DOSAGE FORMS

Read the clinical situations and answer the questions

1. A patient with dry scaly skin lesion suggestive of drug allergy

BETAMETHASONE OINTMENT / POVIDONE IODINE OINTMENT/CLOTRIMAZOLE

a) Choose the appropriate preparation: Betamethasone ointment
b) Define ointment.
Semisolid preparations in which medicaments are distributed in a greasy base and is applied without friction. Ointments are preferred in dry scaly lesions as it contains a greasy base which acts as an emollient .
c) What is an emollient? Give 2 eg.
An emollient is a bland oily substance which sooth and soften skin, they form occlusive film over the skin, preventing evaporation and thus restoring elasticity of dry skin. eg: Cocoa butter, Olive oil, Liquid paraffin, Beeswax

2. A 20 year old patient complains of sore throat suggestive of streptococcal pharyngitis

AMOXYCILLIN CAPSULE/AMOXYCILLIN INJECTION/ TRAMADOL TABLET

a. Choose the appropriate drug and dosage form
Amoxycillin capsule
b. Mention 2 advantages of the chosen dosage form
Compared to tablets, Capsules are easy to swallow and masks the unpleasant tastes and odours better due to gelatin cover and thus improves patient compliance
c. What is its tablet strength?
500 mg
d. What is its expiry date and batch no.?
e. What is meant by SR tablet?
Sustained release tablets – contain drug particles which are coated with polymer to dissolve at different rates and release the known quantum of the drug slowly over a specified prolonged period.

3. A child brought with severe itching suggestive of scabies

BETAMETHASONE OINTMENT/GAMMA BENZENE HEXACHLORIDE LOTION/CLOTRIMAZOLE CREAM

a. Choose the appropriate preparation
Gamma BHC / Lindane lotion
b. Mention the method of application
BHC lotion is rubbed over the body below neck and a scrub bath is taken 12-24 hrs later. Repeated treatment only if mite persists and that too only after 1 week.
c. Enumerate drugs used for scabies
Permethrin, Lindane, Crotamiton, Sulfur, Ivermectin, Benzyl benzoate, Dicophane (DDT)
d. Name orally effective drug for this condition
Ivermectin single dose of 12 mg in adults

4. A mother brings a 5 yr old child with fever

PARACETAMOL TABLET/ PARACETAMOL SUSPENSION/ ASPIRIN TABLET

a. Choose the appropriate drug and dosage form

Paracetamol suspension

b. What is the difference between syrup and elixir?

Syrup is a drugs in a concentrated solution of sucrose in water (66% w/w). They have higher concentration of sugar and thicker in consistency.

Elixirs are hydroalchoholic solutions of drugs which are sweetened by syrups and flavoured by fruit extracts.

c. Name other dosage forms of this drug : Tablets, Syrups, Oral Suspensions, Oral Drops, Suppository , solutions for IV and IM use.

d. Which drug should be avoided in this patient? Why?
Aspirin – Due to risk of Reye's syndrome, a rare form of hepatic encephalopathy, in children with Viral fever

5. A patient complains of dyspepsia

CARMINATIVE MIXTURE/ ONDANSETRON SOLUTION/ PARACETAMOL SUSPENSION

a. Choose the appropriate preparation
Carminative mixture

b. What is a carminative? Give eg.
Preparation intended to combat flatulence either by preventing formation of gas in the gastrointestinal tract or facilitating its expulsion.
Eg: Dill oil, Peppermint oil, Fennel oil, Amylase etc

c. What is an antifoaming agent? Give eg.
Antifoaming agent is a substance which reduces surface tension and collapses froth claimed to prevent gas. Eg : Methyl polysiloxane.

d. What is the difference between mixture and draught?

Mixture is a liquid preparation containing one or more soluble or insoluble ingredients containing multiple doses for internal use . A mixture containing only one dose is called **'draught'**.

EXERCISES

Find out the various dosage forms available for these drugs

Drug	**Dosage forms**		
	Oral	**Injection**	**Topical**
Eg. Paracetamol	Tab, syrup	Solution	Suppository
Nitroglycerine			
Adrenaline			
Lignocaine			

Metronidazole			
Hydrocortisone			

1. A 35 yr old patient with bronchial asthma is advised Salbutamol
    a. Identify the device
    Metered dose inhaler
    b. What is the optimum size of particles that is administered through this device?
    1-5 μ. (Ideal particle size to deposit on bronchioles and effectively act. Larger particles will deposit in oropharynx and cause local side effects like cough, candidiasis. Smaller particles do not settle anywhere and will exhale out)
    c. Examples of drugs administered through this device
    β2 agonists (like Salbutamol, Salmeterol, Formoterol)
    Ipratropium, Cromolyn sodium, Inhalational corticosteroids
    d. Name the steroids administered through this device
    Beclomethasone, Budesonide, Fluticasone, FlunisolideCiclesonide
    e. What precautions should be taken when steroids are given through this device?
    Rinse mouth and gargle throat after each use (to prevent dysphonia & oral candidiasis)
    f. What adverse effects can occur when steroids are given by inhalation?
    Dysphonia & oral candidiasis
    g. What is the dose per puff of the given device?
    h. Explain the method of using MDI to the patient

    - Sit up straight and lift the chin to open the airways
    - Shake the inhaler vigorously, remove the cap (if used for the first time or after a time period of more than one week, spray into the air to see whether it works)
    - Breathe out slowly, emptying the lungs of as much air as possible
    - Place the mouthpiece of the inhaler between the teeth and seal the lips tightly around it.
    - Tilt the head backwards slightly
    - As one starts to breathe in slowly, press down on the canister one time
    - Keep breathing in as slowly and deeply as one can. (It should take one about 5-7 seconds to completely breathe in)
    - Hold the breath for 10 seconds (count to 10 slowly) to allow medication to reach the airways of the lung
    - Breathe out through the nose
    - If it is required to take another puff, wait for 30 seconds, shake the inhaler and repeat the steps.
    - Replace the cap on the MDI when finished
    - Rinse the mouth with warm water especially if the medication contains an inhalational corticosteroid to prevent oral candidiasis.

2. 5 year old child with episodes of asthma
    a. Identify the device/ devices : MDI with spacer
    b. What are the advantages of spacer

No need for synchronising with breath- so easier to use in children and elderly who have difficulty synchronising

Less chance of oropharyngeal candidiasis – Larger particles will accumulate in walls of spacer

c. What other device can be used for smaller children? The spacer with MDI can be connected to a mask

d. Explain the method of using MDI with spacer.

3. Transdermal patch

a. What are the advantages of this device?

Provides smooth plasma concentration of the drug without fluctuations
Bypass first pass metabolism
Long duration of action
Painless and convenient, Better patient compliance

b. Examples of drugs that can be given by this type of device

Nicotine, Hyoscine, Nitroglycerine, Clonidine, Fentanyl

c. What disadvantage can occur? How can it be minimised?

Local irritation and erythema - minimised by changing the site of application each time
Slow onset of action, Expensive
Can fall off without patient noticing leading to therapeutic failure

d. Mention the sites of application

On hairless areas preferably chest, abdomen, buttocks
- Patch to prevent motion sickness applied over mastoid process

4. Suppository

a. Give examples of this device used for systemic and local delivery of drugs

Systemic: Paracetamol, Diazepam, Diclofenac
Local: Bisacodyl, Glycerine

b. What are the advantages and disadvantages of this dosage form?

Advantages : Bypasses first pass metabolism
- Can be used for children, unconscious patients and in patients with severe vomiting
Disadvantages : Patient compliance low, Inconvenient and embarrassing, Absorption is slow, irregular and unpredictable, Rectal inflammation can result from irritant drugs

c. Name another dosage form utilising the same route of administration. What are its two types with eg ?

Enema.(Rectal route)
Evacuant enema eg: Glycerine, Soap and water enema
Retention enema eg: Hydrocortisone enema

5. Calamine lotion

a. Mention three uses of this preparation

Sunburns, Eczema, Insect bites, Urticaria, Contact dermatitis

b. What is an astringent? Give examples?

Astringents are substances that precipitate proteins, but do not penetrate cells, thus affecting the superficial layer only. They toughen the surface making it mechanically stronger and decrease exudation.
Eg :Tannic acid, Alcohol, Zinc, Alum

c. What are sunscreens? What are its types?
Sunscreens are substances that protect the skin from harmful effects of exposure to sunlight
Two types- chemical and physical
-Chemical sunscreens- they absorb and scatter UV rays that are responsible for sunburns and phototoxicity, but allow longer wave lengths to penetrate, so that tanning occurs. Eg: PABA, Benzophenones, Cinnamates
- Physical sunscreens – they stop and scatter UV light and also visible light. Prevent sunburns as well as tanning. Eg: Heavy petroleum jelly, titanium dioxide, zinc oxide, calamine

d. What is SPF?
SPF (Sun Protection Factor) is the ratio of the dose of UVB radiation that will produce minimal erythema on protected skin to the dose required for same on unprotected skin. It is a measure of efficacy of a sunscreen formulation

6. Insulin syringe

a. Identify the device
b. Name the drug administered through this device
c. Mention the routes of administration : Subcutaneous
d. Capacity of syringe : 1 ml
e. How are the markings in the syringe calibrated? In units
f. What are the two types of insulin syringes?
Red markings – 40 U / ml
Blacl markings : 100 U/ml

7. Insulin pen

a. Identify the device
b. Give two advantages of this device
Portable, easy to administer, Prefilled cartridges- so less time consuming, Less painful, Accurate dose can be administered
c. Give two disadvantages of this device
Expensive, Wastage of drug (some drug left behind in cartridge , but not enough to inject)

8. Tuberculin syringe

a. Identify the device
b. What are its markings? In ml
c. Mention 2 uses : BCG vaccination, Mantoux test, Drug sensitivity testing.

9. Lumbar puncture needle

a. Give two uses of this needle : Spinal CSF tap, Spinal Anesthesia
b. Mention the site of insertion of this needle : Subarachnoid space between L2-L3 or L3- L4.
c. Mention the route of administration : Intrathecal
d. Name two drugs administered through this route : Lignocaine, Bupivacaine, Methotrexate

10. Eye drops

a. What is the route of administration of this dosage form?
Topical
b. Name two other drugs available in the same dosage form

Ocular antibiotics like Moxifloxacin, Ciprofloxacin
Ocular NSAIDs like Flurbiprofen, Ketotifen
Ocular steroids like Dexamethasone, Hydrocortisone

c. Name the other ocular dosage forms.
Ointments : Azithromycin, Ciprofloxacin, Loteprednol
Applicaps : Chloramphenicol
Ocusert : Pilocarpine, Artificial tears
Vitreal inserts : Ganciclovir

d. What precautions will you take before administering eye drops?
Make sure solution is clear .
Observe strict hygiene and aseptic practices- wash hands before using eyedrops. Tip of the dropper should not come in contact with eye.
Drug should be instilled into lower fornix and not directly on cornea.
Use the drug within one month of opening the bottle. Remnant drug after treatment duration should be discarded and not to be stored for future use.

e. What are the disadvantages of this formulation?
Short duration of action- needs frequent dosing
Easy to contaminate, conjunctival /corneal irritation , Stinging.

f. How many drops need to be instilled at one time? One drop only (the max volume of conjunctival cul de sac is only 30 μl ; Normal 7-10 μl)

g. Suppose you want to administer two different eye drops at the same time. How will you do it?
Administer 2nd eyedrop 5 min after instilling 1st one.

h. What are the advantages and disadvantages of eye ointment over eye drops?
Advantages-
Prolonged retention in the conjunctival sac → longer duration of action, No stinging on application (important in children), Lack of preservatives, Less bacterial contamination , Prevent ocular surface drying due to lubricant nature, so minimise morning lid stickiness in case of infective conjunctivitis, Esp useful for night time application
Disadvantages:
Less rapid onset of action as compared to drops, Lower peak concentration, Greasy appearance on the lid margins, Blurring of vision

i. How can you reduce the systemic absorption of eye drops?
By pressing the medial canthus of eye (Limits systemic absorption through Nasolacrimal duct)

j. Name some ocular routes of drug administration other than topical?
Periocular injections: Subconjunctival, Subtenons, Retrobulbar, Peribulbar injections
Intraocular injections: Intravitreal, Intracameral (into anterior / posterior chamber of eye)
Vitreal implants: Ganciclovir, Fluocinolone.

11. Xylometazoline Nasal drops

a. Mention the use of the given drug?
Rhinitis, Sinusitis , Nasal polyposis (as nasal decongestant.)

b. Name TWO drugs given through this route for local and systemic effects?
Local – saline , oxymetazoline, Xylometazoline, Fluticasone.
Systemic – Desmopressin nasal spray for Diabetes Insipidus; Diazepam nasal spray for status epilepticus esp in children; Calcitonin, GnRH agonists, Sumatriptan

What are excipients?
Excipient is an inert substance added to a tablet to increase the bulk of the tablet. Eg: Starch, Cellulose, Gelatin, Glycerine
Name some colouring agents?
eg: white -titanium dioxide, blue – indigo, yellow - Sunset yellow, tartarazine; red – amaranth; brown- Caramel

PH 5.2: COMMUNICATION- OPTIMAL USE OF DEVICES AND STORAGE OF DRUGS

Study the technique for using MDI , MDI with spacer, Insulin pen, Transdermal patch , Suppository,Eye drops.

Exercises:

1. Give instructions to the parent of a 5 year old child with bronchial asthma regarding the use of MDI with spacer
    i. Shake the MDI well. Remove the cap
    ii. Fix the MDI into the open end of the chamber. (Opposite the mouthpiece)
    iii. Breathe out completely, emptying the lungs of as much air as possible
    iv. Place the mouthpiece of the chamber between the teeth and seal lips tightly around it
    v. Tilt the head backwards slightly
    vi. Press the canister once
    vii. Breathe in slowly and completely through the mouth. If one hears a “horn” like sound, one needs to slow down the speed of breathing
    viii. Hold the breath for 10 seconds to allow the medication to reach the airways of the lung and then breathe out into spacer
    ix. Repeat the above steps several times for each puff and wait for about 1 minute in between the puffs
    x. Replace the cap on the MDI when finished
    xi. If one is using a corticosteroid MDI, one should rinse and gargle their mouth using warm water after each use
    xii. Air dry the spacer before next use.

2. 35 year old male is prescribed 10 units of Insulin Lispro injection. Demonstrate the use of Insulin pen in this patient
    i. Check expiry date of Insulin cartridges.
    ii. Wash hands. Take 2 alchohol swabs and needles.
    iii. Remove the pen cap and clean tip of the pen with alchohol swab
    iv. Remove the protective cover from the insulin pen needle, attach the needle to the pen and screw tightly onto the pen.
    v. Remove the outer needle cap , put it aside, remove and discard the inner cap.
    vi. To remove air bubbles and check if needle is working properly:- turn the dose selector to 2 U, hold the pen with needle pointing upwards and tap the insulin reservoir and press the dosing button till dose selector turns to zero to discard the air bubbles. Make sure insulin drops appear at needle tip. If not change needle and repeat.
    vii. Choose the required dose at dose selector window by turning.
    viii. Clean the injection site with alchohol swab and let it dry

ix. Grip the pen firmly and insert the needle perpendicularly into the skin.
x. Press the dosing button to inject insulin slowly until the marking zero lines up with the pointer
xi. Withdraw the needle after 5 more seconds
xii. Cover the needle with big outer cap tightly and use it to unscrew the needle from the pen.
xiii. Discard the used needle in a sharp's container
xiv. Put the cap back to pen , label the date when it was first opened

3. Give instructions for a 50 year old man with chronic stable angina regarding use of **nitroglycerine** transdermal patch

i. Advise the patient to read the patient information leaflet before using the patch for the first time. Check the expiry date.
ii. Apply with clean dry hands in a clean, hairless, dry and non-bruised area, preferably on upper body or upper arms
iii. Remove the patch from the wrapper just prior to application and peel off the protective backing.
iv. Place on skin and press firmly with palm of hand for 10-20 seconds.
v. Do not touch exposed adhesive area of patch. Wash hands thoroughly before and after application.
vi. Apply the patch only for 14- 15 hours daily and remove after it
vii. Apply different patch daily **at the same time** on a different area for application.
viii. Wash old application site thoroughly with soap and water after removing patch.
ix. If patch becomes dislodged, discard patch and apply fresh patch to hairless area.
x. If u miss a dose, take it as soon as you remember. If the next scheduled dose is within 6 hours, omit the dose and proceed with next patch.
xi. Activities such as bathing or swimming should not affect patch however, it should be kept as dry as possible.

4. Communicate regarding the proper use of pulse oximeter in a COVID 19 patient.
Sir/ Madam, As u have COVID ,you have to monitor your oxygen saturation regularly to exclude any complications. Pulse oximeter is needed for that
i. Sitting position is preferred.
ii. Place the oximeter preferably in the index finger (should not have any deformity), finger tip under red light. Keep hand steady in a resting position.
iii. Allow the reading to stabilize for a minute before recording. Do not press the oximeter while reading is being taken.
iv. If reading is below or equal to 95% consult a doctor immediately
Shivering/ cold extremities may alter values
Light source should not be blocked by dust. Clean oximeter properly.
To check if it is working properly, try on another person who doesn't have any symptoms.

5. Give instructions for a 45 year old man with constipation regarding use of Bisacodyl suppository.
    - Check the expiry date
    - If the suppository is too soft,let it harden by keeping the pack in refrigerator or hold under cold running water.
    - Wash your hands
    - Remove the covering if suppository is firm. Remove possible sharp rims by warming in the hand

- Moisten the suppository with cold water
- Lie on your side, straighten the lower leg and bend upper leg forward towards stomach.
- Gently insert the suppository , rounded end first into the anus.
- Remain lying down for few minutes

1. What is the difference in storage of insulin vial and insulin pen
   Pen : Keep insulin catridges refrigerated till opening. Once opened and start using, it can be kept at room temperature.
   Vial : One opened, a vial can be used for 23 days. It can be stored in fridge or at room temperature.
2. Comment on the use and storage of eyedrops.
   Use :
   i. Wash your hands and remove the cap from bottle
   ii. Lie down or sit down with your head tilted back
   iii. Pull down your lower eyelid to make a pocket
   iv. Instill one drop to the pocket making sure the tip don't touch your eye
   v. Close your eye and apply pressure on the inner corner of your eye for a minute to prevent systemic absorption through nasolacrimal duct.
   vi. Wipe away the excess liquid from around your eye.
   vii. Wait for 5 minutes after each application, if you want to use more than one eyedrops.
   viii. Close the bottle and store properly.
   Storage: Store in a cool dry place. Once opened, it should not be used after 1 month.
3. Advice the patient regarding the reconstitution and storage of Amoxicillin dry powder.
   Reconstitution is done with sterile water got along with powder. Add 1/3 of total water for reconstitution and shake vigorously to wet powder. Add remainder of water and again shake vigorously to make suspension.
   Storage: Dry powder can be stored for 3 months. Reconstituted solution should be stored at 2-5^0 C in refrigerator for max 14 days.
4. What is cold chain for vaccine? List the storage conditions for different vaccines involved in the Universal Immunisation Programme.
   Cold chain is the system of transporting and storing vaccines at recommended temperature from the point of manufacture to the point of use.
   Cold chain storage equipments include walk in storage, deep freezers and ice lined refrigerators. Cold boxes, vaccine carriers and day carriers are the transporting equipment.

The administrative level	Storage period	Temperature	The vaccines
Central & regional stores	Maximum three months	- 20° to- 30°C	OPV, Measles, MMR,BCG
		+2° to +8°C	DPT, DT, dT, TT& HB,Hib
Districts stores& local immunization centers	Maximum one month	0°C to+8°C	OPV, Measles, MMR, BCG
		+2° to +8°C	DPT, DT, dT, TT& HB,Hib