer to use 2% lidocaine HCl as a local anesthetic for the caudal epidural anesthesia. A rule of thumb is to use 0.1 mg of lidocaine HCl per pound of body weight or 1 cc of 2% lidocaine HCl per 200 pounds of body weight. With practice, a technician can estimate the body weight and have the appropriate amount of lidocaine drawn up in anticipation of the veterinarian's request. The volume should always be double-checked prior to administration!

Procedures involved in initial patient preparation include clipping and surgical preparation of the sacrococcygeal region in anticipation of a caudal epidural injection, tying the tail, and cleansing of the perineum. Identification of the injection site for a caudal epidural injection involves locating the most proximal movable intervertebral space at the tailhead. To locate the most proximal movable intervertebral space, the tail is grasped at the level of the ventral commissure of the vulva and the tail is lifted like a "pump handle" while palpating the dorsal intervertebral spaces with the free hand. The most proximal space, where the first or second finger of the free hand is forced from the intervertebral space while the tail is lifted, is the proposed site of epidural injection. A 10 cm x10 cm area centered on the proposed injection site is clipped or shaved and aseptically prepared. While the veterinarian is administering the epidural injection, the technician should prepare a section of clothesline or light rope for the tail tie.

A 12-foot section of clothesline is of sufficient length to tie the tail of most cows. A sheet bend knot with a quick release is used to secure the rope to the switch of the tail. The free end of the rope is then passed across the cow's back to the opposite forelimb. The free end of the tail tie is passed around the elbow and secured with a quick release knot. By crossing over the cow's back, the tail is lifted away from the vulva. By securing the tail to the cow, accidental traumatic amputation of the distal tail is prevented. After the tail is secured to the cow, and not to an inanimate object, the perineal area can be cleansed in preparation for the obstetrical examination.

The vaginal prep can be accomplished in a variety of ways. Some practitioners use a disinfectant scrub followed by a tap water rinse while other practitioners prefer non-irritating dish soap applied with cotton swatches

until the vulva is clean. The primary goal is to prepare the perineal region so that minimal contamination of the uterine environment occurs during the vaginal examination. Following preparation of the perineum a sterile obstetrical sleeve is offered to the veterinarian and sterile lubricant is applied to the external surface of the sleeve. The initial examination is performed with a sterile sleeve and sterile obstetrical lubricant to decrease the risk of uterine contamination until a cesarean section has been ruled out.

During the vaginal examination the technician should prepare an obstetrical chain or strap to be placed on a leg of the calf. The chain should be presented to the veterinarian with a loop formed in one end of the chain. The technician should practice presenting the chain so the veterinarian need only advance a hand into the loop and proceed with placement on the limb. While the first chain is being placed on a leg, the technician should prepare the second chain, as previously described, and hold an OB handle to apply gentle traction to the first leg chain during placement of the second chain. While the second chain is being placed, the technician should obtain the second handle from the disinfectant bucket and be prepared to present the head snare or eyehooks. Following placement of the second leg chain, or head snare or eyehooks if requested, the assisted delivery is initiated.

Initially, traction is applied to each leg in an alternating pattern to insure the elbows are in full extension. Alternating leg traction is continued to "walk" the fetus into the pelvis while the head is directed by the veterinarian. This process may take several minutes to allow the vagina and vulva to stretch under moderate pressure. Once the fetus has "crowned" and the thorax is in the pelvic canal, the technician switches hands on the handles (left handle to right hand, right handle to left hand) to allow the calf to rotate approximately 45 degrees with additional traction. This rotation will allow the widest portion of the calf's pelvis to enter the dam's pelvis at the angle of greatest diameter. Failure to rotate the pelvis may increase the likelihood of creating a "hip lock" condition. Hip lock occurs when the pelvis of the calf becomes lodged in the pelvic canal of the dam. During the rotation of the calf, the direction of traction is directed ventrally with respect to the dam. The redirection of the traction will allow the calf to better conform to the slope of the dam's pelvis, decreasing the force required to extract the calf.

As the calf continues through the pelvic canal, care should be exercised to prevent the calf from falling to the floor with excessive force. Once the calf is delivered, the chains and handles are removed from the calf and returned to the disinfectant bucket. The veterinarian will reenter the cow to determine if another fetus is present or if vaginal lacerations requiring attention are

present. The technician will usually be responsible for care of the neonate while the vaginal reexamination is performed.

2) *Assisted delivery: Abnormal fetal posture*

Following patient preparation and vaginal examination, the veterinarian determines that a malposition or postural abnormality is present. The veterinarian may need to repel the fetus into the uterus to allow repositioning of the fetus. In some cases, a Kuhn's crutch is required to allow repulsion of the fetus a sufficient distance for fetal repositioning. Umbilical or obstetrical tape may be used to secure the Kuhn's crutch to a proximal limb during repulsion. Following repositioning, the fetus may be delivered with the techniques described in a routine assisted delivery, an assisted delivery with a fetal extractor, or a fetotomy depending on concurrent findings.

3) *Assisted delivery using a fetal extractor ("calf jack")*

Following patient preparation, vaginal examination, and placement of the obstetrical chains, as previously described, the veterinarian decides that additional traction will be required to deliver the calf. Whether the fetal extractor is unloaded upon arrival or when required depends upon the veterinarian's preference. Unloading all of the equipment potentially required for a dystocia will decrease the time spent waiting for equipment during the procedure, but will also increase the amount of time required to clean up and load the truck following the procedure.

The technician obtains and assembles the fetal extractor and places the breech bar at the level of the escutcheon, midway between the vulva and udder. A strap, rope, or string frequently is attached to each side of the breech bar and passed over the cow's back, cranial to the tuber coxae, to prevent the fetal extractor from sliding down to the cow's hocks. The obstetrical chains are attached to the fetal extractor under traction and the "slack" is taken up with the ratchet mechanism on the extractor. The obstetrical chain handles should be returned to the disinfectant bucket. Care should be exercised to avoid "jacking" the calf through the pelvis. Excessive force applied to the chains can fracture the calf's legs and cause unnecessary trauma to the birth canal and intrapelvic nerves of the dam. Instead, once the slack in the chain is taken up, the bar of the fetal extractor is slowly rotated ventrally to apply gentle traction on the chains. Once the fetus has started moving into the canal, the bar is lifted and the slack in the chains is taken up again with the ratchet. While the thorax of the calf is in the pelvic canal of the dam, rotate the calf so that the calf's hips enter the dam's pelvis at an angle to prevent hiplock. The process is repeated until successful delivery of the calf has occurred.

Once the calf has been delivered, the chains and handles are removed from the calf and returned to the disinfectant bucket. The veterinarian will reenter the cow to determine if another fetus is present or if vaginal lacerations requiring attention are present. While the vaginal reexamination is performed, the technician will usually be responsible for care of the neonate.

4) *Fetotomy: Dismemberment and delivery of a dead calf*

Following patient preparation, vaginal examination, and placement of the obstetrical chains, as described previously, the veterinarian decides that the calf cannot be delivered intact through the birth canal and cesarean section is not feasible. Fetotomy is an acceptable procedure to decrease the probability of intraoperative abdominal contamination with uterine contents associated with cesarean section with an emphysematous fetus. The technician should know the location of the equipment required for a fetotomy. Specific equipment required for a fetotomy should be stored together and easily accessible in the truck or clinic. The equipment can be set up on a covered table or, on an ambulatory call, a drape-covered bale of straw.

Initially, the technician should examine the fetotome to insure the wire passages are free from obstruction secondary to improper cleaning or improper assembly post-cleaning. A length of embryotomy wire four times the length of the fetotome, approximately 148 inches (376 cm) should be cut. One end of the wire is threaded through the fetotome and attached to an embryotomy wire handle. If a limb or the fetal head will be directed through a loop of wire for removal, the free end of the wire is threaded through the fetotome and attached to an embryotomy wire handle. If the free end must be passed around a body part before threading, the free end is then attached to a wire introducer or weight and passed to the veterinarian. Following passage of the wire around the body part, the veterinarian returns the free end to the technician. The introducer or weight is cut from the free end and returned to the disinfectant bucket. The free end of wire is then threaded through the fetotome with the wire threader. The orientation of the fetotome should always remain constant to avoid twisting of the embryotomy wire between the fetotome and the fetus. Twisted wire wears and breaks easily. Following placement of the embryotomy wire, slight tension is applied to both wire handles to prevent kinking of the wire during introduction of the fetotome into the vagina. The fetotome is slid down the wire until the cranial end of the fetotome is in the desired position. The veterinarian controls the intrauterine portion of the fetotome to protect the uterine wall. The technician therefore, will operate the wire saw.

The wire is pulled through the fetotome in an alternating pattern to allow the wire to saw through the

soft tissue and bone. Long, smooth strokes with rotation at the hips are used with slight back pressure to prevent kinking of the wire. Rapid, short strokes require more energy and use only a very short section of the wire resulting in premature wire wear and breakage. Ideally, the wire should be replaced following each cut but in reality, most practitioners reuse the wire at least once before replacement during a fetotomy. When the wire requires replacement, the technician should work efficiently to present the re-threaded fetotome to the veterinarian as soon as possible. As each body part is delivered, the technician should direct the producer to place the part in a location that will allow the veterinarian to see which parts remain in the cow. Following complete delivery of the fetus, the first duty of the technician should be to pass the threader through the fetotome to remove as much hair and tissue as possible. When all of the instruments have been gathered and returned to the truck the fetotome should be thoroughly cleaned and rinsed with copious amounts of water and a mild disinfectant to prevent clogging of the wire passages with hair and tissue. All tissue should be removed from all instruments and chains, and the equipment disinfected, before storing them in the truck. Used wire is discarded.

5) Cesarean Section: fetopelvic disproportion, incomplete cervical dilation, predelivery uterine or cervical involution, uterine torsion, abnormal presentation, position, or posture

The role of a veterinary technician during cesarean sections in cattle will vary widely between practices and situations. The duties commonly performed by technicians include patient preparation, instrument set-up, non-sterile assistance, assistance with fetal delivery, neonatal care, instrument clean-up and resterilization, and restocking of equipment. Prior to arrival at the farm or presentation of the patient to the clinic, the major role of the technician should be to organize the equipment and materials required for the surgery.

Organization of the surgical equipment in the ambulatory truck might include an itemized inventory with locations of materials noted on the inventory. Another technique, space permitting, would be to create a surgical tote that includes all of the equipment and materials required to perform a celiotomy and cesarean section. Following the initial vaginal examination, when the veterinarian determines that a cesarean section will be required, the technician can grab the tote from the truck and everything is at hand for the procedure. Equipment and supplies in the tote should be layered in the order that things will be used.

Patient preparation for a cesarean would include positioning and clipping the cow, performance of the mechanical prep, performance of the aseptic prep, and

assistance with the local anesthetic administration. If the surgery will be performed in the same location as the initial examination, the technician should double check on which approach the veterinarian wishes to use prior to clipping. In some practices, all cesarean sections are performed through the left paralumbar fossa or left paracostal approach, while in other practice situations, the approach will vary depending on the veterinarian's preference or the position of the fetus within the uterus. In the latter situation, double checking the approach will prevent the embarrassment and wasted time from clipping both sides of the animal. When clipping the cow, wide margins will mean a longer preparatory time but can prevent contamination of the abdomen during manipulation of the uterus and fetus. Additionally, if regional anesthesia such as a proximal paravertebral block will be performed, the block site should be included in the clipped area. The mechanical prep should concentrate on the removal of organic debris from the entire clipped area, the surgical field, and the hair surrounding the clipped area depending on the amount of organic debris present. The number of scrub/rinse cycles and time of the mechanical prep will be determined by the amount of organic debris present in the surgical field. Following the mechanical prep, an initial 5 minute aseptic prep should be performed prior to blocking the region or incision site with local anesthetic.

If a proximal paravertebral nerve block will be performed, the technician should have a sterile 18-gauge, 6-inch needle, a sterile 14-gauge, ½-inch needle, a sterile 10-35 ml syringe, a sterile 18-gauge 1-inch needle, and at least two 100 ml bottles of 2% lidocaine HCl organized. These items can be stocked in a small plastic container within the surgery tote mentioned above. If a distal paravertebral nerve block, an inverted "L" block, or a line block will be performed, the local anesthetic box should contain several 18-gauge, 1½-inch needles, a 35-60 ml syringe, and at least two 100 ml bottles of 2% lidocaine HCl.

Following the nerve block, the technician will be responsible for setting the surgical table, assisting the veterinarian in preparing for surgery (gowning, gloving, etc.), and presenting sterile supplies (blades, suture material, sterile obstetrical sleeves) to the veterinarian. Cesarean section-specific equipment, beyond that required for a rumenotomy or exploratory laparotomy in cattle, are two obstetrical chains and handles. Some surgeons prefer a straight Keith's abdominal needle for the uterine closure.

Some practices will have a technician scrubbed in to increase the efficiency during the procedure by anticipating the instrument needs of the veterinarian and keeping the instruments organized and clean. A sterile technician would also assist with controlling the uterus following delivery to decrease abdominal contamination.

During delivery, an extra set of experienced hands can help lift the calf out of the uterus while maintaining an aseptic field.

After the delivery of the calf, the technician is usually responsible for neonatal care. At the conclusion of

the procedure, the technician gathers and organizes the instruments and equipment and repacks the truck for the return to the clinic or the next call. Upon arrival at the clinic, the truck will need to be restocked and the instruments sterilized.