

Routes of drug administration and dosage forms

By

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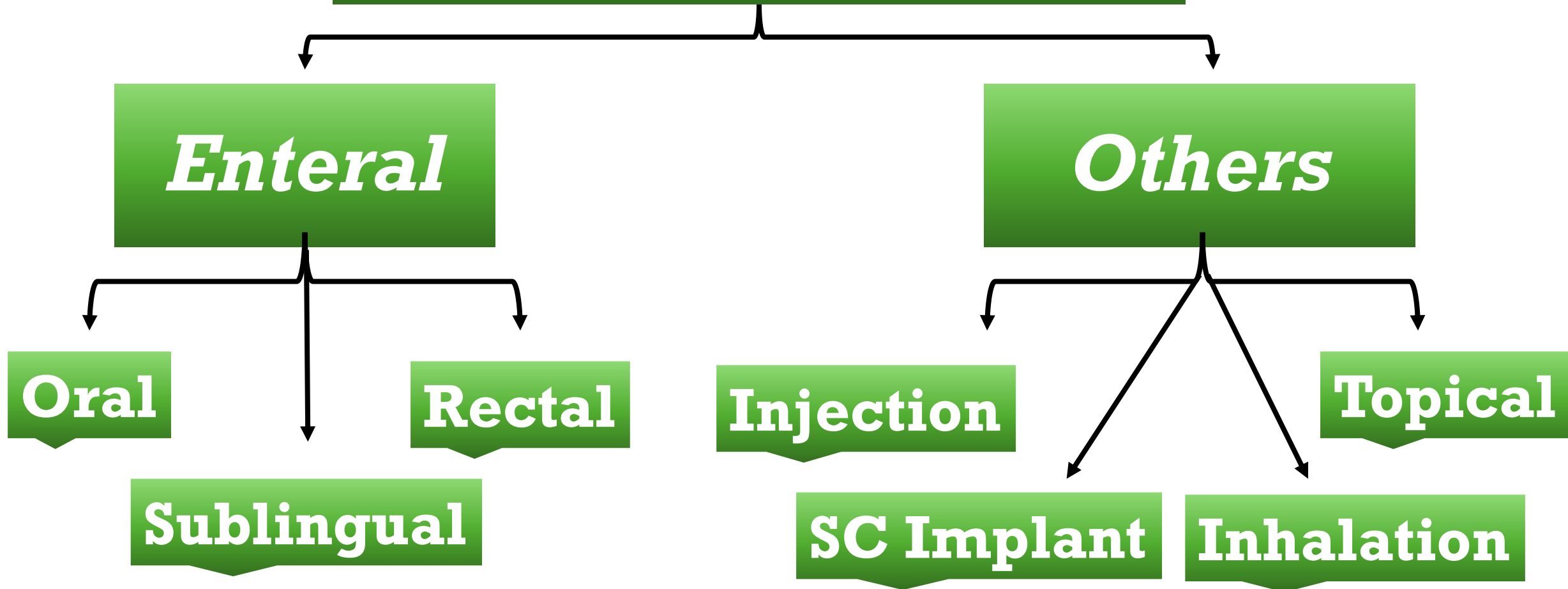


ILOS



- Recognize different routes of drug administration.
- Identify difference between IV and IM routes.
- Enumerate advantages and disadvantages of IV and IM route.
- Analyze advantages and disadvantages of SC route.
- Mention indications of ID route.

Routes of Administration



Injection..

Dosage form for injections are:

- Solution
- Suspension
- Powder (to be reconstituted before use)

Drugs are dispensed in:

- Ampoule (single use)
- Vial (single or multiple use)
- Bottle (or IV bags)
- Prefilled syringes

The container Should be:

- ✓ Sterile
- ✓ Pyrogen-free

Drugs are dispensed in:



Ampoule



IV bags



Vial

Injection..

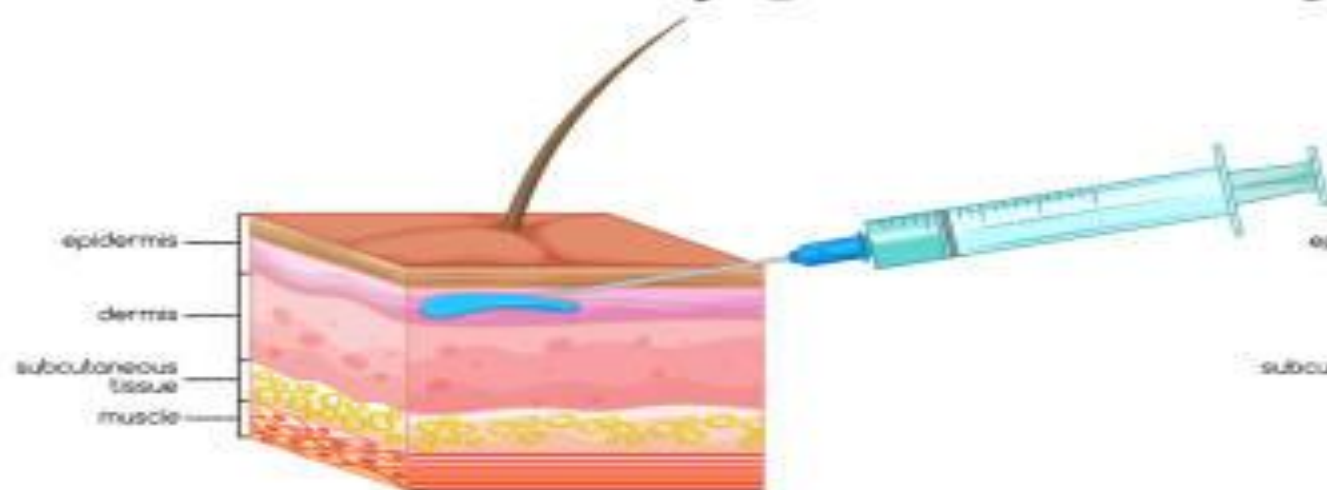
**Subcutaneous
(S.C.)**

Intradermal

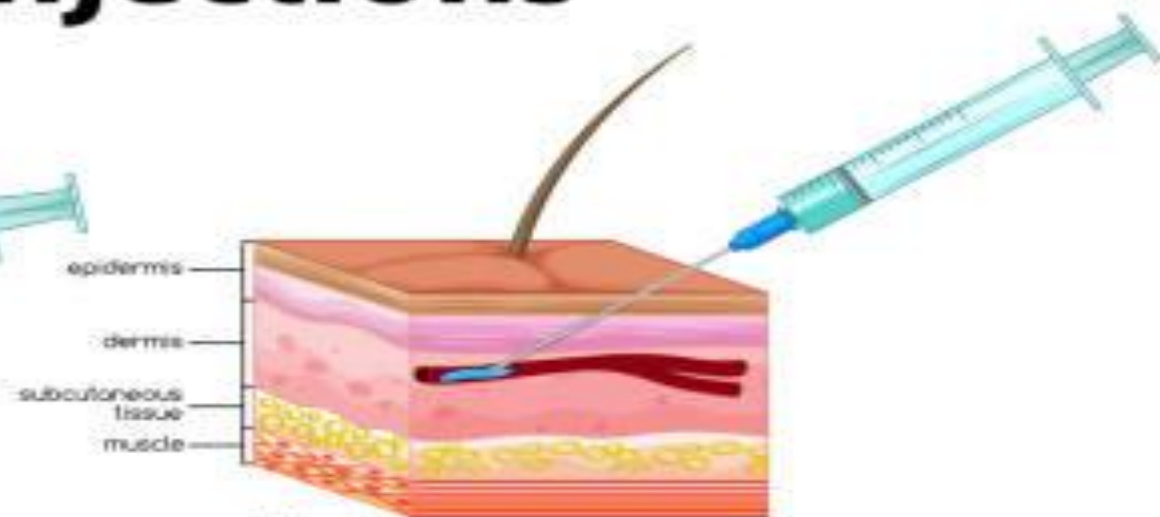
**Intramuscular
(I.M.)**

**Intravenous
(I.V.)**

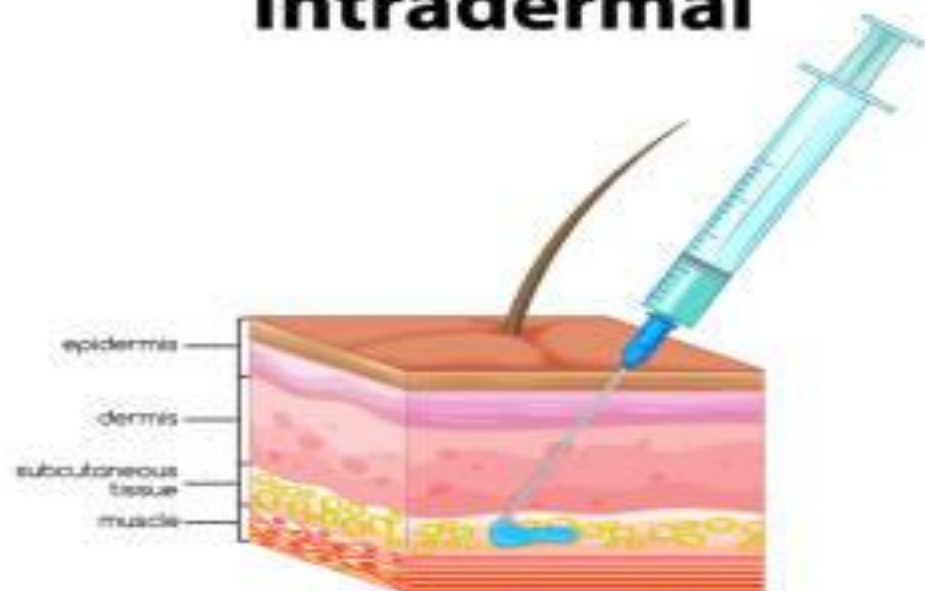
Types of Injections



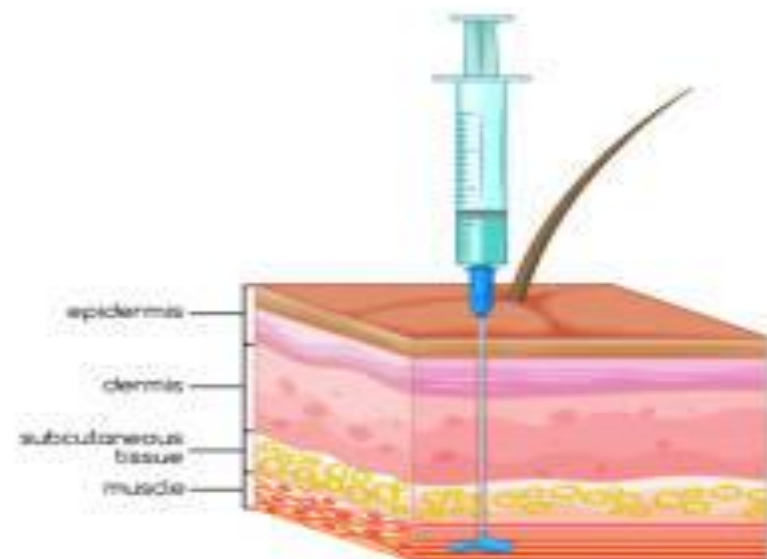
Intradermal



Intravenous

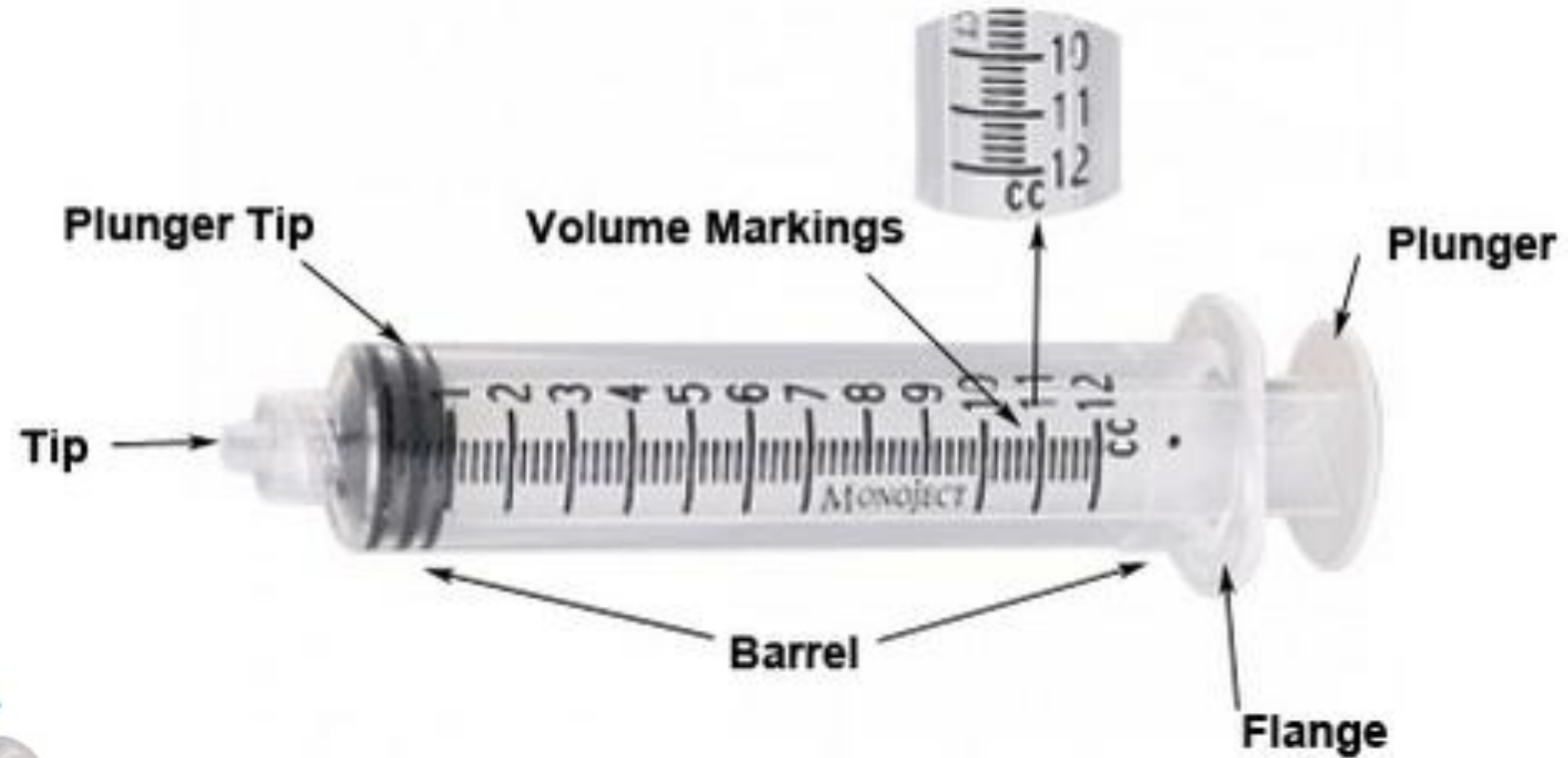


Subcutaneous



Intramuscular

Anatomy of a Syringe



Injection..

A. Intradermal

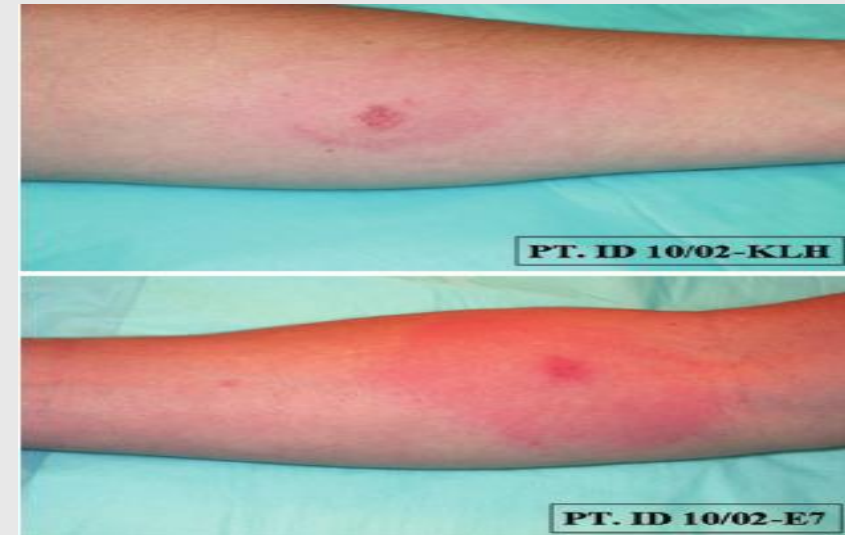
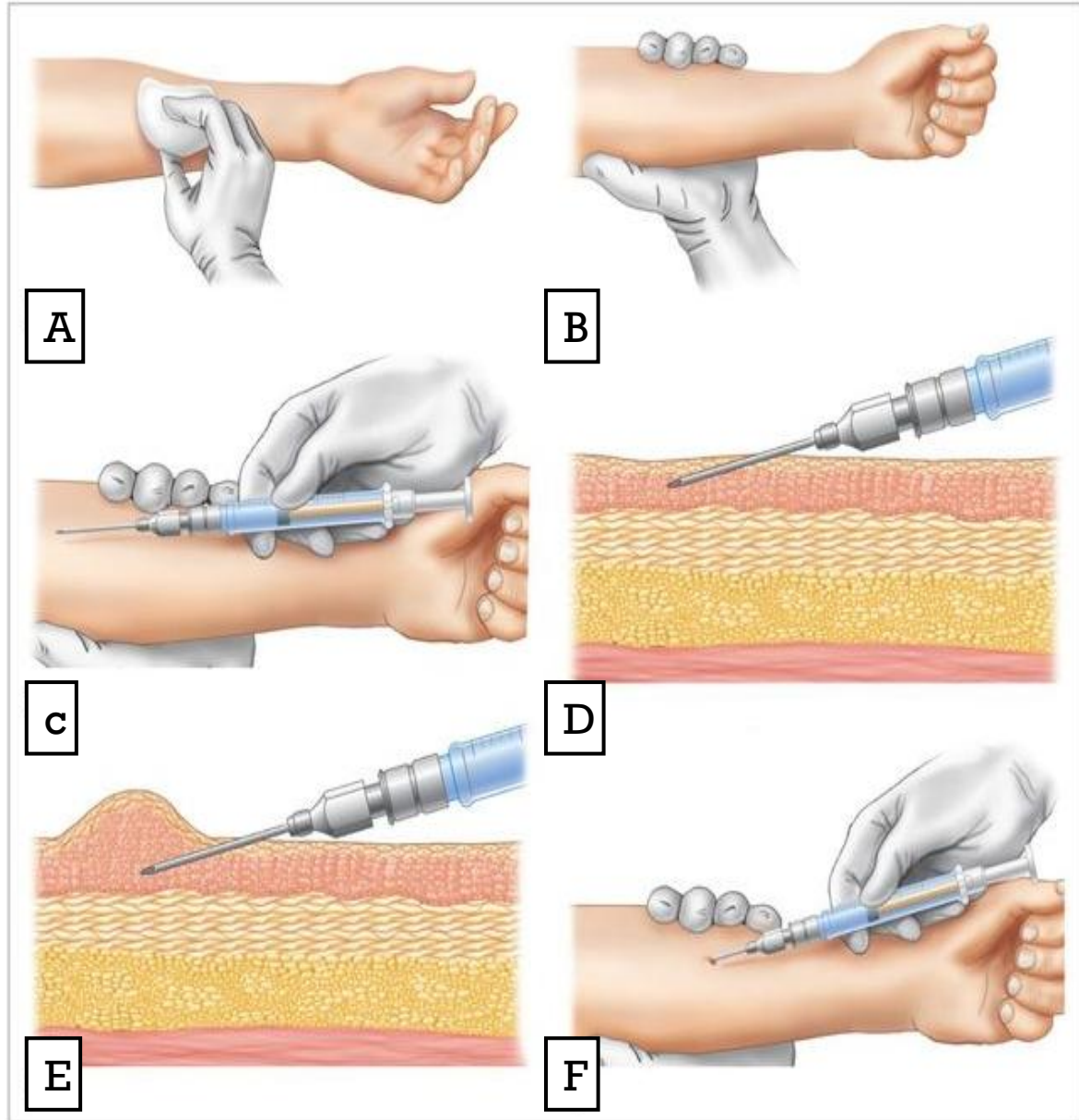
❖ **It is used for injection of vaccines, local anesthesia or sensitivity tests.**

Site & Volume of injection:

- ❑ Ventral forearm is the site of choice, **Inject Less than 0.5ml** of fluid into skin

Methods:

- ❑ Prepare the injection site with an alcohol swab, with the nondominant hand retract patient's skin proximal to the injection site until skin over the site is taut.
- ❑ With the other hand place the syringe flat & insert by pressing it slowly against the skin (**approximately at a 15° angle**) **with bevel up.**
- ❑ When injection is complete withdraw the needle and apply gentle pressure, Do not massage, this might irritate the area.





ID route video

Injection..

B. Subcutaneous (S.C.)

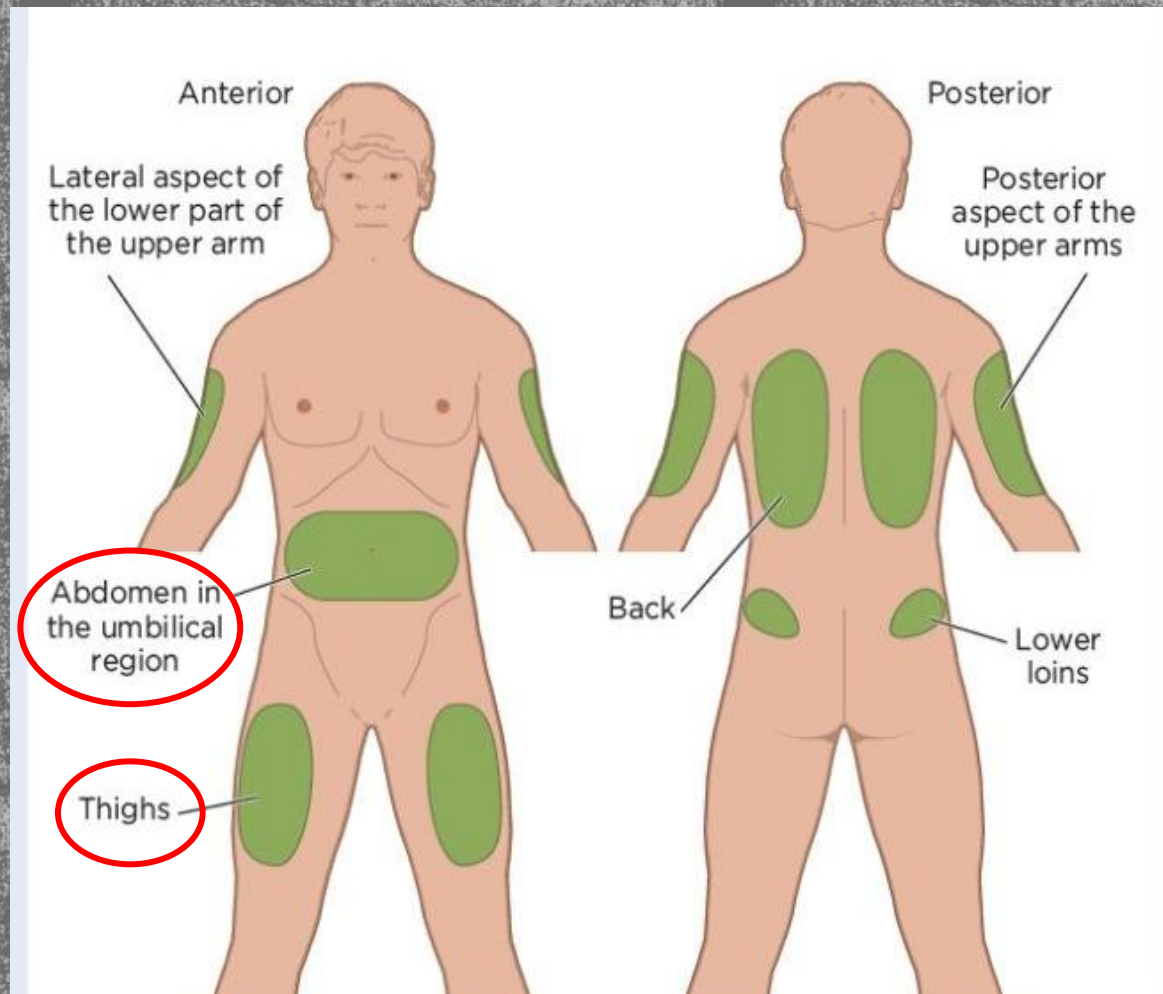
❖ Absorption from S.C. sites is faster and complete than oral administration

Drug:

- Should be non-irritant aqueous Solution or suspension
- Absorption through capillaries produces local and systemic effect
- Soluble preparation is absorbed at faster rate than suspension

Precautions:

- Vasoconstrictor agent → retards absorption
- Peripheral circulatory failure → Poor absorption
- Volume Not more than 1 ml



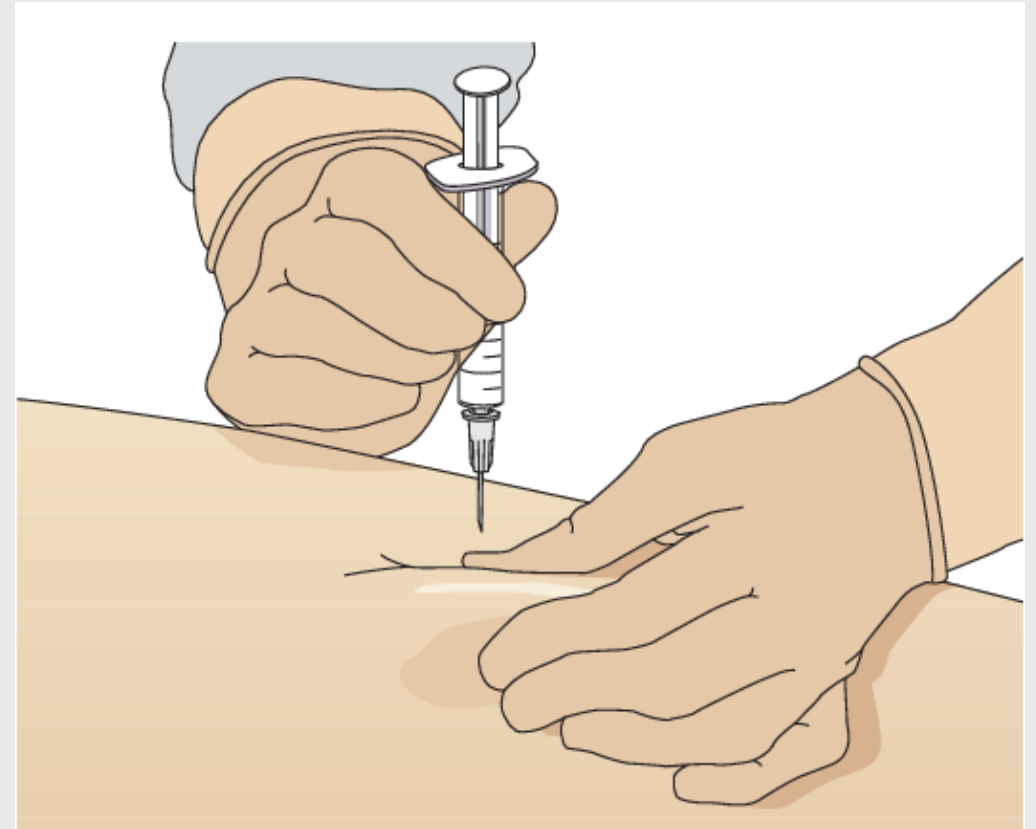
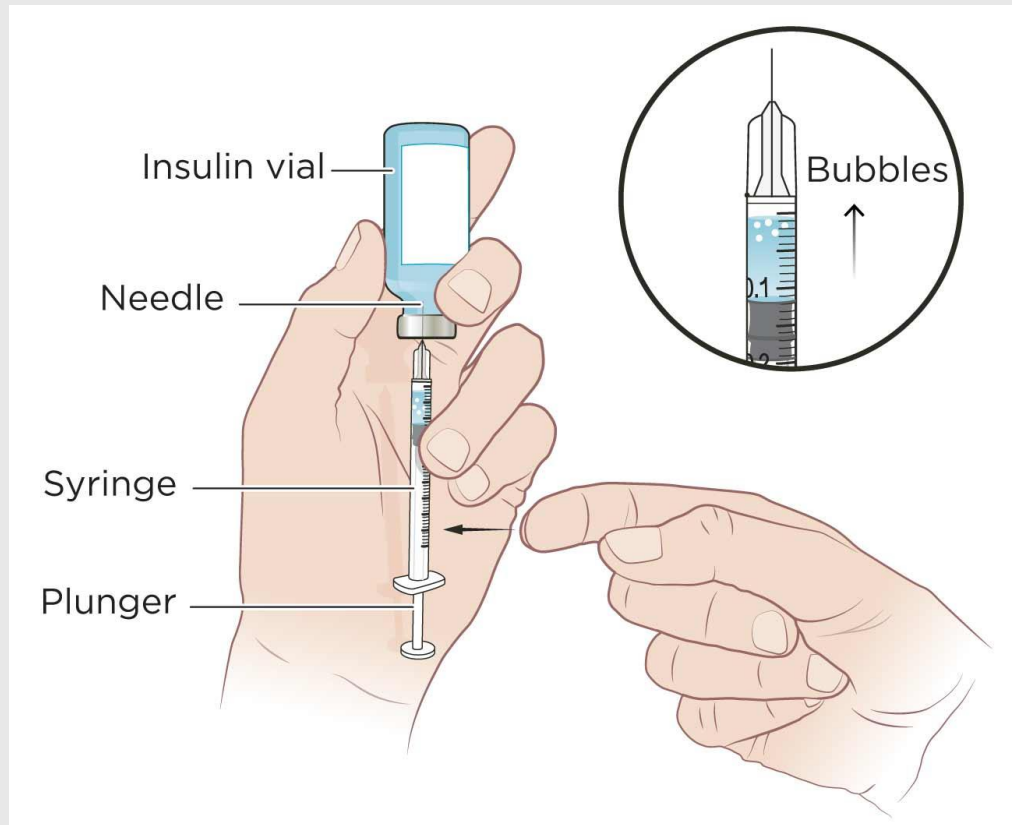
Site of injection; Area relatively distant from nerves and major vessels as:

- Lateral aspect of upper arm.
- Thigh and abdomen for frequent injection (Insulin)

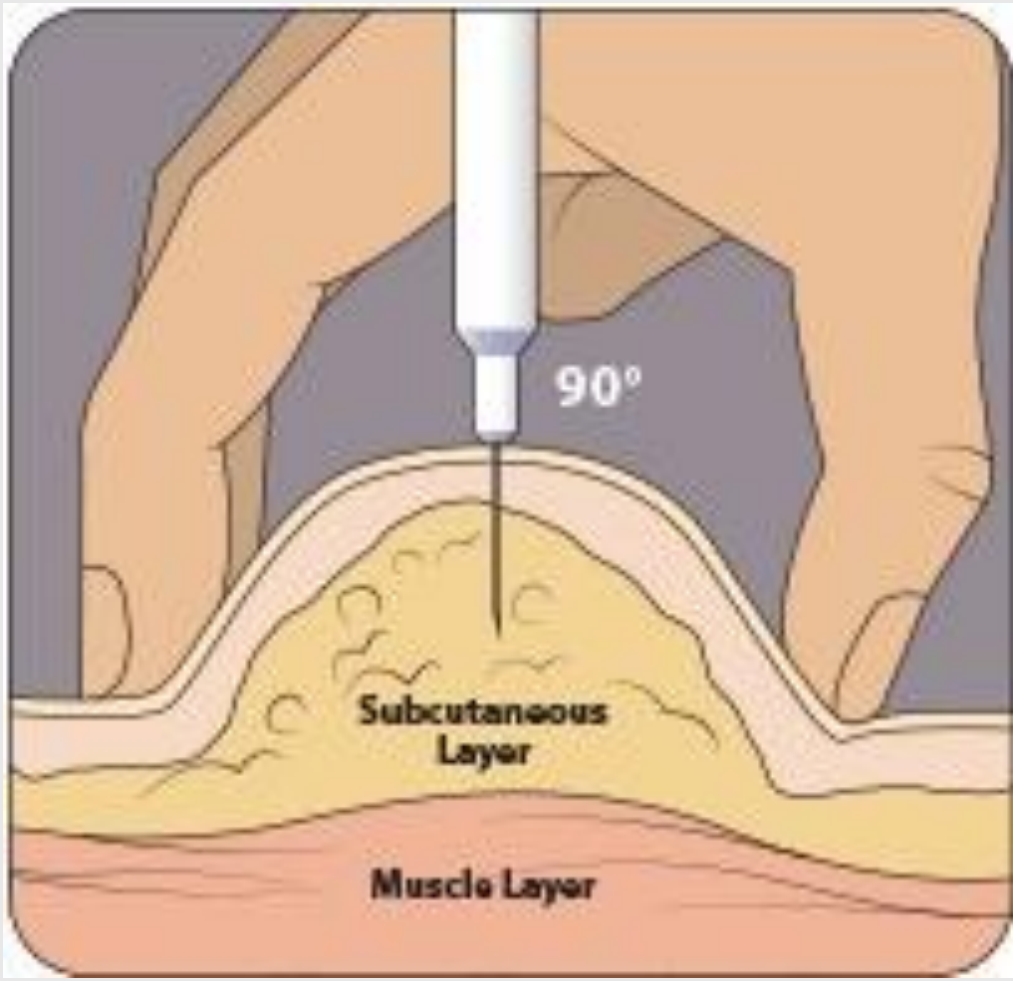
Systemic rotation of injections is of value to maintain these sites

Method of SC injection:

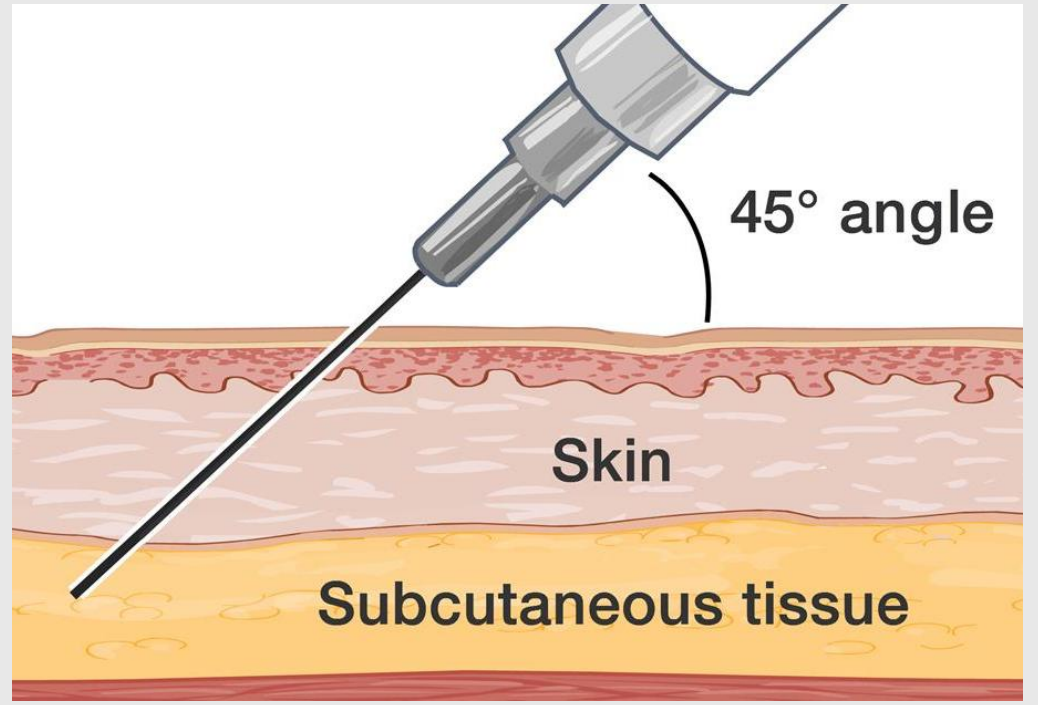
1. Use syringe with 25 to 23G.
2. Grasp 2.5 cm skin fold between the thumb & first 2 fingers of non-dominant hand.
3. In the dominant hand, hold the syringe like pencil with the bevel of the needle up.
 - ❑ If the needle is $\frac{1}{2}$ inch short hold it at 90° angle.
 - ❑ If the needle is long hold it at 45° angle.
4. Insert the needle using quick motion, then release skin fold & slowly inject medication.
5. After complete injection of drug quickly withdraw the needle and continue to apply gentle pressure for several seconds.



Short needle



Long needle



Injection..

C. Intramuscular

❖ Drugs are absorbed through capillaries to reach systemic circulation.

Advantages:

- ❑ The rate of absorption from muscles is greater than that from subcutaneous tissues
- ❑ Rapid rate of absorption than oral.
- ❑ It is suitable for aqueous or oily solutions and suspensions of insoluble drugs in water or in oil.
- ❑ Moderately irritating drugs can be given by this route.

Drugs:

- ❑ Drugs in aqueous solution are absorbed quite rapidly after I.M. injection, while with solution in oil or suspended in water oil (depot preparations) the rate of absorption is very slow and constant.

Onset of action:

- ❑ Within 10-15 min of the injection

Volume of IM injection:

- ❑ For adults is 5 ml [maximum]

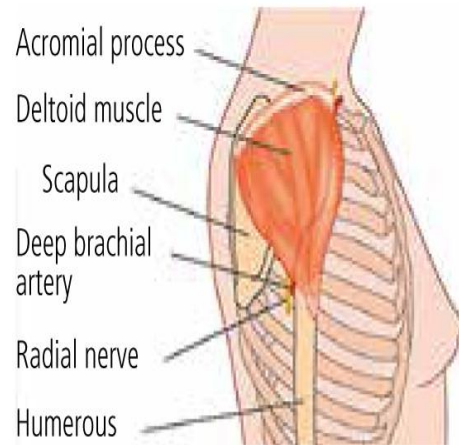
Common sites of injection:

- ❑ Dorso gluteal, ventro gluteal, vastas laterals, rectus fumerous.

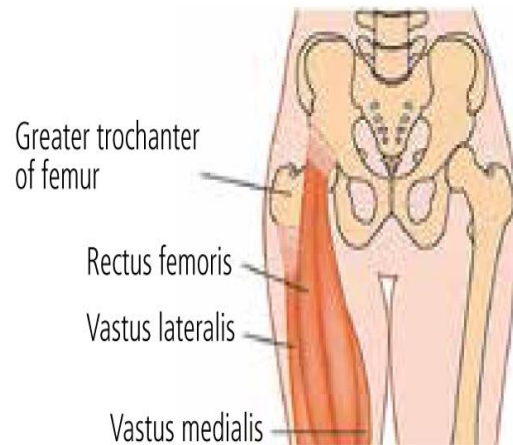
Common Sites Of Injection:

Dorso-gluteal, Ventro-gluteal, Vastus Laterals, Rectus Femoris.

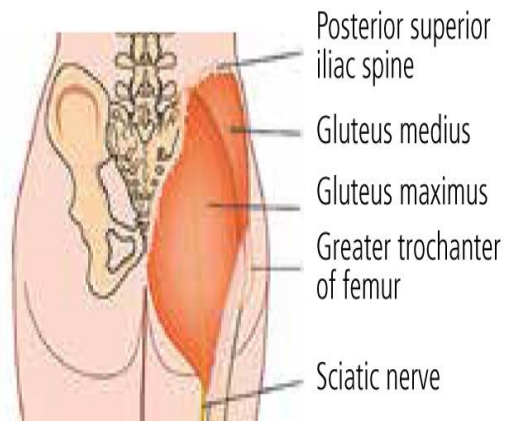
Deltoid



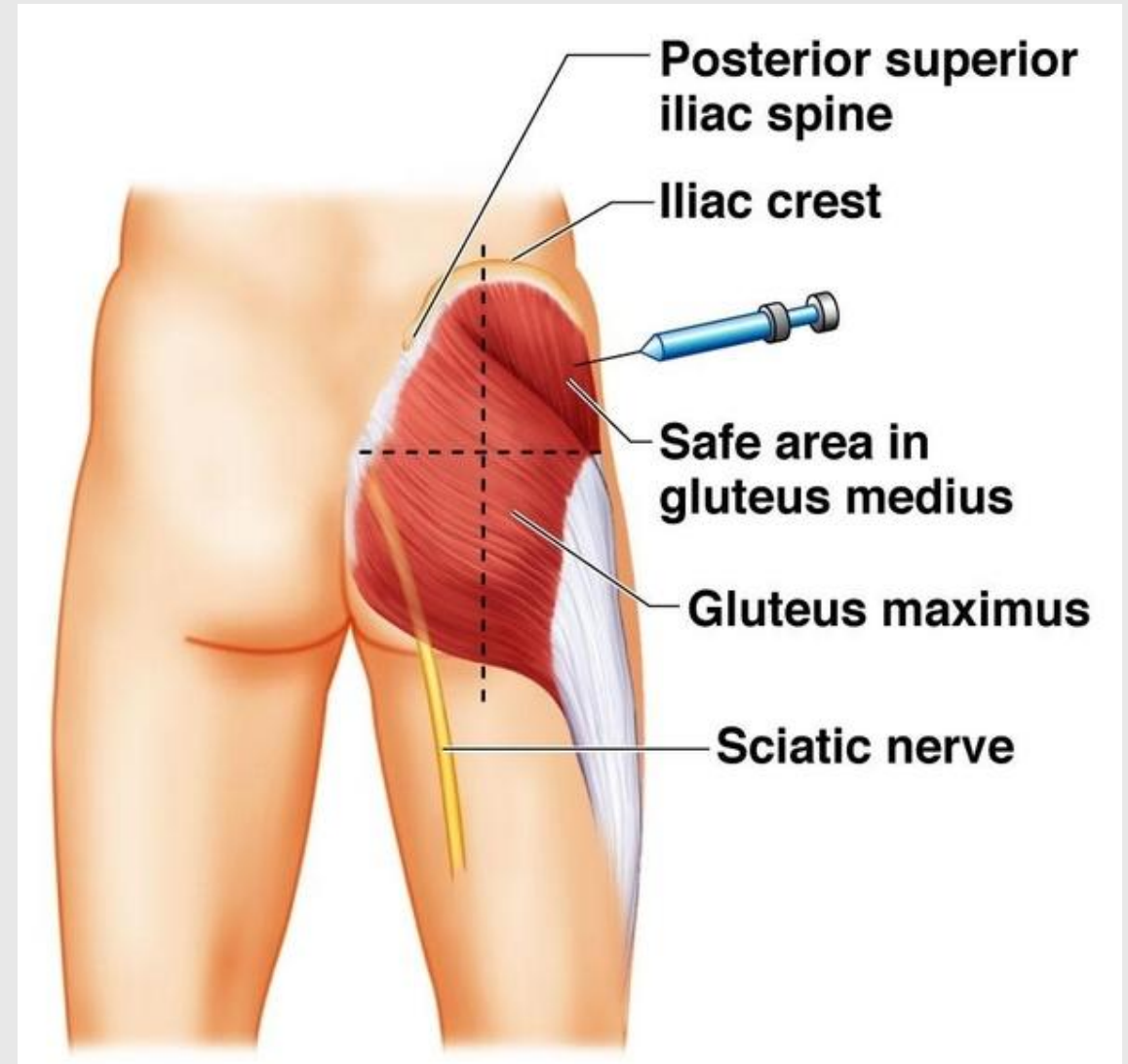
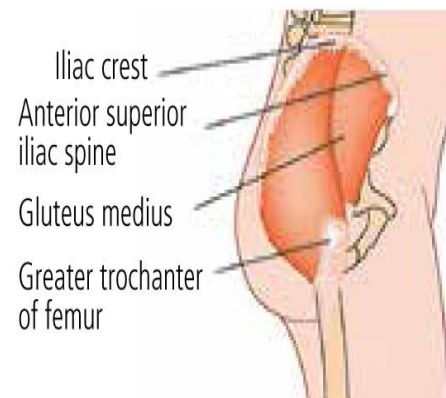
Vastus lateralis and rectus femoris



Dorsogluteal



Ventrogluteal



Precautions:

- ❑ Avoid major blood vessels and nerve travel the muscle
- ❑ Change site of injection to avoid damage to muscle

Technique:

- ❑ Expose area of injection & prepare 5 cm using alcohol swab.
- ❑ Grasp syringe like pencil in dominant hand with a quick light motion insert **needle at 90° angle into muscle.**
- ❑ Gently aspirate to be sure not in vessel then start slow injection.
- ❑ When injection is completed place alcohol swab over the insertion site & press while quickly withdrawing needle then massage the site of injection.

How to Give an Intramuscular Shot



1. Use an alcohol swab to clean the skin where you will give the shot.



2. Hold the muscle firmly and insert the needle into the muscle at a 90° angle (straight up and down) with a quick firm motion.



3. After you insert the needle completely, release your grasp of the muscle.



4. Gently pull back on the plunger of the syringe to check for blood. (If blood appears when you pull back on the plunger, withdraw the needle and syringe and gently press the alcohol swab on the injection site. Start over with a fresh needle.)



5. If no blood appears, inject all of the solution by gently and steadily pushing down the plunger.



6. Withdraw the needle and syringe and press an alcohol swab gently on the spot where the shot was given.

D. Intravenous

Drugs:

- Drugs are given either in a bolus form or infusion (drip).
- Drugs given by this route should be in a form of aqueous sterile solution (pyrogen-free).
- Some form of drugs given IV must be given slowly and with constant monitoring of the response of the patients.

Site of injection:

- Adult: superficial veins in dorsum of hand and forearm.
- Infant: **Vessel of scalp or Umbilical vessel**
- Subclavian common internal or external jugular vein for long term administration

Technique of injection:

- For one-time bolus administration use antecubital vein & use syringe with needle.**
- For continuous or intermittent infusions lasting a few days select vein of the hand, wrist, forearm, scalp or umbilicus and use cannula.**





IV route video

Types of IV administration:

- Direct bolus OR Intermittent infusion
- Calculating I.V. drip rate, Use the equation:

Drip rate = No. of drops / min. = (Total No. of ml / Total No. of min.) x Drip factor

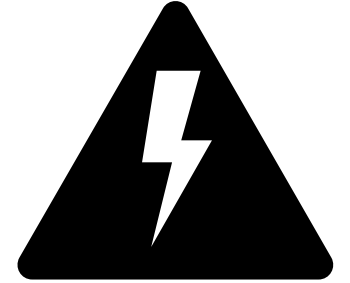
NB: drip factor common 15 Drops/ml

Advantages:

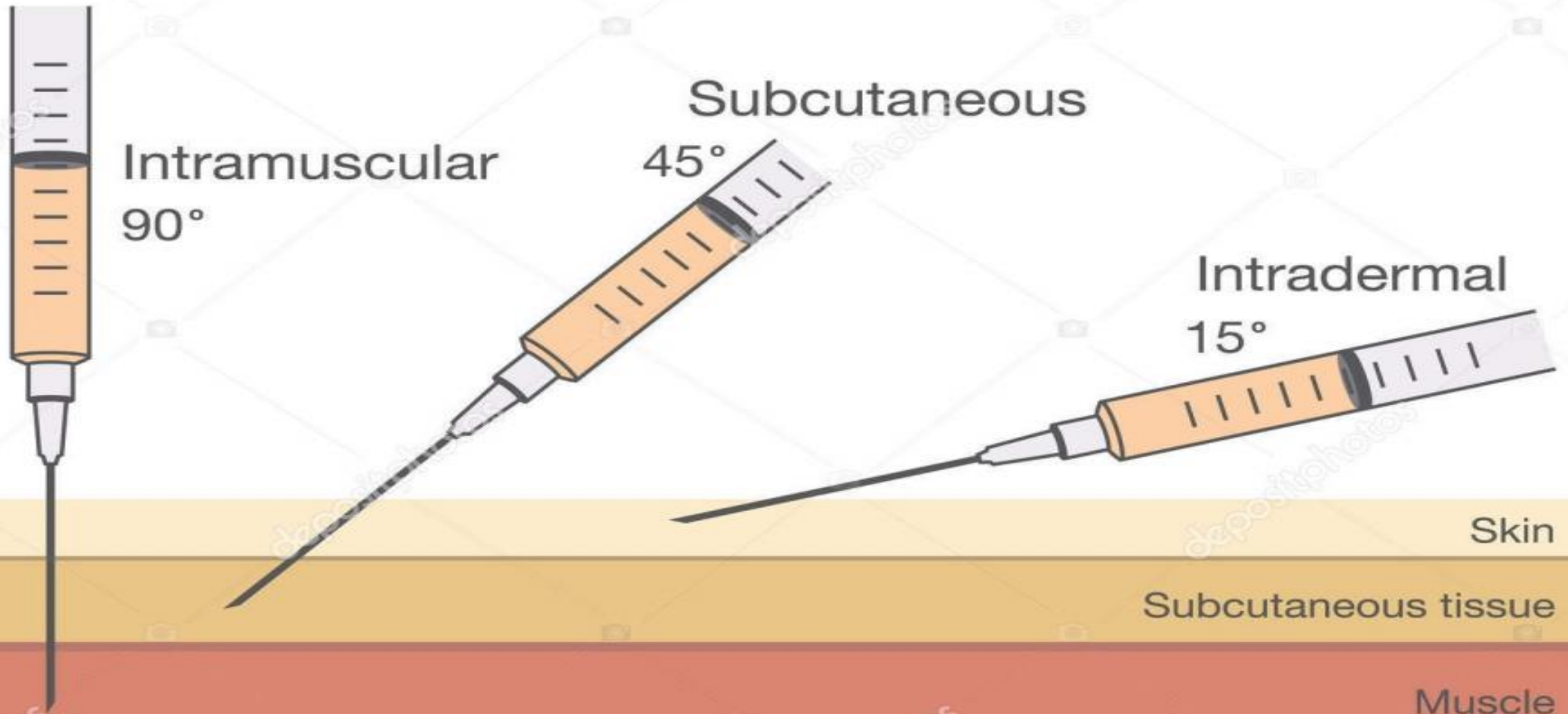
- 100% bioavailability
- Immediate onset
- High plasma concentration
- Useful for Irritant & Large volume drugs

Disadvantages:

- If Allergy → Anaphylactic shock
- If Very Irritant → Thrombophlebitis
- If Extravasation of irritant drug → Severe pain and inflammation
- If Rapid I.V. → Velocity reaction → Cardiac problems (Aminophylline)
- Pyrogenic reaction by phospho-lipo-protein of microorganisms
- Transmission of diseases e.g. Viral Hepatitis C & AIDS
- Once the drug is injected, there is no retreat
- Not suitable for drugs in an oily vehicle



Comparison of angles of injection.

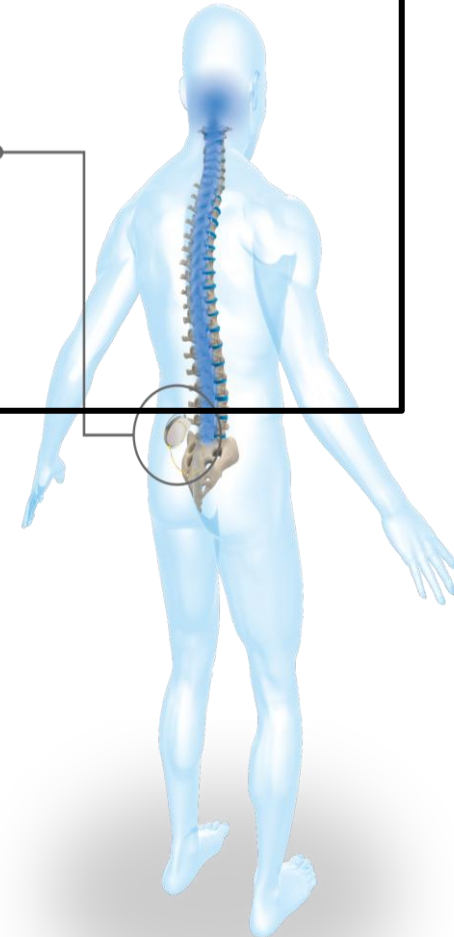


Other Uncommon sites of Injection;

Intrathecal:

- ❑ The drug is injected in subarachnoid space via a “lumbar puncture needle”
- ❑ This route is used to produce “spinal anesthesia” and to inject antibiotics in treatment of meningitis.
- ❑ Could be used for radiography.
- ❑ Can produce nerve injury or infection

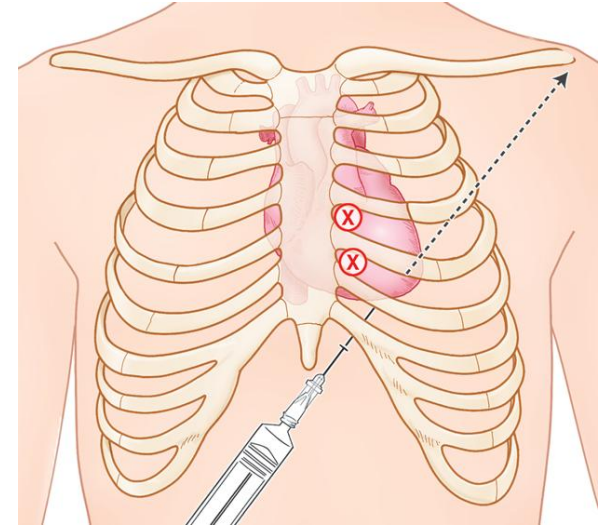
Intrathecal •
Targeted delivery of
the drug directly
into the cerebral
spinal fluid.



Other Uncommon sites of Injection...

Intracardiac:

- It is used in emergency as in cardiac arrest (e.g. adrenaline).



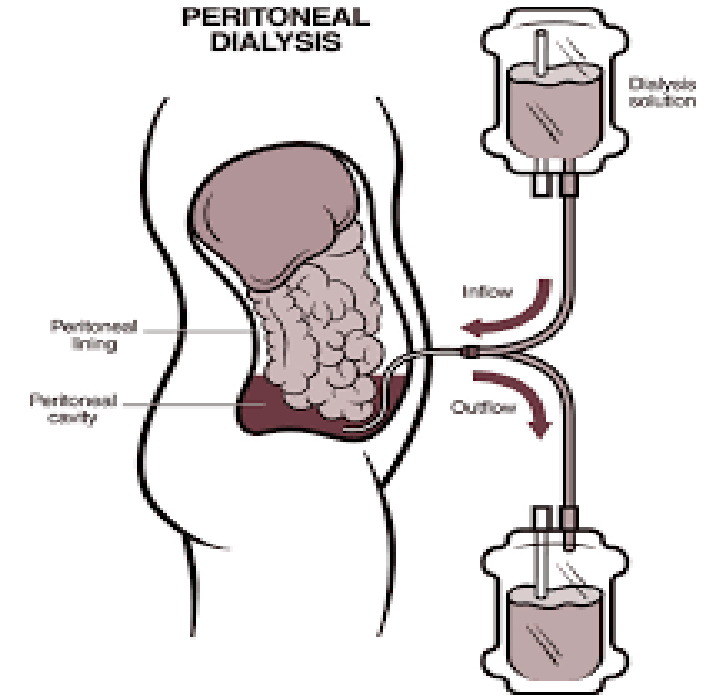
Intra-arterial:

- Used as diagnostic (e.g. arteriography) or therapeutic (e.g. dissolution of coronary thrombus).
- Can produce sever hemorrhage.

Other Uncommon sites of Injection...

Intraperitoneal:

- ❑ Used to inject fluids or drugs in peritoneal dialysis.



Intra-articular:

- ❑ The drug is injected into joint cavity e.g. hydrocortisone in chronic arthritis.



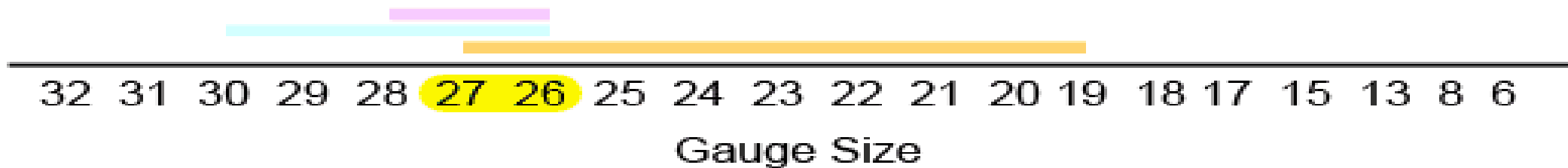
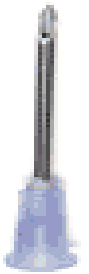
Needle Gauge

Needle Gauge Selection by Type of Injection

Intradermal Injections

Intramuscular Injections

Subcutaneous Injections



- The higher the gauge number, the smaller the needle width. On the other hand, smaller numbers denote a larger diameter or width.
- The higher the viscosity of the fluid, the lower the gauge size needed.
- The lower the gauge no. the stronger the needle, no bending, no breaking.
- The higher the gauge no., less pain or bruising.

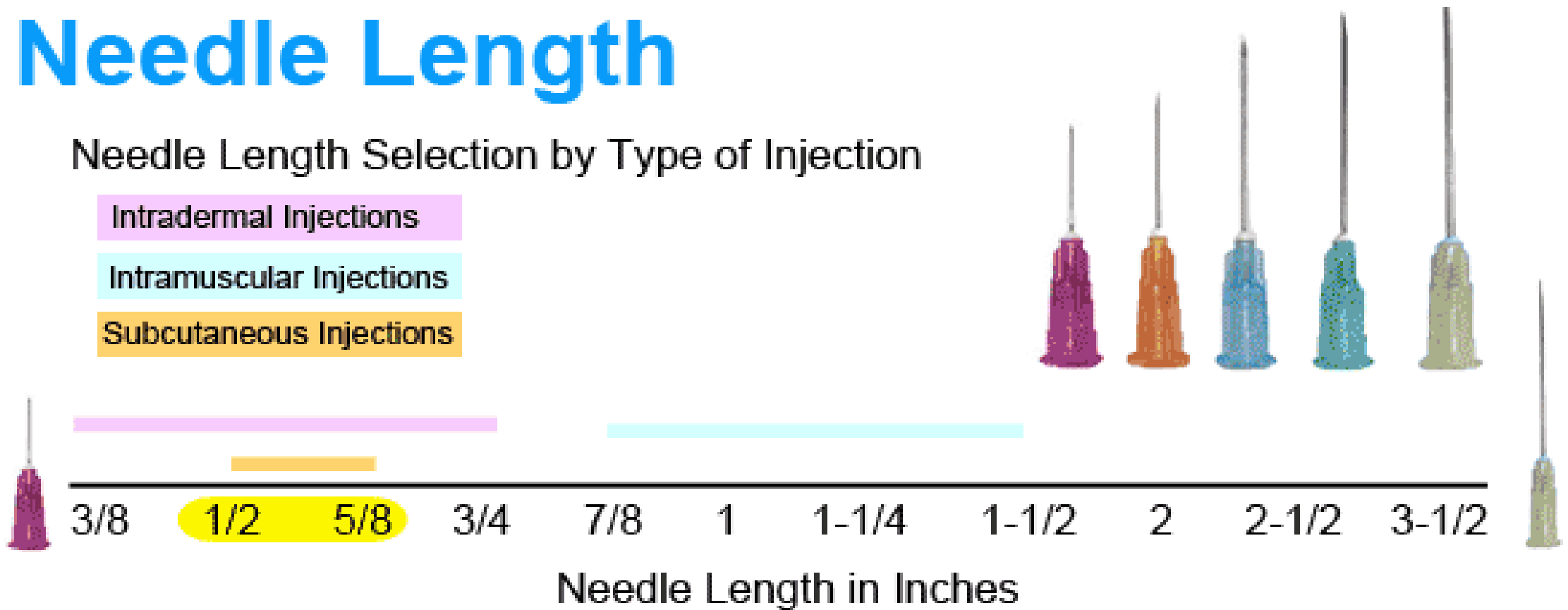
Needle Length

Needle Length Selection by Type of Injection

Intradermal Injections

Intramuscular Injections

Subcutaneous Injections



- The deeper the injection, the longer the needle length required.**
- The shorter the needle length, the less pain or bruising.**

Questions

1. *List two advantages for intramuscular route.*
2. *What is the dosage forms for injection route and mention its criteria?*
3. *Explain :
IV route is preferred in emergency .*
4. *How can you prevent occurrence of anaphylactic shock??*





thank you