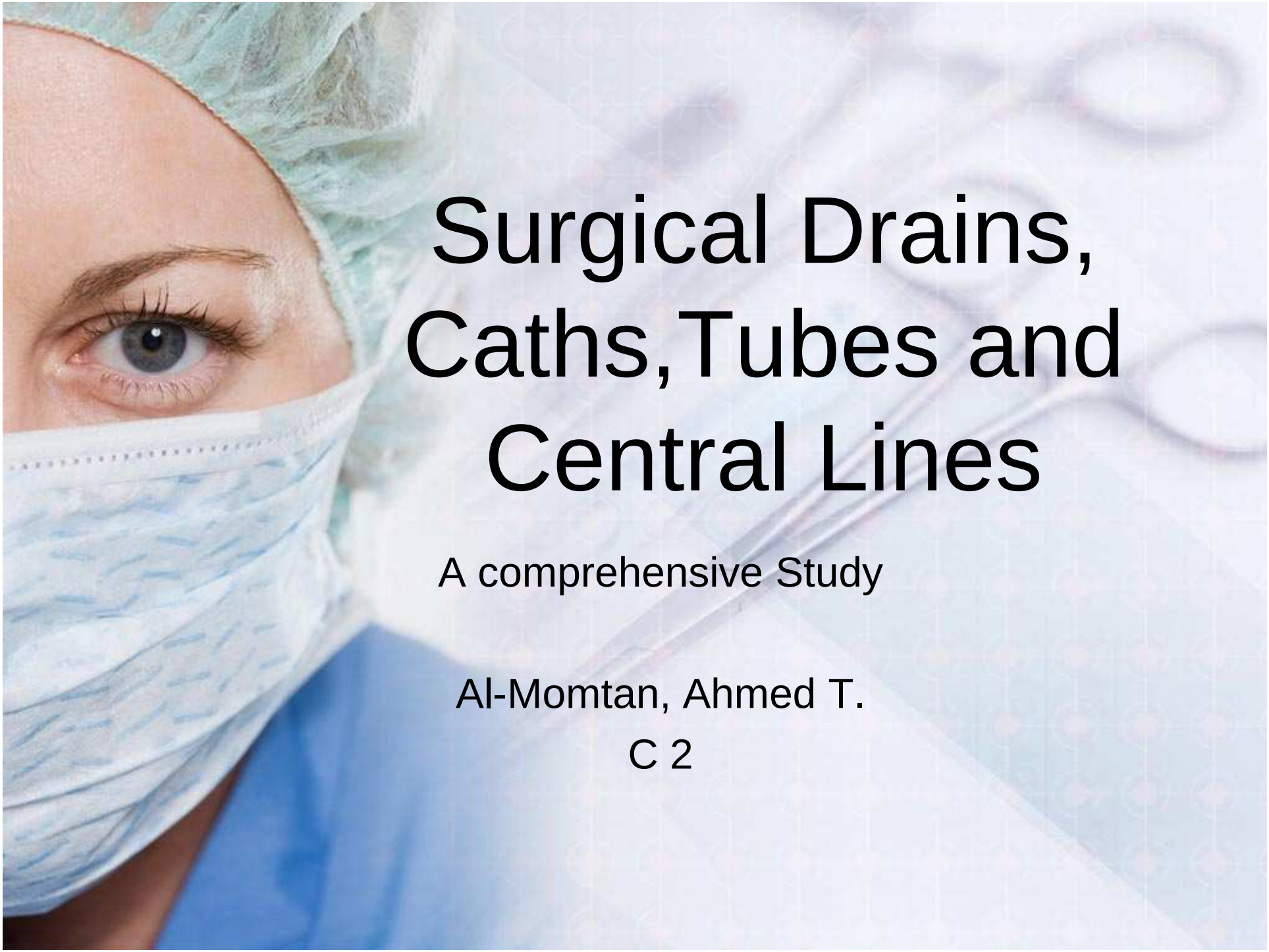


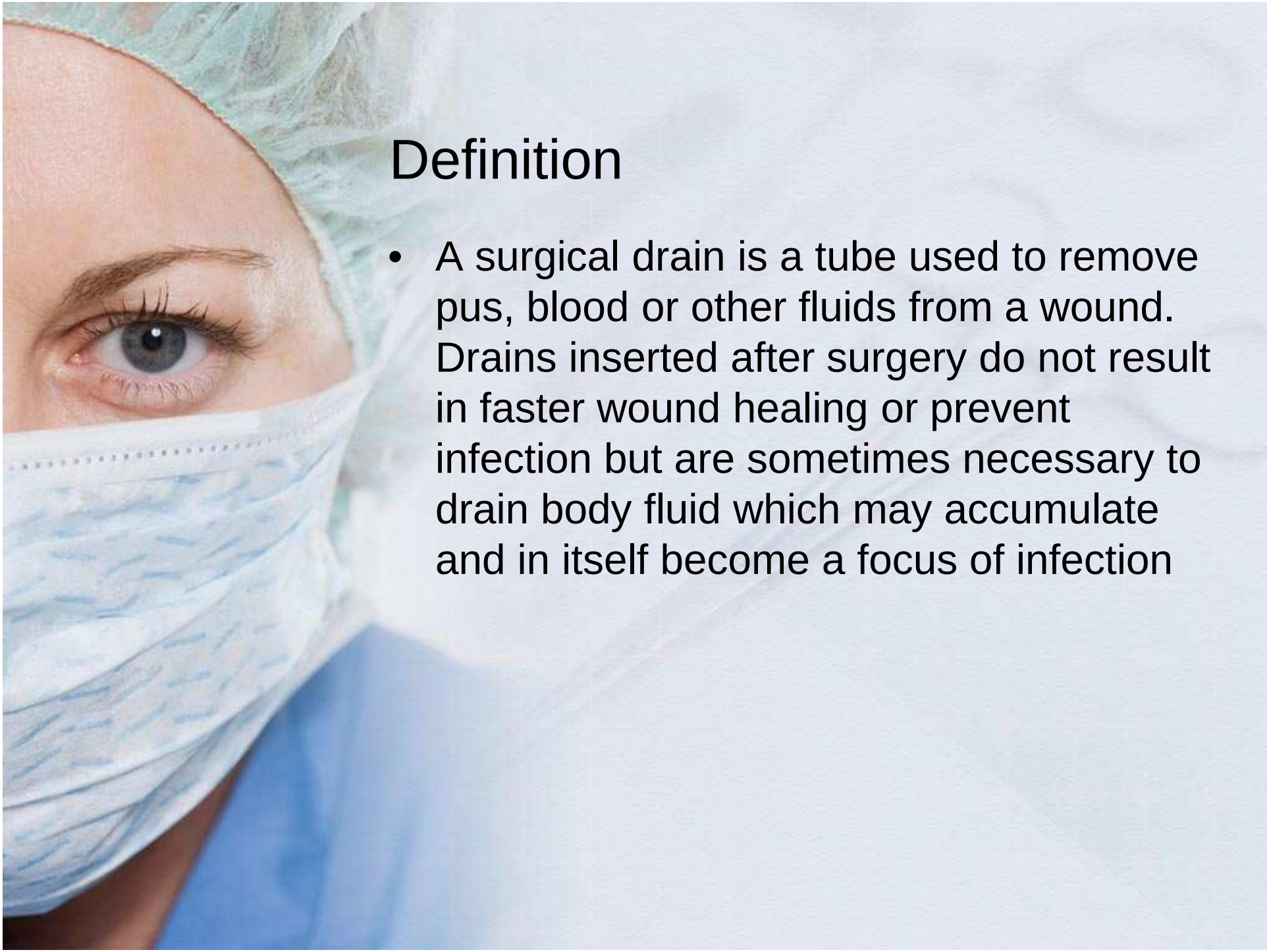
Surgical Drains, Caths,Tubes and Central Lines

A comprehensive Study

Al-Momtan, Ahmed T.
C 2

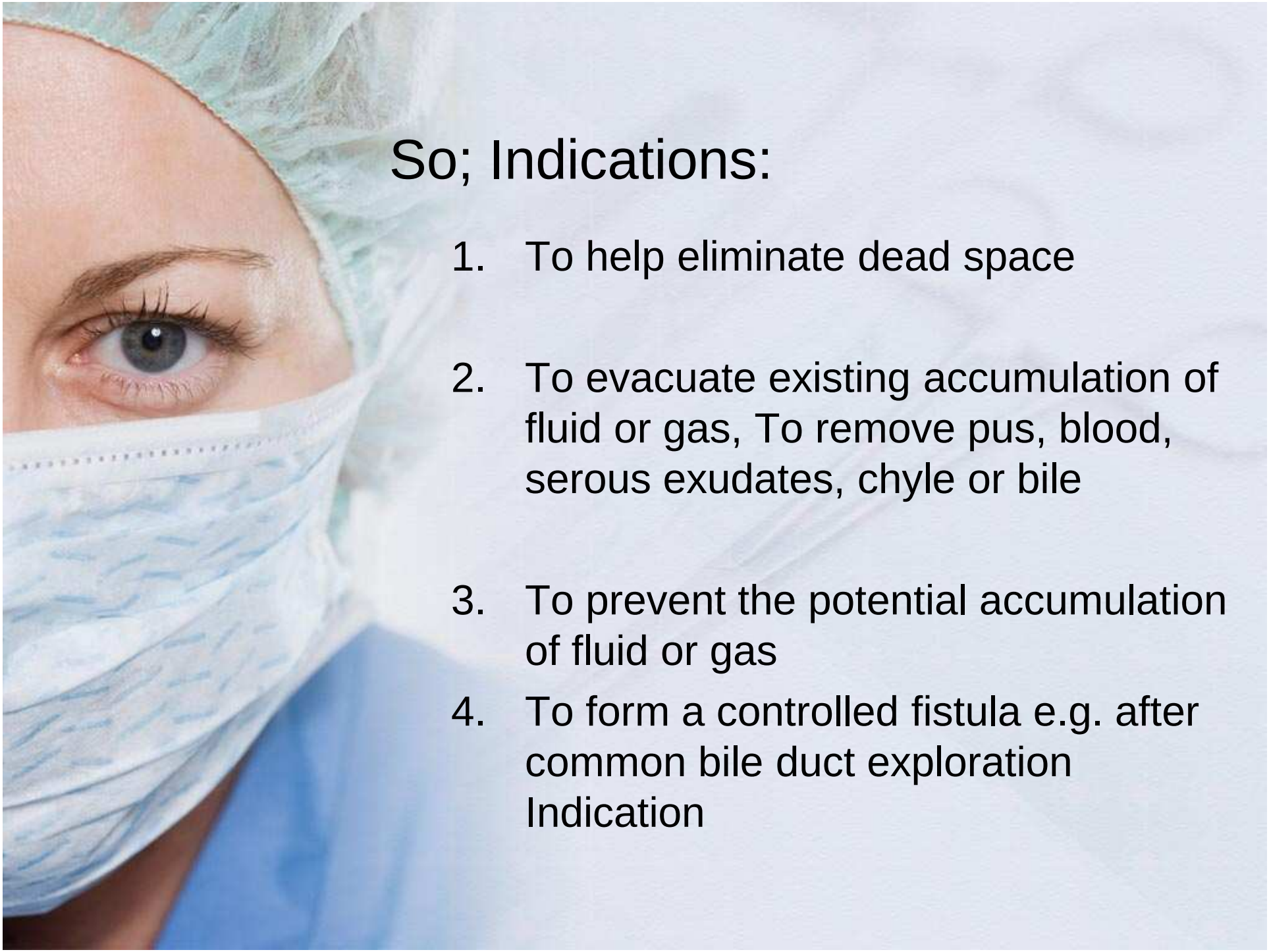
Objectives

- Goals / Indications for Use
  - Why use a drain ?
- Types
  - What are the major types of drains and how do they work ?
- Principals of Use
  - Which drain to use ?
  - What are the complications ?



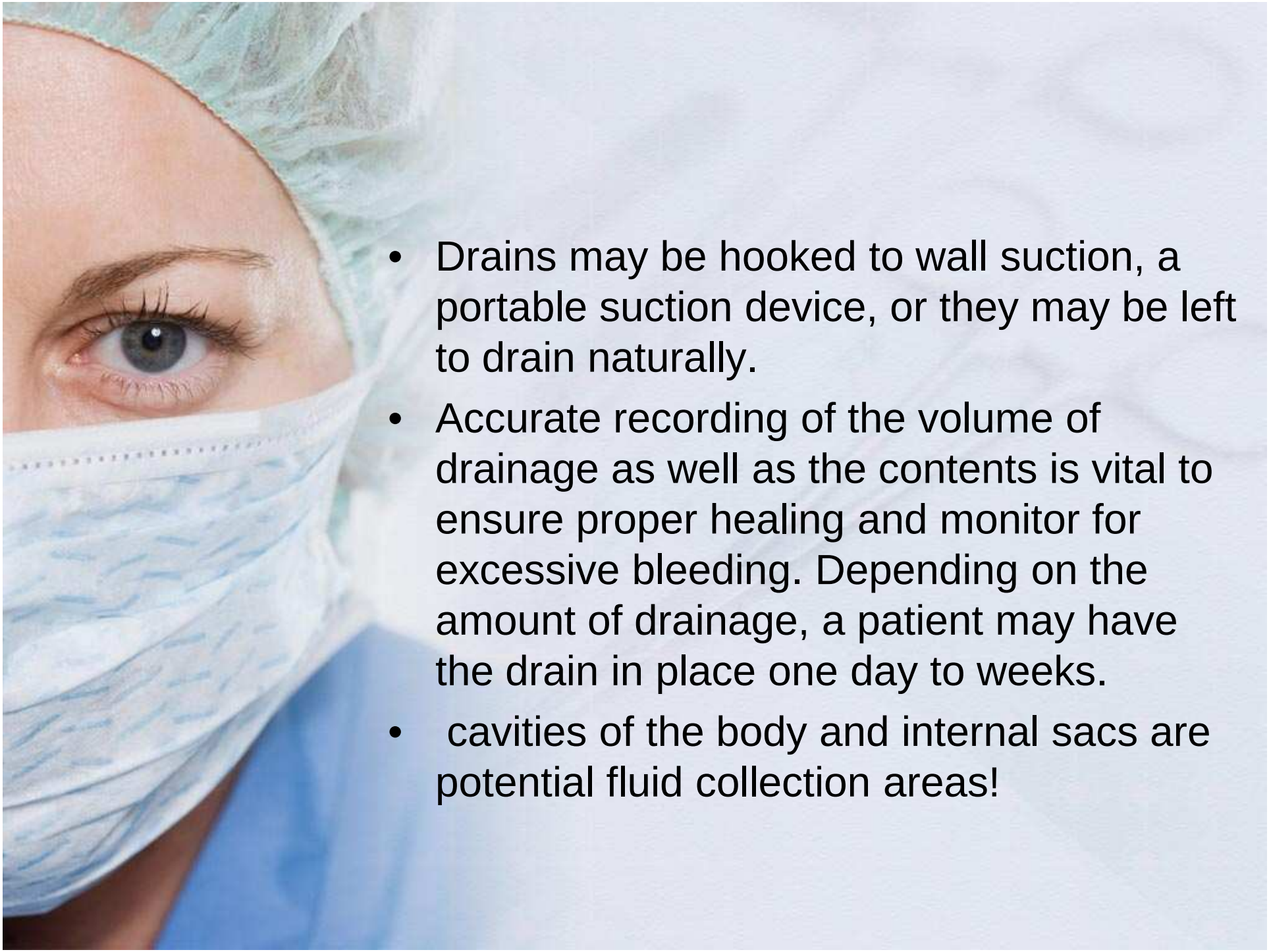
Definition

- A surgical drain is a tube used to remove pus, blood or other fluids from a wound. Drains inserted after surgery do not result in faster wound healing or prevent infection but are sometimes necessary to drain body fluid which may accumulate and in itself become a focus of infection

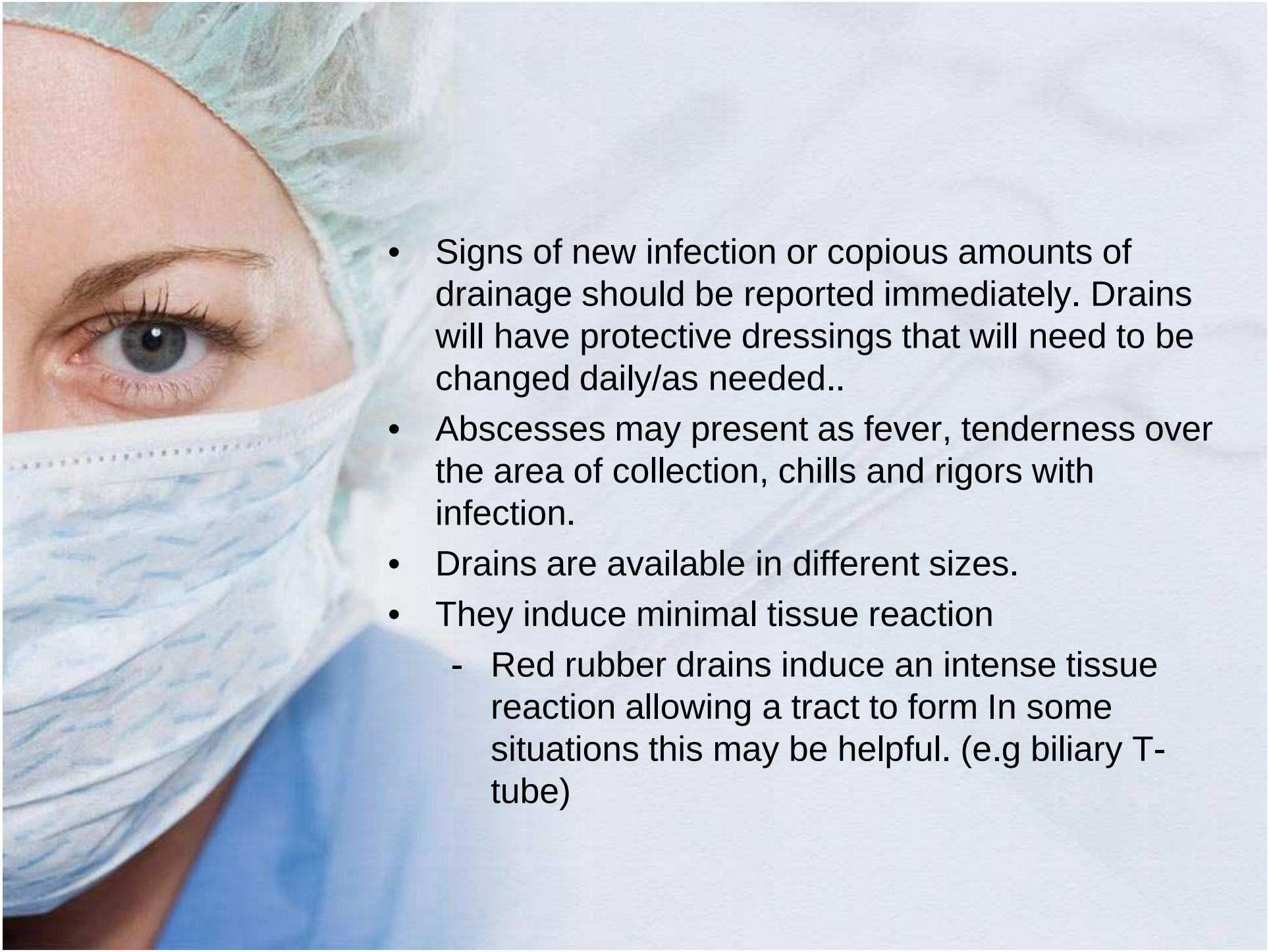


So; Indications:

1. To help eliminate dead space
2. To evacuate existing accumulation of fluid or gas, To remove pus, blood, serous exudates, chyle or bile
3. To prevent the potential accumulation of fluid or gas
4. To form a controlled fistula e.g. after common bile duct exploration Indication



- Drains may be hooked to wall suction, a portable suction device, or they may be left to drain naturally.
- Accurate recording of the volume of drainage as well as the contents is vital to ensure proper healing and monitor for excessive bleeding. Depending on the amount of drainage, a patient may have the drain in place one day to weeks.
- cavities of the body and internal sacs are potential fluid collection areas!



- Signs of new infection or copious amounts of drainage should be reported immediately. Drains will have protective dressings that will need to be changed daily/as needed..
- Abscesses may present as fever, tenderness over the area of collection, chills and rigors with infection.
- Drains are available in different sizes.
- They induce minimal tissue reaction
  - Red rubber drains induce an intense tissue reaction allowing a tract to form In some situations this may be helpful. (e.g biliary T-tube)

Classification:

- Open Vs Closed Systems:
  - Open
  - Closed

- Active Vs. Passive
  - Active.
  - Passive

Open drains

- Include corrugated rubber or plastic sheets
- Drain fluid collects in gauze pad or stoma bag.
- They increase the risk of infection

Closed drains

• Consist of tubes draining into a bag or bottle.
• They include chest and abdominal drains.
• The risk of infection is reduced.

Active drains

- Active drains are maintained under suction
- They can be under low or high pressure

Passive drains

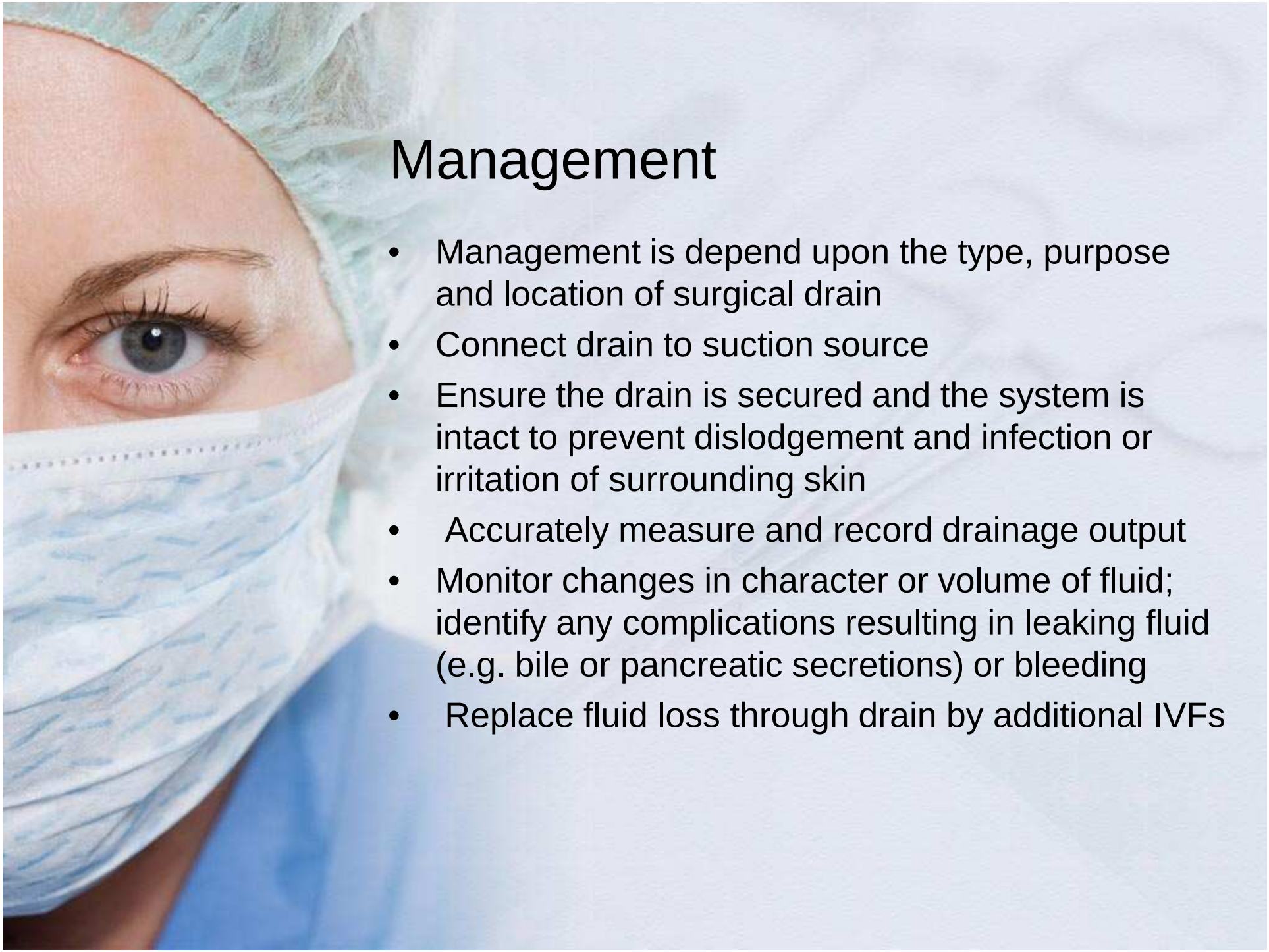
- Passive drains have no suction
- Drain by means of pressure differentials, overflow, and gravity between body cavities and the exterior.

Advantages Vs Disadvantages of **passive** drains

Advantages	Disadvantages
Allow evaluation of volume and nature of fluid	Gravity dependent – affects location of drain
Prevent bacterial ascension	Drain easily clogged
Eliminate dead space	
Help appose skin to wound bed – quicker wound healing	
Passive	
Allow evaluation of volume and nature of fluid	

Advantages Vs Disadvantages of **Active** drains

Advantages	Disadvantages
Keep wound dry – efficient fluid removal	High negative pressure may injure tissue
Can be placed anywhere	Drain clogged by tissue
Prevent bacterial ascension	
Help appose skin to wound bed – quicker wound healing	
Allows evaluation of volume and nature of fluid	



Management

- Management is depend upon the type, purpose and location of surgical drain
- Connect drain to suction source
- Ensure the drain is secured and the system is intact to prevent dislodgement and infection or irritation of surrounding skin
- Accurately measure and record drainage output
- Monitor changes in character or volume of fluid; identify any complications resulting in leaking fluid (e.g. bile or pancreatic secretions) or bleeding
- Replace fluid loss through drain by additional IVFs

Complications and Failure of Drains

- Poor Drain Selection
- Poor Drain Placement
- Poor Post-operative Management

Complications and Failure of Drains

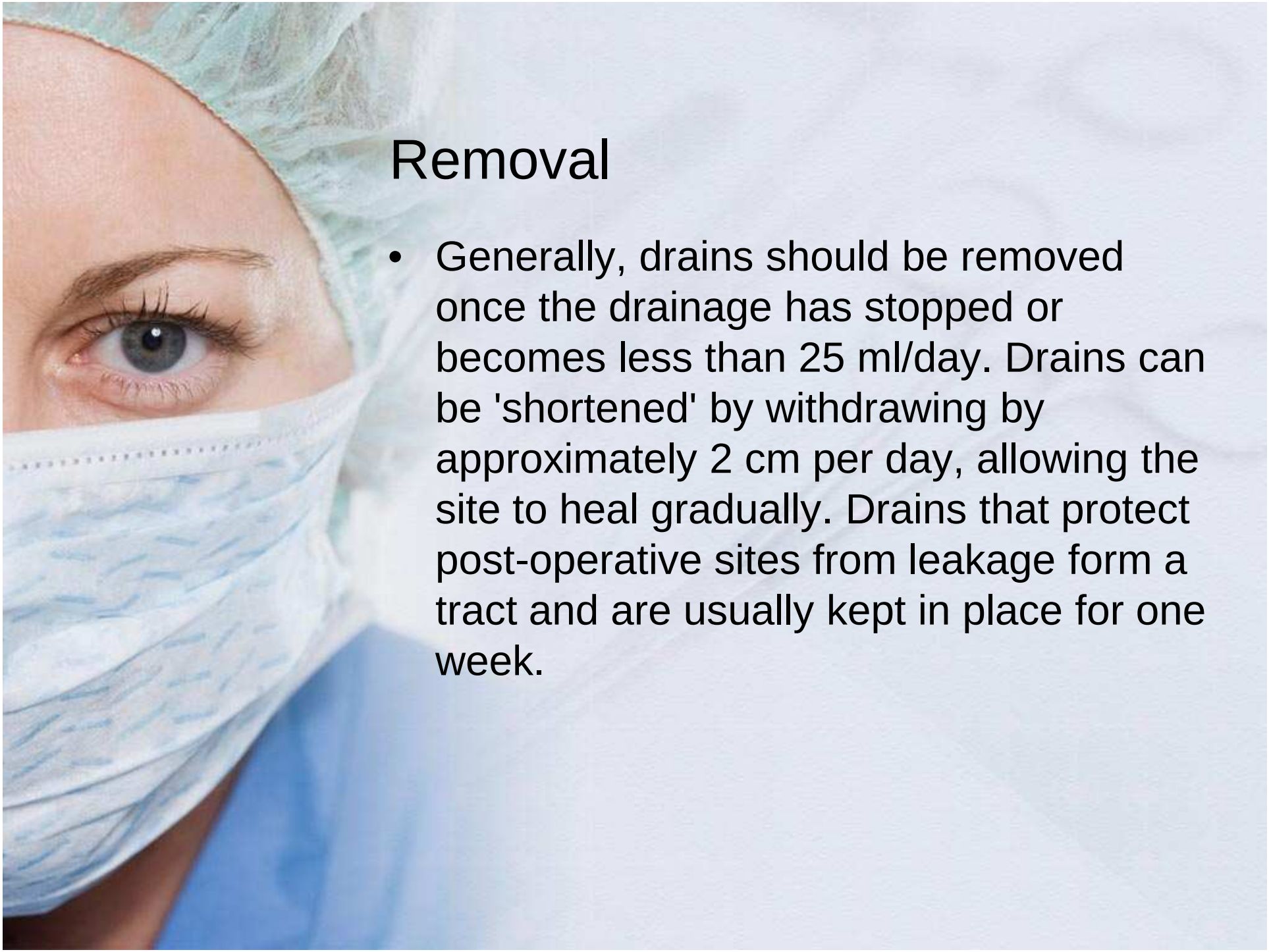
- Infection
  - Ascending bacterial invasion
  - Foreign body reaction
  - Decreased local tissue resistance
  - Bacterial hiding places
  - Poor placement – fluid accumulation, drain kinked
  - Poor postoperative management

Complications and Failure of Drains

- Discomfort / Pain
  - Thoracic Tubes – diameter too large
  - Stiff tubing
- Inefficient Drainage
  - Exiting in non-dependent locale (passive drains)
  - Kinked tube
  - Obstructed
  - Poor drain selection – diameter too small to remove viscous fluid

Complications and Failure of Drains

- Breakdown of anastomotic sites
- Erosion into hollow organs (firm drains)
- Incision dehiscence / hernia
  - Poor placement
- Premature Removal
  - Accumulation of fluid



Removal

- Generally, drains should be removed once the drainage has stopped or becomes less than 25 ml/day. Drains can be 'shortened' by withdrawing by approximately 2 cm per day, allowing the site to heal gradually. Drains that protect post-operative sites from leakage form a tract and are usually kept in place for one week.

Continue Removal

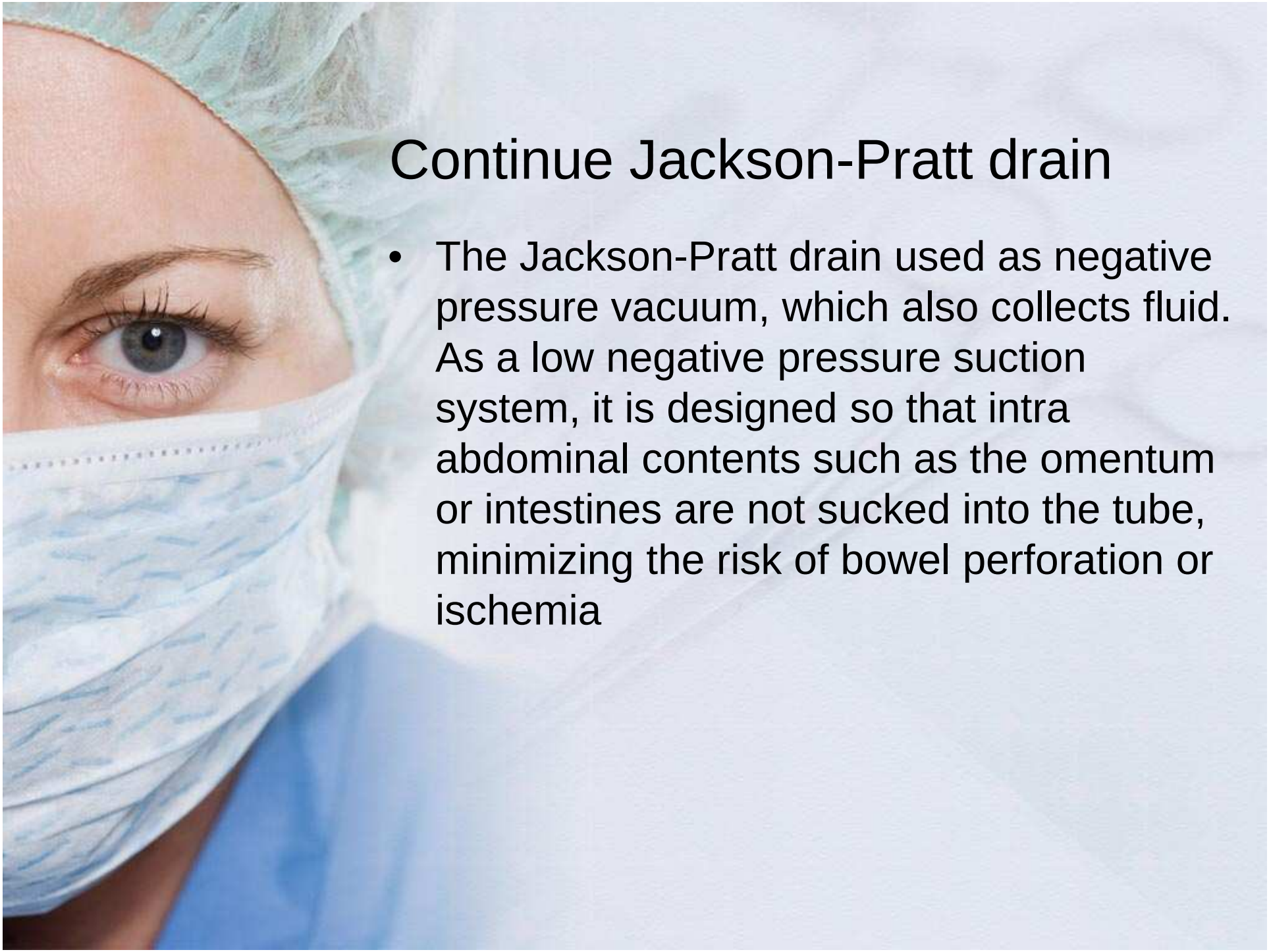
- Inform patient that there may be some discomfort when the drain is pulled out
- Assess the patient's need for pain medication prior to removal
- Place dry dressing over the site where the drain was removed; replace as appropriate
- Some drainage from the site commonly occurs until site heals
- Drains left in place for prolonged periods may be difficult to remove. Early removal may decrease the risk of some complications!

Types of Drain

- Jackson-Pratt Drain.
- Penrose drain.
- Negative pressure wound therapy
- Chest tube
- Redivac drain
- Pigtail drain – has an exterior screw to release the internal “pigtail” before it can be removed
- Redon drain
- Davol .

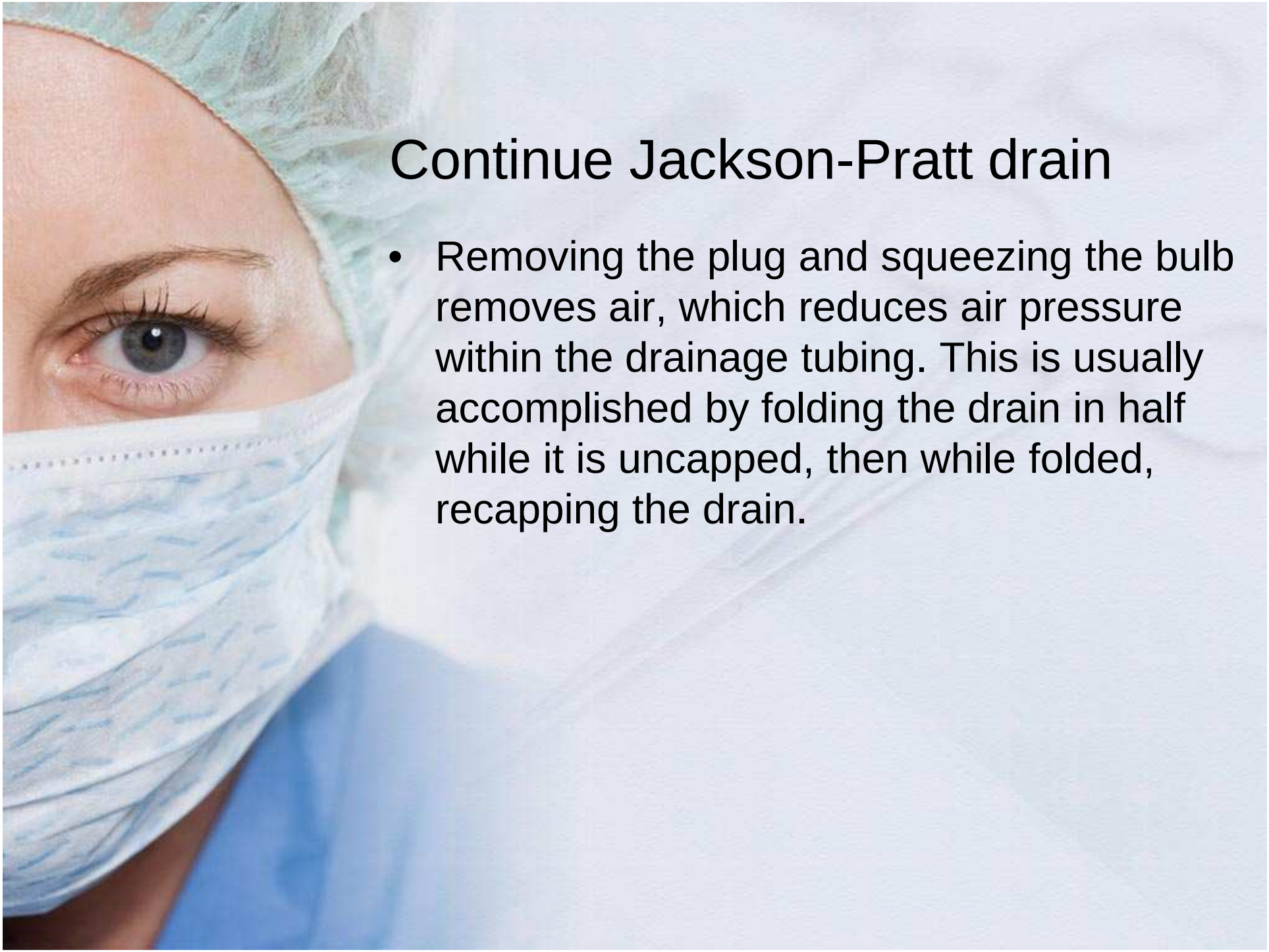
Jackson-Pratt drain

- Jackson-Pratt drain, JP drain, or Bulb drain, is a drainage device used to pull excess fluid from the body by constant suction.
- The device consists of a flexible plastic bulb -- that connects to an internal plastic drainage tube.



Continue Jackson-Pratt drain

- The Jackson-Pratt drain used as negative pressure vacuum, which also collects fluid. As a low negative pressure suction system, it is designed so that intra abdominal contents such as the omentum or intestines are not sucked into the tube, minimizing the risk of bowel perforation or ischemia

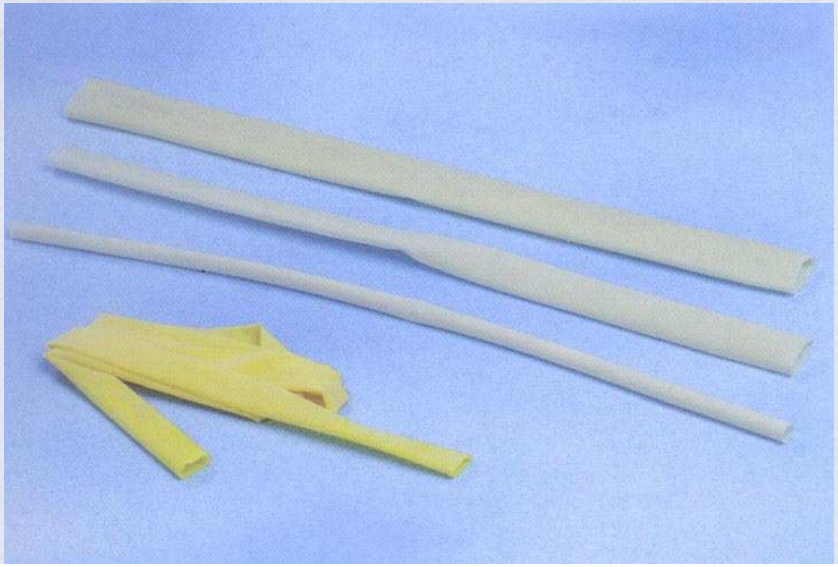


Continue Jackson-Pratt drain

- Removing the plug and squeezing the bulb removes air, which reduces air pressure within the drainage tubing. This is usually accomplished by folding the drain in half while it is uncapped, then while folded, recapping the drain.

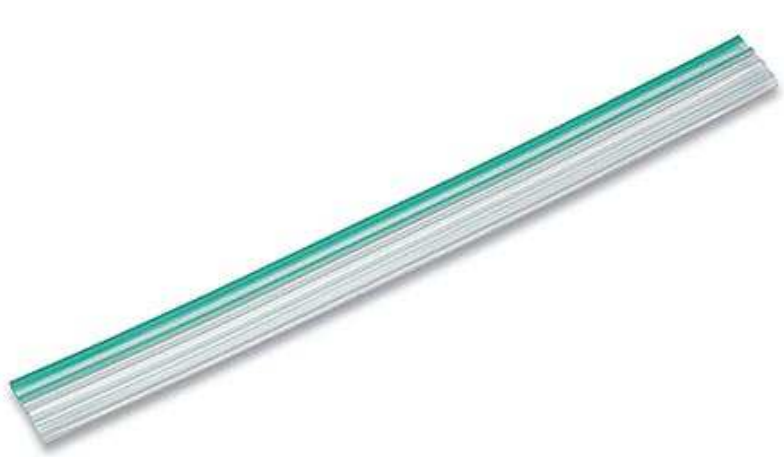
Penrose drain (open drain) :

- A Penrose drain is a surgical device placed in a wound to drain fluid. It consists of a soft rubber tube placed in a wound area, to prevent the build up of fluid



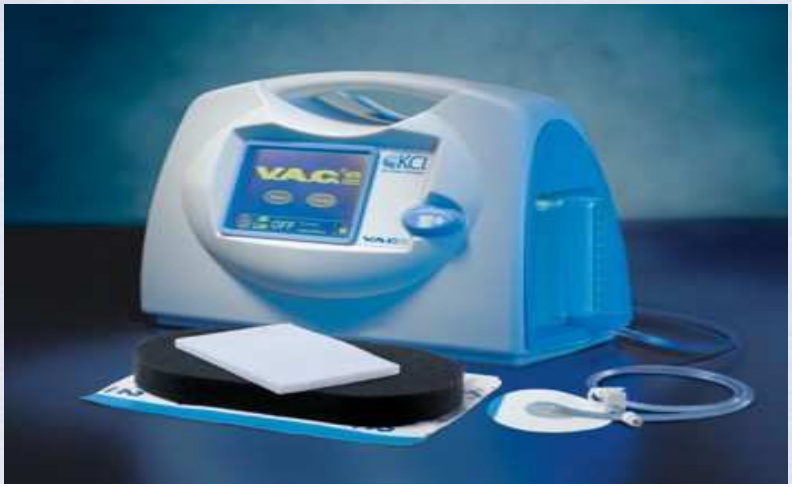
Corrugated Rubber Drain (an open drain)

- Rubber causes a tissue reaction and the drain track caused by this material persists longer than when inert materials arc used. The drain is fixed by a suture at the end of the wound and a safety pin must he placed through the end to prevent the drain slipping inwards. Corrugated rubber drains can be used either for the wound or for deep drainage.



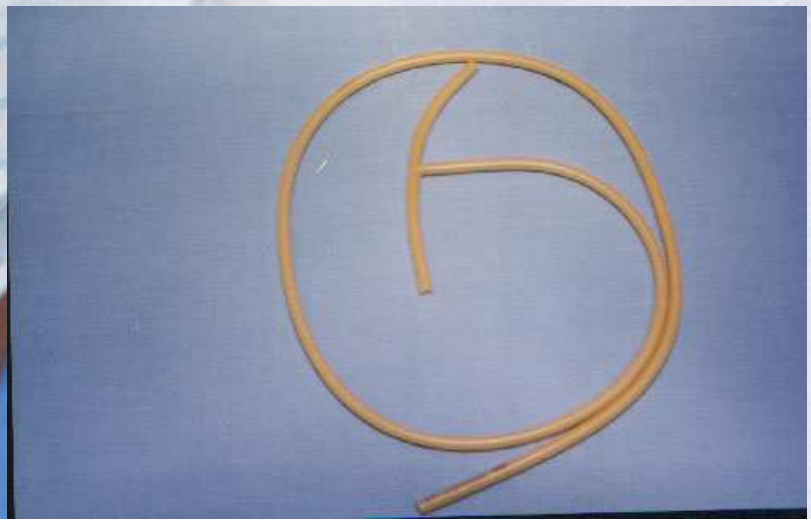
Negative pressure wound therapy :

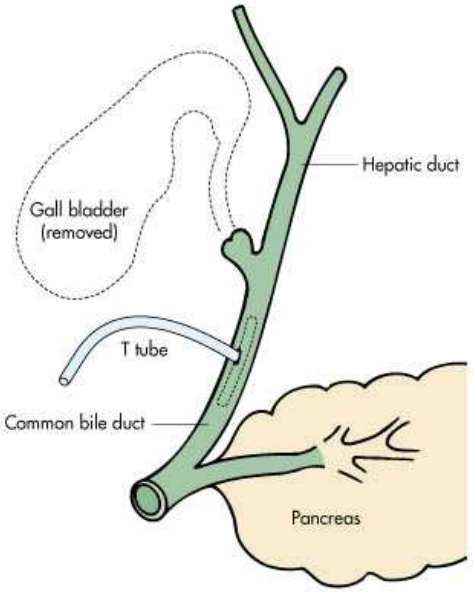
- Negative pressure wound therapy - Involves the use of enclosed foam and a suction device attached; this is one of the newer types of wound healing/drain devices which promotes faster tissue granulation, often used for large surgical/trauma/non-healing wounds.

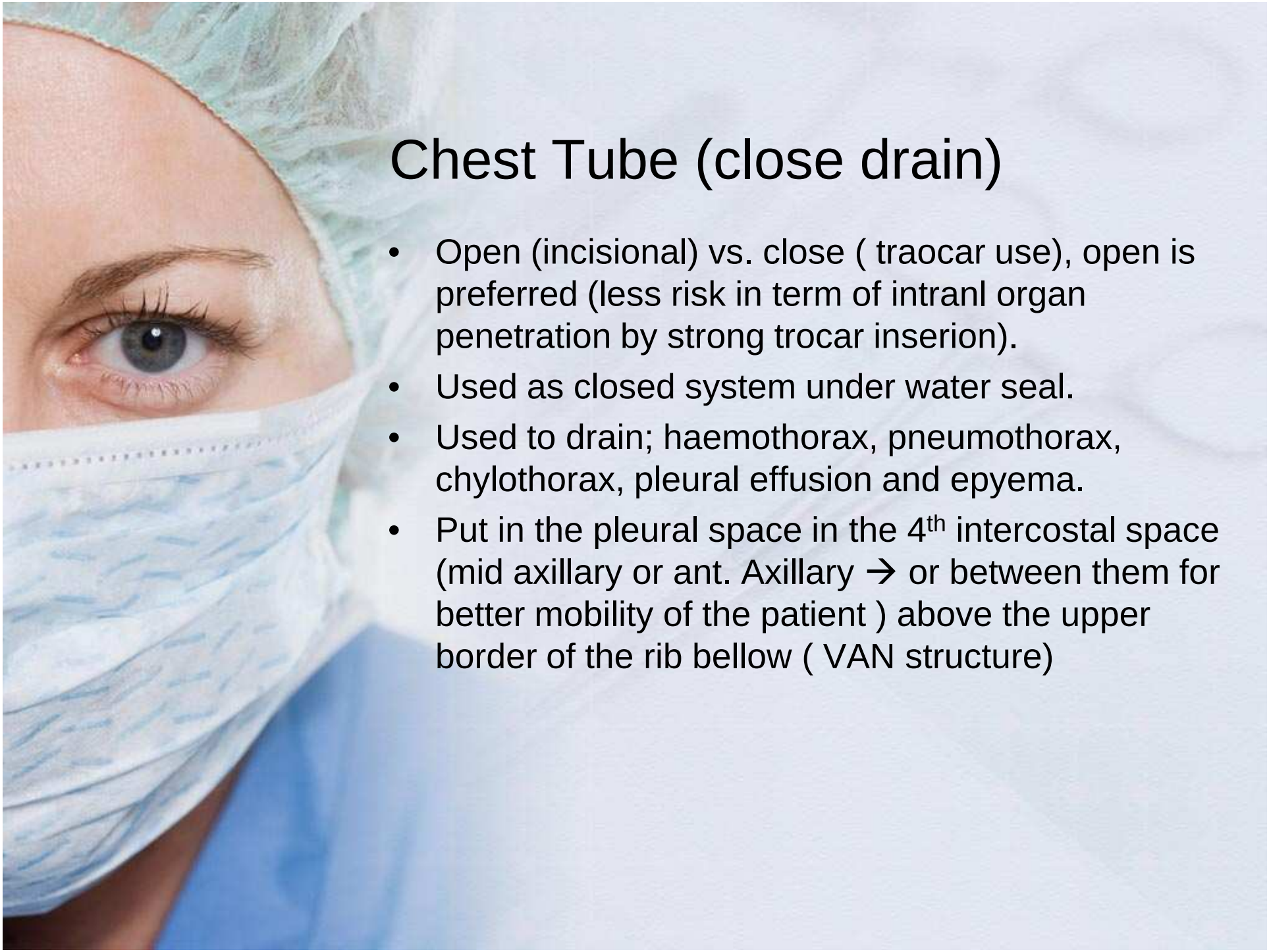


T-Tube

- Kehr's T tube : a tube consisting of a stem and a cross head (thus shaped like a *T*). The cross head is placed into the common bile duct while the stem is connected to a small pouch (i.e. bile bag). It is used as a temporary post-operative drainage of common bile duct. Sometimes its used in ureteric problems too.

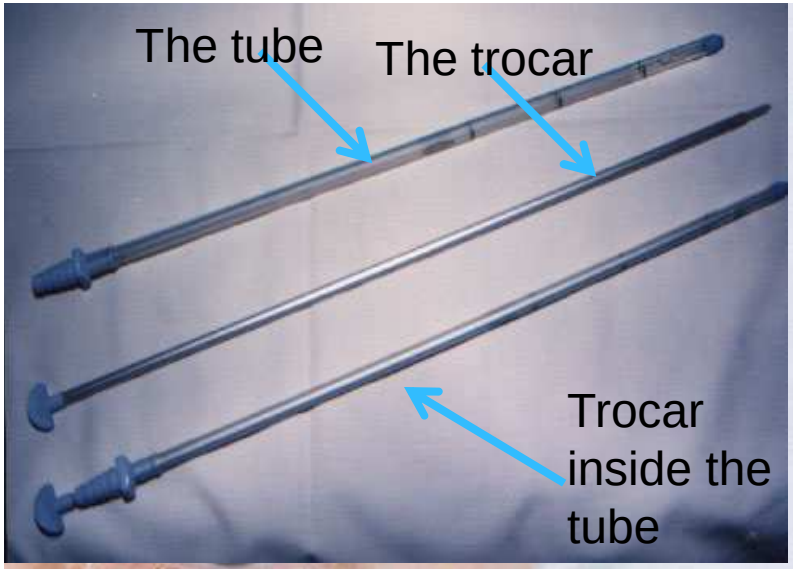


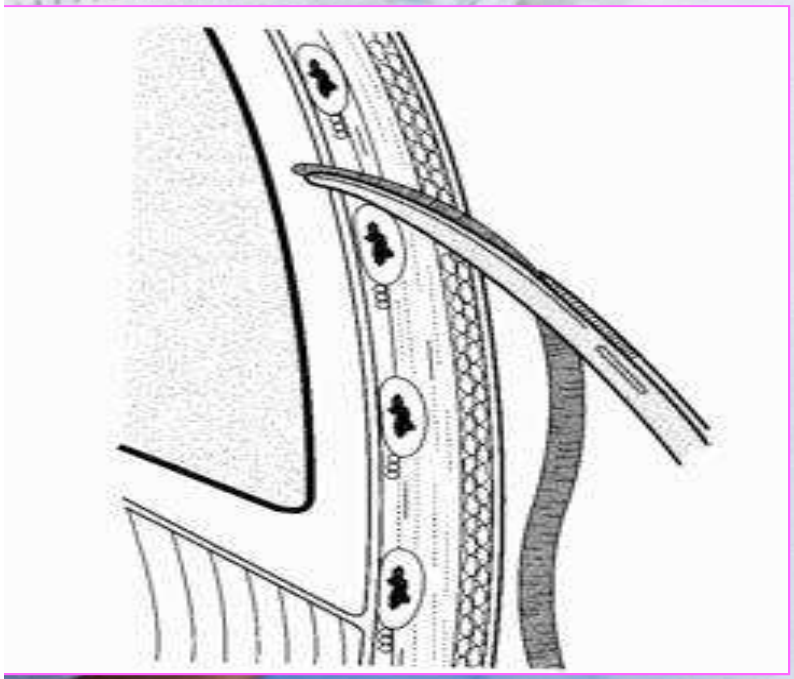


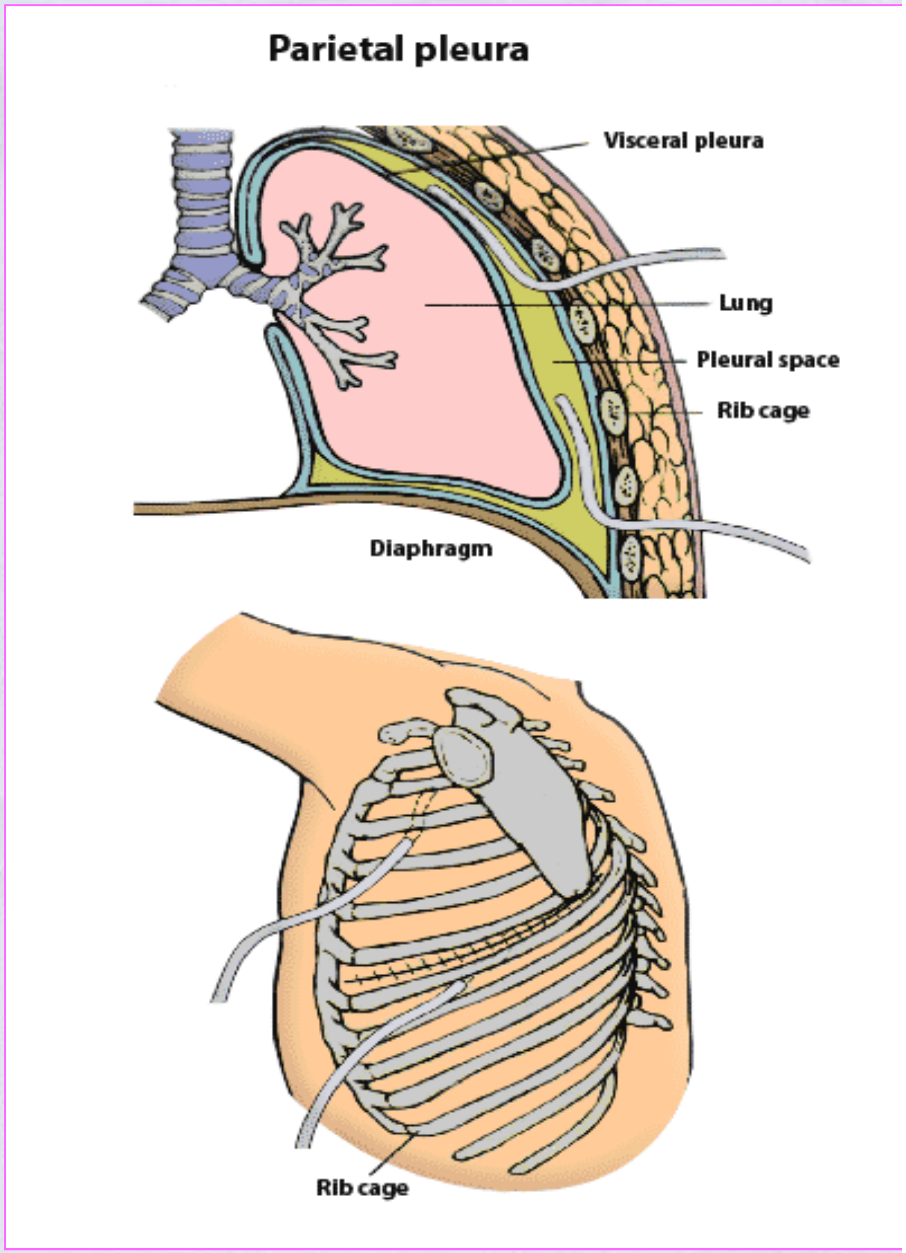


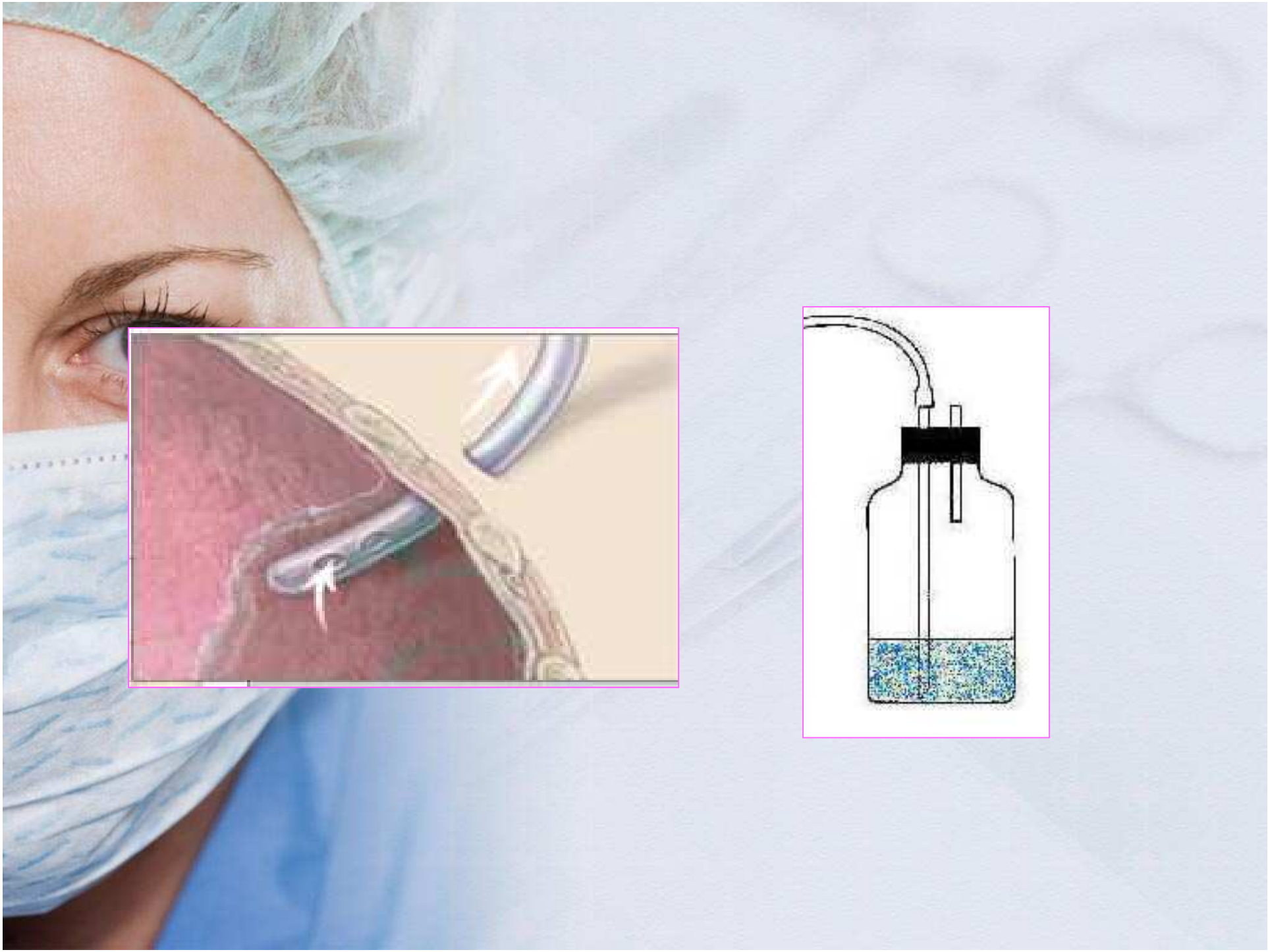
Chest Tube (close drain)

- Open (incisional) vs. close (traocar use), open is preferred (less risk in term of intranl organ penetration by strong trocar inserion).
- Used as closed system under water seal.
- Used to drain; haemothorax, pneumothorax, chylothorax, pleural effusion and epyema.
- Put in the pleural space in the 4th intercostal space (mid axillary or ant. Axillary → or between them for better mobility of the patient) above the upper border of the rib bellow (VAN structure)


The tube
The trocar
Trocar inside the tube




Parietal pleura
Visceral pleura
Lung
Pleural space
Rib cage
Diaphragm
Rib cage



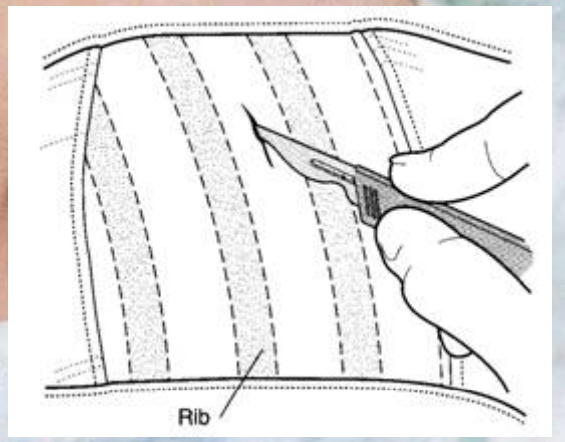
Some Info!

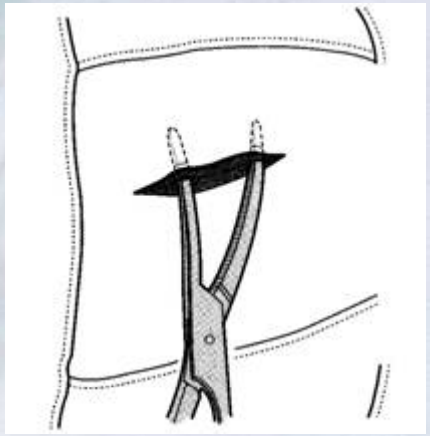
Size of chest tube	
Adult or teen male	28-32 Fr
Adult or teen female	28 Fr
Child	18 Fr
Newborn	12-14 Fr

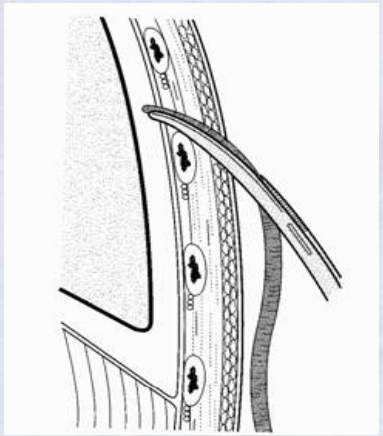
The **French scale** or **French gauge** system (most correctly abbreviated as Fr, but also often abbreviated as FR or F) is commonly used to measure the size (diameter) of a catheter. 1 Fr = 0.33 mm, and therefore the diameter of the catheter in millimeters can be determined by dividing the French size by 3:

$$D\ (mm) = Fr/3$$

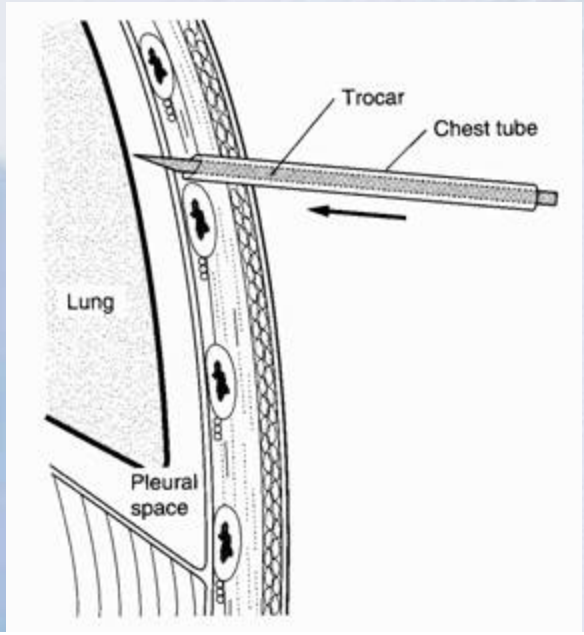
Open method Vs Closed



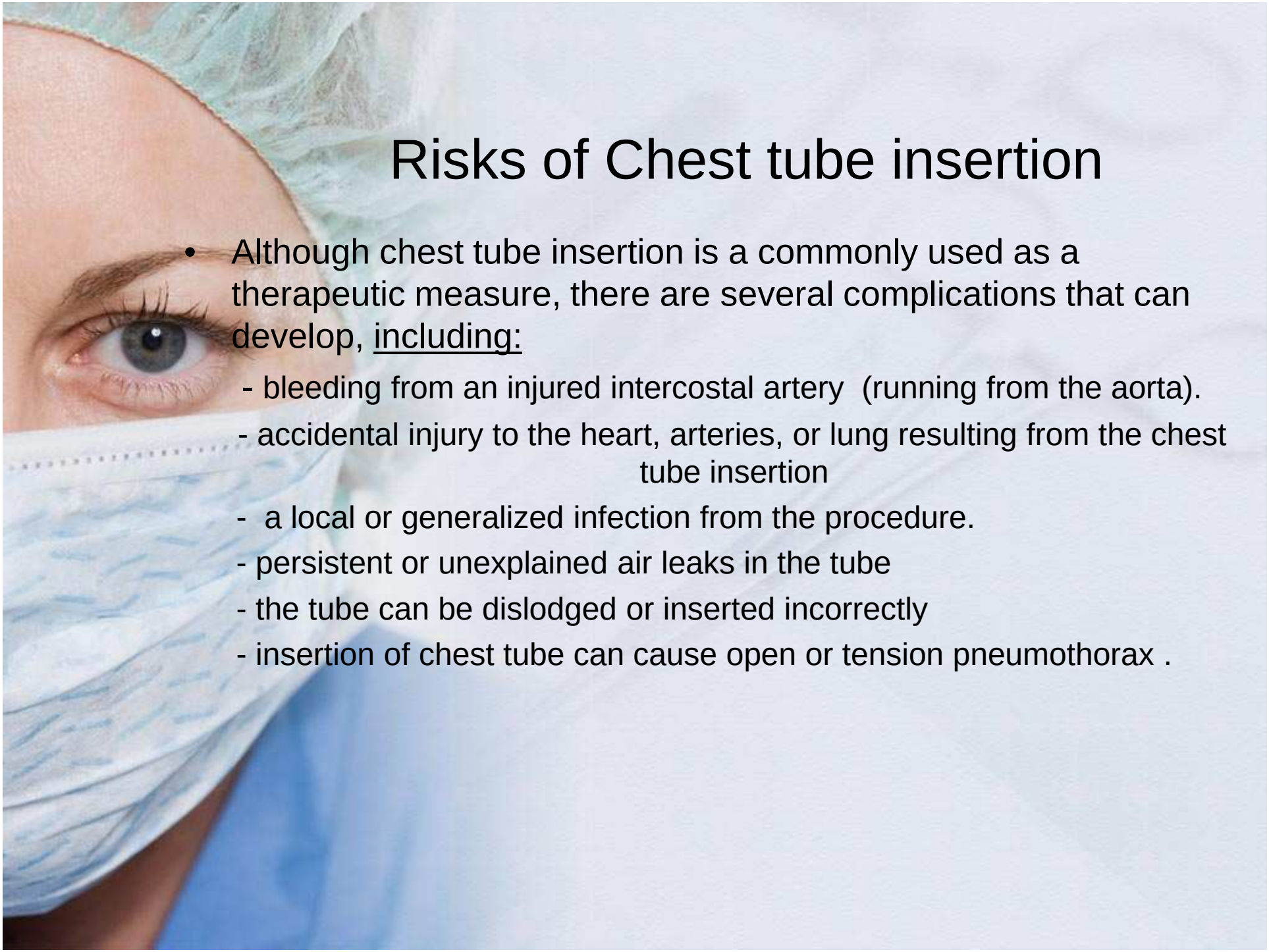




Open method with incision and Opening the incision with a Kelly clamp or a finger



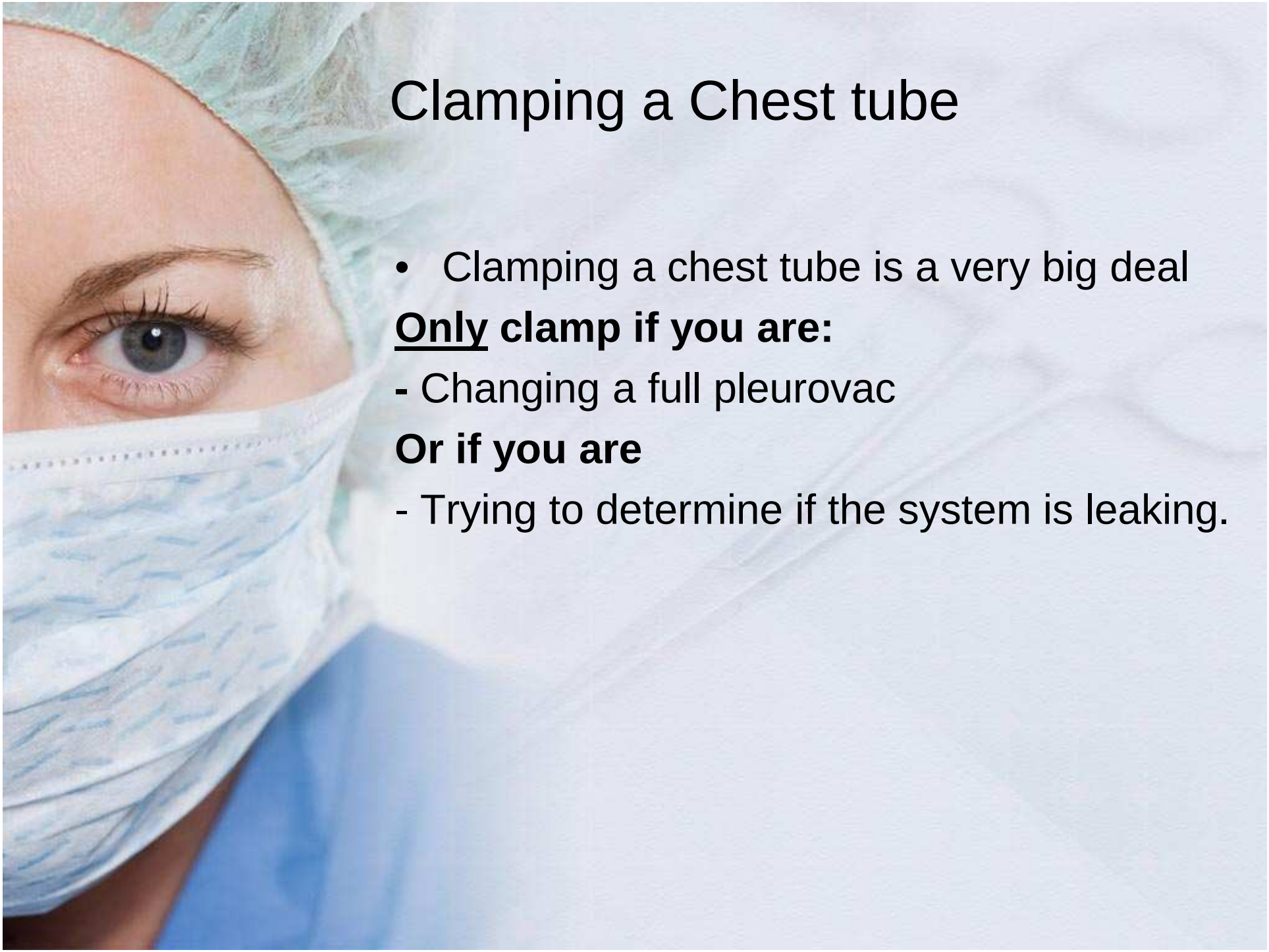
Closed method with trocar



Risks of Chest tube insertion

- Although chest tube insertion is a commonly used as a therapeutic measure, there are several complications that can develop, <u>including:</u>

  - bleeding from an injured intercostal artery (running from the aorta).
  - accidental injury to the heart, arteries, or lung resulting from the chest tube insertion
  - a local or generalized infection from the procedure.
  - persistent or unexplained air leaks in the tube
  - the tube can be dislodged or inserted incorrectly
  - insertion of chest tube can cause open or tension pneumothorax .



Clamping a Chest tube

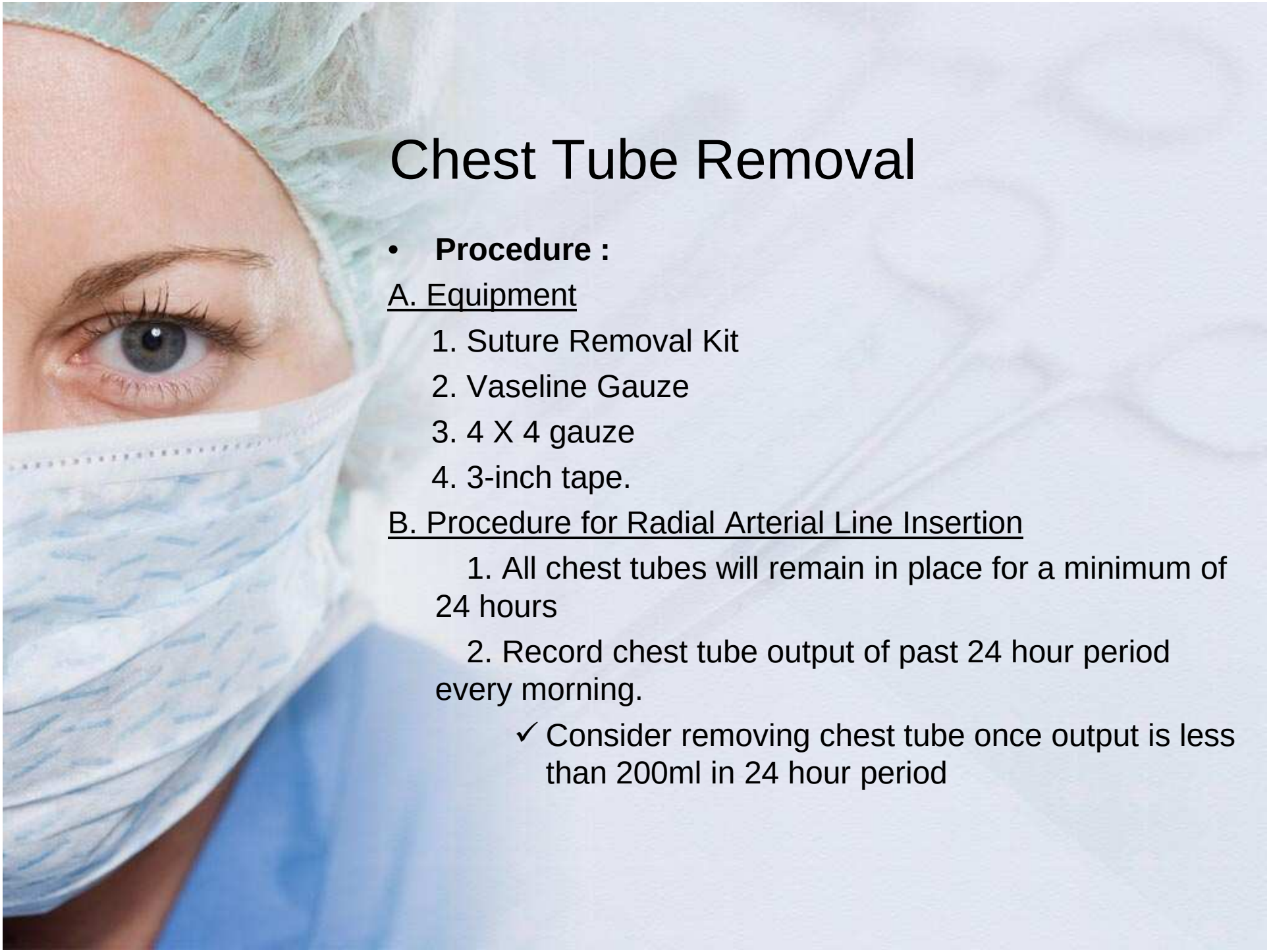
- Clamping a chest tube is a very big deal

<u>Only</u> clamp if you are:

- Changing a full pleurovac

Or if you are

- Trying to determine if the system is leaking.



Chest Tube Removal

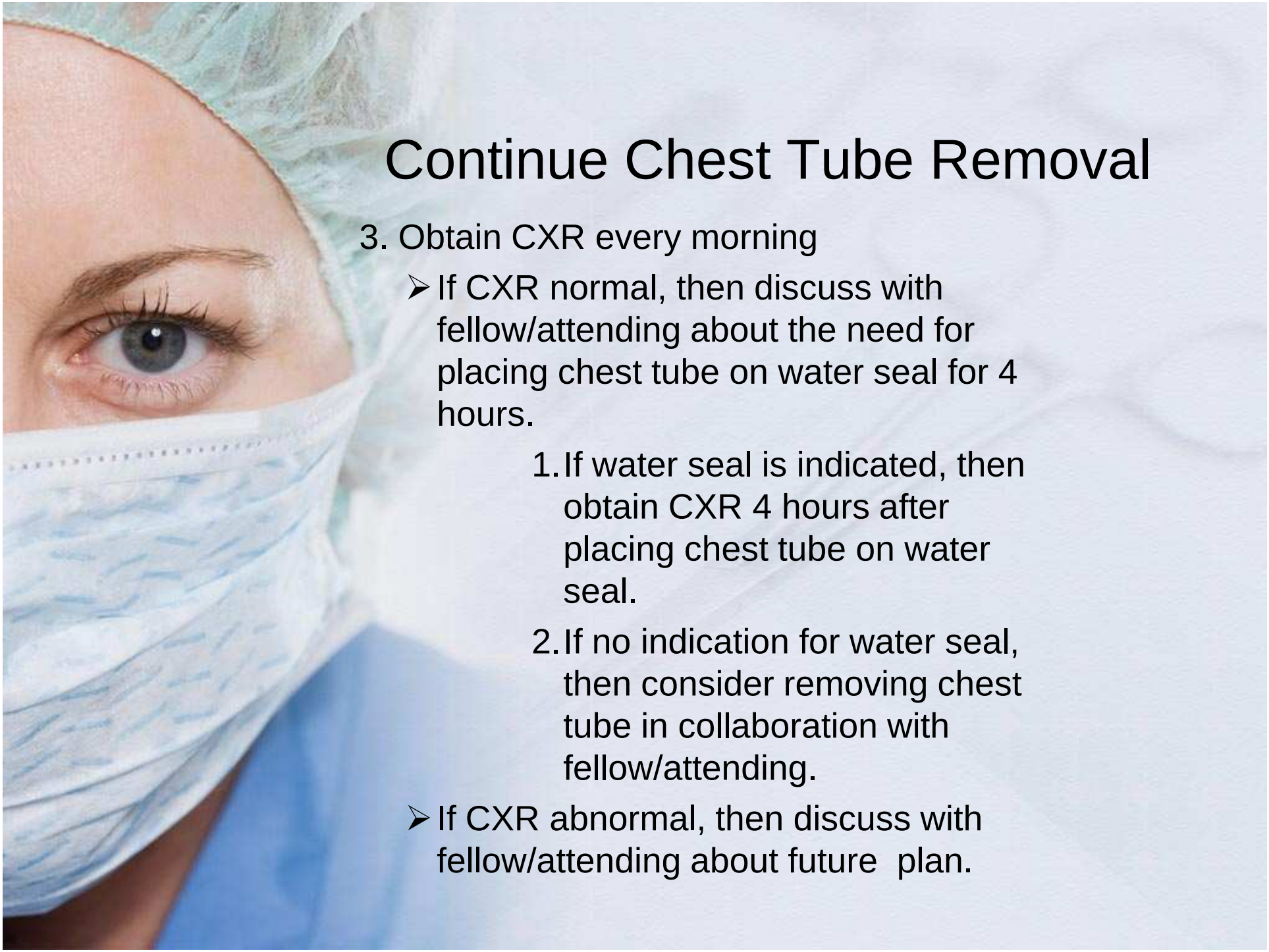
- **Procedure :**

A. Equipment

1. Suture Removal Kit
2. Vaseline Gauze
3. 4 X 4 gauze
4. 3-inch tape.

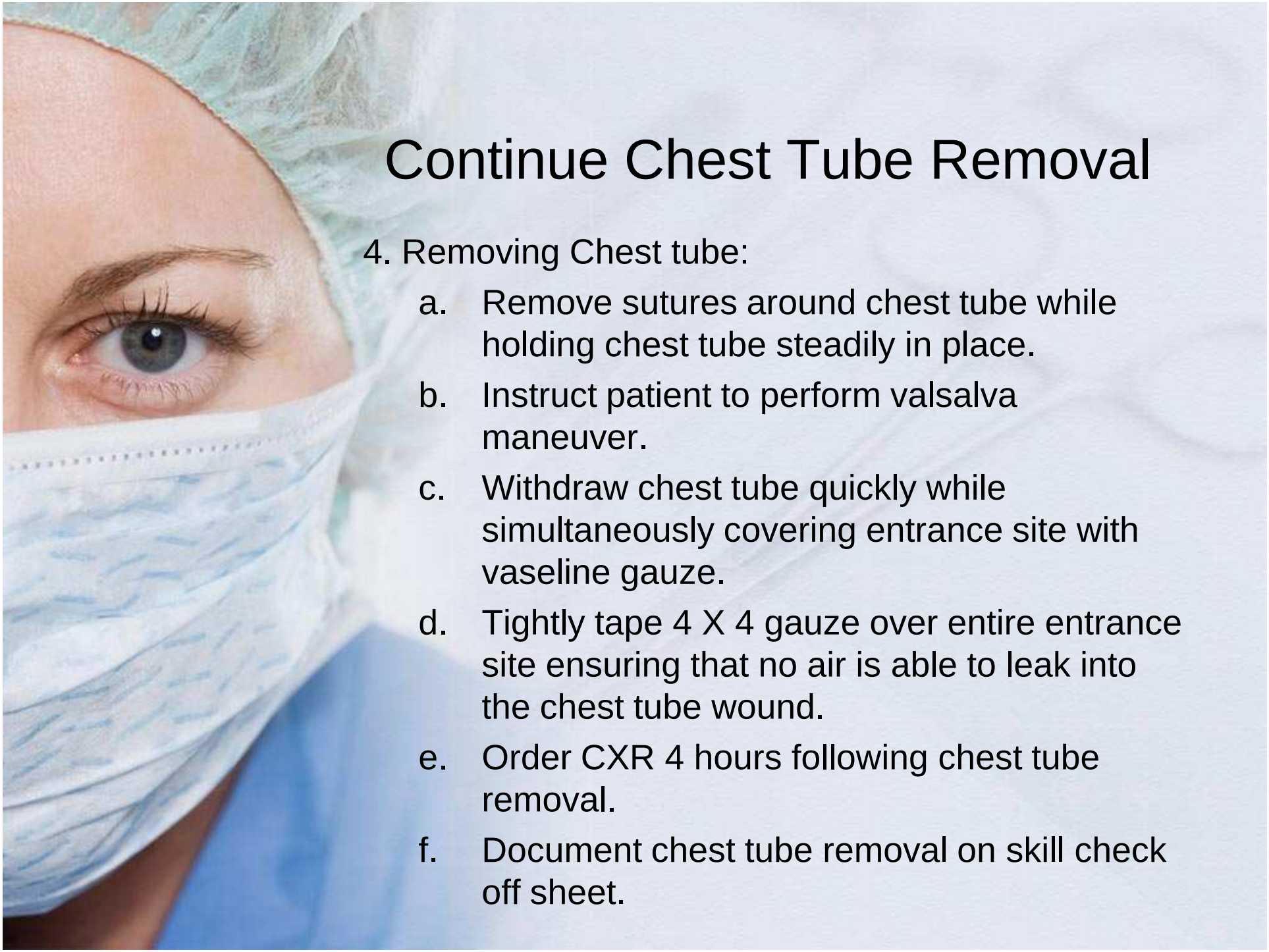
B. Procedure for Radial Arterial Line Insertion

1. All chest tubes will remain in place for a minimum of 24 hours
2. Record chest tube output of past 24 hour period every morning.
   - ✓ Consider removing chest tube once output is less than 200ml in 24 hour period



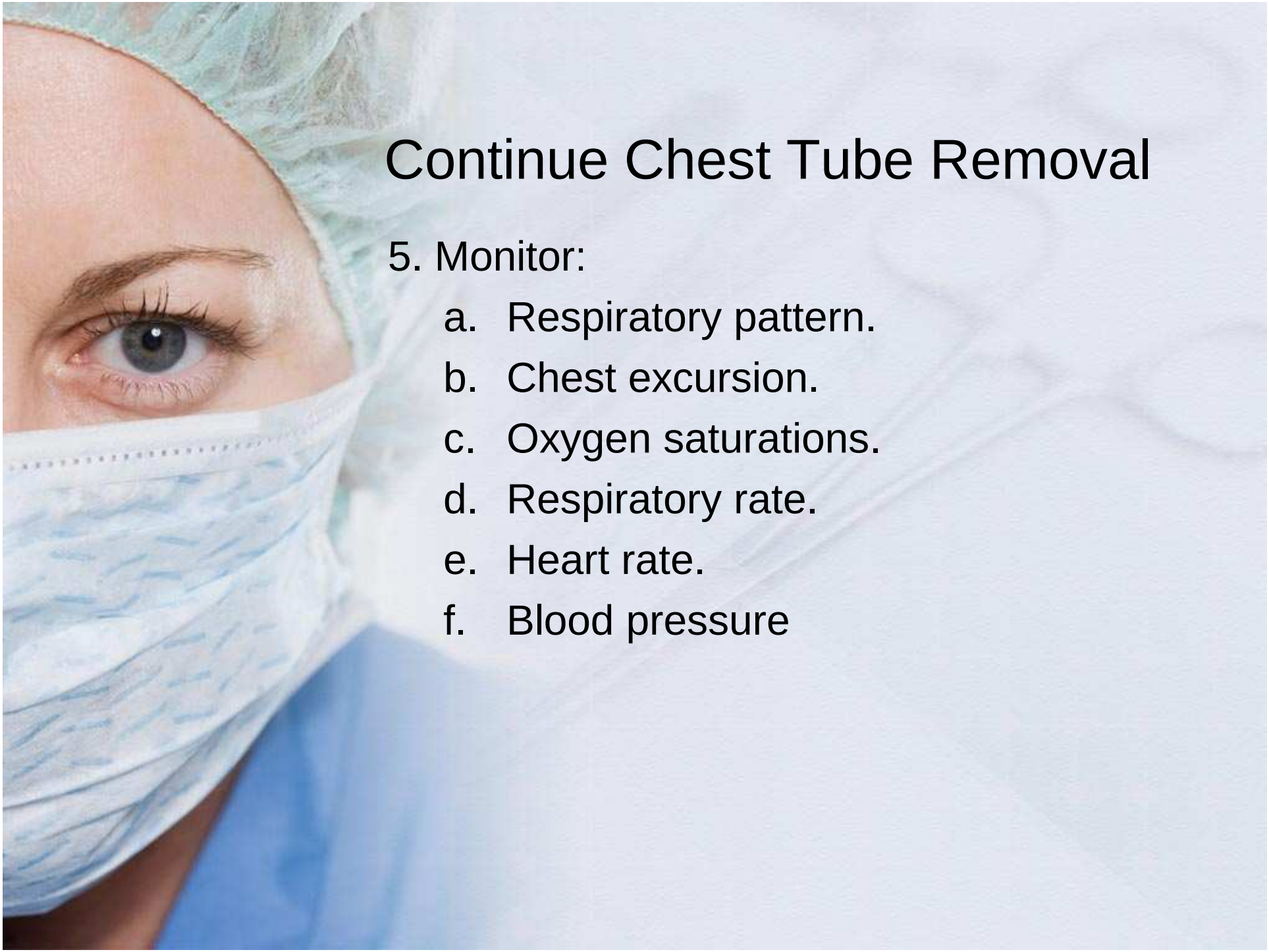
Continue Chest Tube Removal

3. Obtain CXR every morning
   - If CXR normal, then discuss with fellow/attending about the need for placing chest tube on water seal for 4 hours.
     1. If water seal is indicated, then obtain CXR 4 hours after placing chest tube on water seal.
     2. If no indication for water seal, then consider removing chest tube in collaboration with fellow/attending.
   - If CXR abnormal, then discuss with fellow/attending about future plan.



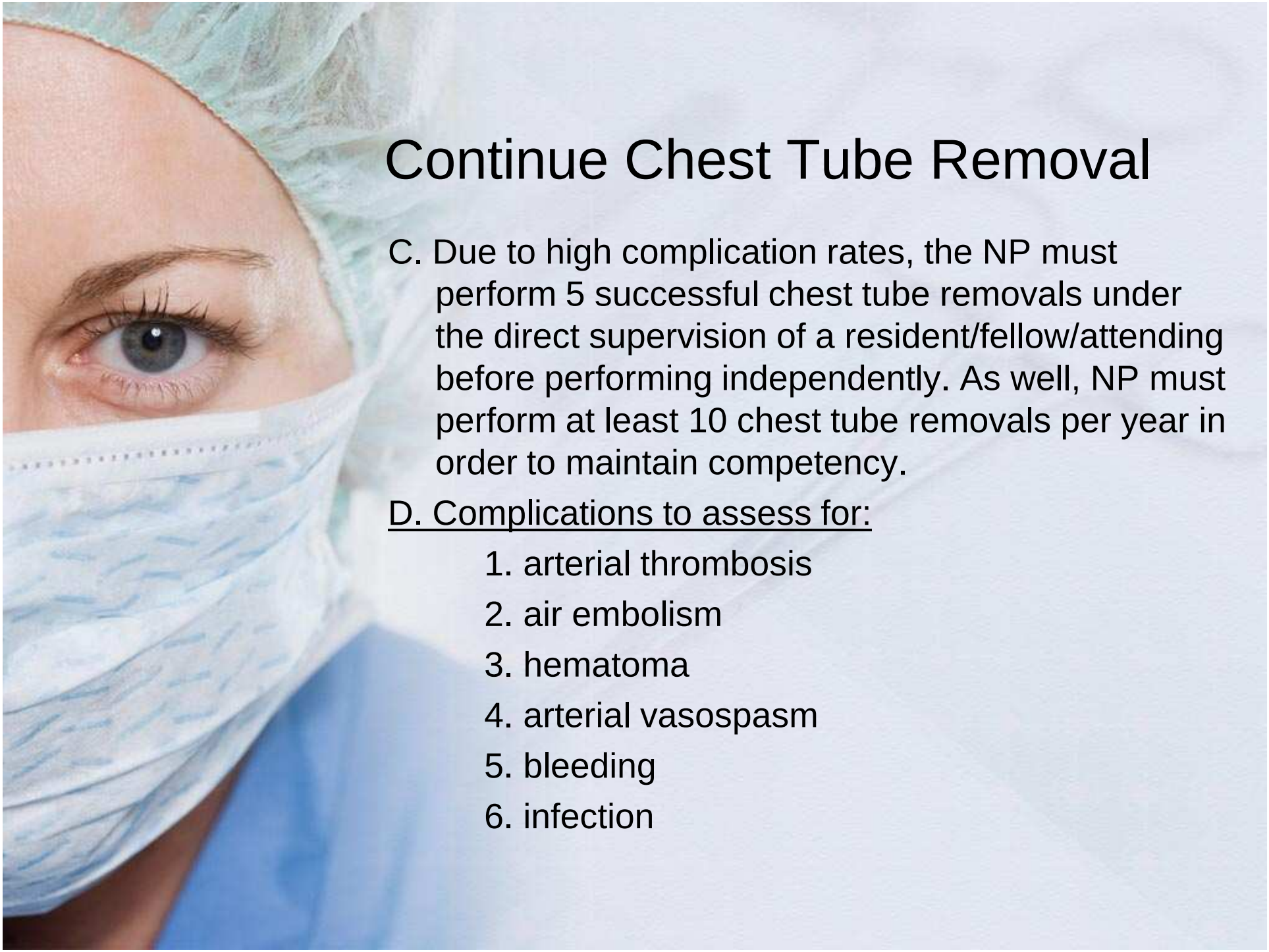
Continue Chest Tube Removal

4. Removing Chest tube:
   a. Remove sutures around chest tube while holding chest tube steadily in place.
   b. Instruct patient to perform valsalva maneuver.
   c. Withdraw chest tube quickly while simultaneously covering entrance site with vaseline gauze.
   d. Tightly tape 4 X 4 gauze over entire entrance site ensuring that no air is able to leak into the chest tube wound.
   e. Order CXR 4 hours following chest tube removal.
   f. Document chest tube removal on skill check off sheet.



Continue Chest Tube Removal

5. Monitor:
    a. Respiratory pattern.
    b. Chest excursion.
    c. Oxygen saturations.
    d. Respiratory rate.
    e. Heart rate.
    f. Blood pressure



Continue Chest Tube Removal

C. Due to high complication rates, the NP must perform 5 successful chest tube removals under the direct supervision of a resident/fellow/attending before performing independently. As well, NP must perform at least 10 chest tube removals per year in order to maintain competency.

D. Complications to assess for:

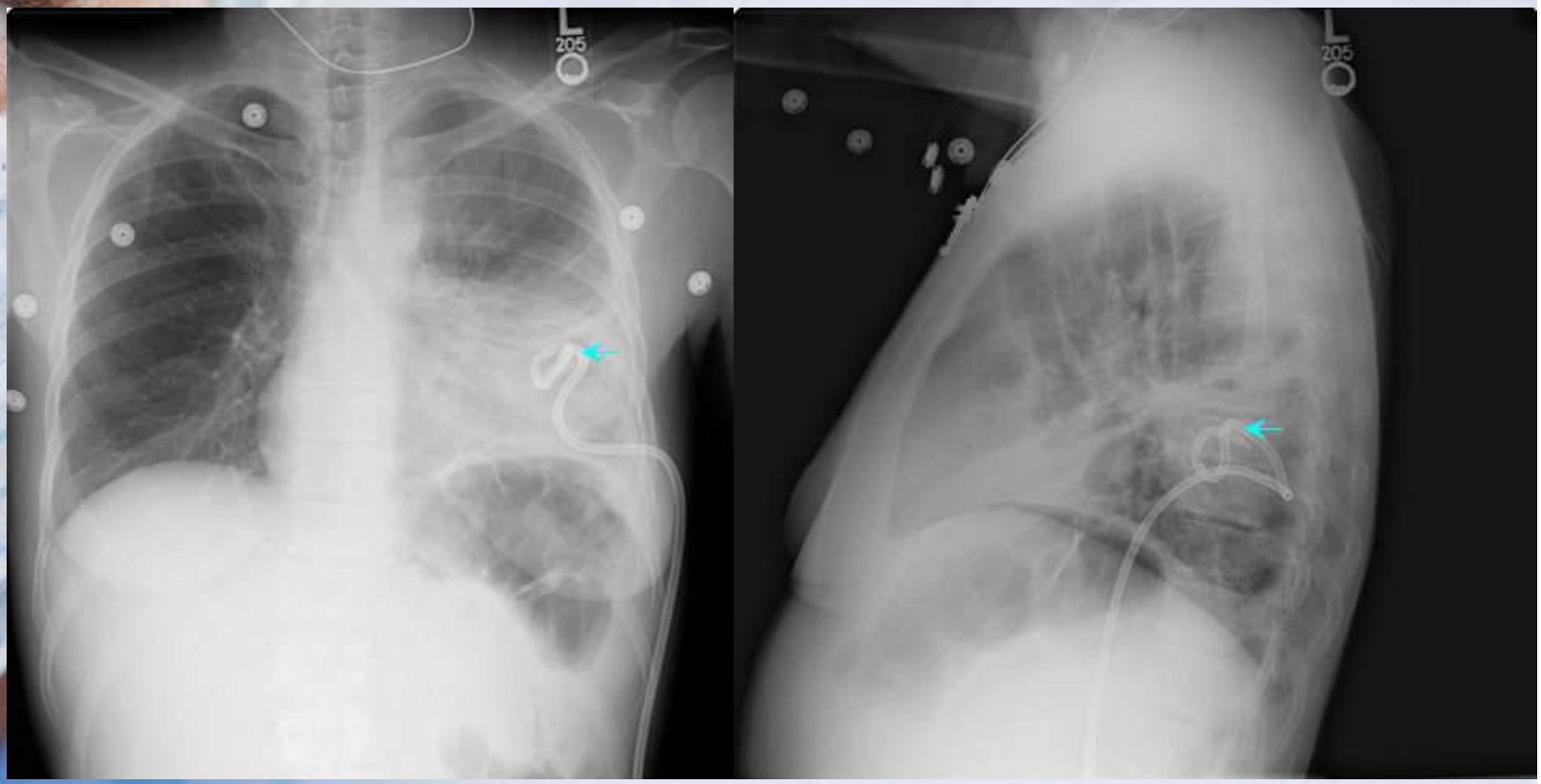
1. arterial thrombosis
2. air embolism
3. hematoma
4. arterial vasospasm
5. bleeding
6. infection

Pigtail drain

- A pigtail drain tube (pigtail) is a type of catheter that has the sole purpose of removing unwanted body fluids from an organ, duct or abscess. Pigtail drains are inserted under strict radiological guidance to ensure correct positioning.
- A pigtail is a sterile, thin, long, universal catheter with a locking tip that (once inserted and adjusted by the radiologist) forms a pigtail shape, hence its name. A guide wire is also part of the sterile insertion kit.

The tip of the pigtail has several holes, which facilitate the drainage process. The open end of the catheter has an outlet, which is compatible with an intravenous (IV) luer lock

Pigtail drain



Continue pigtail drain

- Pigtails are inserted percutaneously (through the skin) by a radiologist. It may be inserted to allow, for example, urine to drain directly from a kidney, if the ureter is diseased or blocked. This is called a nephrostomy.

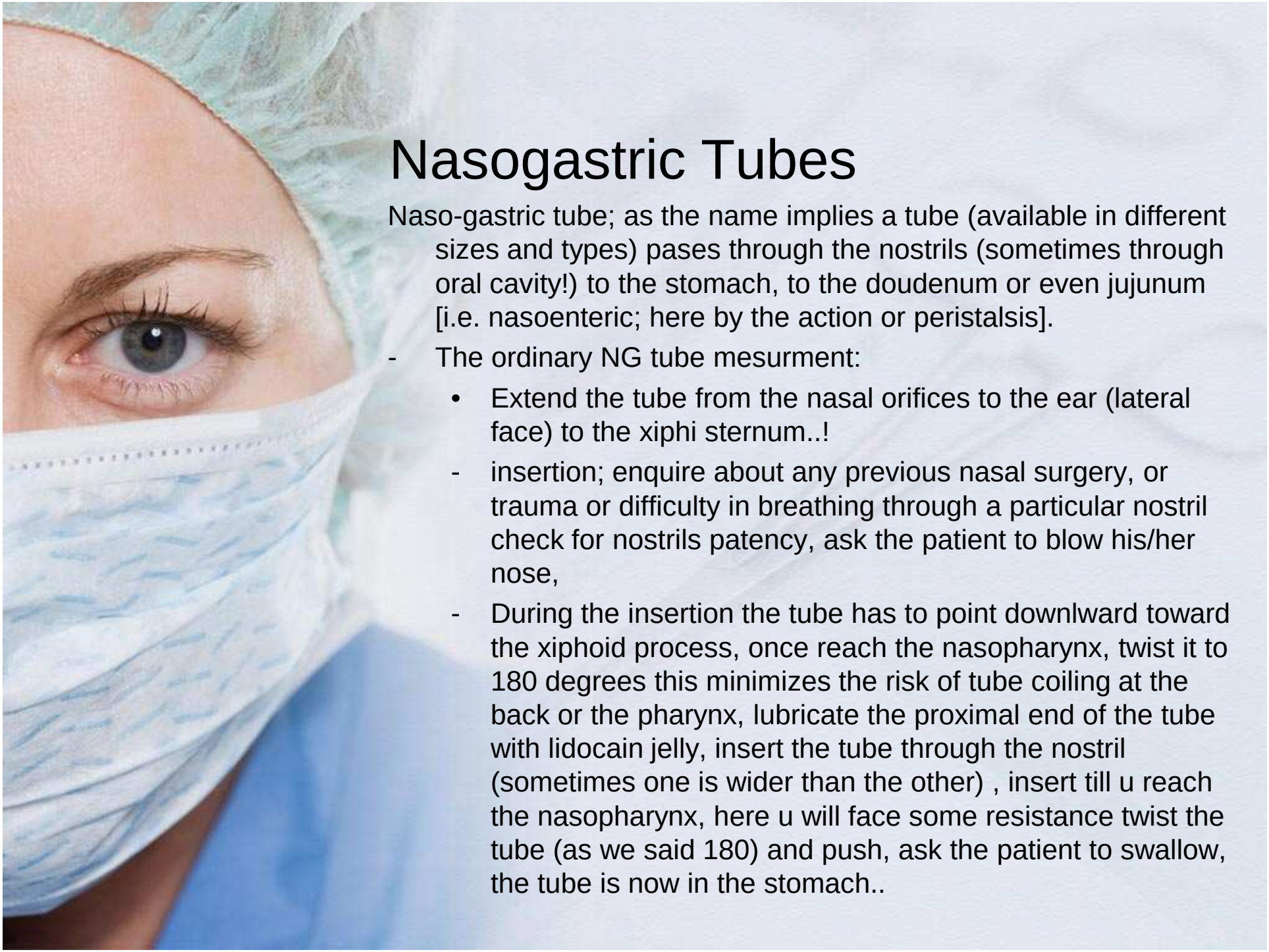
  Other conditions requiring the insertion of a pigtail drain include a blocked bile duct that needs to be drained of bile, or a pus-filled abscess. The type of fluid that drains depends upon the reason for its insertion.

Davol Drain

- In soft, supple silicone with x-ray opaque strip. Designed to minimize tissue trauma and discourage clogging.
- Drains have a triple lumen configuration to increase drain versatility and effectiveness. Large center lumen for maximum removal; filtered air vent helps reduce risk of infection. Third lumen permits irrigation and instillation of medication. 0.3 micron antibacterial filter removes virtually all bacteria from incoming air. Suture cuff helps fasten drain. Packaged 5 per box.

Redivac Drain (a close drain)

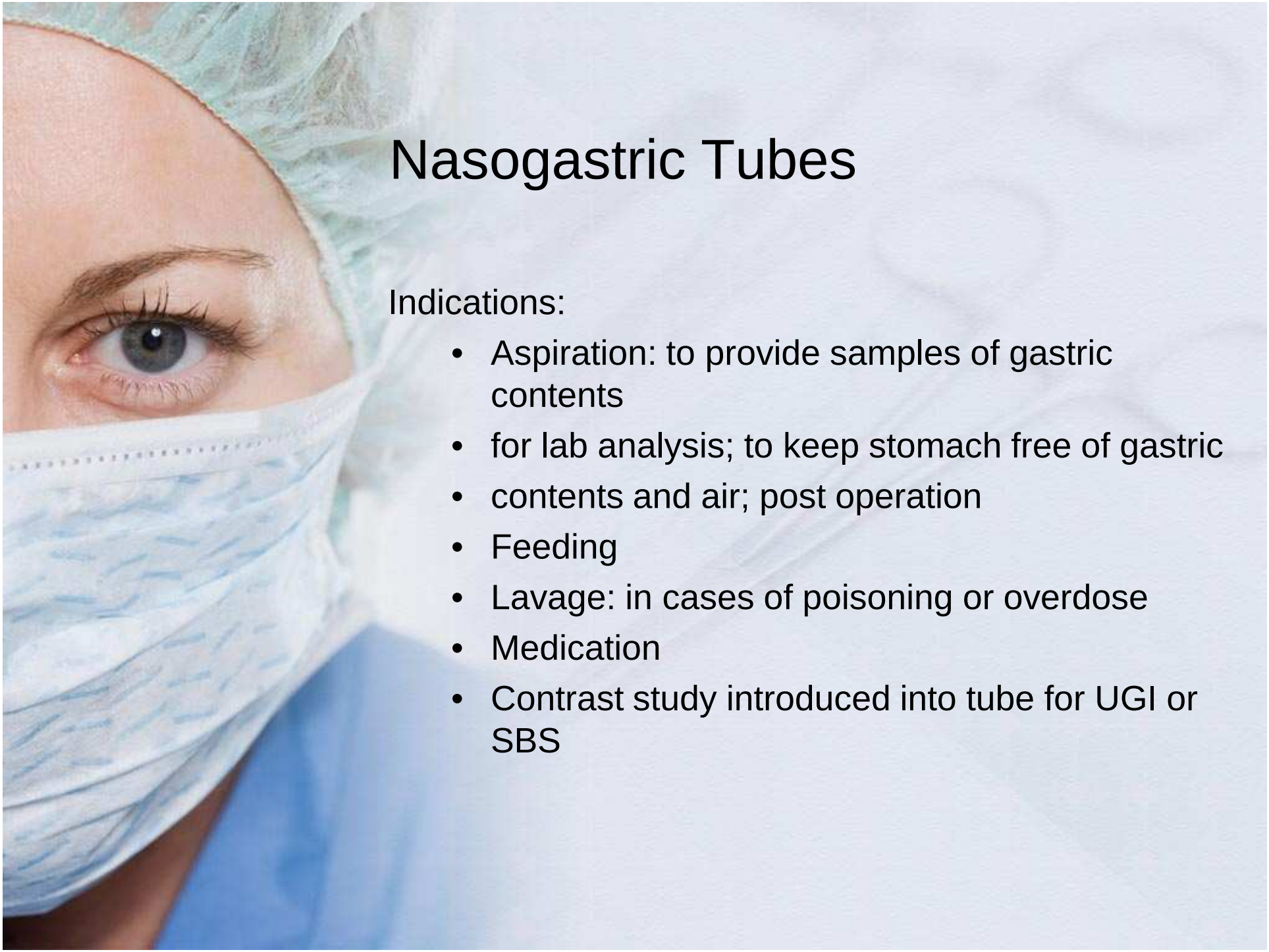
- This is a fine tube. with many holes at the end, which is attached to an evacuated glass bottle providing suction. It is used to drain blood beneath the skin, e.g. after mastectomy or thyroidectomy, or from deep spaces, e.g. around a vascular anastomosis.



Nasogastric Tubes

Naso-gastric tube; as the name implies a tube (available in different sizes and types) pases through the nostrils (sometimes through oral cavity!) to the stomach, to the doudenum or even jujunum [i.e. nasoenteric; here by the action or peristalsis].

- The ordinary NG tube mesurment:
  - Extend the tube from the nasal orifices to the ear (lateral face) to the xiphi sternum..!
  - insertion; enquire about any previous nasal surgery, or trauma or difficulty in breathing through a particular nostril check for nostrils patency, ask the patient to blow his/her nose,
  - During the insertion the tube has to point downlward toward the xiphoid process, once reach the nasopharynx, twist it to 180 degrees this minimizes the risk of tube coiling at the back or the pharynx, lubricate the proximal end of the tube with lidocain jelly, insert the tube through the nostril (sometimes one is wider than the other) , insert till u reach the nasopharynx, here u will face some resistance twist the tube (as we said 180) and push, ask the patient to swallow, the tube is now in the stomach..

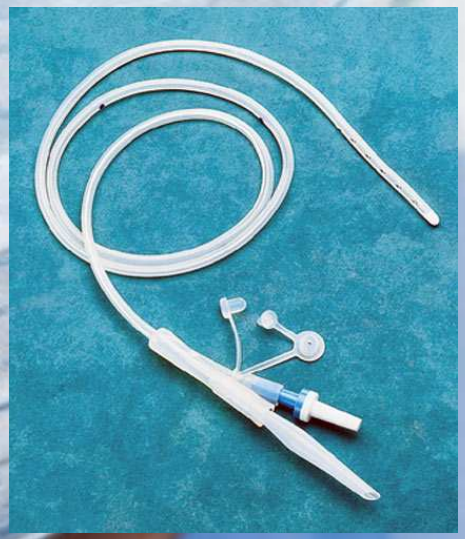


Nasogastric Tubes

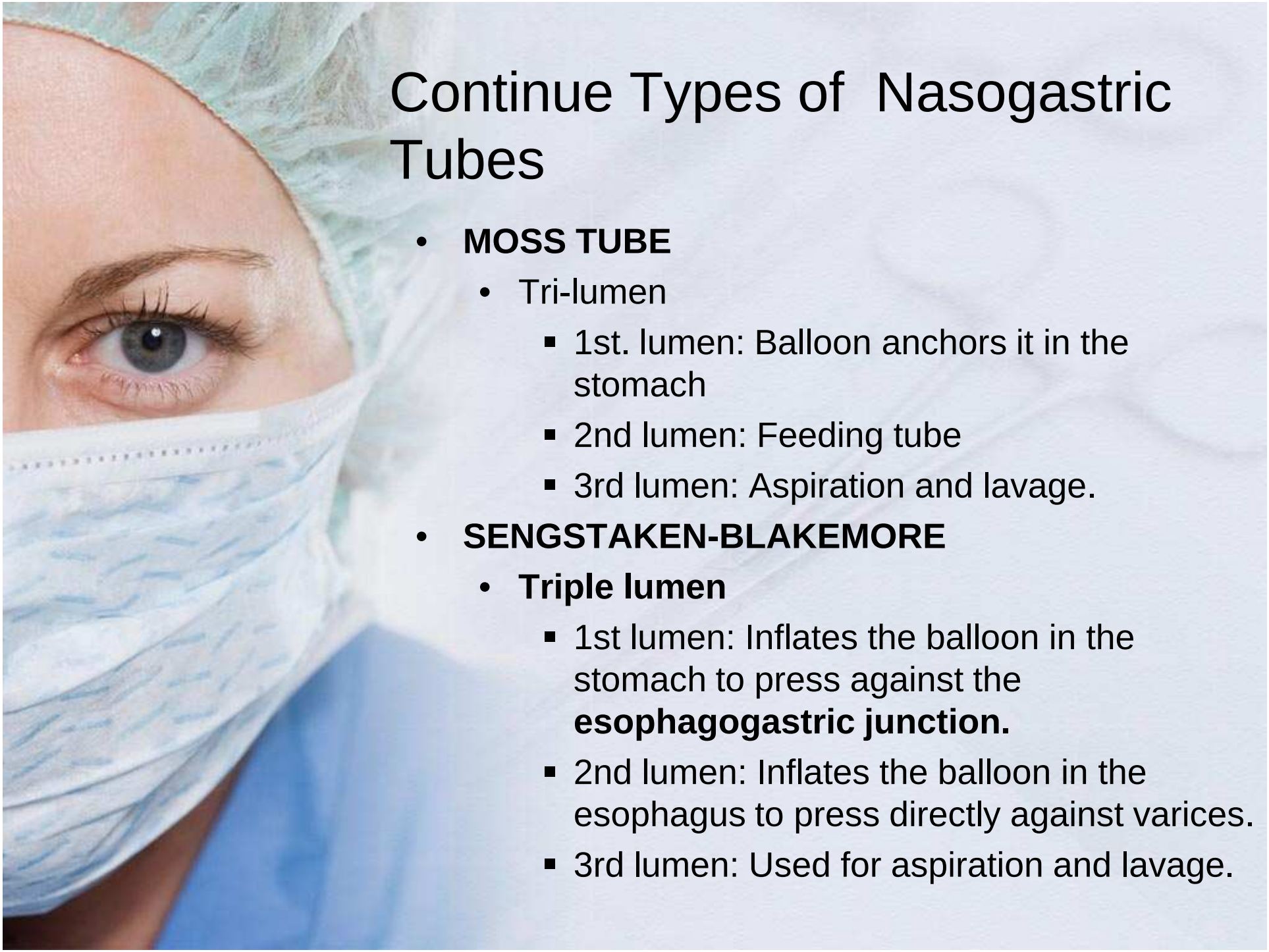
Indications:

- Aspiration: to provide samples of gastric contents
- for lab analysis; to keep stomach free of gastric
- contents and air; post operation
- Feeding
- Lavage: in cases of poisoning or overdose
- Medication
- Contrast study introduced into tube for UGI or SBS

Types of Nasogastric Tubes

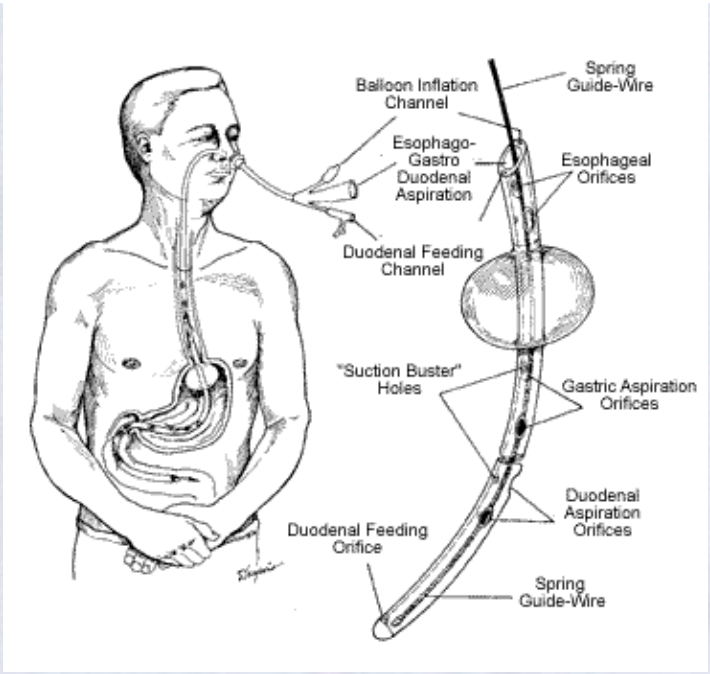


- **LEVIN TUBE:**
  - Single lumen, holes near tip
  - Prevents accumulation of intestinal liquids and gas during and following surgery. Prevents nausea, vomiting and distention due to reduced peristaltic action.
- **SUMP: (SALEM)**
  - Double lumen, radiopaque
    - 1st lumen: suction of gastric contents
    - 2nd lumen: blue extension (pig tail) open to room air to maintain a continuous flow of atmospheric air into the stomach.
  - Controls the amount of suction pressure placed on
  - stomach walls. Prevents injury, ulcers.

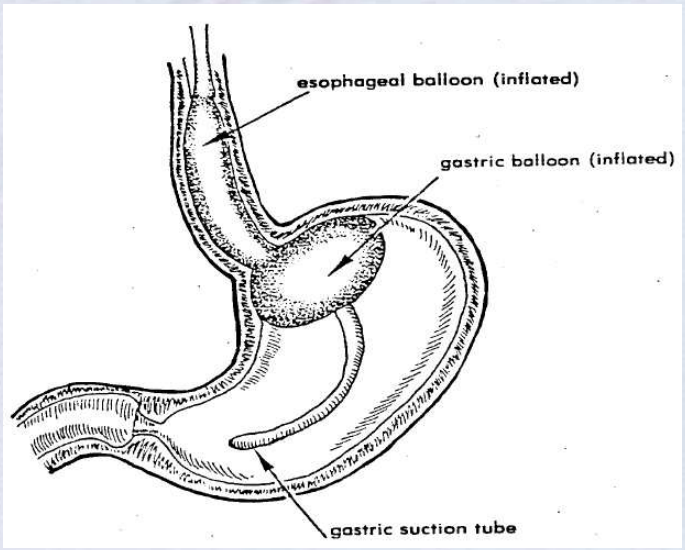


Continue Types of Nasogastric Tubes

- **MOSS TUBE**
  - Tri-lumen
    - 1st. lumen: Balloon anchors it in the stomach
    - 2nd lumen: Feeding tube
    - 3rd lumen: Aspiration and lavage.
- **SENGSTAKEN-BLAKEMORE**
  - **Triple lumen**
    - 1st lumen: Inflates the balloon in the stomach to press against the **esophagogastric junction.**
    - 2nd lumen: Inflates the balloon in the esophagus to press directly against varices.
    - 3rd lumen: Used for aspiration and lavage.



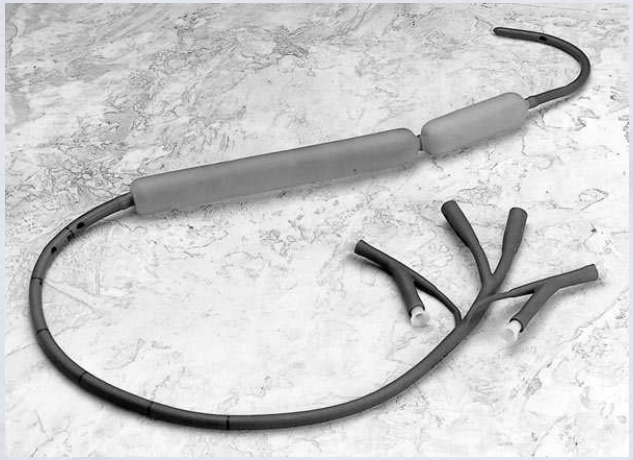
Moss Tube



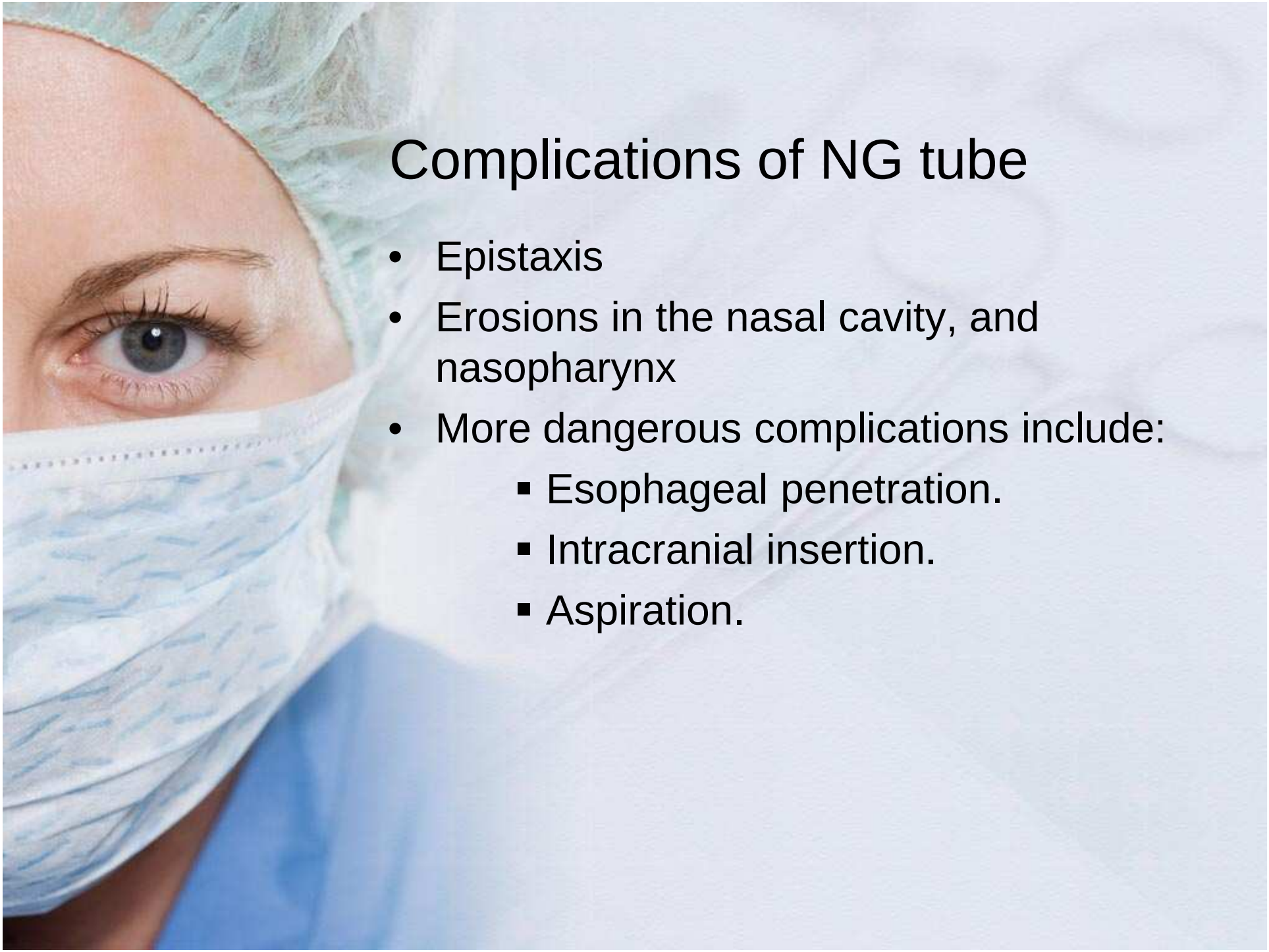
SENGSTAKEN-BLAKEMORE

Continue Types of Nasogastric Tubes

- **MINNESOTA TUBE:**
  - 4 LUMEN



- **NUTRIFLEX TUBE**
  - Feeding tube: usually radiopaque.
  - Mercury weighted
  - Coated with lubricant
  - activated with gastric secretions to keep
  - tube supple and not injure stomach lining

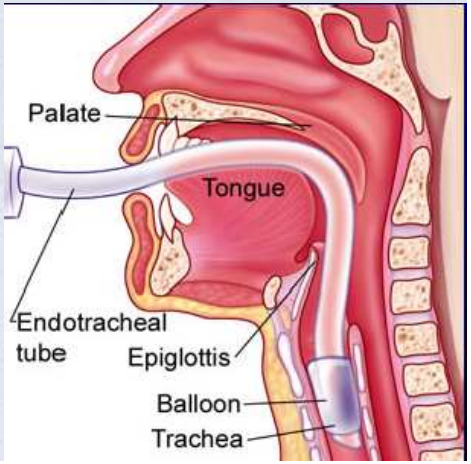


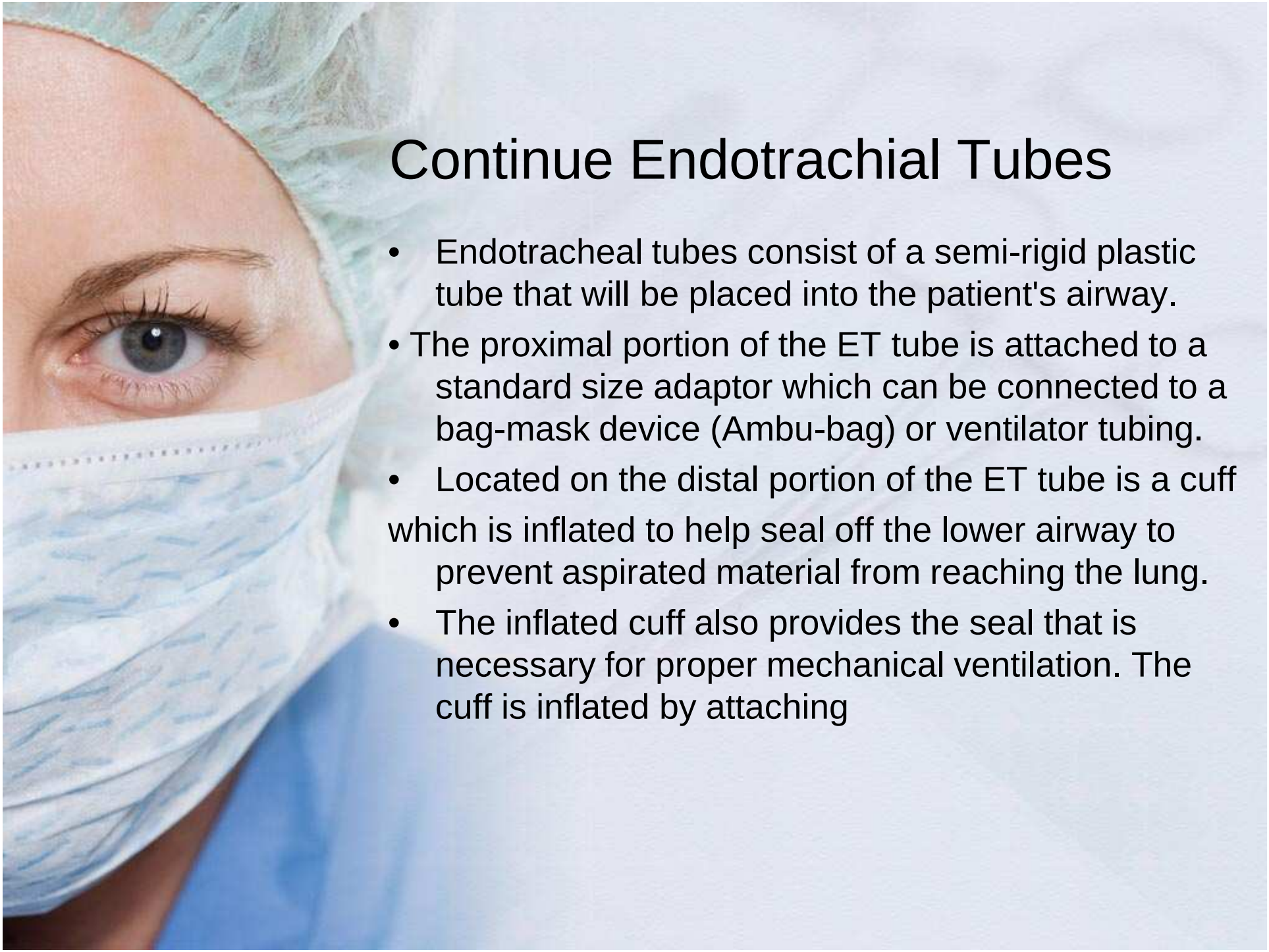
Complications of NG tube

- Epistaxis
- Erosions in the nasal cavity, and nasopharynx
- More dangerous complications include:
  - Esophageal penetration.
  - Intracranial insertion.
  - Aspiration.

Endotrachial Tubes

- Endotracheal tubes (ET Tubes) are used to assist in airway management.
- ET tubes may be placed when an airway obstruction has occurred, or when a patient is unable to breath independently and needs mechanical ventilation.
- In the latter case, the ET tube provides a route for the ventilator to deliver oxygenated air.





Continue Endotrachial Tubes

- Endotracheal tubes consist of a semi-rigid plastic tube that will be placed into the patient's airway.
- The proximal portion of the ET tube is attached to a standard size adaptor which can be connected to a bag-mask device (Ambu-bag) or ventilator tubing.
- Located on the distal portion of the ET tube is a cuff which is inflated to help seal off the lower airway to prevent aspirated material from reaching the lung.
- The inflated cuff also provides the seal that is necessary for proper mechanical ventilation. The cuff is inflated by attaching

Continue Endotrachial Tubes

INTUBATION

- The process of placing an ET tube into a patient's airway is known as intubation.
- Some common reason for intubation are:
  - Traumatic Upper Airway Obstruction
  - Severe Bronchospasm or Larynospasm
  - Respiratory Arrest
  - Cardiac Arrest
  - Pulmonary Edema
  - Sedative or Narcotic Drug Effects
  - Severe Allergic Reaction


Catheters and Tubes!!

History and origin of “catheter”

- Late Latin, from Greek:

- KATHETER, came from KATHIENAI,

- kathe- *to send down* : kat-, kata-, *cata-* + hienai- *to send .*

Definition:

• A **catheter** is a hollow flexible tube that can be inserted into a body cavity, duct or vessel. Catheters thereby allow drainage or injection of fluids , distend a passageway or provide access by surgical instruments.
The process of inserting a catheter is **catheterization**.

• In most uses a catheter is a thin, flexible tube: a *"soft"* catheter;
in some uses,
>> it is a larger, solid tube: a *"hard"* catheter.

What is a Catheter made up of?

Materials:

A range of *polymers* are used for the construction of catheters, including *silicone rubber latex* and *thermoplastic elastomers.*

Silicone is one of the most common choices because it is inert and unreactive to body fluids and a range of medical fluids with which it might come into contact.

Materials:

CATHETER:

- Polyvinylchloride (PVC)
- Polyethylene (PE)
- Fluoropolomers (PTFE) (TEFLON)
- Polyurethane (PUR)
- Silicone (SI)

Ideal characteristics of catheters

- Better Torque Control
- Strength
- Radiopacity
- Flexible
- Atraumatic Tip
- Low Surface frictional resistance for good trackability over guide wire.

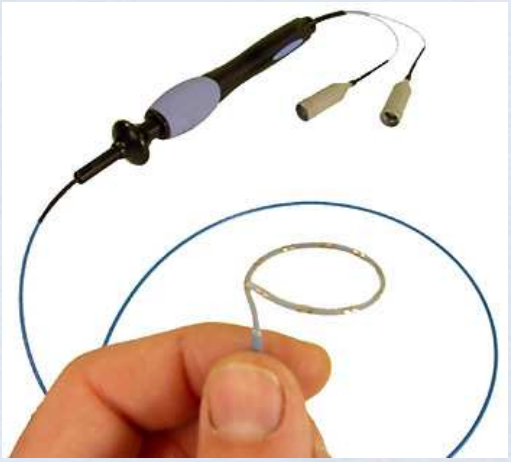
Parts of a catheter

- Hub
- Body
- Tip

Hub

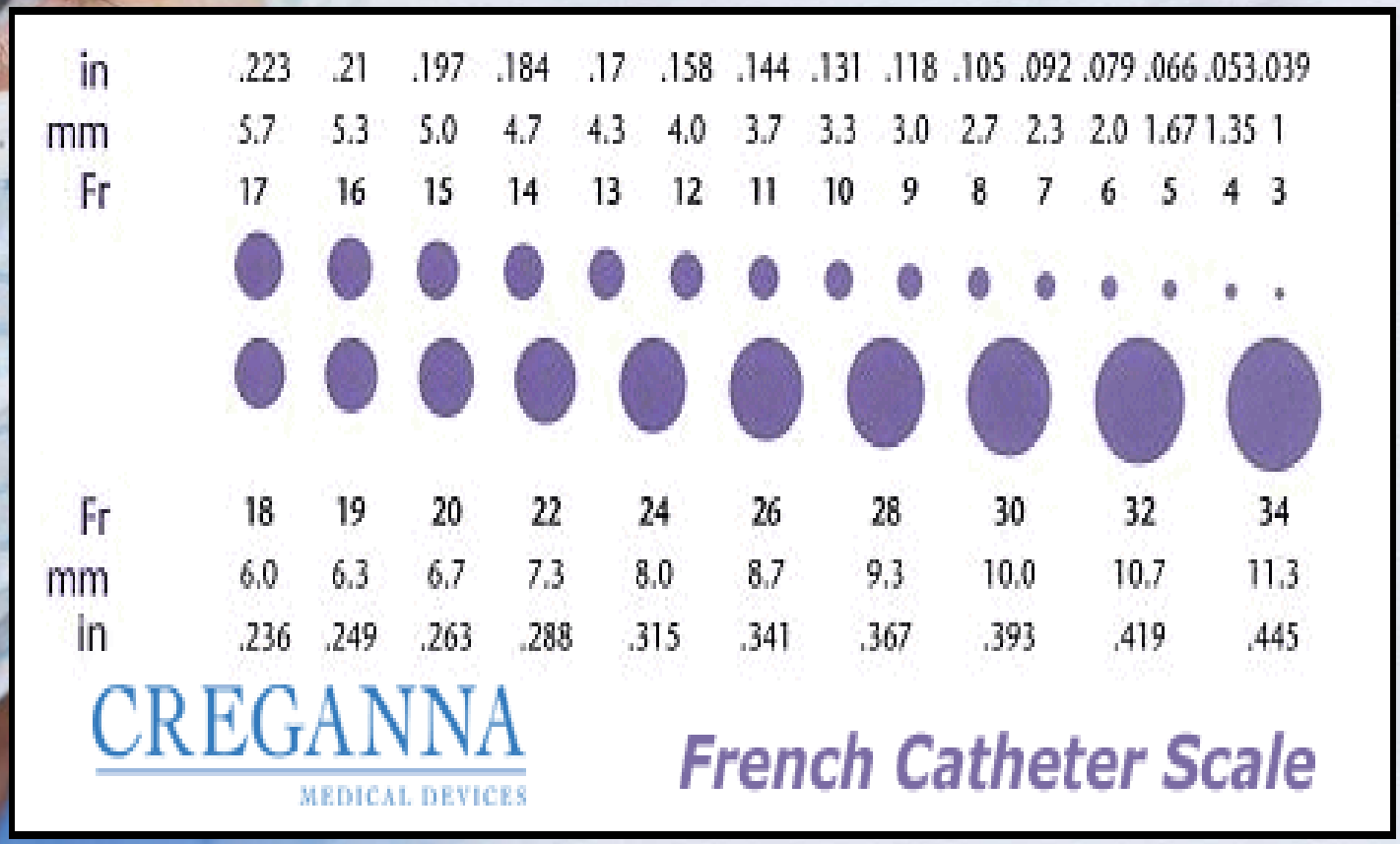
Body

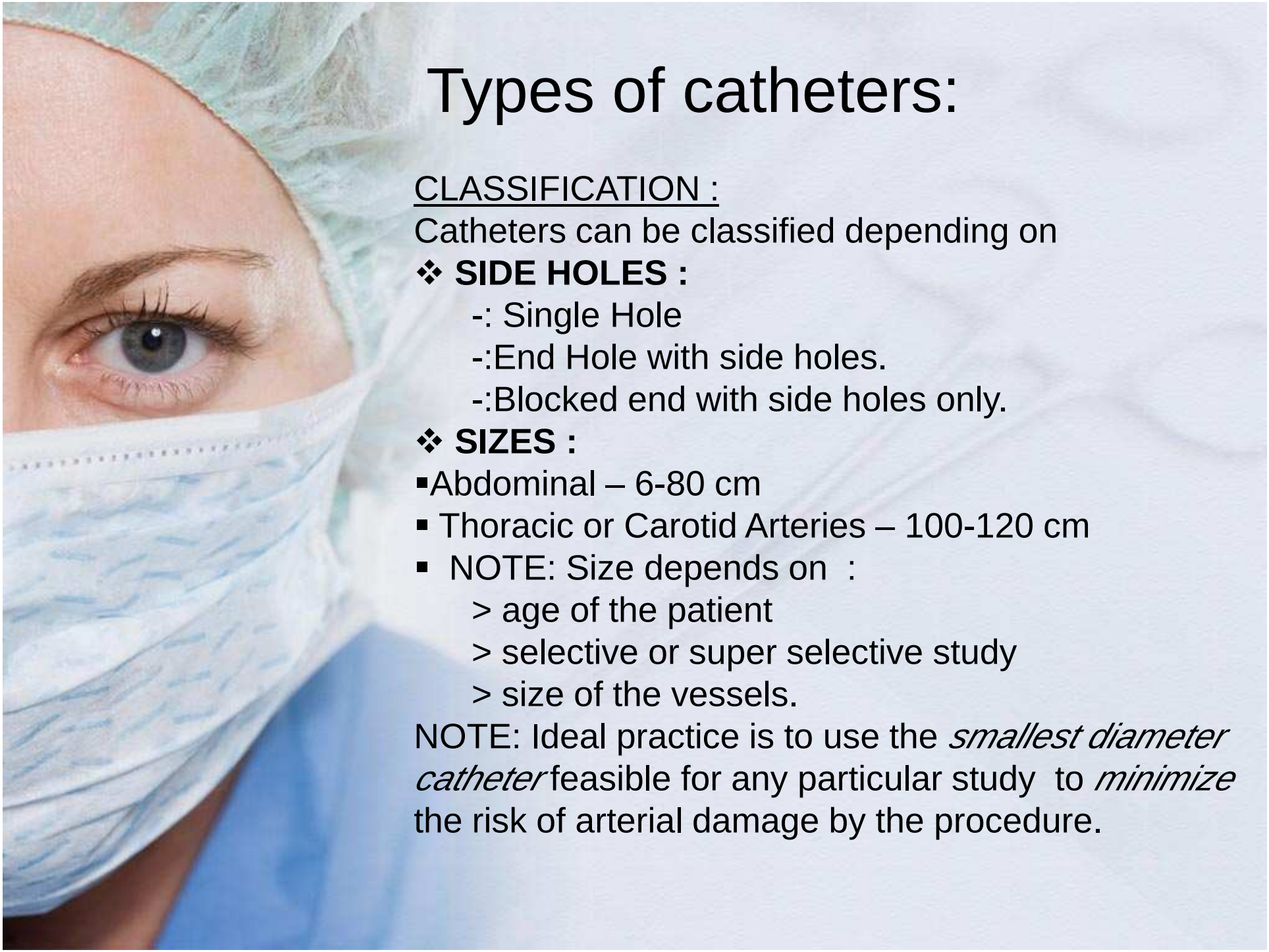
<u>Tip</u>



Measurement:

- Most commonly in adult Diagnostic Catheters of 5 – 7 Fr is used.
- **1 Fr = 0.3 mm**





Types of catheters:

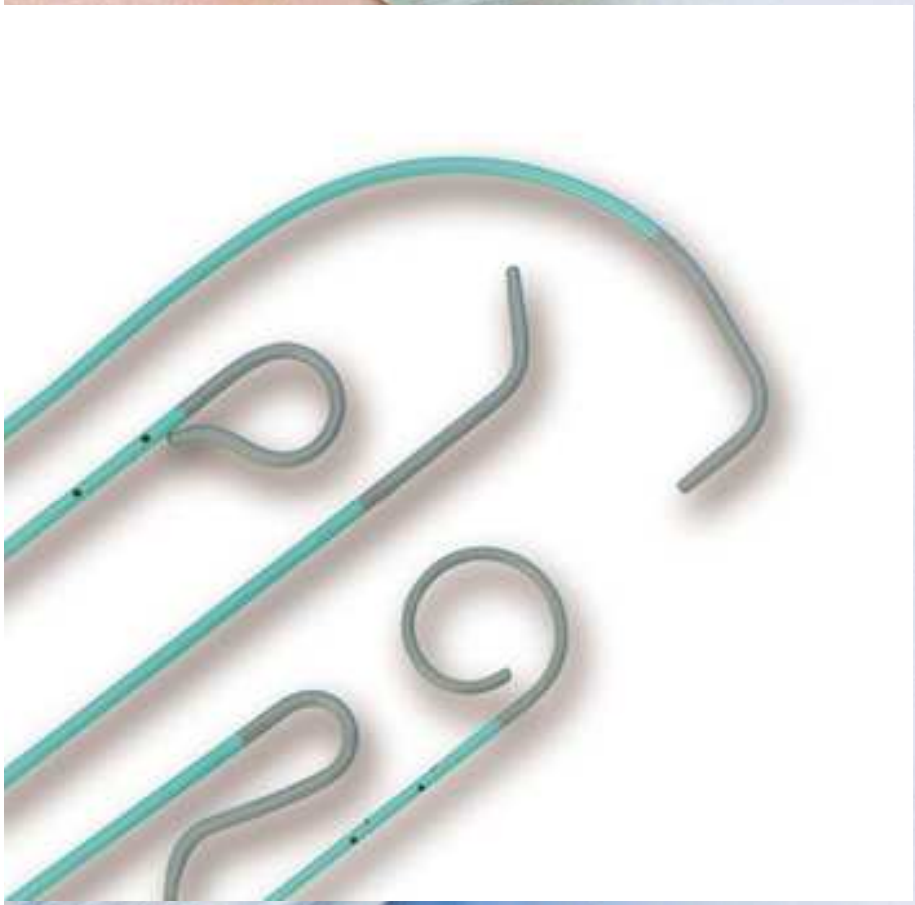
CLASSIFICATION :

Catheters can be classified depending on

- **SIDE HOLES :**
  - -: Single Hole
  - -:End Hole with side holes.
  - -:Blocked end with side holes only.
- **SIZES :**
  - Abdominal – 6-80 cm
  - Thoracic or Carotid Arteries – 100-120 cm
  - NOTE: Size depends on :
    - > age of the patient
    - > selective or super selective study
    - > size of the vessels.

NOTE: Ideal practice is to use the *smallest diameter catheter* feasible for any particular study to *minimize* the risk of arterial damage by the procedure.

Types of catheters



SHAPES

- Straight Catheter
- Pigtailed Catheter
- Cobra Shaped Catheter
- Side Winder Catheters (Shepherd)

Some Other Types of Catheters:

- **Hydrophilic Catheters :**

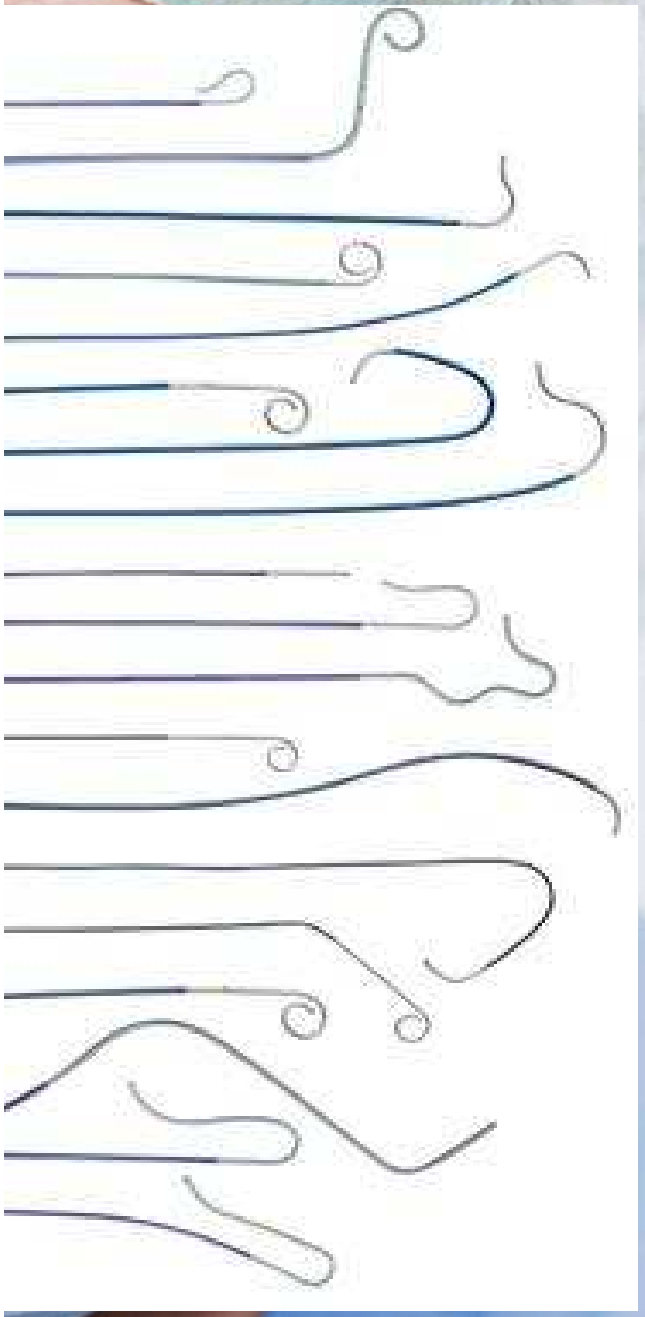
Hydrophilic-coated catheters have a layer of polymer coating that is bound to the catheter surface.
The polymer absorbs and binds water to the catheter, resulting in a thick, smooth and slippery surface.

- **Intermittent Catheters:**

Intermittent catheters are hollow tubes used to drain
urine from the bladder.

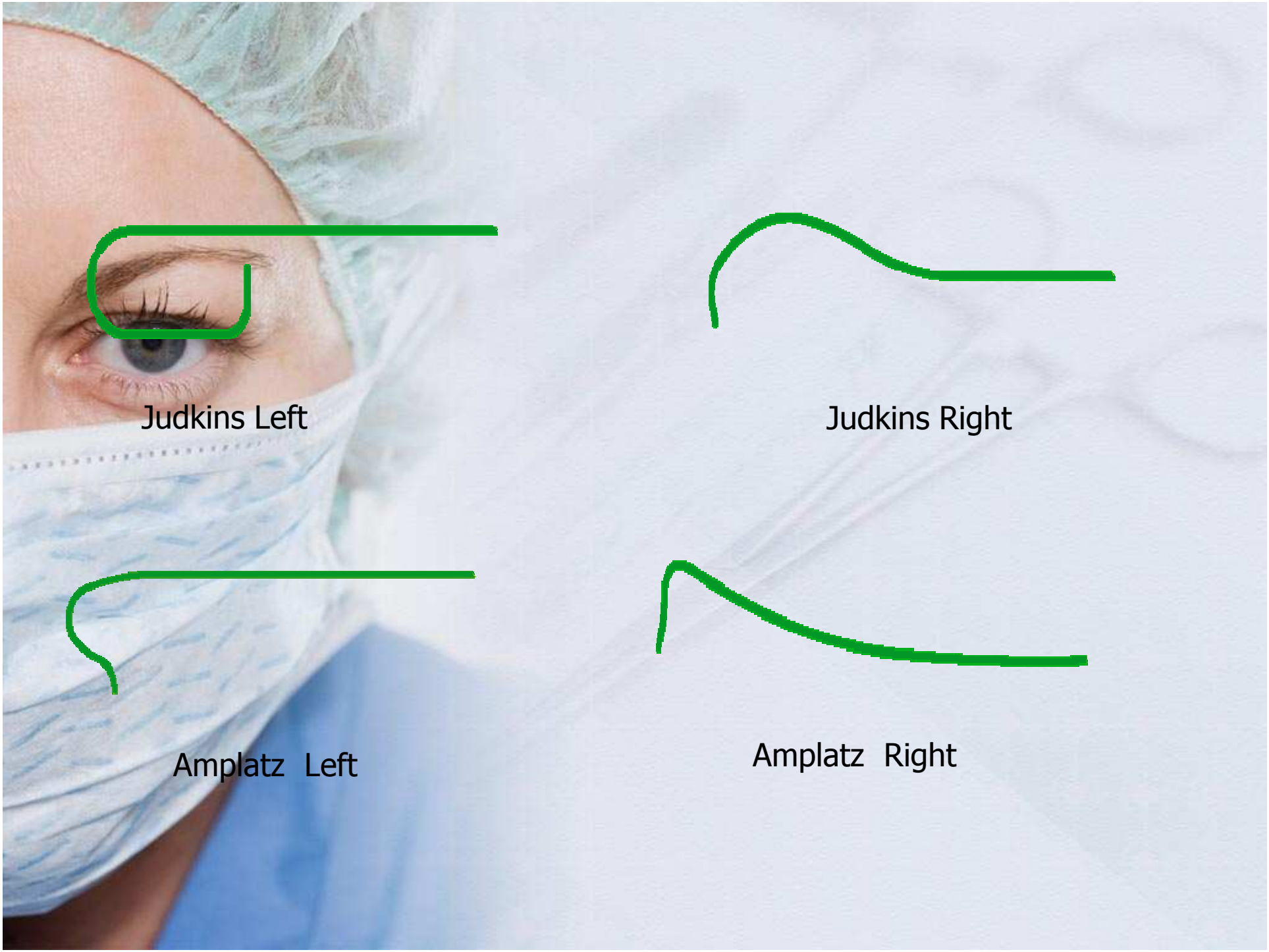
- **Pediatric Catheters:**

Usually its around 80cm.

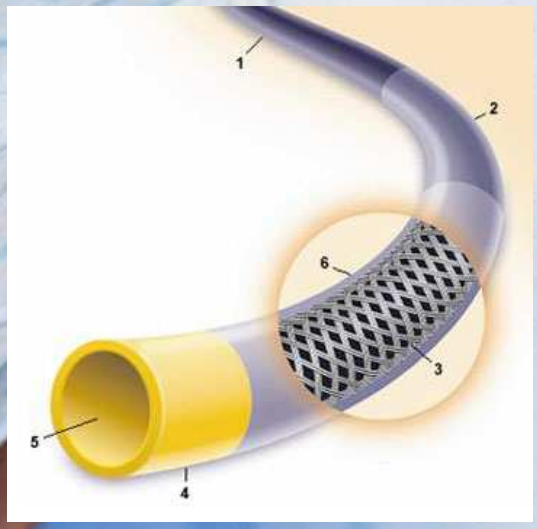


Different catheter curves for different purposes:

- Judkins Left (JL)
- Judkins Right (JR)
- Judkins Left Short Tip
- Judkins Right Short Tip
- Amplatz Left (AL)
- Amplatz Right (AR)
- Left Coronary Bypass
- Right Coronary Bypass
- Cardiac Pigtail
- Multipurpose


Judkins Left
Judkins Right
Amplatz Left
Amplatz Right

Catheters can be broadly classified Under these groups:



- **DIAGNOSTIC CATHETERS**

  Used for *Angiographs .*

- **GUIDING CATHETERS**

Used for *Angioplasty.*

• Guiding catheters are like angiography catheters only difference is that guiding catheters are more *stiffer* & f*irm* as it carries Balloon catheters, PTCA wires and stent delivery system.

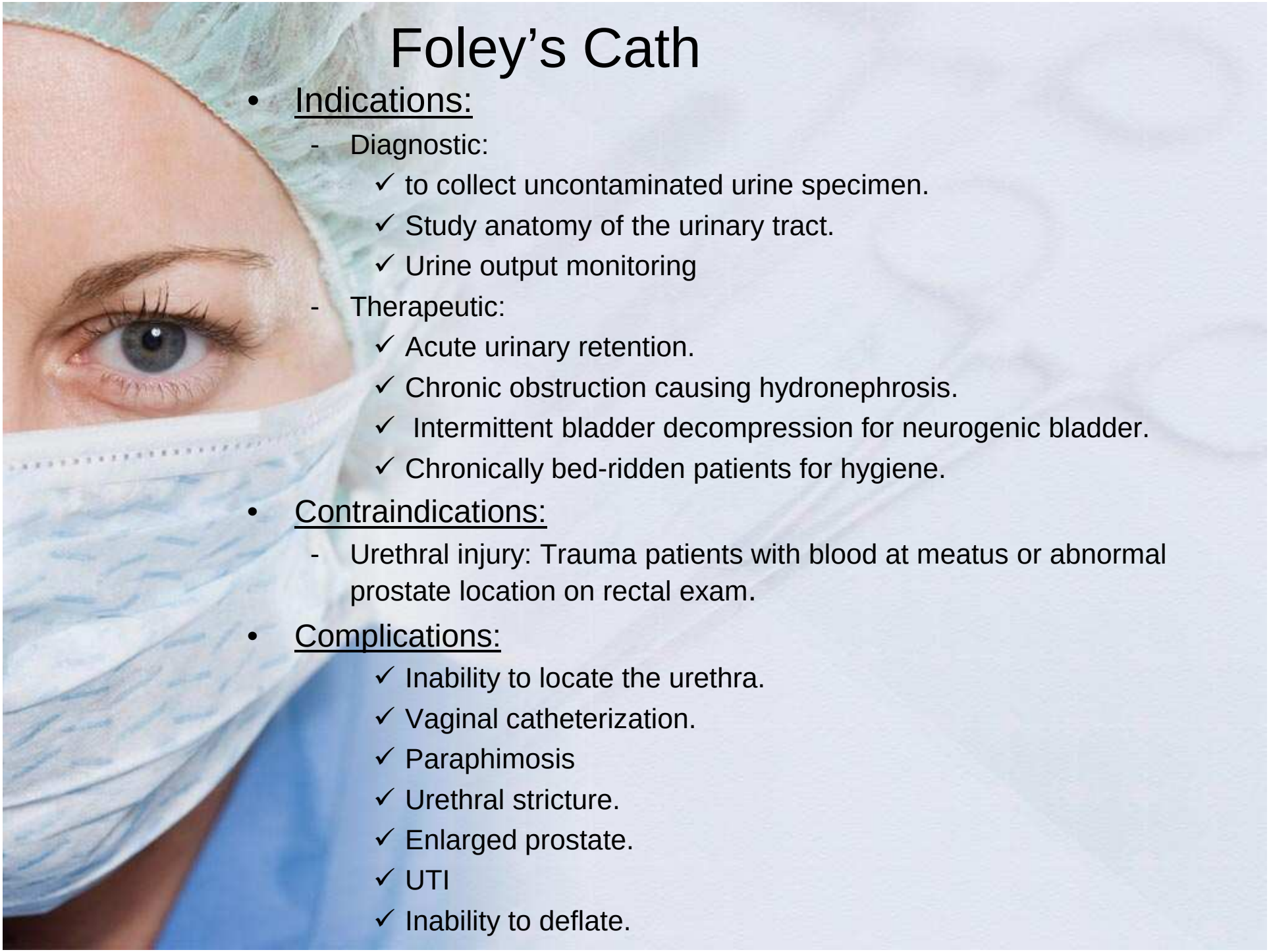
• Mild stiffness comes due to the wire braided design.

• Good Push ability .

• Good Tractability.

Balloon Catheters:

Butterfly Catheters



Foley's Cath

- Indications:
  - Diagnostic:
    - ✓ to collect uncontaminated urine specimen.
    - ✓ Study anatomy of the urinary tract.
    - ✓ Urine output monitoring
  - Therapeutic:
    - ✓ Acute urinary retention.
    - ✓ Chronic obstruction causing hydronephrosis.
    - ✓ Intermittent bladder decompression for neurogenic bladder.
    - ✓ Chronically bed-ridden patients for hygiene.
- Contraindications:
  - Urethral injury: Trauma patients with blood at meatus or abnormal prostate location on rectal exam.
- Complications:
  - ✓ Inability to locate the urethra.
  - ✓ Vaginal catheterization.
  - ✓ Paraphimosis
  - ✓ Urethral stricture.
  - ✓ Enlarged prostate.
  - ✓ UTI
  - ✓ Inability to deflate.

Foleys Catheter
(1way, 2way or 3way)

<u>Folye's is classified according to:</u>

-The number of lumens:

- ➢1 way → for aspiration and drain.
- ➢2 way → one for the balloon inflation and the other for drain or aspiration.
- ➢3 way → one for irrigation (infusion), one for the balloon inflation, and the third for drain. >> see the pic.

-The material it was made of:

- ➢ Rubber made >> irritative and immunogenic >> not used for longer periods of time, may induce fibrotic changes. [not more than a week!], [remember, foley's induced strictures]
- ➢Silicone coated rubber>> less immunogenic, used for longer time than the rubber alone
- ➢Silicone made>> used for longer periods reaching up to one month!.

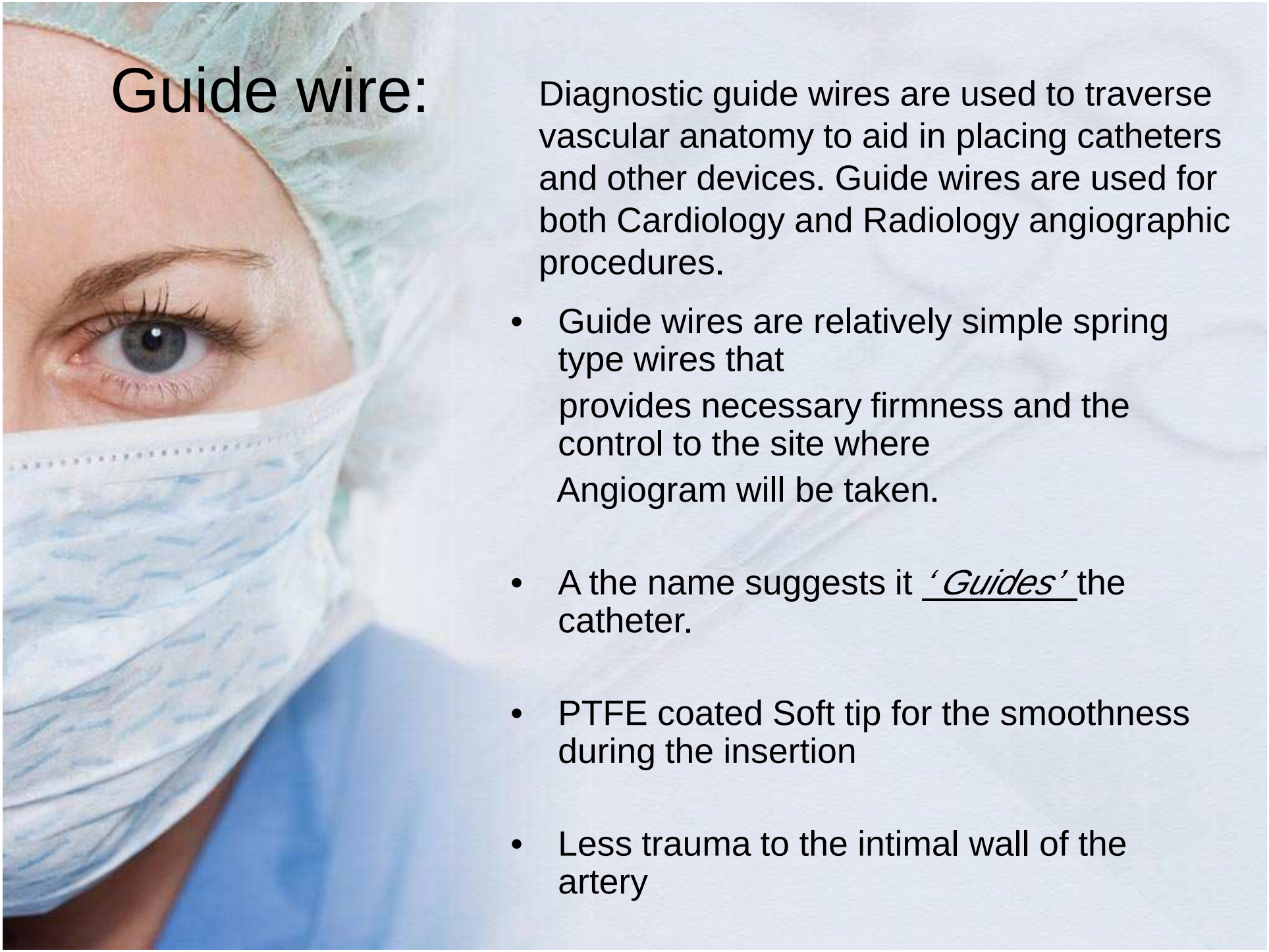
Puncture needles:

Used to cannulate or puncture the artery.

Usual Sizes include
18 ga, 19 ga , 20ga, 21 ga.

The selection of the Size depends on the guide wire going to be inserted through that needle port.

Seldinger Needle



Guide wire:

Diagnostic guide wires are used to traverse vascular anatomy to aid in placing catheters and other devices. Guide wires are used for both Cardiology and Radiology angiographic procedures.

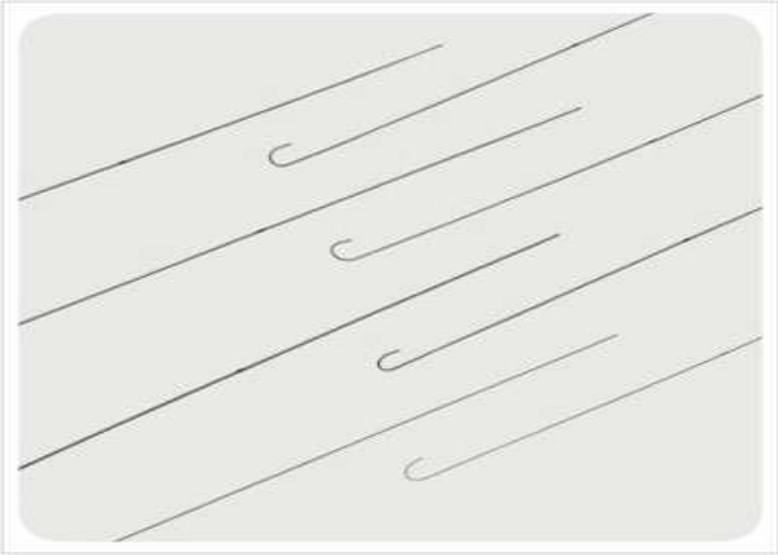
- Guide wires are relatively simple spring type wires that
  provides necessary firmness and the control to the site where
  Angiogram will be taken.

- A the name suggests it *'Guides'* the catheter.

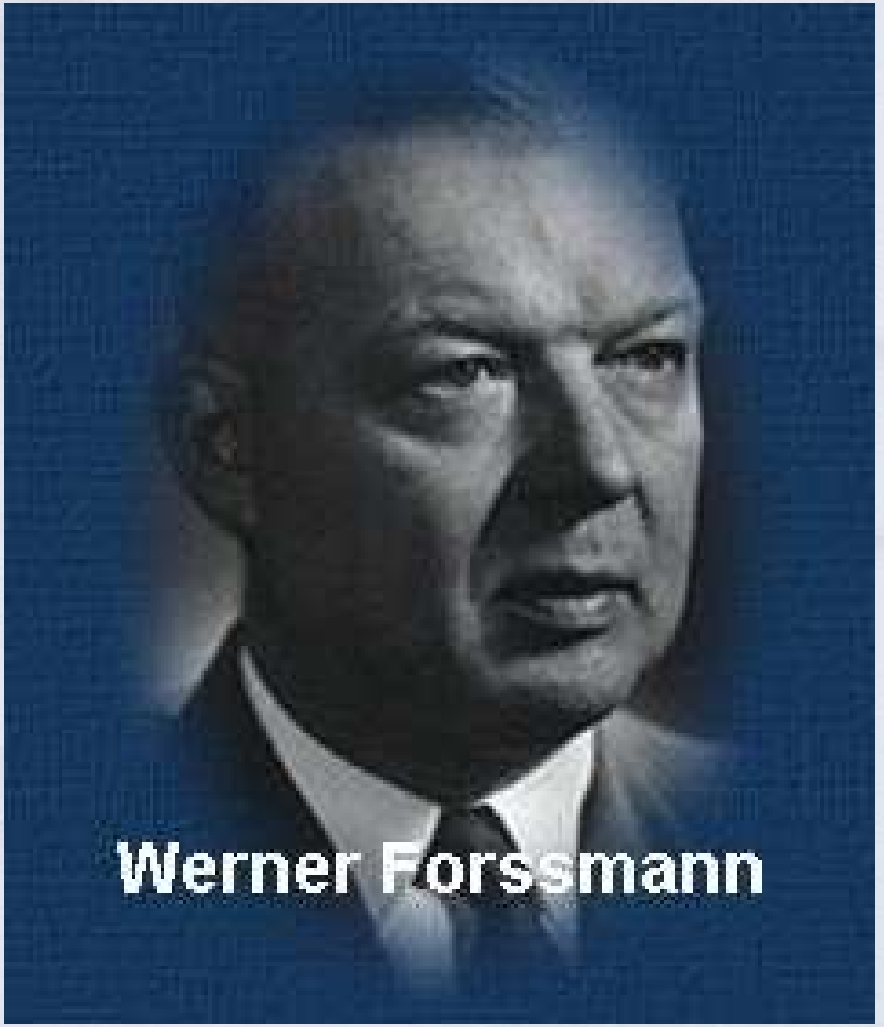
- PTFE coated Soft tip for the smoothness during the insertion

- Less trauma to the intimal wall of the artery

Shape of the Tip :
J Tip / Straight Tip



- In 1929 **Werner Forssmann** demonstrated that a simple Rubber catheter could be passed to the pulmonary artery through the Anti- Cubital Vein and An angiographic film could be obtained using radiographic contrast.



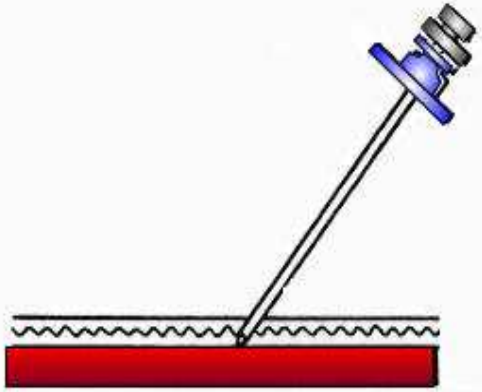
In 1953 ,
Sven –Ivar Seldinger invented
The technique of gaining access
Percutaneusly into an artery
without An arteriotomy.

Sven- Ivar Seldinger

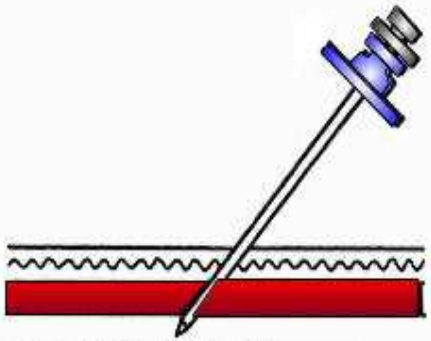
Technique of inserting a catheter

- **SELDINGER TECHNIQUE**:
  The technique of catheter insertion via double-wall needle puncture and guide-wire is known as
  The **SELDINGER TECHNIQUE**.
  - **Double Wall Puncture**:
    - Mostly done.
    - Compression to prevent Hematoma of the other wall.
    - Rotatory movement to get the needle into the lumen.

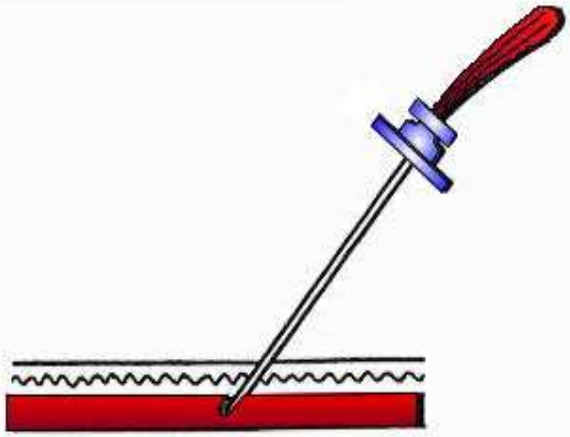
  - **Single Wall Puncture:**
    Usually done for patients co-agulation time is less.



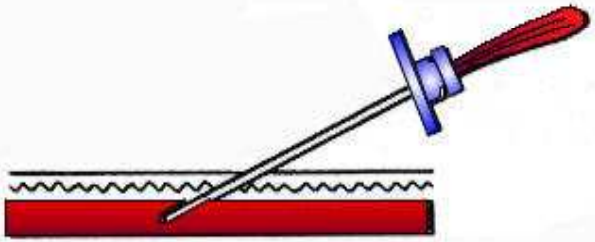
1. 針先を動脈壁にあてる.



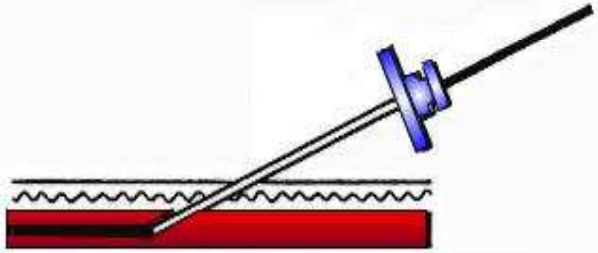
2. 動脈を貫通する.



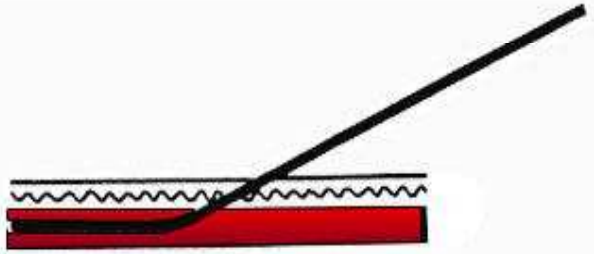
3. 内套針とマンドリンを抜去し
外套針を徐々に引き戻すと
血液が噴出する.



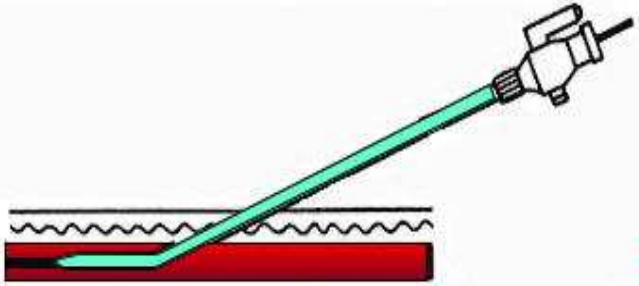
4. 針の向きを変えて少し進める.



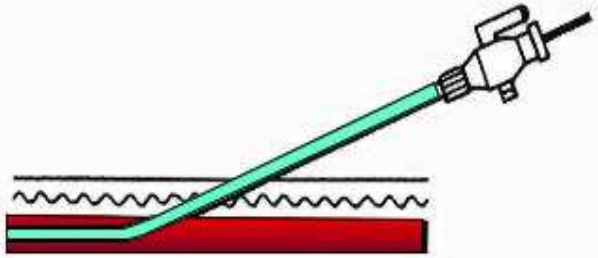
5. ガイドワイヤーを挿入する.



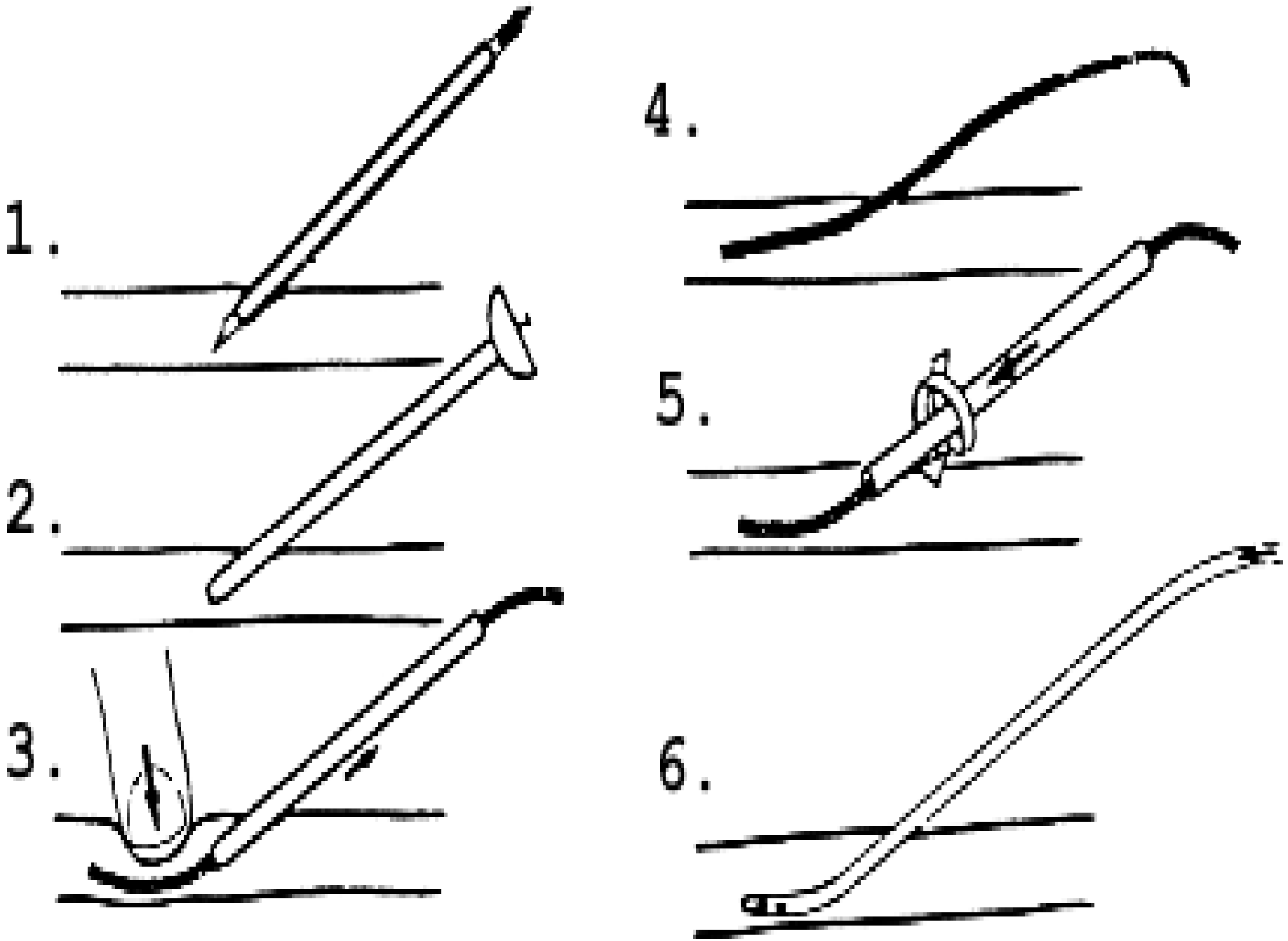
6. 針を抜き去る.



7. カテーテルをワイヤーに
かぶせて挿入する.



8. ワイヤーを抜き去る.


1.
2.
3.
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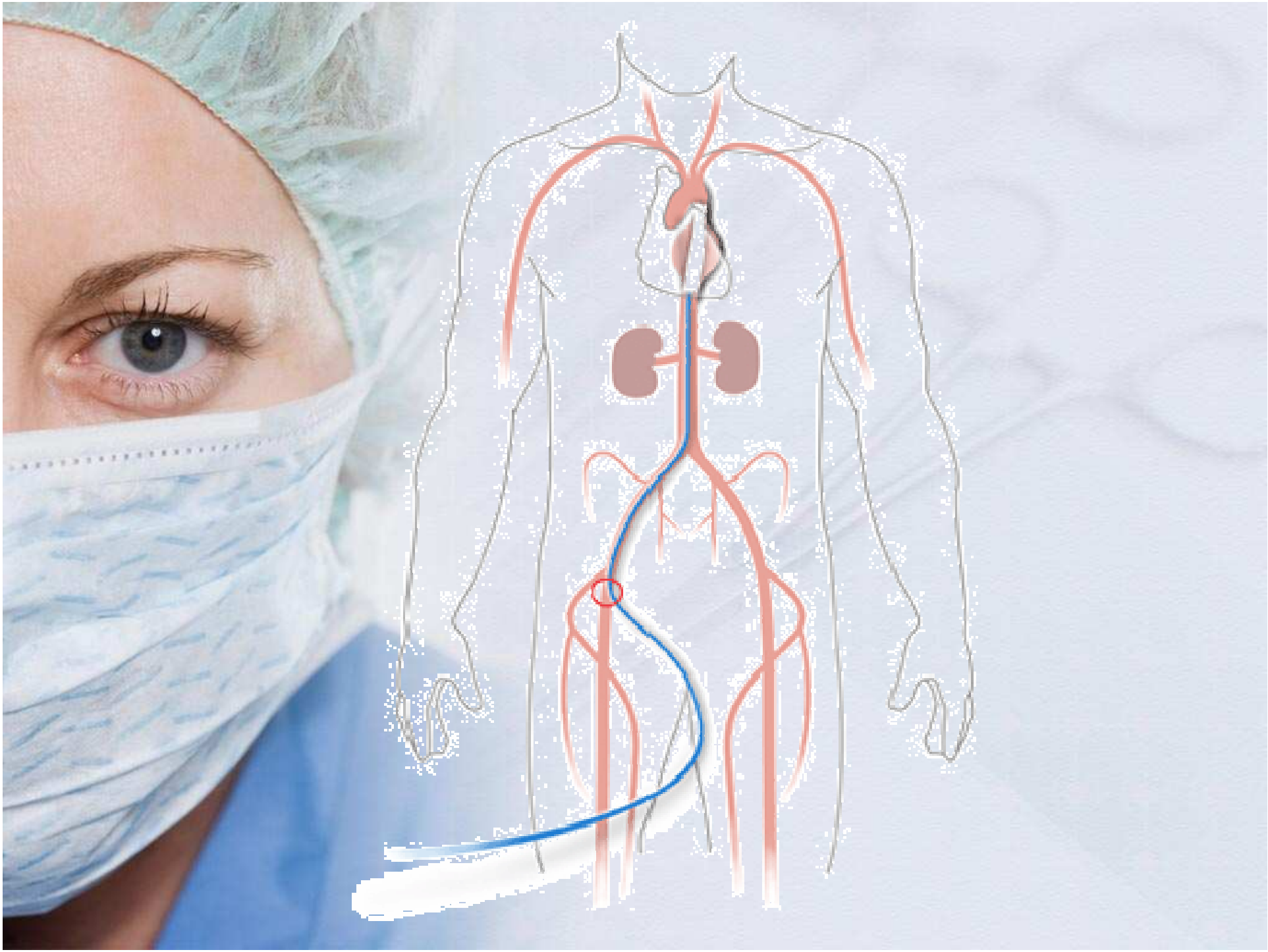
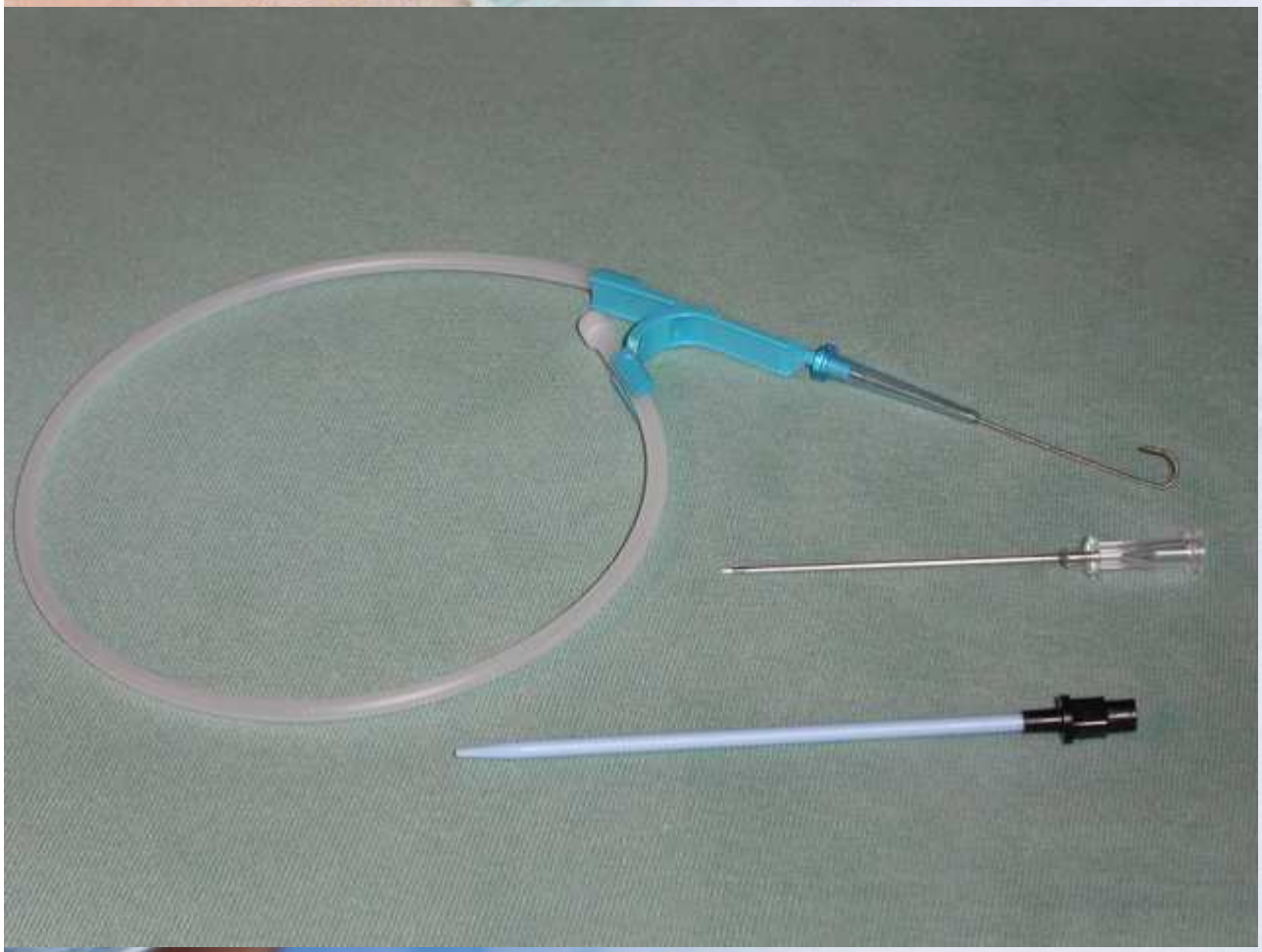
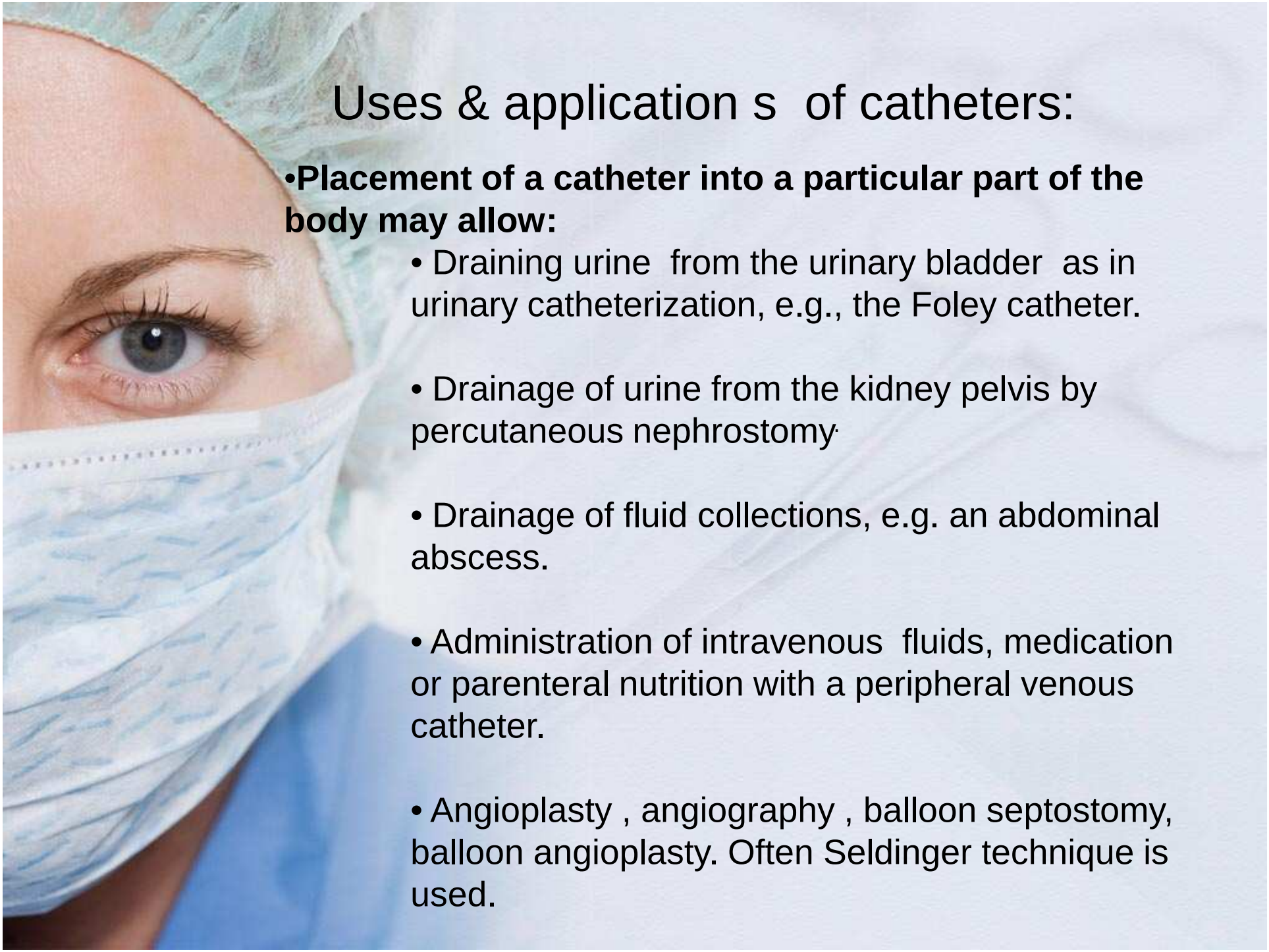


Complete apparatus:

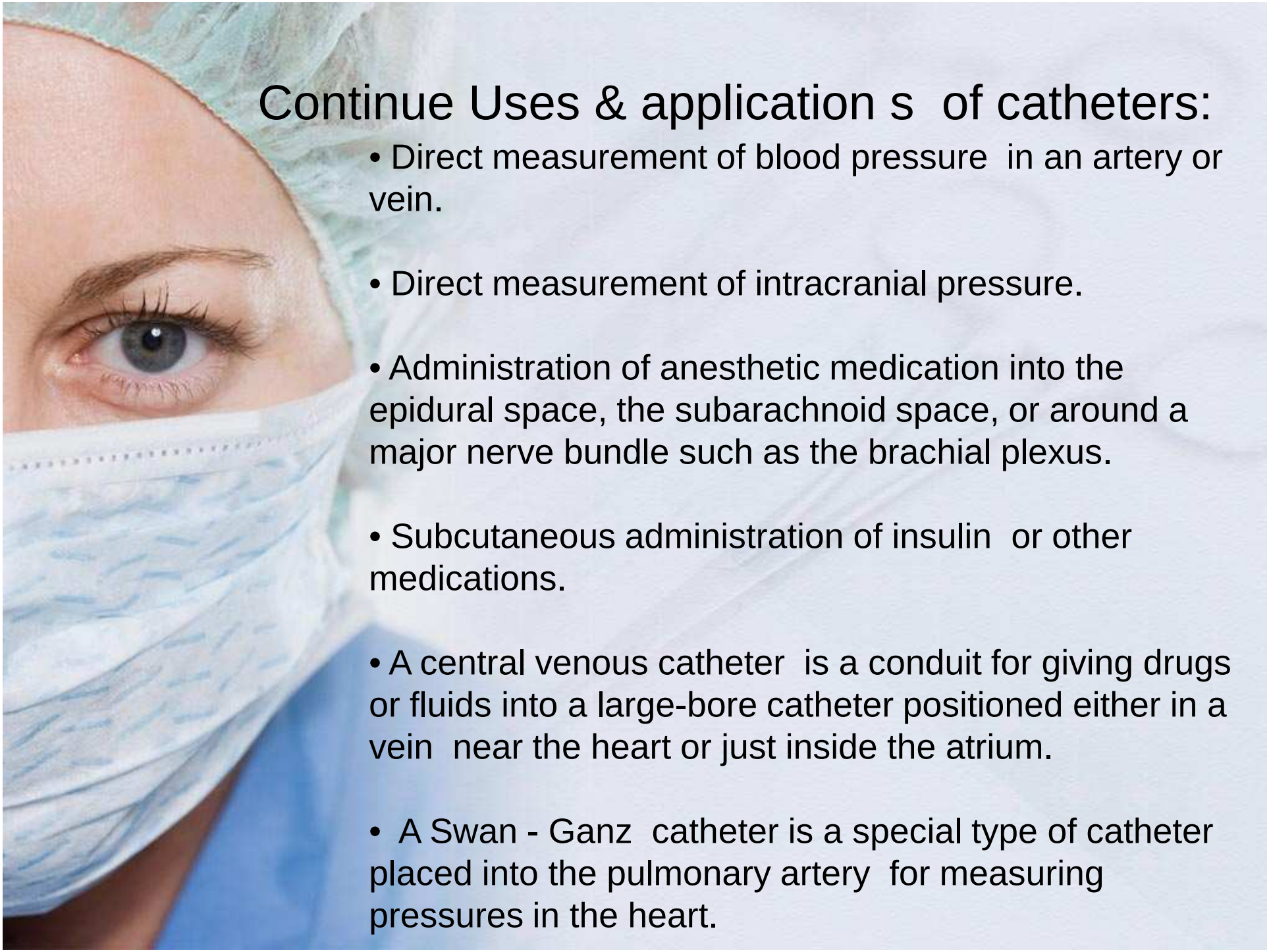


- Needle
- Guide Wire
- Sheath
- Catheter



Uses & application s of catheters:

- **Placement of a catheter into a particular part of the body may allow:**
  - Draining urine from the urinary bladder as in urinary catheterization, e.g., the Foley catheter.
  - Drainage of urine from the kidney pelvis by percutaneous nephrostomy.
  - Drainage of fluid collections, e.g. an abdominal abscess.
  - Administration of intravenous fluids, medication or parenteral nutrition with a peripheral venous catheter.
  - Angioplasty , angiography , balloon septostomy, balloon angioplasty. Often Seldinger technique is used.



Continue Uses & application s of catheters:

- Direct measurement of blood pressure in an artery or vein.

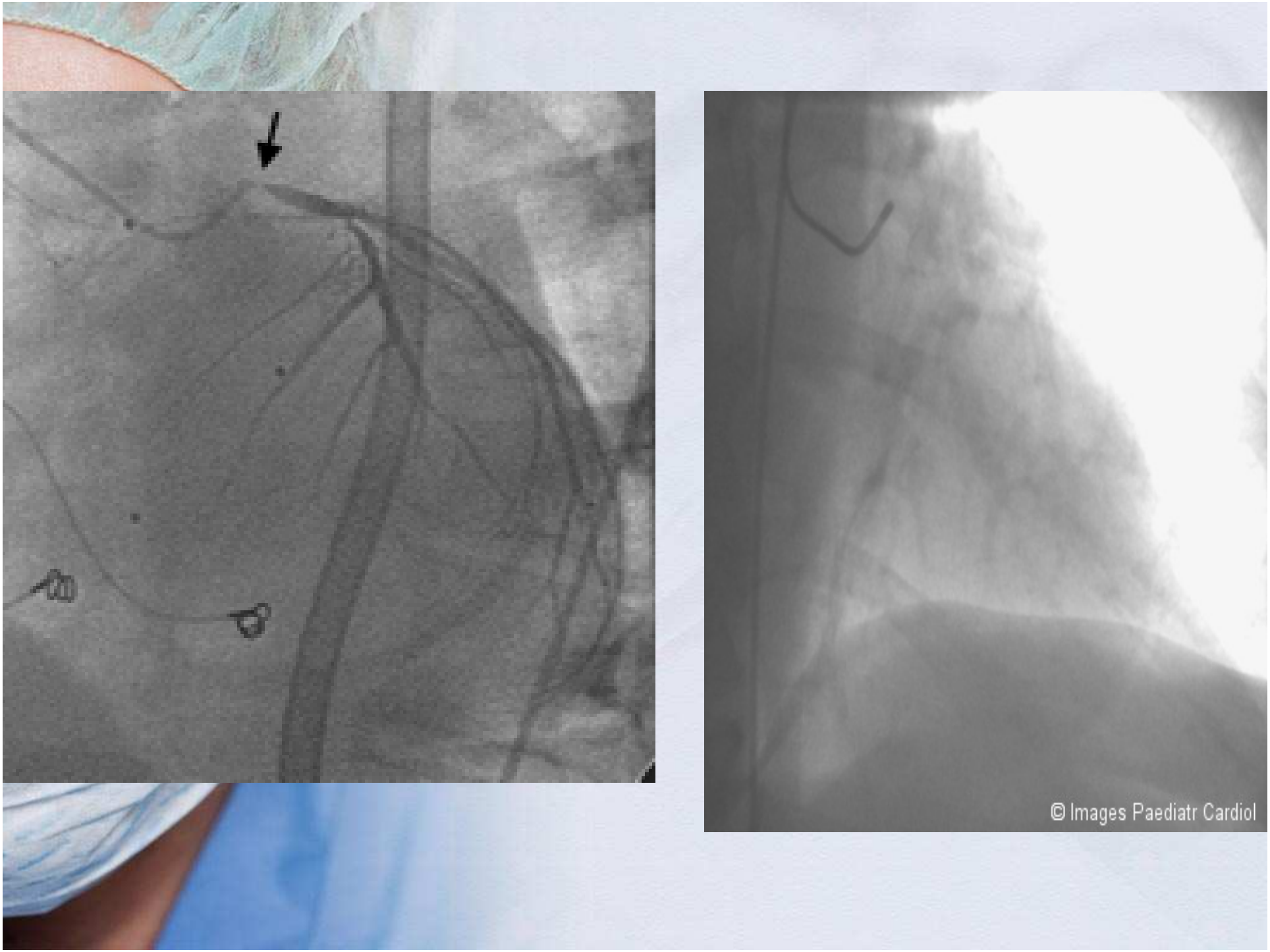
- Direct measurement of intracranial pressure.

- Administration of anesthetic medication into the epidural space, the subarachnoid space, or around a major nerve bundle such as the brachial plexus.

- Subcutaneous administration of insulin or other medications.

- A central venous catheter is a conduit for giving drugs or fluids into a large-bore catheter positioned either in a vein near the heart or just inside the atrium.

- A Swan - Ganz catheter is a special type of catheter placed into the pulmonary artery for measuring pressures in the heart.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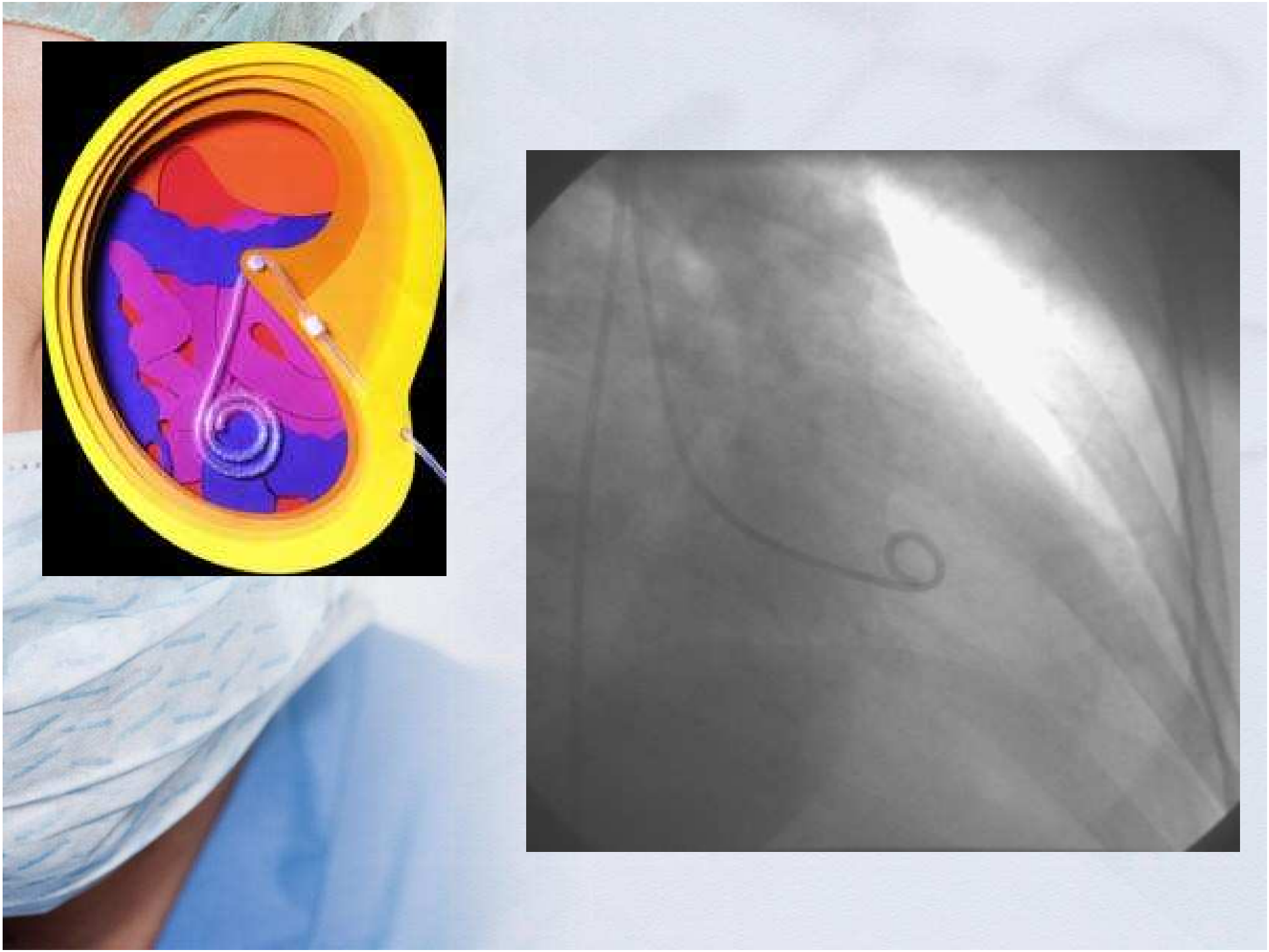
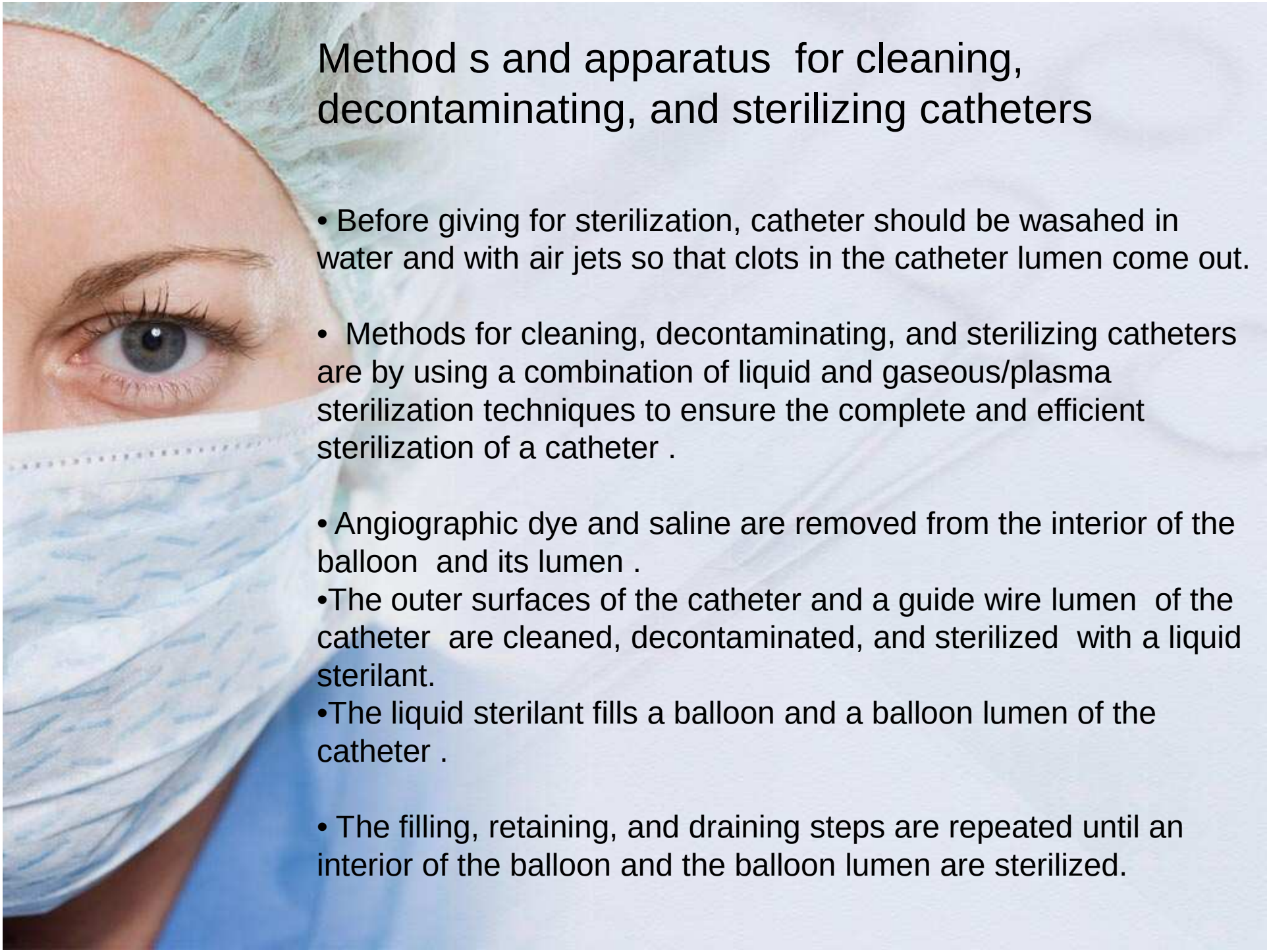




Method s and apparatus for cleaning, decontaminating, and sterilizing catheters

• Before giving for sterilization, catheter should be wasahed in water and with air jets so that clots in the catheter lumen come out.

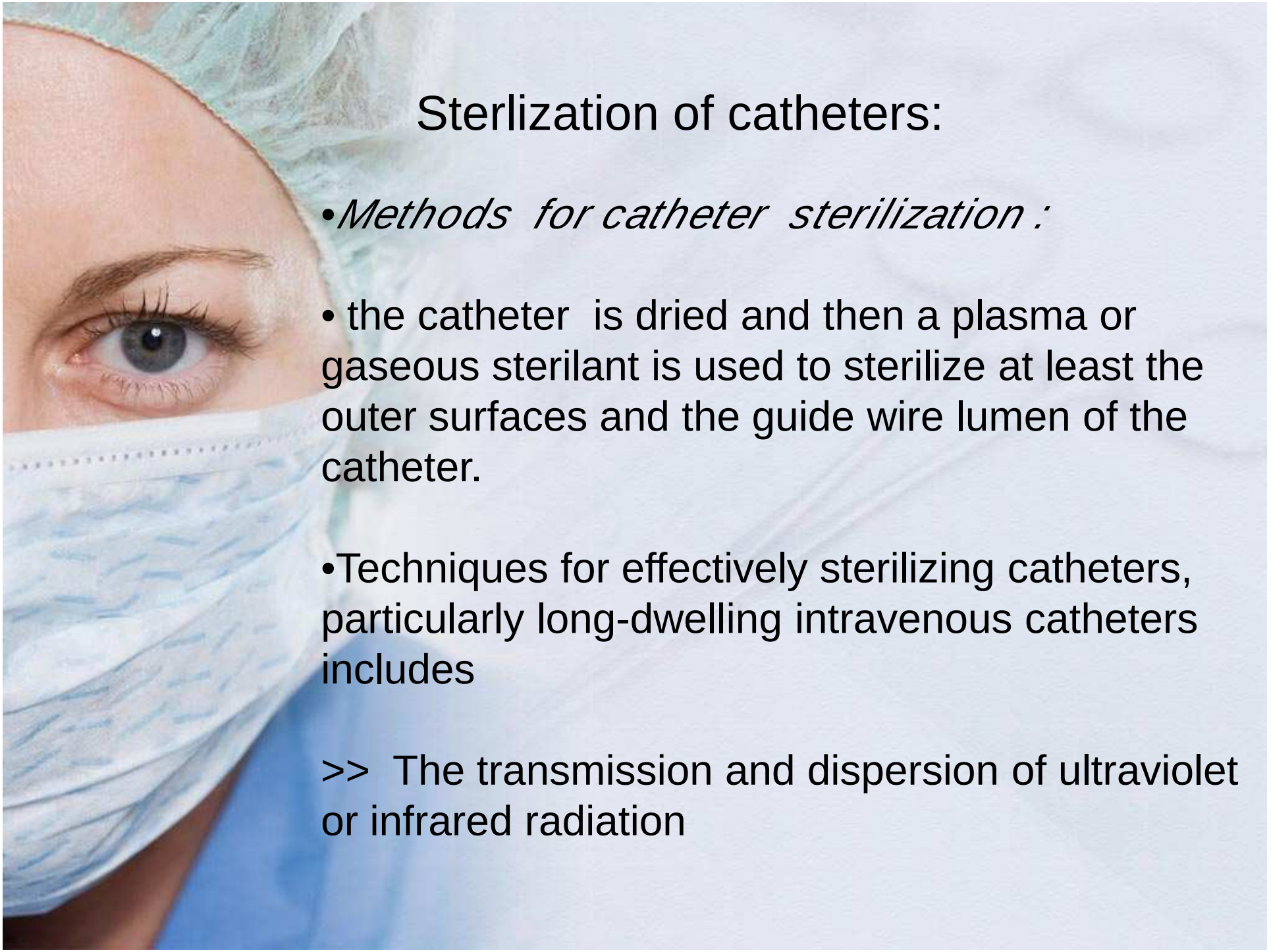
• Methods for cleaning, decontaminating, and sterilizing catheters are by using a combination of liquid and gaseous/plasma sterilization techniques to ensure the complete and efficient sterilization of a catheter .

• Angiographic dye and saline are removed from the interior of the balloon and its lumen .

•The outer surfaces of the catheter and a guide wire lumen of the catheter are cleaned, decontaminated, and sterilized with a liquid sterilant.

•The liquid sterilant fills a balloon and a balloon lumen of the catheter .

• The filling, retaining, and draining steps are repeated until an interior of the balloon and the balloon lumen are sterilized.



Sterlization of catheters:

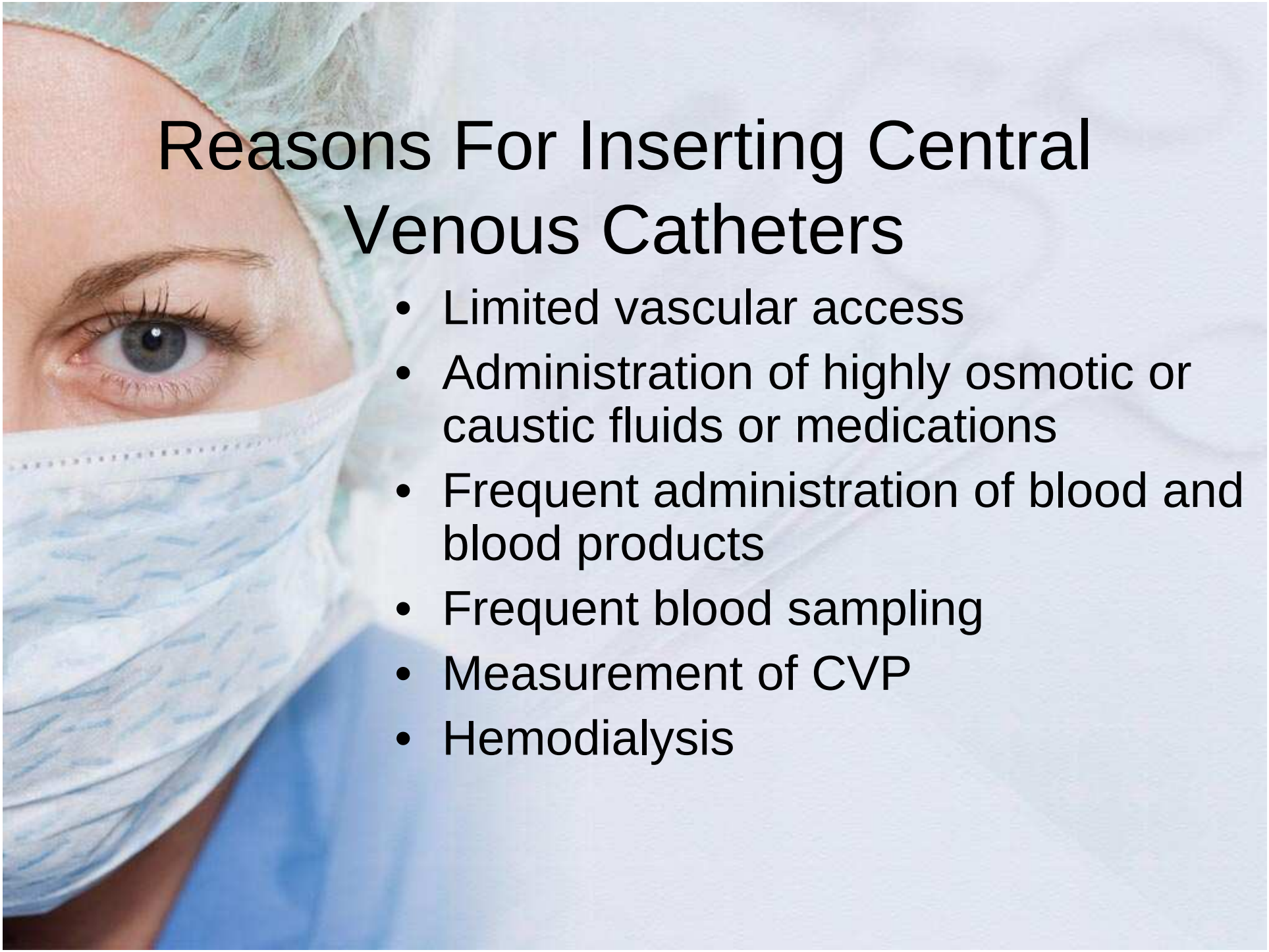
•*Methods for catheter sterilization :*

• the catheter is dried and then a plasma or gaseous sterilant is used to sterilize at least the outer surfaces and the guide wire lumen of the catheter.

•Techniques for effectively sterilizing catheters, particularly long-dwelling intravenous catheters includes

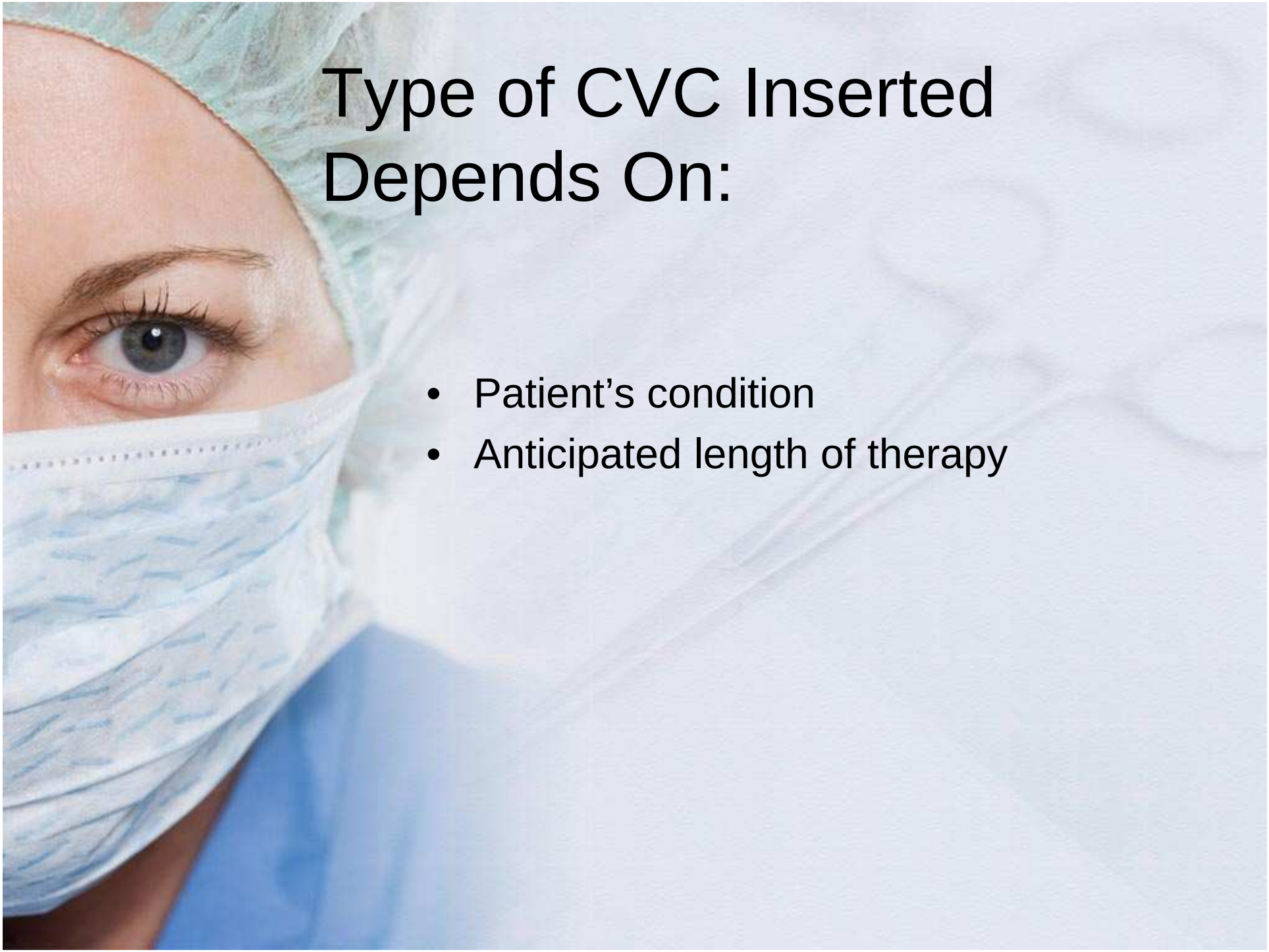
>> The transmission and dispersion of ultraviolet or infrared radiation


Central Venous Catheters



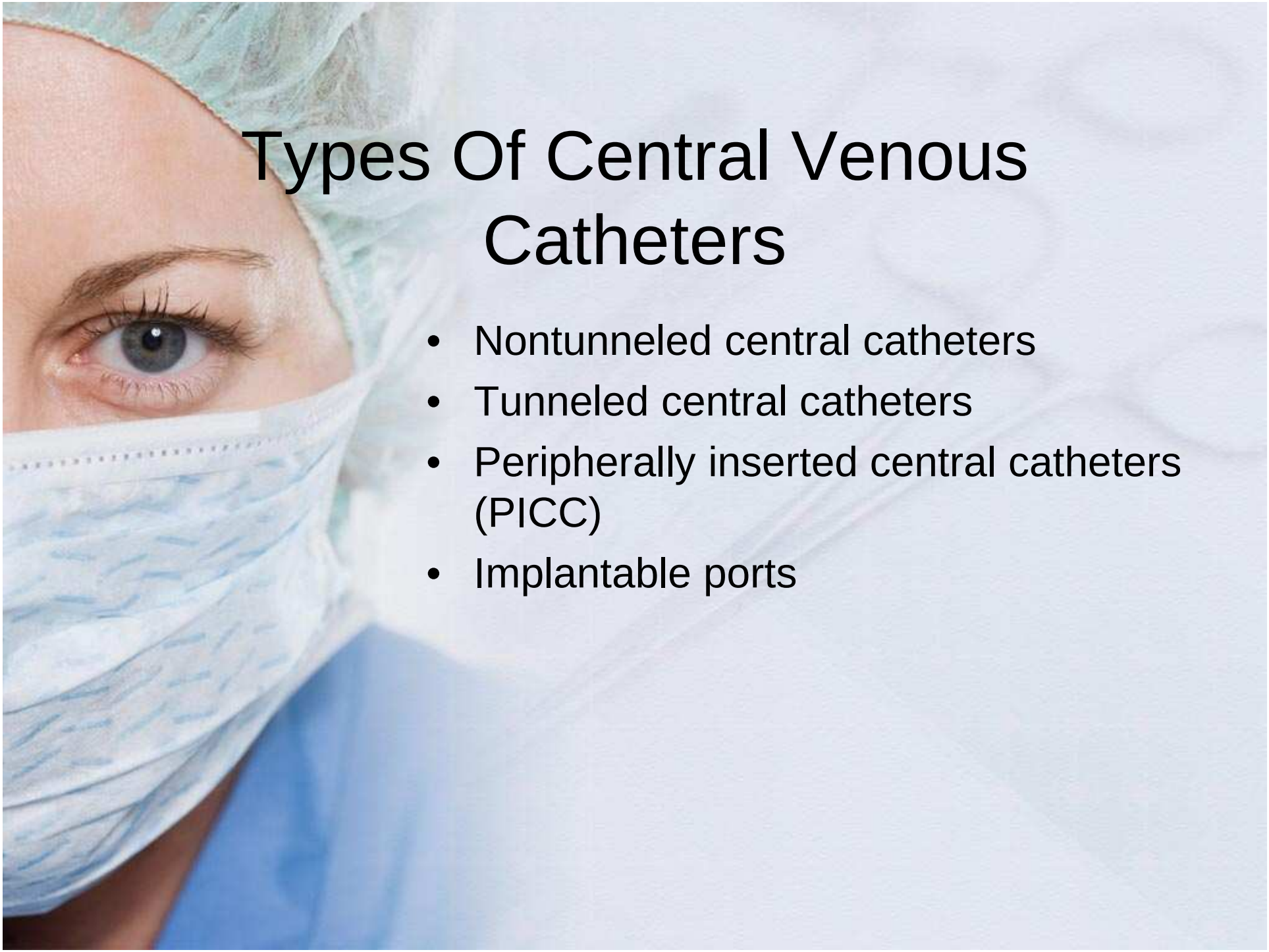
Reasons For Inserting Central Venous Catheters

- Limited vascular access
- Administration of highly osmotic or caustic fluids or medications
- Frequent administration of blood and blood products
- Frequent blood sampling
- Measurement of CVP
- Hemodialysis



Type of CVC Inserted Depends On:

- Patient's condition
- Anticipated length of therapy

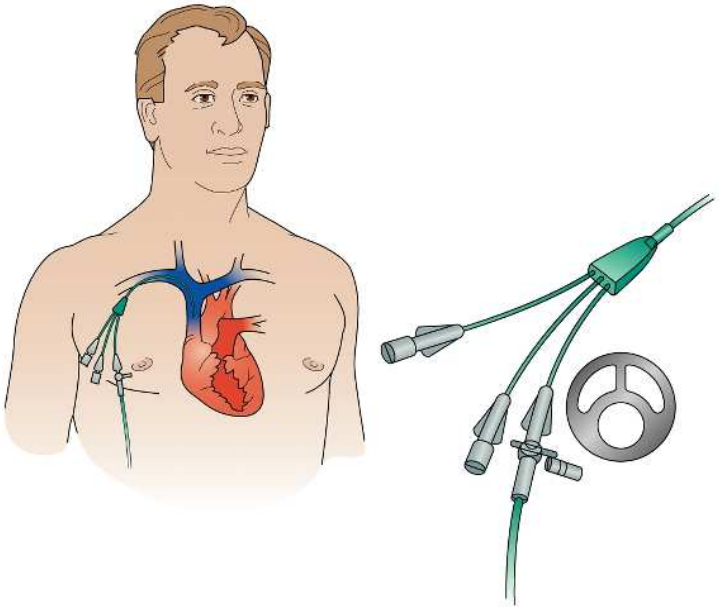


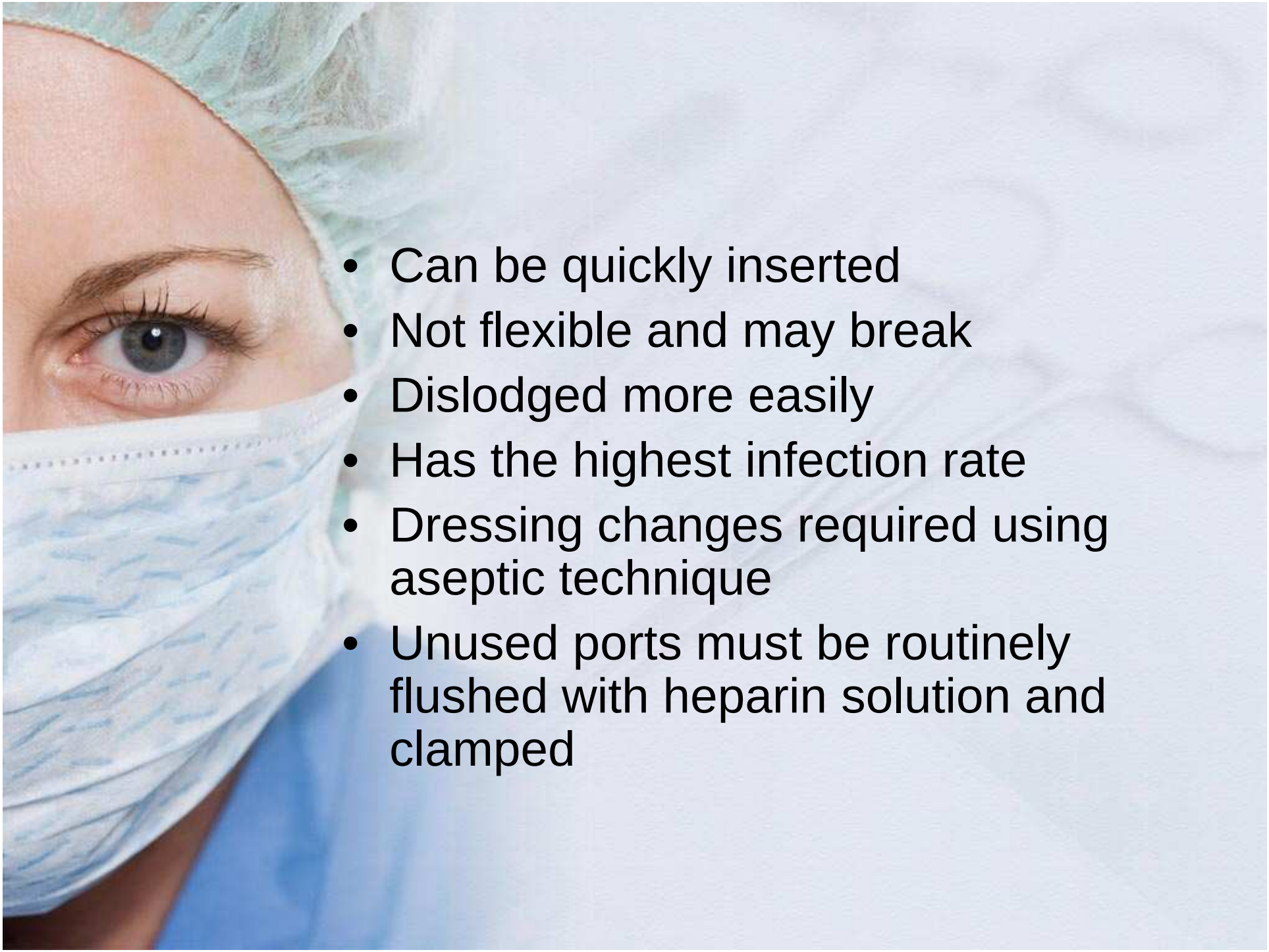
Types Of Central Venous Catheters

- Nontunneled central catheters
- Tunneled central catheters
- Peripherally inserted central catheters (PICC)
- Implantable ports

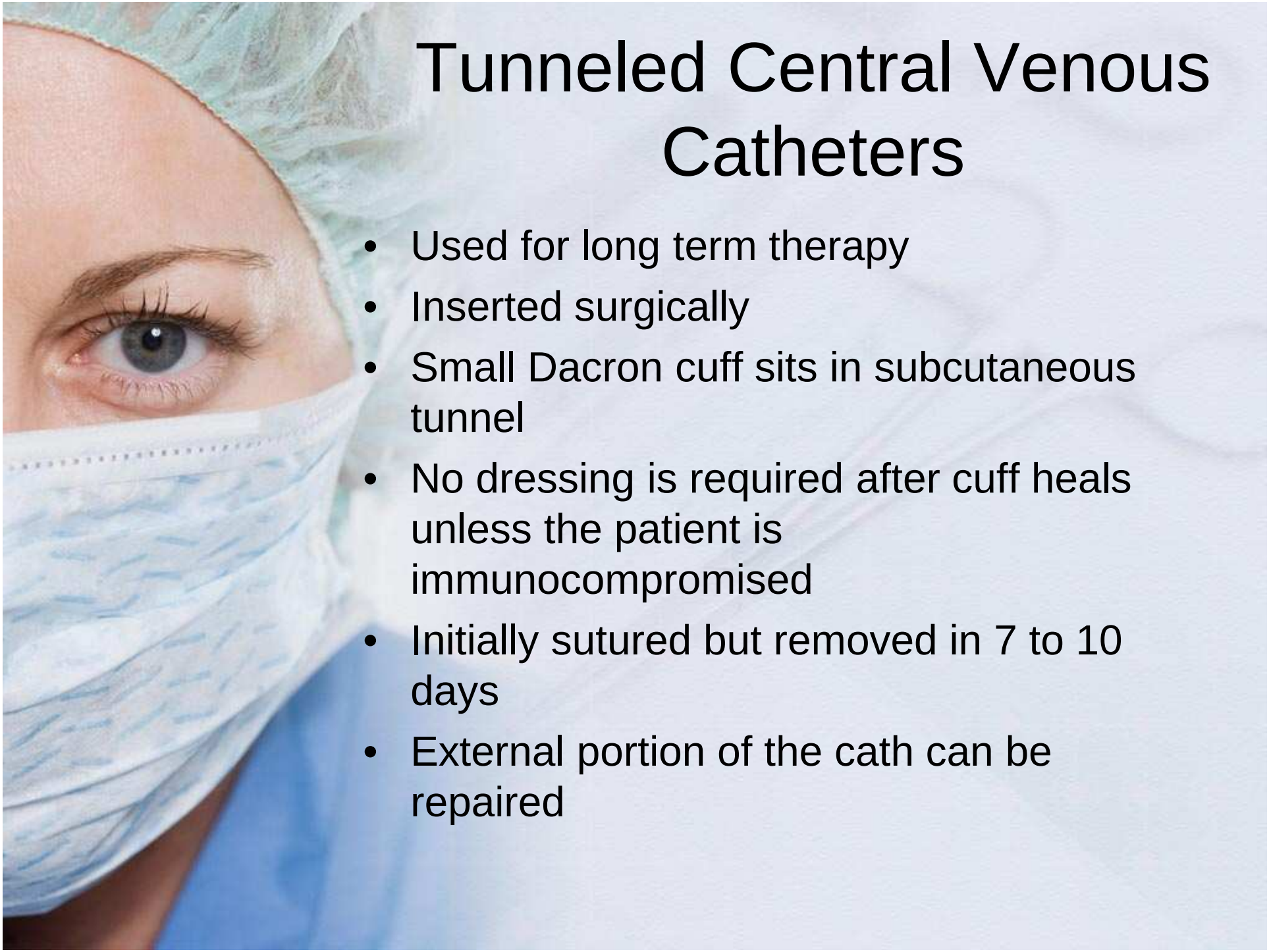
Nontunneled Central Venous Catheters

- Used for short-term therapy
- Inserted percutaneously
  - Subclavian vein
  - Internal jugular vein
  - Femoral vein
- Has from 1 to 4 lumens or ports
- Usually from 6 to 8 inches in length



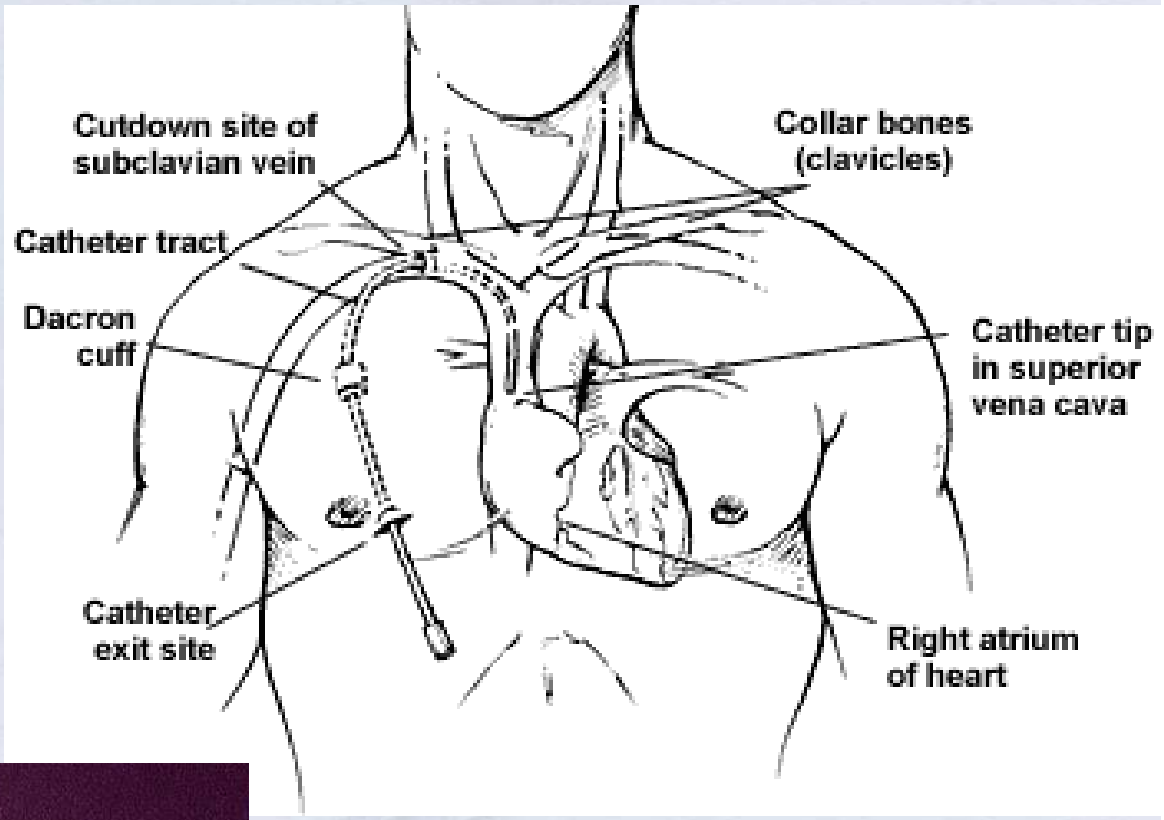


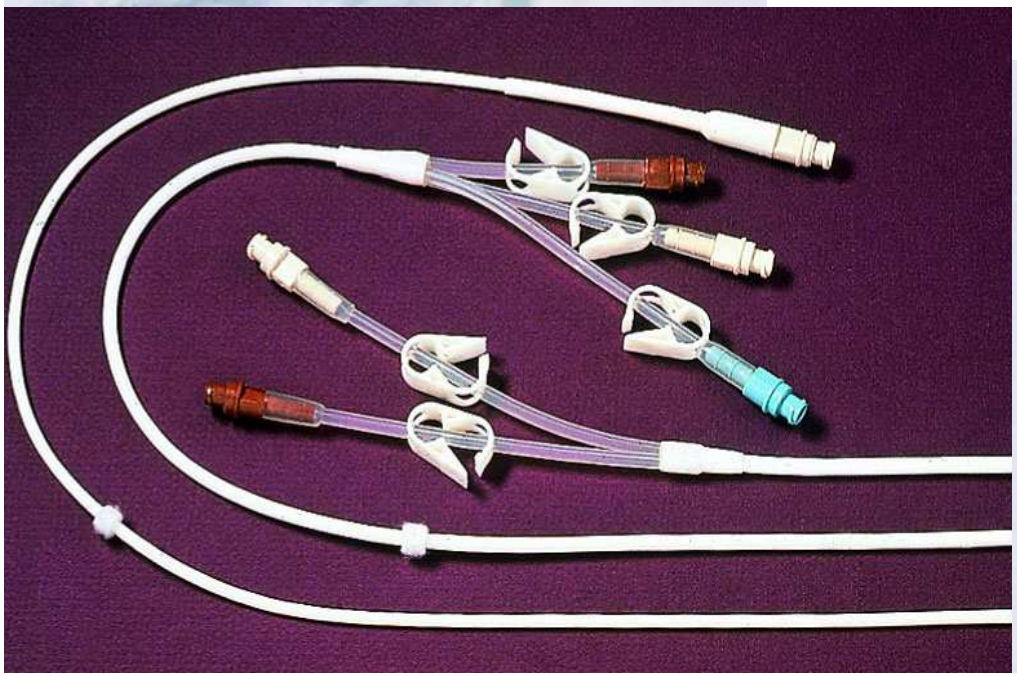
- Can be quickly inserted
- Not flexible and may break
- Dislodged more easily
- Has the highest infection rate
- Dressing changes required using aseptic technique
- Unused ports must be routinely flushed with heparin solution and clamped

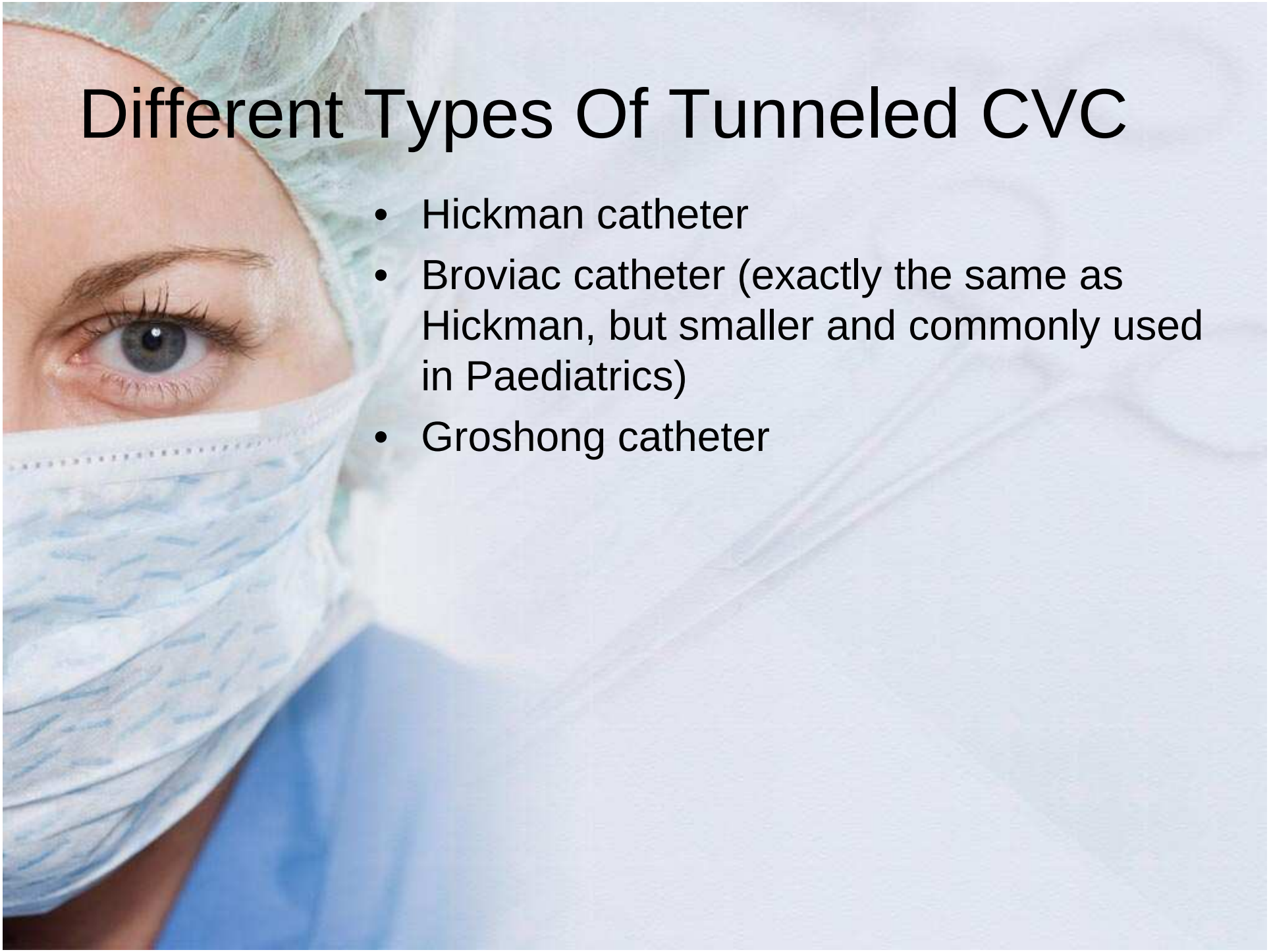


Tunneled Central Venous Catheters

- Used for long term therapy
- Inserted surgically
- Small Dacron cuff sits in subcutaneous tunnel
- No dressing is required after cuff heals unless the patient is immunocompromised
- Initially sutured but removed in 7 to 10 days
- External portion of the cath can be repaired

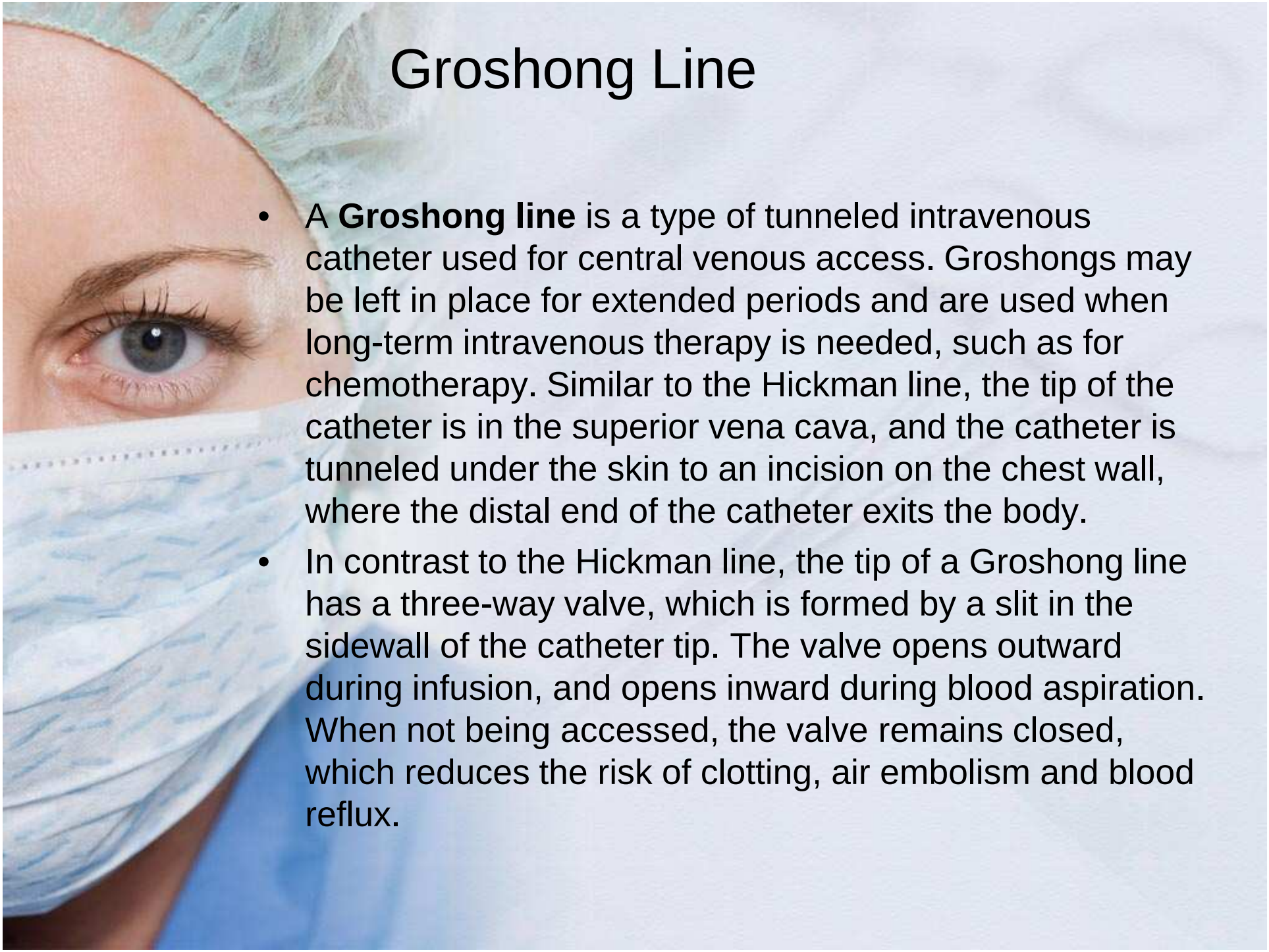

Cutdown site of subclavian vein
Collar bones (clavicles)
Catheter tract
Dacron cuff
Catheter tip in superior vena cava
Catheter exit site
Right atrium of heart





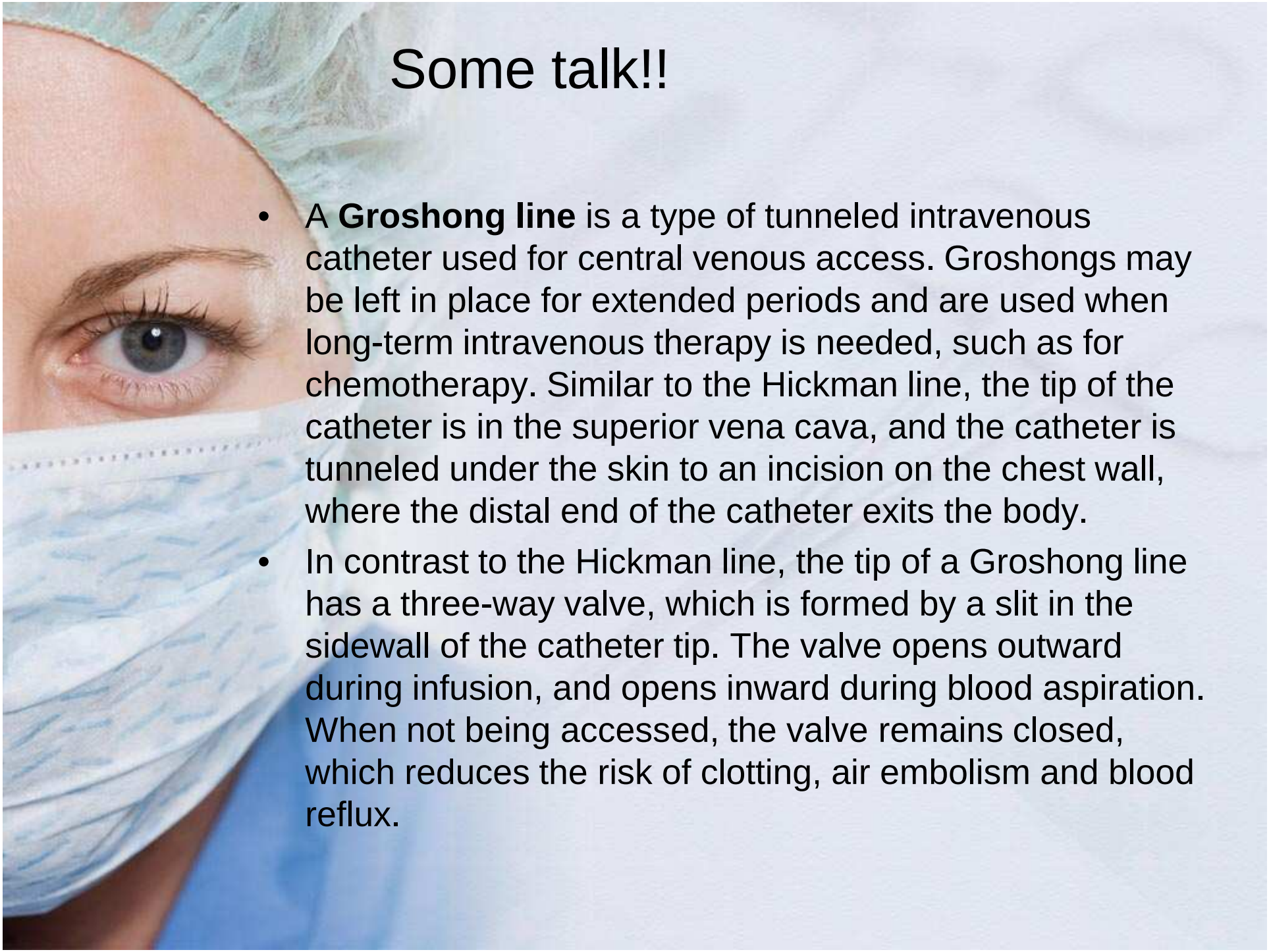
Different Types Of Tunneled CVC

- Hickman catheter
- Broviac catheter (exactly the same as Hickman, but smaller and commonly used in Paediatrics)
- Groshong catheter



Groshong Line

- A **Groshong line** is a type of tunneled intravenous catheter used for central venous access. Groshongs may be left in place for extended periods and are used when long-term intravenous therapy is needed, such as for chemotherapy. Similar to the Hickman line, the tip of the catheter is in the superior vena cava, and the catheter is tunneled under the skin to an incision on the chest wall, where the distal end of the catheter exits the body.
- In contrast to the Hickman line, the tip of a Groshong line has a three-way valve, which is formed by a slit in the sidewall of the catheter tip. The valve opens outward during infusion, and opens inward during blood aspiration. When not being accessed, the valve remains closed, which reduces the risk of clotting, air embolism and blood reflux.



Some talk!!

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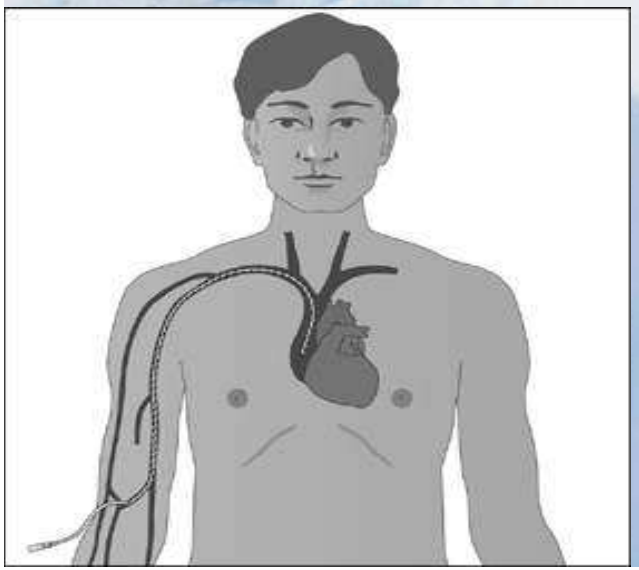
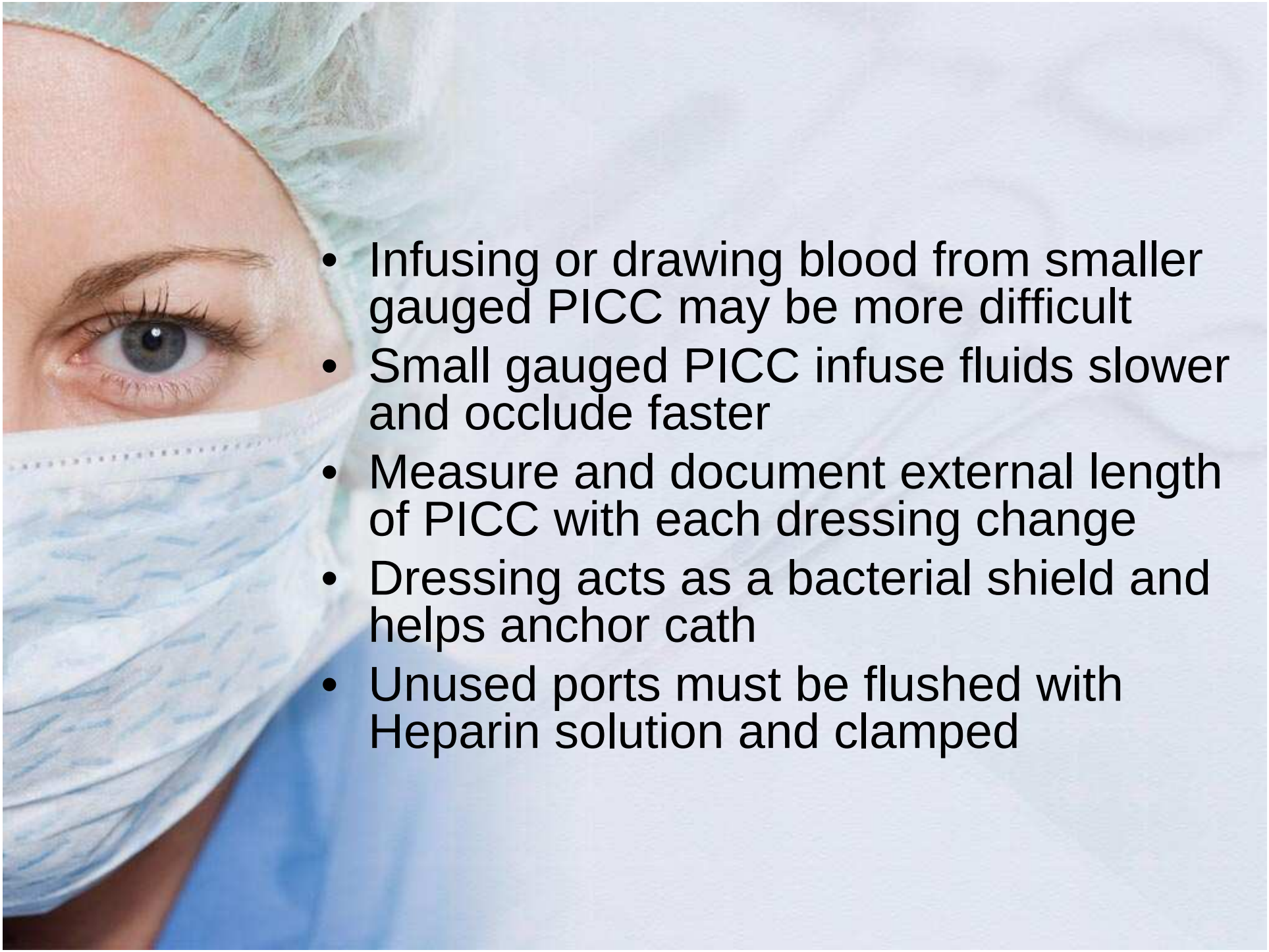
Peripherally Inserted Central Catheters (PICC)

- Used for intermediate to long term therapy
- May be single or double lumen
- Inserted percutaneously
  - Basalic vein
  - Cephalic vein
- Threaded into the superior vena cava
- May be inserted by specially trained RN

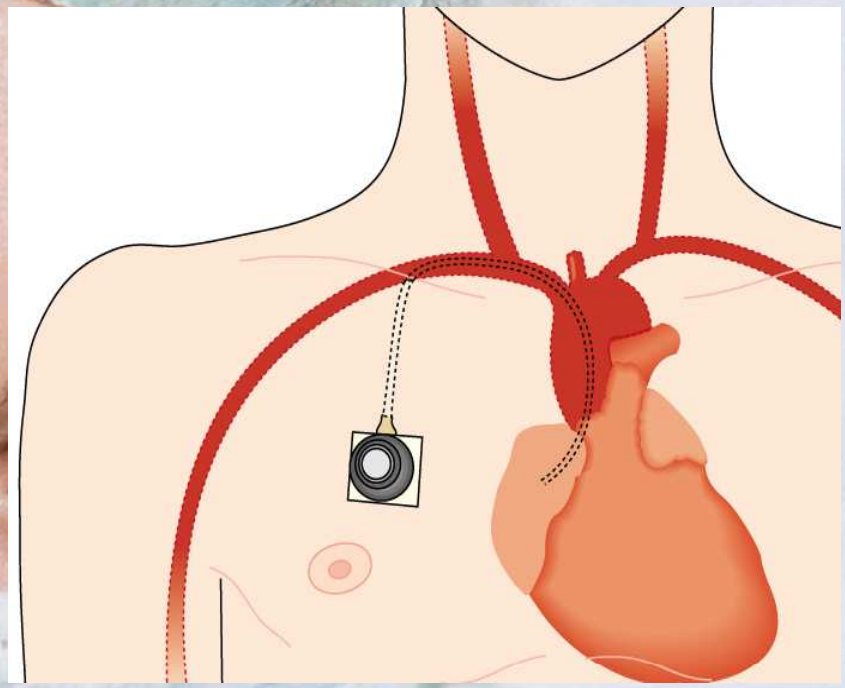




- Infusing or drawing blood from smaller gauged PICC may be more difficult
- Small gauged PICC infuse fluids slower and occlude faster
- Measure and document external length of PICC with each dressing change
- Dressing acts as a bacterial shield and helps anchor cath
- Unused ports must be flushed with Heparin solution and clamped

Implantable Ports

- Used for long term therapies
- Surgically implanted
- Consists of metal or plastic housing
- Silicone cath placed in superior vena cava
- Dressing required until insertion site healed

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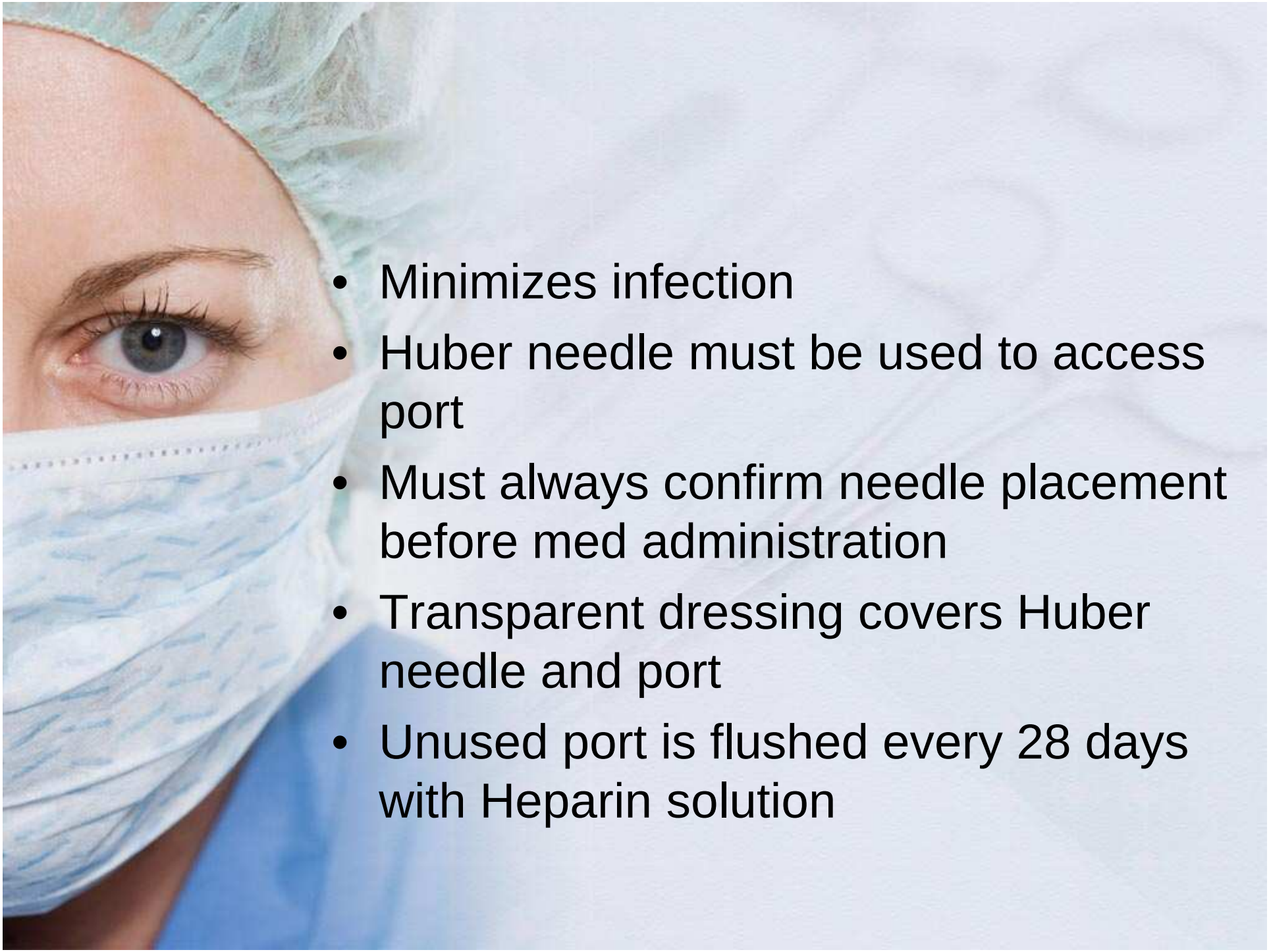
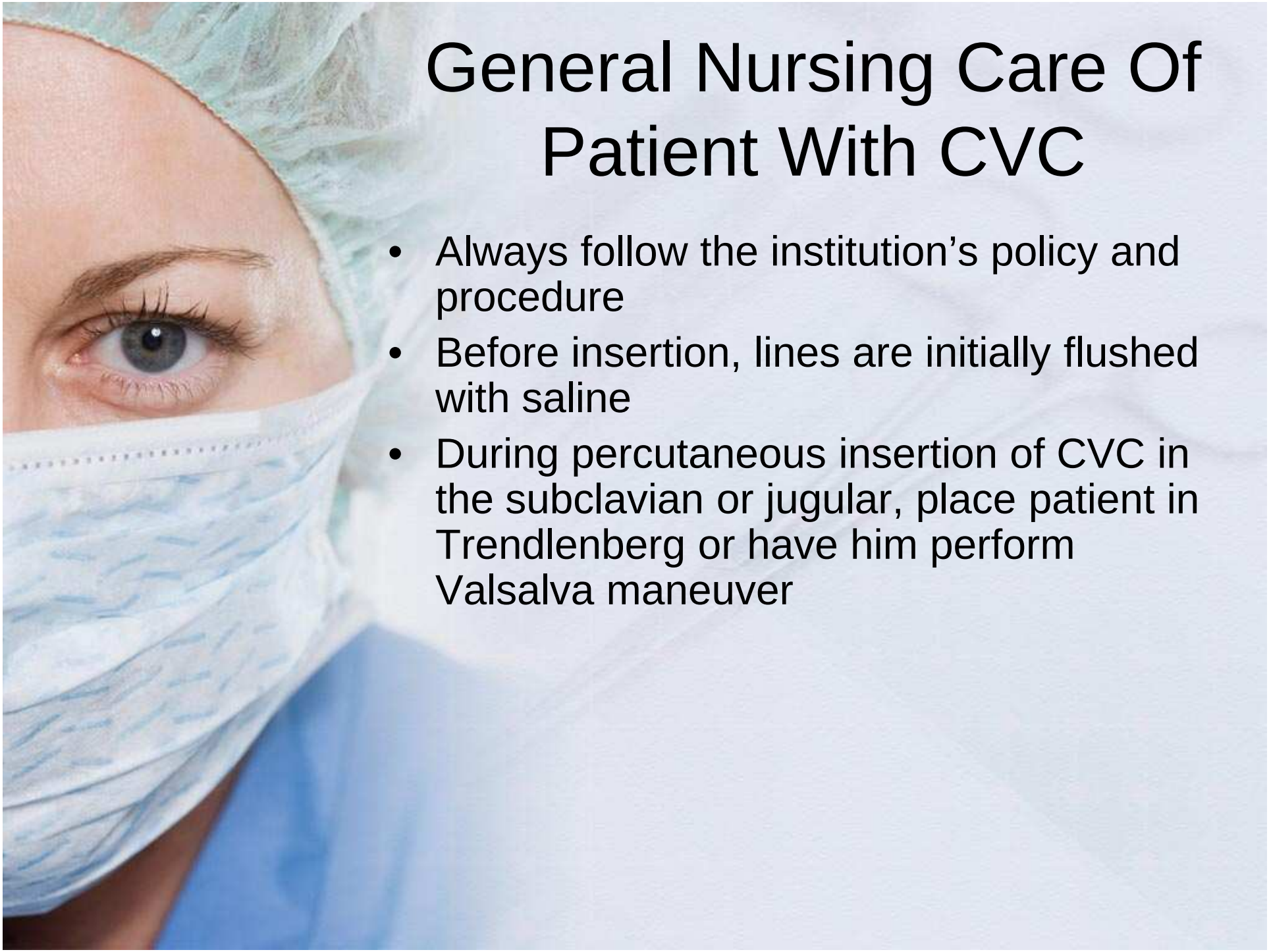
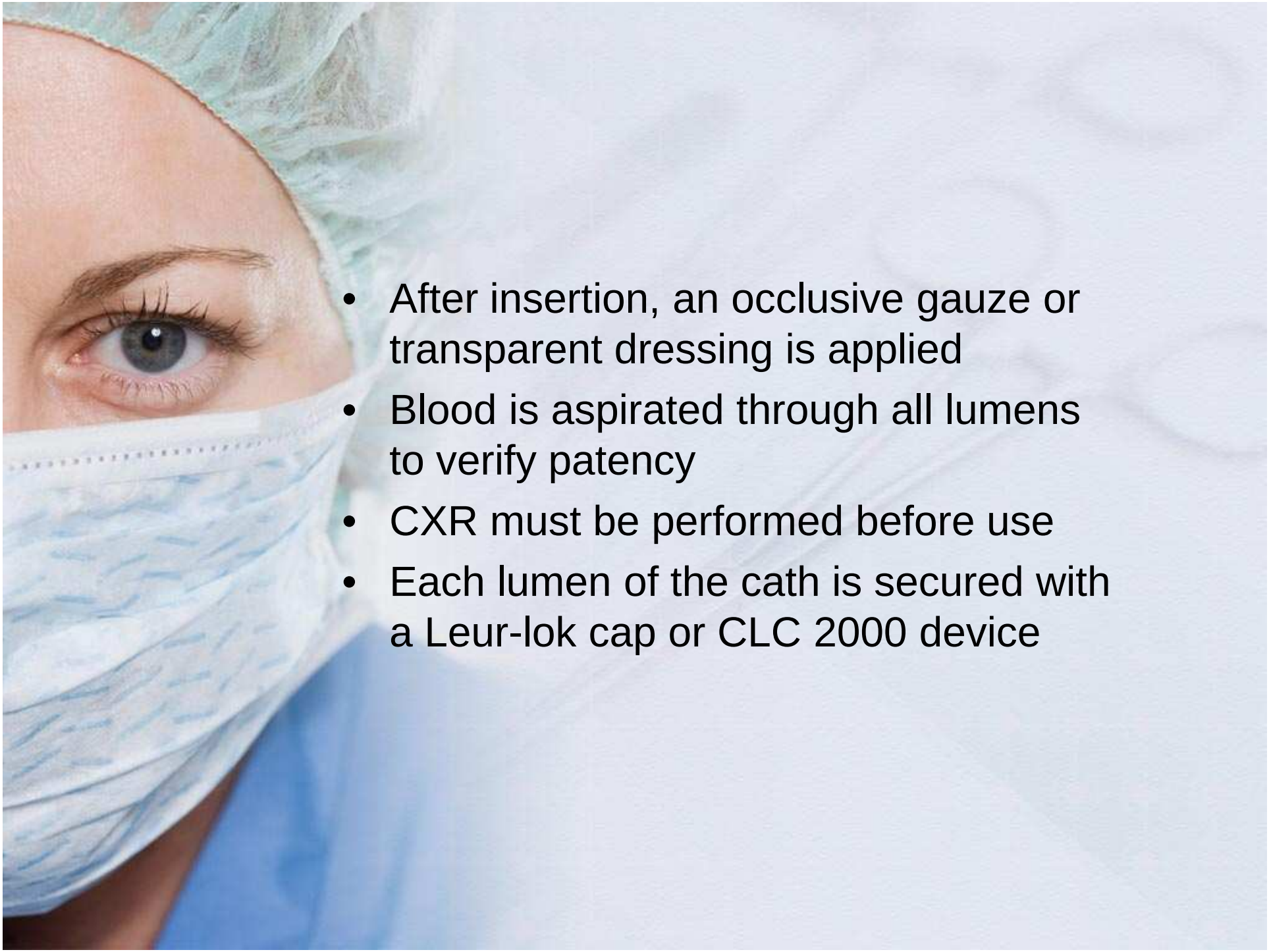


- Minimizes infection
- Huber needle must be used to access port
- Must always confirm needle placement before med administration
- Transparent dressing covers Huber needle and port
- Unused port is flushed every 28 days with Heparin solution

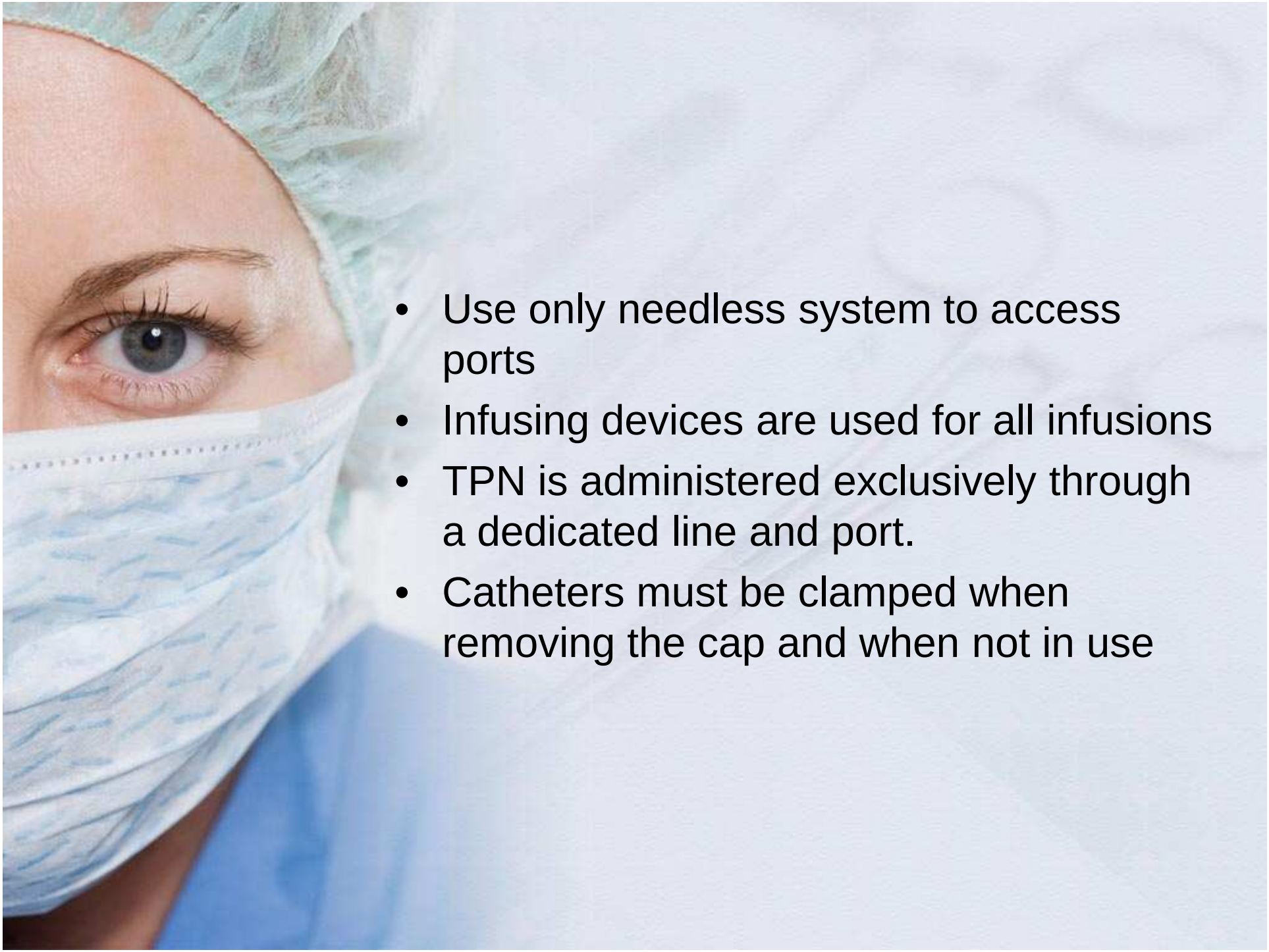


General Nursing Care Of Patient With CVC

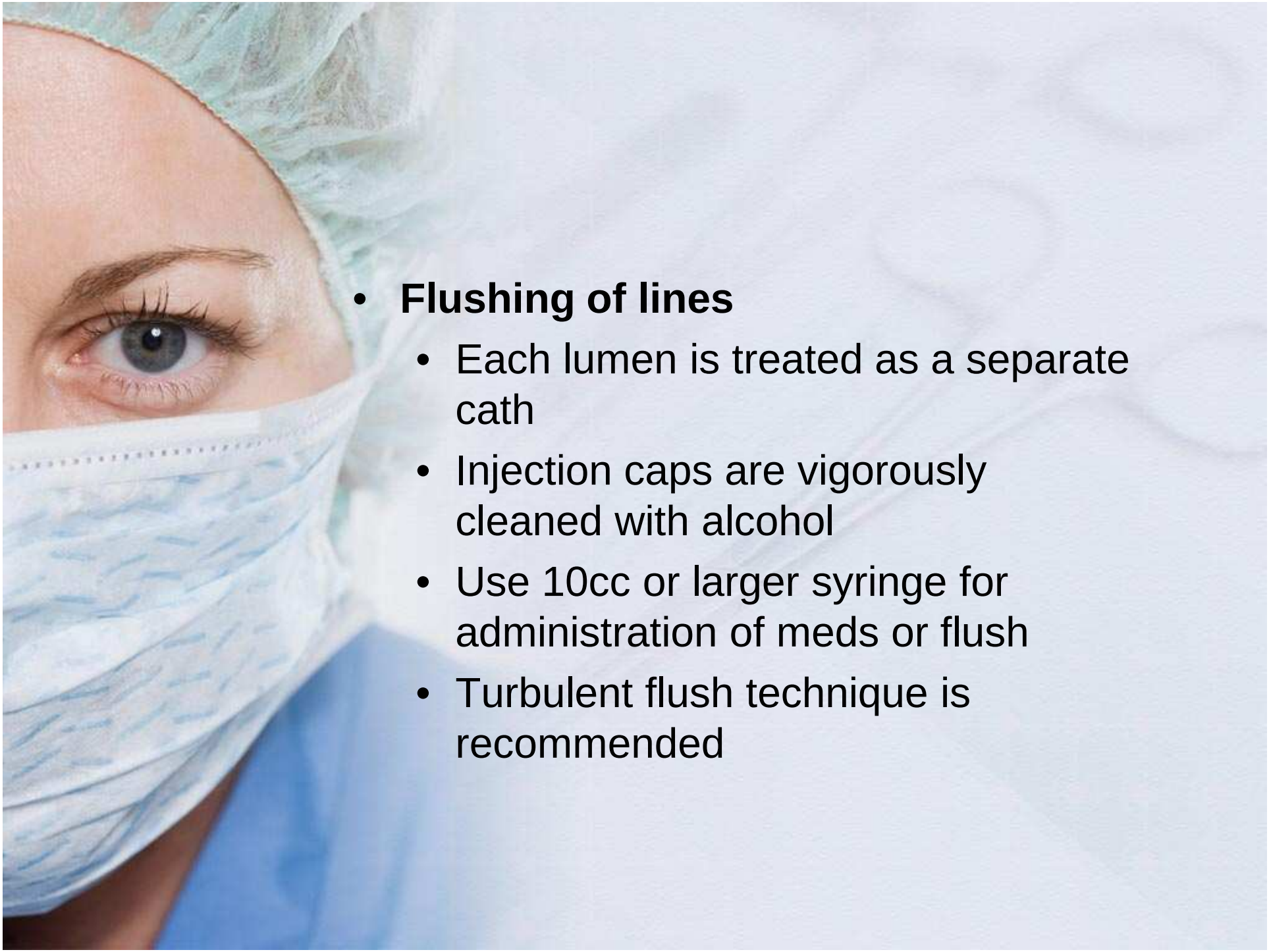
- Always follow the institution’s policy and procedure
- Before insertion, lines are initially flushed with saline
- During percutaneous insertion of CVC in the subclavian or jugular, place patient in Trendlenberg or have him perform Valsalva maneuver



- After insertion, an occlusive gauze or transparent dressing is applied
- Blood is aspirated through all lumens to verify patency
- CXR must be performed before use
- Each lumen of the cath is secured with a Leur-lok cap or CLC 2000 device



- Use only needless system to access ports
- Infusing devices are used for all infusions
- TPN is administered exclusively through a dedicated line and port.
- Catheters must be clamped when removing the cap and when not in use

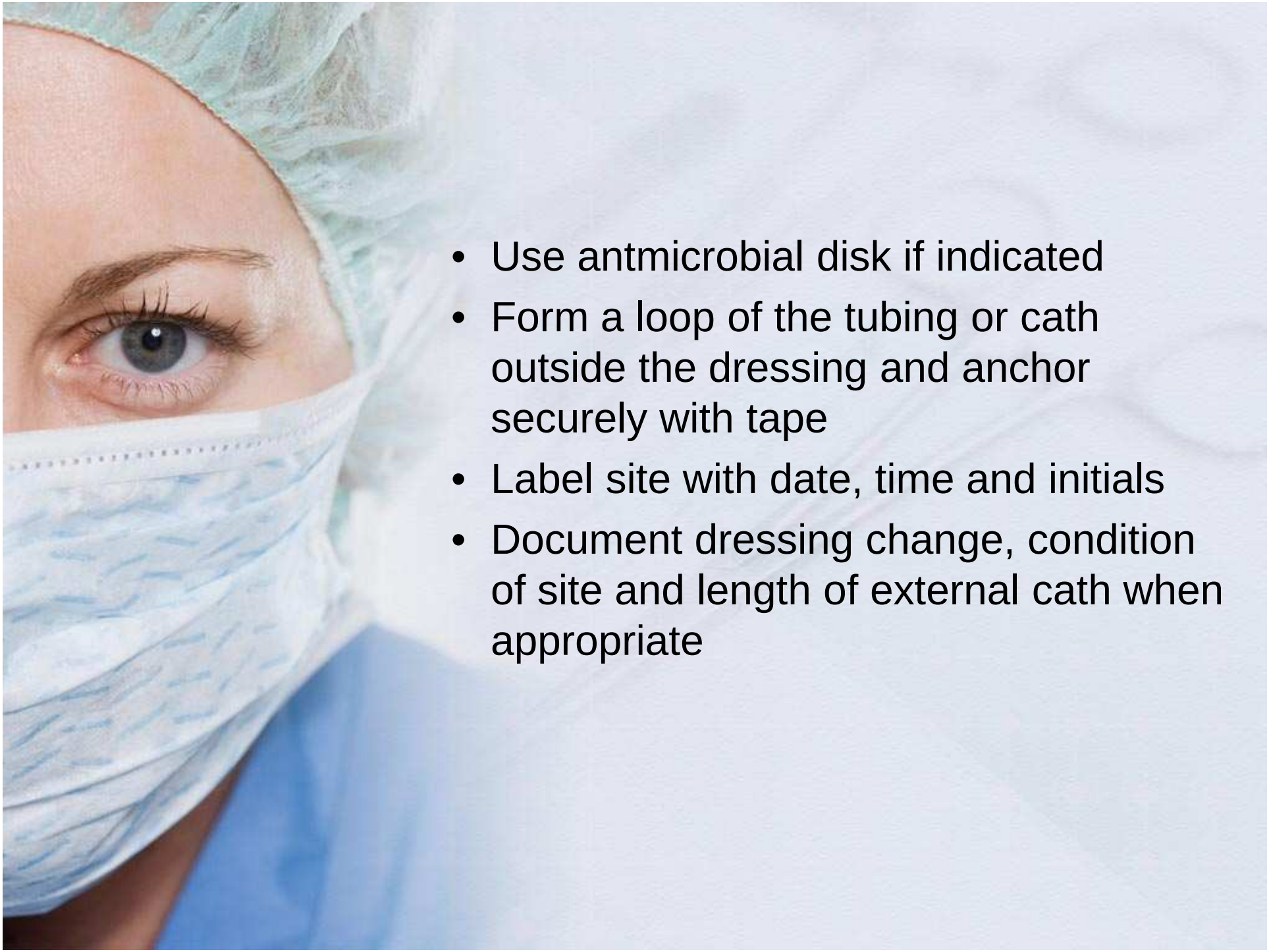


- **Flushing of lines**
  - Each lumen is treated as a separate cath
  - Injection caps are vigorously cleaned with alcohol
  - Use 10cc or larger syringe for administration of meds or flush
  - Turbulent flush technique is recommended

- For med administration, use SAS method
- If port is not to be maintained with a continuous infusion, end with Heparin flush solution
  - Peds 10kg> and adults – 100 units Heparin/ml with preservatives
  - Neonates and peds <10kg – 10 units Heparin/ml without preservatives
  - For specific amounts see procedure
- Clamp cath while infusing last ½ cc of flush
- If CLC 2000 used, do not clamp cath until syringe disconnected

- Site assessment and determination of external cath length is performed and documented with each dressing change
- Tubings are changed per protocol – 72hrs
- Caps and connections are changed per protocol – 3-7 days

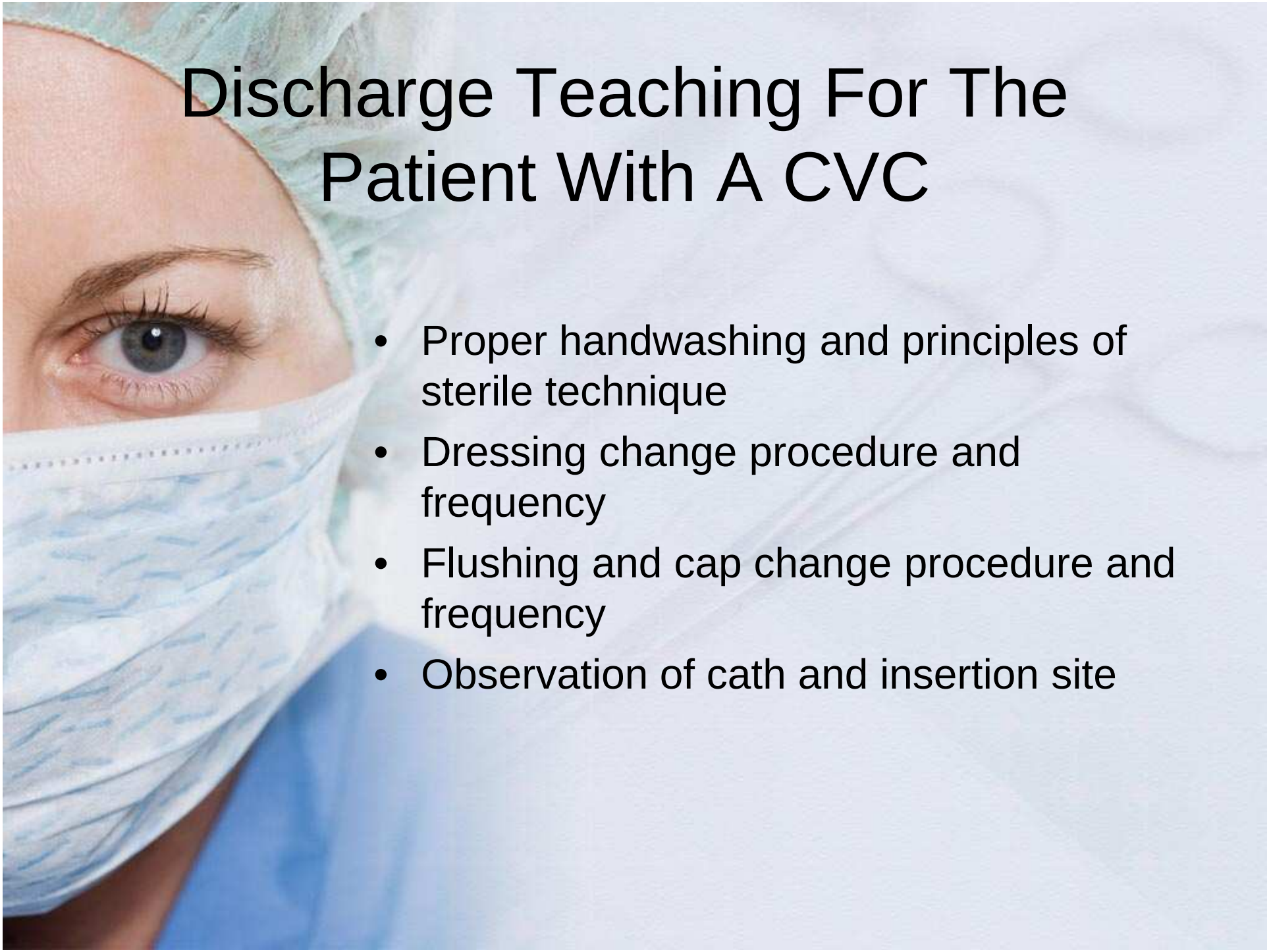
- Dressing changes per protocol
  - Use sterile technique
  - Change when damp, soiled or loosened
  - Change every 7 days if transparent
  - Change every other day if gauze is used
  - Clean skin around insertion site with alcohol in a circular motion. Also clean cath with alcohol
  - Next clean with Chloroprep, or more alcohol if patient sensitive to Chloroprep



- Use antmicrobial disk if indicated
- Form a loop of the tubing or cath outside the dressing and anchor securely with tape
- Label site with date, time and initials
- Document dressing change, condition of site and length of external cath when appropriate

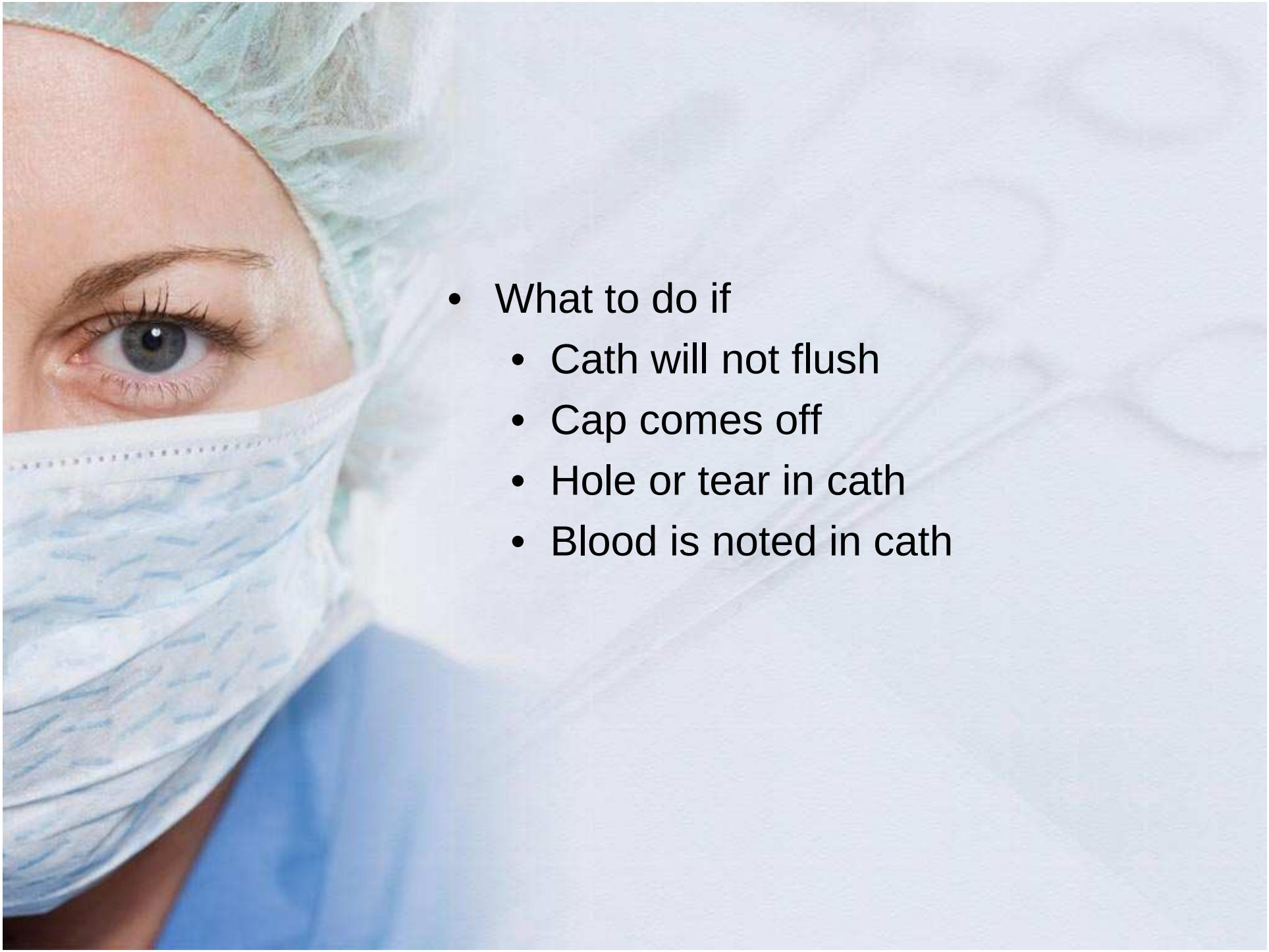
- For drawing blood specimen
  - Discard initial sample of blood
  - Collect specimen
  - Flush with 10cc saline
  - Flush with Heparin solution if indicated

- Monitor for complications
  - Infection
    - Phlebitis
    - Septicemia or pyrogenic reaction
  - Air embolism
  - Thrombosis/occlusion
  - Extravasation
  - Damaged cath

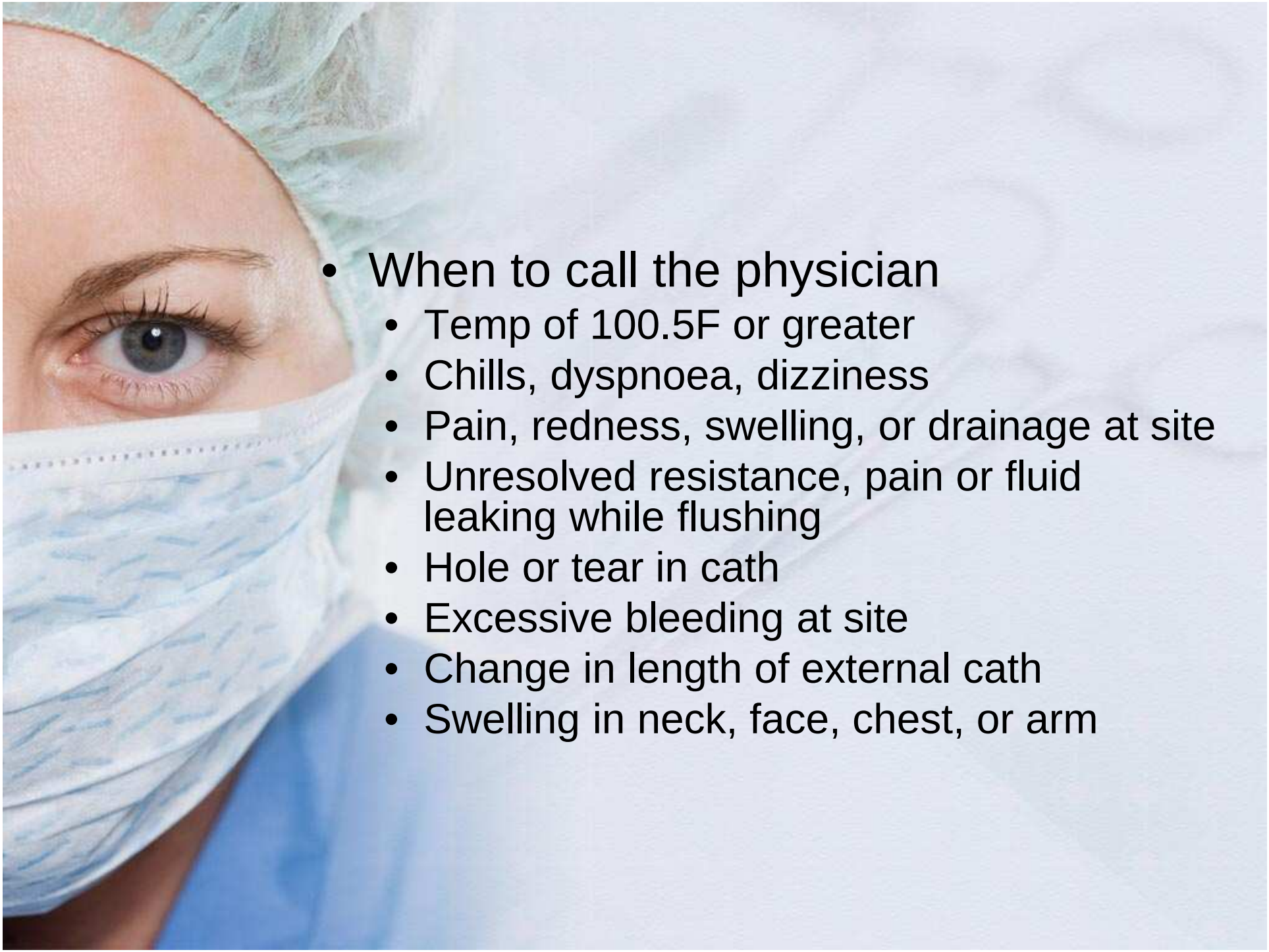


Discharge Teaching For The Patient With A CVC

- Proper handwashing and principles of sterile technique
- Dressing change procedure and frequency
- Flushing and cap change procedure and frequency
- Observation of cath and insertion site

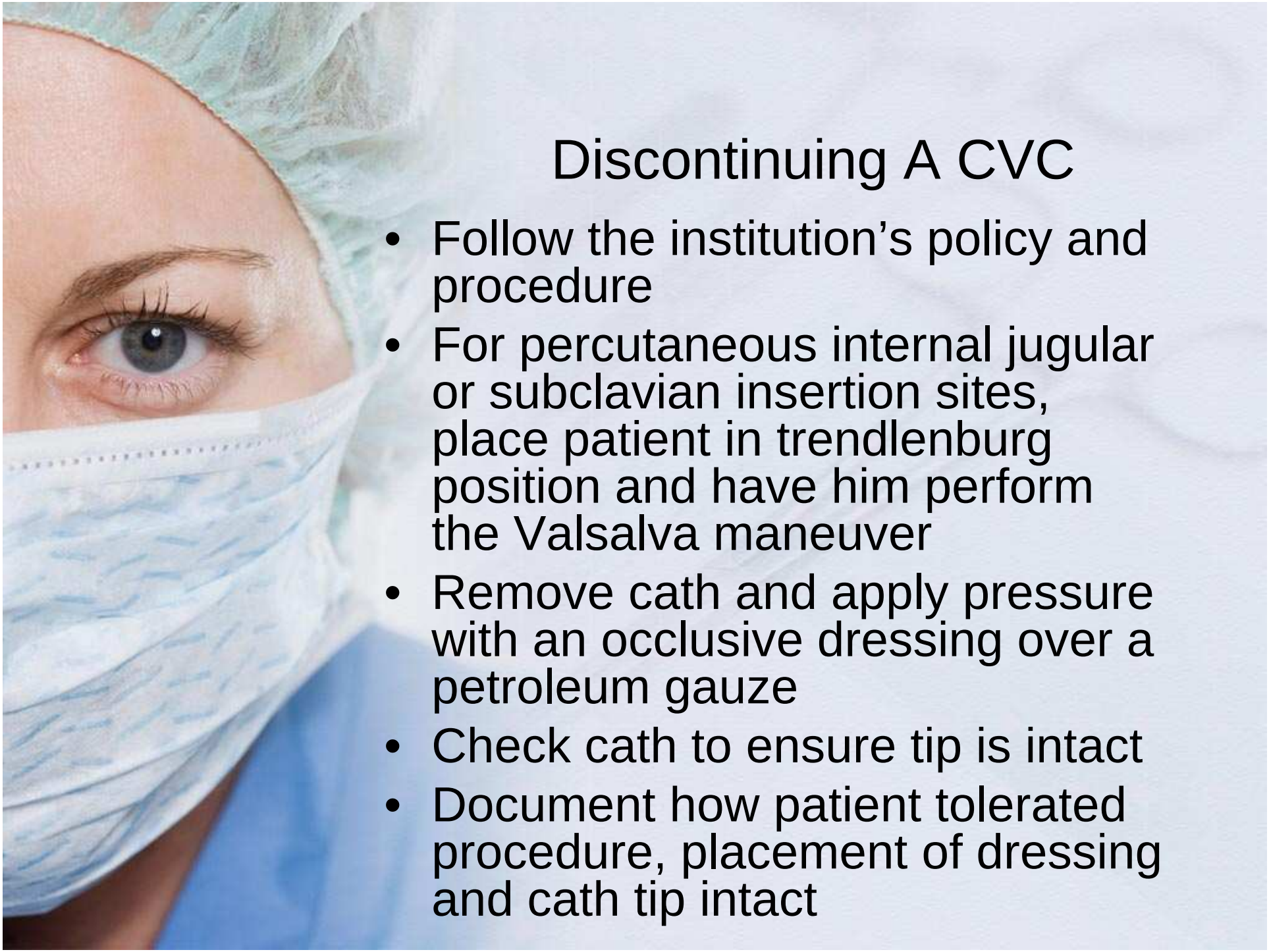


- What to do if
  - Cath will not flush
  - Cap comes off
  - Hole or tear in cath
  - Blood is noted in cath



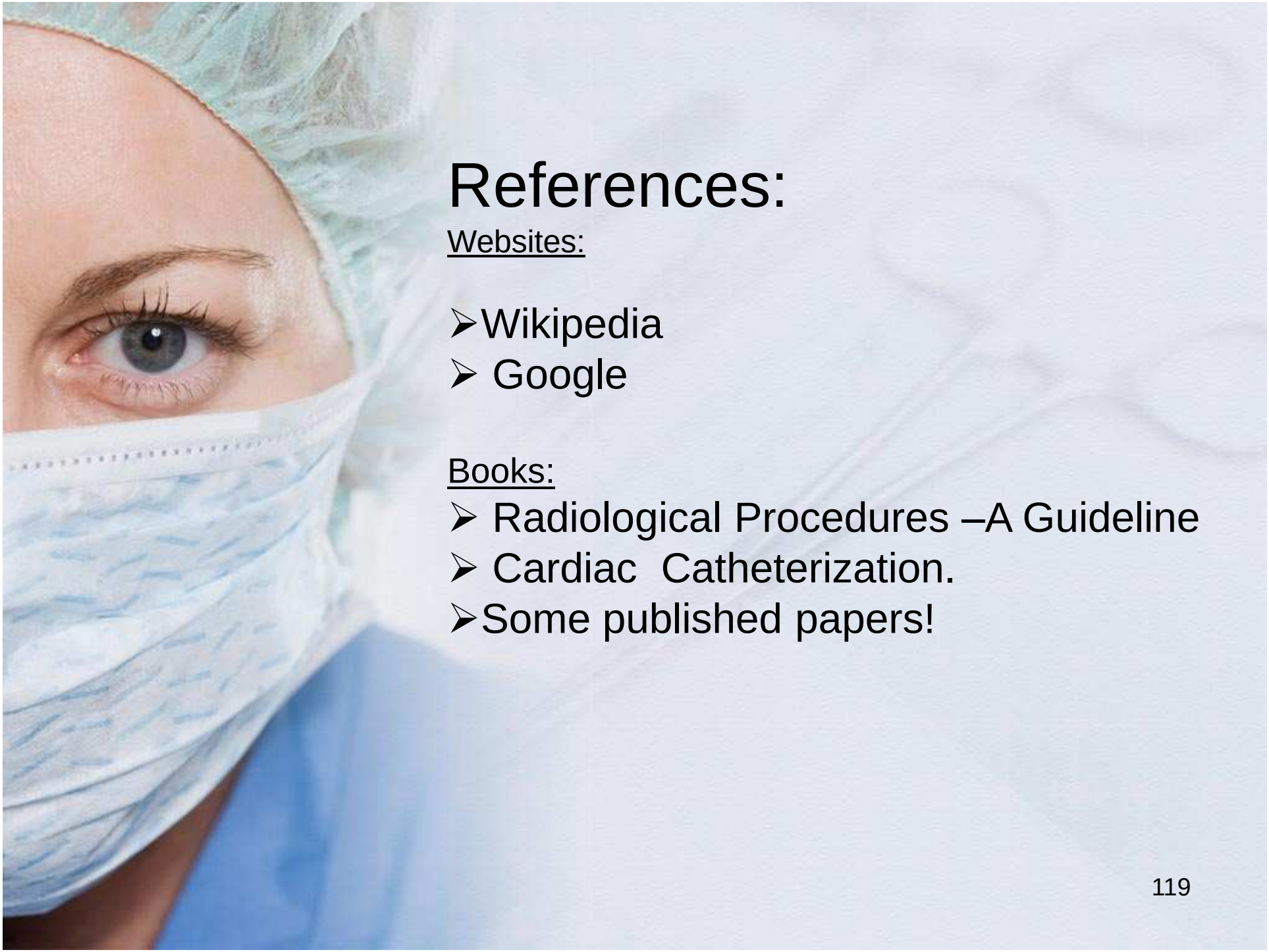
- When to call the physician
  - Temp of 100.5F or greater
  - Chills, dyspnoea, dizziness
  - Pain, redness, swelling, or drainage at site
  - Unresolved resistance, pain or fluid leaking while flushing
  - Hole or tear in cath
  - Excessive bleeding at site
  - Change in length of external cath
  - Swelling in neck, face, chest, or arm

- General safety measures
  - No sharp objects near cath
  - Clamp cath when not in use
  - No pulling or tension on the cath
  - Discard syringes and needles in sharps container
  - Activity limitations
  - Use a stress loop
- Home health referral



Discontinuing A CVC

- Follow the institution's policy and procedure
- For percutaneous internal jugular or subclavian insertion sites, place patient in trendlenburg position and have him perform the Valsalva maneuver
- Remove cath and apply pressure with an occlusive dressing over a petroleum gauze
- Check cath to ensure tip is intact
- Document how patient tolerated procedure, placement of dressing and cath tip intact



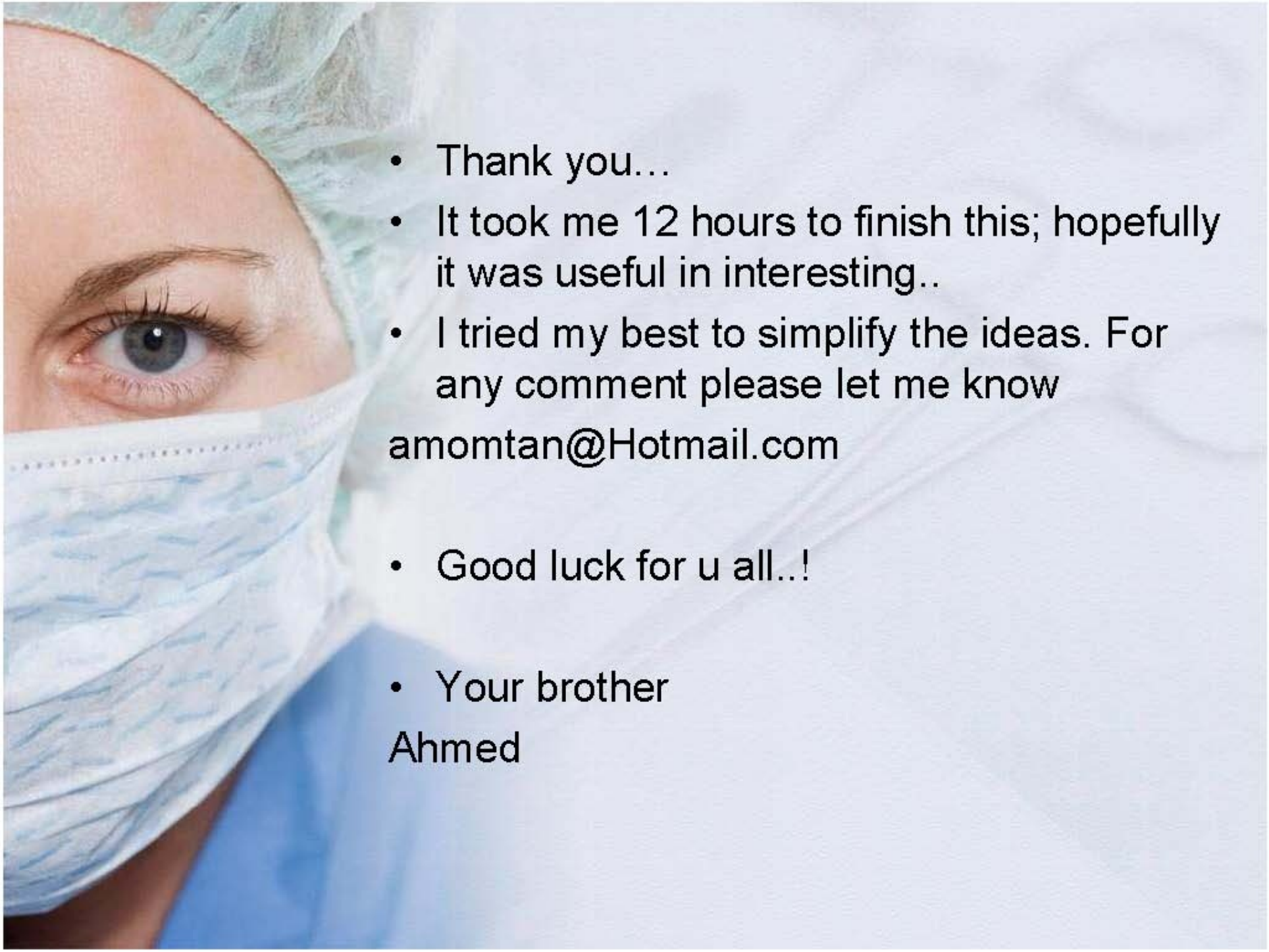
References:

Websites:

- Wikipedia
- Google

Books:

- Radiological Procedures –A Guideline
- Cardiac Catheterization.
- Some published papers!



- Thank you…
- It took me 12 hours to finish this; hopefully it was useful in interesting..
- I tried my best to simplify the ideas. For any comment please let me know

amomtan@Hotmail.com

- Good luck for u all..!

- Your brother

Ahmed