PRACTICAL 5 ADMINISTRATION OF MEDICATION AND INTRAVENOUS FLUIDS

Structure

5.0 Objectives
5.1 Introduction
5.2 Safety Measures and Possible Errors in Administration of Drugs
5.3 Drug Calculations
5.4 Routes for Administration of Drugs
  5.4.1 Factors for Determining Route
  5.4.2 Oral Route
  5.4.3 Parenteral Route
  5.4.4 Inhalation Route
  5.4.5 Topical Route
  5.4.6 Rectal Route
5.5 Administration of Medications in Special Conditions
5.6 Common Drugs Administered to Neonates
5.7 Intravenous Fluid Therapy
  5.7.1 Types of Fluid used for Newborn
  5.7.2 Preparation of Different Types of Fluids used for Newborn
  5.7.3 Fluid Requirements for Newborn
  5.7.4 Regulation of Flow Rate for Newborn
  5.7.5 Equipments Required
  5.7.6 Procedure
5.8 Recording/Monitoring
5.9 Total Parenteral Nutrition (TPN)
5.10 Activities and Guidelines
5.11 Let Us Sum Up

5.0 OBJECTIVES

After completing this practical, you should be able to:

• Administer drugs through various methods to the pediatric patients;
• Calculate and administer accurate dose as required;
• Become familiar with the actions of the commonly used group of drugs;
• Recognize the fact that narrow margins exist between therapeutic level and toxic level of same drugs for neonates/children;
• Practice the safety principles so that drug error is avoided;
• Identify importance of drug interaction;
• Identify situations requiring intravenous fluid therapy;
• List common fluids used for newborn;
• Calculate fluid requirement for newborn;
• Prepare different types of fluids used for newborn e.g.- N/5,N/3,N/2 in 10%, 5% dextrose;
• Calculate and regulate accurate flow rate for newborn;
• Perform procedure step by step effectively; and
• Monitoring/recording of IV therapy for newborn.

5.1 INTRODUCTION

In this practical, we will learn about administration of medication and drug supplement. The safe administration of medication to children presents a number of problems that are not encountered when giving medications to adult since we need to consider multiple effecting factors like body surface area and the ability to absorb, metabolize and excrete medications when administering the medications to the neonates. Nurses must be particularly alert when calculating and administering drugs to infants and children.

In the case of very sick or premature newborn, parenteral route is used to maintain fluid and electrolyte within normal range. Intravenous fluid is given to ensure that the newborn baby receives necessary fluid, recommended calories and electrolytes. IV fluids may be either plain IV fluids or parenteral nutrition fluids. IV fluids are usually glucose and electrolyte solutions e.g. – Isolyte P, Ringer’s lactate, and glucose. And neonates may also be given drugs through this route. Therefore, it is essential for the nurse to understand her responsibility in maintaining proper administration of fluids and medications.

5.2 SAFETY MEASURES AND POSSIBLE ERRORS IN THE ADMINISTRATION OF DRUGS

Safety Measures

It is essential to revise the seven ‘Rights’ before administration of medication to the paediatric group. These as you know are:

i) The right patient
ii) The right drug
iii) The right dose
iv) The right route
v) The right time
vi) The right documentation
vii) The right of parents and child/baby

Possible Errors in Drug Administration

There can be various reasons for error in administering drugs:

i) Poor communication of intention by the prescriber
ii) Failure to keep an established routine when administering therapy
iii) Lack of understanding of the objectives of therapy
iv) Failure of the nurse to recognize that the medical officers and pharmacy departments may make errors
v) Poor concentration or constant interruption
vi) Ignoring the need for an experienced person to double check the drug, the dose, identification of the patient and any previously administered preparation
vii) Failure to calculate to one’s own satisfaction
viii) Failure to learn appropriate pediatric doses of commonly used medications
ix) Lack of knowledge regarding drug interaction and side effects
x) Inadequate security of drug storage
xi) Failure to record administered doses

- If you are in doubt, do not give the medication, however no medication should be omitted without the pediatrician’s order.
- If an error is made, doctor must be informed and action prescribed to be carried out. An incident form is to be completed. It is necessary to report this incident to your sister incharge/senior nursing staff/doctor.

5.3 DRUG CALCULATIONS

On admission, the baby/infant can be weighed as required during his stay in hospital. It is also essential to remember while using age of the child as a method of drug calculation that children of the same age group vary considerably in size. So age alone may prove a poor guide to drug calculation especially where the child is very sick.

- See the dose required for the child on the leaflet provided by the manufacturer.
- Read the manufacturer’s instruction carefully before preparing the drug.

5.4 ROUTES FOR ADMINISTRATION OF DRUGS

There are various routes by which we can administer drugs, and you are already highly skilled in administering drugs by various routes.

5.4.1 Factors for Determining Route

Factors that are considered when selecting the route for an infant or a child include the following:

- The amount and character of the medications to be given
- The general condition of the baby
- Factors that may interfere with the absorption and distribution of drugs
- The child’s ability to tolerate the drugs.

5.4.2 Oral Route

The oral route is prepared for administering medications to children whenever possible because in case of administration of oral medications most of the drugs
are dissolved or suspended in liquid preparations. Most pediatric medications come in palatable and colorful preparations.

They can be made acceptable if given along with fruit flavored syrups. But do not mix the medication with food as the infant may develop aversion to particular food if mixed with the medicine. Capsules should not be opened and administered as the powder is unpalatable. If child cannot swallow; open the capsule and mix powder with the honey/sugar or other sweetened syrups.

**Equipments**

A tray containing

- Prescription sheet
- Oral medication e.g. tablets, syrup etc.
- Medicine measures /Milliliter measures
- 1 ml syringe/ 5 ml spoon, plastic dropper (preferable calibrated)
- Medicine tray with medication card
- Glass of fruit juice or sweets( in case of older children)
- Glass of water

**Procedure**

- Explain the procedure to mother or the caregiver.
- Read the prescription sheet carefully.
- Confirm that medicine contained in the bottle is prescribed one for example, if liquid, shake the bottle first to mix the content.
- Hold the measure at eye level and keep a finger at the appropriate graduation and pour the medication.
- While pouring ensure the bottle label is upper most.
- Replace the stopper and place the measure containing medicine on a small tray and take to the newborn’s bedside with the medicine card.
- If the quantity of medicine is small then use a spoon.
- In case of tablet, remove the tablet from the packet and crush it between two spoons.
- Mix crushed tablet with jam or fruit juice.
- Rinse the measuring glass to wash off the residue e.g. if elixir of digoxin is to be measured the best is to use 1 ml syringe for accurate dose.
- Record it in medication card and nurses note.

- As a nurse you must remember to talk to the baby/child before administering the medicine. Make the baby/child sit in mother’s lap to achieve better control or the baby can be restrained in a blanket or sit with his right arm tucked under your (nurse’s) left arm. Then you can control his left arm as you administer the medicine.
- You should take care that the baby does not ingest the medicine when he is struggling.
Techniques in Newborn and Infant Care

➢ Provide something pleasant after the medicine is administered.

• After medicine is administered orally, wipe bottles and close container and replace in the cupboard. The used measure glass, spoon, dropper are thoroughly washed, rinsed and dried before replacing in the cupboard.

5.4.3 Parenteral Route

An injection is an unpleasant experience for a person at any age and is particularly traumatic to the small child who often lives in fear of the next “needle prick”.

To allay fear and anxiety, the drug should be prepared away from the bed side so that the procedure is over before the baby is fully aware of the situation. It is essential that you have another nurse to help restrain the baby while you administer the drug. The most commonly used syringe in pediatric unit is of 2 ml. It is graduated in 0.1 ml (1/10 ml) division, so that drug dosage requiring multiples of 0.1 ml can be accurately administered.

For administration of a drug in less than 0.1 ml, 1 ml Mantoux syringe bearing 0.01 ml (1/100 ml) graduation is essential. Special syringes for administration of insulin are graduated in 20 units/ml.

Needles used should be disposable, sharp and straight for each injection.

It is essential to remember the colour code used by each manufacturer for their own brand of needle according to the diameter of the needle lumen and length. Injections, can be administered intramuscular, subcutaneous, intra-venous, hypodermic and intrathecal depending on the type of drug to be administered.

Equipments

Tray containing

• Sterile equipment: syringe, needle, spirit swab
• Injection card
• Drug vials
• Pair of sterile gloves
• Sterile distilled water ampoule
• File
• Kidney tray

Procedure

• This method requires strict asepsis. As the protective skin is punctured and micro-organisms can easily gain entry.

• Ensure that the articles are sterile and hands thoroughly washed and dried before you handle the syringe.

Remember

• Do not touch the sterile needle.

• Read the patients prescription sheet carefully.

• Take out the appropriate drugs and once again check with patients papers/injection card.
Now we shall see how to use multidose and single dose vials

Using a Multidose Vial

- Dilute the drug according to the manufacturer’s recommended quantity of diluent.
- The quantity of diluent added is of considerable importance particularly as a single dose container intended for one dose for an adult may well be used for fractional doses for children. For example, Ampicillin 250 mg is diluted with 1.8 ml of water for injection to give a resulting strength of 125 mg in 1 ml.
- Insert the needle through the rubber diaphragm at right angle and inject air.
- Apply negative pressure by withdrawing the piston to the appropriate level.
- Read the syringe at eye level and adjust with the point of the needle still in the bottle.
- Do not eject excess air into the drug.
- Reinsert the needle into the sheath until ready for use.

Using a Single Dose Ampoule

- Collect the drug into the body of the ampoule.
- With a file snap off the neck.
- Draw the medication in required amount in the syringe and eject the excess back into the ampoule.
- Reinsert the needle into its sheath until ready for use.
- Place the syringe in the injection tray.
- Take a swab of spirit and the tray and go to patient’s bed side. Check once again if it is right patient, drug and dose.
- Appropriate site is selected and after immobilizing the newborn, inject the drug. The right technique should be used when administering the drug.
- Withdraw the needle and apply firm pressure at the site with a swab to enhance circulation and quick absorption of the drug; discard the swab in a kidney tray or dustbin.
- Record in nurses notes and chart in order book or TPR chart, if required.
- Wash the syringe, if disposable then dispose the needle separately in a sharp instrument bin and the syringe separately in another bin.

Now we shall focus on various routes of giving injections

1) Subcutaneous injection:
   - It is the injection given below skin not in the muscles.

Site

- the upper outer area of the arm
- the front and outer sides of the thighs
- the abdomen, except for a 2 inch area around the navel
• the upper outer area of the buttocks
• the upper hip

Equipments
• Prescribed medication
• Alcohol swab or 70% alcohol and cotton ball
• Syringe and needle
• Container for disposal

Procedure
• Wash your hands with soap and water. Rinse and dry with clean paper or cloth towel.
• Find a site for the injection. This is usually the upper part of the thigh or upper arm.
• Check the medication before using it. Look at the label and check that you have the correct medication and concentration. Make sure that the expiry date has not passed and that the top of the bottle is not damaged. Make sure the medication has not changed color or consistency. Follow the given instructions for mixing the medication prior to use.
• Clean the top of the bottle with an alcohol swab or a cotton ball dipped in alcohol. Allow it to dry.
• Remove the needle cover from the syringe by pulling it straight off. Lay the cover on a flat surface.
• Draw air into the syringe by pulling back on the plunger to the amount of medication to be given. Insert the needle of syringe, push the air in the medication vial and with draw medicine, change the needle, thereafter.
• If needed, have your baby straddle or sit on the lap of a known adult. This person can hug and stabilize arms and legs not being injected.
• Clean the site with alcohol using friction. Let the alcohol dry.
• With your thumb and index finger, pinch a small area of skin (fat tissue).
• Insert the needle through the skin into the fat tissue at a 45 degree angle if you use a long needle (1/2 inch or 5/8 inch long). Insert the needle through the skin into the fat tissue at a 90-degree angle if you use a short needle (5/16 inch long).
• If the medicine in the syringe is clear of blood, slowly push all the medicine into the tissue.
• After you remove the needle, gently press on the site with a dry gauze or tissue until the bleeding stops.
• Wash your hands well again.

Remember
Do not give the injection in the same spot each time. Write down the site you use each time and give each injection in a new site
2) Intra-Muscular Route of Injection

It is the injection given into the muscles.

Site:

✓ Vastus lateralis

Location: Palpate to find greater trochanter and knee joints, divide vertical distance between these two landmarks into thirds, inject into middle third.

Needle insertion and site: Insert needle at 45 degree angle toward knee (22-25 gauge, 3/4 to 1 inch)

Advantages

• Large well developed mass that can tolerate upto 0.5 ml of fluid
• Easily accessible
• A trochanter can be applied above injection site to delay drug hypersensitivity reaction if necessary

Disadvantages

• Thrombosis of femoral artery from injection in mid-thigh area
• Sciatic nerve damage from long needle injected posteriorly and medically into small extremity

Purpose

• When rapid action is required
• When drug would prove irritating to the subcutaneous tissue
• Site selected should be such where there is a reasonable amount of muscle with no underlying nerves or blood vessels that can be damaged

Equipments

• Disposable or sterile glass syringe with needle size 24 or 26 G
• Cotton swabs
• Alcohol/spirit
• Medication

Procedure

• Follow asepsis and universal precautions.
• Attach a needle and load the syringe with the required accurate dose.
• Attach a fresh needle.
• Restrain the baby.
• Expose the thigh and identify the injection site.
• Cleanse the site with alcohol and wipe.
• Grasp & extend the muscle in between the thumb and the finger and insert needle into the middle of the vastus lateralis muscle at right angle (90°).
Techniques in Newborn and Infant Care

• Aspirate the syringe to see that the needle is not in the blood vessel. (if blood is aspirated then take out the needle and reinsert it at a separate point).

• Inject the required amount.

• Withdraw the needle

• Wipe with alcohol swab and press with dry cotton. Don’t rub.

3) Intravenous Administration

This route of administering drugs is becoming more popular in the paediatric practice.

Purpose of this Route

• When rapid action is required

• High serum concentration required of the drug

• Babies who cannot absorb drugs from gastro-intestinal route because of continuing diarrhoea, dehydration or other problems

Equipment

Tourniquet, scalpvein or veinflow, spirit swab, adhesive

Procedure

• Select the vein. A vein in the antecubital fossa i.e. the cephalic or median basilic is usually selected and the elbow extended.

• Make the vein prominent by constriction above the site with the hand of the assisting nurse or a rubber tourniquet can be used. If the vein on the dorsum of the hand is selected and digital constriction is applied around the wrist, precaution should be taken not to occlude the radial pulse.

• Once the vein is prominent clean the area and let it dry.

• Gently enter the vein, once blood is seen in the scalp vein/veinflow tubing release the pressure.

• Secure the scalp vein/veinflow with adhesive.

• Inject the drug kept ready and close the opening, two way set can also be connected and kept.

• When intravenous drugs are discontinued, the needle should be withdrawn and firm pressure applied over the site and the limb may be elevated for one minute.

Key points to remember in this method of administration

• It is essential not only that the correct drug and volume of drug dosage be used but also that the desired concentration of the drug reaches the site where it can be most effective.

• If the infusion of fluid is slow, then the drug actually reaching the child is delayed and hence there can be mistiming of peak level in the blood.

• Do not change the set immediately after injecting the drug as there can be some loss of drug with the discarded set.
• Multiple drugs can be administered sequentially.
• It is essential to remember the rate of infusion of a drug influences the effect of a drug on the baby/newborn.
• Faster the rate of infusion, greater would be the peak concentration of a drug in the vascular system.
• If the rate of infusion is almost the same as the rate of clearance, the drug serum level may be close to non-existent. Hence, those drugs with high rate of clearance should not be administered by this method.
• When administering drug by this route, it is essential to remember the expected action of the drug, untoward reaction, side-effects and their antidotes.
• Check and cross check the amount of drug prescribed.
• Check the solution in which it is to be diluted, compatibility of the drug and intravenous solution, the precise dilution of the drug for effectiveness, the length of time needed to infuse the drugs e.g. drugs like calcium gluconate, soda bicarbonate are to be given slowly.
• Drugs designed for intravenous administration should only be given by this route.
• Some drugs given intravenous are very toxic or irritating to body tissues outside the intravascular system. Hence, it is important to check the site of infusion for proper placement and signs of infiltration.
• Do not administer intravenous drugs with blood or blood products like lipids etc.
• Administer the drug within the stability time period when mixed.
• Do not mix antibiotic with each other or with vitamins and any other supplements as they may inactivate them.
• As there is no control over a drug administered intravenously, therefore, continuous monitoring is essential for drug reaction.
• Ensure that the arm is well immobilized by strapping to the arm board.

5.4.4 Inhalation Route

Therapies that can be administered by inhalation are oxygen, humidification-cool mist and steam, administering local medication. The medication is commonly administered through inhalation by using ultrasonic nebulizer/jet.

Purpose
To relieve nasal congestion and sinusitis.

5.4.5 Topical Route

The medication in topical route is administered through ear, nose and eye.

Drops are instilled into the nose, ear and eyes of the baby in much the same way as they are in the adult with the following exceptions:
• The dose of medication may be smaller than the amount the adult receives
• The use of a medicine dropper that has a smooth tip to prevent injury
Techniques in Newborn and Infant Care

- Medication warmed to room or body temperature before administration
- The young baby head must be immobilized to prevent any accidents

1) **Nose Drops**

Instillation of medication in the nose.

**Purpose**
- To relieve nasal obstruction
- To shrink the mucous membrane
- To relieve the stuffed feeling
- To reduce excessive nasal discharge
- To relieve bronchospasm

**Equipments**
Nasal drops, dropper, medication card

**Procedure**
- Explain the mother or caregiver.
- Hold the infant in cradle position when administering nasal drops.
- Tilt his head back and stabilize it in the crook of your arm by pressing it between your arm and body.
- Squeeze drops into each nostril as prescribed.
- Ask to sniff after you instill the drops.
- Ensure that the baby does not sneeze; as the medication will be sprayed out.

**Points to remember**
- Ensure the drops come in contact with the surface of the posterior portions of the nose.
- If nose is filled with secretions suction with a soft rubber bulb nasal syringe.
- Keep drops and dropper separate for individual infant or at least use separate dropper for several infants.
- Rotate the head when drops are instilled in the right nostril to right side similarly when drops are instilled in left nostril rotate head to left side.

2) **Eye Drops**

Medication is instilled in the form of drops or ointment into eye.

**Purpose**
- To dilate pupil e.g. Atropine 1%, drosyn 5% or 10%
- To constrict the pupil e.g. Pilocarpine 0.5%
- To prevent or control infection e.g. antibiotics
- To lubricate eye ball e.g. caster oil or paraffin
- Prior to examination of the cornea e.g. flouresicin 2%
- To induce local anaesthesia prior to removal of foreign body e.g. cocaine hydrochloride
To reduce inflammatory response e.g. Sofracord Hydrocortisone eye ointment

**Equipments**

Eye drops, pipette/tube with ointment, sterile cotton wool, medication card, kidney tray for soiled swabs

**Procedure**

- Explain the mother or caregiver.
- Clean the eye using sterile distilled water or boiled cooled water.
- Position the baby in supine position. Preferably mummify the baby with blanket or baby sheet.
- Check the prescription.
- Wash and dry your hands.
- Fill the pipette or dropper with the required medication.
- Rest your right hand on the forehead of the baby and with the index finger and thumb using mild traction hold both lids apart.
- The dropper is held a few millimeters over the lower-fornix and while the baby looks upward the medication is expressed within the conjuntival sac.
- An alternative to instill drops is when the baby looks downwards. The solution is expressed into the upper fornix.
- Mop the excess medication from the cheek.
- Apply slight pressure on the conjunctival sac or position the face upwards for 2 – 3 minutes to discourage the drainage into lacrimal passage and also to prevent dilution of the drug with the tears.
- In case of ointment, wipe the nozzle with a cotton swab.
- Apply a thin strip of ointment to the exposed lower fornix of the conjunctiva.

**Precaution**

- Do not touch the tip of dropper or nozzle to the conjuctiva or the eye.
- Do not put solution drop directly into the cornea.

3) **Ear drops**

Now we shall discuss the procedure of instilling ear drops.

**Purpose**

- To soften wax (4% sodium bicarbonate, olive oil, wax solvent etc.)
- To relieve the pain of otitis media (phenoldrops etc.)
- To treat infection of the external auditory meatus (e.g. chloramphenicol or neomycin ear drops etc.)
- To float out small insect (e.g. olive oil)
**Techniques in Newborn and Infant Care**

### Ear Drops, Pipette/Dropper, Medication Card

**Equipments**

Ear drops, pipette/dropper, medication card.

**Procedure**

- Examine the ear to ensure it is clean.
- Exclude ear perforation.
- Position the baby in supine position and restrain.
- Place the baby laterally on his unaffected side or in a sitting position with his head tilted toward the unaffected side.
- Instill the warm ear drops holding the dropper to the edge of the meatus.
- Maintain the position of the infant for 5 to 10 minutes to ensure the medication remains in contact with the ear drum for few minutes.
- Place a small well loosened cotton wool in the outer meatus to absorb the excess solution.

**Points to remember**

- Do not insert the dropper into the ear canal nor hold it too far from the ear.
- Do not instill cold drops as when it comes in contact with the tympanic membrane the child can experience pain or severe vertigo.
- Do not tightly plug the ear as it can block the free flow of discharge from the ear canal.

### 5.4.6 Rectal Route

A drug may be administered by rectal route in the form of suppository or enema for either systemic or local effect.

1) **Suppositories** are cone-shaped gelatinized preparation sometimes containing medicine.

**Purpose of giving suppositories**

- To evacuate the bowel
- To administer a drug which is unpleasant to take orally (aminophylline)
- In the relief of rectal or anal discomfort e.g. Anmol(Paracetamol)

**Equipments**

Tray containing

- Prescribed suppositories and medicine card
- A bowel of warm water
- Pair of gloves
- Kidney tray to receive used gloves

**Procedure**

- Explain the procedure to mother and care giver.
- Provide privacy.
Administration of Medication and Intravenous Fluids

1) Suppository

- Relax the infant.
- Place the infant in left lateral position with flexed lower limb, draw the buttocks to the edge of the bed, place a mackintosh under the buttocks, baby is well draped leaving the buttocks exposed.
- Lubricate the suppository.
- Separate the buttocks and visualize the anus.
- With the gloved hand insert the lubricated suppository through the anal sphincter to the length of index finger. The anal area is cleansed and the glove and gauze piece discarded. If there is tendency for the suppository to be expelled, the buttock may be held together for few minutes.
- The baby is made comfortable and kept with the mother.

Special Point to Remember

- Glycerine Suppositories to be lubricated by dipping the tip in warm water and bowel action occurs 20 to 30 minutes later.
- For Dulcolax suppositories lubricate with KY jelly or Vaseline. Bowel action can be expected in 5 to 10 minutes.
- Suppositories containing drugs like aspirin preparation in case of pyrexia should not be rejected. Therefore, should be inserted deep in the anus. The mother and baby to be ensured that a bowel action is not necessary.

2) Enema

- Enema may be given for the purpose of cleansing for therapeutic uses; to relieve intra-cranial pressure, abdominal distension, intussusception and for diagnostic purpose.
- The procedure has to be done in the same way as for an adult patient. But it is essential to remember that small tubing will be required and more precaution to be taken and the amount of fluid required is less. The tube should be inserted 2 to 4 inches only.
- The equipments used should be thoroughly washed, dried and replaced.

5.5 ADMINISTRATION OF MEDICATIONS IN SPECIAL CONDITIONS

If the baby is unable to take medications through oral route because of various conditions like post-operative phase, poor sucking and swallowing reflex etc. then the medication can be given through various methods like:

- Nasogastric medication administration
- Gastrostomy medication administration
- Orogastric medication administration

Articles
Tray containing medicine, syringe, kidney tray, paper bag and water
Techniques in Newborn and Infant Care

Procedure

• Explain and reassure the mother.
• Pour the mediation in the container keeping 7R’s in mind.
• Confirm that the tube is properly positioned.
• Remove the plunger of a sterile syringe and connect barrel of the syringe with the tube.
• Pour 3-5 ml of water then give required amount of medication.
• Flush the syringe with 2-3 ml of water.
• Make the baby comfortable.
• Do accurate recording and reporting.

Points to be kept in mind for nasogastric, orogastric or gastrostomy medication administration in children:

• Use elixer or suspension preparations of medications whenever possible.
• Dilute viscous medication or syrup if possible with a small amount of water.
• If administering tablets, crush tablet to a very fine powder and dissolve drug in a small amount of warm water (drug can be sent for fraction to Pharmacy if possible).
• Never crush enteric coated or sustained release tablets or capsules.
• Avoid oily medications because they tend to cling to side of tube.
• Do not mix medication with enteral formula unless fluid is restricted.
• Have medication at room temperature.
• Measure medication in calibrated cup or syringe.
• Check for correct placement of nasogastric or orogastric tube.
• Add syringe to the tube (without plunger).
• Pour medication into syringe.
• Unclamp the tube and allow medication to flow by gravity.
• As soon as syringe is empty, pour in water to flush tubings. The amount of flush solution usually is 1½ times the volume of drug.
• With certain drug preparation more fluid may be needed.
• If administering more than one drug at the same time, flush tube between each medication with clean water.
• Clamp tube after flushing, unless tube is left open.

5.6 COMMON DRUGS ADMINISTERED TO NEONATES

Following are some drugs commonly used in nursery, presented in alphabetical order. Simple formula for calculation of drug amount is given below:

\[
\frac{\text{Desired strength of the drug}}{\text{Drug strength in hand}} \times \text{Quantity} = \text{Amount required}
\]

\[
\frac{D}{H} \times Q = A
\]
# Administration of Medication and Intravenous Fluids

## I. Adrenaline

<table>
<thead>
<tr>
<th>Presentation</th>
<th>1 mg/ml (1:1000 concentration).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>0.1-0.3 ml/kg/dose of 1:10,000 dilution, repeat every 3-5 minutes, if necessary</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous or endotracheal route</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Take 0.1 ml in 1 ml syringe. Dilute it with 0.9 ml water for injection (10 times dilution) to make 1 ml, the resultant concentration is 1:10,000 solution.</td>
</tr>
</tbody>
</table>

## II. Aminophylline

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 250 mg in 10 ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Apnea of prematurity</td>
</tr>
<tr>
<td>Dosage</td>
<td>Loading dose: 5.0-8.0 mg/kg/ IV, maintenance: 1-2.5 mg/kg/dose q 8 hourly IV, PO.</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous or oral route</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Take 0.1 ml of solution in 1ml syringe. Dilute with 0.9 ml to make 1 ml with water for injection. Resultant concentration is 2.5mg/ml. Administer required dose IV over 20 minutes.</td>
</tr>
<tr>
<td>Compatible</td>
<td>With 5% dextrose, normal saline, ringer lactate</td>
</tr>
<tr>
<td>Incompatible</td>
<td>Sodium bicarbonate</td>
</tr>
<tr>
<td>Caution</td>
<td>Never give by intramuscular route.</td>
</tr>
</tbody>
</table>

## III. Ampicillin

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 100, 250 &amp; 500mg vials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Sepsis, pneumonia, meningitis etc.</td>
</tr>
<tr>
<td>Dosage</td>
<td>Sepsis/pneumonia: 50-100 mg/kg/day divided q8-12 hourly IV, IM; meningitis: 100-200mg/kg/day divided q6-8 hourly IV.</td>
</tr>
<tr>
<td>Directions for use</td>
<td>250 mg vial: add 5.0 ml water for injection, resultant concentration 50mg/ml, administer the required quantity IV slowly.</td>
</tr>
</tbody>
</table>

## IV. Calcium gluconate

<table>
<thead>
<tr>
<th>Presentation</th>
<th>9 mg/ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Treatment of low blood calcium level</td>
</tr>
<tr>
<td>Dosage</td>
<td>1-2 ml/kg/dose every 6-8 hourly</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous route only</td>
</tr>
</tbody>
</table>
### Directions for use

To be diluted in equal amount of distilled water. Inject very slowly while MONITORING HEART RATE. If there is bradycardia, discontinue the injection.

### Incompatible

Sodium bicarbonate

### Caution

Take care to avoid extravasation, if being given as infusion since it may cause sloughing of skin.

### V. Gentamicin

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 80mg, 40mg and 20mg/2ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Sepsis, pneumonia, meningitis etc.</td>
</tr>
<tr>
<td>Dosage</td>
<td>Conventional: &lt;7 days: 2.5mg/kg/dose q12 hourly IV, IM; &gt;7 days: 2.5 mg/kg/dose q8 hourly IV, IM; single dose: preterm: 4mg/kg/dose 24 hourly IV, IM; Term: 5mg/kg/dose 24 hourly IV, IM</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous, intramuscular routes</td>
</tr>
<tr>
<td>Directions for use</td>
<td>20mg/1ml (40mg/2ml) ampoule: Take 0.1 ml and dilute with 0.9 ml with water for injection to make 1ml. Resultant concentration is 2mg/ml</td>
</tr>
<tr>
<td>Compatible</td>
<td>With 5% dextrose, normal saline</td>
</tr>
<tr>
<td>Incompatible</td>
<td>Sodium bicarbonate, heparin, chloramphenicol</td>
</tr>
</tbody>
</table>

### VI. Phenobarbitone

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 200mg/ml in 1ml ampoules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Neonatal seizures</td>
</tr>
<tr>
<td>Dosage</td>
<td>Loading dose: 15-20mg/kg IV, maintenance: 3-5mg/kg/day IV, PO in 1-2 divided doses</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous and per oral</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Take 0.1 ml of solution and dilute with 0.9 ml of water for injection to make 1 ml, give required amount slowly over 15-20 minutes</td>
</tr>
<tr>
<td>Caution</td>
<td>May cause respiratory arrest</td>
</tr>
</tbody>
</table>

### VII. Phenytoin

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Injection 100 mg/2ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses</td>
<td>Neonatal seizures</td>
</tr>
<tr>
<td>Dosage</td>
<td>Loading dose 15-20 mg/kg IV</td>
</tr>
<tr>
<td>Route</td>
<td>Intravenous route only</td>
</tr>
<tr>
<td>Directions for use</td>
<td>Dilute in normal saline, give slowly at a rate 1 mg/kg/min infusion over 15-20 minutes</td>
</tr>
<tr>
<td>Compatible</td>
<td>Normal saline only, incompatible with all other solutions.</td>
</tr>
<tr>
<td>Caution</td>
<td>After giving, flush the cannula with saline to prevent phlebitis. Do not use cloudy solutions.</td>
</tr>
</tbody>
</table>
5.7 INTRAVENOUS FLUID THERAPY

Intravenous fluid therapy refers to the infusion of fluid directly into venous system which may be accomplished through the use of needle, canula or venous cut down.

**Purposes**
- To provide electrolyte and maintain acid/base balance and/or correct imbalances.
- To meet nutritional requirement by infusion of parenteral fluids
- To administer blood and blood products
- To provide intravenous medication

**Indications for intravenous fluid**
- Entire intake cannot be met orally e.g. extreme prematurity, GI hypomotality
- Feeding contra-indicated e.g. Necrotising entrocolitis, intestinal obstructions, some inborn error of metabolism
- Correction of a deficit e.g. dehydration, hypoglycemia, severe dyselectrolytemia
- As a channel for drug administration e.g. morphine etc.

5.7.1 Types of Fluid used for Newborn
- 5% dextrose, 10% dextrose
- Isolyte – P, N. Saline, R. Lactate
- N/5 in 10% Dextrose

**Constituents of fluids**

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Na (mEq)</th>
<th>K (mEq)</th>
<th>Glucose (gms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5% Dextrose</td>
<td>-</td>
<td>-</td>
<td>5 gms</td>
</tr>
<tr>
<td>10% Dextrose</td>
<td>-</td>
<td>-</td>
<td>10 gms</td>
</tr>
<tr>
<td>Isolyte-P</td>
<td>2.5</td>
<td>2</td>
<td>5 gms</td>
</tr>
<tr>
<td>N-saline</td>
<td>15</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>R. Lactate</td>
<td>13</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>N/5 in 5% Dx</td>
<td>3</td>
<td>-</td>
<td>5 gms</td>
</tr>
<tr>
<td>N/5 in 10% Dx</td>
<td>3</td>
<td>-</td>
<td>10 gms</td>
</tr>
</tbody>
</table>

5.7.2 Preparation of Different Types of Fluids used for Newborn

**How to prepare N/5 in 5% or 10% Dextrose**

For preparing N/5 in 5% or 10% Dextrose

**You should take**
- One bottle of 10% Dextrose
- One bottle of N. Saline
- I.V set
Method – 500 ml of N/5 in 10% Dextrose

N/5 = 1 part Normal Saline + 4 parts of 10% Dextrose

If you are having 500 ml bottle

Remove 100 ml of 10% Dextrose from the bottle

And add 100 ml of Normal Saline in it

Ideally 500 ml of N/5 in 10% Dextrose should have 0.18 gm/100 ml of sodium chloride (NaCl) i.e. NaCl 0.9 gm/500 ml

and 10 gms/100 ml of 10% Dextrose i.e. 50 gms/500 ml.

The solution that we have made has

0.9 gm NaCl/500 ml and

40 gms of 10% Dextrose/500 ml.

There is a deficit of 10 gms (50-40 gms)

This deficit is to be corrected by using either 50% or 25% Dextrose.

As we know that 50% Dextrose is 50 gm/100 ml &

25% Dextrose is 25 gm/100 ml.

So the final solution should be

100 ml of Normal saline + 400 ml of 10% Dextrose and 2 ml of 50% Dextrose or

4 ml of 25% Dextrose.

You will get 500 ml N/5 in 5% or 10% Dx

Other method: You can convert N/5 in 5% Dx to 10% Dx by adding 50% Dextrose ampoule

N/5 in 5% Dx means 25 gm of Dx is already there in bottle, we have to add 25 gm more to convert into 10 % Dx, so you should add 2 ampoules of 25ml 50% Dx because one ampoule contains 12.5 gm Dx, so you should add 2 ampoules of 25ml of 50% Dx to convert N/5 in 5% Dx to N/5 in 10%. (You can also add ampoules of 50ml 50% Dextrose)

Sometimes readymade fluids are not available in neonatal units like for example neonatologist advised you to start – N/5 in 10% Dextrose 100 ml/8 hourly and it is not available in your unit so you should know how to prepare N/5 in 10% Dextrose

5.7.3 Fluid Requirements for Newborn

The average requirement of fluid for 24 hrs in neonates is as follows:

<table>
<thead>
<tr>
<th>Age of Neonate</th>
<th>Amount of fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>60 – 80 ml/kg</td>
</tr>
<tr>
<td>Day 2</td>
<td>80 – 100 ml/kg</td>
</tr>
<tr>
<td>Day 3 and thereafter</td>
<td>100 – 150 ml/kg</td>
</tr>
</tbody>
</table>
According to the birth weight day 1 the requirement are as follows:

<table>
<thead>
<tr>
<th>Age of Neonate</th>
<th>Amount of fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1.5 kg</td>
<td>60 ml/kg</td>
</tr>
<tr>
<td>1 – 1.5 kg</td>
<td>80 ml/kg</td>
</tr>
<tr>
<td>&lt; 1 kg</td>
<td>100 ml/kg</td>
</tr>
</tbody>
</table>

On day 1 – 2 the baby needs Dextrose, but no electrolytes.

After day 1, the fluids are increased at 15-20 ml/kg/day to reach a total of 150-180 ml/kg/day. By 1st week of life potassium is added after urine output is established. Sodium is added after weight loss is established.

**Dextrose requirement**

The normal physiological requirements are 4 – 5 mg/kg/min, this amounts to 5.8 – 7.2 gm/kg/day

This amount of daily dextrose can be provided by any of the following:

1) 120 – 150 ml/kg/day of N/5 in 5% Dx or
2) 120 – 150 ml/kg/day of isolyte-P or
3) 60 – 70 ml/kg/day of N/5 10% Dx

Depending on the day of life

**Sites Used for Infusion in Newborn**

Common veins used for infusion in newborn and infant are:

- Scalp veins – frontal, superficial, temporal vein
- Umbilical veins – during 1st few days of life
- Superficial veins of hands, wrist, arms, foot
- Infant and older children – on the basics of accessibility of veins
- Intraosseous route used only in emergency

**5.7.4 Regulation of Flow rate for Newborn**

After knowing about types of fluid your baby is getting and how much e.g. – you got order you should start N/5 in 10% Dextrose 100 ml/12 hourly

So the calculation of flow rate of fluids is your responsibility for infusing correct amount of fluid in right duration of time because a small error can create severe problems for neonates. Formula for calculating flow rate as:

\[
\frac{\text{Total volume to be infused}}{\text{Time in minutes}} \times \text{Drop factor} = \frac{\text{Drops}}{\text{Min}}
\]

Drop factor – if you are using micro dripset 1ml= 60 drops while in adult 1ml = 20 drops
For example – neonatologist prescribed 100 ml of N/5 in 5% Dextrose in 8 hours
Amount to be infused – 100 ml
Drop factor – 60
Time – $8 \times 60$ mts

On putting the values in the formula

Flow rate to be regulated in 12 – 13 drops/min (figure is rounded up to 13)

For accuracy in the case of small amount or drop rates are less than 20 drop/min refer to use of infusion pump for more precise/accurate infusion.

5.7.5 Equipments Required

- Fluid prescribed by neonatologist/facilitators
- I.V infusion set (micro drip set) (Fig. 5.1)
- Adhesive tapes
- Padded splint
- Spirit swabs
- Vein flow/cannula/scalp vein/butterfly needle
- Kidney tray
- Infusion pump
- IV stand
- Syringe 50 ml

![Fig 5.1: Infusion Pump](image)

5.7.6 Procedure

- Explain the need for the infusion and the procedure to the parents/relatives.
- Assemble all the equipments at the bed side.
- Do calculations in advance about flow rate etc.
- Wash hands and dry them.
• Prepare baby for procedure considering developmental supportive care, oxygenation, thermoregulation, pain, safety and comfort measures.

• Have second person to hold newborn in position.

• Identify a suitable vein.

• Prepare site or shave the hair if scalp vein is chosen.

• Put on gloves.

• Cleanse the area with alcohol and allow it to dry.

• Ensure skin is stretched.

• Assist the paediatrician in insertion of canula.

• Secure this with occlusive dressing and tape being sure to maintain visibility of insertion site.

• Turn on infusion pumps and connect pressure monitoring line (PMO) to I/V cannula.

• Ensure correct flow rate e.g. – 15 ml/hour or 15 ml/min.

• Apply padded splints to protect from accidental dislodging of the needle.

• Settle the baby.

• Remove gloves and wash hands.

• Documentation – location, time, size of needle, I.V. initiator, I.V. solution, flow rate etc.

### 5.8 RECORDING/MONITORING

Babies on intravenous fluids require careful monitoring of hydration for which day to day monitoring is important. This should be modified depending on hydration status of the baby as shown by:

• Weight change

• Urine output

• Urine sp gravity

• Serum Na

• Urea

• Clinical Signs

Monitoring is essential for proper I.V fluid therapy

• Inspect the infusion site every hour

• Look for redness, swelling around the insertion site of the canula

• Check the volume of fluid infused and compare to prescribed volume

• Record all findings

• Assess hydration daily

• Weigh the baby daily
5.9 TOTAL PARENTRAL NUTRITION (TPN)

TPN meets the total nutritional requirements of those who cannot receive feedings by ways of the gastro-intestinal tract.

**Indications**
- Very premature babies
- Congenital gastro intestinal anomalies
- Diarrhoea and vomiting
- Chronic bowel obstruction

**Differences between I.V fluid therapy and TPN**

<table>
<thead>
<tr>
<th>I.V. Therapy</th>
<th>TPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Contain electrolytes and sugar</td>
<td>• Contain electrolytes, sugar and fat</td>
</tr>
<tr>
<td>• No protein and fat</td>
<td>• Vitamins, minerals and trace elements</td>
</tr>
</tbody>
</table>

5.10 ACTIVITIES AND GUIDELINES

**Activity 1**
Select a newborn receiving nasal decongestion drops and administer the same

**Activity 2**
Select two newborns receiving eye ointment and practice administering the same

**Activity 3**
Practice administering eye drops to two newborns and write down the steps used

**Activity 4**
Select a newborn baby receiving intravenous fluid therapy from neonatal nursery
- Identify the type of fluid the newborn is getting
- Check the requirement of fluid prescribed by paediatrician
- Calculate flow rate
- Inspect I.V site for any problem
- Do monitoring
- Do recording
  - Prepare N/5 in 5% Dx or 10 Dx if not available in NICU
Activity 5

Assess a neonate for hydration level

- Select a newborn who is receiving I.V. fluid therapy
- Administer I.V. fluid therapy

Submit the report to the supervisor

Name of the baby : ________________________
Date of birth : ________________________
Birth weight : ________________________
Current Weight of the newborn : ________________________
Indication for I.V. therapy : ________________________
Amount of fluid prescribed : ________________________
Flow rate : ________________________
Comments on I.V. site for any problems : ________________________
Record/monitor : ________________________

5.11 LET US SUM UP

In this practical you have learnt various methods of administering medications namely, oral, rectal, injection, inhalation and local application to eye, ear and nose. It is very important to remember the 7R’s. Always record the drugs administered to avoid repetition or re-administration.

It is essential to be aware of side effect and complication and the antidote that can be given for side effect and reaction. If precautions are followed and drugs are administered with skill and right technique, they can be made less painful for newborn/infants.

We have also learnt about monitoring I/V fluid therapy, indications, types of fluids, fluid requirement and preparation of different fluids in this unit.