Quality Improvement Activity: Recognition of Complication Related to Fluid Management

At 1900, a diabetic 57-year-old woman was admitted to the Medical ICU for generalized weakness, fever, and fatigue. The patient reports that she joined a rigorous hiking adventure with her family at around 1500. Since then, she has states of fever unrelieved by tylenol and complains of extreme thirst. Upon arrival in the ED, the nurses reported that the patient is a "hard stick" and was only able to start an IV site on the right antecubital. They were able to draw blood and also obtained a urine specimen. The nurses also noted a fruity breath coming from the patient. The lab results show elevated WBC (21000), elevated glucose (560), and ketones positive in the urine. When the patient was transferred to the ICU, a head-to-toe assessment conducted by the ICU nurse revealed that she has a purulent, grade 2 diabetic foot ulcer. The patient states that she "did not realize" what she has on her feet. Cultures were obtained from her foot ulcer and tested positive for *Pseudomonas aeruginosa*. The ICU doctor diagnosed the patient with Diabetic Ketoacidosis and placed orders to put the patient in an insulin drip and on an antibiotic treatment.

After seeing the orders of Regular Insulin and Piperacillin-Tazobactam (Zosyn), the nurse drew the medications in the Pyxis machine and grabbed an IV pump. Seeing that there is only one IV site available, the nurse decided to infuse both medications in the Y-site. Since it was shift change, the day nurse gave report to the night nurse and did not properly assess the IV site. An hour has passed since the medications were started and the night nurse was ready to titrate the insulin dosage. As she was about to obtain the patient's blood sugar, she noticed that the patient's fingers were cold and capillary refills were more than 3 seconds. The night nurse assessed the IV site and discovered that it was red, warm, edematous, peeling, and tender to the touch. The patient also complained of excruciating pain when asked about her arm. The IV tubing was also very cloudy and sedimentary particles formed along the arm end of the catheter.

Describe the scenario. In what way did the patient care or environment lack? Is this a common occurrence?

In the scenario, a diabetic patient experienced diabetic ketoacidosis and was promptly transferred to the medial intensive care unit. A diabetic ulcer was discovered on her foot that she denies experiencing. This is common in diabetic patients since they experience neuropathy. A stage 2 diabetic ulcer was discovered, and it was positive for Pseudomonas, which was the reason for the patient's fever and increasing WBC count. Naturally, an antibiotic would be added to the treatment plan with the insulin drip. However, these medications are both incompatible. These should never have been combined on a single IV line. A prudent nurse would have checked compatibility and started a new site or recommended a PICC line since there would be multiple infusions. A single lumen will not be sufficient and will risk multiple complications, phlebitis in this particular scenario. The nurse should've been diligent in performing her duties, regardless of if it's almost shift change. Additionally, the incoming night nurse should have checked the patient and the IV site since she has medications infusing. A study conducted by the *Journal of Intensive Care* reveals that 7.5% of peripherally inserted vascular catheters lead to phlebitis in the ICU setting. This study concludes that PIVC-related phlebitis and other complications are common in critically ill patients (Yasuda, et al 2021).

What circumstances led to the occurrence?
The circumstances that directly led to this occurrence was the ICU nurse did not diligently check the IV compatibility of the medications. Although it was a late admission and it is almost shift change, it is the nurse's duty to make sure that the patient is safe and given the proper medical attention. An additional IV site would have also prevented this. Furthermore, the incoming night nurse was not prudently checking on her patient. The nurse should've checked the patient, especially her IV site, after obtaining the report.

In what way could you measure the frequency of the occurrence? (interview nurses, examining charts, patient surveys, observation, etc.)
Measuring the occurrence of fluid management complications can be quite a challenge. To measure the complication, I would recommend reporting any incident to the charge nurse before any intervention is performed. The charge nurse will perform an assessment of the IV complication and records it. Another way to track occurrence is to interview the patients during the discharge procedure. Asking the patients for any concerns on the IV sites during their stay in the hospital while carefully assessing the sites would be another way to measure. Reviewing patient's charts will also be beneficial in measuring occurrences.

What evidence-based ideas do you have for implementing interventions to address the problem?
IV site complications are very preventable. One way to implement IV site complications is to collaborate with the pharmacy. Medication labels should have a warning label or sign on the bags to alert nurses to check compatibility. Some examples include:


Another way to implement IV site complications would be to automatically link all the patient's medications and pyxis/Epic notifies for incompatibilities. For instance, when the nurse pulls up both Zosyn and Insulin, a prompt will appear that these medications cannot be Y-ed together. During medication scanning in the patient's room, another prompt will appear showing that these are incompatible with a recommendation to infuse on another lumen or start a site. Lastly, we can provide a bigger and improved IV compatibility chart in every med room.

How will you measure the efficacy of the interventions?
To measure the efficacy, I recommend dedicating a space on the floor's entrance board to keep track of changes. Beside the spot for patient falls and CLABSI counts would be the optimal place that can put the number of IV site complications. This will be an effective way to keep track of the interventions. The board will be updated every day until the goal of 0 is achieved and sustained. That way, everyone gets a reminder that this is a team effort to reduce preventable problems. Another way to document efficacy is to interview nurses on how this change impacted them in their practice, positively or negatively. I will also remind everyone that this is a continuous process, and everyone's input will be valued and considered.

Sources

Journal:

Yasuda, H., Yamamoto, R., Hayashi, Y., Kotani, Y., Kishihara, Y., Kondo, N., Sekine, K., Shime, N., Morikane, K., Abe, T., Takebayashi, T., Maeda, M., Shiga, T., Furukawa, T., Inaba, M., Fukuda, S., Kurahashi, K., Murakami, S., Yasumoto, Y., … Ishii, J. (2021). Occurrence and incidence rate of peripheral intravascular catheter-related phlebitis and complications in critically ill patients: A prospective cohort study (Amor-Venus Study). Journal of Intensive Care, 9(1). https://doi.org/10.1186/s40560-020-00518-4

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