

USING KIRBY'S RULE OF TWENTY TO CREATE NURSING PLANS

CLINICAL PATHOLOGY/NURSING

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As the amount of medical care owners are willing to provide for their pets changes, so does the need for veterinary technicians with increased knowledge as well as technical and critical thinking skills. Patients that are hospitalized for treatment of their conditions require technicians that are confident and proficient in these abilities, while also being diligent in their monitoring and nursing care. Kirby's Rule of Twenty, developed several years ago by Rebecca Kirby, DVM, DACVIM, DACVECC, provides a guideline to make sure that all monitoring parameters are met to prevent any additional morbidities, or even death, in our hospitalized patients.

Nursing care plans are common in human nursing, and are sometimes called bundles, orders, or protocols. They are intended to allow the nurse some autonomy when caring for their patients. An example of this could be that if a nurse notices an abnormal heart sound on auscultation, she can also run an electrocardiograph without pre-approval from a doctor first. While veterinary medicine still has some room to grow in this area, certainly in some settings where trust between the staff and doctors is strong, this could prevent and catch some important changes in a patient's parameters. Allowing this freedom for technicians not only increases job satisfaction (as it inherently proves trust in the staff to make some decisions), but is also can save time when caring for patients whose medical status can change very rapidly. Preventing the need to ask a veterinarian if running a blood pressure on an ill patient is OK can help catch life threatening hypotension faster, and treatment can be implemented much more quickly. Teaching technicians that just because a monitoring parameter is *not* circled on the treatment sheet does not mean they aren't allowed to check that parameter is the first step in building that doctor-technician-patient care trust.

By using the list in Table 1, veterinary medical staff can create lists, treatment sheets, or other forms and checklists to ensure that each patient is having each parameter met. Each parameter has important consequences when not adequately monitored. All of the parameters rely on each other to work appropriately as well. For example, you cannot appropriately address renal function if you are not also monitoring fluid balance and electrolytes. You also cannot appropriately address nutrition if you have not also addressed any gastrointestinal (GI) motility issues.

Table 1. Kirby's Rule of Twenty

Fluid Balance	Oncotic Pull
Glucose	Electrolytes
Oxygenation and Ventilation	Level of Consciousness and Mentation
Blood Pressure	Heart Rate, Rhythm and Contractility
Albumin	Coagulation
Red Blood Cell and Hemoglobin Concentration	Renal Function
Immune Status, Antibiotic Dosage and Selection, and White Blood Cell Counts	GI Motility and Mucosal Integrity
Drug Dosages and Metabolism	Nutrition
Pain Control	Nursing Care and Mobilization
Wound Care and Bandage Change	Tender Loving Care

Since the majority of hospitalized patients are placed on intravenous therapy, it makes sense that this parameter would need to be monitored often. Patients with comorbidities, such as a patient in renal failure *and* congestive heart failure, can be a challenge to treat with IV fluids. While it may seem simple or mundane, checking to ensure that the IV pumps are working correctly, that boluses have not accidentally been restarted, or that batteries are charged are simple ways to monitor this parameter. Listening frequently to heart and lung sounds is the best way to catch early signs of fluid overload. Patients on IV fluids who have nasal discharge or developed a cough may have been fluid overloaded for an extended period of time. Patients who will require multiple types of fluids, including hypertonic solutions, drugs, or transfusion products, may warrant the placement of a jugular or central venous, multiple port catheter so that these treatments can be provided without causing any phlebitis or drug interactions.

Oncotic pull and albumin monitoring go hand in hand. Albumin is the predominant protein in the vascular space that works to create oncotic pull. Oncotic pull is what keeps the fluids within the vascular space. Without albumin, fluids escape through the vessel walls and cause third spacing and edema. Monitoring for signs of edema, running total

protein tests and making sure the patients are being provided appropriate nutrition can help keep this parameter in check. Patients who are hypoalbuminemic may show signs of drug overdoses despite being given appropriate dosages if the drugs provided are highly protein bound. Without protein to bind to, the free drug is available to exert the effects on more tissues. Critical care facilities may have an osmometer, which can measure the osmotic pressure of a patient's blood. Intravenous albumin, either human or canine, has also been used to increase albumin levels, though not without some controversy. It is important to note that plasma is *not* an appropriate way to increase a patient's albumin level because it requires a significant amount to do so. As an example, a 20lb dog would only require 40mls of 25% albumin intravenously to raise the albumin level 0.5mg/dL, while requiring 180–275mls of plasma to raise the albumin the same amount. In this small patient, this could easily push them into fluid overload territory.

Glucose can be affected in numerous illnesses including diabetes, renal failure, GI disorders, neurologic diseases, and toxicities. Hyper- and hypoglycemia can be a detrimental finding in many conditions as well, including sepsis. It is extremely important that blood glucose tests are performed frequently on patients with diabetes or head trauma, as changes can have very negative consequences, including seizures, coma, or death. Making sure patients are eating adequately, are urinating normally, and are not developing urinary tract infections are other ways to monitor and manage glucose levels. For patients who will require frequent blood sampling to monitor glucose levels, consideration should be made into placing a central venous or jugular catheter to provide a way to draw blood samples without resorting to venipuncture each time.

Electrolytes can change rapidly through dilution of IV fluids, particularly sodium, chloride, and potassium, and, as such, supplementation may be required. Other important electrolytes to monitor include phosphorous and magnesium. Electrolyte changes can affect the neurologic system as well as the cardiovascular system, and can be demonstrated by changes on an ECG reading. Frequent blood work to check electrolytes is important, as is ensuring patients are receiving appropriate nutrition. Additional blood work to follow kidney function is also important, as some kidney disease can cause an increase or decrease in the excretion of certain electrolytes.

How well a patient is able to oxygenate is just as important as how well they can ventilate. Inhaling room air should provide enough oxygen for our patients to do well, but if the issue is primarily respiratory, this can become compromised. On the flip side, the patient must also be able to fully expel carbon dioxide to avoid respiratory acidosis. Pain, primary lung disease, neurologic disorders, tracheal obstructions, and pneumonia are only a handful of causes for derangements in oxygenation and ventilation. The only true way to monitor these parameters is through arterial blood gas analysis, but monitoring respiratory rate and effort can give us a good general idea of how well they are oxygenating and ventilating. Pulse oximetry can be useful, but only if the patient is perfusing well (if distal tissues are not receiving oxygen, pulse oximetry won't work), or if the patient is not anemic (you can still obtain a 100% pulse oximeter reading on a patient with a packed cell volume [PCV] of 12%). Providing oxygen, either via oxygen kennels, nasal oxygen cannulas, or face masks can help provide much needed oxygen. For patients who cannot oxygenate and/or ventilate well on their own, intubation and mechanical ventilation may be necessary.

Level of consciousness (LOC) or mentation are often only thought of as pertaining to neurologic disorders, but all patients should have this parameter monitored frequently. Knowledge of the differences between obtunded, stuporous, and comatose is important. Any change in mentation warrants intervention. Patients with other conditions, including hemoabdomen, dyspnea, diabetes, or certain toxicities, can develop drastic changes in mentation in addition to neurologic patients. Monitoring reflexes and ambulation and performing complete neurologic exams are important in all patients as well. For patients whose LOC has drastically changed for the worse, intubation and mechanical ventilation may be necessary.

Blood pressure is a parameter that is easily skipped due to the cumbersome nature of the Doppler unit, and the inconsistencies seen with oscillometric units. For cats, the Doppler is the most accurate way to obtain a blood pressure. When using the Doppler or oscillometric units, it is important to note that the lower the blood pressure, the more likely the systolic number you are getting is really the mean arterial pressure (MAP). All units are most accurate when patients are normo- or slightly hypertensive. Ensure that staff members know how to correctly measure for the correct blood pressure cuff, as cuffs too large/loose give a reading that is falsely low, while cuffs that are too small/tight give a reading that is too high. Blood pressure measurements can help detect cardiac, renal, and neurologic problems. Hypotension is a common finding in patients suffering from anaphylaxis. Medications like pressors or fluid boluses can be given to hypotensive patients, while drugs like nitroprusside or amlodipine can be

given to patients with high blood pressure. Palpating femoral or pedal pulses can give you a quick idea of the patient's blood pressure, but should not be done in place of using a monitor to obtain a reading. Trends in blood pressure readings are more important than a one-time number. The use of a pulse oximeter will not only give you a heart rate, but can be used as a general way to measure blood pressure, as it will have a hard time reading when the patient's blood pressure starts to decline.

Heart rate and the ability of the heart to beat completely and normally is often a parameter that gets missed. Using the ECG machine may seem cumbersome or time consuming. Fear of being unable to interpret the ECG reading also may prevent staff members from monitoring this parameter, but it is paramount that it be done. There are many ways to monitor the heart's ability to function without using the ECG machine, though using it is ideal. Frequently auscultating the heart, palpating pulses, and monitoring blood pressure can provide a lot of information on the function of the heart. A basic heart rate and mucous membrane (MM)/capillary refill time (CRT) check can also provide basic details on the heart's ability to pump. Running a lactate measurement as part of the blood work will also give you an indication as to whether the organs and tissues are being correctly perfused.

A patient that cannot clot well is important to monitor closely, as are patients who are deemed hypercoagulable (likely to throw clots), which includes patients with sepsis, Cushing's disease, or immune mediated hemolytic anemia (IMHA). A patient that is obviously hemorrhaging from trauma or rodenticide toxicity will require blood transfusions, which always warrant one-on-one patient monitoring. Testing coagulation times, either in house or to an outside lab, require specific blood draw techniques. Hypercoagulable patients can often go from appearing normal one moment, to neurologic or painful in the next. Heparin and aspirin therapy can sometimes be instituted in hypercoagulable patients to reduce the chances of a thromboembolism. Watching for Cushing's reflex (bradycardia with hypertension), petechia, epistaxis, or blood in the stool or vomit are additional ways to monitor coagulation in our patients.

PCV are one of the easiest blood tests to perform, and can be run while checking a total solids to monitor albumin and oncotic pull. Anemia can be primary in nature, as with diseases like IMHA or bone marrow disease, or it can be iatrogenic from frequent blood draws in a hospitalized patient. Patients with increased PCVs are more likely to have a thromboembolic event. Both polycythemic and anemic patients are likely to have heart murmurs, so frequent MM/CRTs and auscultation of the heart are imperative. It is important to note any hemorrhage, whether from dislodged IV catheters, blood in the vomit or stool, or an oozing incision so that interventions can be made. Combining multiple blood draws into less frequent tests can help prevent iatrogenic anemia. Patients with IV catheters in place should always be monitored 24 hours a day, and not left alone without staff to monitor them. For patients who are symptomatic from the anemia, whole blood or packed red cell transfusions may be necessary.

The ability of the kidneys to excrete toxins appropriately is no more important than when hospitalized. Kidney dysfunction can be primary, or secondary from things like anaphylaxis, lily, grape, or ethylene glycol toxicity. Monitoring urine output, either by placing an indwelling urinary catheter or measuring potty pads can help determine the course of blood work, IV fluid therapy, and medication administration. Decreased urine production may warrant increasing fluid rates or can indicate worsening kidney function. Monitoring kidney values at least daily can also help determine if the patient is improving or not. Radiographs and abdominal ultrasounds can also be performed to check the appearance of the kidneys. Patients with decreased function may need to have certain medications decreased or removed from the treatment plan altogether.

Knowledge of how well the immune system is functioning is important, as it will affect how quickly the patient will recover and leave the hospital. White blood cell counts, temperature checks, and appearance of wounds can all give indications on how well the immune system is functioning. Monitoring patients closely that are receiving blood products or antivenoms is also necessary, as these patients can have exaggerated immune responses to these treatments. Anaphylaxis and allergic reactions can also be seen and need to be treated accordingly. Temperature trends are great indications of whether an infection is setting in. Patients with IV or urinary catheters who suddenly develop a temperature should have their catheters tended to and possibly replaced. Antibiotics may be necessary if the immune system is not working correctly, as indicated by increased or decreased white blood cell counts.

Drug dosages should be double checked every day to make sure a patient is not accidentally receiving an under- or overdose of any of the medications prescribed. Hospitalized patients should be weighed at least twice a day to make sure they are maintaining weight, and, if not, interventions should be made to prevent further changes. Additionally,

any changes in weight would also warrant readdressing drug dosages and fluid therapy. Determining that a patient no longer requires a medication is also important (i.e., a patient no longer vomiting may no longer require an antiemetic). Patients who are receiving oral medications should be monitored after administration to avoid any pills that may have been rejected and spit out.

Nutrition is necessary for any patient, including those who have been vomiting, have parvovirus or pancreatitis, or have been anorexic. We know now that withholding food for more than 12 hours is actually detrimental to patient health. In patients with retracted vomiting, providing antiemetics would be helpful, as would providing H₂ blockers to patients with regurgitation. If it has been more than 12 hours since a patient has vomited, and it is still not interested in food, a feeding tube must be considered. This can include temporary nasogastric or nasoesophageal tubes, which are very simple to place. Syringe or force feeding are unacceptable as they promote food aversion and do not generally provide enough calories. Any food not eaten by the patient must be removed quickly to avoid spoilage and additional food aversion. Offering many types and textures of food, including the patient's own food can help entice a reluctant patient to eat.

Pain control is also a commonly overlooked treatment. Often what we see as lethargy is actually pain. Panting, hypertension, dilated pupils, posturing, and tachycardia are all signs of pain, even when it is difficult to find the source. Patients with dyspnea often benefit from low dose pain control to help relieve their anxiety. With the large selection of mu agonists, alpha 2 agonists, steroids, and nonsteroidal anti-inflammatories available to our patients, it is unacceptable to withhold pain medications. Alpha 2 agonists and mu agonists all have reversal agents available should the need arise, and butorphanol is a great mu antagonist that also continues to provide analgesia. Patients in pain do not heal as fast, and do not go home as quickly as those who receive adequate pain control. Anxious or fractious patients should also be provided medications to relieve their anxiety, whether pain is apparent or not. Monitoring for changes in pain scores is a great way to determine if pain is being managed appropriately, or if there is a need to investigate further (i.e., sepsis developing after abdominal exploratory surgery).

Nursing care may seem like an easy parameter to monitor, but it is the one that most frequently gets skipped, particularly when the clinic is busy or there is a high patient load. Unfortunately, the things that require the least amount of time are often the ones we skip when we can't find the time. Making sure patients have litter boxes; are walked outside on time; and are given soft, comfortable, and clean bedding goes a long way in decreasing hospitalization time. Giving baths when necessary, wrapping tails in patients having diarrhea, and providing supplemental heat to hypothermic patients is also important. Changing kennels for new scenery, while also allowing staff the ability to manage the patient in a comfortable manner, is just as important. The most important thing we can do for overall nursing care is to ensure proper staffing.

Wound care does not just involve bandages or incisions and lacerations a patient may have, but also any insertion points for any catheter the patient may have. Inserting a feeding tube, IV, or urinary catheter will introduce bacteria, no matter how vigilant we are, so maintaining the patency of the catheters and tubes will help monitor for signs of infections. This may include rebandaging IV catheters, replacing urinary catheters if a urinary tract infection is found, or cleaning insertion sites. Any surgical incision, bite wound, or laceration repair should also be monitored daily to insure that they are dry and intact. Any changes to the wound or insertion site, including redness, swelling, heat, or discharge should be addressed immediately, and new medications may need to be instituted. Patients with wounds or catheters should also be kept extra clean to prevent any urine or feces coming in contact with those areas. Gloves should be worn whenever a patient is having a wound addressed, dressing change, or IV patency checked. And, finally, we cannot forget that all of our patients need some tender loving care (TLC). Spending a few quiet moments snuggling or sitting next to a patient not only makes them feel better, but gives us a mental break from the craziness of the clinic. As difficult as it can sometimes be, allowing owners to come visit their pet is also a way to provide TLC, not only to the patient, but also to their owner. Providing stuffed animals, walking animals outside to get some sun, or providing a favorite food or treat can help reduce the length of time they are required to be in the hospital.

While veterinary medicine may not quite be ready to allow veterinary technicians the autonomy that human nurses enjoy, using lists like Kirby's Rule of Twenty to create nursing plans for each patient is a step in the right direction. Allowing technical staff the ability to make some decisions on behalf of their patients provides a level of job satisfaction unknown in facilities where the doctor is relied on heavily to make corrections to a treatment plan or to order a test.

References available upon request.