Saint Luke's REGIONAL LABORATORIES

Clinical Laboratory News

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Red Blood Cell Additive Solutions and Pediatric Transfusion

Red blood cells (RBC) for transfusion are stored in anticoagulant-preservative citrate phosphate dextrose adenine-1 (CPDA-1) which preserves and maintains viability for 35 days. Additive solutions (AS) further improve viability and extend shelf-life to 42 days. The dextrose, adenine and mannitol present in AS (dextrose and adenine are also present in CPDA-1) were thought to potentially alter intracerebral pressure and possibly cause hepatic or renal toxicities in neonates. However, the accumulated literature suggests that blood components stored in AS are safe and efficacious for small volume transfusions (10-15 mL/Kg) in neonates (Jain, R., Transfus Apher Sci 2001;24(2):111-115; Strauss, R.G.,J Pediatr 2000;136:215-219; Goodstein, M.H., J Pediatr 1993;123(5):783-788). The literature remains controversial in the context of large volume RBC transfusions in infants, such as exchange transfusions, cardiac surgery or extracorporeal membrane oxygenation (Mou, S.S., N Engl J Med 2004;351:1635-1644, Luban, N.L., Transfusion 1991;32(3):229-235).

Many advantages of using RBC stored with AS for neonatal transfusions have been identified;

1. RBCs preserved in AS deliver less extracellular potassium as compared to RBCs stored in CPDA-1 (Fung M.K., AABB Technical Manual 2014).
2. RBCs with AS have comparatively less plasma, so risk of hemolysis from transfusion of Group O red cells with high-titer anti-A and anti-B is very low (Venkatesh, V., Br J Haematol 2013;16(4):421-433).
3. Longer shelf life of RBCs with AS may result in decreased donor exposure (Luban, N. L.C., Early Hum Dev 2008;84(8):493-498).

Historically, Saint Luke's Health System has only utilized CPDA-1 RBC units for pediatric transfusions. Moving forward, SLHS blood banks will transition to RBCs stored in AS for small volume pediatric transfusions (including neonatal transfusions). This will expand the available inventory for pediatric transfusions. For neonatal exchange transfusions, cardiac surgery and extracorporeal membrane oxygenation, CPDA-1 units can still be arranged on request.

Usefulness of Fibrinogen Levels in Coagulation Screen Testing

Prothrombin time (PT) and partial thromboplastin time (PTT) testing are mainstays in monitoring abnormal bleeding/coagulation in patients on anti-coagulation therapy and in screening patients with a history suggestive of inherited or acquired bleeding. These tests are not useful in screening ambulatory patients with no bleeding history. In addition, an increased risk of post-operative bleeding/thrombosis cannot be reliably associated with abnormal PT and PTT values. Dysfibrinogenemia and fibrinogen deficiency, whether acquired or inherited, requires determination of serum fibrinogen levels and functional fibrinogen assays. The primary screening test for dysfibrinogenemia is thrombin time (TT). The sensitivity of TT test is not well characterized; however, specificity is poor due to factors such as heparin contamination of plasma and/or presence of direct thrombin inhibitors and anti-thrombin antibodies which prolong TT. Shortening of TT is seen with dextran, hydroxylethyl starch, and rarely dysfibrinogen.

Plasma fibrinogen levels, TT, and platelet counts are variably offered as a part of coagulation panels in many health care facilities. Investigators at University of Washington reviewed two separate coagulation panels that were offered in their facility – first, a two-component panel consisting of PT and PTT, and second, a four-component panel consisting of PT, PTT, TT, and kinetic fibrinogen. From 1998 through early 2007, a disproportionate increase in ordering of the four-component coagulation panel was noted. Investigators

reviewed a total of 28,737 four-component coagulation panel results representing 6-months of testing. Approximately 39% of the total tests showed normal PT and PTT. Prolonged PT, seen in 33% of results, was associated with liver failure (8%), warfarin (23%), and presumed vitamin K deficiency (69%). Prolonged PTT occurred in 34% of results and was primarily attributed to lupus inhibitor. An additional 15% of results showed prolonged TT and PTT, indicating heparin contamination. Fibrinogen levels were normal in approximately 98% of panels. Critical fibrinogen levels seen in 0.6% of panel results were associated with bleeding in nearly all patients (90%). Interestingly, only 8% of panel orders were clinically indicated based on patient history. The conclusion of this study was that many coagulation test panel orders were not clinically indicated resulting in overuse and increased cost.

Saint Luke's laboratories offer a three-component coagulation screening panel which includes PT, PTT, and fibrinogen. Between January 16 and January 23, 2017, Saint Luke's laboratories performed 258 coagulation screening tests on approximately 216 patients. Of these, only 4 (1.5%) tests showed fibrinogen levels less than the normal range of 146 mg/dL. Interestingly, in all 4 cases PT values were elevated. PTT values in all 4 cases were variable and ranged from normal to critically elevated. These results are similar to the published study suggesting that in approximately 98% of coagulation screening tests requested, fibrinogen levels do not add relevant information for patient management. Therefore, PT and PTT testing may be sufficient as an initial coagulation screen in patients with no bleeding history.

Urine Drug Screen Interpretation Tips

Urine drug screens are frequently ordered on patients who exhibit symptoms of intoxication, experience trauma or have a history of drug ingestion. Most hospital laboratories use immunoassays to detect drugs because they are relatively simple to perform, have high sensitivity for drugs of abuse and provide rapid turnaround time**.** Saint Luke's Health System laboratories use a rapid immunoassay (Triage) to screen for drugs of abuse in urine. The major problem with all rapid immunoassays is their less than perfect specificity for each drug class.

Most false positives occur when 2 to 4 drugs are positive in the same specimen, suggesting nonspecific interference in the screening assay. Prescription drugs, over the counter medications and herbal supplements may also cause false positive screening results. False positive THC reactions are most commonly associated with Clozaril, Propulsid, Protonix, Paxil, Tegretol and Zocor. Over the counter remedies can produce false positive results in the phencyclidine and benzodiazepine assays. Herbal supplements containing ephedra may produce a positive amphetamine reaction, while ingestion of poppy seeds may produce a positive opiate reaction.

Most rapid immunoassays are designed to detect opioids such as heroin, codeine, and morphine, but may not detect hydrocodone and oxydocone. Testing for either of these drugs is available as an individual assay. Likewise, fentanyl is not reliably detected by screening, but is available separately, either on urine or blood specimens.

The laboratory often receives phone calls asking how long a particular drug of abuse can be detected in urine. The detection window for the most common drugs of abuse is summarized below**.**

Drug	Detection Time
Amphetamine	1 - 3 days occasional use 7 – 10 days chronic use
Methamphetamine	1 - 3 days occasional use 7 -1 0 days chronic use
Barbiturates	4 - 6 days
Benzodiazepines	2 – 7 days
Cocaine	2 – 3 days occasional use 4 days chronic use
Fentanyl	1 – 3 days
LSD	1 – 5 days
Marijuana	3 – 5 days occasional use 8 weeks chronic use
Methadone	2 – 3 days
Opiates	2 -3 days
PCP	7 – 14 days
Propoxyphene	1 – 7 days

Pregnancy Related Tests

Urine protein/creatinine ratios (24 hour and random) are now an orderable test for pregnant patients. The unit of the results reported is protein mg/creatinine mg. In addition, serum TSH is also an orderable test for pregnant patients. The results reported show trimester-specific reference ranges.