


# Evidence-based Clinical Guideline

Subcutaneous insulin injection for people with diabetes mellitus

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## Updating and publication

The Association of Hong Kong Diabetes Nurses (AHKDN) is responsible for updating the clinical guidelines every 4 years.

## Research Questions

As a basis for developing the recommendations set forth in the guideline, the guideline development committee addressed six questions relevant to the clinical practice:

1. How should insulin injections be prepared?
2. Which sites should be used for insulin injection?
3. What should be the appropriate needle length?
4. How should insulin injection be performed?
5. How should insulin and insulin pens be stored?
6. How should lipohypertrophy and lipoatrophy be managed?

## 1. How should insulin injections be prepared?

### Skin preparation

1. Cleanliness of the skin must be ensured prior to subcutaneous insulin injection in all settings.[29] (III A)
2. Disinfection of the skin is not necessary prior to subcutaneous insulin injection in the home environment.[23,27,44,51,59,80] (I B)
3. If skin swabbing is performed, the skin must be allowed to dry properly before injection.[60,86] (III A)

### Insulin vial and penfill membrane preparation

1. Cleanliness of membrane must be ensured prior to needle puncture. (III B)
2. It is not necessary to disinfect the membrane of the pen filling or vial membrane to reduce the risk of infection in the home environment [45,59] (III A)

### Insulin pen administration system

Insulin administration systems and penfills must be kept strictly for individual use.[38,47,75] (II A)

### Mixing of cloudy insulin

1. Cloudy insulin (e.g. NPH and pre-mixed insulin) must be well mixed before injection.[2,15,16,63] (III A)
2. Tipping the insulin pen (to 1800) for at least 20 cycles must be done to ensure complete re-suspension of the NPH insulin before injection.[48] (I A)

### Drawing of insulin by syringe

1. When drawing up insulin, the volume of air equivalent to the volume of insulin to be administered should be drawn up first and injected into the vial to facilitate insulin withdrawal.[29] (III B)
2. Air bubbles should be expelled from the syringe before injection.[39,60] (III A)
3. Soluble insulin (e.g rapid or short acting) must be drawn into the syringe before intermediate acting (e.g. NPH) insulin.[68] (III A)
4. Only compatible insulins can be drawn into one syringe.[2] (III A)

### Priming of insulin pen

1. Air generated in the insulin pen should be removed (if any) before injection.[19,34] (II B)
2. Pens devices must be primed before each injection.[2,39] (III B)
3. Priming, when conducted must be ensured by observing at least a drop at the needle tip.[39] (III A)

### Maximum dose of insulin for each administration

Single insulin doses greater than 50 units should be considered to be given as 2 separate injections.[5,20,36,56] (III B)

# How should insulin injections be prepared?

## Skin preparation

1. Cleanliness of the skin must be ensured prior to subcutaneous insulin injection in all settings.[40] (III A)
2. Disinfection of the skin is not necessary prior to subcutaneous insulin injection in the home environment.[23,27,45,52,60,81] **(I B)**
3. If skin swabbing is performed, the skin must be allowed to dry properly before injection.[61,87] (III A)

## Insulin vial and penfill membrane preparation

1. Cleanliness of membrane must be ensured prior to needle puncture. (III B)
2. It is not necessary to disinfect the membrane of the pen filling or vial membrane to reduce the risk of infection in the home environment [46,60] (III A)

Scientific support scale

**I** At least one randomized controlled trials (RCTs)

**II** At least one non-randomized (or non-controlled or epidemiologic) study

**III** Consensus expert opinion (including e.g. case reports, case series) based on extensive patient experience

Strength of recommendation scale

**A**. Strongly recommended

**B**. Recommended

**C.** Unresolved issue

# How should insulin injections be prepared?

**Insulin pen administration system**

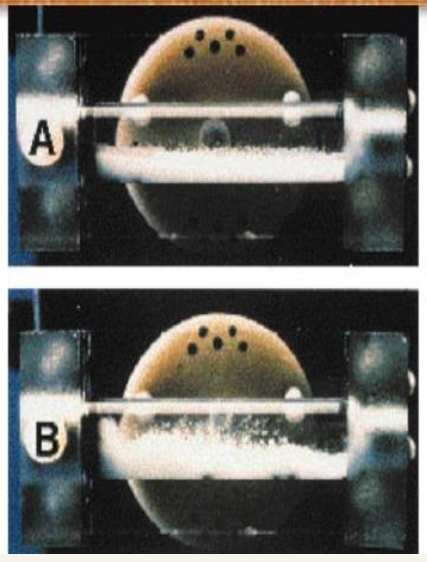
- Insulin administration systems and penfills must be kept strictly for individual use.[39,48,76] (II A)

**Mixing of cloudy insulin**

1. Cloudy insulin (e.g. NPH and pre-mixed insulin) must be well mixed before injection.[2,15,16,64] (III A)
2. Tipping the insulin pen (to $180^0$) for at least 20 cycles must be done to ensure complete re-suspension of the NPH insulin before injection.[49] **(I A)**

## Recommendation 1.4.2

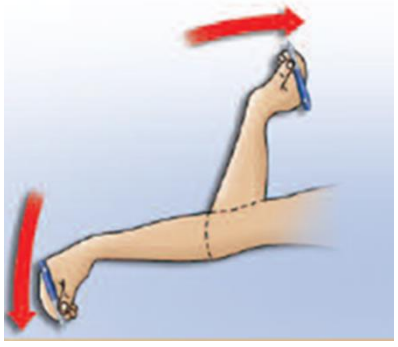
**Tipping the insulin pen (to 180°) for at least 20 cycles must be done to ensure complete re-suspension of the NPH insulin before injection.(IA)**




A: Before (after 24 h sedimentation).

B: After seven cycles

C: After 20 cycles.



Mixing of NPH insulin by a mechanical device showed that at least 20 cycles of **tipping** (to $180^0$) were necessary to re-suspend the insulin completely

Figure 2: Suspension of NPH insulin before and after electronic tipping to 180° (one cycle) p1606

Jehle, P., C. Micheler, D. Jehle, D. Breitig, and B. Boehm. "Inadequate suspension of neutral protamine hagendorn (NPH) Insulin in Pens." *The Lancet* 354.9190 (1999): 1604-607.

# How should insulin injections be prepared?

**Drawing of insulin by syringe**

1. When drawing up insulin, air equivalent to the dose should be drawn up first and injected into the vial to facilitate insulin withdrawal.[40] (III B)
2. Air bubbles should be expelled from the syringe before injection.[40,61] (III A)
3. Soluble insulin (e.g rapid or short acting) must be drawn into the syringe before intermediate acting (e.g. NPH) insulin.[69] (III A)
4. Only compatible insulins can be drawn into one syringe.[2] (III A)

# How should insulin injections be prepared?

**Priming of insulin pen**

1. Air generated in the insulin pen should be removed (if any) before injection.[19,34] (II B)
2. Pens devices must be primed before each injection.[2,40] (III B)
3. Priming, when conducted must be ensured by observing at least a drop at the needle tip.[40] (IIIA)

**Maximum dose of insulin for each administration**

- Single insulin doses greater than 50 units should be considered to be given in 2 separate injections.[5,20,36,57] (III B)


Thank you!