Cruciate disease can be a confusing and difficult to explain to clients especially if they are financially constrained. However it is the number one cause of hind limb lameness in dogs and costs Americans $1.32 billion dollars per year. It effects almost all breeds of dogs and is surrounded by controversy regarding which surgical procedure is most beneficial.1 There have been several iterations of surgical procedures that have come and gone over the years, and new procedures continue to be tested in research settings. Over the last 20 years, as the incidence of cruciate disease increased so have the specialty and referral options for owners. There are now multiple opinions with little scientific evidence increasing the confusion for primary veterinarians and owners. In fact, the controversy started to erode the confidence that the public has placed in veterinarians. Many articles in the lay press have noted that there was a disconnect between the evidence and the recommendations for a more invasive and more expensive technique thus fueling the suspicion that veterinarians were making recommendations to promote monetary gain over animal welfare.2,3,4 There have been recent strides in veterinary medicine to fill some of the knowledge gap.

Cruciates can be addressed either surgically or conservatively. The magic cutoff for dogs treated conservatively versus surgically is 30 pounds based on a 1972 paper where most small breed dogs recovered satisfactorily with rest whereas working dogs and large breed dogs required surgical intervention for a satisfactory outcome.5 Since then, very little has been published on conservative therapy. Dogs with experimentally created cruciate ruptures improve over time but do not return to normal weight bearing, and they are used as an induced osteoarthritis model.6 More recently, the University of Minnesota compared dogs receiving institutional rehabilitation, weight loss program, and an NSAID to those receiving a TPLO. The surgery group did better, but 2/3 of the conservatively treated dogs had successful outcomes.7 More aids in conservative management have become available including braces. These range in types and expense and have little to know evidence for their use.

Surgical management falls under the following categories: reconstruction/replacement, extracapsular stabilization, and biomechanical alteration. All the methods have the same goal: to stabilize the knee or eliminate cranial tibial thrust. We have used humans as a model for the reconstruction/replacement techniques using tissue autografts or allografts as replacements for the cruciate ligament. These techniques do not alter the range of motion of the stifles or the femorotibial contact, but results have been disappointing thus far.8

Extracapsular stabilization techniques are those that require a direct cranial tibial thrust opposing force outside the joint. This would include fibular head transposition (the lateral collateral ligament is moved into a position to counteract thrust), lateral fabellar suture (or its multiple variations), or tightrope. The lateral fabellar suture and tightrope more widely used than the fibular head transposition in general. The technique for the lateral fabellar suture has improved with crimp clamps decreasing knot size and irritation; however, the nylon suture is not expected to last the lifetime of the dog and has been shown to stretch, loosen or break; however, rehabilitation of the muscles which can assist in stifles stabilization with the help of scar tissue can still end in a good result. The tightrope is stronger material when compared in mechanical testing, and it is placed using bone anchors or tunnels rather than around the fabella. However, the suture still cycles and therefore is unlikely to last a lifetime. The bone can also remodel and allow loosening of the tightrope. The fibular head transposition depends on the fixation of the fibular head cranial to its original position and fixation failure is not uncommon allowing fibular head movement caudally. These techniques in general also decrease flexion of the stifles by decreasing the ability of the tibia to internally rotate. The tightrope procedure uses landmarks that help ameliorate this as much as possible.

The remaining category is biomechanical alteration of the joint to eliminate the cranial tibial thrust. This includes the tibial plateau leveling osteotomy (TPLO), tibial tuberosity advancement (TTA), and Closing Wedge Osteotomy (CWO). These techniques have been developed based on biomechanical investigation of the canine knee and aim at altering the stifles to allow a mechanical advantage for the muscles, and other tendons and ligaments to counteract cranial tibial thrust.

Which is the best technique?
The best technique would be minimally invasive, re-establish the biomechanics and kinematics of the knee prior to injury, low complication rate, and be inexpensive. Unfortunately, this is not the case with current techniques. To date, the TPLO has the best evidence for the best outcome.9,10 This includes a recent meta-analysis that came to this conclusion.9 The highest level of evidence is a randomized controlled clinical trial. Recent trials comparing TPLO to lateral fabellar sutures and TPLO to TTA have been performed. In the TPLO to lateral fabellar suture trial, the TPLO group had a better outcome based on owner satisfaction (93% of dogs in the TPLO were rated a 9 or 10 compared to 75% in the LFS group) and gait analysis (11% better in the TPLO group at a trot).10 In the
trial comparing TTA to TPLO, presented but not published in a peer-reviewed journal, dogs receiving a TPLO did slightly better than dogs receiving a TTA. There may be several reasons for this including a steep learning curve for TTA’s. Complications can also be used to compare the procedures, but similar rates have been reported ranging from 19-28%. The majority of major complications such as implant failure are much lower and superficial skin infections are higher. This is also likely associated with experience with the procedure which is typically not addressed in the largely retrospective studies.

If TPLO is the best why offer other procedures?
1. Small size. There is still very little evidence in dogs under 30lbs that a TPLO would be better than any other procedures in dogs that fail conservative therapy.
2. Aftercare issues. Occasionally, owner will openly refuse to do the aftercare needed for a TPLO. In those cases, implant failure in a TPLO is much more catastrophic than a tightrope or lateral fabellar suture. Also, since controlled exercise is permitted after suture techniques, some will choose based on the personality of the dog.
3. Financial considerations. Some owners want the least expensive option regardless of “best”.
4. Age. Some owners do not want the invasiveness, or the long term differences in the procedures don’t matter as much to them.

What should the owners expect for aftercare?
Tightrope and LFS require controlled exercise for 6-8 weeks at least. Rehabilitation makes a big difference in the outcome. TPLO and TTA require rest to prevent implant failure. No running jumping playing and limited walking to prevent implant complications associated with fatigue until the bone is healed (6-8 weeks). Then slowly increasing exercise over time to rebuild muscle.

Managing long-term expectations
Dogs with cruciate ruptures have osteoarthritis. Unfortunately, there is no cure for osteoarthritis. Surgical intervention is designed to slow it down, but it is not uncommon for dogs to have occasional flare ups of the osteoarthritis.

References
12. TTA LEARNING CURVE


Cruciate disease is the number one cause of hind limb lameness in dogs and costs Americans $1.32 billion dollars per year. It affects almost all breeds of dogs and is surrounded by controversy regarding which surgical procedure is most beneficial. The majority of the cost is in surgical interventions; however, not all dogs are surgical candidates.

Cruciates can be addressed either surgically or conservatively. The magic cutoff for dogs treated conservatively versus surgically is 30 pounds based on a 1972 paper where most small breed dogs recovered satisfactorily with rest whereas working dogs and large breed dogs required surgical intervention for a satisfactory outcome. Since then, very little has been published on conservative therapy. Dogs with experimentally created cruciate ruptures improve over time but do not return to normal weight bearing, and they are used as an induced osteoarthritis model. More recently, the University of Minnesota compared dogs receiving institutional rehabilitation, weight loss program, and an NSAID to those receiving a TPLO. The surgery group did better, but 2/3 of the conservatively treated dogs had successful outcomes. More aids in conservative management have become available including braces. These range in types and expense and have little to no evidence for their use. The anecdotal evidence of brace use points to possible increased proprioception therefor allowing better active stabilization of the knee.

Physical rehabilitation has grown out of human physical therapy profession. It is still in its infancy in veterinary medicine. To rehabilitate is to restore health or normalcy. Sometimes the goal is to maximize function as full rehabilitation is not possible. In veterinary medicine, rehabilitation is typically used to treat dogs after orthopedic or neurologic surgery to increase the rate of return to normal activity, and those dogs that have significant osteoarthritis. However, it is increasing in popularity as an adjunct treatment to affect weight loss, improve ambulation with non-surgical neurologic disease, prevent muscle atrophy and maintain strength in a variety of disease states.

The most researched area of rehabilitation in the dog is after stifle surgery rather than for cruciate disease. Both TPLO and lateral fabellar suture benefit from rehabilitation post-operatively. It is possible that the disparity in the results of the 2 procedures is mitigated by rehabilitation. Rehabilitation has also shown to be beneficial in treating dogs with cruciate ruptures that are not surgical candidates. Weight loss is also a benefit of most rehabilitation programs. This may be the SINGLE most important aspect of conservative therapy.

**Treatment modalities**

**Icing**
Applying a cold minimizes inflammatory processes and provides analgesia. Lowering the temperature of skin and underlying tissue causes vasoconstriction, reduces blood flow, and decreases sensory and motor nerve conduction velocity. This is tolerated well in pets and can start immediately after surgery. Twenty minutes of icing decreases the temperature in the affected tissue 1-4° C. Cold water compression with a cold water circulating compression blanket is arguably the best modality for post-operative swelling reduction.

**Warm packing**
This can be performed after 3 days to a week after surgery. Warm packing can be used to warm muscle up prior to stretching. Use immediately after surgery may increase vasodilation and swelling.

**Ultrasound**
Therapeutic ultrasound units are designed to emit sound waves into tissue, which heats the deep tissues and causes vasodilation and increased blood flow, and intern increased healing. Typically this is used in treating chronic tendonitis, limited ROM secondary to tissue contracture, myositis, bicipital tendonitis, and muscle spasm. This is generally tolerated well in awake patients.

Shockwave ultrasound is a more intense burst of energy that may cause microdamage or irritation to deep structures. This temporary increase in inflammation promotes long-term healing. This has been shown to be helpful in dogs with patellar tendonitis after TPLO and may even speed bone healing. Dogs receiving shockwave therapy typically require sedation during treatment.

**Massage**
Massage is the gentle manipulation of muscles and soft tissues. It is used most often to help decrease swelling by promoting lymphatic drainage and to help warm up muscle prior to exercise. This modality is often well tolerated in dogs even within the first 24 hours of surgery.

**Passive range of motion and stretching**
The standard of care in humans after cruciate repair is to start passive range of motion and icing immediately after surgery. This helps to decrease swelling, and decrease cartilage damage and muscle contracture. It can also be used as a muscular warm up prior to activity later in the treatment program. Many dogs tolerate these exercises by occasionally they must be delayed for a few days as the dog may anticipate pain.
Neuromuscular electrical stimulation
This modality is designed to increase muscle strength/ decrease atrophy and muscle spasm. Used correctly, it should not be painful, but shaving is usually necessary.

Pulsed signal therapy
Can be used in acute pain situations or for chronic osteoarthritic pain. This modality consists of the generation of a magnetic field that encourages vascularity and healing. There is some evidence of the efficacy for this modality in patients with osteoarthritis.

Cold laser therapy
This is used to stimulate tissues without heating them. This is very controversial in both human and veterinary rehabilitation.

Therapeutic exercise
This is the largest and one of the most important modalities for rehabilitation. Dogs are encouraged to exercise the appropriate muscle groups in a safe manor. Since dogs will not sit on an exercise making and lift weights, creativity is needed to develop appropriate exercises. The goals are often it increase range of motion, increase function or weight bearing, decrease the risk of reinjury, build muscle mass, or prepare for return to work. Loosing weight may also be a positive side effect.

Realistic goals are tantamount for success. These are tailored to the individual patient based on fitness level, degree of dysfunction, stage of healing, and risk of complications. Depending on the goal, exercise can be changed based on the speed, difficulty, or duration of the activity.

Owners, practitioners, or technicians can perform exercises with or without aids. Some examples of therapeutic exercises that do not need special equipment/aids include sit to stand, leash walks, hills, figure 8’s, and natural obstacles (like tall grass). Therapeutic exercises that do need special equipment include thera-bands for lateral muscle work or resistance training, underwater treadmill therapy, balance boards, treadmills, and exercise balls. Some of these exercises will be demonstrated at the presentation.

Swimming
This is great exercise for most minimally debilitated and healthy patients. Swimming burns calories, encourages use of multiple muscle groups and core muscle activation. From an orthopedic standpoint, the primary benefit is the elimination of concussive forces to the body and joints. Swimming is often used to help restore normal function, stamina, and muscle mass.

Treatment plans are fluid and should be re-evaluated as changes occur with the pet. Some owners do a superb job with therapeutic exercises at home and others do not. There are social (owners time, patience, and life style) and pet factors (aggressive, fractious, or difficult to control) that may go into the home performance. Institutional rehabilitation has more guidance and rapid application of changes in the treatment plan.

References
Soft tissue injury is the all-encompassing term we use for an injury to a muscle, tendon, or ligament. Unfortunately, in our veterinary patients, it can also be used as a non-specific diagnosis for cause of lameness that is not recognizable on examination or simple imaging.

We are relatively successful in treating these injuries in dogs with rest and pain management. However, there are subcategories of dogs that improve with rest but relapse after that period is over. Additionally, there are dogs that are expected to return to work ASAP after an injury.

Rehabilitation at an institution with trained CCRP personnel is always recommended for these patients but not always geographically or economically feasible. There are some exercises that can be performed at home safely in patients with soft tissue injuries. The presentation will demonstrate the exercises and the conditions in which they are safe.

**Passive range of motion exercises**
- The owner flexes and extends all joints for 10 repetitions holding the joint at the end of extension or flexion for a count of 10. The owners should flex and extend to the pain threshold and not go over. This should not hurt.
- This helps to keep the joints lubricated, reduce stiffness, and maintain or improve the overall range of motion of the joint.
- Safe in general for injuries that do not require splints or slings
- **THIS IS NOT STRETCHING** (stretching is avoided in the first 3 weeks of minor muscle or tendon tears)

**Balancing exercises**
- Several different methods starting with gently nudging the pet to cause a weight shift while standing. These can be stepped up to uneven surfaces like couch cushions to wobble boards.
- Can help improve coordination and hopefully, therefore decrease recurrence
- Isometric contractions are also good for most injuries as a way of maintaining function without straining the injured tissue
- Balancing exercises are safe for multiple soft tissue injuries

**Controlled exercise**
- Short, frequent walks are best initially. Control is key. Walk, not trot is important
- Patient/client selection is important
- Walking in water can also be encouraged though swimming is sometimes too much depending on the injury
- Start flat and hills can be added later at end of rest/rehab period (Assuming no lameness
- Good for muscle strains (i.e. iliopsoas) or tendonitis (i.e. patellar)

**Core strengthening**
- Alternating leg lifts on rear or front help to strengthen the core leg muscles
- Sit to stand
- Down to stand
- Sit/Down to stand on uneven surfaces
- Roll to sternal position from lateral recumbancy
- Appropriate for the majority of soft tissue injuries

Many of the exercises described have videos that owners can view on Youtube. The problem with many of them is that they also are advertising medications or other products.
A good orthopedic examination is imperative in helping animals with lameness. Imaging may show incidental problems or no problems and should be interpreted in light of the clinical signs and examination findings. The following are tips and tricks to improve examination skills

**Tip #1 Keep the goal in mind/ find the pain**
The goal depends on the patient (eg. New puppy/pre-purchase exam vs dog with a lameness) although there is some overlap.

The goal of the most common type of orthopedic examination is to find the cause of lameness. This means finding the source of pain. Finding pain is the most helpful in identifying the cause and developing a treatment plan. This is physical and can feel mean.

1A. Examine off of pain medications
1B. REPEAT if you cannot tell
1C. Repeat exam in different position or circumstances. Some dogs will show more in front of or away from owners.
1D. If it is worse with exercise, re-examine after exercise

**Tip #2 Start with the “good” legs and end with the “bad” legs**
Starting with the “good” legs gives a baseline for behavior to help judge pain. Does the pet just not like the toes touched? or is it pain? It also helps if multiple limbs are affected which helps in diseases like polyarthritis, metastatic cancer, or infectious disease. This occurs sometimes when other limbs are less effected allowing a single limb to appear lame

**Tip #3 Start at the toes and move up**
This helps because joints can be better isolated in that order. For instance, the knee can be flexed and extended without moving the hip, but when the hip is extended the knee is extended. If the knee is not painful on extension without moving the hip but there is painful on hip extension, the pain is isolated to the hip or hip flexors. Done in the opposite order, it is difficult to determine if the pain is associated with the hip or the knee

**Tip #4 Don’t forget about the spine**
Nerve root signatures cause referred pain in the limb. A disc rupture in the neck can cause a forelimb lameness and a lumbar disc rupture can cause a rear limb lameness.

**Tip #5 Don’t forget about the digits and digital pads**
If initial exam does not produce pain response, try again with emphasis on each individual toe, digit joint, and pad.

**Tip #6 Don’t forget about symmetry**
For the most part, muscles, tendons and joints are symmetrical. Muscle atrophy can be especially helpful. If it is very quick and severe, think neurogenic. If it is mild and ongoing, it is more likely orthopedic but it can give you an idea of chronicity even if owner has not noticed a lameness.

**Tip #7 Try things not taught in vet school (after initial flexion and extension of the effected joints)**
7A. Medial shoulder instability test – With pet in lateral recumbancy, place one hand on the scapula to stabilize and lift the limb laterally. It should move 45 degrees or less
7B. Biceps test – flex shoulder with digital pressure on the biceps tendon, flex shoulder with elbow extended and digital pressure on the tendon
7C. Iliopsoas test – extend hip and externally rotate knee, or direct pressure on the iliopsoas muscle
7D. Patellar tendonitis test – flex stifle and place digital pressure on the patellar tendon

**Tip #8 Big dogs are more difficult and can be difficult to overpower especially if they are worked up**
Use an assistant for restraint. This is why the gold standard for cranial drawer is under sedation. Cranial tibial thrust is easier than cranial drawer in larger dogs even under sedation.

**Tip #9 Sometimes owner are wrong!**
In forelimb lameness, owners are often wrong as to which leg is the lame leg because the fast leg is eye catching but virtually always the normal side. Owners also will tell you their right rather than the dog’s right.
**Tip #10 Sometimes owners are right!**

Especially owners that is very cognizant of small changes in gait (i.e. agility, field trial, etc). Sometimes really subtle problems are recognized early. In these dogs, sometimes its necessary to watch them do the activity that is “off” like go down an A-frame or zig-zag through the poles.
The major function of splints and casts are immobilization of a joint, bone, muscle group or combination. Immobilization has secondary unintended consequences and significant complication rates. Skin wounds are reported as high as 63% in casts. Splints are easier to maintain and potentially have fewer complications than casts, but casts are stiffer and provide more support.

**General pros of splints/casts**
1. Less expensive than surgery (most of the time)
2. Less morbidity than surgery
3. Possible faster healing if stability maintained (callous is not disrupted by surgery)
4. Decrease pain quickly when instability is made stable

**General cons of splints/casts**
1. Bandage sores which can be quite serious
2. Dermatitis
3. Cartilage atrophy- can become permanent especially in growing animals with long term coaptation
4. Muscle atrophy
5. Joint stiffness
6. Decreased tendon and ligamentous strength

The following are guidelines with associated pros and cons given different clinical situations.

**Fractures**

**Patient selection**
- Young animals heal faster
- Transverse fractures are easier to reduce and keep reduced
- Oblique and comminuted fractures are difficult to keep reduced
- Owner control and compliance of the pet makes a big difference
- Fracture

**Tibia/fibula**
Recommend splint if fracture is only fibula only with intact tibia, if it is a greenstick fracture, or non-displaced fracture in a young dog. Tibial fracture only with intact fibula is a grey area that depends on the patient/client factors.

**Pros**
1. Generally heals well (inherently good blood supply)
2. Lateral splint relatively easy to make and apply
3. Some indications are very short period of time (greenstick and nondisplaced puppy fractures)
4. Decreases pain

**Cons**
1. Some breeds are difficult/impossible anatomically– i.e. Corgi
2. The thigh muscles are cone shaped and therefore extending above the knee is difficult (Often green stick and fibula only fractures only need splints that extend to just below the stifle)
3. Splints/casts above the stifle cause ambulation difficulty
4. Bandage sores common on lateral digits, calcaneus, and patella
5. Sedation may be required for changes

**Radius/ulna**
Recommend splint if it is an ulna only fracture with intact radius or greenstick fracture. Fractures of the radius with an intact ulna and combined radius and ulna fractures that are transverse or non-displaced depend on patient/client factors. SURGERY IS RECOMMENDED IS SMALL BREED DOGS WITH RADIUS AND ULNA FRACTURES because they have decreased blood supply to the radius and therefore a higher rate of non-union in splint or cast.

**Pros**
1. Easy application and maintenance generally
2. Less bandage sores if placed caudally
3. Decreases pain

**Cons**
1. Increased non-unions in small breed dogs
2. Bandage sores on olecranon may be difficult to get to heal
3. Deep chested dogs more difficult to stabilize the elbow

**Metacarpals/metatarsals**
Splinting recommended when <2 metatarsals affected, open fractures with associated infections (i.e. dog bite), or if fractures are minimally or non-displaced. Extend splint past toes (typically caudally) to assure metacarpo/tarsophalangeal joint immobilization.

**Pros**
1. Easy applications
2. Good ability to heal

**Cons**
1. Bandage sores on accessory carpal bone or calcaneus
2. Risk of malunion because easy to put pressure on toes to cause rotational malunion

**Digital fractures**
Splint recommended when combined with a wound from the trauma or if multiple toes affected.

**Pros**
1. Decreases pain
2. Less expensive than toe amputation

**Cons**
1. Have to immobilize the carpus also to get the bandage to stay on
2. More expensive than not splinting

**Humeral or femur fractures**
Surgical intervention recommended but if that is not an option, the pros and cons can be weighed with the patient factors

**Pros**
1. Can be pain relieving
2. Can theoretically improve healing rate
3. Can theoretically decrease the chances of non-union over no treatment

**Cons**
1. Malunion if heals although this is likely with cage rest alone also
2. Bandage sores – multiple areas including flank and axilla
   a. The splint must extend over the shoulder or pelvis which (Spica)
   b. This increases the risk of urination contamination or bandage sores
3. Still difficult to stabilize bone
4. Difficult to ambulate
5. Heavy especially in large dogs
6. Quadriceps contracture (“tie down”) risk increases dramatically with femur fracture

**Tips for cases without surgical options**
1. Sometimes a Spica is necessary to get bandage to stabilize the stifle
2. Sponge donuts over boney prominences
3. Can incorporate rods in splints to avoid cast
4. Can change/remake splint if wounds occurring
5. Metasplints are not good enough unless it is a small dog and it fits perfectly

**References**
Complications are a necessary part of practicing veterinary and human medicine. However, there are significant environmental factors that add to chaos and predispose to complications. Many of these things are avoidable in practice. Implementing many of the strategies designed to decrease chaos and complications results in higher job satisfaction for staff.

It is a fact that we practice on patients, and it is a necessary evil. As people train, mistakes are made, complications occur, and outcomes are affected. This training can add to chaotic environments. This has been published in both veterinary and the human literature. For example, dogs presenting to the University of Illinois Veterinary Teaching Hospital for unilateral cruciate disease were entered into a trial in which their gait was analyzed before surgery (lateral fabellar suture or TPLO) and at 6 weeks, 12 weeks, and 6 months after surgery. The data was analyzed to determine if a single resident was affecting outcome or if experience affected outcome. The data showed that a single resident didn’t affect outcome but the year of training mattered. The first and third year residents had statistically better outcomes than the second year residents. At the time, first year residents were supervised heavily with more autonomy the second year. It is likely that the resident had mastered the skills necessary for those particular surgeries by the third year given the caseload. In a second similar cruciate study with the same procedures, the residents were analyzed for the effect on outcome and the level of experience did not affect outcome. In this second study, direct supervision of the residents during the cruciate study regardless of experience level was required. It is possible that the added supervision decreased the incidence of small errors affecting outcome. The sample size is low and has a historic bias for direct comparison of the 2 groups of residents, but it is certainly an interesting observation.

Mehmet Oz said “As a surgeon you have to have a controlled arrogance. If it's uncontrolled, you kill people, but you have to be pretty arrogant to saw through a person's chest, take out their heart and believe you can fix it.” In general, surgeons and those training to be surgeons are known for their confidence, and this reputation has spilled over into veterinary medicine. Confidence is good but overconfidence is bad. Overconfidence is a type of cognitive bias that can effect recommendations that surgeons make. For example, human orthopedic surgery residents were given several sets of radiographs to review. They gave a diagnosis and a probability of being correct. The residents overwhelmingly gave high probabilities of being correct, even when they were wrong leading to missed fracture diagnoses. Understanding human limitations, practice, follow-up, and re-evaluation can help to alleviate these types of mistakes.

It is reasonable to assume that training technical staff or adding new procedures to a practice has the same type of learning curve. In our practice, new surgery technicians are 3 times more likely to make a mistake than the experienced staff. This has lead to some changes in training of technicians once hired. They are trained with direct supervision for weeks and slowly allowed to become more independent.

Complications and chaos in the work place can lead to a vicious cycle of poor outcomes, poor owner satisfaction and poor staff job satisfaction. Keeping these to a minimum is easier said than done in the majority of veterinary practices. There are doctors and technical staff at all levels of training and competency. Distractions, multi-tasking, and noise pollution from mechanical devices and patients that contribute to miscommunications and even potentially short tempers of doctors and staff.

In human medicine, it is estimated that more than 1,000,000 people are injured by preventable medical injuries with 100,000 deaths as a result in the US as reported by the National Coalition on health Care. These are injurious errors, not including those mistakes that contribute to a bad experience or do not cause morbidity (i.e. radiograph view that has to be retaken). Also only 20 states have mandatory reporting of medical errors, and even in those 20 only a small percentage are reported. There is every reason to believe that there are similar error rates in veterinary medicine.

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One area of particular concern in human medicine is the noise pollution in the intensive care units. Multiple false alarms desensitize nursing staff to alarms that matter. They also contribute to general stress, distraction, and can negatively impact staff job performance. Decreasing the number of alarms and tailoring them to the individual patient can reduce the desensitization and distraction that the noise can cause. This can be a problem in veterinary medicine as well especially in large multi-doctor practices. Not only can distracted or stressed staff cause complications and add to chaos, but if much of the chaos can be attenuated, often times they can catch errors and substantially add to positive patient care. Fostering technical staff as team members can act as a safety catch. The residents overwhelmingly gave high probabilities of being correct, even when they were wrong leading to missed fracture diagnoses. Understanding human limitations, practice, follow-up, and re-evaluation can help to alleviate these types of mistakes.

It is reasonable to assume that training technical staff or adding new procedures to a practice has the same type of learning curve. In our practice, new surgery technicians are 3 times more likely to make a mistake than the experienced staff. This has lead to some changes in training of technicians once hired. They are trained with direct supervision for weeks and slowly allowed to become more independent.

Complications and chaos in the work place can lead to a vicious cycle of poor outcomes, poor owner satisfaction and poor staff job satisfaction. Keeping these to a minimum is easier said than done in the majority of veterinary practices. There are doctors and technical staff at all levels of training and competency. Distractions, multi-tasking, and noise pollution from mechanical devices and patients that contribute to miscommunications and even potentially short tempers of doctors and staff.

In human medicine, it is estimated that more than 1,000,000 people are injured by preventable medical injuries with 100,000 deaths as a result in the US as reported by the National Coalition on health Care. These are injurious errors, not including those mistakes that contribute to a bad experience or do not cause morbidity (i.e. radiograph view that has to be retaken). Also only 20 states have mandatory reporting of medical errors, and even in those 20 only a small percentage are reported. There is every reason to believe that there are similar error rates in veterinary medicine.

One area of particular concern in human medicine is the noise pollution in the intensive care units. Multiple false alarms desensitize nursing staff to alarms that matter. They also contribute to general stress, distraction, and can negatively impact staff job performance. Decreasing the number of alarms and tailoring them to the individual patient can reduce the desensitization and distraction that the noise can cause. This can be a problem in veterinary medicine as well especially in large multi-doctor practices. Not only can distracted or stressed staff cause complications and add to chaos, but if much of the chaos can be attenuated, often times they can catch errors and substantially add to positive patient care. Fostering technical staff as team members can act as a safety catch for short cuts that clinicians may be tempted to take even if it is not the best idea.

There are some other lessons that veterinarians can learn from research into the human field. There are some hospitals with lower than average complications rates for specific surgeries. This is possible by subspecialization. For instance, if the only surgery that one performed was a TPLO, the complication rate would likely be a lot lower than that reported in the literature. Another possibility is a rehearsal. In one hospital, surgical procedures that are rarely performed are practiced first. The surgical team rehearses the procedure with everyone going over his or her part. I have used this technique to minimize the complications experienced at the University of Illinois with total hip replacement surgeries. The nature of the teaching hospital was such that I only performed about 6 total hips.
replacements per year. In addition, the surgical team was different each time varying levels of expertise from technical staff, student to third year resident. Since the procedure was performed rarely, the total hip replacement was practiced (typically on a cadaver or pelvic specimen) so that the team had a refresher course on the procedure. Although there is no comparative data on the success of this practice, on average, the rehearsal was about 2 times longer than the surgical procedure.

The Checklist Manifesto by Atul Gawande brought to the forefront a major push in human medicine to use checklists to decrease patient complications. Checklists have been instituted in multiple institutions with overall success in reducing complications and medical errors. The most notable is the implementation world wide of the World Health Organizations Surgical Safety checklist. In 2 hospitals studied, there was an 8.4% decrease in risk reduction, and the mortality rate went from 1.9% to 0.2% after implementation of the checklist. This has spawned other checklists in a wide variety of areas as well as support form organizations all over the world. The checklist has also been well received by patients and families that participate in the pre-operative portion.

Although the World Health Organizations Surgical Safety Checklist does not directly translate to veterinary medicine, it can be adapted or the principles behind it can be used to create one that works for any practice. In my practice, I kept track of the chaos that occurred and to which patients prior to implementing a checklist and afterward. These anarchies that contributed to chaos and complications included errors in prescriptions that could have caused injury to missing instruments in packs that delayed surgical time. Prior to implementation of the checklist, the rate was reduced by half from 36.3% to 16.7% after the checklist was added. This is a simple checklist that involved each surgical patient. The technical staff uses this checklist to make sure that the patient is ready for surgery.

Since implementation, other checklist specific to the way a specific clinician works have been developed at our practice. The technical staff have also embraced the idea and use them now and developed their own for cleaning, stocking, and sterilization purposes. However, there was considerable push back in the beginning with the thought that it was just “more paperwork” to fill out. However, knowing our rate of chaos and errors helped in that the staff understood that it was unacceptable. Once in the habit of using the checklist, they do not want to live without it.

The World Health Organization Surgical Safety Checklist can be found online at http://www.who.int/patientsafety/safesurgery/tools_resources/SSSL_Checklist_finalJun08.pdf or by googling WHO SSC. This website also contained information on implementations of websites.

References
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