

2nd Edition



Fundamentals of FORENSIC NURSING & Introduction to INDIAN LAWS

Semester V

Includes the latest Criminal Laws—BNS, BNSS and BSA

As per the Revised INC Syllabus for BSc Nursing

Gautam Biswas
Nidhi Sagar

Forewords
Virginia A Lynch
Rakesh K Gorea

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CHAPTER

6 Collection and Preservation of Evidence

"Physical evidence cannot be intimidated. It does not forget. It sits there and waits to be detected, preserved, evaluated, and explained."

— Herbert Leon MacDonell
(Inventor of the MAGNA Brush fingerprint device, and expert in blood splatter analysis)

Learning Objectives

At the end of this chapter, the student should be able to:

1. Define and discuss forensic evidence.
2. Explain the role of forensic nurses in collection and preservation of evidence.
3. Describe the documentation of biological and other evidence related to criminal/traumatic event.
4. Discuss forwarding of biological samples for forensic examination.

CASE STUDY 11

You are a forensic nurse posted in the emergency room (ER). Ms SM, a 22-year-old female presents with alleged history of stabbing by her ex-boyfriend because of jealousy and frustration (as shown in **figure**). She is bleeding profusely and her clothes are soaked in blood. She is to be taken to the emergency OT shortly.



Q1. What can the forensic nurse do to help in this case?
Q2. What evidence can be collected that may be used in the court case?
Q3. What documentation will be most important from the perspective of the nurse?*

**Discuss the questions with your teacher/facilitator.*

INTRODUCTION

- **Forensic evidence:** Any item or information legally submitted and accepted by a court to prove or disprove a claim (determine the truth of any matter under investigation).
- The collection, preservation, and analysis of the evidence from the crime scenes and victim's/perpetrator's body are often critical in determining a suspected person's guilt or innocence.
- In addition to providing comprehensive health care, forensic nurse also has the legal, ethical, and professional responsibility of identifying, collecting, storing, documenting and maintaining the chain of custody of evidence which contributes to the effectiveness of the care provided to the victims and to justice.

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- Forensic evidence collection is a systematic process that follows legal requirements and guidelines. Forensic nurse should:
  a. Ensure that proper documentation is made prior to handling evidence.
  b. Maintain the chain of custody by whom the evidence was handled.
  c. Apply appropriate analysis and preservation methods.
  d. Uphold legal and ethical standards.
  e. Preserve evidence properly so that it is usable in the future.

The advent of DNA testing has revolutionized forensic analysis of biological evidence and greatly affected criminal proceedings. The following sections comprise an overview of forensic evidence collection.

TYPES OF EVIDENCE

There are various types of evidence which can be produced before the court:

1. **Oral evidence:** All statement which the court permits or requires to be made before it by witnesses, in relation to matter of fact under inquiry. It must be direct.
   - **Direct evidence** will prove the point in fact without interpretation of circumstances. An ER nurse may be called as a witness regarding what happened while caring for a patient.
2. **Documentary evidence:** All documents including electronic records produced for the inspection of the court.
   - *Primary evidence:* Documents itself produced for the inspection of the court, e.g., clinical notes, injury documentation, photographs showing the injuries, etc. It is considered to be the *best evidence*.
   - *Secondary evidence* is allowed by the court in the absence of the primary evidence, e.g., certified copies.
3. **Real evidence (or physical evidence)** consists of material items involved in a case, objects and things the court can physically hold and inspect.
   - Some consider physical evidence as *nonliving inorganic matter* (any material, condition, solid, liquid, or gas), whereas biological evidence as *living organic matter* **(Table 6.1)**.
   - Physical evidence is admitted because it tends to prove or disprove an issue of fact in a trial.
4. **Indirect/circumstantial evidence** relies on an inference to connect it to a conclusion of fact.
5. **Hearsay evidence** is the statement of a witness not based on his personal knowledge but on what he heard from others.

Table 6.1: Real evidence.

Physical evidence	*Biological evidence*
• Clothing • Tool markings • Fingerprints • Bullet and shell casings, gun • Gunpowder particles • Fibers • Shoe and tire impressions • Creams, lotions, toothpaste • Electronic devices • Glass fragments, paint chips, soil	• Blood and seminal stains • Teeth and bite marks • Insects • Plants and plant materials, wood chips • Saliva, vomitus, urine, feces • Tissue and organs • Hair • Skeletal remains, bones or bone fragments

Purpose of Evidence Collection

Physical evidence establishes a link between victim and perpetrator **(Box 6.1)**.

Box 6.1: Reasons/purpose for evidence collection and preservation.

a. Proves that a crime has been committed
b. Helps establish a modus operandi of a crime
c. Confirm or refute an alibi or statement
d. Identify weapon(s) of injury
e. Connect the presence of a suspect(s) in relation to a crime
f. Acquits the innocent
g. Substantiates the testimony of the victim
h. Identification of biological markers specific to a particular individual (e.g., DNA)
i. Identification of ingested substances, such as drugs, poisons, or any other substance
j. More reliable than an expert witness

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PRINCIPLE OF EXCHANGE

- The principle governing evidence collection was put forth by Edmond Locard, a 20th century French criminologist. Locard's theory is the basis for linking victims, perpetrators and crime scenes.
- Locard's **principle of exchange** states that "When two objects come into contact with each other, there is always some transfer of material from one to the other". It means that *every contact leaves a trace, i.e.*, during a criminal act, the perpetrator brings something into the scene and takes away something from the scene. For example, footprints, fingerprints, hair, fibers, broken glass, tool marks, or DNA from skin, blood, semen or other body fluids etc. **(Fig. 6.1)**.
- Once this transfer is detected and the substance classified and/or individualized, the forensic specialist will have a clue as to what may have occurred at the scene.
- The forensic scientist's job is to uncover and reconstruct how the evidence fits into the investigation of a crime.

CONSENT

- Written, informed consent from persons more than 12 years should be obtained prior to evidentiary examination or else from parents/guardian if he/she is <12 years.
- This consent should inform the patient what evidence will be collected (including photography, if planned).
- Consent forms should address confidentiality issues.

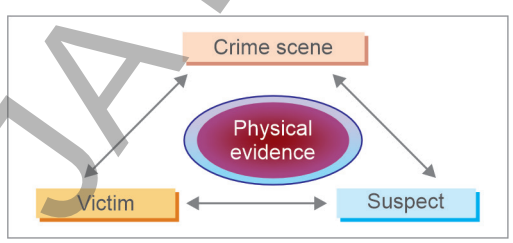

Fig. 6.1: Locard's principle of exchange.

GUIDELINES FOR COLLECTING AND PRESERVING EVIDENCE

- The essential requirements for evidence collection and preservation are shown in **Figure 6.2**.

Forensic uses of "Vacutainers":

a. **Yellow top vacutainers (contain acid citrate and dextrose solution):** Useful for conventional serological testing and DNA testing.
b. **Purple top vacutainers (contain EDTA):** Useful for DNA testing; may inhibit certain conventional serological tests.
c. **Red top vacutainers (no additives):** Useful for conventional serological tests; less useful for DNA testing; can be used for pregnancy and HIV testing.
d. **Grey top vacutainers (contain sodium fluoride and sometimes EDTA):** Useful for toxicological testing; not suitable for conventional serological analysis and may not be suitable for DNA analysis.

- Physical evidence with the greatest potential value is often present on the victim's/perpetrator's body.
- Whenever forensic nurses are required to collect items for forensic evaluation, it is important to prevent contamination and loss.

Following are do's and don'ts in evidence collection and preservation:

a. Wear clean nonpowdered gloves while handling evidence to reduce cross contamination.
b. Wear masks, shoe cover and head cover, and hair should be tied back—to prevent contamination.
c. Trace evidence is particularly at risk for contamination and loss—should be handled as little as possible.
d. Treat all biological samples as infective material.
e. Avoid talking, sneezing, and coughing over evidence.
f. Be careful to open evidence bags and collection containers without touching the inside.
g. Dry stains are obtained with wet swabs and wet stains are obtained with dry swabs.
h. Paper bags/envelopes are used for packing. Plastic bags are avoided as they gather moisture and degrade evidence.

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Fig. 6.2: Essential requirements for evidence collection and preservation.

i. The articles (swabs, clothes, smears) must be air dried before packaging them. Drying of swabs is absolutely mandatory as there may be decomposition/degradation of evidence. Do not dry stained material by heating or placing the article in bright sunlight.
j. Use containers of appropriate size for the specimen and use one container per item of evidence to minimize cross contamination.
k. Following collection, every paper bag should be labeled and sealed.
l. Seal it tightly and seal each evidence bag with breakaway tape or wax seal.
m. Store evidence in secure locker or area until it is handed over to the police.

Observation and Recognition of Evidence

- Before collecting, recognition of something as physical evidence is a major objective in crime scenes and hospital settings. Evidence recognition and recovery requires experience and extensive training.
- Typically, the recognition of physical evidence starts by observing the scene/victim/perpetrator.
- Based on initial observations and taking into consideration the context of the case, possible scenarios, the nature of the incident, a search strategy is formulated. This includes searching with the naked eye and magnifiers, and also using light sources.
- Once the evidence is recognized, appropriate recovery methods (e.g., cotton swabs) and adequate packaging (e.g., collection bags/boxes, containers for sharp objects) are used.
- Priorities in evidence recovery might have to be decided to avoid unnecessary loss or degradation of evidence.
- Selecting what is relevant evidence is a challenge of the recognition and recovery phase. It requires a good understanding of what can be done on the various types of physical evidence in a FSL, as well as the information that can be obtained. However, it might be preferable to recover more evidence, and select at a later stage of the investigation.

COLLECTION AND PRESERVATION OF EVIDENCE

Collection Techniques

- The techniques for collecting trace evidences are picking, lifting, scraping, vacuum sweeping, combing, and clipping.
  - The swabbing collection technique should be used for the recovery of biological evidence in a dried or liquid state.

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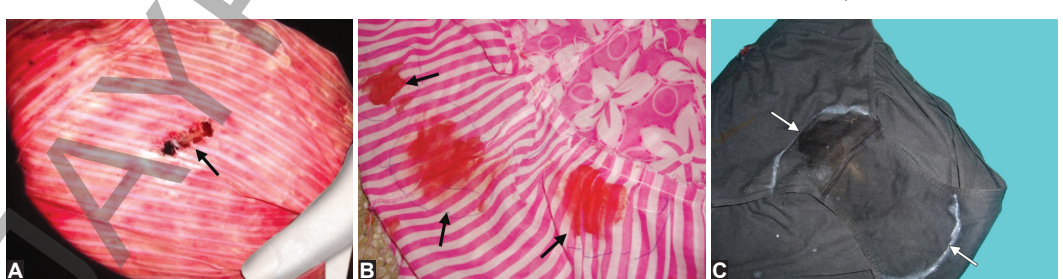
- Several tools can be used for the collection of trace evidence (e.g., blunt end forceps, tweezers, adhesive tape lifts, spatulas, nail clippers, etc.).
- The collected evidence should be immediately packed and secured to avoid sample loss.

a. **Picking:** Trace evidence may be separated from an item by using clean forceps.
b. **Lifting:** An adhesive tape is repeatedly and firmly patted or rolled over the item causing loosely adhering trace evidence to stick to the tape. The collected tapes are then placed on a transparent backing (e.g., clear plastic sheeting, glass slides, and clear plastic/glass petri dishes).
c. **Scrapping:** A clean spatula is used to remove the trace evidence from an item onto a collection surface, such as clean paper.
d. **Vacuum sweeping:** A small vacuum cleaner equipped with a filter trap is used to recover trace evidence from an item or area.
e. **Combing:** A clean comb is used to recover trace evidence from the hair of an individual. The combing device and collected debris from the hair should be packed together.
f. **Clipping:** Trace evidence can be recovered from fingernails by nail clipping. Fingernails may be clipped with clippers and packed in clean paper/glass tube.

Collection procedures for some of the most common types of physical/biological evidence are as follows:

1. Clothing

- **In sexual assault**
  - If the patient is wearing the clothes they had during the assault, all items are preserved. If the patient is not wearing the same clothes—clothing put on later by the patient, such as underwear, may still contain bodily fluids other than the patient's.
  - The examiner sets two layers of clean papers/sheets on the floor. The patient then removes one item of clothing at a time and places it in a separate paper bag (to prevent cross-contamination) while standing over the sheet placed on the floor.
  - The top sheet captures the loose debris that may fall from the clothing, which is folded inwards, and secured in a paper evidence bag separately. Debris may include leaves, grass, or loose hair that may not be the patient's.
- **In gunshot injury**
  - Garments with suspected gunshot holes are to be handled carefully to prevent the loss of gunshot residues and its distribution around the hole/defect **(Fig. 6.3A)**.
  - Clean polythene/paper may be kept under and above the suspected hole.
- Each piece of clothing must be dried thoroughly, if wet or damp. All stains or tears to the clothing must be documented and marked **(Figs. 6.3B and C)**. Use protective paper to prevent stains from touching.
- If possible, the patient's clothes should remain intact. However, if the clothes need



Figs. 6.3A to C: (A) Bullet hole in clothes. (B) Survivor's salwar with blood stains; and (C) Stains in underwear (arrows).

[*Courtesy:* Dr Mohit Gupta, Professor, VMMC, Delhi, **(Fig. 6.3A)** Dr Promila Jindal, Ex-Professor and Head, DMCH **(Figs. 6.3B and C)**]

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to be cut, it is done without cutting through any stains, tears, holes, or other defects in the fabric.

2. Footwear

- Footwear should be packaged separately from the clothing, and each shoe packed individually.
- Soil or other trace materials may collect within the grooves and ridges of the soles of shoes and may be linked to a source at a scene or from a vehicle.

3. Bed/Trolley Sheets

Some patients may have also been brought in by ambulance on a bed sheet; this too can be collected for evidence as it may contain debris that fell off the patient and may be valuable in establishing where the crime occurred.

Biological Stains or Deposits

Since DNA analysis is important for many inquiries involving biological evidence, the forensic nurse must ensure that the biological evidence is not subjected to alteration, degradation or deterioration during collection, storage or laboratory analysis.

Control Swabs

Control swabs may be used as a standard. These swabs are moistened with sterile water and used for the entire evidence collection process.

4. DNA

- The application of DNA technology revolutionized the field of forensic science. DNA analysis is applied in both criminal and civil cases.
- Commonly collected is blood or buccal sample. Hair sample is also useful.

a. **Blood (most common sample):** 5 mL of venous blood is collected in a purple stoppered vacutainer (EDTA tube) and mixed thoroughly without shaking. Sample can be preserved at 2–8°C (not frozen).

Blood and buccal smear samples can be stored on Whatman FTA® cards at room temperature with subsequent amplification by PCR.

Advantages of FTA

i. Simple collection
ii. Convenient room temperature storage and transport
iii. Safe handling and easy shipping

Format

- Blood sample collection kit
- Buccal sample collection kit

Blood collection using Whatman FTA blood collection kit

1. Place the contents of the kit out on a clean dry table.
2. Wear gloves and unfold protective flap of FTA to expose the printed circle.
3. Use alcohol swab to clean the finger properly.
4. Firmly hold the end of the lancet on the part of the finger that was cleaned and press the trigger to prick the finger.
5. Press the finger to deposit a drop in the printed circle without touching the card **(Fig. 6.4)**.
6. Do not over-saturate, as DNA cannot be recovered from FTA card that is saturated with too much blood.
7. Allow the card to dry for 1–2 hours at room temperature. Close the protective cover of the FTA card and insert the card with desiccant packet into the Multi-barrier pouch.
8. Insert the multibarrier pouch in the envelope provided.



Fig. 6.4: FTA card with blood sample.

b. **Buccal epithelial cells (buccal swabs)** are considered as a convenient alternative for collecting genetic material, as they are relatively easy to collect, inexpensive and noninvasive.

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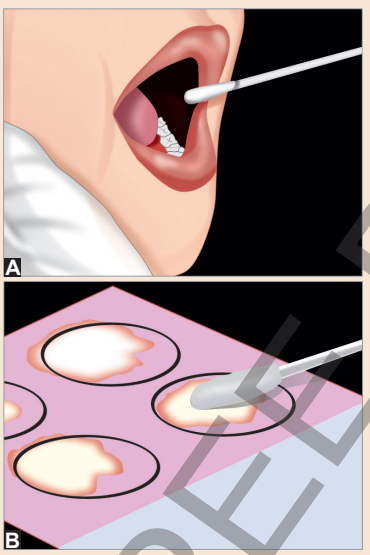
Buccal cell collection using Whatman FTA Buccal collection kit (Figs. 6.5A and B)

1. Place the indicating FTA card and other components on a clean dry surface.
2. Remove one sterile foam tipped applicator.
3. Holding the plastic handle of the applicator, place the foam applicator in the mouth.
4. Soak up as much saliva as possible by running the foam applicator on the inside cheek for 30 seconds. Repeat the process with the opposite side of the applicator.
5. Carefully lift the paper cover of the indicating FTA card to expose the pink sample area.
6. Apply pressure; rock the foam applicator from side to side three times.
7. Run the applicator over and repeat the other side within the same circle.
8. The sample area will turn white indicating the transfer of sample.



Figs. 6.5A and B: Collection of buccal swabs using FTA card.

c. **Hair follicles with roots (plucked hair)**, about 10–20, from the head is used as a reference standard **(Figs. 6.6A and B)**. The root of the hair contains nuclear DNA, and the shaft contains mitochondrial DNA.

5. Blood

Blood sample are collected for grouping and also helps in comparing and matching bloodstains at the scene of crime.

- Venous blood is collected with a sterile syringe and needle and transferred to 3 sterile vials/vacutainers for the following purposes: plain vial/vacutainer—blood grouping and drug estimation; sodium fluoride—alcohol estimation; EDTA—DNA analysis **(Figs. 6.7A and B)**.
- Collect blood before administration of crystalloids, medications or blood products.
- Soap and water are used to clean the site to be venipunctured for blood alcohol sampling.

6. Oral Swabs

- If there was an oral assault, oral swab is collected for detection of semen and spermatozoa. The likelihood of evidence beyond 24 hours is low.
- Prior to swabbing, there should be an assessment of the mouth for any injuries.
- Swabs are taken from the posterior parts of the buccal cavity, behind the last molars or area beneath the tongue where the chances of finding any evidence are highest and rotate the swabs during collection **(Fig. 6.8)**.



Figs. 6.6A and B: (A) Plucking the hair from roots. (B) Collected hair sample.

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Figs. 6.7A and B: (A) Drawing of blood sample. (B) Blood sample in EDTA vacutainers.



Fig. 6.8: Oral swab collection.

- A mouth rinse can be collected (before she eats or drinks anything) for any evidence of semen, if the survivor reports oral sex in the last 48 hours. She can rinse her mouth with sterile water into a sterile container and then sealed and labeled.

7. Fingernail Scrapings

- In case of struggle, the accused and the survivor may have scratched each other,



Fig. 6.9: Fingernail scraping.

and epithelial cells of one may be present under the nails of the other that can be used for DNA detection. It may contain skin cells or blood of the perpetrator transferred during the attack.

- Nail clippings and scrapings are taken from both hands and packed separately.
- Using a nail scraper/cuticle stick, scrape nail debris from each hand over a piece of paper and then collect the contents, as well as the scraper for evidence collection **(Fig. 6.9)**.
- Alternatively, nails can be clipped close and collected in an envelope.
- Skin obtained may provide material for DNA typing and the assailant identification.

8. Hair

- Hair and fiber evidence are among the most common forms of trace evidence encountered in crime investigations.
- Detection of scalp hair and pubic hair of the accused on the survivor's body (and vice-versa) has evidentiary value.
- **Scalp hair:** Obtaining head hair samples include a small comb and piece of paper; the hair is combed over the paper so that any loose hair or debris falls onto the paper. The comb and paper are collected for analysis.
- **Pubic hair:** Matted pubic hair should be cut and placed in an envelope. The forensic nurse should gently comb the hair to collect any foreign material or hair that may identify the assailant **(Figs. 6.10A and B)**. The comb and specimens obtained

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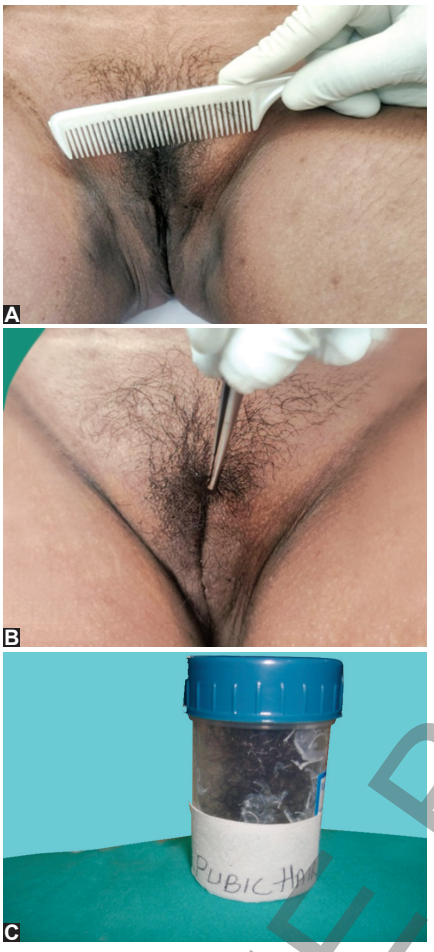

Figs. 6.10A to C: Collection and preservation of pubic hair: (A) Combing; (B) Plucking ; and (C) Control sample.

are placed in a clean paper towel, then in an envelope. Next, 10–20 pubic hairs plucked or cut, and are placed in a separate envelope or container as "controls" **(Fig. 6.10C)**.

- Alternatively, all hair may be collected in a catchment paper which is then folded and sealed.

9. Bite Marks

- Bite marks need to be swabbed and measured **(Fig. 6.11)**.
- Use moistened swabs on the area where the teeth and lips of the assailant would have pressed on the patient's skin (best place to obtain evidence).

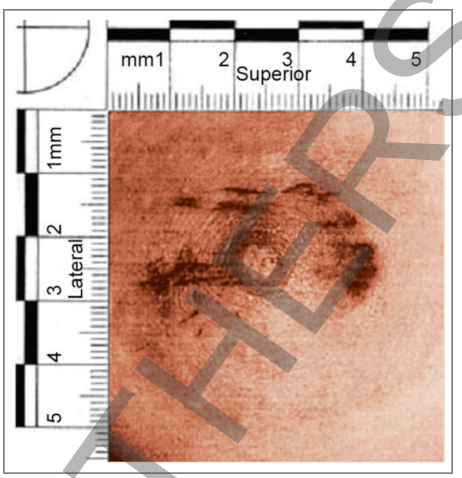

Fig. 6.11: Bite marks on breast of the victim of sexual assault.

(*Courtesy:* Dr Nitul Jain, Eklavya Dental College and Hospital, Kotputli, Rajasthan, India)

- A *double swab technique* is recommended for collection of evidence from bite marks—use of moist swab followed immediately by a dry swab.

10. Genital and Anal Swabs

If a woman reports within 72 hours (3 days) of the assault, all swabs based on the nature of assault are collected. The spermatozoa can be identified till 72 hours after assault. If she reports after 3 days, swabs for spermatozoa are useless. In such cases, swabs should only be sent for identifying semen.

- Two swabs are taken from the vulva, vagina and anal opening depending on the history and examination. Swabs from orifices should be collected only if there is a history of penetration **(Fig. 6.12A)**.
- Two vaginal smears are to be prepared on the glass slides provided, air-dried in the shade and sent for seminal fluid/spermatozoa examination **(Fig. 6.12B)**.
- Often lubricants are used in penetration with finger or object, so swabs must be taken for detection of lubricant.
- Vaginal washing is collected using a syringe and a small rubber catheter. Two milliliter of normal saline is instilled into the posterior fornix of vagina and fluid is aspirated.

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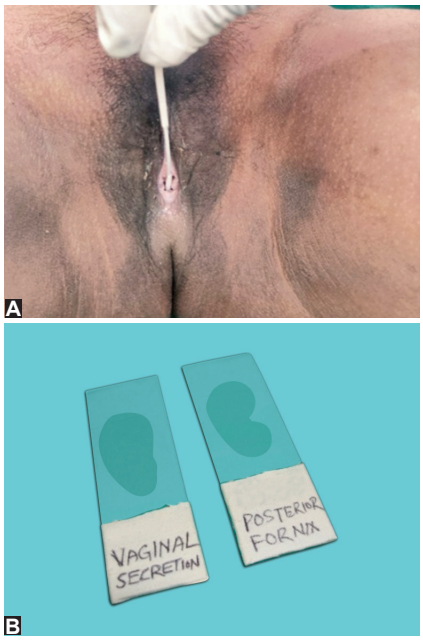

Figs. 6.12A and B: (A) Vaginal swab; (B) Vaginal smears.

Fluid filled syringe is sent to FSL for motile sperms after putting a knot over the rubber catheter. Spermatozoa are best recovered from the posterior fornix.

- Any foreign bodies found within the vagina (including tampon) should be collected, air dried and preserved.

11. Perineal Swab

- Swabbing the perineal area is required if there was a rectal or vaginal assault since it may contain the perpetrator DNA (such as sperm or penile epithelial cells).
- The area should first be inspected for any injuries and swabbed with moistened swabs **(Fig. 6.13)**.
- If there was a rectal assault, then swabs should be taken within 24 hours.
- When taking an anorectal swab, swab the area for the smear slides and then repeat the procedure with the second set of swabs.

12. Penile Swabs

- Penile swabs are taken from the accused, minor or any nonconsensual victim.

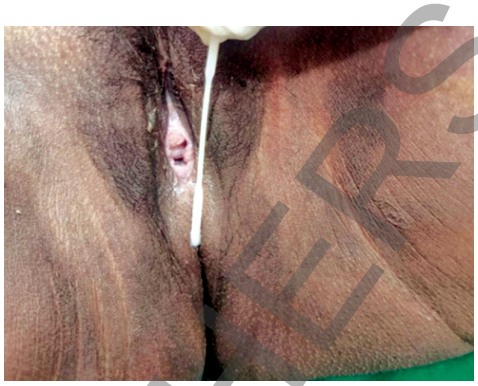

Fig. 6.13: Perineal swab.

- Using moistened swabs, swab the glans, shaft, and base of the penis with a rotating motion to ensure uniform sampling.

13. Additional Swabs

- Swab any area when there is an indication based on the history or suspicion of bodily fluid transfer, such as licking, kissing or biting for trace evidence. Swabs are taken from bloodstains, foreign material, seminal stains and other stains on the skin/body surfaces.
- An alternative light source may be used. Any area that fluoresces under the florescent light should be swabbed with moistened swabs.
- It is best to have the patient undress, and then turn off the lights and examine the patient's body to see if any areas indicate the need for a swab. Dried seminal stains on the skin appear as pale-yellow glistening areas, and will fluoresce under a Wood's lamp (long wave UV source of light).
- Particular attention should be paid to the thighs, buttocks and genitalia when viewing the skin for possible seminal stains.

14. Firearms, Bullets, and Projectiles (Box 6.2)

- Firearms and projectiles may contain various types of physical evidence, such as fibers, hair, blood and tissue. In the case of bullets, they also may contain primary markings that allow for comparison to known firearms.

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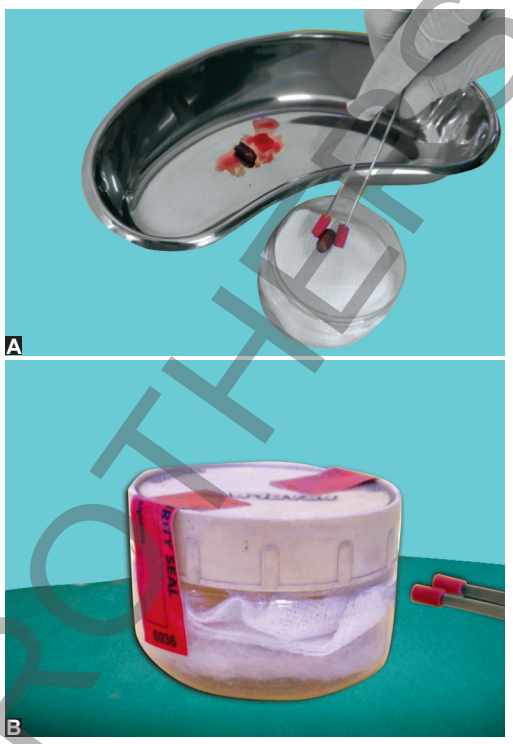
Box 6.2: Collection of firearm evidence.

1. Clothes with trace evidence
2. Wound dressings
3. Victim's hair, fibers and blood
4. Gunpowder and other evidence on the hands
5. Unspent ammunition and empty cartridges
6. Gun used in the crime

- Clothing, bullets and wound dressings are important for detection of gunshot residue (GSR)* which can identify a link between the firearm, suspect and the victim.
- Swab the hands of suspect (preferably upper left hand, palm of left hand, upper right hand and palm of right hand) using 5% HNO_3 (or use sticky tape) and one control sample should be taken for GSR. Wrap the suspect's hands in a paper bag for GSR, if swabbing is not done.
- **Firearms** should never be packaged in a paper envelope. They should be handled as little as possible and only while wearing gloves (to preserve biological material, fingerprints and other evidence). Ideally, firearms should be placed in a clean cardboard box and kept secure.
- **Bullet:** All bullets and recognizable parts of bullets in the victim must be recovered from the body and preserved with correct labeling of each bullet to the corresponding wound and placed in a separate envelope. It should be removed with fingers or with a rubber tipped forceps **(Fig. 6.14A)**. The recovered bullet should be dried and not washed, since washing removes the powder residue.
- **Pellets:** In a shotgun injury, few pellets and all wadding should be recovered to determine the shot size, bore and type of ammunition.
- **Preservation and packing:** Fired cartridge cases, bullets, pellets, slugs and wads are wrapped in sterile cotton or gauze padding and packed in cardboard box or plastic container and sealed, after drying **(Fig. 6.14B)**.



Figs. 6.14A and B: (A) Bullet is handled with rubber coated forceps; and (B) Preservation of bullet.

15. Sharp Objects

- Sharp objects, such as knife, syringe with needle, razor blades, or glass fragments should be packed in rigid, puncture-resistant, and leak-proof containers so as to prevent injury to others and preserve trace evidence on the item.
- The knife may be tied into cardboard holders or placed into specially designed sharps containers with air vents **(Figs. 6.15A and B)** and secured in cardboard boxes of the appropriate size.

Cases Pertaining to Toxicology

Chemicals and Drugs

In cases of suspected poisoning, use of controlled substances or effects from prescription medications, the collection of appropriate

* GSR contains trace amounts of primer and burnt and unburnt gunpowder when firearm is discharged which gets deposited on clothing, hands or face of the shooter. This GSR is highly perishable and transient.

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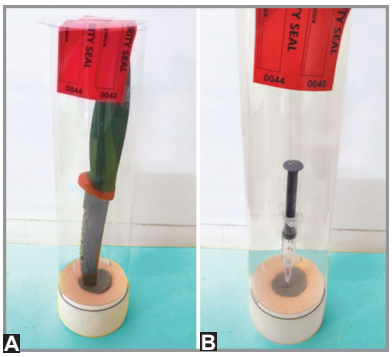

Figs. 6.15A and B: Preservation and packaging of (A) Knife; and (B) Syringe with needle.

evidence and documentation is important for treatment of the patient who presents at the hospital.

The evidences commonly encountered in toxicological cases are **(Table 6.2)***:*

i. Vomitus of the patient
ii. Container of the poison
iii. Tumbler, cup or similar utensil used to consume/administer the poison
iv. Bottles of water, cold drinks or liquor, etc.
v. Clothes suspected to have poison/vomit stain
vi. Empty injection vial/ampoules, hypodermic syringes and needle, etc.
vii. Gastric lavage
viii. Blood and urine sample

Table 6.2: Sample preservation for toxicological analysis.

Sample	*Quantity*	*Preservative*
Whole blood	10 mL	Lithium heparin or EDTA tube; fluoride/ oxalate, if alcohol is suspected
Urine	20–50 mL	No preservative; sodium fluoride is added, if alcohol is suspected
Gastric contents	25–50 mL	No preservative
Scalp hair	About 100–200	No preservative
Exhaled air	As required	No preservative
Scene residues	As appropriate	No preservative



Fig. 6.16: Urine sample.

16. Urine

- Urine sample is collected to test for drugs and alcohol levels **(Fig. 6.16)**. The time limit for toxicology testing is about 96 hours since the time of the assault or the time during which substances were believed to be ingested.
- For estimation of alcohol levels, full quantity of urine passed must be collected. It is collected in a large clean, sterilized, screw capped bottle.
- If drug/alcohol is found in the blood/ urine, the validity of consent is called into question. There may not be any physical or genital injuries, since this may have affected the survivor's ability to offer resistance.
- Urine samples should be stored in a locked refrigerator.

17. Vomitus and Stomach Contents

- Vomitus is placed either in a clean glass jar or a plastic tub with a tight-fitting lid. There is no need to add any preservatives.
- Gastric lavage *(stomach washing)* is most useful within 1 hour after ingestion of any poison (can be done till 4–6 hours after ingestion). The fluid taken out initially after gastric lavage is preserved for chemical analysis **(Fig. 6.17)**.

Motor Vehicle Accidents

Clothing should be inspected for evidence of tire tread marks, glass pieces, dirt, vegetations, foreign bodies or paint transfer, and should be

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Fig. 6.17: Ryle's tube aspirate.



Fig. 6.18: Evidences packed in a single paper bag, sealed and the chain of custody mentioned over it.

preserved as described earlier. This may help in reconstruction of the events.

Burns

In case of burns, clothes and hair of the victim should be preserved/sealed separately in a similar fashion by the examiner.

LABELING OF EVIDENCE

- Label it correctly and clearly with black pen (permanent marker) with the case number/MLR number, type of specimen, (e.g., blood/urine/vaginal swab/anal swab etc.), site of collection, name, age and sex of the patient, date and time of collection, and examiner's name and signature.
- Each bag is then placed in a larger bag, properly labeled with the patient's identifying information, MLR/Case No., examiner's name and signature, date and time **(Fig. 6.18)**.
- Write across the edge of the tape onto the paper in several places to ensure it cannot be removed and replaced.

CHAIN OF CUSTODY

- The chain of custody of evidence is a written record of every individual who has had physical possession of the evidence. Every time the evidence is opened from its collection container and the evidence seal is broken or moved, there must be a log of that activity.
- Maintaining proper chain of evidence is as important as collecting proper evidence.
- Without complete documentation (along with signatures) of chain of custody from the individual who collected the evidence to the courtroom, the evidence will be inadmissible.
- In collecting and processing evidence, the fewer people who handle that evidence, the better. There is less chance of contamination and a shorter chain of custody for court admissibility.
- The chain of custody:
  a. Begins with the first person who has contact with the piece of evidence.
  b. Ensures that items have been under constant surveillance, have remained in a secure area, and have not been tampered with during handling or transfer, except for analysis by authorized laboratory personnel.
- The forensic nurse must maintain control of evidence during examination, while the evidence dries, and until the evidence is in container/bag and sealed.
- To maintain the chain of custody, all evidence should be locked up with limited access until it is handed over to the police.
- Documentation of evidence transfer should be noted in medical notes and on the chain of custody form. Documentation should include:

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a. Type of evidence being transferred (evidence kit, photographs, clothing, copies of the medical chart, etc.).
b. Number of bags of evidence being transferred.
c. Time and date of the transfer.
d. Name and signature of the person releasing the evidence.
e. Name and badge number of the police officer collecting the evidence.

The original chain of custody form accompanies the evidence.

DOCUMENTATION OF EVIDENCE

- If physical evidence, such as body fluid, stains or trace evidence is identified at a scene or during the examination of a patient, that evidence should be thoroughly documented prior to collection. Documentation is an integral part of the recovery process, including the precise location of the evidence before recovery.
- Body diagrams, notes, photographs and video recording are important methods of documentation and are considered as evidence in legal proceedings. Each method has advantages and disadvantages—should be employed as seems appropriate to the situation.
- As with other aspects of nursing, thorough and extensive notes are the foundation of good evidence documentation **(Box 6.3)**. These notes can also provide the examiner with important information after evidence collection. Notes also provide the link to other evidence documentation methods and key documents, such as chain of custody.

Box 6.3: Documentation of firearm injury.

- Record the patients' statements accurately.
- Record the patient's appearance (condition), behavior, attitudes and concerns.
- Record location, size and appearance of injuries and take photographs.
- Document the presence of tattooing, soot, abrasion collar.
- Record the location of the projectile(s) recovered.
- Record firearm collection.
- Identify the container in which the projectile is preserved with the patient's data.
- Report incident to the police.

- Photographs of the injuries should also be taken at the time of examination. Whenever photographs are taken, an appropriate scale should be included to document the size and appearance of those injury patterns. Afterward, photographs should be taken without a scale.

FORWARDING OF BIOLOGICAL SAMPLES

The forwarding letter signed with stamp by the competent authority should be addressed to the Director, Forensic Science Laboratory. It should include:

1. Details of all the exhibits sent indicating the impression of the seal.
2. Nature of examination required on each exhibit.
3. Copy of medico-legal report, if any.
4. Copy of postmortem report in cases of death.
5. Copy of all medical treatments given before death, if hospitalized.
6. Sample seal.
7. Chain of custody form.

SUMMARY

Collection and Preservation of Evidence—Role of the Forensic Nurse

1. **Obtain informed consent**
   - Explain the purpose and steps of evidence collection.
   - Collect evidence only with the patient's voluntary consent.
2. **Maintain aseptic, standardized procedures**
   - Use approved forensic kits (e.g., sexual assault evidence kit).
   - Wear gloves; change between tasks to avoid contamination.
   - Follow universal precautions.

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3. **Systematic collection of evidence**
   Typical evidence includes:
   - **Biological evidence**
     - Swabs from body sites (oral, genital, anal, skin).
     - Blood, saliva, hair, nails, and bodily fluids.
   - **Trace evidence**
     - Clothing, fibers, debris, foreign material.
     - Fingernail scrapings or cuttings.
   - **Injury documentation**
     - Photographs with scale and without.
     - Written descriptions: size, color, shape, location.
     - Body maps for recording injuries.
   - **Toxicology samples:** Blood and urine (for alcohol/drug-facilitated assault).
4. **Prevent contamination**
   - Use paper bags, not plastic, for evidence.
   - Package each item separately.
   - Seal with tamper-proof tape and sign/date seals.
   - Air-dry biological evidence before packaging.
5. **Chain of custody**
   - Document every person handling the evidence.
   - Record date, time, place, and purpose of transfer.
   - Ensure secure storage until handover to law enforcement.
   - Maintain integrity: No breaks, alterations, or unauthorized access.
6. **Proper documentation**
   - Use objective, factual language.
   - Record the survivor's statements verbatim.
   - Note the exact time, site, and method of collection.
   - Complete all kit forms accurately.
7. **Evidence storage and handover**
   - Keep evidence in a secure, locked area.
   - Transfer only to authorized personnel (police, FSL).
   - Obtain signatures for every transfer.
8. **Preservation of patient dignity**
   - Provide trauma-informed care throughout.
   - Keep the survivor warm, comfortable, and covered when possible.
   - Explain each step before performing it.



MULTIPLE CHOICE QUESTIONS

1. **Evidence which is sensitive to absolute temperature or fluctuations of temperature?**
   A. Physical evidence
   B. Latent print evidence
   C. Biological evidence
   D. Trace evidence

   Explanation: Some evidence, particularly biological evidence, may be sensitive to absolute temperature or fluctuations in temperature. Temperature in the extremes can cause problems with evidence either being "cooked" or "frozen". Blood when exposed to the sun would be decomposed or contaminated by bacteria to a point where further analysis would be impossible or inconclusive.

2. **The main goal of forensic nursing in cases of abuse is to:**
   A. Prescribe medication
   B. Provide nutrition counseling

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C. Document injuries and collect evidence for legal purposes
D. Train other healthcare providers

Explanation: The primary goal of forensic nursing in abuse cases is to accurately document injuries and collect, preserve, and safeguard evidence so it can be used in legal and judicial proceedings. Forensic nurses bridge healthcare and the legal system while ensuring patient-centered, trauma-informed care.

3. **Which of the following refers to proper collection and preservation of evidence?**
   A. Storage and packing
   B. Bag it Tag it
   C. Evidence analysis and storage
   D. Acquiring proper storage of evidence

   Explanation: Used in the field of forensic science, "bag it" refers to putting evidence in a sealed bag or container, and "tag it" refers to the tag or label attached describing the contents and context of their retrieval.

4. **Evidence collected from a victim should be:**
   A. Handled by as many people as possible
   B. Stored without labeling
   C. Collected, preserved, and documented carefully
   D. Washed to remove contaminants

   Explanation: Evidence collected from a victim must be handled with great care to preserve its integrity and evidentiary value. Proper collection, preservation, and thorough documentation ensure the evidence remains reliable and admissible in legal proceedings.

5. **Best method to identify a person is by:**
   A. Scars
   B. Blood groups
   C. Fingerprints
   D. DNA analysis

   Explanation: Fingerprinting is a very useful method in the identification of a person. A fingerprint is unique to an individual and is permanent. However, the best method is DNA fingerprinting. The most common method of DNA typing is Short Tandem Repeat (STR) analysis paired with Polymerase Chain Reaction (PCR) and Capillary Electrophoresis (CE).

6. **Which of the following types of fluids are useful for DNA collection?**
   A. Blood
   B. Saliva
   C. Semen
   D. All of the above

   Explanation: Semen, blood and saliva are useful for DNA collection.

7. **Trace evidence such as hair or fibers should be collected using:**
   A. Bare hands
   B. Adhesive tape or forceps
   C. Water and gauze
   D. Plastic scoops

   Explanation: Trace evidence such as hair, fibers, paint chips, or soil is extremely small and easily contaminated or lost. Using adhesive tape or clean forceps allows the forensic nurse to collect this evidence accurately and without direct contact, preserving its integrity for laboratory analysis.

8. **Assertion (A) Wet blood stains on cloth should be preserved after drying under room heater.**

   Reason (R): Drying under heater causes disintegration of blood stains.
   A. Both (A) and (R) are correct.
   B. Both (A) and (R) are incorrect.
   C. (A) is correct, but (R) is incorrect.
   D. (A) is incorrect, but (R) is correct.

   Explanation: Wet stains must be air dried before packaging them; else there may be decomposition/degradation of evidence. But it should not be dried by heating or placing the article in bright sunlight as it gets denatured.

9. **The following steps are followed to avoid contamination/denaturation of DNA evidence:**
   A. Touch the area where one believes DNA may exist
   B. Wear gloves
   C. Avoid coughing, sneezing or talking over evidence
   D. Air dry evidence before packing

   Explanation: Avoid touching the area where you believe DNA may exist. Single hair, perspiration and/or saliva deposited mistakenly by an investigator can cost valuable time and create the potential for excluding a suspect, as well as confuse the interpretations of the physical evidence.

10. **When indicated by forcible oral copulation (or its attempt) or uncertain patient history, the nurse examiner should obtain two swabs of:**
    A. Tongue
    B. Tonsillar fossae
    C. Behind the buccal sulci.
    D. All of the above

    Explanation: When forcible oral copulation (or an attempt) is indicated, or when the patient's history is uncertain, the nurse examiner should

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obtain two swabs from all relevant oral sites to maximize the chance of recovering forensic evidence such as semen, saliva, or epithelial cells.

11. **Collection of evidence from bite marks is particularly useful in:**
    A. Identifying motive
    B. Creating a firm legal case
    C. Determining the timeframe of assault
    D. Identification of the perpetrator through DNA-tested saliva

    Explanation: Bite marks may be seen in assaults, homicides, and child abuse. The presence of bite marks is useful for guiding saliva collection, which can be used to connect the victim to the suspect thru DNA analysis.

12. **When documenting gunshot wounds, forensic nurses should:**
    A. Identify the caliber of bullet
    B. Identify entrance or exit wounds
    C. Remove gunshot powder residue with a clean, damp cotton swab
    D. Remove bullets or fragments with rubber-coated forceps and handle as little as possible.

    Explanation: Bullets when removed from victims, they should be extracted with rubber-coated forceps and handled as little as possible. When documenting gunshot wounds, they need not identify entrance or exit wounds or determine the caliber of the bullet.

13. **An appropriate container for the collection and preservation of dried blood in clothing is:**
    A. Plastic container
    B. Glass jar
    C. Paper bag
    D. Plastic bag

    Explanation: Container should be cardboard box, envelope or a paper bag. Never pack in plastic container. The packaging of biological evidence in plastic or airtight containers must always be avoided, because the accumulation of residual moisture could contribute to the growth of DNA-destroying bacteria and fungi.

14. **The following are some practical tips in the packaging and shipping of evidence, *except*:**
    A. Completely seal the outer container
    B. Affix the evidence and biohazard labels
    C. Affix the evidence examination request
    D. Identify essential and nonessential personnel

    Explanation: Identifying essential and nonessential personnel is related to scene management and access control, not to the packaging and shipping of evidence.

15. **Why is it important for the forensic nurse to maintain a proper chain of custody?**
    A. It will exonerate the perpetrator
    B. It will assist in gathering enough data for conviction
    C. Evidence will convict the assailant
    D. It will be accepted as evidence and can be used in the court of law

    Explanation: The chain of custody is important to maintain the authenticity of the collected evidence and make it admissible to court for legal proceedings.

ANSWER KEY

1. C	2. C	3. B	4. C	5. D	6. D	7. B	8. D	9. A	10. D
11. D	12. D	13. C	14. D	15. D					

VERY SHORT ANSWERS QUESTIONS

1. **What personal protective equipment (PPE) should be used during evidence collection?**

   Ans. Gloves (and masks/gowns when necessary).

2. **What is trace evidence?**

   Ans. Small, transferable materials such as hair, fibers, soil, or glass.

3. **Why should gloves be changed between evidence collections?**

   Ans. To prevent cross-contamination between samples.

4. **Why should each item of clothing be packaged separately?**

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Ans. To prevent cross-contamination of evidence.

5. **Why is patient consent essential before collecting sexual assault evidence?**

   Ans. It is a legal and ethical requirement.

5. **Why must biological evidence be air-dried before packaging?**

   Ans. To prevent mold growth and DNA degradation.

6. **What type of container is best for packaging dried biological evidence?**

   Ans. Paper bags or envelopes.

7. **Why is proper labeling of evidence important?**

   Ans. To ensure correct identification and maintain legal admissibility.

8. **Which sample is most commonly used for toxicology screening?**

   Ans. Blood.

9. **Why is refrigeration used for toxicology samples?**

   Ans. To slow degradation of substances.

10. **Why is hair useful in toxicology testing?**

    Ans. It provides a long-term history of drug exposure.



SHORT ANSWER QUESTIONS

1. Write a short note on principle of exchange.
2. Discuss briefly the various types of evidences.
3. What are the essential requirements for collection and preservation of evidence?
4. What is the purpose behind evidence collection?
5. Describe in brief how firearm evidences are collected.
6. Write a note as to how fingernail scraping is collected and preserved.
7. Write a note as to how hair evidence is collected and preserved.
8. Describe briefly how clothing evidence is collected and preserved.
9. What is meant by "chain of custody?" Explain.
10. Explain why documentation of evidences is necessary.



LONG ANSWER QUESTIONS

1. Describe how blood is collected in FTA card.
2. Describe how buccal swab is collected in FTA card.
3. Describe how genital and anal evidences are taken from a victim.
4. Discuss in detail the collection and preservation of biological evidences.

CASE STUDY 12

A 14-year-old girl arrives at the hospital with history of sexual assault by a neighbor. She is emotionally distressed and unsure about the examination process. A trained forensic nurse examiner (FNE) takes responsibility for her care and the medico-legal evidence collection.

Q1. What evidences will the forensic nurse collect?

Evidence Collection Process

1. **Preparing the survivor:** The forensic nurse ensures privacy, obtain informed assent and parental consent, and explains each step in simple, reassuring language to reduce anxiety. Trauma-informed communication is used throughout.

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2. **Physical examination:** The nurse conducts a gentle head-to-toe assessment, noting injuries, bruises, abrasions, and behavioral cues. Findings are documented using body charts and written descriptions.
3. **Forensic sample collection:** Following national protocols, the FNE collects:
   - Clothing and undergarments
   - Vaginal, oral, and skin swabs
   - Fingernail scrapings
   - Hair samples (pulled and combed)
   - Trace evidence (fibers, debris)

   All items are sealed, labeled, and transferred using strict chain-of-custody procedures.
4. **Documentation:** Detailed notes, injury diagrams, timestamps, and photographs (if appropriate) are recorded to ensure accuracy and legal validity.
5. **Interdisciplinary coordination:** The nurse communicate findings to law enforcement, child protection services, and psychologists, ensuring a holistic response.

Outcome

The meticulously collected evidence will match FSL results and align with the survivor's testimony. This strong, unbiased evidence is central to the prosecution, and will lead to the conviction of the accused.

OSCE Station: Evidence Collection: Forensic Nurse (Sexual Assault Case)

Setting: Emergency/Forensic Unit
Actor/Mannequin: Standardized patient or pelvic model
Station stem (candidate instructions)

You are the Forensic Nurse on duty. A 24-year-old rape survivor, *Ms. R*, has arrived within 12 hours of the assault. She has not bathed or changed clothes.

Your tasks are to:

1. Explain the purpose of evidence collection and obtain informed consent.
2. Demonstrate or describe evidence collection steps using trauma-informed care.
3. Show proper packaging, labeling, and chain of custody procedures.
4. Describe documentation required for forensic evidence.

You do **not** need to perform a full physical examination, but you **must demonstrate the correct sequence** and reasoning.

A. Communication and consent

- Introduces self and explains forensic role
- Ensures privacy and patient comfort
- Explains purpose of evidence collection
- Uses trauma-informed, nonjudgmental language
- Obtains informed, voluntary consent for each step
- Encourages questions and checks understanding

B. Preparation and infection control

- Performs hand hygiene
- Wears appropriate PPE
- Organizes forensic kit and materials
- Uses clean equipment and prepares separate sterile swabs
- Ensures good lighting and a safe environment

C. Evidence collection procedure

- Follows a systematic, head-to-toe approach
- Collects oral, genital, anal, and skin swabs (as appropriate)
- Collects trace evidence (hair, fibers, debris)

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- Collects clothing using paper bags
- Air-dries moist evidence before packaging
- Collects fingernail scrapings/cuttings
- Collects blood/urine samples for toxicology if indicated
- Changes gloves between tasks to prevent contamination
- Avoids plastic bags and condensation
- Minimizes patient exposure and maintains dignity

D. Injury documentation

- Describes wounds with objective terminology
- Uses body maps
- Takes photographs (with scale and without)
- Notes color, size, shape, location
- Records patient's statements verbatim in quotation marks

E. Packaging and labeling

- Packages each item separately
- Uses paper bags or envelopes
- Seals with tamper-proof tape
- Signs/date across seals
- Labels with patient ID, site, date, time, collector initials

F. Chain of custody

- Completes chain of custody form accurately
- Documents all handlers, transfers, date and time
- Stores evidence in secure, restricted-access location
- Hands over only to authorized personnel
- Obtains receiving signature

G. Professionalism and trauma-informed care

- Maintains calm, respectful demeanor
- Provides reassurance and emotional support
- Maintains confidentiality within legal limits
- Explains each step before performing it
- Offers follow-up care and referrals (counselor, OSC, legal support)

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Salient Features

- Authentic textbook on Forensic Nursing drafted by the author of the best-selling Textbook in Forensic Medicine and Toxicology, ensuring accurate, evidence-based, and clinically relevant content.
- Completely revised and updated in accordance with the latest competency-based nursing education (CBNE) curriculum prescribed by the Indian Nursing Council (INC) and aligned with the evolving regulatory framework of the National Nursing and Midwifery Commission (NNMC).
- Updated Indian legal provisions incorporating the latest Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), and the Bharatiya Sakshya Adhiniyam (BSA) relevant to nursing practice.
- All prescribed competencies in forensic nursing and Indian laws comprehensively addressed and integrated chapter-wise.
- Learning objectives provided at the beginning of every chapter to facilitate competency-based learning.
- Uniform chapter organization with key terms, core concepts, illustrations, summary, case studies, and self-assessment for systematic learning.
- Extensively revised content incorporating the latest advances, current guidelines, and contemporary forensic nursing practices.
- Stepwise presentation of forensic nursing procedures for easy understanding and clinical application.
- Fully colored numerous tables, flowcharts, line diagrams, photographs, and illustrations included to simplify complex concepts and promote visual learning.
- Case studies at both the beginning and end of each chapter to stimulate curiosity, enhance clinical reasoning, and develop problem-solving and medico-legal decision-making skills.
- Chapter-end assessment strengthened with 15 multiple choice questions (MCQs), 10 very short answer questions (VSAQs), and short answer questions (SAQs) and long answer questions (LAQs) for effective examination preparation.
- Student-friendly presentation with concise, point-wise text, highlighted key facts, and quick revision features for better retention.
- Ideal for undergraduate nursing students, while also serving as a valuable reference for postgraduate students, nurse educators, practicing nurses, and other healthcare professionals involved in medico-legal care.

Gautam Biswas did his MBBS and MD (Forensic Medicine) from University College of Medical Sciences and GTB Hospital, New Delhi, India. He currently serves as Professor and Head of the Department of Forensic Medicine and Toxicology at Dayanand Medical College and Hospital, Ludhiana, Punjab, India. In 2009, his textbook *Forensic Medicine and Toxicology* was first published and is currently in its 6th edition, with the 7th edition scheduled for release soon. He is also the Editor of the widely acclaimed *Recent Advances in Forensic Medicine and Toxicology*, Volumes 1–3, a valuable resource for postgraduate students, faculty, and medical practitioners working in emergency and medico-legal settings. Volume 4 is scheduled for publication by the end of this year. In 2015, he authored the *Practical and Postmortem Record Book in Forensic Medicine and Toxicology*. The book has subsequently been revised in accordance with the latest National Medical Commission (NMC) Competency-based Medical Education (CBME) guidelines and renamed *Manual of Forensic Medicine & Toxicology*, making it a comprehensive practical guide for undergraduate medical students. In 2023, he co-authored *Fundamentals of Forensic Nursing and Introduction to Indian Laws* with Dr Triza Jiwan. The book has been widely appreciated and enthusiastically accepted by nursing students for its comprehensive, student-friendly approach to forensic nursing and the legal aspects relevant to nursing practice.

Nidhi Sagar MSc (Nursing) PhD (Nursing) is Professor-cum-Vice Principal and Head of the Department of Obstetrics and Gynecological Nursing at Dayanand Medical College and Hospital, College of Nursing, Ludhiana, Punjab, India. She possesses 1 year of clinical experience and over 21 years of total teaching experience. She completed her undergraduate and postgraduate studies at Christian Medical College and Hospital, College of Nursing, Ludhiana, Punjab, and her PhD from Baba Farid University of Health Sciences (BFUHS) in Obstetric Nursing, recognized by the Indian Nursing Council (INC). She has contributed significantly to academic and research activities, with more than 29 publications in national and international journals and has received recognition for Best Paper Presentation at a national conference. She has been a reviewer of one book and also reviewed several research articles in different journals. Till date she has guided 36 postgraduate thesis and 3 graduate thesis and presently guiding 3 PhD candidates under BFUHS. She is a member of various associations like Trained Nurses' Association of India (TNAI), Society of Community Health Nurses of India (SOCHNI), Advance Nurses Executives of India (ANEI), Punjab, and Society of Midwives of India (SOMI). She is also the Chairperson of Nursing Education and Research Committee of TNAI, Punjab state branch. She also serves as an inspector for BFUHS and Indian Nursing Council (INC) and also as an external examiner for undergraduate and postgraduate nursing examinations in institutions across and outside the state, including BFUHS, PGI Chandigarh, MMU Ambala, and SRHU Himalayan University, Dehradun, India.

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