

# CORONAVIRUS DISEASE 2019 (COVID-19)

## Guidance on Conservation of Blood Collection Tubes



**Audience:** Clinical Leadership, Physicians, Nurses, Supply Chain and Labs

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Due to the ongoing logistics/manufacturing issues that have arisen with the pandemic, Trinity Health continues to be challenged with the nationwide shortage of blood collection tubes from the two FDA registered blood collection tube manufacturers. This shortage has now spread to include light blue, green, gold, pink, and purple tops with varying ranges of impact, depending on the RHM. This shortage is anticipated to continue through the first quarter of calendar year of 2022. Each Health Ministry should gather key stakeholders to develop an internal plan for ongoing evaluation to include frequent monitoring of blood tubes and estimated days on hand of inventory.

- Recommendations have been developed to conserve affected tubes, understanding that not all recommendations are suitable to every ministry.

It is critical that tight monitoring of tube usage and projected days-on-hand be closely monitored with the help of local supply chain leaders and partnership with laboratory leaders. Because the supply situation is fluid, some ministries may be asked to share supplies with less resourced ministries within the Trinity Health system. Such requests would go through local laboratory leaders so that the supply of tubes on hand locally would be adjusted to reflect any transfers.

### **Conservation Strategies:**

1. Communicate and educate Residents and Physicians and all applicable clinicians on existing shortages and the need for blood tube conservation strategies:
  - Avoid Rainbow Draws in the ER: Work with ER leaders to assess what can/can't be removed. Criticality of inventory should help drive decision.
  - Avoid multiple draws, by bundling care
  - Add on testing to previously drawn specimens
2. Supply Chain and Lab:
  - Days on hand: Develop process for determining inventory days on hand (DIOH) and reporting cadence/communications.

- Consider using tools such as, Teams, to allow for shared document across RHMs and departments
  - Utilize Hospital daily Safety Huddle or Incident Command, as applicable
  - Discuss inventory pipeline
  - Review allocation reports and ensure available inventory is ordered
  - Identify additional storage space if needed to increase days on hand
  - Use OBI (Oracle Business Intelligence) Pandemic Dashboard to assist with understanding Trinity Health DIOH. Local Supply Chain can access blood collection tubes, which have been categorized by color for ease of use in determining specific DIOH
  - Par level review: Review par levels on inpatient units and non-acute care locations to optimize supply and safely reduce/utilize shelf inventory. Laboratory to work with outpatient physician offices to do the same. Centralize inventory for re-dispensation.
  - Eliminate Wastage: Proactively review inventory expiration dates and move short dates to high volume users.
3. Consider Add on Tests to Previously Drawn Specimens:
- Driven by local HM Lab specimen stability policy:
    - Consider evaluating sample stability to extend allowed timeframes for add-on testing opportunity
4. Avoid the use of additive tubes as discard tubes
5. Involve Cardinal, Greiner and BD reps to drop ship inventory, if/as applicable

### **Testing and Tube Type Alternatives:**

#### **1. Point of Care Testing**

Point of Care (POC) testing may provide a viable solution for tube conservation, depending on each Health Ministry's available equipment. This may help to ensure a ready backup plan that the HM may quickly pivot to when days-on-hand inventory reaches less than 2 weeks (and help to extend existing inventory).

#### **Common POC Examples to Consider:**



















- Abbott iStat
  - Wide range of Chemistry, Coagulation and Hematology (Hgb/Hct) testing available
- Blood Gas analyzers
  - Depending on make and model most will provide electrolytes, Hgb, Hct, glucose, ionized calcium and creatinine
- HemoCue (Hemoglobin)

Correlation studies must be performed by the HM's local laboratory for any tests on an existing POC platform that are not currently being reported or any new POC instruments added. Result and order integration may also be required.

## 2. **Identify Viable Tube Alternatives:**

- Laboratory leaders to identify viable alternatives depending on equipment and tube validations
  - Chemistry test potential alternatives: Lithium Heparin plasma separator (PST), Lithium Heparin plasma (no separator), Red top serum, gold top serum
    - Pivot non-acute care locations to gold tops to conserve green tops for inpatients
  - Blood Bank Pink Top alternatives: 10mL EDTA purple tops, 4mL - 6mL EDTA purple tops (note more tubes may need to be drawn)
  - Hematology Purple top alternatives: 2 mL – 6mL EDTA purple tops

Guide Added 11/15/2021

<div>Order of Draw</div> <div>Vacutainer Tube Guide</div>										
Greiner										
BD										
	BLUE	DARK BLUE Serum NO Additive	RED	GOLD	ORANGE	MINT GREEN	DARK GREEN	LAVENDER	PINK	DARK BLUE K <sub>2</sub> EDTA
Min draw vol:										
Max draw vol:										
Coagulation ANTI-THROMBIN III* (ACTIVITY) DIMER* FACTOR ASSAYS * FIBRINOGEN * APTT* PT LAC*  *SEPARATE AND FREEZE PLASMA  NOTES: FOR ACCURATE RESULTS, FILL BLUE TOP TUBE TO THE TOP OF THE LABEL. DRAW A RED DISCARD TUBE PRIOR TO COLLECTING THE BLUE TUBE.	Trace Elements Aluminum Copper Chromium Selenium Zinc  NOTE: SEPARATE AS SOON AS POSSIBLE	Select Chemistry Tests  & <u>OB Tests</u> MSAFP INT ONE INT TWO QUAD FTS SEQ SCR1 INT ONE NT INT TWO NT	Gen Chemistry See Mint Green List  Use this if Mint Green/Dark green with yellow ring or the Dark green plan or with black ring are not available.	Troponin	Gen Chemistry AFP TUMOR MARKER ALBUMIN ALK PHOS AMYLASE ANA BAS PANEL BILIRUBIN BUN BHCG CA 125 CALCIUM CEA CK CMP CRP CHOLESTEROL CHLORIDE CREATININE ELECTROLYTES ESTRADIOL FERRITIN FOLATE GLUCOSE HDL HEPATITIS AB HPR (A,B)	HEPATITIS C (HCVR) 1 SST & 1 LAV IGA, IGG, IGM IRON PROFILE LDH LDLD LPT LIPASE LITHIUM MAGNESIUM MONO POTASSIUM PROTEIN PSA RF SYTPA SYSTEM RUBELLA SGOT(AST) SGPT(ALT) SODIUM TESTOSTERONE TRIGLYCERIDE TSH FT3 FT4 URIC ACID VITAMIN B12 VITAMIN D, 25H	Ammonia Transport on ice and deliver within 20 min  Lactic Acid Specimen good for 30 min on ice, 10 min at room temp  Homocysteine  Parathyroid Hormone, Intact  Also suitable for Gen Chemistry	Hematology & BNP HEMOGLOBIN A1C RBC FOLATE SED RATE SICKLE CELL F5L  VITAMIN B6 DELIVER TO LAB WITHIN 1 HR.  VITAMIN B1 DELIVER TO LAB WITHIN 1 HR.  2 4mL or 1 6mL can be used in place of pink top for Blood Bank	Blood Bank ABO Type & Rh Antibody Screen Direct Coombs  Blood bank samples must have full patient name, date of birth, date/time of collection, and collector name on label. Transfusion samples also require SS# or SJMHS ID#  SS# or SJMHS ID# must also be written on the requisition to match with specimen.  BNP	Trace Elements Arsenic Cadmium Lead Manganese Mercury RBC Zinc RBC Copper RBC Magnesium

**Light Blue top Tube: The following guidelines provide alternatives to reduce the need for coagulation testing.**

Medications Requiring Frequent Monitoring	Monitoring Tests Required (additional on initiation)	Alternatives with Less Frequent or No Required Monitoring
<b>Alternative anticoagulant options vary on indication and patient specific factors (i.e., renal insufficiency etc.). Contact your pharmacist for more information.</b>		
Heparin Infusion (Prophylactic (low dose) heparin does not usually require monitoring)	APTT or Anti-factor Xa Every 6-8 hours until values are stable in therapeutic range. (~3-4 blue tops/day)	1. Low Molecular Weight Heparin (Enoxaparin)* 2. Direct Acting Oral Anticoagulants (Apixaban/Eliquis®; Rivaroxaban/Xarelto®; Dabigatran/Pradaxa®; Edoxaban/Savaysa®)*
Argatroban (Usual use: suspected Heparin-Induced Thrombocytopenia/HIT)	APTT every 2-4 hours until values are stable in therapeutic range. (~4-6 blue tops/day)	1. Factor X Inhibitor (Fondaparinux, (Arixtra)* 2. Direct Acting Oral Anticoagulants (Apixaban/Eliquis®; Rivaroxaban/Xarelto®; Dabigatran/Pradaxa®; Edoxaban/Savaysa®)*
Warfarin	INR/PT - sometimes daily during acute illness; or upon initiation until stable then based on response (1 blue top per day)	1. Direct Acting Oral Anticoagulants (Apixaban/Eliquis®; Rivaroxaban/Xarelto®; Dabigatran/Pradaxa®; Edoxaban/Savaysa®)* 2. Low Molecular Weight Heparin (Enoxaparin)* 3. Where possible, reduce the frequency and/or extend timing of PT/INR orders especially for stable patients on long term warfarin <sup>1</sup>
*Check baseline renal function/CrCL		
1. College of American Pathologists Blue Top Tube Recommendations. <a href="https://documents.cap.org/documents/CAP-Blue-Top-Tubes-recommendations_FNL.pdf">https://documents.cap.org/documents/CAP-Blue-Top-Tubes-recommendations_FNL.pdf</a> ; Sodium Citrate Blood Specimen Collection Tube Conservation Strategies – Letter to Health Care and Laboratory Personnel. FDA. <a href="https://www.fda.gov/medical-devices/letters-health-care-providers/sodium-citrate-blood-specimen-collection-tube-conservation-strategies-letter-health-care-and">https://www.fda.gov/medical-devices/letters-health-care-providers/sodium-citrate-blood-specimen-collection-tube-conservation-strategies-letter-health-care-and</a>		

Each Health Ministry should gather stakeholders to develop a plan for addressing options with pharmacy, evaluating POC testing options and assessing utilization efforts. This will help to ensure every Health Service Area has sodium citrate tubes available for those instances when coagulation studies must be performed. In addition, if both BD and Greiner tubes have been validated at an HSA, order from both vendors as needed to maximize supply.

## **Tiered Conservation Strategies:**

### **Tier 1: Estimated 3-month supply or less:**

- 1) Exclude blue top tubes from the Emergency Department and phlebotomy “Rainbow” blood draws.
- 2) Monitor the number of citrate tubes used for daily testing by tracking orders for D-dimer, PTT, PT, INR, and Factor Xa. Note care is needed to prevent over-counting when multiple tests are ordered on one accession such as PT and PTT or fibrinogen and d-dimer.
- 3) Pull back and centralize excess citrate tubes from hospital floors and physician offices. Keep two to three-day supply on floors. Make sure that crash carts have full supply of citrate tubes.
- 4) Establish a working group of stake holders to approve escalation of measures to conserve blue top tubes. Members may include laboratory, nursing, pharmacy, emergency department, hospitalists, and hematology with ad-hoc participation by surgery and radiology.
- 5) Recruit pharmacy and/or physician lead to review all inpatients on coumadin, heparin or argatroban.
  - a. Consider calling physicians to see if pts can be converted from coumadin to direct acting oral anticoagulant (DOAC) or from heparin to lovenox.
- 6) If current orders for DOACs have an automatic order for coagulation testing, discontinue this order unless highly suspicious for antiphospholipid antibody syndrome.
- 7) Discuss with cardiology, vascular surgery and cardiac surgery the use of lovenox and DOACs when possible.
- 8) Consider delaying hypercoagulability work ups until shortage is over.
- 9) Emphasize or establish guidelines for the need for pre-procedural radiology coagulation testing.
- 10) Consider placing warning cards on every computer workstation throughout the hospital as a reminder of which tests involve citrate tubes.
  - a. Consider adding “avoid ordering mixing studies when PT and PTT are normal.”
  - b. Consider adding “avoid routine coagulation testing on patients who do not take anticoagulants without bleeding or bleeding history.”
- 11) Consider using mechanical thrombectomy instead of EKOS for massive PE.
- 12) Consider communicating with outpatient physicians to have patients on coumadin and who do not have a Point of Care (POC) INR test kit, obtain a kit or switch the patient to DOAC if possible.

### **Tier 2: Estimated 2-month supply or less:**

- 1) Review and reimplement all Tier 1 approaches.
- 2) Change heparin monitoring to q 8 hours from Q 6 hours.
- 3) Obtain POC testing for all coumadin pts in the ED and the hospital.
- 4) Consider changing patients with ESRD on dialysis with AFIB from coumadin to apixaban if insurance allows. (This does NOT apply to DVT/PE patients).
- 5) Re-examine adoption of DOACs and lovenox by clinical stakeholders.

### **Tier 3: Estimated 1-month supply or less:**

- 1) Review and reimplement all Tier 2 approaches.
- 2) In acute coronary syndrome patients with Cr Cl above 30:
  - a. STEMI: stay with heparin

- b. NSTEMI: CrCl over 30: Consider lovenox with IV lovenox given in Cath lab
- 3) Consider restricting D-dimer testing to DIC and eliminate use for “rule out” of DVT/PE.
- 4) Consider eliminating D-dimer testing in COVID patients.
- 5) Head trauma on an anticoagulant:
  - a. If on Apixaban or Rivaroxaban: consider not testing INR/PTT, obtain CT scan and reverse with Kcentra if head or spine bleed.
- 6) Any patient sent home on coumadin and who does not have a home POC INR device should be sent to a coumadin clinic or a physician office that uses POC INR for follow-up and/or if suitable clinically, the patient should be assisted in acquiring a POC INR device.

**Tier 4: Estimated 2-week supply or less:**

- 1) Review and reimplement all Tier 3 approaches.
- 2) Consider placing all ESRD patients with either Afib or VTE (DVT/PE) on apixaban.
- 3) Consider restricting all hypercoagulability testing unless approved by coagulation specialist/hematologist.
- 4) Consider restricting all d-dimer testing unless approved by coagulation specialist/hematologist.
- 5) Consider having all heparin orders require review and approval by coagulation specialist/hematologist.
- 6) Consider having any coumadin orders require review and approval by coagulation specialist/hematologist.
- 7) Consider having all orders for blue top tube reviewed by coagulation specialist/hematologist or pathologist and phone call made to physician.

**Tier 5: Estimated 1-week supply or less:**

- 1) Review and reimplement all Tier 4 approaches.
- 2) Any patient who absolutely MUST have heparin should be monitored with ACT (preliminary protocol available from St. Joseph Mercy AA).
- 3) All patients with an Impella and other cardiac devices that require heparin should be diverted to a hospital with expertise and testing supplies or develop protocol for ACT testing.