SAMSUNG 삼성서울병원

Right isulin injection practice

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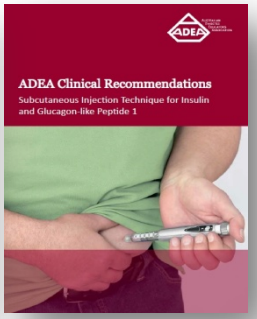
Background

International injection technique documents has been established to provide evidence-based best practice information for insulin therapy to achieve the best possible health outcomes by ensuring that the dose is delivered in the right injection site, using the right technique, every time.



Recommendations for Best Practice in insulin Injection Technique were published By Korean Association Diabetes Nurse Educators(KADNE) in 2010.

Right insulin injection practice

What you need to know

1. Type of insulin
2. How to inject
3. Where to inject

Right insulin injection practice

What you need to know

1 **Type of insulin : Name of the insulin, how it works and WHEN to take insulin**

- There are a number of types of insulin available. From rapid acting to long acting
- Insulin can be categorised by how the insulin is derived and how quickly it acts.

Common insulins

➢ Common insulin products in the Korea include the following

Type	Name		Insulin Time
Rapid-acting insulin	Lispro Aspart Glulisine		before or with a meal.
Intermediate -acting insulin	Humulin® N		morning and night
Premixed insulin	NovoLog® Mix 70/30, 50/50 Humalog® Mix 75/25, 50/50		before or with a meal
Long-acting insulin	Glargine Detemir		before bedtime and/or in the morning

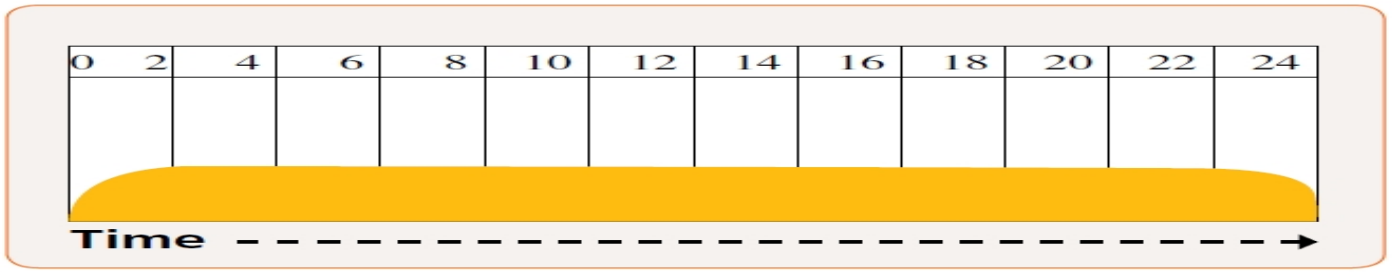
Long-acting insulin

- Name of insulin : Lantus®

Levemir®

- This is a type of basal insulin.
- Provides 24-hour insulin coverage and may be given 1 to 2 times per day.
- Injection is usually taken **before bedtime and/or in the morning**.

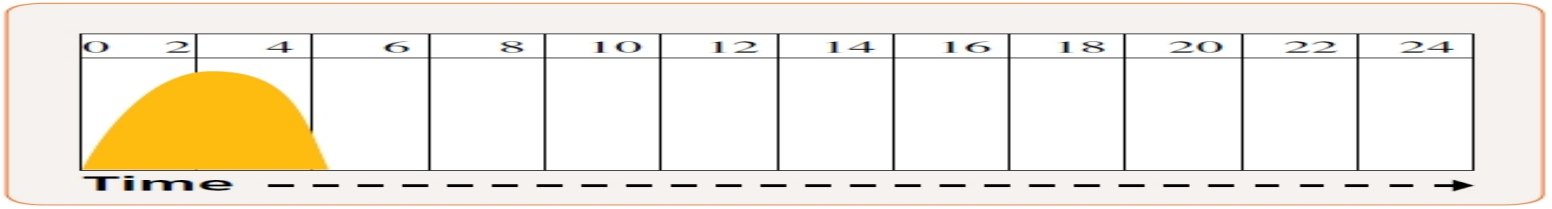
Onset of Action	Peak Action	Duration
2 to 4 hours	No peak, stable	20 to 24 hours



Rapid-acting insulin

- Name of insulin: Humalog®
  NovoLog®,
  Apidra®
- This is a type of bolus insulin
- It should be injected immediately **before a meal.**
- They should eat a meal within 5 to 10 minutes after using Rapid-acting insulin **to avoid low blood sugar**

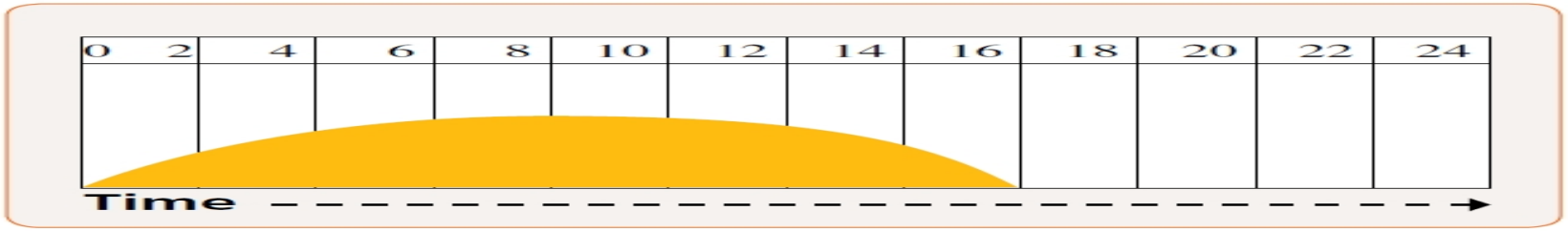
Onset of Action	Peak Action	Duration
Within 15 min	1 to 2 hours	3 to 4 hours



Intermediate-acting insulin

- Name of insulin: Humulin® N
- This is a type of basal insulin
- Works more slowly than regular insulin, but lasts longer. Injection is usually taken 2 times per day (morning and night).

Onset of Action	Peak Action	Duration
2 to 4 hours	4 to 10 hours	10 to 16 hours

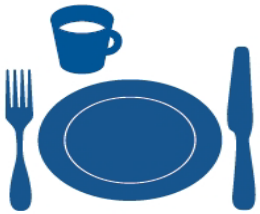


Premixed insulin

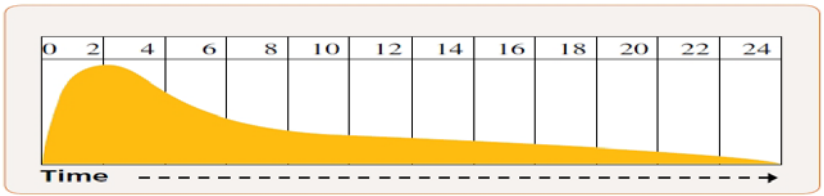
- Name of insulin

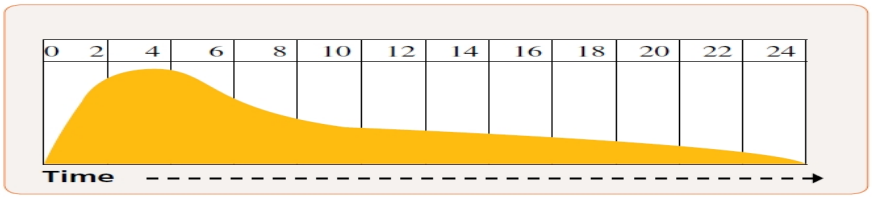
  NovoLog® Mix 70/30
  NovoLog® Mix 50/50
  Humalog® Mix50/50
  Humalog® Mix 75/25

- This is a type of **basal-bolus insulin**.
- Injection is usually taken 2 times per day (**before** breakfast and **before** dinner).



Onset of Action	Peak Action	Duration
Within 15min	Dual	Up to 24 hours





➢ **Larger doses may cause a delay the peak and increase the duration of action.**

Information about insulin

Many different insulin formulations are currently available.

- *Read the label to avoid confusion*
- Always check the label on the insulin to make sure you have the right kind. and the expiry date.

Right insulin injection practice

What you need to know

2

How to inject

The CORRECT WAY to use your insulin pen

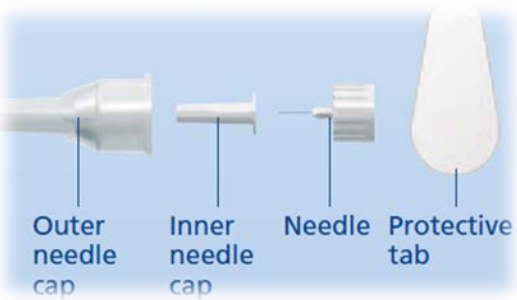
Step 1 : Prepare for injection
Step 2 : Attach a new pen
Step 3 : Prime the pen
Step 4 : Select the dose
Step 5 : Inject the dose
Step 6 : Remove the pen needle from the pen

Right insulin injection practice

Step 1 : Prepare for injection

- Prepare the insulin pen device, pen needle, alcohol swab.

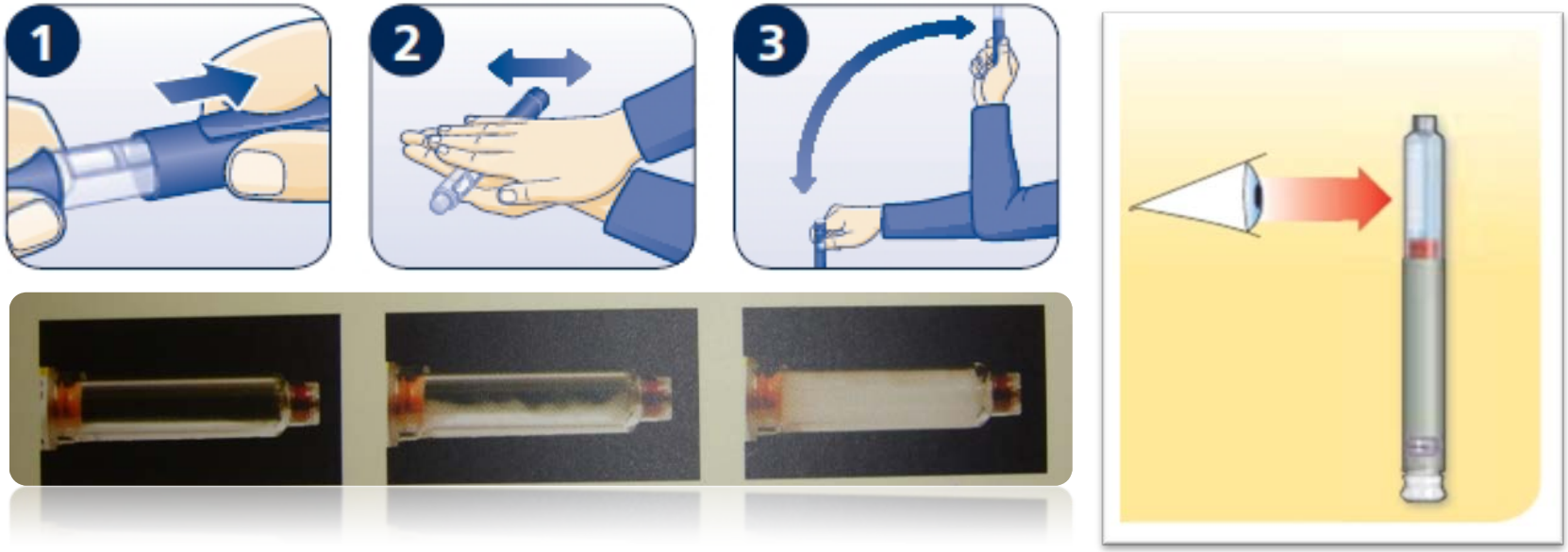
- Wash your hands
  : Injections should be given into a clean site using clean hands.



The CORRECT WAY to use your insulin pen

- **When using cloudy insulin**

  It should be rolled gently **10 times**,
  then tipped (not shaken) **10 times**, and
  finally visually checked to ensure the suspension
  has a consistently milky white appearance.

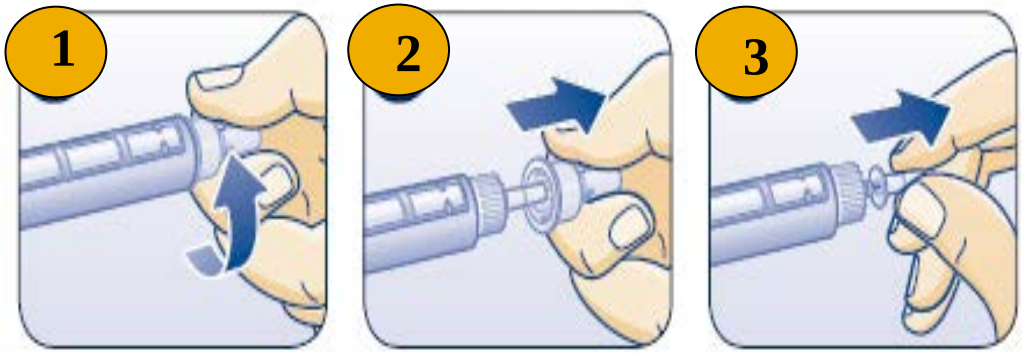


The CORRECT WAY to use your insulin pen

Step 2 : Attach a new pen

- **Using a new needle each time**

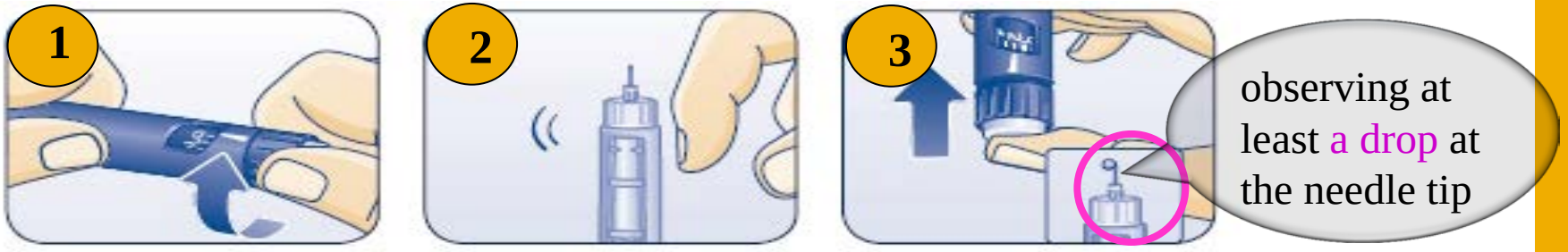
  may reduce the risk of needle breakage in the skin, "clogging" of the needle, occurrence of l**ipohypertrophy, inaccurate dosing and indirect costs**



The CORRECT WAY to use your insulin pen

Step 4 : Prime the pen

- **Air bubbles** in the insulin cartridge must be eliminated because they **reduce insulin delivery**.
- **Always prime your insulin pen before each injection.**
  1. Dial two units on your pen
  2. Point the needle up. tap the insulin cartridge Twice or three times with the forefinger.
  3. Push the dose knob to allow the bubbles to escape.



The CORRECT WAY to use your insulin pen

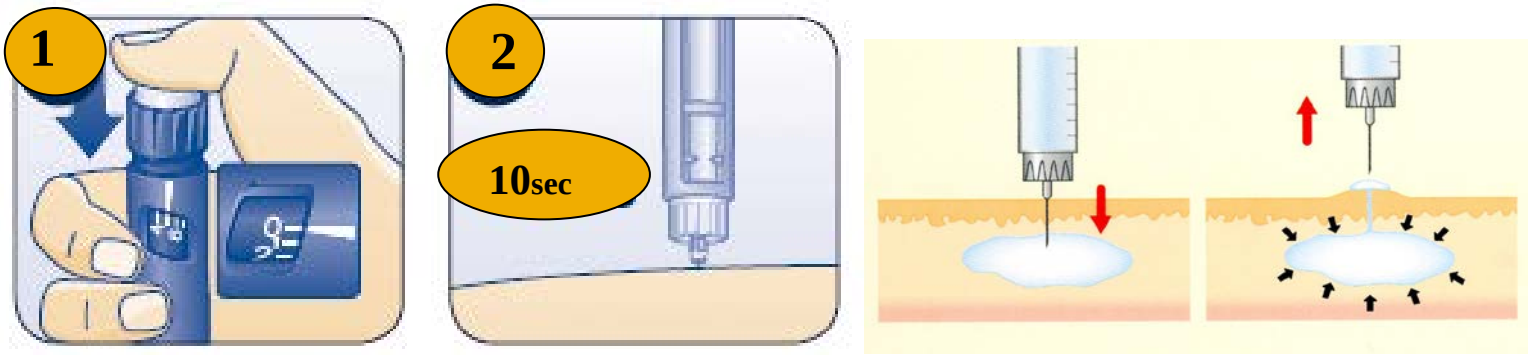
Step 4 : Select the dose

- Turn the dose button until the number of units you need lines up with the dose indicator.
- Remember that 60 units(Lilly, Novo products) or 80 units(Sanofi products) is the maximum dose
- If you need more than 60 units you must divide your dose into two injections. Inject the 60 units first and then make a new injection with the remaining number of units needed to complete your dose

The CORRECT WAY to use your insulin pen

Step 5 : Inject the dose

- **After pushing the thumb button in completely**, the individual counts to 10 slowly (10 seconds), before withdrawing the needle **in order to deliver the full dose and prevent the leakage of medication**.
- Counting past 10 seconds may be necessary for **higher doses**.



The CORRECT WAY to use your insulin pen

Step 5 : Inject the dose

- Pen devices with a dose window should be checked at the end of each injection, “0” should be showing when the desired dose has been injected.
- If a number other than “**0**” is showing,
  this indicates dose of insulin that has not been given

The CORRECT WAY to use your insulin pen

Step 6 : Remove the pen needle from the pen

- The needle should always be removed after each injection and discarded.
- This helps prevent contamination and/or infection, entry of air into the insulin reservoir and leakage of insulin.

Right insulin injection practice

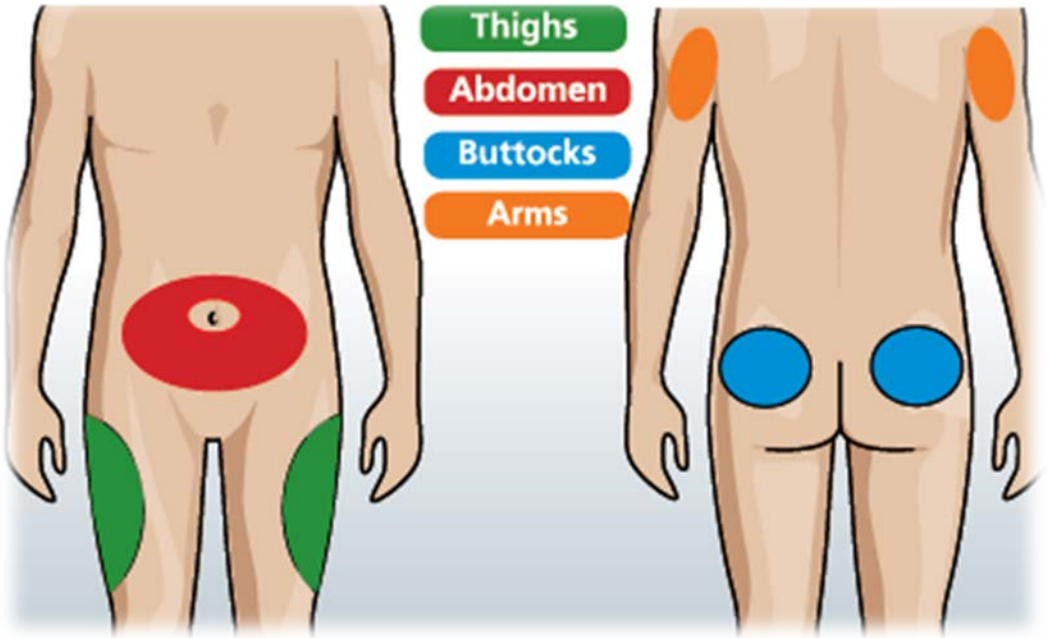
3 Where to inject

People often select injection sites based on many factors: accessibility, presence of fatty tissue, and rate of insulin absorption

Where to inject

Insulin Injection Sites

- The diagram shows the current recommended injection sites for injectable therapy



Where to inject

Insulin Injection Sites

- Insulin goes into subcutaneous tissue.
- The most common injection site is the abdomen. The back of the upper arms, the outer side of the thighs and the upper buttocks or hips are also used.

- abdomen

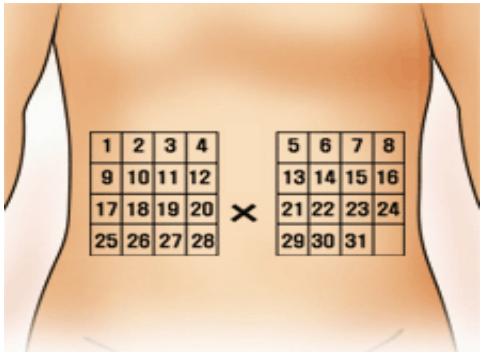
The back of the upper arms

The outer side of the thighs

Where to inject

Insulin Injection Sites

- **Absorption** is fastest with injection in the abdomen, followed by the arms, thighs, and buttocks.
- **Abdomen is the preferred site for consistency of absorption.**
- Keep your shots **1 inch away from scars and within 2 inches away from your navel .**
- Do not put a shot in a spot that is bruised, swollen, or tender.



Where to inject

Generally subcutaneous insulin injections cause few problems;

*"**Lipohypertrophy is a common complication of subcutaneous insulin therapy.** however, occur but can be minimised by using **different injection sites in rotation."***

Lipohypertrophy

- **Lipohypertrophy** has been linked to poorer glycemic control and may reduce absorption by as much as **25%.**
- Higher A1C levels have been reported with patients injecting into lipohypertrophic sites.
- **Areas of lipohypertrophy** are associated with use of non purified insulins, **repeated injections** into a small (less than postage stamp) area, reuse of needles and failure to inspect the injection sites on a regular basis.

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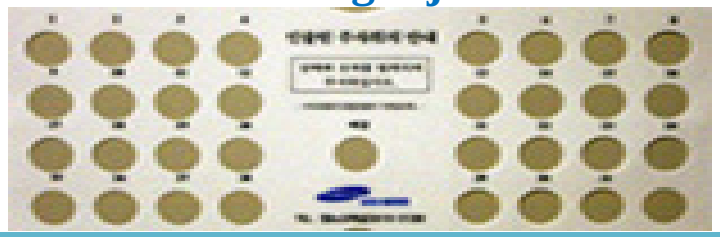
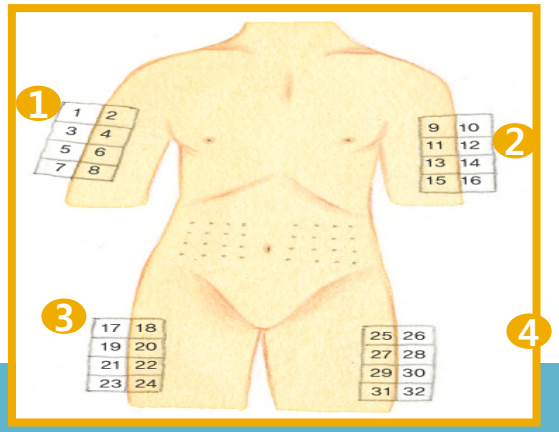
Where to inject

- **To prevent lipohypertrophy and maintain consistent absorption**, patients should be taught a personalized "**structured rotation**" for their injection sites.
- Structured rotation is recommended in the **same anatomical region at the same time of day** with injections being at least **2 to 3cm apart** (2 fingers) across the entire area.

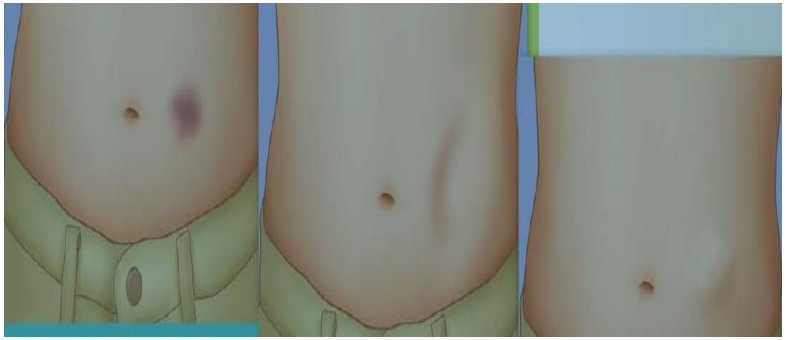
❖ **Aid in Locating injection Areas**





Where to inject

- **Patients repeatedly choose** the **lipohypertrophic sites** because these areas have limited nerve innervation and are relatively **painless**
- When changing injection sites from a lipohypertropic to healthy site patients should be cautioned to initially reduce the **insulin dose and monitor their blood glucose** more frequently
- **Diabetes educators need to inspect sites for signs of lipohypertrophy.**



Smart Tips for Site Rotation

- **Do not inject close to the belly button**.
  The tissue there is tougher, so the insulin absorption will not be as consistent. For the same reason, do not inject close to moles or scars
- **If you inject in the upper arm, use only the outer back area** (where the most fat is).
- **If you inject in the thigh, stay away from the inner thighs**. If your thighs rub together when you walk, if might make the injection site sore.

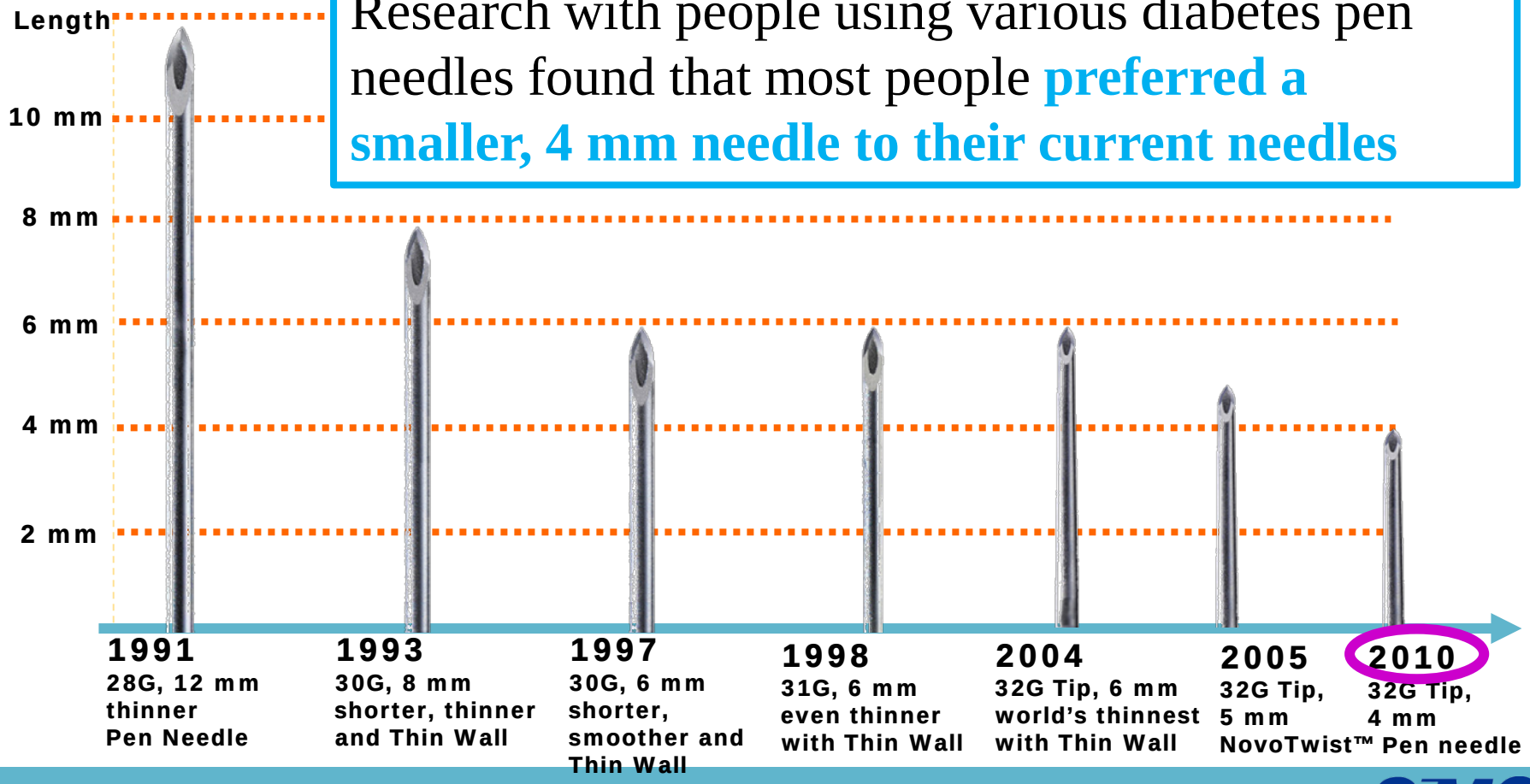
Smart Tips for Site Rotation

- **Do not inject in an area that will be exercised soon**. Exercising increases blood flow, which causes long-acting insulin to be absorbed at a rate that's faster than you need.

- **Move to a new injection site every week or two.**
  - Inject in the same area of the body, making sure to move around within that area with each injection, for one or two weeks.
  - **Use the same area for at least a week** to avoid extreme blood sugar variations.

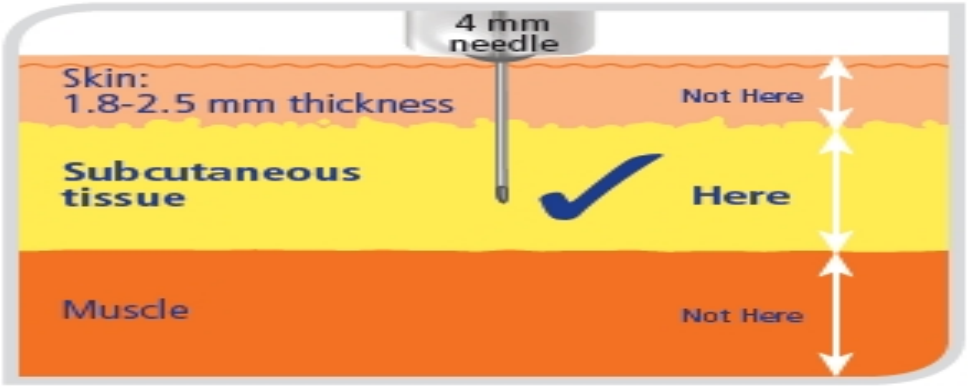
Needle size:

63% of people with diabetes are using the same needle they started on at diagnosis
Research with people using various diabetes pen needles found that most people **preferred a smaller, 4 mm needle to their current needles**



Use of pen needles

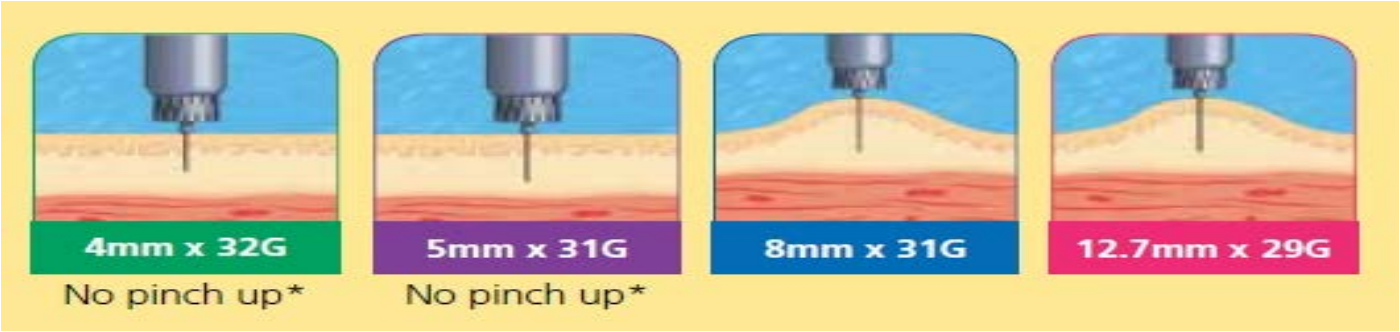
- Many factors can contribute to **perception of pain** with injection therapy, including **needle length and diameter, injection technique, and intramuscular (IM) injection.**



- **Short and narrow-gauge (4 to 5-mm x 32G)** insulin pen needles have been reported to **reduce pain**

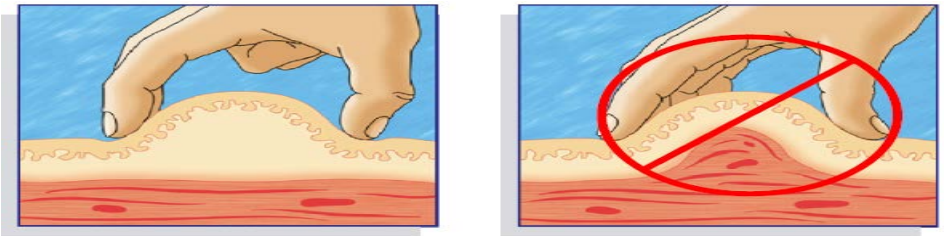
Choose the right needle

- Initial insulin therapy should start with the **shorter length.**
- **4, 5 and 6mm needles** are suitable for all people with diabetes regardless of BMI.
- A skin lift may not be required, particularly if using a 4mm needle.



Best Practice Recommendations

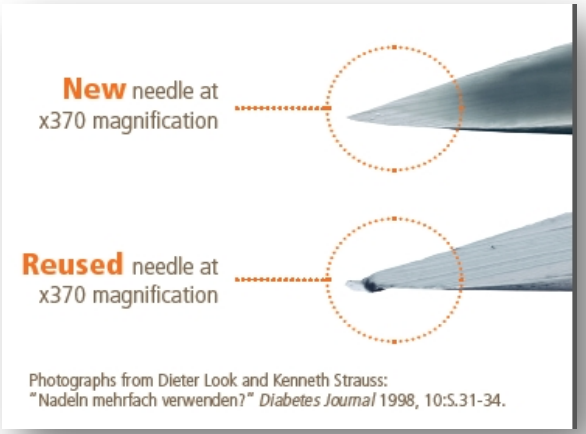
- When using 8, 12mm needles, injection should be given into a skin lift at a 90 degree angle
- Slim individuals should use a skin lift and a 45 degree angle to **prevent possible IM injections**.
- **A skin fold** lift is made using the thumb and index or middle finger to gently lift subcutaneous tissue away from the muscle layer to reduce the risk of administering the medicine intramuscularly.



Correct pinch-up Incorrect pinch-up

Reuse of needles

- Reuse of needles or syringes is usually not recommended. Nevertheless, many patients adopt this practice.
- Re-using needles can cause pain, needle bending and breakage, skin damage, needle clogging and dosing inaccuracy.



- Reuse is unadvisable in patients with **poor personal hygiene, acute concurrent illness, open wounds on the hands or injection site, or decreased resistance to infection.**

Reuse of needles

People with diabetes should be informed that after use:

- The needle will no longer be sterile insulin may block the needle

- Extremes of temperature can cause insulin to leak from the needle if it is not removed from the pen
  ; this could change the relative **concentrations of short or intermediate-acting insulin in a mixture**

- air may enter the device through the needle, which can lower the dose.

Insulin storage

- Extreme temperatures(<2°C or >30°C) and excess agitation should be avoided to prevent loss of potency, clumping, frosting, or precipitation.
- **Insulin injected at room temperature** may reduce irritation, burning or painful injections, which may occur **when cold insulin is used**
- To avoid any possible discomfort, insulin **Give the insulin at least 30 minutes at room temperature before injecting**.

Insulin storage

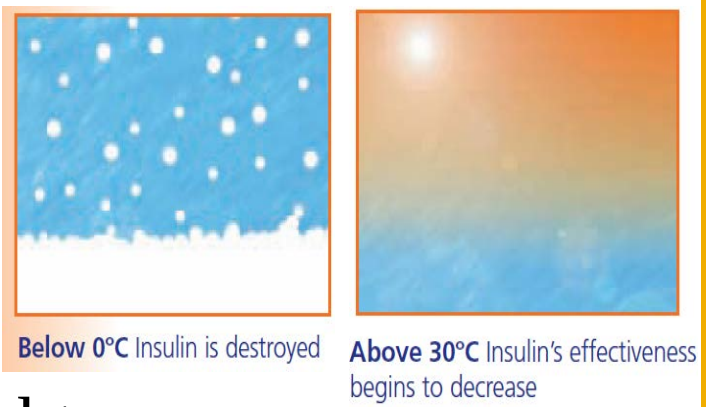
Do

- **Not in-use** pens(Spare insulin) should be kept in the refrigerator.
- **The insulin device or cartridge in use** can be kept at normal **room temperature for one month**.
- If travelling, keep your spare insulin in a cooler bag or vacuum flask

Insulin storage

Don't

- Freeze your insulin
- Keep your insulin above 30°C
- Keep your insulin in direct sunlight
  e.g. on a window sill
- Keep your insulin in a hot place
  e.g. above a radiator
- Use insulin that is lumpy or a strange colour
- Use insulin after the expiry date



Below 0°C Insulin is destroyed

Above 30°C Insulin's effectiveness begins to decrease

Insulin storage

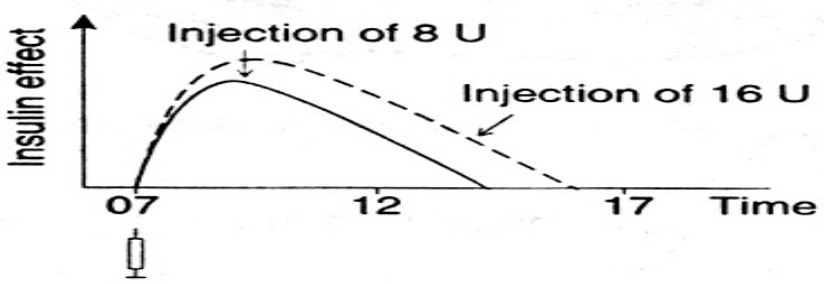
As per product monographs, once insulin is opened it should not be used for longer than **28 days** with the exception of **insulin detemir** which can be used for up to **42 days.**

Product name	Refrigerated		Room temperature
	Opened	Unopened	Opened / Unopened (Days)
Humulin® N	Do not refrigerate	Until Expiration Date Stamp	28
Humulin® 30/70	Do not refrigerate	Until Expiration Date Stamp	28
Humalog®	Do not refrigerate	Until Expiration Date Stamp	28
Humalog® 25/75	Do not refrigerate	Until Expiration Date Stamp	28
Actrapid®	Do not refrigerate	Until Expiration Date Stamp	42
Insulatard®	Do not refrigerate	Until Expiration Date Stamp	42
Mixtard® 30/70	Do not refrigerate	Until Expiration Date Stamp	42
Novorapid®	Do not refrigerate	Until Expiration Date Stamp	28
Lantus®	Do not refrigerate	Until Expiration Date Stamp	30
Levemir®	Do not refrigerate	Until Expiration Date Stamp	42

Factors Affecting insulin Absorption

Injection volume

- **A larger volume and a higher concentration** of insulin delays insulin uptake.
- Insulin injections above 50 units per dose may be more desirable to split into 2 separate injections
- **The larger the dose**, the **more delayed** the action of NPH, short acting human insulin, and rapid acting analog insulin.



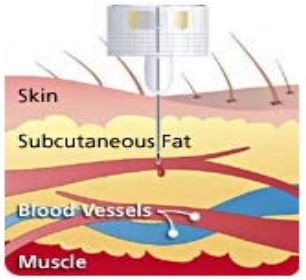
Factors Affecting insulin Absorption

Site of injection

Abdominal injection results in the quickest absorption; arm injection results in quicker absorption than thigh or hip injection

Injection depth

- Patients should be advised to inject insulin at a consistent depth to avoid unpredictable absorption
- Insulin is absorbed faster when administered intramuscular compared **subcutaneous fat**



Factors Affecting insulin Absorption

- **Massaging the injection site** increases the absorption rate and is not generally recommended.
- **Exercising** a muscle can increase blood flow up to 7 times compared with before the exercise starts(Strauss et al. 1999).
- **Higher temperatures** increase the absorption rate e.g. a sauna or a hot bath.
- **Smoking** gives rise to slower insulin uptake (Hildebrandt & Madsbad 1989)

How to avoid pain when injecting insulin

Many diabetic patients are worried about the pain of injecting insulin. There are several methods that can help avoid or minimise pain when injecting.

- Making sure the muscles above which you're injecting **are relaxed**, this will allow for a better coverage of fat where you're injecting.
- Use insulin and a needle which is **at room temperature**
- Push the needle in **quickly**
- Try not to wiggle the needle as you're injecting or withdrawing the needle
- Always use a brand **new needle**

Common insulin injection problems

Bleeding at site of injection

- Do not rub the injection site
- Apply light pressure with finger to prevent bruising
- If bruising, avoid that injection site again until the bruise resolves
- Frequent bruising or bleeding at the injection site may indicate poor technique or another medical problem; inform healthcare provider and/or diabetes educator

Common insulin injection problems

Bleeding at site of injection

- Local bruising and/or bleeding will occasionally occur at the injection site and is seen more frequently in patients taking **anti-platelet therapy**.
- Studies suggest that bruising and/ or bleeding does not affect the absorption of the medication.

Common insulin injection problems

Insulin is dripping from the pen needle after injection

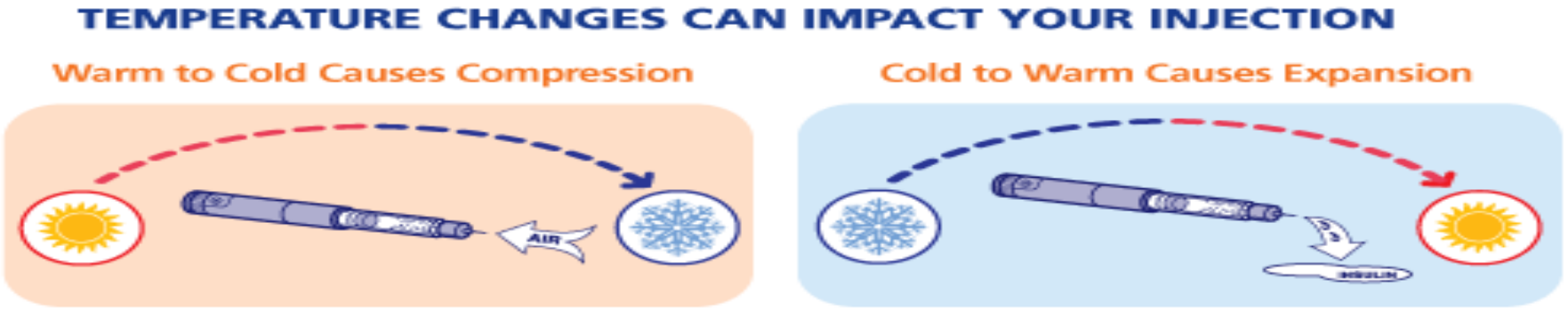
- Wait at least 10 seconds after injecting before removing the needle.
- Do not carry a pen with the needle attached.
  This causes air to enter the cartridge,
  thus slowing the time it will take to get
  the insulin dose

Safety Precautions

- Pen devices and cartridges are for single person use only and should never be shared due to the risk of cross contamination.
- Pen needles should be used only once.

Safety Precautions

- Needles should be safely disposed of immediately after use and not left attached to the pen.



- Going from a **warm place** to a **cold place** causes insulin to compress
- **Air may fill the empty space**
- This may cause an under-dose

- Going from a **cold place** to a **warm place** causes the insulin to expand
- As insulin expands it will **leak out** through the passage way that the needle creates.
- So, changing the concentration of insulin

Conclusion

The instruction of **correct injection technique** is a **core function for diabetes educators**.

I hope these **clinical recommendations** become a useful working document assisting all diabetes educators to reflect on their current practice and promote the use of evidence based practice.


Thank you