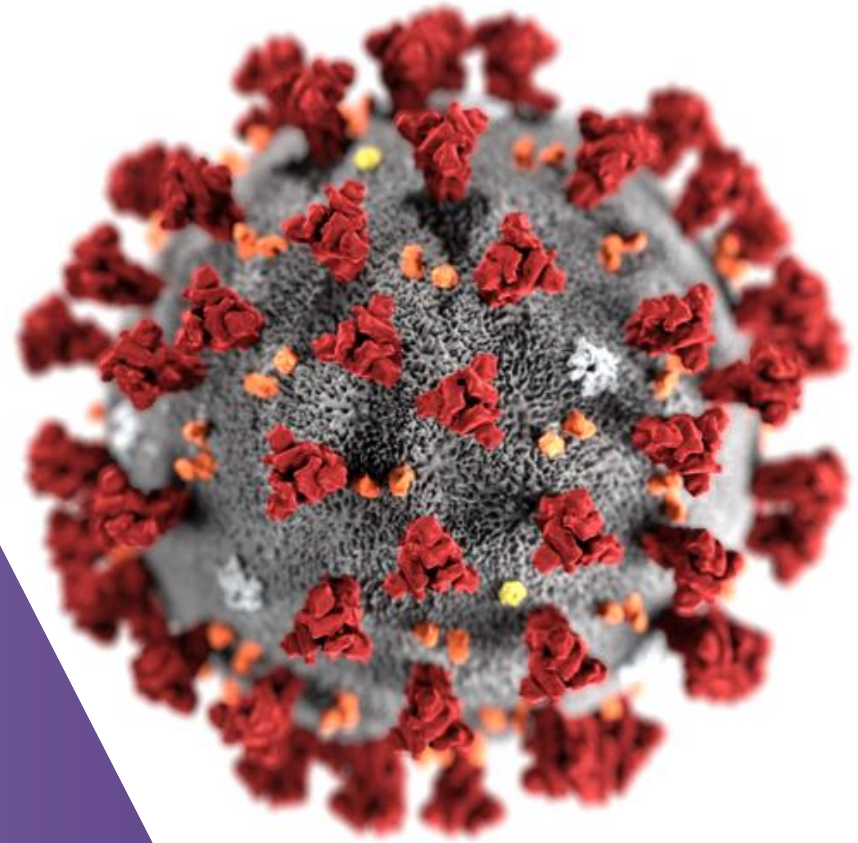
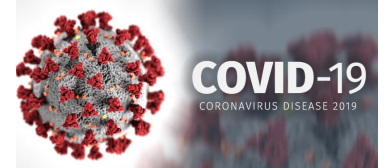


# Safe bedside vascular access for patients with COVID-19

Updated 11/19/2020



# CME Credits



## To claim credit:

- Click on the link and then "Tests" to complete the evaluation and claim credit: [https://northwestern.cloud-cme.com/COVID\\_Vascular](https://northwestern.cloud-cme.com/COVID_Vascular)

**Disclosures:** There are no relevant financial relationships.

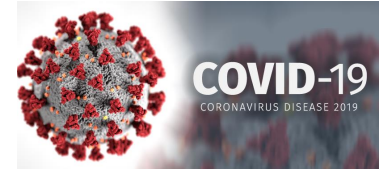
## Accreditation Statement

- The Northwestern University Feinberg School of Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

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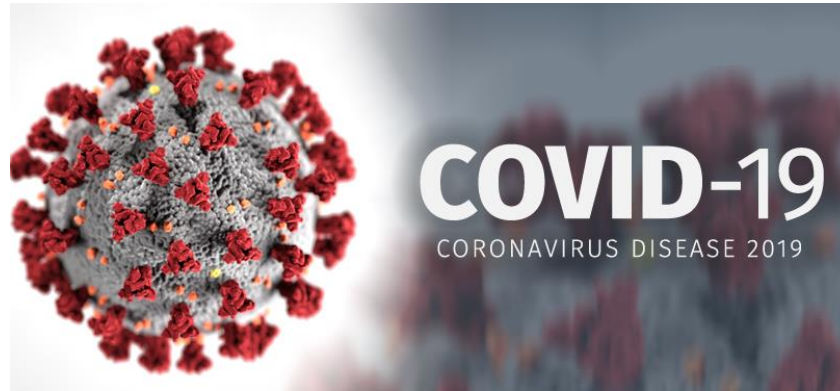
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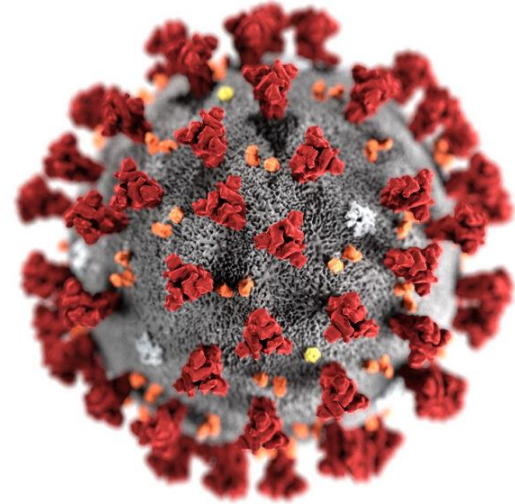
# Learning objectives

- This educational module is designed to give an overview for safe and informed care of Covid-19 patients while performing bedside vascular access
- This module provides general guidelines to consider as well as access to additional resources



# COVID-19 vascular access needs

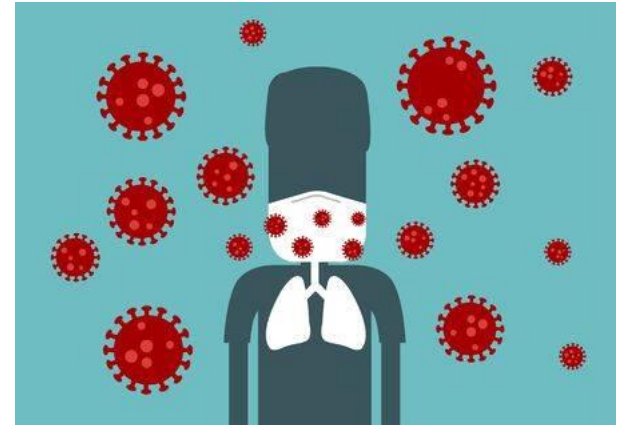
- Most COVID-19 positive patients have required vasopressors in the immediate peri-intubation period necessitating central venous access
- Most COVID-19 positive patients who require intubation can be expected to require serial arterial blood gas assessment to guide management of their respiratory failure necessitating arterial access



# General Guidelines

All bedside procedures performed on COVID-19 patients

- All efforts should be made to minimize exposure to healthcare workers.
- Safety procedures, including donning and doffing of PPE, shall not be altered or rushed no matter how emergent the situation.
- Limit the number of healthcare providers in the room during the procedure.
- Procedures should be performed by the most experienced provider available.
- If multiple procedures are required, providers should make every effort to coordinate and batch these procedures to minimize trips in and out of the patient's room and conserve PPE while ensuring procedures are done safely.



# General Guidelines

All bedside procedures performed on COVID-19 patients

- Careful preparation outside the room is strongly recommended. All necessary supplies should be gathered and checked prior to entering the room.
- An outside the room time out, including a review of necessary supplies, should be performed.
- Clear lines of communication, possibly via white board, should be maintained through the window to a runner outside the room.



# Proper PPE for bedside procedures

## Prior to entering room

- For all providers in room
  - N95 respirator or PAPR  
(*Perform N95 seal test*)
  - Shield (preferred) or goggles
  - Non-sterile gown
  - Non-sterile gloves
  - Bouffant head cover
  - Consider knee-high trauma boots/shoe covers

## Prior to placing sterile line

- Only for providers directly involved in line placement
  - Sterile gown
  - Sterile gloves

Sterile gown and gloves are placed **over non-sterile PPE** while in the patient's room.



# Safe Putting On (Donning) of PPE

[Updated Videos and content on NMI](#)

- [1. Putting on PPE with a New Surgical Mask or N95 Respirator Mask](#)
- [2. Putting on PPE with a Used N95 Respirator Mask](#)
- [3. Putting on PPE while Wearing a Continuous Use Surgical Mask or N95 Respirator Mask and Goggles or Face Shield](#)
- [4. Perform N95 Seal Check](#)

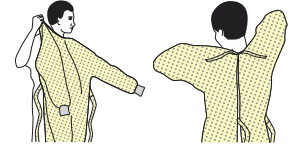
Sterile gown and gloves will be placed over standard PPE prior to sterile portion of the procedure

## SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

### 1. GOWN

- Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist



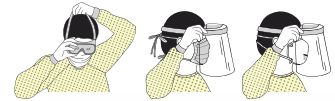
### 2. MASK OR RESPIRATOR

- Secure ties or elastic bands at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



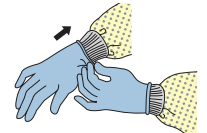
### 3. GOGGLES OR FACE SHIELD

- Place over face and eyes and adjust to fit



### 4. GLOVES

- Extend to cover wrist of isolation gown



## USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

# Safe Removal (Doffing) of PPE

[Updated Videos and content on NMI](#)

## 1. Removing PPE

## 2. Removing PPE while Wearing a Continuous Use Surgical Mask or N95 Respirator and Goggles or Face Shield

## 3. Wearing, Discarding, and Storing Masks

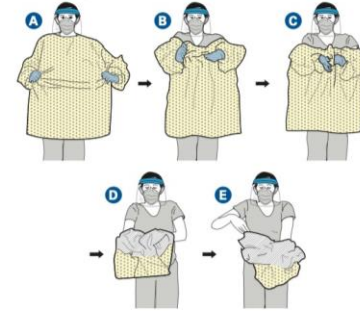
If feasible change scrubs after each patient.  
Shower if soiled with blood or other bodily fluid.

## HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 2

Here is another way to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. **Remove all PPE before exiting the patient room** except a respirator, if worn. Remove the respirator **after** leaving the patient room and closing the door. Remove PPE in the following sequence:

### 1. GOWN AND GLOVES

- Gown front and sleeves and the outside of gloves are contaminated!
- If your hands get contaminated during gown or glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp the gown in the front and pull away from your body so that the ties break, touching outside of gown only with gloved hands
- While removing the gown, fold or roll the gown inside-out into a bundle
- As you are removing the gown, peel off your gloves at the same time, only touching the inside of the gloves and gown with your bare hands. Place the gown and gloves into a waste container



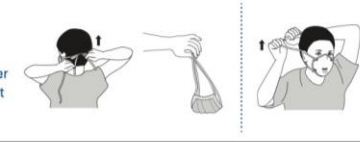
### 2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band and without touching the front of the goggles or face shield
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container



### 3. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container



### 4. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



**PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE**

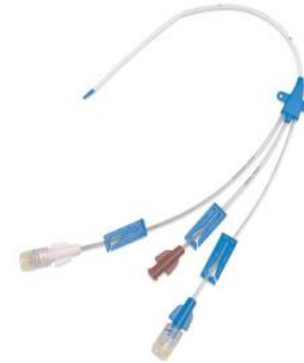


# Central venous access



Full PPE is required

- Most COVID-19 positive patients in our center have required vasopressors in the immediate peri-intubation period.
- This should be anticipated and prepared for by the care team with a plan for central venous access once the airway is secured.
- To limit exposure of PICC placement providers, **triple lumen catheters are preferred as a first line** for vasopressor administration.
- PICCs should be considered if vasopressor requirement is expected to last for longer than 10 days or long term central IV access is needed for other indications.



# Central venous access

## Line considerations



Full PPE is required

- Unless there are contraindications, the **Left internal jugular vein** is preferred for central venous access as many critically ill COVID-19 patients will eventually require a tunneled right IJ HD catheter.
- Consider placement of a trialysis line in place of a TLC if the patient has underlying CKD or severe AKI in anticipation of renal replacement therapy.
- If trialysis catheter is not available consider double sticking left IJ
- **Perform the procedure using standard ultrasound-guided technique**



Incidence of AKI  
**0.5-23%**

Naicker S, et al. *Kidney Int* 2020; doi.org/10.1016/j.kint.2020.03.001



More common in  
ICU setting  
**8.3% vs 2.0%**

Wang D, et al. *JAMA* 2020; 323 (11): 1061-69



Need for CRRT  
**0.8-9%**



Cheng Y, et al. *Kidney Int* 2020; doi.org/10.1016/j.kint.2020.03.005  
Guan W, et al. *NEJM* 2020; doi:10.1056/NEJMoa2002032

Urinary abnormalities  
Albuminuria 34%  
Proteinuria 63%  
Hematuria 26.7%  
**Both 44%**



Naicker S, et al. *Kidney Int* 2020; doi.org/10.1016/j.kint.2020.03.001

# Central venous access

## Standardized site preference



Full PPE is required

In order of priority for TLC, trialysis or alternate catheter

- Left IJ
- Right IJ
- Left subclavian
- Right subclavian
- Femoral

In order of priority for temporary HD catheter (Not trialysis)

- Right IJ
- Left IJ
- Left subclavian
- Right subclavian
- Femoral

These are general recommendations. Patient factors and physician judgement should also be considered in consultation with the critical care team.

Consider avoiding subclavian access on COVID-19 patients requiring high PEEP.

# Central venous access

## Lower extremity access



Full PPE is required

- Many critically ill COVID-19 patients require prone ventilation making femoral access problematic due to kinking of the catheter
- Considerations for lower extremity venous access when necessary
  - Access femoral vein low to avoid the skin crease
  - Access the great saphenous vein in the thigh
  - Use long 55cm HD catheter with lateral stick and “tunnel” portion of the catheter subcutaneously to the vein
- **Perform the procedure using standard ultrasound-guided technique**



# Arterial lines



Full PPE is required

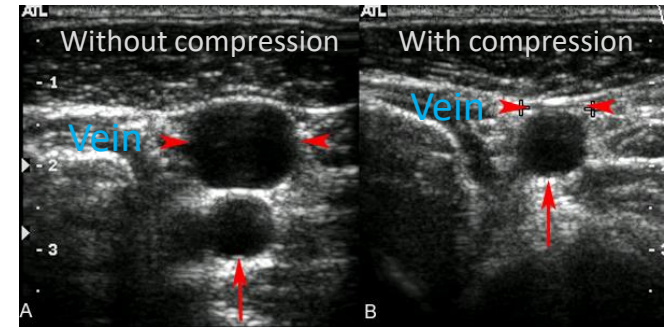
- Most COVID-19 positive patients who require intubation can be expected to require serial arterial blood gas assessment to guide management of their respiratory failure. Therefore, arterial line placement is recommended in patients with respiratory failure to avoid repeated provider exposure drawing blood gases.
- Radial artery access at the wrist is the preferred location
- If radial access is not available consider brachial access over femoral access to avoid issues with line kinking should the patient require prone positioning.
- Ensure nursing team and set up a-line setup with appropriate length tubing.
- **Perform the procedure using standard ultrasound-guided technique**

# General US guided vascular access steps

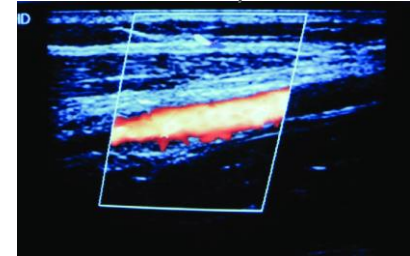
## Step 1 – Identify target vessel

- Identify target vein or artery prior to prepping and draping
- Using ultrasound, visualize the target vessel in short and long access view
- Confirm patency of the vessel
  - Vein – use compression with the ultrasound probe to evaluate for venous thrombosis. Patent veins should compress fully
  - Arterial
    - Perform distal pulse exam and Allen test when appropriate
    - Use color flow or doppler to confirm vessel patency

Patent Internal Jugular Vein



Patent radial artery on color flow

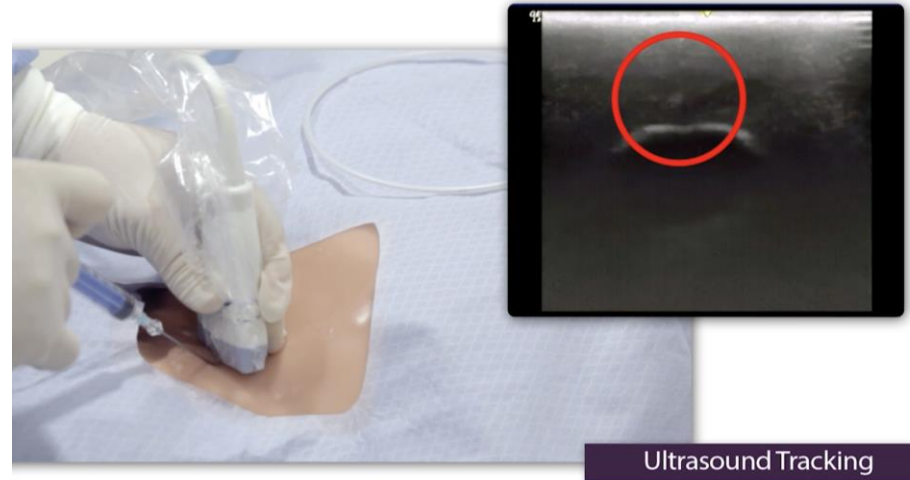




# General US guided vascular access steps

## Step 2 – Use real-time US guidance for puncture of the vessel

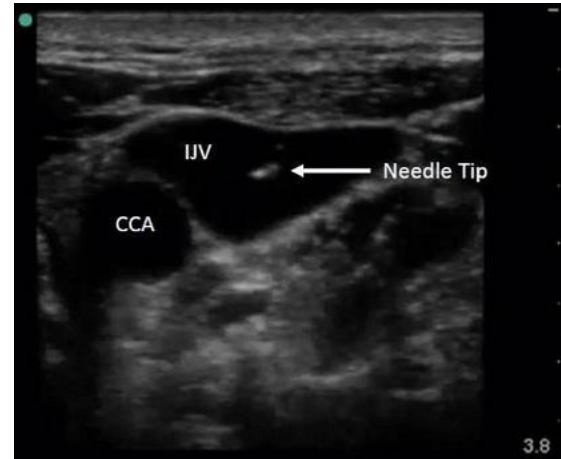
- Use sterile technique
- Use the short axis/out-of-plane or long-axis/in-plane approach
- Try to constantly visualize the tip of the needle during the approach and puncture of the target vessel
- Consider using a micropuncture system in patients who are coagulopathic, have small vessels or challenging anatomy



# General US guided vascular access steps

## Step 3 – Confirm needle position in the vessel

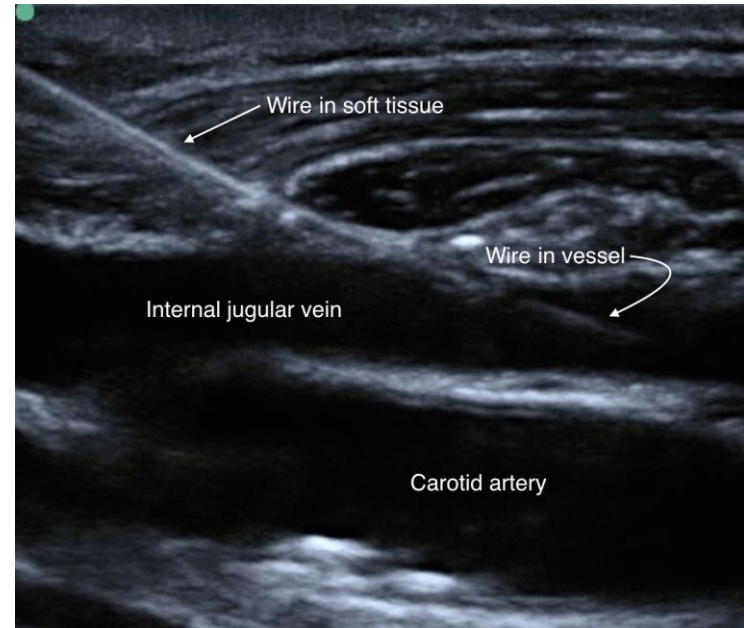
- Confirm the needle tip is placed centrally in the target vessel before introducing the guidewire



# General US guided vascular access steps

## Step 4 – Confirm wire position in the target vessel

- Confirm the correct position of the guide wire in a short and long axis
- Follow wire to full extent possible within the sterile field to ensure it remains within the target vessel



# Conclusions

- Minimize the risk of exposure to yourself and team members with the proper use, putting on, and removal of PPE according to current guidelines
- Ensure you have all necessary equipment prior to entering the room
- The left IJ is the preferred site for central venous access
- **Standard femoral access can kink in patients that require prone ventilation**
- **Perform the procedure using standard ultrasound-guided technique**



# COVID Central Line Team | Daily 7AM – 7PM

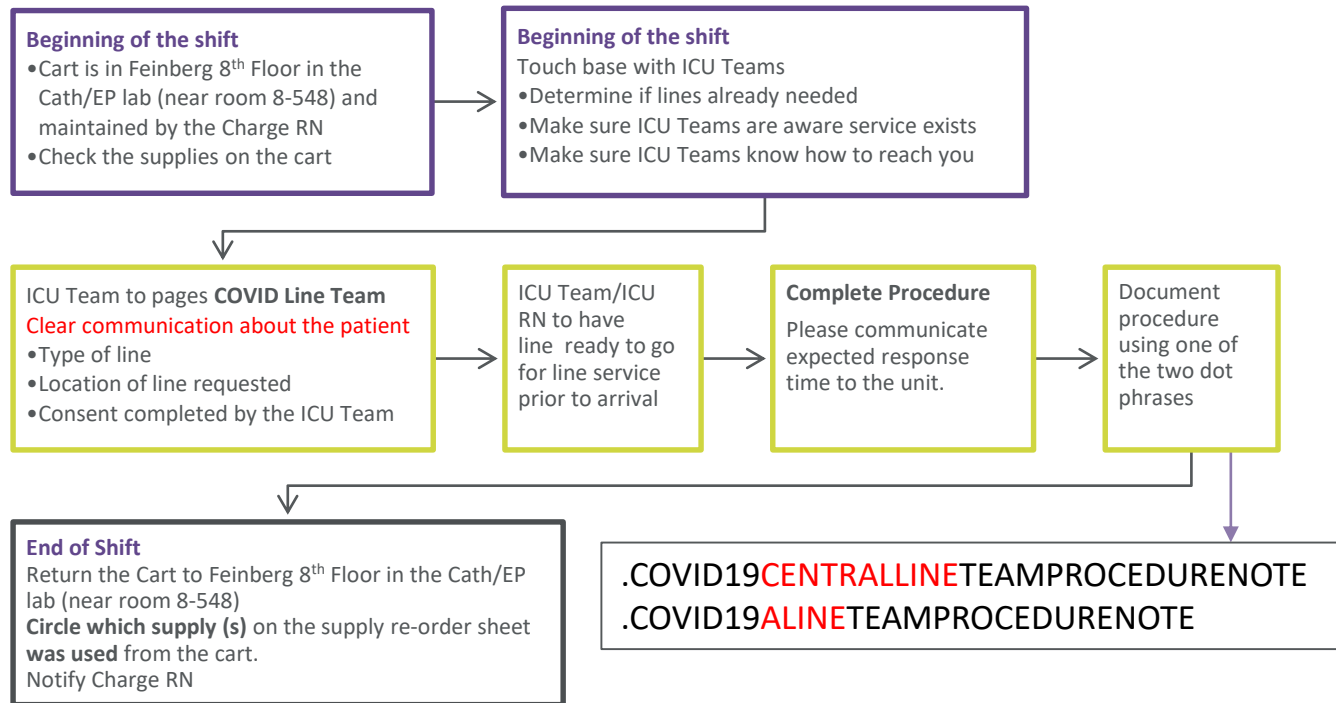
## Pager: 57557 (COVID Line Team)

Goal of COVID Line Team is to assist COVID ICU teams with central and arterial lines.

**November 2020 Update:** Line team may not be immediately available due to current limitations. Please plan accordingly and allow additional time for response.



IR supplies are maintained in IR mobile cart.



# Best Practices

## PRE/SUPPLY

- Supply cart is in Feinberg 8<sup>th</sup> Floor in the Cath/EP lab (near room 8-548)
- Make sure consent is completed by the ICU Team
- Usually the MICU fellow or APN will call with a request via the pager. Be sure to ask the access needed: line type, and location, and make sure consent is completed
- Different COVID units have different supplies in stock. (Some have central line and A line kits with a lot of equipment in the unit supply room.)
  - Assume the rooms do not have the supplies needed
  - Ask ICU team for supplies
  - Only use the supplies in the cart as a supplement.

## ON UNIT/BEST PRACTICES

- PPE is readily available on a large cart on the unit including glasses, face shields, etc. N95 masks are in a little basket on the nurses station
  - Actions to take prior to donning PPE and going in the room: (Triple check a supply list before donning PPE and going in the room)
1. Huddle with the nurse OUTSIDE room
    - a) confirm consent obtained
    - b) review site and catheter desired
    - c) get ultrasound in room (Make sure Sonosite/ultrasound is available. Triple check that a sterile probe cover is brought in.)
    - d) discuss bed positioning AND patient positioning
    - e) Discuss sedation state and if there is need for more sedation to optimize for fast, successful line placement
    - f) Do they have the right catheter? Arrow catheters for radial arterial line?
  2. Ask the nurse to go in the room first and confirm basic supplies (4x4, saline for flushes, 18 gauge needles, right length 25 gauge needles, etc.)
  3. Gather equipment, don PPE, and enter the room

## POST PROCEDURE

- Ask the nurses to order the post-placement CXR.
- Adhere the **patient's sticker** to the supply re-order sheet that should be on the cart.
- Circle which supply (s)** on the supply re-order sheet **was used** from the cart-this will allow us to charge the patient appropriately from EP Cost Center.



IR supplies are being maintained in IR mobile cart.

# Additional vascular access resources

- Below is a link to several videos with more detailed information regarding central venous access. (requires NU login)
  - [Radial arterial line \(non-ultrasound guided\)](#)
  - [Central venous catheter](#)
- Link to suggested [shopping list](#) (requires NU login)