CAUTI: Catheter-Associated Urinary Tract Infections

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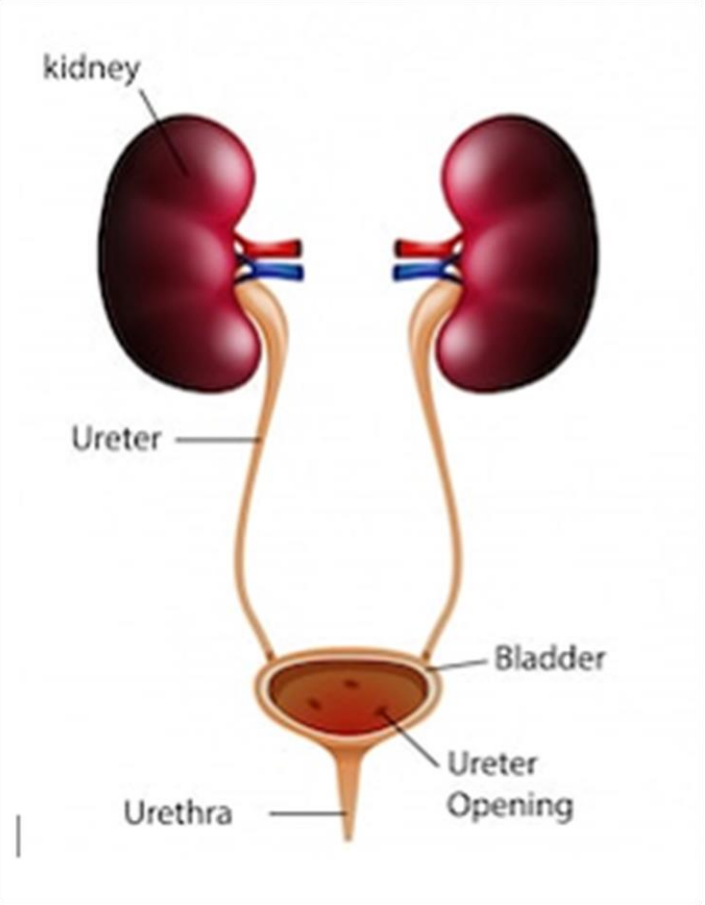
Objectives

- Review elements of aseptic technique important in the prevention of transmission of uropathogens
- Demonstrate opportunities to prevent pathogen transmission by appropriate aseptic technique
- Describe circumstances appropriate for the use of indwelling urinary catheters
- Describe alternatives to indwelling urinary catheters
- Demonstrate indwelling catheter maintenance guidelines in order to prevent pathogen transmission

What is a UTI?

- Urinary tract infections can occur anywhere in the urinary tract, but most often in the bladder
- Bacteria found in the intestines of humans are often the cause of urinary tract infections



Ronald, 2002

When does a UTI become a CAUTI?

The following are criteria must be met in order for a UTI to be considered a CAUTI:

- Patient has or had an indwelling catheter in place for more than 2 consecutive days, with day of device placement being day one prior to diagnosis, and the catheter was in place on the day of event or had been removed the day before diagnosis
- At least one of these signs/symptoms:
  - Fever (>38.0C)
  - Suprapubic tenderness*
  - Costovertebral angle pain or tenderness*
  - Urinary urgency^
  - Urinary frequency^
  - Dysuria
- A urine culture with at last one bacterium of $\geq 10^5$ CFU/ml

* with no other recognized cause

^ these symptoms cannot be used with catheter in place, as an indwelling catheter can cause complaints of frequency, urgency, or dysuria

Is this CAUTI?

Mr Davis was admitted to the hospital on Monday, and had an indwelling catheter placed once he arrived to the unit. The catheter was removed on Tuesday. On Thursday, he began to complain of burning with urination. A urine culture revealed the presence of e. coli and the primary physician began treatment with an antibiotic. Does Mr Davis's UTI meet the criteria for a CAUTI?

No. The indwelling catheter was in place <48 hours. Symptoms also began >24hours after the catheter was removed.

Is this CAUTI?

Miss Liza is incontinent and had a urinary catheter placed to allow a significant wound on her sacrum to heal. The catheter had been in place for 5 days, and the bedside RN noted that Miss Liza's urine looked very dark. She obtained a urine culture, which showed 1,000 CFU of gram negative rods. Miss Liza denies any pain or discomfort. Is this a CAUTI?

No. Miss Liza is not suffering from any symptoms of a urinary tract infection. Additionally, the number of bacteria does not meet the requirement for a CAUTI.

Is this CAUTI?

Mr Ronnie was admitted to the hospital in critical condition and had an indwelling catheter in place. As he improved, the catheter was removed on day 4. The next morning, he developed a fever, and part of his fever investigation included a urine culture, which grew >100,000 CFU of Klebsiella. The primary physican began antibiotic treatment. Is this a CAUTI?

Yes. Mr Ronnie had the indwelling catheter in place >48 hours, and it was removed <24 hours before he developed symptoms. His culture grew >10^5 CFU.

Catheter Associated Urinary Tract Infections

- One of the most common types of hospital acquired infections (HAIs)
- 75% of UTIs that develop during hospitalization are associated with an indwelling urinary catheter
- 12-16% of hospitalized patients have an indwelling catheter placed
- About 5% of long-term care residents use indwelling catheters
- With an indwelling catheter in place, the daily risk of acquiring a UTI is 3-7%
- CAUTI infection ratio increased by 19% in 2022 compared to the previous year – Leapfrog, 2023

Magill, 2014; Maki, 2001

Risk of Urinary Tract Infections

- Pain and discomfort
- Increased use of antibiotics – can lead to antibiotic resistance
- Risks associated with antibiotic use, such as c. diff or candida
- Prolonged hospitalizations
- Increased costs for medical care
- UTIs put patients at risk of bacteremia and sepsis – CAUTI is the leading cause of secondary hospital acquired bloodstream infections, which have a mortality rate of 10%
- Increased mortality

IHI, 2011; Gould, 2009

Costs of CAUTI to the institution

- Costs associated with healthcare-acquired infections must be absorbed by the institution
- On average, a CAUTI will cost the institution $14,000
- Increase length of stay – fewer beds for new patients
- Increased use of antibiotics – higher risk of antibiotic resistance, and increased risk of secondary issues related to the use of antibiotics

AHRQ

Factors that contribute to development of CAUTI

- Failing to perform hand hygiene prior to handling catheter
- Breaks in the closed system
- Contamination of the drainage bag or tubing
- Not using sterile technique when catheter inserted
- Foley bag raised above the level of the bladder
- Catheter not secured to body
- Catheter left in place longer than necessary

Patient related risk factors

- Aged > 50 years
- Incomplete emptying of the bladder
- Fecal incontinence
- Poor hygiene
- Diabetes
- Bacterial colonization
- Sickle cell anemia
- Immobility
- Dehydration
- History of UTIs

AVOID PLACING INDWELLING CATHETERS

- Ensure patient meets criteria for placement of an indwelling catheter
- Avoid/remove policies or practices that include automatic catheter placement

Use Indwelling Catheters Only When Indicated

Appropriate	Inappropriate
Acute urinary retention or obstruction	Incontinence
Accurate measurement of urinary output in critically ill patients	Prolonged postoperative duration without appropriate indication
Perioperative use in selected surgeries	To obtain a urine culture when the patient can voluntarily void
To assist healing of perineal or sacral wounds	
Hospice/palliative/comfort care	
Required immobilization for trauma or surgery	

Meddings, J, et al, 2015

Alternatives to Indwelling Catheters

- External catheter
  - Wicking system
  - Condom catheter
- Intermittent straight catheterization
- Incontinence supplies
  - Adult diaper
  - Chux
  - Pads
- Toileting protocols
- Bedside commodes
- Urinals
- Bladder scanner

Alternatives to Indwelling Catheter – External Catheter

Alternatives to Indwelling Catheter – Incontinence supplies

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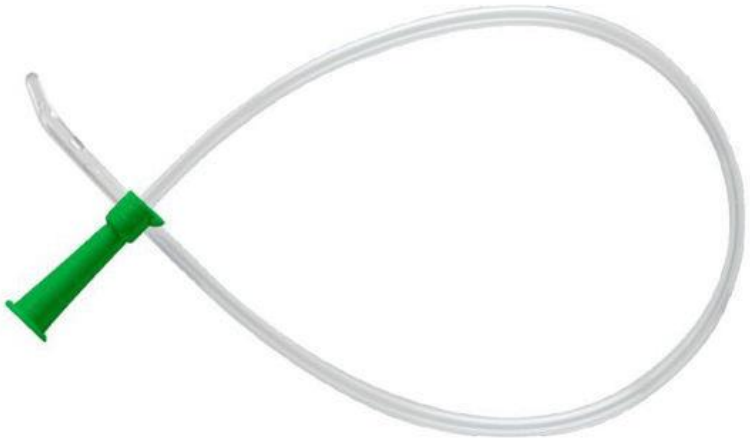
Alternatives to Indwelling Catheter - Bedside Commodes and Urinals

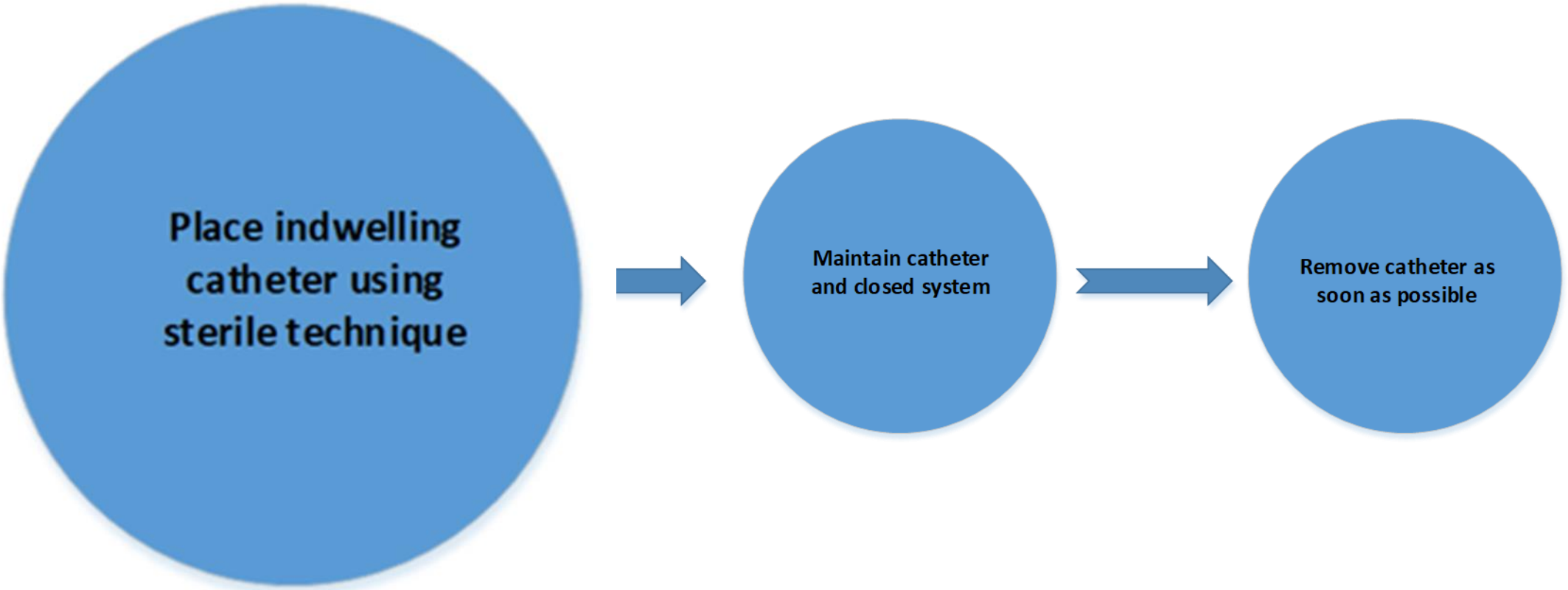
Alternatives to Indwelling Catheter – Toileting protocols

- Focuses on a schedule for voiding
- Typically begins with frequent trips to the toilet, but time between trips can be extended as bladder allows
- Increase access to toilet – use of bedside commodes, elevated seats, grab bars
- Mobility assistance and training

Alternatives to Indwelling Catheter – Bladder scanner

Alternatives to Indwelling Catheter – Intermittent straight catheterization




Place indwelling catheter using sterile technique
Maintain catheter and closed system
Remove catheter as soon as possible

Best Practices for Prevention of CAUTI

- Use urinary catheters only when indicated
- Remove indwelling catheters as soon as possible
- Practice hand hygiene before handling catheter site or apparatus
- Use aseptic technique and sterile equipment when inserting a catheter
- Maintain a sterile, closed drainage system
- Provide routine hygiene for meatal care
- Keep collection bag below the level of the bladder at all times
- Replace the entire system if it becomes contaminated
- Empty collecting system regularly, using a separate container for each patient
- Maintain unobstructed urine flow
- Obtain urine cultures from catheter sampling port

HICPAC, 2009

Aseptic Technique

Asepsis or ‘sterile’ technique refers to measures taken to get the microbial count as low as it can go. (Crow, 1989)

- Keeping clean, dirty, and sterile separate
- Ensure sterile technique when donning and wearing sterile gloves
- All items on the sterile field should be sterile, and open and transferred to the sterile field in a way that maintains sterility
- Sterile field should be continuously monitored for contamination
- Trash should not be placed near the sterile field
- Any contact from a non-sterile item renders the entire sterile field contaminated

Proper Indwelling Catheter Insertion

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Improper indwelling catheter placement

Watch the following video and see how many instances of contamination you see

Improper Indwelling Catheter Placement

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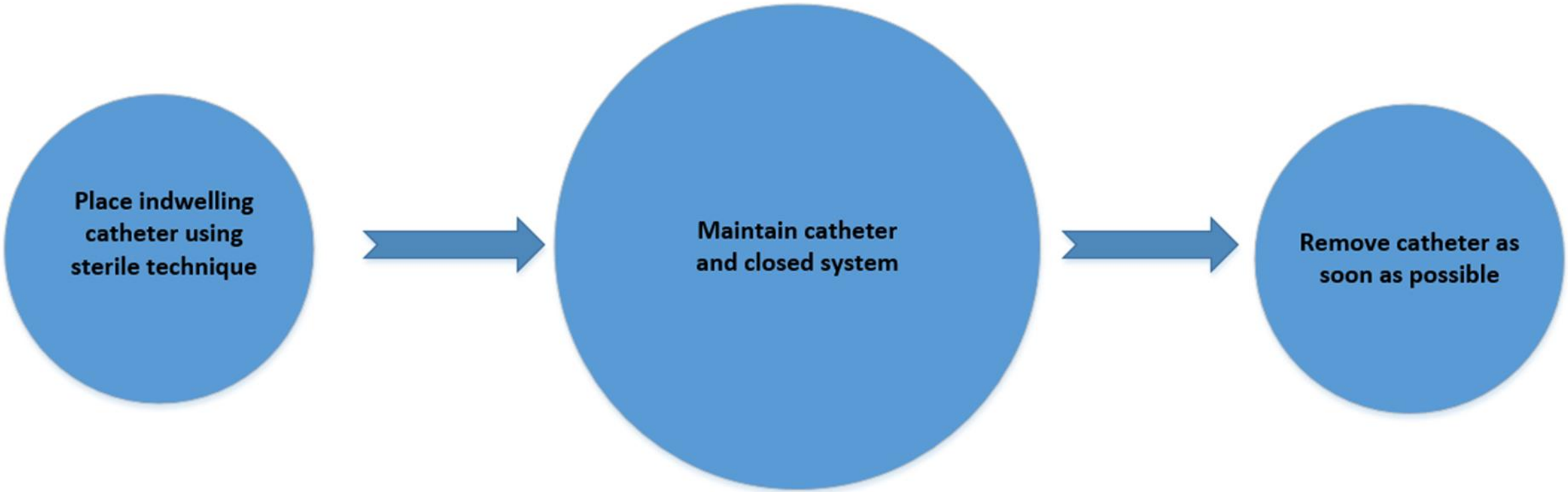
Improper Catheter Placement

- It is very easy to make errors, especially when rushed.
- You can help avoid contamination errors by:
  - Having at least one other staff member present
  - Ensuring the patient is able to cooperate (if not, additional staff member may need to be present)
  - Preparing the area prior to setting up the sterile field


Place indwelling catheter using sterile technique
Maintain catheter and closed system
Remove catheter as soon as possible

Maintaining the Indwelling Catheter

- Each day that an indwelling catheter is in place, there is an increased risk of infection
- Additionally, biofilm will develop on the catheter, making infections more difficult to treat
- There are steps we can take to decrease the risk of infection while the catheter is in place
  - Practice hand hygiene before handling catheter site or apparatus
  - Maintain a sterile, closed drainage system
  - Provide routine hygiene for meatal care
  - Keep collection bag below the level of the bladder at all times
  - Replace the entire system if it becomes contaminated
  - Empty collecting system regularly, using a separate container for each patient
  - Maintain unobstructed urine flow
  - Obtain urine cultures from catheter sampling port

Hanchett, 2012

Biofilms

- Biofilms form when proteins, electrolytes, and pathogens attach to the surface of the catheter
- This becomes an immobile community with is difficult to eradicate and allows bacteria to flourish
- While antibiotics are often unable to penetrate the biofilm, bacteria may move in and out of the matrix and cause infections

Trautner, 2004

What's Wrong With These Pictures?

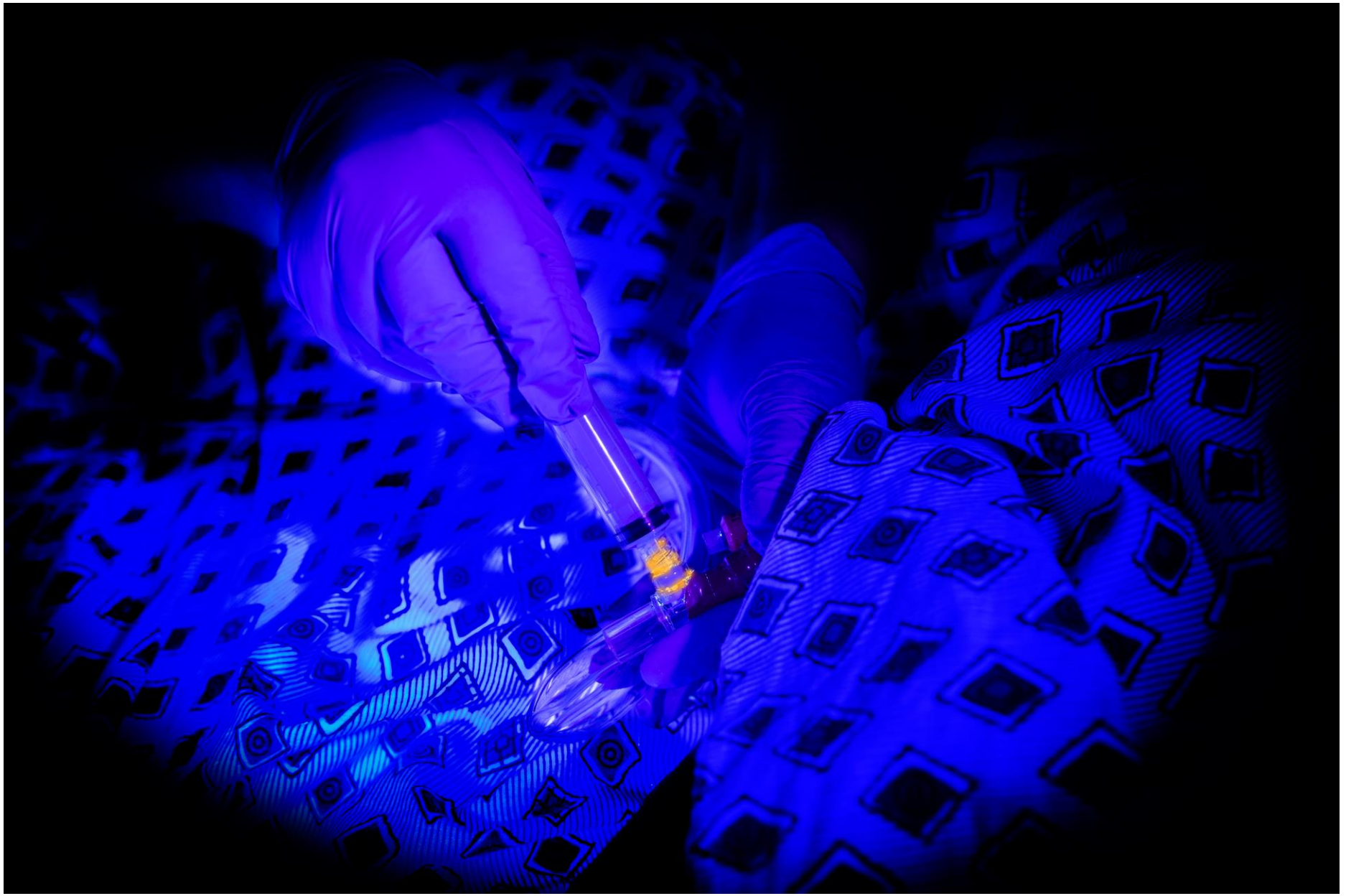
Let's look over the following photographs. Identify what is wrong with each photo, how these errors impact patient health, and what intervention should take place.

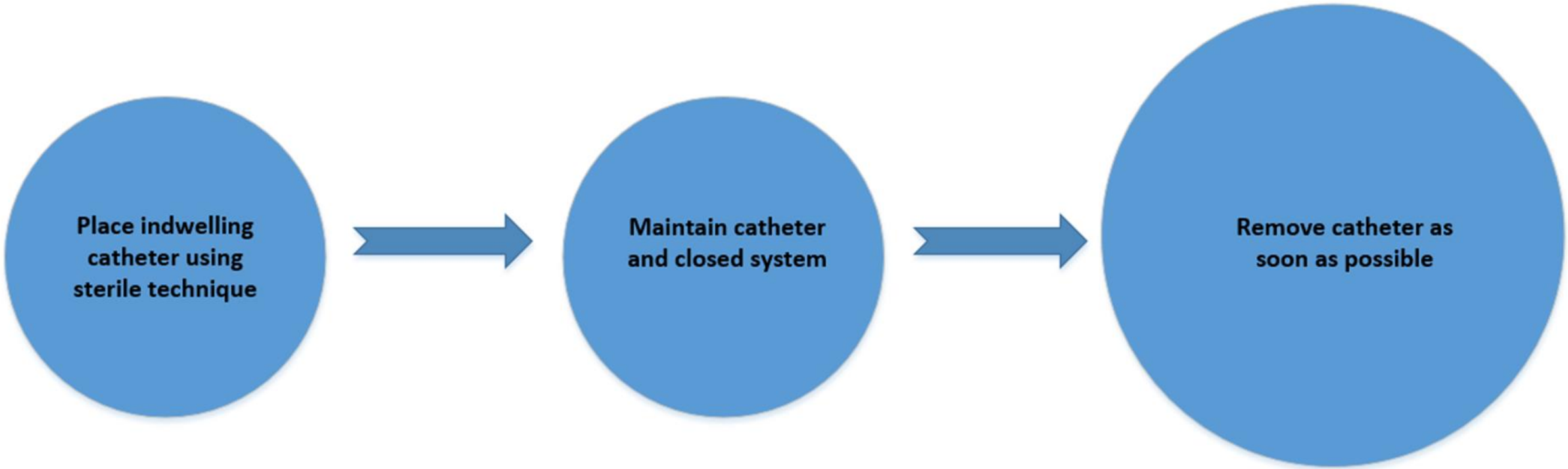

EURO
350
325
300
275
250
225
200
175
150
125
100
75
50
45
40
35
30
25
20
15
10
5


REMOVE with ALCOHOL

Urinary Samples From An Indwelling Catheter

- Urinary samples should be taken from the sampling port located on the closed system
- It is important to cleanse the port thoroughly so that pathogens are not inadvertently introduced to the bladder




Place indwelling catheter using sterile technique
Maintain catheter and closed system
Remove catheter as soon as possible

Measure to assist with early removal

- Use CAUTI bundles
  - Bundles can include daily reminders to review the need to an indwelling catheter
  - EMR reminders for physicians and APPs

- Nurse driving protocols
  - Allows nurses to remove indwelling catheters when pre-determined criteria are met

Saint, 2013; Oman, 2012

Take Away Points

- Place an indwelling catheter only when necessary and remove as soon as possible
- Be sure to use aseptic technique when placing an indwelling catheter
- Ensure hand hygiene is completed prior to handling an indwelling catheter or the closed system
- If there is a break in the system, the catheter must be removed
- Use bundles or nurse driven protocols to facilitate process improvement and allow staff to remove catheters as soon as criteria are met

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