



Scheduling and Performing Elective C-section in Dogs

*Using C-sections to Maximize a Breeding Program
Agendando e realizando cesariana eletiva em cães*

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*Summary

1. Decision making
2. When to plan a C-section
3. Timing
4. C-section prep
5. Anesthesia
6. Surgical procedure
7. Maternal Support
8. Puppy Resuscitation
9. Unplanned C-section
10. Managing a whelping at the veterinary hospital

•Basic concepts

- A. Do NOT cut corners
- B. Good timing
- C. Good anesthesia
- D. IV fluids
- E. Great team of staff
- F. Teamwork with the Breeders and your Veterinary Team

Breeders and veterinarians share 2 great fears: the 1st and most devastating is the loss of a dam “in whelp”. The 2nd is the loss of a litter or an overwhelming number of pups. A 10% to 40% loss of pups is reported to be a “normal loss”. This staggering figure is difficult to substantiate and sources do not always indicate if it includes loss from conception to 12 weeks of age or from birth to 12 weeks of age. Losses that exceed 10% warrant veterinary investigation. If an underlying cause can be determined, the remaining pups in that litter as well as pups in subsequent litters can be protected. Under the best circumstances, we must recognize that there will be unavoidable losses. Neonates are fragile; disorders that are mild in an adult or slight alterations in environment often have much more severe consequences in the neonate.

1. Decision Making

- **Do not be afraid of a c-section!**
- Safer now than ever
- IV fluids
- Faster & safer anesthesia
- Earlier intervention
- Planned c-sections
- More live puppies from c-section than free-whelping

2. When is a planned C-Section recommended?

A. Large litter > 9 – why a c-section?

Dams whelping litters of 9 or larger tend to have prolonged labors, due to the numbers of pups to deliver. During this prolonged labor, the uterus and the dam tend to become exhausted. Additionally, the uterus contracts over and over, causing premature placental separation, and the distance from uterine horn tip to vaginal vault is longer. As a result, we see more pups born dead in



the last ½ of the pups born. For this reason, a scheduled c-section has the benefit of producing more live pups.

B. Small litter1 to 2 pups – why a c-section? Labor is initiated by pups, not by the dam. As pups grow and begin to become crowded and outgrow their placental capacity, pups become stressed. As they stress, they produce cortisol, initiating labor. In smaller litters, there are fewer pups and less crowding, leading to less cortisol production. This in turn leads to the dam not going into labor at day 62 or 63 of gestation, but rather 64 or as long as 70 days. In this amount of time, the placentas deteriorate – the placenta was only meant to function for 63 days. Additionally, in litters with fewer pups, they grow larger as the gestational period is longer. This means the pups may become oversized, and difficult for the dam to deliver.

C. Breed

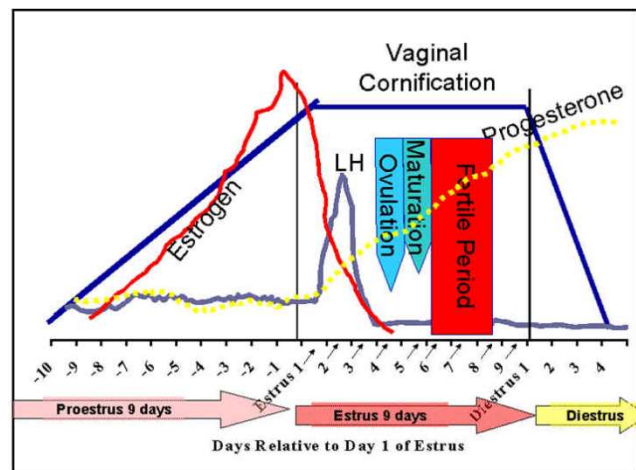
D. Maternal history

1. Pelvic fractures
2. Vaginal strictures/septum or hyperplasia
3. Limited semen
4. Herpes
5. Position or size of pups
6. Illness

7. Previous C-section

E. Tips for radiographs - Essential

1. Fasting
2. “Matching”
3. Or suppository
4. Right and Left lateral
5. Digital X-rays
6. After day 55 of pregnancy



3. How does timing the breeding help time the C-Section?

Progesterone levels are the backbone of timing dams for breeding. Progesterone testing is useful in determining when a dam should be receptive for a natural breeding in cases where either the female or male is reluctant to breed. Additionally, knowing her progesterone levels at the time of breeding allows us to predict within 48 hours when she should whelp. This information can save money, time, and puppies.

As soon as the client notices their dam is in season, have them contact your clinic. If you are planning to use frozen or fresh chilled semen, it is helpful if the client has notified you in advance. You can assist in arranging shipment of the frozen semen prior to the start of her heat cycle. Also help arrange for supplies and manage the details of shipping fresh semen.

The first progesterone level should be drawn on day 6 of the dam's heat cycle. If the dam has a history of short cycles, the first progesterone should be drawn at the first sign of estrus. Recommend the client repeats the progesterone testing every 2 to 3 days until the dam's progesterone rises to 3 ng/dl; it should be repeated the next day. A progesterone of 3 ng/dl indicates she is very close to ovulation.

Ovulation occurs when the progesterone is 5 ng/dl (4-8). It is recommended to have at least one more progesterone 2 to 3 days after her progesterone reaches or exceeds 5 ng/dl to assure the dam has completed her ovulation. We typically breed 2 days after 5 ng/dl if using fresh or fresh chilled semen. We typically breed 3 days after 5 ng/dl if using frozen semen IF the progesterone reaches or exceeds 20 ng/dl. Many dams will have a progesterone level of 15 to 40 ng/dl at the time of the breeding; this is normal. We breed 7 days a week, including holidays, based on your dam's ideal time for breeding.

The following are guidelines for submitting blood samples for progesterone levels:



1. Submit the sample to an approved laboratory for a Canine Progesterone assay whenever possible. Include the date and TIME the sample was drawn on the requisition form. The sample should be placed in a non-barrier tube (not an SST tube), spun down, and the serum transferred into a transport tube. In-office semi-quantitative tests (such as ICG or Camelot Farms) are not accurate enough to use for this situation. Submit samples to Antech, IDEXX, or a local human hospital that can provide verified and prompt results to have a progesterone level run there as they are not species specific.
2. Draw and submit the first sample on day 6 of the dam's cycle. Draw the sample on day 3 of her cycle if she has been brought into heat with medication or has a short proestrus. If the first date is not known, submit at the earliest time you are contacted by the client.
3. Subsequent tests are run approximately every 2 to 3 days but this will vary based on the results and the day of the week upon which this falls.
4. Breed 2 to 3 days after the progesterone level begins to rise above 5 ng/dl. In many dams, this rise can be very rapid.

Sometimes, there is a client who wants to plan a c-section but did not do progesterone timing of the breeding. This leads to more challenges in scheduling a c-section prior to the dam going into labor.

How can this be handled? By using as many of the following as possible:

1. "Reverse" progesterone - c-sections are usually safe if the progesterone is under 2 ng/dl and the dam's progesterone did not drop prematurely. Unfortunately, progesterone drops at the termination of a pregnancy are not linear and are not the same for every dam. The progesterone can hang at 3 ng/dl for a week or it can drop from 10 ng/dl to 1 ng/dl in 12 hours.
2. Ultrasound – intestinal motility and renal papillae structure
3. Skeletal maturity – radiographs showing the pups toes and teeth are calcified
4. Lactating
5. Nesting behavior

4. **Managing the C-section = Preparation for Success**

• **Planners save puppies**

• **C-section Preparation for owner**

- Know Due date
- Bathe - Chlorhexidine
- Pack
- Cell phone
- Gas in the car
- A crate for the pregnant dam to travel in
- Sleep – have the client be well-rested
- Adaptil pheromone collar
- Fasting – the dam should not be fed for 8 or more hours pre-op
- Blankets and towels
- A heat source for the pups
- An ice chest or other sturdy box to take the pups home in
- A bulb syringe and DeLee mucus trap in case pups are born on the way to the hospital
- A way to tie and cut umbilical cords

• **Staff C-section Prep** Prior to induction for the surgical procedure, the doctors and staff should briefly discuss their plan for managing the puppies and dam to be certain they are familiar with equipment location, have adequate drugs and supplies, and all staff is familiar with their duties to maximize efficiency.



- 18-24 hours pre-op
- Methylprednisolone sodium succinate– 1 mg/lb IV → lung maturity
- Metoclopramide 0.3 mg/kg TID → lactation
- Adaptil pheromone collar → maternal skills

The day of the C-section

The veterinary team should have a checklist of supplies and equipment to have ready

A list of the sequence of events to help the team coordinate the many steps needed for an efficient procedure

Methylprednisolone sodium succinate – IF not administered prior – at least 1 hour prior to surgery unless the pups are in trouble

Ultrasound to assure pups have good heart rates and the pups are mature enough to go to surgery

Shave her belly

Wrap her tail

Blood work

EKG pre=op

IV catheter + IV fluids

–Atropine

–Calcium 10% Gluconate SQ

–Metoclopramide

–IV fluids

–Oxygen

–Blood work

–EKG

–Ultrasound

–IV Fluids

–Oxygen -face mask

–Metoclopramide

–Clip in advance

–C-section “team”

–Checklist

–Speedy

–Endotracheal tube

–NO spay

•Prior to anesthesia

–Atropine → fetal heart rates

–Calcium → maternal skills

–Metoclopramide → lactation

–IV fluids → maternal and fetal blood flow

–Oxygen

–Tail wrap → hygiene

–Shave belly → minimal time before pups

C-section Set up

Paperwork:

- Patient Record, including breeding dates and ovulation timing and medical history
- Surgery consent form – signed by the owner, after informed consent is given.
- Anesthesia form
- C-section surgical report
- C-section discharge sheet
- Patient ID band

Induction/IV setup:



- IV Catheter
- Mouth Gag
- 1" white tape for IV catheter
- Endotracheal Tube
- Ties for Endotracheal tube
- Laryngoscope
- Bland eye ointment
- IV injection port
- Saline flush for IV flush

Surgery Room Set-up:

- Lactated Ringer or fluid of the doctor's choice, kept warm for abdominal flush
- Colloids – hetastarch if necessary
- Surgery table
- V-tray or surgery table with V capability
- Heating source for the dam – be careful to avoid anything that could cause thermal burns
- Towels ready to support rear of dam if needed
- Sterile Lap towels – 2 large and 4 small
- Surgery gown – 1 per person scrubbing in
- Surgery caps and masks for all in the surgical suite
- Scalpel blade
- Suture for closing the uterus, abdominal wall, subcutaneous tissue and skin
- Surgery pack, large – with a system for an instrument and gauze count
- 4 to 8 towel clamps
- 1 Metzenbaum scissors
- 1 Mayo scissors
- 1 thumb forceps
- 1 scalpel handle
- 2 straight carmalts
- 2 curved carmalts
- 5 curved Kelly forceps
- 3 curved mosquito forceps
- 1 needle holder
- Surgery gloves
- Duct tape to keep long coated hair away from the incision site
- Puppy ID towels – 1 set of each colored sterilized/non-sterilized

Drugs to set-up for the dam:

- Atropine injectable
- Butorphanol injectable
- Buprinex injectable
- Calcium for SQ injection
- Lidocaine or bupivacaine
- Metoclopramide injectable (Reglan^R)
- Oxytocin
- Post-op pain medication injectable
- Propofol or Alfaxan injectable
- Solu-Medrol 1 to 24 hours pre-op

Drugs to set-up for the neonate:

- Caffeine tablets*
- Ceftiofur – keep frozen reconstituted*
- Dexamethasone
- Dextrose*
- Dopram – 0.1 cc per pup
- Epinephrine diluted 1:10*
- Lasix injectable



- Vitamin K injectable

*Pre-dilute just prior to anesthetic injecti

Puppy Set-up:

- Non-sterilized set of colored towels matching sterilized set in the surgery suite
- Heating pads
- Puppy scale (weight in kilograms preferred)
- Stethoscopes
- Laryngoscope or otoscope with large tip to aid in neonatal intubation
- Sterile umbilical pack (needle holder and hemostat)
- Suture for umbilical cords
- Laundry baskets or large Styrofoam boxes
- Bulb syringes
- DeeLee mucous traps
- Endotracheal tubes suitable for puppies – Cole tube, tom cat catheters, red rubber feeding tubes cut and end smoothed to allow for ventilation or large bore IV catheters (prepare these in advance, clean and can be reused)
- Stylet for endotracheal tube
- Face masks, small fitted with diaphragm for neonatal ventilation
- Tincture of iodine, in contained to dispense to client – to dip cords in, disposable
- AmbuBag, pediatric and End to adapt endotracheal tube to fit Oxygen hoses or Ambu bag
- O₂, with regulator turned on or Oxygen concentrator
- Incubator
- Hair blow-dryer to aid in drying off wet neonates
- Dog dish, disinfected, for warm water bath to use to warm neonates

Additional set-up to keep work area clean and safe:

- Place non-slip mat in under surgery table
- Place towels in work area and around surgery table

Sequence of events:

- Arrival of the dam with possible or confirmed dystocia
- Exam room with blanket for dam to nest on during evaluation
- Palpation/vaginal digital exam
- Episiotomy if indicated (pup trapped in vagina by stricture) should be done ASAP
- Technician to take history and assist with examination
- Assess the dam - PE/TPR/Blood pressure of dam
- Radiograph and or ultrasound as indicated
- Examination glove and lubricant (KY jelly^R, Nolvalube^R, or J-lube^R)
- Incubator or basket with heat source for pups
- Towels
- Supplies and drugs as listed for neonatal resuscitation
- Owner signs consent form to allow anesthesia and surgical procedure after informed consent with doctor, discussing options and risks
- Pre-surgical blood panel with protime if available/progesterone if available
- Doppler or abdominal ultrasound to assess pups heart rates if available
- Administer drugs to the dam: small animal atropine injectable (1 cc per 20 pounds SC or 0.02 to 0.04 mg/kg (0.01 to 0.02 mg/lb) IV, IM, SC, using atropine 0.54 mg/ml), Metoclopramide injectable at 0.3 cc per 10 pounds SC, calcium at 0.5 ml per 10 pounds SC (dosed at 0.2 to 0.4 mg/kg, using metoclopramide 5 mg/ml), and Solu-Medrol^R SLOWLY IV (at 1 mg/lb based on the dam's body weight, using 125 mg/2 ml). Start with Solu-Medrol^R to provide maximal time from administration to induction.
- Place IV catheter & start fluids – stabilize before proceeding if indicated
- Start oxygen by face mask or other administration if tolerated by dam.
- Administer antibiotics only if indicated by condition of dam and pups
- Shave abdomen before anesthesia



- STOP! LOOK AROUND TO BE SURE ALL SUPPLIES AND STAFF ARE IN PLACE AND READY TO MOVE QUICKLY
- Move dam to surgery room
- Induce anesthesia with Propofol^R or Alfaxan^R
- Bland eye ointment apply to protect her eyes
- Mouth gag, intubate and inflate cuff/secure tube with tie
- Place the dam on surgery table with left side slightly rolled down
- Attach anesthetic machine and monitors
- Continue IV fluids at rate on chart per hour
- Scrub the site with Nolvasan^R and alcohol alternating preps or routine surgical prep per your hospital protocol while the doctor is scrubbing in, avoiding scrubbing the sebum off the nipples
- Roll her onto back and secure in final position as doctor prefers – be sure she is in a comfortable position with her head, neck, and back level, avoid tipping head down (avoid gastric reflux which can cause irreparable damage to esophagus)
- Prep again in case final positioning contaminated surgical field
- Open supplies – gown/gloves/surgery pack/blade/towel clamps/drape/suture/lap towels/puppy towels

Caesarean Section Procedure

| DAM | PUPS |
|---|--|
| <input type="checkbox"/> Increase Gas if light or titrate with Propofol or Alfaxan | <input type="checkbox"/> Clear membranes off the face ASAP, keeping pup tilted head down and face out of pooled fluids. Hand to waiting tech in sterile colored towel to start rubbing. |
| <input type="checkbox"/> Metacam ^R (at 0.18 ml/10#sq) or Rimadyl ^R (at 4.4 mg/kg sq) after last pup | <input type="checkbox"/> Suction with bulb syringe and/or DeeLee mucus trap |
| <input type="checkbox"/> Suture uterus <input type="checkbox"/> | <input type="checkbox"/> Monitor/assist with respirations |
| <input type="checkbox"/> Oxytocin p r n <input type="checkbox"/> | <input type="checkbox"/> Stethoscope and Doppler to check for heart beat if not obvious |
| <input type="checkbox"/> Belly flush and eliminate soiled lap towels | <input type="checkbox"/> Oxygen as needed – face mask or chamber |
| <input type="checkbox"/> Re-glove | <input type="checkbox"/> Acupuncture if needed 25 g needle in upper lip |
| <input type="checkbox"/> Closure of abdominal wall, sq and skin | <input type="checkbox"/> Dopram ^R &/or Caffeine to stimulate respirations (controversial). Dopram ^R must not be given unless the airway is open, oxygen is being administered and the pup is at least 10 minutes old |
| <input type="checkbox"/> Wash disinfectant off skin with saline along mammary chain so pups can nurse without ingesting surgical scrub | <input type="checkbox"/> Intubate trachea if needed, or use face mask ventilation, begin ventilations with O ₂ |
| <input type="checkbox"/> Apply DAP collar | <input type="checkbox"/> Check for cleft palates and other defects/treat |
| <input type="checkbox"/> Prepare discharge instructions | <input type="checkbox"/> Ligate umbilical cord/treat with tincture of iodine |
| <input type="checkbox"/> Make up meds for owner to take home – Metacam ^R / Reglan ^R / Nolvasan ^R / Nemex ^R / +/- Antibiotics | <input type="checkbox"/> Mark pups with corresponding color to map of uterine location |
| <input type="checkbox"/> Remove IV catheter AFTER/IF entire dose of IV fluids have been administered and OK with attending veterinarian | <input type="checkbox"/> Weigh pups and placentas, record <input type="checkbox"/> Photographs of pups |
| | <input type="checkbox"/> Assist pups in nursing |
| <input type="checkbox"/> Discharge the dam and pups, being sure you have shown the owner how to tube feed and care for the pups, and all instructions and supplies are sent home with the breeder | <input type="checkbox"/> Reweigh pups after nursing <input type="checkbox"/> Place in oxygen/incubator or warmed basket <input type="checkbox"/> Prepare warmed transport container for travel home |
| | <input type="checkbox"/> Blot or dab pups with reserved amniotic fluid to increase dam's acceptance of pups |
| | <input type="checkbox"/> Administer plasma to ineffective nursers or all pups |



| | |
|--|---|
| <input type="checkbox"/> Discharge pups and dam to owner | if colostrum is not available <input type="checkbox"/> Discharge pups and dam to owner |
|--|---|

5. Anesthesia

- Elective C-sections in Dogs
- Propofol or Alfaxan induction
- Then sevoflurane or isoflurane maintenance
- Then Metacam^R/Rimadyl^R
- Tramadol???
- Oxytocin IV after last suture is tied
- Elective C-sections in Dogs
- Puppy Vigor: Paula Moon 2002
- Are c-sections safe?
- 807 cesarean derived litters – 3908 puppies
- 109 practices – Canada and USA
- Survival immediately, at 2 hours and 7 days after delivery
- **Survival rates – Moon 2002**
- Elective C-sections in Dogs
- MUST avoid
- Ketamine
- Rompun/Domitor/Dexdomitor
- Methoxyflurane
- Local anesthesia only

• C-section anesthetic protocols – Paula Moon 2002

Factors correlated with increased

1. Surgery – not an emergency
2. Dam - not brachycephalic
3. 4 puppies or less in the litter
4. No deformed puppies
5. All pups breathed spontaneously/
6. 1 vocalized spontaneously
7. NO methoxyflurane gas, ketamine nor xylazine/dexdomitor/domitor

6. The Surgical procedure

C-section Tips and Tricks

- Checklist – steps & supplies
- Pre-shave to minimize time from anesthetic induction to delivery of 1st pup.
- Left side down during prep to keep weight off aorta, roll onto her back at incision time
- Colored towels
- Marked gauze – radiographically visible, count before and after
- Count instruments – count before and after
- IV fluids
- Intubation for protected airway and oxygen/anesthetic gas delivery
- Adhesive drape – to minimize scrubbing sebum off the dam’s nipples – helps pups nurse better



Closing the uterine wall – single layer closure, 2-0 absorbable suture – Utrecht - <https://www.youtube.com/watch?v=zcLrHrBRCLg>

- Abdominal Wall – Simple Interrupted –
- 0 suture on medium – large dogs
- 2-0 SQ and Subcuticular
- Skin - Ford Interlocking - <https://www.youtube.com/watch?v=6fqBGWFqAGs>

- Can I spay her on the table at the C-section?
- NEVER RECOMMENDED
- It will not affect milk production.
- The ovary is not involved in milk production or maternal skills
- RARE to find uterus so badly damaged it is necessary
- 30% Blood loss and hemorrhage make this too risky

7. Maternal Support for C-sections

- Adaptil Collar – improved maternal skills – put on 3 days before surgery/whelping
- Placental fluid – save, send home in a bottle to dab on the pups.
- Oxytocin IV after last uterine knot is tied – for maternal skills and reduce uterine bleeding – give SLOWLY IV or the dam's heart rate will plummet
- Metoclopramide – to improve lactation
- Calcium orally
- Post op pain medication – NSAIDs – Carprofen or Meloxicam

• Maternal aggression – minimized with a pheromone collar, oxytocin and calcium

- Reduces risk of
- 1. Eclampsia
- 2. Aggression toward pups
- 3. Aggression toward visitors
- Administer SQ, Gel, Tablets, Powder

- 1. PAIN MEDICATIONS:
Meloxicam or Carprofen
- 2. Metoclopramide for lactation
- 3. Narcotics???

8. Puppy Resuscitation

Many steps and tips- beyond the scope of this presentation.
But please use the:

- a. DeLee Mucus Trap – alternating with a bulb syringe.
- b. Incubator and Oxygen Concentrator

9. The Unplanned C-section

- When is a C-Section indicated?
- Call at the first signs of labor/pre-labor
- 1. Green discharge or meconium before 1st puppy is born



- 2. Dam is sick, weak or distressed
- 3. Dam has not eaten > 24 Hours or is Vomiting excessively
- 4. Hard labor more than 1 Hour on the 1st puppy or there is more than 3 hours between pups
- 5. Pup seen but not delivered – an Episiotomy may be a consideration
- 6. Vaginal Exam - Odd position = head back/mouth open
- Or her labor is Not progressing
- 7. Rectal Temperature drops & returns without progress within 4 hours
- 8. Pregnancy > 64 Days long
- Placental dysfunction
- Especially small litters
- 9. Previous history of dystocia
- 75% maternal
- 25% fetal



- 10. Fetal Distress
- Heart Rates are < 160 BPM
- Doppler
- Ultrasound
- 11. Weak/non-productive contractions
- Multiple pups left
- 12. Minimal response to calcium and oxytocin

- 13. Breeds at risk
- Bernese Mountain Dog
- Greater Swiss Mountain Dog
- English Bulldog
- Brachycephalics
- Pembroke And Cardigan Welsh Corgis

- 14. Predicted based on
- Vaginal strictures//hyperplasia
- Pelvic fractures
- Canine Herpesvirus
- Litters of 1-2 or > 9 pups

- 15. Puppy count X-ray
- Puppies not delivered



16. Vet or client is distressed

- Trust your instincts

❖ Why are puppies born dead?

1. Prolonged labor
2. Dystocia
3. Stressed dam – poor uterine blood flow
4. Failure to use IV fluids on dam
5. Inappropriate anesthetic protocols (Paula Moon)
6. Genetic abnormalities
7. Inborn defects of metabolism
8. Infectious causes
9. Elective C-sections in Dogs

❖ Which can you predict?

❖ Which can you Control?

Should you do a C-Section?

- Don't wait too long
- # of pups left?
- Condition of dam?
- Oxytocin response?
- Time of day?
- Alternative to care?
- Elective C-sections in Dogs

When is an Emergency C-Section Needed?

- Decreasing fetal heart rates
- Poor uterine contraction patterns
- Too long a delay
- Other pups born dead
- X-rays or ultrasound → problem

Basic equipment for veterinary clinics to have for whelping:

1. Propofol and/or Alfaxan
2. Record keeping system.
3. Method to re-mark puppy's identification.
4. Room thermometer to track temperature at the puppy's surface.
5. Rectal thermometer, digital is ideal, to monitor the dam's and pup's temperatures.
6. Scale to weigh pups. This should weigh in ounces or grams.
7. Feeding tube and appropriate syringes if supplementation is necessary.
8. Formula to feed, if supplementation is necessary.
9. Tincture of iodine - to dip the umbilicus in at birth, 2 and 8 hours post partum.
10. Chlorhexidine disinfectant solution
11. Bulb syringe and Dee Lee Mucus Trap.
12. Laundry basket
13. Heating pads, rice bags, or Snuggle Safe^R

10. Managing a whelping at the veterinary hospital:

In general, assume that the client will put saving the dam ahead of saving the pups if a decision between the two needs to be made. Fortunately, this decision rarely needs to be made because care that is



good for the mother is usually also good for the pups. Assume that you have at least 1 viable pup when making medical decisions.

A radiograph or ultrasound upon arrival of the dam with dystocia should be the 2nd procedure when she walks in the door – the 1st is a vaginal evaluation to be certain a pup is not presenting in the vagina and is tragically forgotten while paperwork, history, and imaging is handled. The breeder-client should be consulted early on regarding how they prefer to proceed. Some will be very willing to move to C-section if the first pup is not easily delivered upon arrival at the veterinary hospital. Some clients will be reluctant to proceed to C-section regardless of the higher puppy survival rate of Caesarian over vaginal delivery. There will come a point at which a C-section may become the ONLY option if pups cannot be delivered vaginally. Sending a dam home that has retained pups with no hope of vaginal delivery is inappropriate and may be a difficult financial and ethical problem to deal with.

If the owner is reluctant to proceed to C-section without first attempting vaginal delivery, there are several “tricks” you can use to aid in the delivery of a litter. Maneuvers can be done along with calcium SQ, oxytocin, and IV D5W to assist the delivery of pups.

1. To assist with vaginal delivery, position the dam either standing or laying on her side with an assistant holding her head as she may resist vaginal examination. Once the vulva is prepped and gloves are on, the lips of the vulva should be gently parted and one or two fingers inserted carefully into the vagina, sliding upward. If a pup is easily grasped, with gauze or a towel, apply steady gentle traction in a ventral direction (toward the dam’s feet, not straight back). Try to pull gently in coordination with the dam’s pushes to maximize your efforts. Attempt to grasp the neck behind the head, the pelvis, or a pair of feet. Traction on only the tail or one foot or leg can lead to severe damage to the puppy. Rupturing the chorioallantoic membrane does not speed the delivery of the pup. It is easier to grasp the puppy and assist the delivery if membranes are ruptured.

2. If only the tip of a pup can be reached, one of two maneuvers can be attempted. First is to rotate the examiner’s hand and stroke the underside of the sacrum from inside the vagina – this is 3. a Ferguson maneuver and many dams will push with this stimulation.

4. If this is not successful and the pup cannot be palpated, have the examiner insert their gloved fingers into the rectum and by directing their fingers ventrally, gently direct the pup through the rectal tissues and slide it caudally. With the other hand, another person’s assistance, or a freshly changed glove on the examiner’s hand, grasp the now accessible pup and attempt to deliver it.

5. In some cases, the pup is just a little too far up inside the vagina to reach vaginally or rectally. When this occurs, if the forequarters of the dam can be elevated on a chair, stair, or by an assistant; gravity may assist moving the pup outward enough to be grasped and delivered.

6. If the pup cannot be reached, taking the dam out for a walk to urinate and move can assist moving the pup. In the dark, a flashlight and towel should be taken along as some dams will deliver a pup while squatting.

7. At home or at the veterinary clinic, vanilla ice cream (orally administered) can improve the hydration, energy and calcium balance of the dam. The dam should not be allowed to ingest any other food or placentas in the event she needs a C-section.

8. If no progress is being made, IV 5% dextrose in water, oxytocin administered by SQ or IM route in low doses, and SQ 10% calcium gluconate can aid in coordinating and strengthening uterine contractions. The IV 5% dextrose in water can be given at an appropriate dose based on the patient’s condition. The minimum dose would be her maintenance level, and can be increased as indicated. This will improve her energy balance (not a complete replacement, but it helps), and improve her hydration status. Most dams in labor have gone many hours with little to eat or drink and simple fluid replacement therapy boosts their efforts to labor. Other fluid therapy may be indicated based on the dam’s condition. For instance, if her blood pressure or physical findings suggest she is showing signs of shock, colloidal or crystalloid therapy should be administered according to your veterinary hospital’s protocol.

9. Calcium gluconate 10% can be administered at a range of 0.5 to 1.0 ml per 10 pounds body weight SQ only. The calcium preparation MUST be 10% calcium gluconate to administer SQ and should be split into at least 2 injection sites to reduce the risk of a skin slough. IV administration is risky and should be reserved for dams with eclampsia.

10. Oxytocin can be administered on a conservative basis (most published or label doses are too high so check for current dosage recommendations) at 0.1 ml per 10 pounds of body weight (at 20 USP U/ml, this calculates to 2 units per 10 pounds of body weight) of body weight SQ or IM, 2 doses maximum per pup delivered.



This should not be done without first assuring that there is no obstruction to delivery (radiography and palpation), making certain the dam is not already having strong contractions, and discussing the risks of administering oxytocin and of delaying a C-section with the owner.

Oxytocin is an amazing and powerful hormone. It is the natural hormone that creates both uterine contractions and release of milk from the mammary gland. But it must be treated with a healthy respect. Recent research shows that most of the published doses of oxytocin are too high, putting the pups and dam at risk. Smaller doses create more effective waves of contraction, and are safer. When the dam is strong and healthy, the uterus is correctly positioned, the pups are small enough to be delivered, there is no pup obstructing the way, and her cervix is open, oxytocin administration with caution is appropriate.

Oxytocin should not be used in certain situations. If uterine contractions are too forceful, this will create several risks to the dam and the pups. The dam may experience such forceful contractions that her uterus can rupture, leading to the development of the life-threatening conditions of shock and peritonitis. The risks to the pups are restricted blood supply to the placenta and premature disruption of the placental attachment to the uterus, increasing the risk of fetal death.

The situations in which to avoid the use of oxytocin are:

1. Prior to the delivery of the 1st pup - if the cervix is closed or malpresentation of a pup.
2. The dam is already in hard labor.
3. When 2 doses in 20 minutes have already been administered.
4. When 2 doses do not succeed in delivering a pup, C-section should be recommended.

Some but not all veterinary clinics are comfortable dispensing oxytocin to their clients. This is best done in combination with uterine contraction monitoring using titrated doses based on the existing uterine activity pattern. Again, oxytocin is contraindicated in the presence of fetal distress or in the presence of existing strong uterine contractions. Oxytocin is a prescription item and must only be dispensed and used under the veterinarian's supervision. Some clients have oxytocin in their possession and would benefit from instruction in its use.

The following guidelines can be included with the oxytocin dispensed. It is also a good idea to dispense only small quantities pre-measured and labeled in syringes to minimize the use of the drug and reduce the likelihood of client error. A valid-client-patient-veterinary relationship should be in place for the veterinarian to dispense oxytocin.

OXYTOCIN RULES: •

- When & how can I use Oxytocin? With GREAT care
- The correct maximum dose is 0.1 cc per 10 pounds of body weight SQ or IM only – start low and increase if necessary
- Maximum 1 cc regardless of size of the dam
- Do not exceed 2 doses in 20 minutes
- If 2 doses are unsuccessful, proceed to C-section
- Do NOT use if the dam is in hard labor or no pups have been delivered
- Risks include uterine rupture and “shrink wrapping” the pups
- Along with oxytocin, IV fluids with 5% dextrose (for fluid, energy, and electrolyte replacement) and SQ calcium injections can be used along with attempts to manually deliver the pups.

8. Puppy Resuscitation

| Puppy ID | Weight Oz/Kg | Temp °F/C | Heart Rate | Resp Rate | MM Color | Urine Color / SG | Stool Character | Reflexes Present/Absent | Owner Concerns | Feeding/Therapy | PE Findings | Notes from Birth | Other |
|----------|--------------|-----------|------------|-----------|----------|------------------|-----------------|-------------------------|----------------|-----------------|-------------|------------------|-------|
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9. The Unplanned C-Section

Questions for evaluation of the dam at home or at the hospital indicating the probable need for an Emergency C-Section:

1. Has the dam been in hard labor (abdominal pushing) over 2 hours on the first or 1 hour on subsequent pups?
2. Did she initially show good abdominal contractions and stop without producing a puppy?
3. Is there is green vaginal discharge PRIOR to the delivery of the first puppy?
4. Does the dam seem distressed? Frantic? Sick? Weak or unable to stand? Tremoring? Repeated vomiting?
5. Is this labor pattern different than her previous ones?
6. Has the dam been unwilling or unable to eat and/or drink for over 12 hours?
7. Have any pups been born dead?
8. Did a previous radiograph or ultrasound suggest there could be a problem? (low heart rates on ultrasound or pups without visible heartbeats?) (malpresented or very large pups)
9. Is a pup palpated on vaginal examination and in an unusual position or not progressing through the birth canal?
10. Did her temperature drop to 98 degrees and rise to normal (over 101.0) and stay there more than 4 hours?
11. Has her pregnancy exceeded 63 days?
12. Does she appear to have a very large or very small litter? 2 or fewer or more than 9?
13. Does she have a previous history of dystocia?
14. Is she a breed at risk for maternal or fetal causes of dystocia?
15. Is she having weak or non-productive contractions with multiple puppies left?
16. Has WhelpWise^R or ultrasound indicated there is a problem with fetal heart rates (<160 BPM) or uterine contraction patterns?
17. If oxytocin has been used, has there been a minimal or no response?
18. Does the breeder or veterinary staff member have a feeling that something is going wrong? Trust their intuition.

If the answer to any of these questions is yes, assess the dam as soon as possible and advise your client that the dam should proceed to emergency surgery unless you can immediately correct any cause for dystocia.

•When is an Emergency C-Section Needed?

- Green vaginal discharge before first puppy
- Planning in advance have failed.
- Maternal or fetal distress
- “Sinking feeling”

CLOSING THOUGHTS

- NO cutting corners – Great outcomes cost money.
- NO spays at c-section – consider a tubal ligation if the client is afraid of an accidental breeding before a spay can be performed. A second surgery to spay the dam is safer than a spay at C-section
- Plan for A planned C-section
- Plan for an unplanned C-section
- Planners save puppies - More live puppies = Maximum outcomes
- Healthier dams
- Healthier puppies

Your Vet clinic name here. C-SECTION REPORT

DATE: _____ Client name _____ Pet's name _____



| | | | | | |
|----------------------------|---|---|--|--|---|
| Vital Signs: | TEMP F PULSE/ MIN MM/Refill ____ | RESP/MIN _____ | BP _____ Hydration _____ AGE _____ | Today's WEIGHT _____ LB _____ KG | Pre-pregnancy Weight _____ LB _____ KG |
| | ET TUBE | SIZE | FR/MM | IV Cath size: g | Site: |
| Drugs: | DOSE mg or ml administered: | Dosage calculation: | ROUTE | TIME to administer/done | RESPONSE Initials |
| Solu-Medrol | | 1 cc/62 pounds BW of 125 mg/2 ml per vial | IV slow | On Arrival / | |
| Atropine | | 1 cc/ 20 pounds BW of 1/120 gr/ml | SQ | 20 min preop / | |
| Metoclopramide | | 1 cc/37 pounds BW of 5 mg/ml | SQ | On Arrival/ | |
| Calcium labeled for SQ use | | 1 cc/10 pounds BW of 0.9 mEq/10 ml) | SQ in 2 sites | 20 min preop / | |
| Adaptil collar | | Small/large | | On Arrival | |
| Other | | | | | |
| Fluid Dose | | 10 cc/ # body weight | | | |
| Meloxidyl 1.5 mg/ml | | 2 u/lb BW PO/ 0.09 mg/lb | PO/SQ | / | |

Client # _____

| | | |
|--|---|--|
| Orders for PRE-OP EVENTS FOR C-SECTION | | |
| <input type="checkbox"/> Ordered by Dr. _____ <input type="checkbox"/> Completed by _____ | | |
| <input type="checkbox"/> 1. Vaginal exam to assure no pup is compromised. <input type="checkbox"/> _____ | <input type="checkbox"/> 2. Puppy care for those delivered. <input type="checkbox"/> <input type="checkbox"/> _____ | <input type="checkbox"/> 3. TPR dam and pups. <input type="checkbox"/> _____ |
| <input type="checkbox"/> 4. IV catheter. <input type="checkbox"/> _____ Size _____ g Location _____ | <input type="checkbox"/> 5. Solu-Medrol. <input type="checkbox"/> _____ <input type="checkbox"/> _____ | <input type="checkbox"/> 6. Pre-op blood and EKG as ordered. <input type="checkbox"/> CBC/CS/Protine /Progesterone/EKG/BP |
| <input type="checkbox"/> 7. Ultrasound for viability/HR. <input type="checkbox"/> _____ <input type="checkbox"/> _____ HR results _____ BPM | <input type="checkbox"/> 8. Radiograph <input type="checkbox"/> _____ <input type="checkbox"/> _____ | <input type="checkbox"/> 9. Wrap tail. <input type="checkbox"/> <input type="checkbox"/> _____ / NA |
| <input type="checkbox"/> 10. Clip belly. <input type="checkbox"/> _____ <input type="checkbox"/> _____ | <input type="checkbox"/> 10. Out to urinate /stool with towel and flashlight if dark. <input type="checkbox"/> _____ | <input type="checkbox"/> 11. Administer remaining pre-op drugs listed above. <input type="checkbox"/> _____ |
| <input type="checkbox"/> 12. Verify tasks are assigned/setup complete <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> _____ | <input type="checkbox"/> 13. Induce AFTER doctor is ready. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> _____ | <input type="checkbox"/> <input type="checkbox"/> Antibiotics were/were not administered _____ |

Pre-surgical blood work was completed on _____ at _____ Lab and was within normal limits/_____.

The EKG was WNL/_____.

The first day of estrus was _____. Bred on _____. Predicted to whelp on _____.

Timing at VV/Elsewhere _____.

Ovulation Date Established/Estimated: _____.(Dr Initials)

Bred by Natural/Vaginal AI/TCI/Surgical using Fresh/Fresh chilled/ Frozen semen

Ultrasound revealed: Gut motility +/-//Renal Development +/-//_____ Radiographs revealed: _____ pups.

Pre-op Progesterone: _____ ng/ml. C-section date planned for _____.

Description of surgical procedure:

The dog was assessed for overall condition and labor and found to be _____.

An IV catheter was placed, the hair was clipped with a 40 Oster clipper. The dog was anesthetized with Alfaxan/Sevo/_____ and placed in dorsal recumbency. A sterile prep with Nolvasan^R and sterile



adhesive drape was applied. A ventral midline abdominal skin incision was made halfway between the pubis and umbilicus approximately _____ cm long with a #15 scalpel blade. The subcutaneous fat was sharply dissected off the underlying abdominal wall to clearly expose the fascia for the entire length of the skin incision to facilitate good apposition of the linea at closure. The linea was lifted up with thumb forceps, a stab incision was made thru the abdominal wall and the incision was completed with Metzenbaum scissors. Umbilical hernia? Y/N _____.

The R/L uterine horn was identified and exteriorized. An incision was made lengthwise on the antimesenteric border of the uterus. _____ (#) pups were delivered including placentas. This was repeated for the R/L horn and _____ (#) pups were delivered thru the same/new incision. The uterus did/did not tear during handling.

The incision(s) were located at: _____.

The placentas were detached/easily removed/not removed/ _____.

Resorption sites were/were not noted in R/L horn _____.

Placentas/uterine samples were retained for pathology/culture/ _____.

Additional _____

Notes:

_____.
The uterus was examined from vagina/cervix proximally to both ovaries to assure all pups and placentas were removed and to assess integrity. Cervix was open/closed. The uterine incision(s) were sutured with _____ in a continuous inverting baseball pattern. The uterine condition was _____.

The abdomen was irrigated with 1 L _____.

The abdominal wall was closed using _____ in a simple interrupted pattern in the linea.

The subcutaneous layer was closed using _____ in a simple continuous pattern.

The subcuticular layer was closed using _____ in a simple continuous pattern.

The skin was closed using _____ in a _____ pattern.

Instrument count # _____ (Assistant Initials) _____ (Doctor Initials)

Sponge count # _____ (Assistant Initials) _____ (Doctor Initials)

| # | ID | Suction Y/N | Spontaneous resps Y/N | Intubated Y/N | Caffeine Y/N | Dopram Y/N | APGA R 1 min | APGA R 5 min | Weight Oz/gm | Exam | Other | Temp |
|----|--------|-------------|-----------------------|---------------|--------------|------------|--------------|--------------|--------------|------|-------|------|
| 1 | Red | | | | | | | | | | | |
| 2 | Orange | | | | | | | | | | | |
| 3 | Yellow | | | | | | | | | | | |
| 4 | Green | | | | | | | | | | | |
| 5 | Blue | | | | | | | | | | | |
| 6 | Purple | | | | | | | | | | | |
| 7 | Black | | | | | | | | | | | |
| 8 | White | | | | | | | | | | | |
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| 16 | | | | | | | | | | | | |

Post-op recovery _____

Post-op pain meds by injection _____ Post-op pain meds dispensed for oral use _____

Discharged on _____ Condition at discharge: _____



Comments _____

_____ (Surgeon's Signature)

Anesthesia Tech: _____ Puppy Tech: _____

| Number | Color | Staff name | Time |
|--------|--------|------------|------|
| 1. | Red | | |
| 2. | Orange | | |
| 3. | Yellow | | |
| 4. | Green | | |
| 5. | Blue | | |
| 6. | Purple | | |
| 7. | Black | | |
| 8. | White | | |
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| 12. | | | |
| 13. | | | |
| 14. | | | |
| 15. | | | |
| 16. | | | |



| C-section Discharge Instructions for Clients: | |
|--|--|
| Restraint | <p><input type="checkbox"/> Please protect your pet when leaving the hospital by using either a leash and collar or a pet carrier. Excessive activity may result in injury, or a slower recovery than we would expect from a pet that is kept during the healing process.</p> <p><input type="checkbox"/> Please remove the bandage covering the IV site on your pet's front leg upon a home.</p> |
| Food and Water | <p>With the excitement of returning home, your pet may be inclined to drink and eat excessively, which will most likely result in vomiting. <i>To avoid this, we ask that you remove your pet's food and water dishes for an hour until your pet has settled down. Then, only allow small amounts of food and water for the first day home.</i></p> <p><input type="checkbox"/> Offer only half your pet's normal food and water tonight. Normal feeding may resume tomorrow.</p> <p><input type="checkbox"/> Mixing Royal Canin Starter Mousse canned food to mom's water and food will improve her drinking and eating.</p> <p><input type="checkbox"/> Feed _____ fried (not boiled) brats _____ times a day.</p> <p><input type="checkbox"/> Tube feed your puppies _____ cc/ml _____ times a day with _____.</p> <p>See handout. Keep them in a warm location. Their rectal temperature should be 96 to 98°F prior to feeding.</p> |
| Eliminations | <p><input type="checkbox"/> Your pet may need to be reminded to go outside to urinate during the first evening home. Many patients may not have a bowel movement for 24 to 36 hours after surgery. This is normal.</p> <p><input type="checkbox"/> The puppies may need to be stimulated to urinate and defecate until mom is ready to care for them. Every 3 hours, rub their rectum and penis/vaginal area with a white cotton ball or tissue.</p> <p><input type="checkbox"/> After 24 hours, the pup's urine should look very pale yellow and the stools should be soft, yellow and seedy looking.</p> |
| Exercise and Activity | <p>Patients recovering from surgery or illness need limited activity to heal properly. Due to the effects of anesthesia, your pet may be groggy for the next 12 hours. Avoid access to stairs or situations that may lead to injury during this time.</p> <p><input type="checkbox"/> Your dog may resume normal activity in _____ days.</p> <p><input type="checkbox"/> NO swimming, bathing or grooming for 10 to 14 days.</p> <p><input type="checkbox"/> Your dog should be confined indoors, and taken outside on a short leash only for eliminations for _____ days.</p> <p><input type="checkbox"/> We recommend NOT to leave your dam unattended with the puppies until you are certain that she will not harm them. <input type="checkbox"/></p> <p><input type="checkbox"/> The pups should have their temperatures taken, urine color checked and weighed once daily at the same time every day.</p> <p><input type="checkbox"/> Early Neurologic Stimulation should be performed from day 3 to day 16 once daily on the pups. See handout.</p> |
| Medications Mom: | <p><input type="checkbox"/> Medications dispensed _____ for post op discomfort. Next dose due _____.</p> <p><i>DO NOT ADMINISTER ASPIRIN WITHIN 2 WEEKS OF THE ABOVE PRESCRIBED MEDICATION.</i></p> |
| Pups: | <p><input type="checkbox"/> Medications dispensed for increasing milk production Reglan.^R Next dose _____ cc /tabs _____ times a day due _____.</p> <p><input type="checkbox"/> Give _____ cc Oxytocin SQ _____ times a day after warm compresses on her breasts to improve lactation.</p> <p><input type="checkbox"/> Give _____ cc plasma orally with feeding tube or SQ to _____ pups every _____ hours. Thaw gently before use.</p> <p><input type="checkbox"/> Additional _____ meds: _____ for _____ .Next dose due _____.</p> <p><input type="checkbox"/> Additional _____ meds: _____ for _____</p> |



| | |
|----------------------|--|
| | <p>_____ .Next dose due _____.</p> <p><input type="checkbox"/> Additional _____ meds: _____ for _____</p> <p>_____ .Next dose due _____.</p> <p><input type="checkbox"/> Deworm the puppies & dam once a week with Strongid^R for mom & Nemex^R for pups from 2 to 8 weeks of age.</p> |
| Sutures & Bandages | <p>In order for incisions to heal, your pet must not be licking at the sutures, or the incision site. If your pet is licking, please notify us immediately. Please check the incision twice daily for any redness, swelling, or discharge. If it appears irritated or infected, please notify us immediately. Rechecks of post-op patients are provided at no charge during regular office hours.</p> <p><input type="checkbox"/> Sutures/staples need to be removed 10 to 14 days after surgery. A short appointment is needed.</p> <p><input type="checkbox"/> Sutures are underneath the skin. These will absorb over the next several weeks. They do not need to be removed.</p> <p><input type="checkbox"/> Apply warm compress to the surgical site 3 times daily for 10 minutes each time.</p> <p><input type="checkbox"/> Dip the umbilical cord of each puppy in Tincture of Iodine at 2 hours, then every 8 hours until cord dries and falls off. Take the top off the bottle, put the opening over the pup's cord stump, turn pup and bottle upside down, then upright. Throw away after this litter and replace with a new bottle next litter.</p> <p><input type="checkbox"/> Clean her c-section incision with hydrogen peroxide and remove hair caught on sutures if necessary.</p> |
| Appointments | <p>Please make an appointment for the following:</p> <p><input type="checkbox"/> Suture removal in 10 to 14 days.</p> <p><input type="checkbox"/> Dewclaw removal and/or tail docks in _____ days. Appointment Time _____</p> <p><input type="checkbox"/> Nomogram/Vaccinations and health exams in _____ weeks. Appointment Time _____</p> |
| Monitor | <p>A decrease in activity and/or appetite for the first 24 to 36 hours may be observed. However, if your pet exhibits any of the following symptoms, please notify the clinic immediately:</p> <ul style="list-style-type: none"> •Loss of appetite for over 36 hours •Refusal to drink for over 24 hours and/or diarrhea •The vaginal discharge may have small amounts of thick blood, changing to gray. If excessive or has a foul odor, call us. •Weakness or depression •Vomiting |
| Special Instructions | <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> |

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