**A Survival Guide to Pharmacy Rounding by Systems**

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In our ICU, we typically round in a systematic manner, meaning that to avoid missing elements of patient care; we look at the patient in terms of the patient’s “systems” from head-to-toe. The reason we do this is primarily to bring a consistency to how we look at patients, and secondarily to assure that we look at all the elements to provide the best care to our patients. The systems we look at are pain/sedation, neuro, cardiovascular, pulmonary, gastrointestinal, endocrine, hematology, infectious diseases, and FEN (fluids, electrolytes, and nutrition).

In this “survival guide” we will look at each system and determine what a pharmacist needs to be aware of, what questions a pharmacist needs to ask themselves, and what suggestions a pharmacist can make to provide better treatment for our patients.

**Pain and Sedation:**

When looking at a critically ill patient’s sedation and pain control, we use several tools, the primary of which is RASS (Richmond Agitation and Sedation Scale). The ACCP Critical Care packet in your binder (page 2-184) shows the RASS scale in detail. We use a variety of drugs to achieve a variety of levels of sedation. This system is where we review the patient’s current sedation status (RASS score), the patient’s goal sedation status, and how we can best get the patients to achieve that goal. We will review what agents the patient is receiving for sedation, including benzodiazepines, propofol, analgesics, barbituates or dexmedetomidine. These medications may be given as intermittent doses (IV push) or by infusion. Unless otherwise noted, the patient’s goal RASS will generally be in a range from 0 (awake and calm) to -2 (light sedation). Sedation generally goes hand-in-hand with pain control, and there will be a great deal of overlap in terms of pain and sedation.

In addition, we assess patients for delirium (Delirium is sudden severe confusion and rapid changes in brain function that occur with physical or mental illness) using the CAM-ICU test. It is hypothesized that depth and duration of sedation, severe changes in the patient’s environment and long-term critical illness contribute to delirium. ICU delirium is known to increase ventilator days, ICU days, mortality, and even cognitive dysfunction months to years out in survivors, so prevention is paramount. I’ve included a small packet in your binder about ICU delirium—**make sure you read and understand the material**.

**Neuro:**

The neuro system also tends to overlap with pain and sedation. The difference we have here is generally found in the MICU (2nd floor ICU) in that we have Neuroscience and Neurosurgery patients. These patients may have different or more strict goals based upon their diagnosis and need for additional treatment. Neurological status checks are performed more frequently, and the expectations of those checks are different than they would be on non-Neuro patients. Read up on the Neuro ICU guide in the back of your binder to get a better idea of the different disease states we see in Neurosciences.

**Cardiovascular:**

When assessing a patient’s CV status, we need to be aware of the patient’s vital signs, which can be found in Soarian. Starting off with the blood pressure, we are assessing primarily the patient’s systolic blood pressure (SBP), and the MAP (mean arterial pressure) which can be estimated using the equation (SBP + (2\*DBP))/3. It also will appear on the monitor beneath the blood pressure, and in Soarian. SBP is important because it is the primary parameter for determining how a patient is perfusing their brain post-neurological event. Different disease states have different goals. Patients who are status-post hemorrhagic stroke may have SBP goals of < 220 mmHg to allow downstream perfusion of the semi-affected area known as the penumbra. Patients who are post-embolic stroke or post intervention may have a goal SBP of < 160 mmHg, also to allow perfusion beyond any debris remaining. The situations are called permissive hypertension. Some patients may have a goal of normotension. Check with the team to determine what a patient’s goals are, particularly in the Neurosciences Unit. In other critically ill patients, particularly those in shock, your problem may be HYPOtension, and in these patients the MAP becomes vital. At mean arterial pressures below 65 mmHg, the body gradually begins to lose its ability to perfuse the vital organs. In other words, a MAP below 65 means that the patient is acutely in trouble, and vasopressor therapy may be required. More on pressors later.

As you can tell, there are many varied problems that you can encounter in the ICU, and may different and opposite ways to treat them. When blood pressure control is required, evaluate which drugs the patient is currently receiving and how you can optimize them. Optimization strategies include switching from drips (Cardene/Labetalol) to intermittent dosing of labetalol, metoprolol, or hydralazine, or switching from IV to PO, or simply reducing the number of medications a patient is receiving. Another important element is the predominant rhythm the patient is in, and if and how that rhythm needs to be treated. Certain stable rhythms such as atrial fibrillation may not be a problem, while A-fib with a rapid ventricular response may be more problematic. Heart block syndromes may present themselves in the ICU, and ventricular arrhythmias may also be present in patients. The treatment of these dangerous arrhythmias is vital to patient survival, and could lead to a stabilization in the patient’s overall CV status.

Earlier, I discussed the use of vasopressors. In your ACCP Critical Care packet (pp. 2-174 through 2-178), a good bit of information is available about the various vasopressors and their use in shock situations. The overall goal for the patient is to NOT require vasopressors, and to use fluid boluses to manage occasional hypotension. But in critically ill patients, sometimes filling the tank isn’t enough and additional support is required. Pressors are added, titrated, and removed in a stepwise manner. Each pressor has its strengths and weaknesses in certain situations. Your job on rounds is to optimize that therapy by assessing the patient’s needs and assuring that the patient’s orders match those needs.

Also with patients in shock you’ll hear terms like SCVO2 (central venous oxygen saturation), CVP (central venous pressure), SVV (stroke volume variation), cardiac output and index, and Vigileo monitor. We will look more closely at those things when the opportunity presents on rounds, or separately in a lecture.

Lastly, many medications we commonly use can prolong a patient’s QTc interval. It’s a good idea to review the primary offenders and to keep an eye on the patient’s profile for these drugs. Also, make sure that if a patient is receiving a drug that can prolong the QTc interval that the team orders EKGs on a regular basis (at least every other day).

**Pulmonary:**

We are concerned here with HOW the patient is proceeding with respiration, as well as what QUALITY of respiration the patient is experiencing. First, is the patient ventilated or breathing on their own? Is the patient breathing with supplemental oxygen or are they just on room air? What mode of ventilation is the patient receiving (see the Mechanical Ventilation for Pharmacists article in your binder)? So there’s the HOW. Now focus on the quality. We assess a patient’s ability to ventilate (breathing does not imply appropriate respiration and gas exchange as we’ll see) using the ABG or arterial blood gas. Look in the ACCP Critical Care portion of your packet on pp. 2-169 and 2-170 for how to assess a blood gas. Read this over—it will make your life easier when assessing patients.

In addition, assess the patient’s need for bronchodilators. Do they have a history of COPD? Not every patient on a ventilator requires bronchodilation, as crazy as that sounds.

**Gastrointestinal:**

In the gastrointestinal system, we are concerned with a few things. First, is the patient receiving a form of enteral nutrition? Notice, I did not ask if the patient is EATING. Patients in and out of the ICU may be receiving nutrition through naso-gastric (NG), oro-gastric (OG), percutaneous endoscopic gastronomy (PEG), Dobhoff (smaller-bore type of NG tube that is more comfortable for the patient), or other types of tubes. This allows for us to assess a few things—first, are the patient’s nutritional needs being met? A clinical dietician will usually be on rounds or available for consult to help answer that question. Secondly, can we transition some medications from IV to enteral? This is a large intervention in the ICU and can facilitate patients leaving the ICU for general medical floors or stepdown floors, saving a significant amount of money. Be especially cautious as to what medications you recommend for IV to PO switch. Watch out for bioavailability issues, crushability issues if the patient has a feed tube, or general equivalency issues (no PO equivalent for Zosyn, for example). Lastly, we need to assess the patient’s need for **stress ulcer prophylaxis**. Much has been discussed in medical literature about the use, overuse, and rampant overuse of ulcer prophylaxis. I’ll leave that research and reading to you, but I will let you know that there are only a few literature-proven indications for “GI prophylaxis.” Mechanical ventilation (for > 48 hours), a non-iatrogenic coagulopathy (INR > 1.5 or aPTT > 1.5x control without pharmacologic cause at presentation), severe burns, or neuro trauma are all indications for prophylactic therapy. In our unit, because we are a Neuroscience ICU, we usually allow the neurosurgeons a wide berth and a lot of latitude in defining neuro trauma. There are some secondary risk factors that increase the risk of ulcer formation, including the use of high dose steroids. In addition, if a patient is admitted while receiving prophylactic therapy we will usually allow it to continue as a stable treatment for GERD. However, there are consequences for overusing GI prophylaxis—an increase in the incidence of ventilator-associated and aspiration pneumonias, and a significant increase in the risk of *C. difficile* infection. PPI’s show the highest risk (>3x control), while H2RA’s show less risk (>1.5x control). Our order of preference for GI prophylaxis in patients that require it is to select an H2RA like famotidine first (adjusting dose for renal function, and being wary of thrombocytopenia—where famotidine is relatively contraindicated), a PPI like pantoprazole second (we compound a suspension for use in feeding tubes), and in last resorts, agents like sucralfate. The evidence supporting the use of sucralfate is rather borderline evidence for efficacy. Be aggressive in eliminating GI prophylaxis in patients who no longer meet criteria. Enteral is ALWAYS the preferred route.

Please also see the article, “Enteral Nutrition in the Critically Ill: Myths and Misconceptions,” as this provides a quick evidence-based rundown of things that even seasoned physicians and pharmacists miss during rounds. This also addresses misconceptions and misnomers that someone heard somewhere—all ungrounded in medical fact—that still get incorporated into practice.

**Endocrine:**

Glucose control in the ICU has been debated for many years. The nature of the debate is this: hyperglycemia in the ICU is bad. End organs get damaged, and problems are exacerbated, so patients should be well-controlled in the ICU. HYPOglycemia in the ICU is worse. Much worse. The NICE-SUGAR trial showed that tight glycemic control is ideal, but that a single hypoglycemic event in the ICU increases mortality by a significant amount. Glucose control guidelines will vary depending on the source, but generally a range of 100-180 mg/dL is acceptable. In critically ill patients with severe hyperglycemia, an insulin infusion may be required. Generally, once a patient’s blood sugar is > 180 mg/dL on two consecutive readings despite appropriate coverage and maintenance, an insulin infusion may be started. Our role in this is always to attempt to get the patient off the insulin infusion, as that is a roadblock in the patient’s journey out of the ICU. We should look at the nurses’ flowsheet to determine the patient’s 24 hour insulin requirement (once the patient’s sugars have stabilized on the infusion—not necessarily normalized, but stabilized). This isn’t the drip rate x 24 hours. It’s actually how much IV insulin the patient has required in the last 24 hours. We then look to convert that to a basal/bolus regimen. There are several ways to do this, which we will discuss more in detail when the opportunity arises, but this can also be a significant step in moving the patient out of the ICU.

Another role we have is ensuring that a patient is on their home antidiabetic regimen as appropriate. Critical care people don’t really like long-acting meds, so sulfonylureas and the like are generally not good in the ICU. We’ll cover patients with short acting insulin for the duration of their critical illness. We use regular insulin for patients who are NPO or are receiving tube feeds, and we use Humalog/Novolog in patients who are eating due to its rapid onset.

Lastly, thyroid function can be very important in these patients. Hypothyroidism could be a part of a hypotensive picture, just as HYPERthyroidism can be a part of a HYPERtensive picture. Check to make sure patients, especially stroke patients have had a TSH checked.

**Hematology:**

The majority of what we do regarding hematology is involved with preventing thromboembolic events and recognizing the symptoms of heparin-induced thrombocytopenia. We will assess trends in hemoglobin and hematocrit for signs and symptoms of bleeding, platelet counts for thrombocytopenia, and generalized CBC cell counts to track and trend what could potentially be side effects of medications. Any patient who is not at risk for bleed or admitted for a bleeding-type syndrome (hemorrhage, hematoma, etc) should be placed on DVT prophylaxis. It’s also a good check to make sure that even those patients for whom anticoagulation isn’t appropriate are ordered SCDs (sequential compression devices) to prevent the incidence of thrombosis.

**Infectious Diseases:**

Infectious Disease is often a rotation all its own. For the purposes of these rounds however, we’ll limit the scope to making sure the patient is on the appropriate antimicrobial therapy at the right dose for the right infective process. Ask yourself the following questions: First, does this patient NEED an antibiotic? Look for sources of infection, signs of infection, culture and sensitivity data, and vital signs. Look at the patient’s vital signs—are they febrile (temperature > 100.4F)? Look at the CBC? Is their WBC count elevated, suppressed, or normal? Look at their differential if it’s available. Is their neutrophil percentage elevated? Are they bandemic? Where could an infective process be coming from? CNS? Lung/respiratory tract? Intra-abdominal? Genitourinary system? Could they have cellulitis or have a wound? Do we have positive cultures to support our findings? What guidance do they give? Do we have any information from secondary markers like C-reactive protein (CRP) or procalcitonin? Look at all the studies available—labs, vitals, even radiology to get an idea.

Once you establish that the patient most likely has an infection, we need to establish the appropriate empiric therapy for that infection. Once data limits down the causal agent for the infection, we can now de-escalate or narrow the patient’s antimicrobial therapy appropriately. We may even be able to stop it. Once a patient is receiving antimicrobial therapy we need to be sure that we are monitoring it appropriately. Does the patient’s therapy require drug levels, and if so, are they ordered? If ordered and resulted, have they been appropriately interpreted and acted upon? Another element of infectious disease that makes it so different from critical care or other medical disciplines is that instead of the classic “drug, dose, route, frequency” aspect of pharmacotherapy, we add a fifth element—duration of therapy. Antimicrobial therapy is designed to have an endpoint. We need to assess this endpoint and assess how long each infective process will require treatment early on—most frequently during the initial ordering process.

**Fluids, Electrolytes, and Nutrition**

As you can tell if you’ve glanced through this packet, there are entire textbooks written about this element of patient care. Make sure you read through the FEN section in the ACCP handouts to understand what I’m referring to here. Rule number one—neuro patients should never receive HYPOtonic fluids. This causes intravascular fluids to shift into the periphery and tissues and can cause swelling in the brain. They may and frequently do receive HYPERtonic fluids such as 3% sodium chloride. This is to promote the exact effects—fluids in the periphery will now flow from the periphery into the intervascular space, resulting in a reduction of swelling, particularly in the brain. Rarely—in fact almost never—will we see patients receiving any hypotonic fluid in the Intensive Care Unit.

As for your role on rounds, you’re going to assess the electrolytes and make efforts to replenish and replete whatever is necessary to normalize them as much as possible. By the time you get to rounds, most likely the medical team will have already done this, but it never hurts to ask. Remember too, PO electrolyte replenishment works just as well as IV, and is usually better tolerated. As far as nutrition goes, we have a registered dietician on rounds most days. He/she knows way more than you do about this, so listen well. Some pointers about nutrition are that TPN is a LAST resort; propofol provides 1.1 kcal per mL infused; and always use the gut unless you have a really good reason not to.

**Integumentary**

The skin is the largest organ in the body, and while it’s not specifically always addressed on rounds, skin tears, lesions, and wounds can provide explanation for some of the problems that our patients are experiencing. Don’t forget about the skin!

**Finally**

Before you round, read the patient’s history and physical (H&P). Figure out why they’re here and what their needs are. If you aren’t sure about a disease state, make yourself rudimentarily familiar with it. Read through their current orders, see where the patient is currently. Look at all the objective data—be prepared.

Overall, your final job on rounds is to assess for opportunities to switch agents from parenteral to enteral routes, be certain that drugs are dosed appropriately for a patient’s hepatic and renal function, and make sure that all medications that are soon to expire are assessed and re-ordered if appropriate.

Don’t be afraid to speak up during rounds, don’t be afraid to ask me questions, and remember that everything you do helps the patient in the end. Good luck.