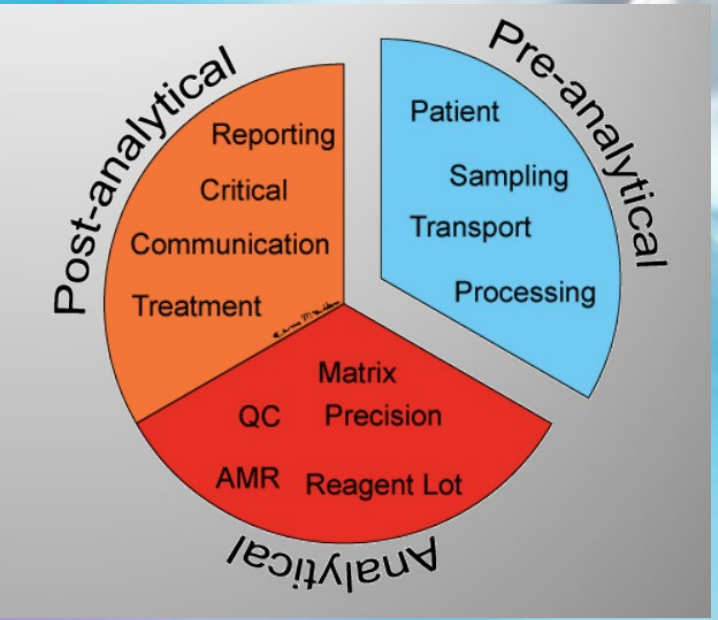


INTRODUCTION TO PRE- ANALYTICAL LAB ERRORS



AMY KINGSLEY, CLS, MLS(ASCP)^{CM}
SHARON MCGOLDRICK M.ED, CLS



INTRODUCTION TO BASIC PHLEBOTOMY PRACTICES TO REDUCE PRE-ANALYTICAL LAB ERRORS



Over 70% of diagnostic and treatment decisions made by clinicians are based on medical laboratory test results.

Lab team-
Pathologists and Pathologist Assistants
Medical Directors
Clinical Lab Scientists
Medical Laboratory Technicians
Phlebotomists
Lab Assistants





UC Davis Health Clinical Laboratory Locations

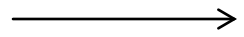
Core Lab (SESP)

- Specimen Processing
- Hematology & Coagulation
- Transfusion Medicine
- Chemistry



Specialty Testing Center

- Microbiology
- Toxicology
- Special Chemistry
- Immunology



Laboratory Errors

- Pre-Analytical
 - Order
 - Specimen collection**
 - Processing
 - Transportation
 - Storage
- Analytical
 - Testing wrong patient
 - Instrument problems
 - Quality Control failure
- Post-Analytical
 - Calculation error
 - Posting results to wrong patient's record
 - Not reporting or not documenting critical values

Goal is to draw specimens correctly to provide the lab with a quality sample, the healthcare team with a meaningful test result and the patient with a minimum number of sticks.



Quality Specimens = Quality Results

Over 70% of diagnostic and treatment decisions made by clinicians are based on medical laboratory test results

Pre-Analytical Errors: **Specimen Collection**

- Patient ID (misabeled/unlabeled specimens)

- IV contamination-dilution effect

- Hemoconcentration

- Carryover Effect

- Hemolysis

- Clotting

- Quantity Not Sufficient (QNS)

- Wrong container for test (often seen in Microbiology)

PHLEBOTOMY QUIZ

- What is recommended time to leave tourniquet on during specimen collection by venipuncture?
- What is meant by “order of draw”?
- Do you know which tubes to draw first when drawing multiple lab tests?
- What is “carryover effect”?
- Name 3 results of incorrect phlebotomy technique.
- Name 3 tests that can be affected by incorrect phlebotomy technique.
- Name 3 things that can cause hemolyzed or clotted specimens.

Patient Identification

- Make positive patient identification using at least 2 identifiers
 - The Joint Commission NPSG01.01.01
 - UCDHS Venipuncture Verification and Blood Withdrawal Policy # 13029
 - UCDHS Specimen Labeling for Laboratory Processing Policy # 18004
- Compare identification on lab order to patient identification on wrist band
- Compare each label to patient identification on wrist band

Venipuncture Preparation

- Needle

Vacuum system – preferred

Syringe with needle – used for small & fragile veins (Requires Transfer Device to fill tubes)

Butterfly – hand veins, pediatric patients

- Tourniquet

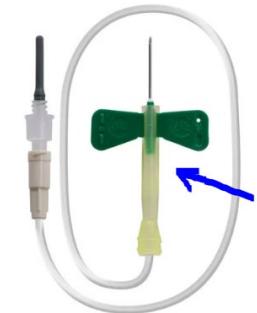
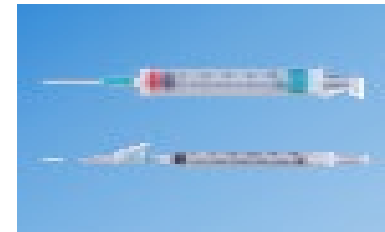
- Alcohol routine blood draws

- CHG (Chloro-Prep) for blood cultures

- Tubes – based on tests ordered and volume required

- PPE: gloves, goggles, mask, gown, respirator

- Post-venipuncture care (gauze, tape, Band-Aid)



Venipuncture

- Cleanse site and allow to **air dry**
- Tourniquet < **1 minute**
- Anchor vein and insert needle at ~ **30-degree angle**
- If blood is flowing freely, release tourniquet (<**1 minute**)
- Fill tubes using **correct “Order of Draw”**
- **Fill tubes completely** to the required volume
- **Invert each tube 8-10 times immediately** after collecting
- Remove needle and use safety device
- **Use transfer devices** for syringe draws
- Recheck labels
- Specimen transport



Specimen Integrity Problems

- Hemolysis
- Clotting
- IV contaminated-dilution effect
- Quantity Not Sufficient (QNS)
- Hemoconcentration
- Carryover Effect

Commonly Used Tubes & Correct Order of Draw

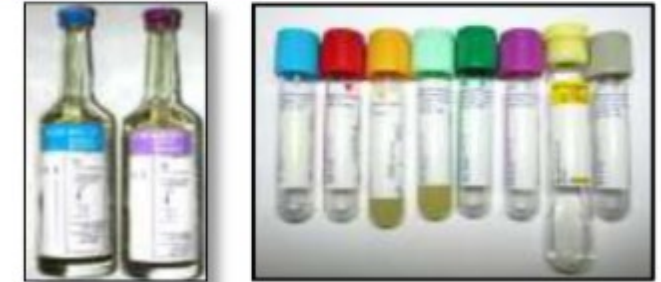
- Sterile Blood Cultures
- LTBLU: Blue top (sodium citrate)
- RED: Red top (serum tube, has clot activator)
- SST: Gold top (serum separator tube, has clot activator + gel separator)
- LTGRN: Light Green top PST (lithium heparin)
- DKGRN: Dark Green (sodium heparin)
- LAV: Purple top (EDTA)
- ACD: Yellow top (acid citrate dextrose)
- GRAY: Gray top (sodium fluoride/potassium oxalate)

Carryover Effect- When trace amounts of additives in one tube are transferred to the next tube









FOLLOW CORRECT ORDER OF TUBE DRAW

UC Davis Health System Department of Pathology & Laboratory Medicine Order of Draw Guide - Vacutainer Common Tubes

Sterile Blood Culture Bottles are always collected first when drawn at the same time as other lab tests/tubes.



Lab Test Directory www.testmenu.com/ucdavis
Client Services (916) 734-7373

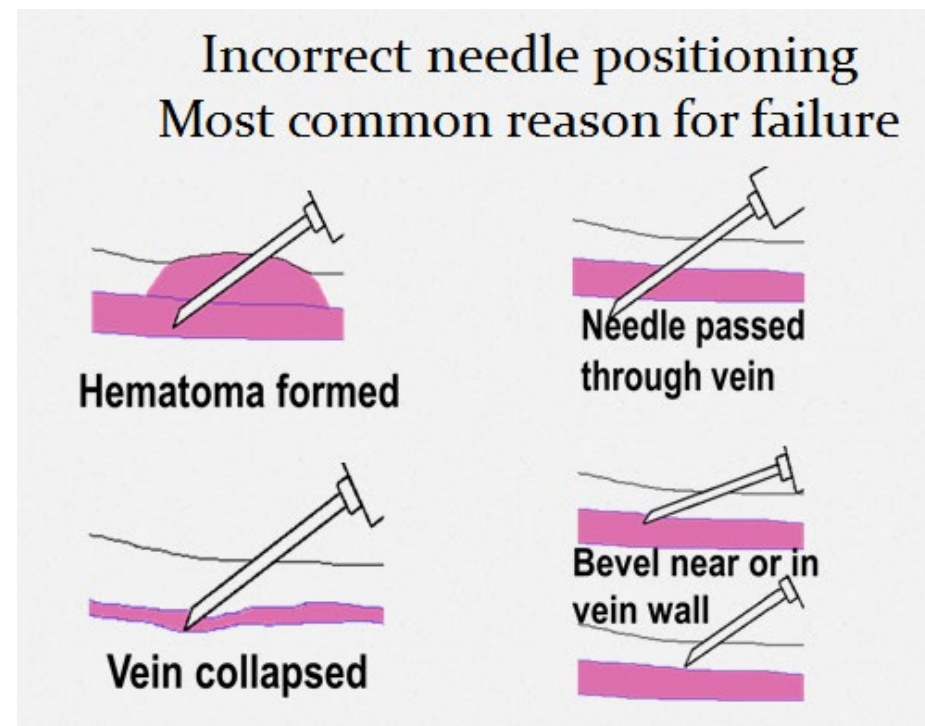
	# 1: [LTBLU] Blue/Lt Blue Top Sodium Citrate 2.7 mL or 1.8 mL (pediatric)		# 5: [DKGRN] Dark Green Top Sodium Heparin 4 mL
	# 2: [RED] Red Top 4 mL or 0.6 mL microtainer		# 6: [LAV] Lav/Purple Top (EDTA) 4 mL or 0.5 mL microtainer
	# 3: [SST] Gold Top Serum Separator Tube (SST) 5 mL, 3.5 mL, or 0.6 mL microtainer		# 7: [ACD] Acid Citrate Dextrose 8.5 mL
	# 4: [LTGRN] Light Green Top Lithium Heparin (PST) 3 mL or 0.6 mL microtainer		# 8: [GRAY] Gray Top (Sodium Fluoride/Potassium Oxalate) 4 mL or 0.6 mL microtainer

Collecting blood in wrong order may cause cross contamination of additives in lab tubes, false increase in coagulation times, contaminated blood cultures, inaccurate test results.

Hemolysis

Hemolysis caused by mechanical trauma to cells:

- not letting alcohol dry before venipuncture
- excessive pulling on syringe
- needle too small (causes increased pressure)
- improper needle placement in vein
- not using transfer device and/or pushing blood through stopper of tube
- vigorous shaking of tube instead of inverting
- drawing thru IV or Central Line
- milking site of capillary puncture or scooping or scraping of blood into tube



Clotting

Clotting may be caused by:

- Leaving blood too long in syringe before transferring to tubes
- Improper mixing-Best practice is to invert tubes 8-10 times immediately after collection (includes microtainers)

IV Contamination

- **IV contamination & dilution effect**

Avoid arm with IV

Shut off IV for 2 minutes *(follow nursing policy) and draw below IV

Discard first 5 cc blood (usu. 2.5 times dead space volume; follow nursing policy)

- **Vascular Access Devices (VADs)**

Vascular access devices, such as catheters and needles, exert shear forces during blood flow, which creates a predisposition to cell lysis

Limited access (who can access, # times can access); requires flushing and may require discard-reinfusion of blood for neonates/critically ill

Can result in heparin contamination of sample: ensure to use proper discard volume

Higher rate of hemolyzed samples compared to venipuncture: avoid pulling too hard or too fast on the syringe when withdrawing blood from VAD

QNS (Quantity Not Sufficient) & Under Filled Tubes

QNS typically encountered difficult sticks & add-on tests

- “Hard stick”, poor blood flow- microtainers available



Correct volume is critical to maintain correct blood to anticoagulant ratio. Use the Lab Test Directory as a guide to minimum volumes

- Underfilled CBC tube (lavender) causes falsely decreased HCT and MCV
- Must use “discard” tube for Coags (blue top) **IF** a butterfly is used; allows for dead space/air in the line to be cleared allowing proper tube filling
 - Under filled blue top tubes: yield falsely increased coagulation times
 - blue top tubes -Underfilled, clotted, and hemolyzed are all canceled
- Volumes are critical for Blood Culture bottles for best organism recovery (QNS may lead to false-negative result)

Hemoconcentration

- Blood can pool at the venipuncture site when occluded
 - Some analytes will remain in vessel and temporarily and significantly increase in concentration WBC, RBC, Hgb, Hct, glucose, K+, ionized calcium, albumin, triglycerides, alk phos, total protein
 - Can lead to erroneously high or low levels of certain analytes.

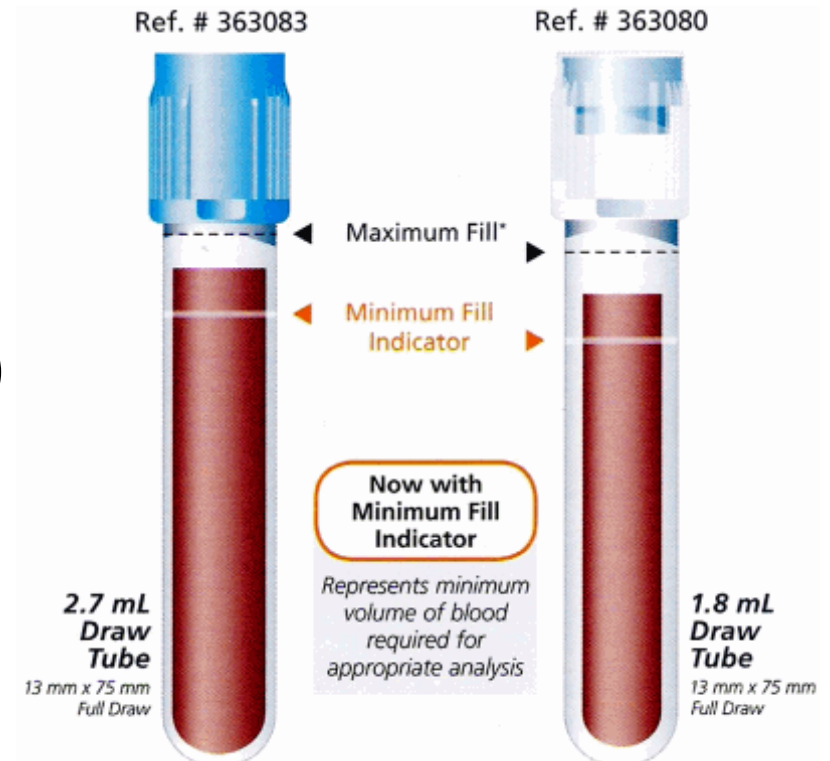
DON'T LEAVE TOURNIQUET ON > 1 MINUTE

DON'T RECOMMEND FIST PUMPING

Error	Effect	1 st Tube Drawn	2 nd Tube Drawn	Analyte to be Tested
None	No carryover	1st = light green (lithium heparin)	2nd = purple (potassium EDTA)	K+ = 3.5 mEq/L
incorrect order of draw	carryover of anticoagulant	1st = purple (potassium EDTA)	2nd = light green (lithium heparin)	K+ = 4.5 mEq/L
incorrect order of draw	carryover of anticoagulant	1st = light green (lithium heparin)	2nd = blue (sodium citrate)	PTT > 150 seconds
hemolysis	↑ K+	light green	n/a	K+ = 5.7 mEq/L
hemolysis	↓Hct ↓Hgb	purple	n/a	Hct = 20 % Hgb = 6.7 gm/dL
clotted	↓PLTS	purple	n/a	PLTS = 15,000
misabeled	WBIT	purple	n/a	ABO/RH = A+ type = B+) (historical
IV contamination	↓Hct	purple	n/a	Hct = 13 %
IV contamination	↑ glucose	gray	n/a	Glucose = 800 mg/dL
QNS (underfilled)	wrong anticoagulant to blood ratio	blue top	n/a	INR = 0.7

Common Pre-analytical Errors

- Sample collected in wrong tube (CBC ordered – red tube collected/sent)
- Glucose ordered; sample not spun
 - Glucose obtained from unprocessed blood samples can decrease 5%–7% per hour due to glycolysis
- Clotted
- Hemolyzed
- Incorrectly filled (QNS)
 - ESR
 - Coagulation Studies (Blue top/Citrate Tube- binds Ca^{++})



REVIEW – PATIENT IDENTIFICATION

- Do
 - Properly perform a two patient ID
 - Compare name and MR on ID bracelet and all labels
 - When possible, have patient state name and DOB
- Don't
 - State patients name and wait for patient to nod/agree

Failure to properly identify the patient may cause laboratory identification error that may lead to patient treatment and/or medication mismanagement.

REVIEW – TOURNIQUET APPLICATION

- Do
 - Apply tourniquet 3-5 inches from intended draw site
 - Dispose of tourniquet after each collection
 - If tourniquet on longer than 1 min, release and retie after 2 minutes.
- Don't
 - Leave tourniquet on for longer 1 minute
 - Hint: not longer than you can hold your breath

Prolonged tourniquet application alters the blood sample which may yield falsely elevated or falsely decreased lab test results (hemoconcentration).



REVIEW – VEIN SELECTION

- Do
 - Choose an appropriate site to perform venipuncture
- Don't
 - Draw a clinical lab specimen above an IV site
 - Draw through an existing hematoma

Drawing above an IV results in a diluted specimen, yields inaccurate test results.

REVIEW – DILATING THE VEIN

- Do
 - Tie the tourniquet and palpate the vein
 - May ask patient to tighten fist to dilate the vein
 - May rotate hand to better position the vein
- Don't
 - Ask patient to pump fist or hold fist while drawing a blood sample.

Fist pumping may increase K⁺ and ionized calcium levels, yields inaccurate lab results.

REVIEW – SITE CLEANSING

- Do
 - Use alcohol to clean site and allow to air dry
 - <1 minute
- Don't
 - Blow, fan or dry with cotton ball or gauze
 - Stick while alcohol is still wet

Alcohol cleans surface bacteria by desiccation- allow alcohol to dry to properly cleanse the site. Performing venipuncture while alcohol is still wet may cause hemolysis- leading to inaccurate results.



REVIEW – NEEDLE SELECTION

- Do
 - Use appropriate gauge needle
 - 21 or 23 gauge
- Don't
 - Use small gauge needle such as a 25 gauge unless small vein or baby/pediatric patient

Using too small of a needle has an increased risk of hemolysis.

REVIEW – SYRINGE COLLECTION

■ Do

- Pull gently on plunger
- Remove safety needle and dispose in a sharps container
- Attach transfer device to syringe and let vacuum fill evacuated tubes

■ Don't

- Apply excessive force while pulling back on the plunger
- Forcibly fill evacuated tubes with syringe
- Use needle to directly fill the tubes

Excessive pulling on the syringe plunger may cause the vein to collapse and hemolyze the sample.

REVIEW – TUBE INVERSION

- Do
 - Invert tubes end to end, immediately after collection 8-10 times
- Don't
 - Shake tubes
 - Not invert tubes

Shaking or not properly inverting tubes may cause hemolysis or clotting- resulting in recollection and delay in patient care.

REVIEW – SPECIMEN DELIVERY


- Do
 - Label specimens at bedside
 - Recheck patient ID and labeled specimens
 - Bag single patient collection in one biohazard bag
 - Tube the specimen bag to the lab in a timely manner
- Don't
 - Label patient's specimens at the nursing station
 - Bag more than one patients collected samples in a single bag
 - Two names in one bag- all samples are cancelled
 - Delay tubing samples to the lab

Bagging multiple patients in one bag may result in identification errors and delay in specimen delivery will delay test results turnaround time and possibly inaccurate results for certain tests.



SPECIMEN LABELING, SAMPLE COLLECTION, AND SAMPLE TRANSPORT

ORDER INQUIRY – PENDING LABS



Debbie Xxtest III
Female, 55yr, 10/2/1966
MRN: 9401513
Bed: S02
Code: Not on file
ACP Docs: None on file

Search

COVID-19 Vaccine: Unknown
COVID-19: Unknown
Infection: Rule Out Coccidioidomycosis
Allergies: Not on File

Ucdavenell, Deborah Anesth, MD
Attending
Coverage: Aetna/Aetna

← →
SnapShot
Chart Review
Results Review
Order Inquiry
Specimen Inquiry
Orders
Identity Manager
Patient Station

Refresh Views Current History All | Release Collect Specimens Case Builder Cancel Add-on CC Results Link Orders Pat. Reports Proc. Cat

S..	Re...	Priority	P	Specimen Type	Specimens	Order	Order Date	Q..	Authorizing Provider	Last Verified	Remaini...	ABN
Lab												
		Routine		BLOOD		Basic Metabolic Panel	01/06/2022		Parikh, Aman Kirit, MD			
		Routine		BLOOD		CBC with Differential	01/06/2022		Parikh, Aman Kirit, MD			
Micro												
		Routine		URINE		Culture Urine, Bacti	01/06/2022		Parikh, Aman Kirit, MD			
		Routine		SPUTUM		Culture Respiratory, AFB Sen...	01/06/2022		Parikh, Aman Kirit, MD			
		Routine		SPUTUM		Culture Respiratory, Fungal	01/06/2022	✓	Parikh, Aman Kirit, MD			
		Routine		SPUTUM		Culture Respiratory (Includes...	01/06/2022		Parikh, Aman Kirit, MD			



SnapShot

Chart Review

Results Review

Order Inquiry

Specimen Inquiry

Orders

Identity Manager

Patient Station

Collection



Collection



SPUTUM specimens

Collection Sequence

x2 {SPEC}*

{SPEC}* (OTHER (SPECIFY IN ADDNL INFO))

Lab: SACTO. CO. PUBLIC HEALTH LAB

Culture Respiratory, AFB SendOut (Scheduled: 1/6/2022 1230)



Send specimens on ICE. If Blood/CSF: AMBIENT

[See Test Menu](#)

{SPEC}* (OTHER (SPECIFY IN ADDNL INFO))

Lab: UCD SPECIALTY TESTING CTR

Culture Respiratory, Fungal (Scheduled: 1/6/2022 1230)



Culture Respiratory: Culture Respiratory (Includes GS), Bacti (Scheduled: 1/6/2022 1230)



Suspect Coccidioidomycosis?

Answer

Comment



Yes



Additional information – link to the Lab Test Directory

LAB TEST DIRECTORY

CULTURE RESPIRATORY, AFB SENDOUT

MICG000026  

Ordering

Collection

Result Interpretation

Administrative

Collect

NASOTRACHEAL ASPIRATE, SPUTUM, BRONCHIAL WASHINGS, SINUS, BRONCHOALVEOLAR LAVAGE, ENDOTRACHEAL ASPIRATE

Sputum - Collect only material brought up from the lungs after a productive cough. Do not collect sputum immediately after a mouth wash. A series of three daily early morning specimens, each submitted promptly to the lab after collection, is recommended. A minimum of 3mL is required. Do not pool specimens. For patients who have difficulty in producing sputum, specimens collected by inhalation of hypertonic saline induction may be used. Submit the specimen in a sterile, labeled container. Close lid tightly.

Type in specific specimen information in the comments field.

Unacceptable Conditions

Swab specimens are inadequate and will not be processed.
Frozen specimens

Storage/Transport Temperature

Specimen in a sterile, leak-proof container on ice. Place each specimen in an individual sealed bag.

Stability (from collection to initiation)

Room Temperature: 1 hr

Refrigerated or on ice: 24 hrs

INTERPRETING SPECIMEN LABELS



INTERPRETING SPECIMEN LABELS

Lab Location	
P	Pavilion Lab (Main hospital)
S	Specialty Testing Center
X	External Reference Lab

Clinical Pathology	
BB	Blood Bank
BG	Blood Gas
CC	Cancer Center Chemistry
CG	Coagulation
CP	Main Lab Chemistry
CS	Cocci Serology
EX	External Reference Lab
HC	Cancer Center Hematology
HP	Hematology
IM	Immunology
MI	Microbiology
MP	Molecular Pathology
SC	Special Chemistry
TX	Toxicology
UA	Urinalysis

Anatomic Pathology**	
SP	Surgical Pathology
CN	Cytology Non-GYN
CP	Cytopathology (pap smears)
FN	Fine Needle Aspirate
OC	Outside Consultation
OS	Outside Slide Consultation

****Anatomic Pathology specimen collection labels will not have the above case mnemonics until the specimen is received by the respective lab section. See subsequent slides for details.**

SPECIMEN LABEL EXAMPLES



Additional instructions

Specimen Container & Transport Conditions

Specimen Containers

{SPEC} = Anaerobic Transport Media (ATM), Sterile Container, Culture Swab

STERILE CONTAINER =
Sterile cup or tube

Transport Conditions

T = Room Temperature

IC = On Ice

R = Refrigerated



Laboratory Collection Label Update

January 23, 2023

UCDLAB Standard Collection Label

Xctestftraining, Jessie 9300142	F 8/27/1991 31 yrs LTBLU* HL_CG.F	Xctestftraini*,J* 9300142	DOB: 8/27/1991 F LTBLU* HL_CG.F
		22P-280CG0001.1*100010017 HEPUFH, BHEPUFH, BAPTT, INR	
22P-280CG0001.1*100010017 HEPUFH, BHEPUFH, BAPTT, INR 10/7/22 10:18 AM Coll By:UCDECKELS,*		*CRITICAL: TUBE MUST BE FULL.*CRITICAL: 22P-280CG0001.1*100010017 LTBLU* 10/7/22 10:18 AM	

UCDLAB Standard Collection Label

UCDLAB STAT Collection Label

 Xctestftraining, Jessie 9300142	F 8/27/1991 31 yrs LTBLU* HL_CG.F	Xctestftraini*,J* 9300142	DOB: 8/27/1991 F LTBLU* HL_CG.F
		22P-280CG0001.1*100010017 HEPUFH, BHEPUFH, BAPTT, INR	
22P-280CG0001.1*100010017 HEPUFH, BHEPUFH, BAPTT, INR 10/7/22 10:18 AM Coll By:UCDECKELS,*		*CRITICAL: TUBE MUST BE FULL.*CRITICAL: 22P-280CG0001.1*100010017 LTBLU* 10/7/22 10:18 AM	

UCDLAB STAT Collection Label

Collection

SPUTUM specimens

{SPEC}* 22X-006EX0002 ↗

Lab: SACTO. CO. PUBLIC HEALTH LAB ✕

∨ Collected on 1/6/2022 at 1232 by KINGSLEY, AMY in UTSS PACU SURGE

📄 Copy

OTHER (SPE 🔍)

OTHER (SPECIFY IN ADDNL INFO)

Culture Respiratory, AFB SendOut (Scheduled: 1/6/2022 1230)

Send specimens on ICE. If Blood/CSF: AMBIENT

[See Test Menu](#)

{SPEC}* 22S-006MI0004 ↗

Lab: UCD SPECIALTY TESTING CTR ✕

⤴ Collapse

📄 Copy

1232 🔍

1/6/2022 📅

KINGSLEY, AMY 🔍

📄 🔍

Add Comment

SPUTUM 🔍

Draw type 🔍

UTSS PACU SURGE 🔍

OTHER (SPE 🔍)

OTHER (SPECIFY IN ADDNL INFO)

Culture Respiratory, Fungal (Scheduled: 1/6/2022 1230) ?

Culture Respiratory: Culture Respiratory (Includes GS), Bacti (Scheduled: 1/6/2022 1230)

Collection Sequence

x2 {SPEC}*

22X-006EX0002.1

22S-006MI0004.1

Add specimen comments

UNUSED SPECIMEN LABELS

- ❑ Printed a label but didn't collect the specimen?
 - ❑ Because a label was printed, the Lab Information System (LIS) thinks a specimen was collected.
 - ❑ **Do not complete the collection** if a specimen label was printed without a specimen being collected. **Cancel the collection** to move it back to the Worklist.

The screenshot displays a software interface for managing specimen labels. The main area is titled "BLOOD specimens" and contains two entries:

- LTGRN 22P-006CP0001**: Lab: UCD PAVILION LAB. Includes a "Scan the label or click to document the collection" instruction, a "Copy" button, and a "See Test Menu" link. The specimen type is "BLOOD, VENOUS" and the test is "Basic Metabolic Panel (Scheduled: 1/6/2022 1615)".
- LAV 22P-006HP0002**: Lab: UCD PAVILION LAB. Includes a "Scan the label or click to document the collection" instruction, a "Copy" button, and a "See Test Menu" link. The specimen type is "BLOOD, VENOUS" and the test is "CBC No Differential (Scheduled: 1/6/2022 1615)".

On the right, a "Collection Sequence" panel shows two items:

- LTGRN 22P-006CP0001.1 (with a red error icon)
- LAV 22P-006HP0002.1 (with a red error icon)

At the bottom, there are three buttons: "Reprint Labels", "Accept", and "Cancel". The "Cancel" button is highlighted with a red box. The text "No labels printed" is visible in the bottom left corner.

Summary

← **Kardex** | Inf Ctl Micro Report 2 Yrs | Bedside Handoff Rpt | Trans

Update Collection Status

Update Collection Status

PRN Labs & POC Orders
(From admission to next 72h)

None

Scheduled POC Orders
(From admission to next 72h)

None

Point of Care Orders to be Released

POC Orders to be Released

Lab and Blood Bank Orders to be Collected

Basic Metabolic Panel - ONCE, Prio: Routine, Needs to be Collected

Scheduled	Task	Status
01/06/22 1615	Print Label for Basic Metabolic Panel	Incomplete

CBC No Differential - ONCE, Prio: Routine, Needs to be Collected

Scheduled	Task	Status
01/06/22 1615	Print Label for CBC No Differential	Incomplete

Work List

+ Add Task | Today 1300 - 0200 | Only Overdue | Filter: Labs - My Discipline

Show: Completed

Time	Type	Task	Frequency	Priority	
1600					
1615	U	Print Label for Basic Metabolic Panel	One Time	Routine	Print Label
1615	U	Print Label for CBC No Differential	One Time	Routine	Print Label
1615	U	Collect C Difficile Surveillance Test	One Time	Routine	Collect

Canceled collection test will appear in the Work List but will be missing from the Kardex summary screen

AmbFive Xxtest
 Female, 31yr, 10/12/1990
 MRN: 9401130
 Bed: UTPSRG-S UTSS PACU 1-S22
 Service: (A) General Surgery
 Level of Care: Med/Surg
 Code: Not on file
 ACP Docs: None on file

COVID-19 Vaccine: Unknown
 COVID-19: Unknown

Johl, Hershman S, MD
 Attending

Work List
 Add Task | Today 1300 - 0200 | Only Overdue | Filter: My Discipline | Show: Completed

Time	Type	Task	Frequency	Priority	
1615	🔗	Print Label for Culture Urine, Bacti	One Time	Routine	Print Label
1615	🔗	Print Label for Basic Metabolic Panel	One Time	Routine	Print Label
1615	🔗	Print Label for CBC No Differential	One Time	Routine	Print Label
1615	🔗	Print Label for C Difficile Surveillance Test	One Time	Routine	Print Label

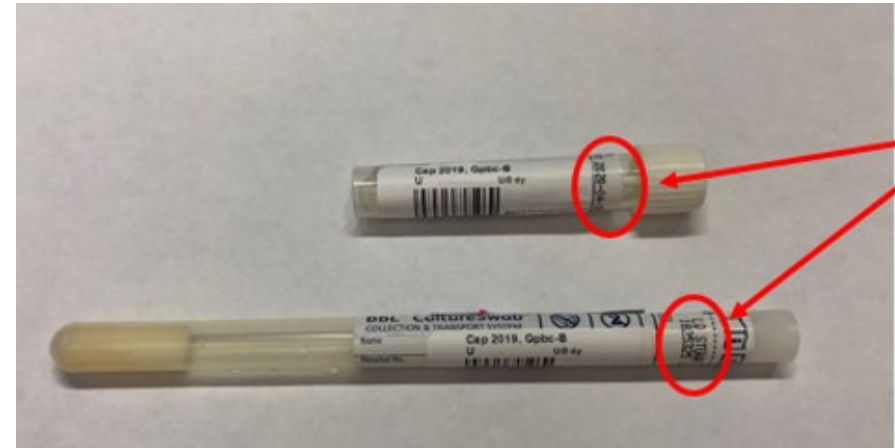
Receiving - Lab Receiving - 1 of 472 selected

Scan | Recent | Expected | Refresh | Remove | Specimen Lookup | Documents | Labels

H	Questio	Receive	Specimen	Patient	Tests	Coll Date	Coll Time	Destination Lab
			21S-005MI0239		MRSA SURV			PAVLB
			21S-005MI0293		GRAM STAIN			PAVLB
			21S-005MI0294		CULT AEROBIC, CULT ...			PAVLB
			21S-005MI0301		MRSA SURV			PAVLB
	✓		21S-005MI0360		CDIFF SURV			PAVLB
			21S-005MI0391		MRSA SURV			PAVLB

SPECIMEN CONTAINER LABELING GUIDE

- Place the label so the barcode is parallel to the longest part of the tube or container
- Do not cover any manufacturer barcodes or expiration dates



Do not cover
lot # or
expiration
date



DO



DON'T



SPECIMEN LABELING

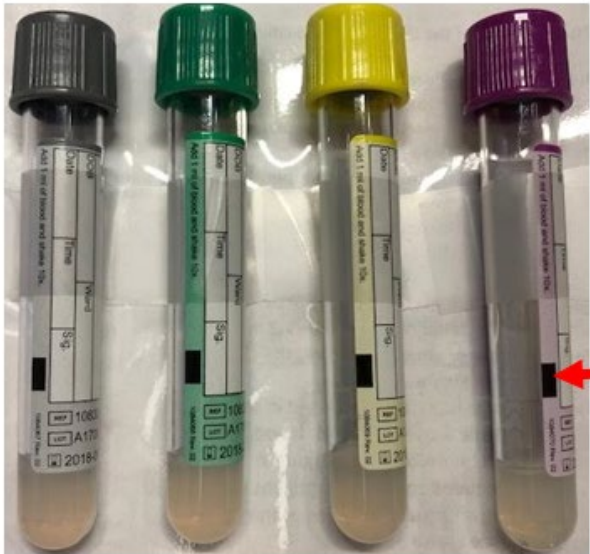


Do not cover the manufacturer barcode or lot information

Do not place label on bottom of the container



Leave window for blood volume to be visible



DO NOT cover **black** mark line on the manufacturer label.
Black line indicates correct blood volume

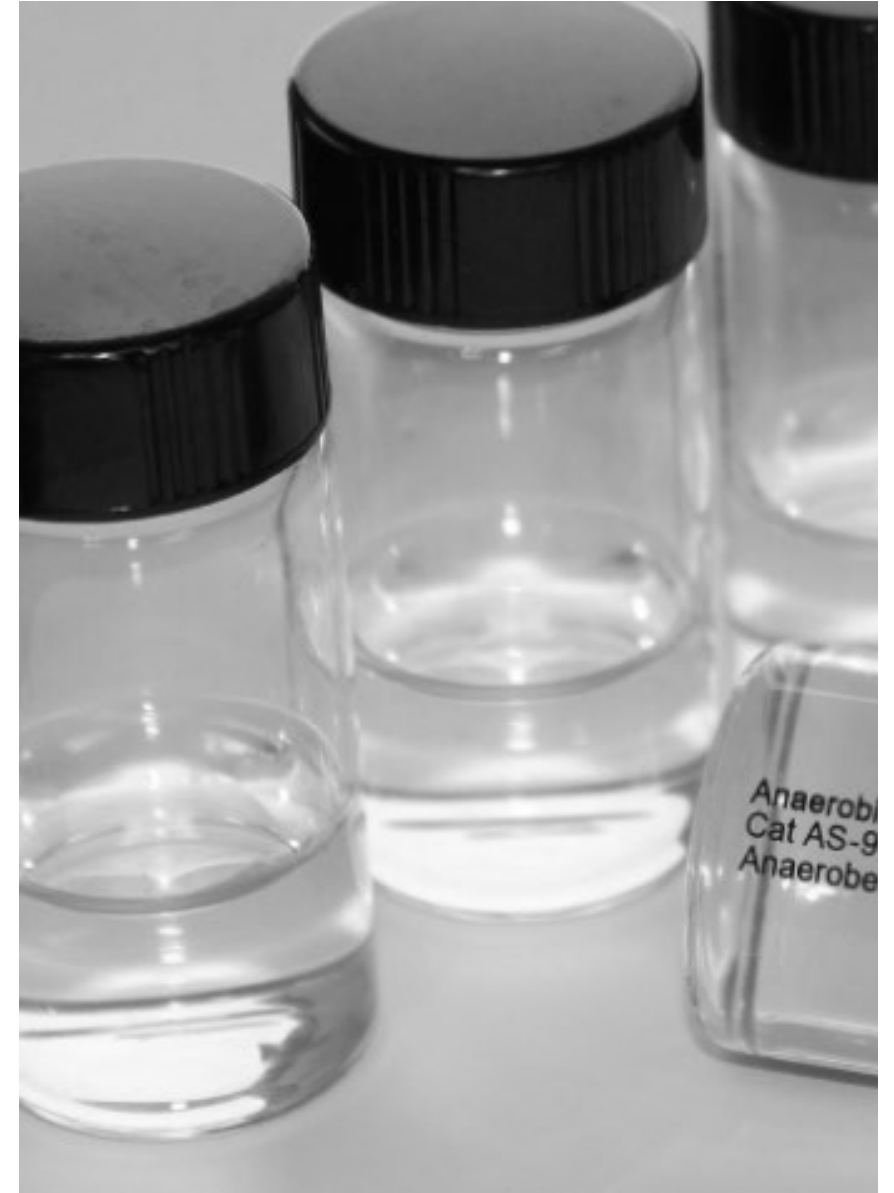
CORRECT SPECIMEN HANDLING

- ❑ One specimen per biohazard zip lock bag
- ❑ Send under proper temperature conditions
 - Refer to the Lab Test Directory or specimen label
 - Use a secondary bag for specimens transported “on ice”. Do not add ice directly to same bag as the specimen or submerge the specimen in ice.
- ❑ Send promptly to the lab – delays can cause specimens to be rejected





MICROBIOLOGY SPECIMEN COLLECTION



PURPOSE OF THE TRANSPORT CONTAINER

STABILIZE THE SPECIMEN DURING TRANSIT TO THE LAB

MICROBIOLOGY SPECIMEN CONTAINERS

- Check transport container expiration date**

- Transport media expires

- CAP prohibits testing specimens that have been collected in expired transport containers

- NO EXCEPTIONS**

MICROBIOLOGY SPECIMENS

❑ Collection container matters

- ❑ Use the correct collection container for the specimen and test ordered

RECTAL SWAB ONLY
C. diff Surveillance, ESBL Surveillance
&
Carbapenem Resistance Surveillance

Aerobic & Fungal Cultures, MRSA Surveillance,
Candida Auris Surveillance ONLY

Anaerobic Cultures



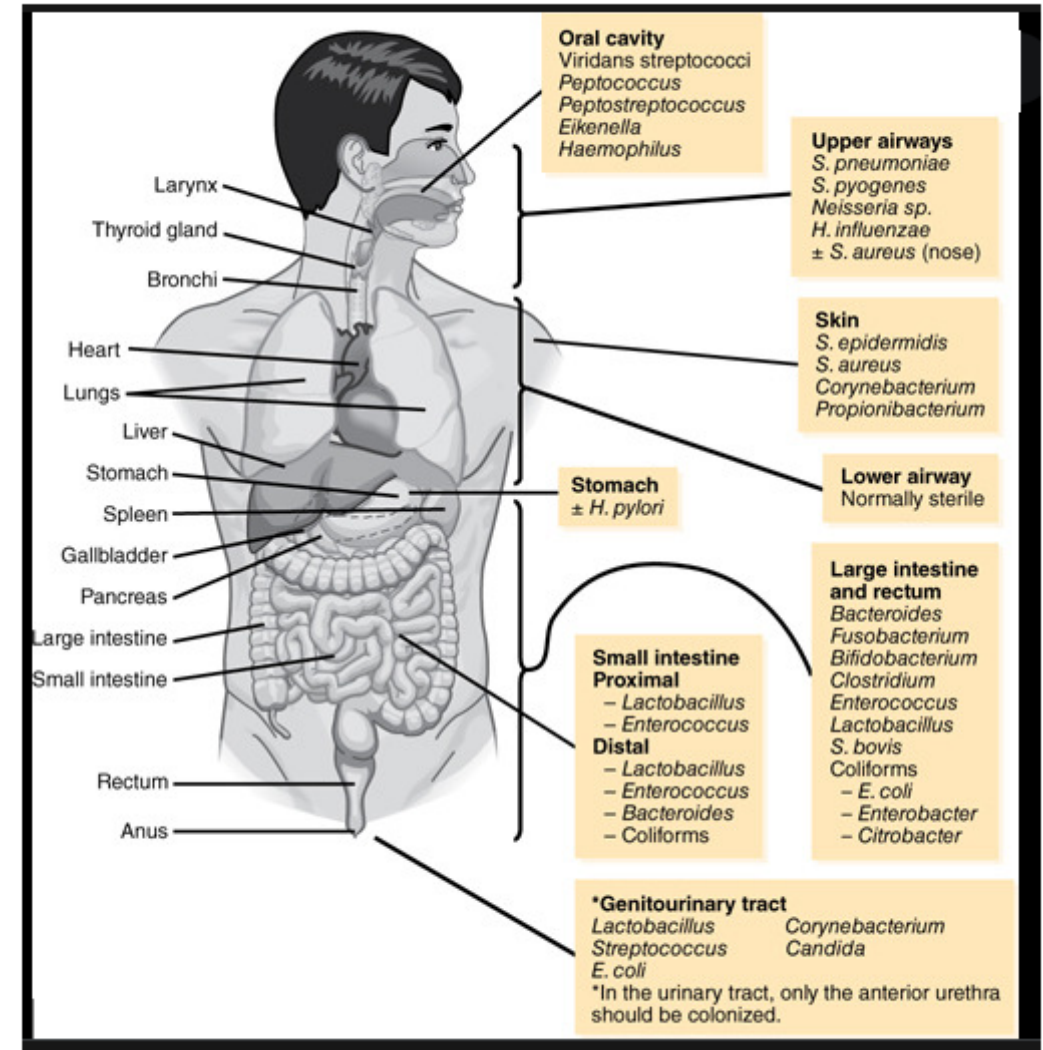
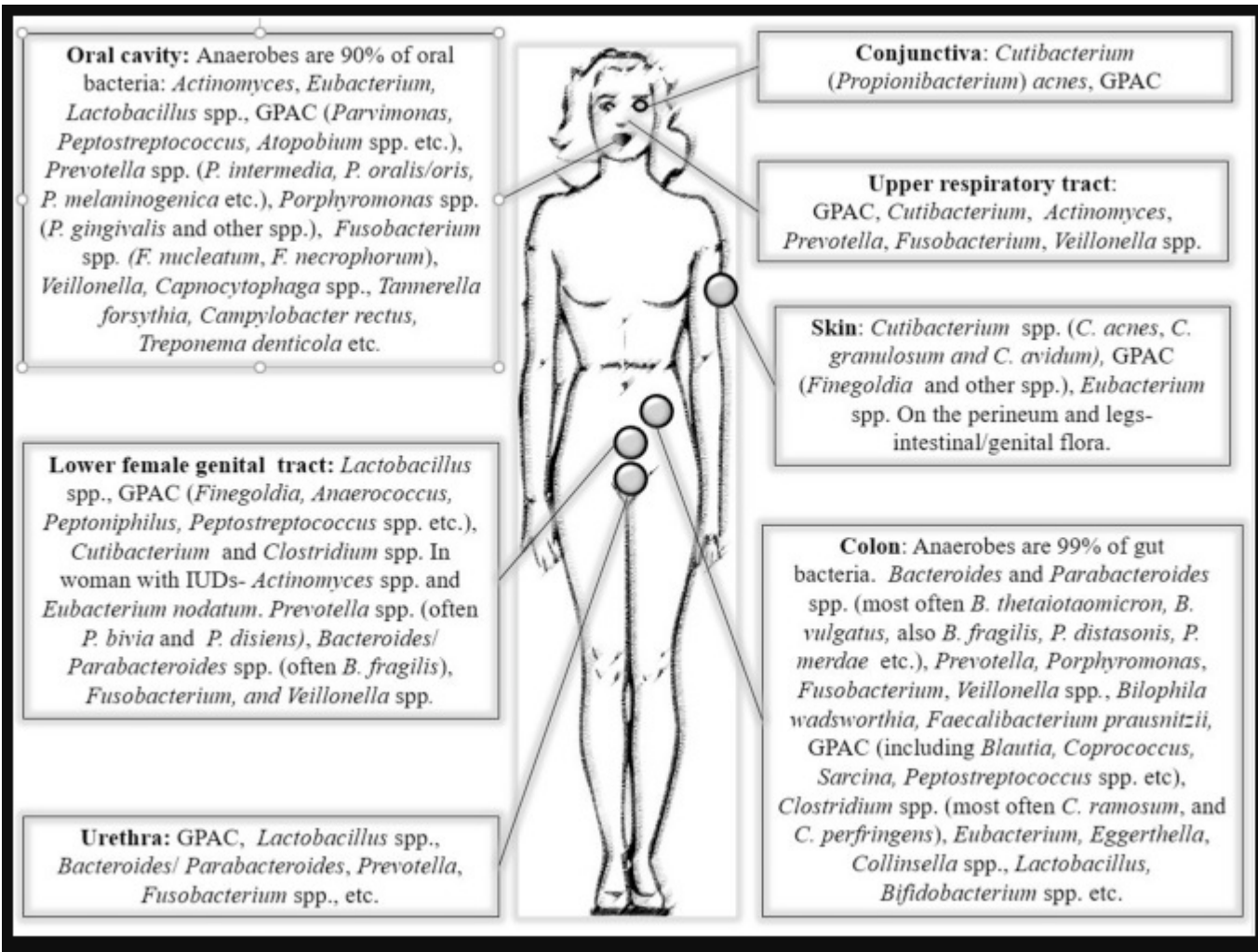
- ❑ Use correct transport conditions for the test
- ❑ Specimen:preservative ratio
- ❑ Do not over or under fill containers
 - ❑ Blood cultures – low volume will not be canceled

MICROBIOLOGY SPECIMENS

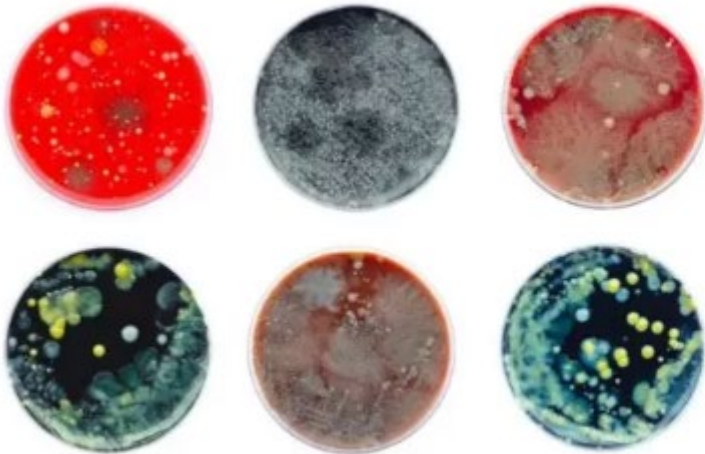
- ❑ **Source of specimen is very important!**
 - Bacterial cultures are set up based on the anatomical location of the body from which the specimen was obtained
 - **We must know the source of the specimen to process it correctly**



NORMAL BACTERIAL FLORA



STANDARD AND SPECIALTY MEDIA



Medium	Composition	Uses
Nutrient agar	Nutrient broth, agar 2%	Routine culture
MacConkey medium	Peptone, lactose, sodium taurocholate, agar, neutral red	Culture of Gram-negative bacteria, such as <i>Escherichia coli</i>
Blood agar	Nutrient agar, 5% sheep or human blood	Routine culture, culture of fastidious organisms, such as <i>Streptococcus</i> spp.
Chocolate agar	Heated blood agar	Culture of <i>Haemophilus influenzae</i> and <i>Neisseria</i>
Deoxycholate citrate agar	Nutrient agar, sodium deoxycholate, sodium citrate, lactose, neutral red, etc.	Culture of <i>Shigella</i> spp. and <i>Salmonella</i> spp.
Thiosulfate citrate bile salt sucrose agar	Thiosulfate, citrate, bile salt, sucrose, bromothymol blue, thymol blue	Culture of <i>Vibrio cholerae</i>
Loeffler's serum slope	Nutrient broth, glucose, horse serum	Culture of <i>Corynebacterium diphtheriae</i>
Lowenstein-Jensen medium	Coagulated hen's egg, mineral salt solution, asparagine, malachite green	Culture of <i>Mycobacterium tuberculosis</i>

MICROBIOLOGY SPECIMENS – BLOOD CULTURES

- Follow specimen collection policies and instructions
 - **Policy 13015:** Drawing Blood Cultures
 - Thorough cleaning of the site is required to prevent contamination

Positive Blood Cultures

Specimens collected between 10/01/2022 to 10/31/2022



Contamination is determined by the number of contaminating organisms from percutaneous and/or line blood draws per total blood culture orders. Any culture yielding growth of an organism that is not a true pathogen, or when multiple non-pathogenic organisms are identified, is considered contaminated. Careful consideration is advised in the context of clinical factors (ex: host immune response).

EMERGENCY

	Total BCs	Positive BCs	% Positive	Contam BCs (Line)	% Contam (Line)	Contam BCs (Peripheral)	% Contam (Peripheral)	Total Contam BCs	Total % Contam
EDPAV	1,120	112	10.0%	3	0.3%	29	2.6%	32	2.9%
Total	1,120	112	10.0%	3	0.3%	29	2.6%	32	2.9%

AEROBIC VS. ANAEROBIC CULTURE

- Aerobic = with oxygen
 - Examples:
 - *Pseudomonas aeruginosa*
 - *Mycobacterium (AFB)*
- Anaerobic = without oxygen
 - Examples:
 - *Bacteroides fragilis*
 - *Clostridium perfringens*
- Facultative = with or without oxygen
 - Examples:
 - *Staphylococcus aureus*
 - *Escherichia coli*



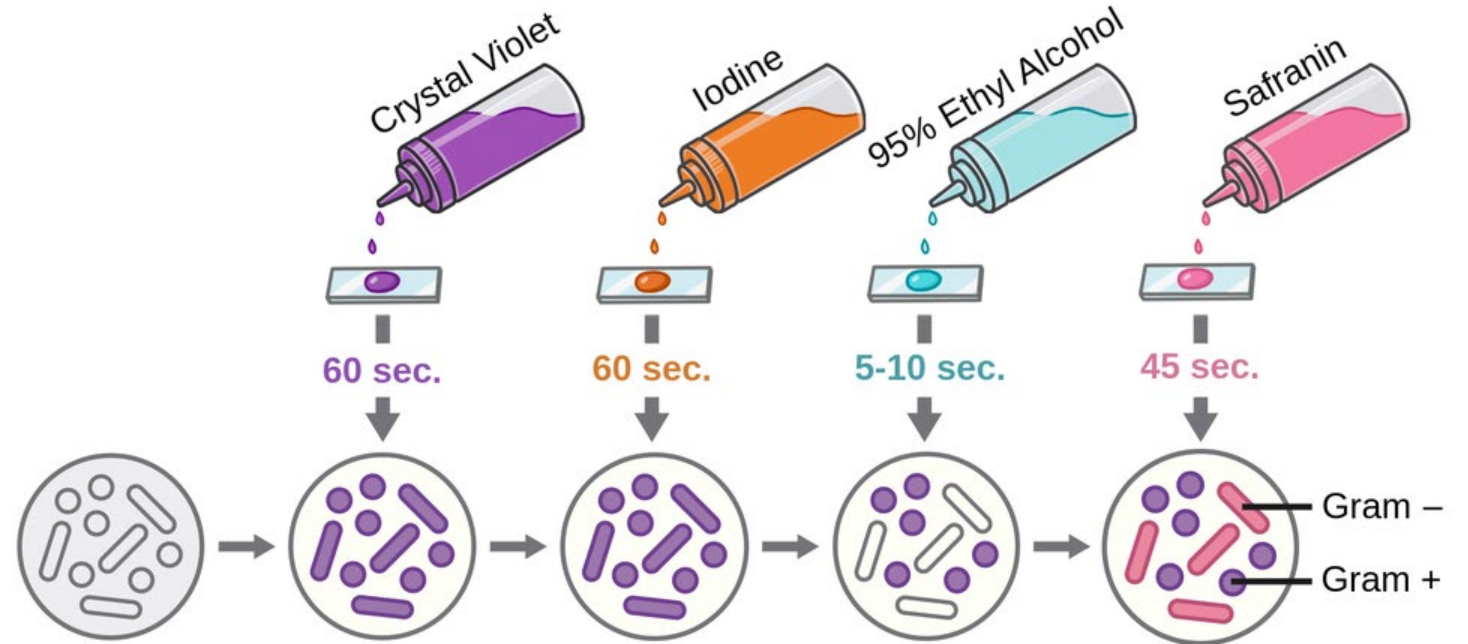
TESTS IN THE MICROBIOLOGY LAB

- Culture Tests
- Rapid or Spot Tests
- PCR Tests

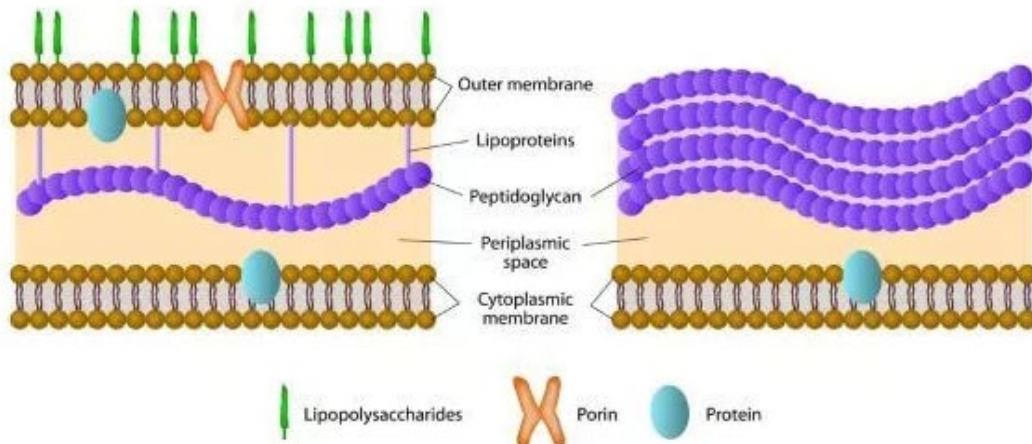


GRAM STAIN

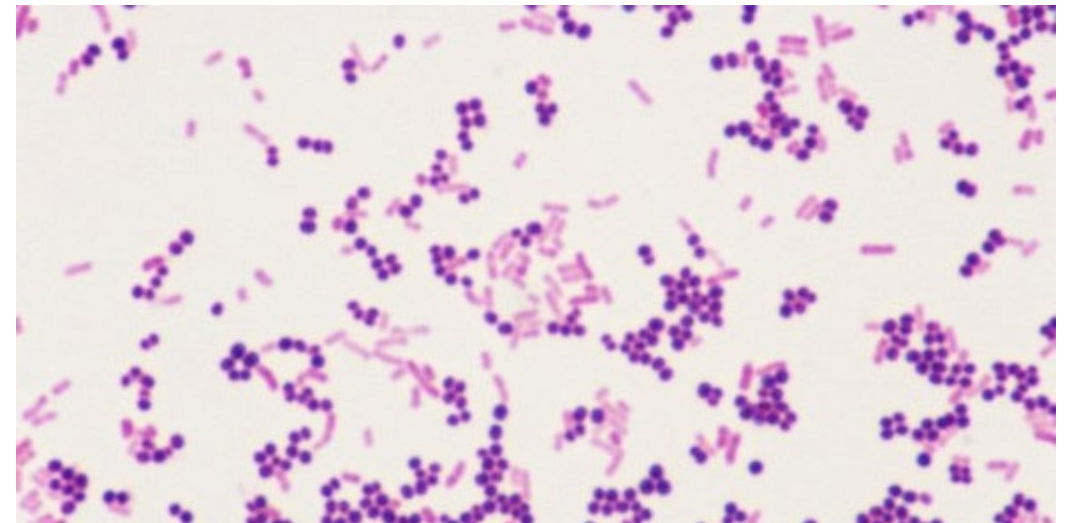
- Stains bacterial cell walls to differentiate between Gram-Positive and Gram-Negative bacteria



GRAM-NEGATIVE



GRAM-POSITIVE



CRITICAL VALUE NOTIFICATIONS

- Hospital Policy 2720
 - Lab staff will notify the appropriate party of the critical lab value
 - Person receiving the critical value will read back the result to the laboratory caller.
 - Quarterly audits

LAB TEST DIRECTORY USERS' GUIDE

WWW.TESTMENU.COM/UCDAVIS



Department of Pathology
and Laboratory Medicine

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UC Davis Health Department of Pathology and Laboratory Medicine serves UC Davis Medical Center, Clinics, Primary Care Network Physicians, Researchers, as well as many Hospitals, Physicians, and Patients throughout Northern California and the West.

UCDH Medical Diagnostics operates 24 hours a day 7 days a week providing physicians and patients both Anatomic Pathology and Clinical Pathology reports which render accurate, clinically relevant diagnosis in a timely fashion, in an academic and interactive setting.

UC Davis Health Department of Pathology and Laboratory Medicine is fully accredited by the College of American Pathologists (CAP), licensed by the State of California, the Clinical Laboratory Improvement Act (CLIA), and American Association of Blood Banks (AABB).

UC Davis Health; Department of Pathology and Laboratory Medicine specialties include:

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[Collection Labeling and Requisition Instructions](#)

[Phlebotomy Locations and Service Hours](#)

[Licenses and Accreditations](#)

[Microbiology Swab and COVID test Media Guide](#)

[Chemistry Alternate Specimen Tubes](#)

[Special Chemistry Alternate Specimen Tubes](#)

[Molecular Alternate Specimen Tubes](#)

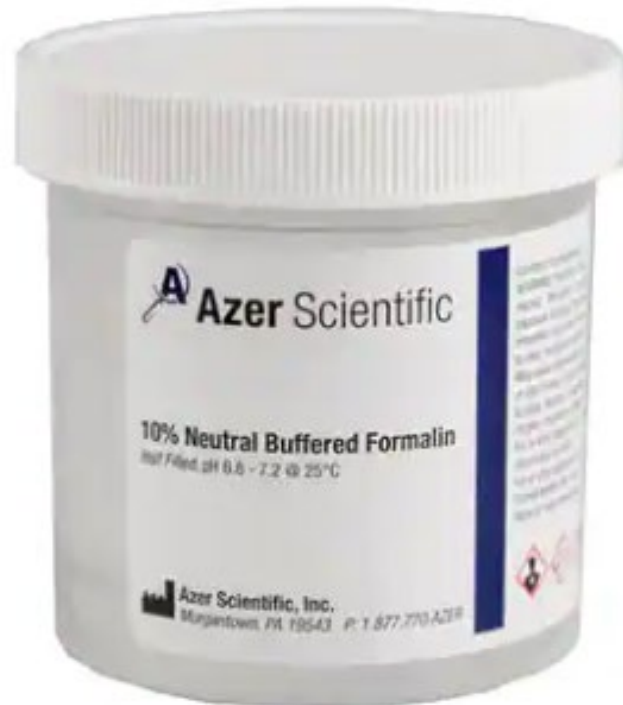
[Toxicology Alternate Specimen Tubes](#)

SURGICAL PATHOLOGY

SPECIMEN SUBMISSION

AND ORDERING

USING ORDER ENTRY



SURGICAL PATHOLOGY SPECIMENS COLLECTED IN CLINIC

- TISSUE BIOPSY SPECIMENS ARE SUBMITTED IN FORMALIN FIXATIVE
 - Specimen containers are pre-filled with 10% neutral buffered formalin.
 - Formalin fixed tissue cannot be used for Microbiology cultures, Flow Cytometry or Cytogenetics (Chromosome Analysis).
 - MUST submit a separate order for fresh specimens to be submitted to Microbiology, Flow Cytometry, and/or Cytogenetics.
 - DO NOT submit ancillary studies on the same order as the formalin fixed tissue.

SURGICAL PATHOLOGY

ORDERING BASICS

- Surgical Pathology specimens collected within the same procedural encounter are placed on one Surgical Pathology order.
- Each specimen container is assigned an alphabetic letter designation
 - ex: A, B, C, D, etc.
- **DO NOT** order Surgical Pathology with any other pathology tests (e.g., Cytology, Dermatology Pathology, Flow Cytometry or Microbiology).
- Print Surgical Pathology order from Epic and submit with specimen(s).

ORDER ENTRY

Surgical Pathology Accept Cancel

Reference Links: • Test Information:

Process Instructions: For any SKIN SPECIMENS (or related sentinel lymph node or other specimens to be sent directly to Dermatopathology), MUST use "DERMATOLOGY PATHOLOGY" Order

Class: Back Office LAB Normal Historical Back Office LAB/AVS Hidden

Status: Normal Standing Future

Expected Date: 12/29/2022 Today Tomorrow 1 Week 2 Weeks 1 Month 3 Months 6 Months Approx.

Expires: 12/29/2023 1 Month 2 Months 3 Months 4 Months 6 Months 1 Year

Priority: Routine

Specimen(s):

CERVIX- 2 O'CLOCK	
VULVA	Anterior
VULVA	Posterior

❗ Suspected Diagnosis:

❗ Clinical Information:

Special Requests:

Comments:

Next Required Accept Cancel

- Type **Surgical Pathology** in the Order Entry screen.
- Use the “**Specimen(s):**” field to indicate the source for **each** specimen container from the source list (e.g., “CERVIX – 2 O’CLOCK”).
- For expanded source specificity or orientation, use the adjacent description field (e.g., “ANTERIOR”).

View of Surgical Pathology order showing multiple sources and comments

SURGICAL PATHOLOGY ORDER COLLECTION ACTIVITY

INPATIENT ORDERS

- Inpatient orders are collected via the *Manage Labs* Activity.
- Select the *Collect* link next to the appropriate Surgical Pathology order to be collected.

The screenshot shows the 'Manage Labs' section of a medical system. At the top, there are tabs for 'Active', 'Signed & Held', 'Home Meds', 'Cosign', 'Order History', 'Manage Labs', and 'Pathways'. Below the tabs, there are two main sections: 'Document Collection' and 'Update Collection Status'. The 'Document Collection' section has a link to 'Jump to Work List to document specimen collection'. The 'Update Collection Status' section has a link to 'Update Collection Status'. A note below these sections states: 'NOTE:Cancel an individual lab collection by clicking the appropriate Discontinue hyperlink. Use the Discontinue link on the right-hand side of the screen associated with the specific lab that was not collected. Do not use the Discontinue link next to the name and frequency of the original order.' Below the note is a 'Lab Orders' section with a 'Collapse | Hide' link. The 'Lab Orders' section shows a list of orders. The first order is 'Surgical Pathology ONCE' with a 'Collect' link highlighted in a red box and a 'Discontinue' link. The order status is 'Needs to be Collected'. Below the order name is a table with columns for 'Question', 'Answer', and 'Comment'. The table contains the following information:

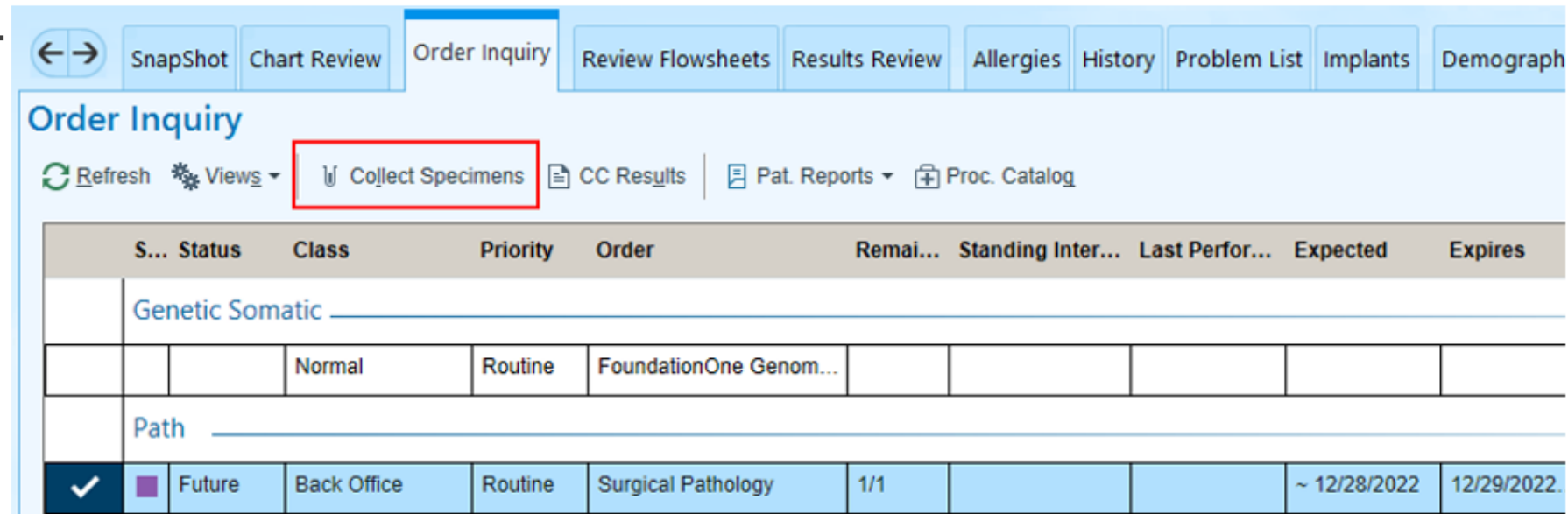
Question	Answer	Comment
Specimen(s):	CERVIX- 2 O'CLOCK	
Specimen(s):	VULVA	Anterior
Specimen(s):	VULVA	Posterior
Suspected Diagnosis:	DX	
Clinical Information:	CI	
Release to patient	Immediate	

View of Surgical Pathology order needing to be collected via Manage Labs

SURGICAL PATHOLOGY ORDER COLLECTION ACTIVITY

OUTPATIENT ORDERS

- Outpatient orders are collected via the Order Inquiry activity.
- Select the appropriate Surgical Pathology order and click *Collect Specimens* to launch the Specimen Collection activity.



The screenshot displays the 'Order Inquiry' interface. At the top, there are navigation tabs: SnapShot, Chart Review, Order Inquiry (selected), Review Flowsheets, Results Review, Allergies, History, Problem List, Implants, and Demograph. Below the tabs, there are action buttons: Refresh, Views, Collect Specimens (highlighted with a red box), CC Results, Pat. Reports, and Proc. Catalog. The main area contains a table with the following columns: S..., Status, Class, Priority, Order, Remai..., Standing Inter..., Last Perfor..., Expected, and Expires. The table has three rows. The first row is for 'Genetic Somatic'. The second row is for 'Normal' with priority 'Routine' and order 'FoundationOne Genom...'. The third row is for 'Path' with a checkmark in the first column, status 'Future', class 'Back Office', priority 'Routine', order 'Surgical Pathology', remaining '1/1', and expected dates '~ 12/28/2022' and '12/29/2022'.

S...	Status	Class	Priority	Order	Remai...	Standing Inter...	Last Perfor...	Expected	Expires
		Genetic Somatic							
		Normal	Routine	FoundationOne Genom...					
✓	Future	Back Office	Routine	Surgical Pathology	1/1			~ 12/28/2022	12/29/2022.

SPECIMEN COLLECTION ACTIVITY

- The specimens entered in Order Entry will display along with any specimen specific comments/descriptions.
- Specimen sources and any specific comments/descriptions can be edited in this activity.
- Once all sources and descriptions are accurate, click the *Print Labels* button.

The screenshot shows a web application interface for 'Specimen Collection'. It is divided into two main sections: 'Collection Sequence' and 'TISSUE Specimens'. In the 'Collection Sequence' section, 'STERILE CONTAINER' is selected, with 'Surgical Pathology' listed below it. The 'TISSUE Specimens' section is active, showing 'STERILE CONTAINER' and 'Surgical Pathology Scheduled: 12/28/2022 1330'. A 'Collect Later' button is visible. Below this, there is a table with two columns: 'Answer' and 'Comment'. The table contains three rows of data: 'CERVIX- 2 O'CLOCK', 'VULVA', and 'VULVA', each with a corresponding comment field. At the bottom right, there are two buttons: 'Procedure Catalog' and 'Print Labels', with the latter highlighted by a red box.

Answer	Comment
CERVIX- 2 O'CLOCK	Enter a comment
VULVA	Anterior
VULVA	Posterior
	Enter a comment

View of Specimen Collection activity for the Surgical Pathology order

SPECIMEN COLLECTION ACTIVITY

- Accurately label each specimen container with the associated specimen collection label.
- Confirm the accuracy of the Collection Details by updating the Collector and Collection date/time.
 - Each specimen must have a collection date/time recorded.
 - The Collector **must** be the name of the provider performing the specimen collection.
- For Inpatient, scan the label for each specimen to document collection information.
- For Outpatient, click the *Collect All* button to document collection information.



Specimen Collection

Collection Sequence

- x3 STERILE CONTAINER
- 280879000-A
- 280879000-B
- 280879000-C

Collection Details

Time	Date	Collector	Department
Now	Today	UCDNOLAN, KATHLEEN LICNRS-ANCSTF	OB/GYN GLASSROCK

Document individually

TISSUE Specimens

STERILE CONTAINER

Surgical Pathology

A. CERVIX- 2 O'CLOCK

Scan label or click to document collection

Source
CERVIX- 2 O'CLOCK

Add Specimen Description

Draw Type
Non-blood Collection Non-blood Collection

B. VULVA

Scan label or click to document collection

Source
VULVA

Specimen Description
Anterior

Draw Type
Non-blood Collection Non-blood Collection

C. VULVA

Scan label or click to document collection

Source
VULVA

Specimen Description
Posterior

Draw Type
Non-blood Collection Non-blood Collection

Procedure Catalog Reprint Labels **Collect All** Accept

Update Collector and Collection Date/Time

For Inpatient orders, scan label to document collection

For Outpatient orders, click *Collect All*

View of Specimen Collection activity for the Surgical Pathology order after Print Labels has been selected

- Note the *Collection Sequence* lists each specimen collection ID number with the corresponding letter designation.
- *Reprint Labels* if a source was updated after Print Labels was selected.
- Click *Accept* to close the Collection Activity.

Specimen Collection

Collection Sequence
x3 STERILE CONTAINER
✓ 280712608-A
✓ 280712608-B
✓ 280712608-C

Collection Details

Time	Date	Collector	Department
1720	1/18/2023	UCDECKELS, LISA F...	INFUSION ADULT I...

[Document individually](#)

TISSUE Specimens

STERILE CONTAINER
Surgical Pathology Scheduled: 1/18/2023 1730

A. CERVIX- 2 O'CLOCK ✓ Collected on 1/18/2023 at 1720 by UCDECKELS, LISA FAC-PHY in INFUSION ADULT IV INFUSION CENTER CA CTR

Source: CERVIX- 2 O'CLOCK Draw Type: Non-blood Collection

B. VULVA ✓ Collected on 1/18/2023 at 1720 by UCDECKELS, LISA FAC-PHY in INFUSION ADULT IV INFUSION CENTER CA CTR

Source: VULVA Draw Type: Non-blood Collection

Specimen Description: Anterior

C. VULVA ✓ Collected on 1/18/2023 at 1720 by UCDECKELS, LISA FAC-PHY in INFUSION ADULT IV INFUSION CENTER CA CTR

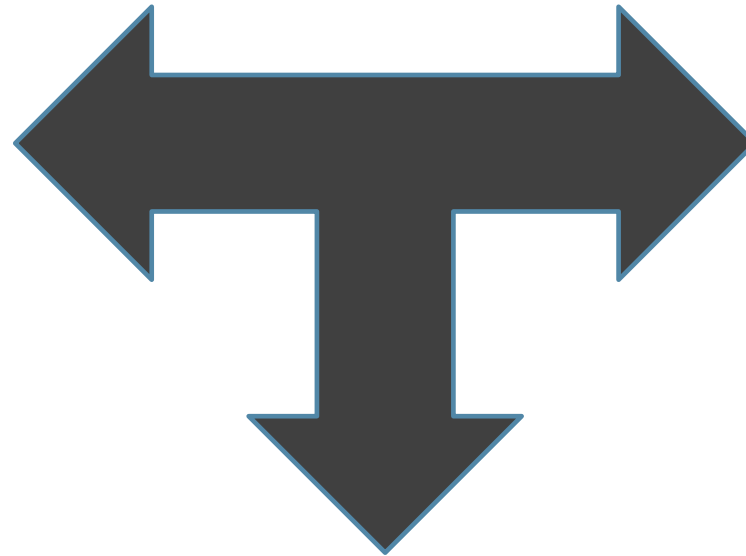
Source: Draw Type:

All collections documented!

Procedure Catalog **Reprint Labels** Collect All **Accept**

**CLINICAL
TEAM**

**LABORATORY
TEAM**



**QUALITY
PATIENT CARE**