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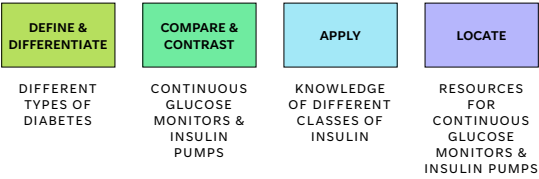
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### LEARNING OBJECTIVES



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### OBJECTIVE 1: DEFINE & DIFFERENTIATE

1. TYPES OF DIABETES
2. TYPES OF MONITORING
3. TYPES OF INSULIN PUMPS

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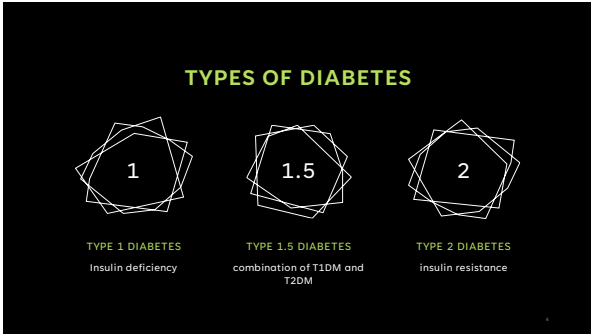
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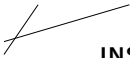
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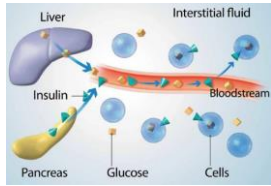
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### INSULIN PHARMACOLOGY REVIEW

#### Insulin In The Body:

- Hormone produced by the pancreas to transport glucose into cells for energy
- Diabetes can alter insulin production/function:
  - Type 1 diabetes: ~0 insulin
  - Type 2 diabetes: insulin resistance



Source: Medtronic – Basics of Insulin Pump Therapy

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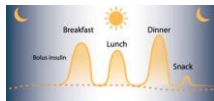


### INSULIN PHARMACOLOGY REVIEW

#### Insulin Requirements:

The body has 2 insulin "modes"

- **Basal:** minimum insulin required to throughout day, regardless of meals
- **Bolus:** insulin required to bring glucose back to normal range after spiking



Source: Medtronic – Basics of Insulin Pump Therapy

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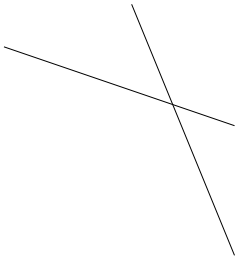
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**OBJECTIVE 1: DEFINE & DIFFERENTIATE**

- 1. TYPES OF DIABETES
- 2. TYPES OF MONITORING
- 3. TYPES OF INSULIN PUMPS

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**TYPES OF MONITORING**

**BLOOD GLUCOSE MONITORING (BGM):**

- Considered the "traditional" form of monitoring
- Capillary blood glucose reading
- One point in time
- ~15 min lag from food ingestion



Source: ADA Consumer Guide

**CONTINUOUS GLUCOSE MONITORING (CGM):**

- "Newer" form of monitoring
- Interstitial fluid glucose reading
- Point in time plus trends
- ~15 min lag from capillary reading



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**BLOOD GLUCOSE MONITORING**

**Important Considerations:**

- Insurance coverage & cost
- Strips & lancets
- Frequency of testing
- Ease of use
- Visual/auditory features
- Reminders
- Batteries required
- Sharing capabilities



Source: ADA Consumer Guide

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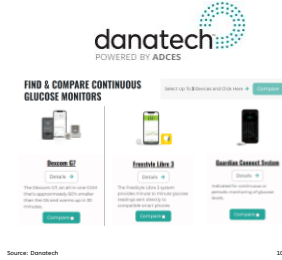
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## CONTINUOUS GLUCOSE MONITORING

### Important Considerations:

- Insurance coverage & cost
- Ease of use
- Frequency of sensor change
- Visual/auditory features
- Warm up period



Source: Danatech

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## OBJECTIVE 1: DEFINE & DIFFERENTIATE

1. TYPES OF DIABETES
2. TYPES OF MONITORING
3. TYPES OF INSULIN PUMPS

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## TYPES OF INSULIN PUMPS

### TRADITIONAL:

- Delivers a set basal rate every hour; programmable & adjustable
- Boluses can be delivered for carb and/or corrections



### AUTOMATED DELIVERY:

- Delivers basal rate every hour, variable based on CGM values
- Boluses:
  - Automated for predicted/actual hyperglycemia
  - Carb and/or correction
- Auto suspension for hypoglycemia



Source: ADA Consumer Guide

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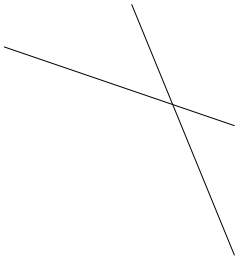
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**OBJECTIVE 2: COMPARE & CONTRAST**

1. CONTINUOUS GLUCOSE MONITORS
2. INSULIN PUMPS

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**CGM COMPARISON:**

PRODUCT	DURATION	WARM-UP	MARD	WATER	rtCGM	SITE	PUMPS?	CALIBRATION
DEXCOM G7 (DME & Rx)	10 DAYS #3 = 30DS	30 MIN	8.2%	≤8 FEET, ≤24 HRS	EVERY 5 MIN	ARM & BUTTOCKS*	YES	OPTIONAL
FREESTYLE LIBRE 3 (DME & Rx)	14 DAYS #2 = 28DS	1 HR	7.9%	≤3 FEET, ≤30 MIN	EVERY 1 MIN	ARM	IN PROCESS	N/A
GUARDIAN (DME)	7 DAYS #4 = 28DS	2 HR	9% - 10.5%	≤8 FEET, ≤30 MIN	EVERY 5 MIN	ARM & ABDOMEN	YES	2x DAILY

MARD = mean absolute relative difference, rtCGM = real time CGM

Source: ADA Consumer Guide, DiabetesWillie Pro Device Library

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**OBJECTIVE 2: COMPARE & CONTRAST**

- CONTINUOUS GLUCOSE MONITORS
- INSULIN PUMPS**

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**INSULIN PUMP COMPARISON:**

PRODUCT	FREQUENCY	COST	TUBES?	WATER	SITE	CONNECTED DEVICES	APPROVED INSULINS
OMNIPOD DASH (Rx ONLY)	UP TO 200 UNITS Q3D	\$\$	NO	≤25 FEET, ≤60 MIN	ARM, STOMACH, THIGH, BUTTOCKS	CONTOUR NEXT, IPHONE APP, FAMILY SHARING	NOVOLOG, HUMALOG, FIASP, LYUMJEV, APIDRA*
MEDTRONIC 630G (DME ONLY)	UP TO 300 UNITS Q3D	\$\$\$\$	YES	NO*	STOMACH, LEG, BUTTOCKS	CONTOUR NEXT, ENLITE CGM	HUMALOG, NOVOLOG

Source: ADA Consumer Guide, DiabetesWise Pro Device Library

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**Pump**  
Pump connects tubing to a small patch called an infusion set that attaches to the body.



**Pump**  
Pods come with reservoirs and directions for application. They can be applied anywhere on the body that is comfortable.



**Reservoir**  
Tubed insulin pumps contain a plastic reservoir or cartridge that is manually filled with insulin and locked into the pump.



**Reservoir**  
Fill reservoir is enclosed with the Pod and used to manually fill the Pod with insulin.



**Infusion Set**  
An infusion set contains the thin plastic tubing that delivers insulin from the pump to the body.



**Controller**  
Separate Android-like is used for manual insulin delivery via a tubeless pod. Data and notifications from the PDM are viewable on a compatible smartphone.

Source: ADA Consumer Guide

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### INSULIN PUMP COMPARISON:

PRODUCT	FREQUENCY	COST	TUBES?	WATER	SITE	CONNECTED DEVICES	APPROVED INSULINS
OMNIPOD 5 (Rx ONLY)	UP TO 200 UNITS Q3D	\$\$	NO	≤25 FEET, ≤60 MIN	ARM, STOMACH, THIGH, BUTTOCKS	DEXCOM G6	NOVOLOG, HUMALOG
MEDTRONIC 780G (DME ONLY)	UP TO 300 UNITS Q3D	\$\$\$\$	YES	NO*	STOMACH, LEG, BUTTOCKS	GUARDIAN	HUMALOG, NOVOLOG
TANDEM T-SLIM X2 (DME ONLY)	UP TO 300 UNITS Q3D	\$\$\$\$	YES	NO*	STOMACH, LEG, BUTTOCKS	DEXCOM G6, DEXCOM G7, IPHONE APP, LIBRE 2+	HUMALOG, NOVOLOG

Source: ADA Consumer Guide, DiabetesWrite Pro Device Library

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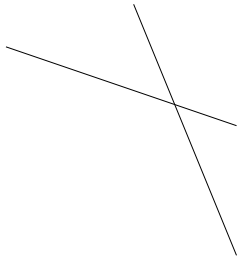
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### OBJECTIVE 3: APPLY

1. KNOWLEDGE OF GUIDELINES
2. KNOWLEDGE ON DIFFERENT CLASSES OF INSULIN

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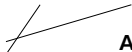
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### ADA STANDARDS OF CARE 2024

#### GLYCEMIC GOALS & HYPOGLYCEMIA:

- 6.1 Assess glycemic status by A1C and/or appropriate continuous glucose monitoring (CGM) metrics at least two times a year. Assess more frequently (e.g., every 3 months) for individuals not meeting treatment goals, with frequent or severe hypoglycemia or hyperglycemia, changing health status, or growth and development in youth. E
  - 6.2 Assess glycemic status at least quarterly and as needed in individuals whose therapy has recently changed and/or who are not meeting glycemic goals. E
- 6.3 Standardized, single-page glucose reports from CGM devices with visual cues, such as the ambulatory glucose profile, should be considered as a standard summary for all CGM devices. E
- 6.4 Time in range (TIR) is associated with the risk of microvascular complications and can be used for assessment of glycemic status. Additionally, time below range and time above range are useful parameters for the evaluation of the treatment plan. C
- 6.5a An A1C goal for many nonpregnant adults of <7% (<53 mmol/mol) without significant hypoglycemia is appropriate. A
- 6.5b If using an ambulatory glucose profile/glucose management indicator to assess glycemia, a parallel goal for many nonpregnant adults is TIR >70% with time below range <4% and time <4 mg/dL (<3 mmol/L) <1%. For those with frailty or at high risk of hypoglycemia, a goal of >50% TIR with <1% time below range is recommended. B

Source: ADA Standards of Care 2024 – 6. Glycemic Goals and Hypoglycemia

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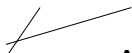
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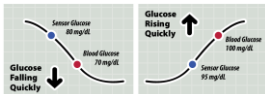


### ADA STANDARDS OF CARE 2024

#### Glucose specific goals:

- Increase time in range (TIR)
- Reduce time above range (TAR) and time below range (TBR)

Technology (CGM +/- pumps) can help patients meet these goals!



Source: ADA Standards of Care 2024 – 6. Glycemic Goals and Hypoglycemia

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Injected insulin regimens	Flexibility	Lower risk of hypoglycemia	Higher costs
MDI with LAA + RAA or URAA	+++	+++	+++
Less-preferred, alternative injected insulin regimens			
MDI with NPH + RAA or URAA	++	++	++
MDI with NPH + short-acting (regular) insulin	++	+	+
Two daily injections with NPH + short-acting (regular) insulin or premixed	+	+	+
Continuous insulin infusion regimens	Flexibility	Lower risk of hypoglycemia	Higher costs
Hybrid closed-loop technology	+++++	+++++	+++++
Insulin pump with thresholds/predictive low-glucose suspend	+++++	+++++	+++++
Insulin pump therapy without automation	+++	+++	+++

LAA, long-acting insulin analog; MDI, multiple daily injections; RAA, rapid-acting insulin analog; URAA, ultra-rapid-acting insulin analog  
 Source: ADA Standards of Care 2024 – 9. Pharmacologic Approaches to Glycemic Treatment 25

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**OBJECTIVE 3: APPLY**

1. KNOWLEDGE OF GUIDELINES
2. KNOWLEDGE ON DIFFERENT CLASSES OF INSULIN

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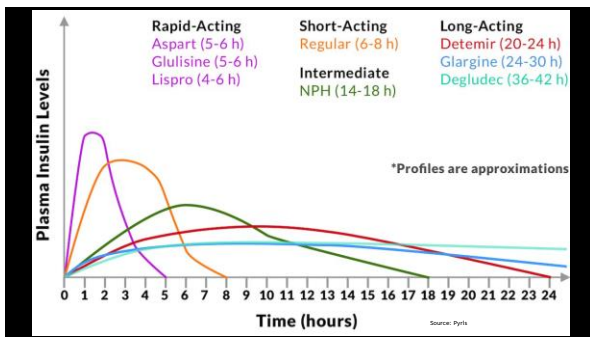
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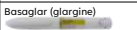

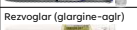
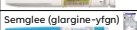


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**TYPES OF INSULINS: BASAL (LAA)**

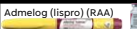
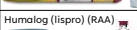

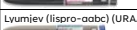

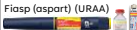
Insulin Name (generic):	Concentration(s) (pack size):	Discard after: room temp unless noted	Duration:
 Tresiba (degludec)	Pens: U-100 (15mL), U-200 (9mL) Vials: U-100 (10mL)	56 days +/- fridge	36-42 hours
 Basaglar (glargine)	Pens: U-100 (15mL)	28 days	24-30 hours
 Lantus (glargine)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	28 days	24-30 hours
 Rezvoglar (glargine-oglr)	Pens: U-100 (15mL)	28 days	24-30 hours
 Semglee (glargine-yfgn)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	28 days	24-30 hours
 Toujeo (glargine)	Pens: U-300 (4.5mL, max: 6mL)	56 days	24-36 hours
 Levemir (detemir)***	Pens: U-100 (15mL)   Vial: U-100 (10mL)	42 days (vials +/- fridge)	20-24 hours

Source: Pyxis, ADA Consumer Guide, Clinical Pharmacology

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**TYPES OF INSULINS: BOLUS (RAA, & URAA)**

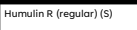
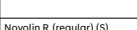
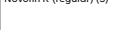
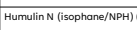

Insulin Name (generic):	Concentration(s) (pack size):	Discard after: room temp unless noted	Onset & Duration:
 Admelog (lispro) (RAA)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	28 days (vials +/- fridge)	15 min 4-6 hours
 Humalog (lispro) (RAA)	Pens: U-100 (15mL), U-200 (6mL) Vials: U-100 (10mL, 3mL)   Cartridge: U-100 (15mL)	28 days (vials +/- fridge)	15 min 4-6 hours
 Lumiview (lispro-aabc) (URAA)	Pens: U-100 (15mL), U-200 (6mL)   Vials: U-100 (10mL)	28 days (vials +/- fridge)	1 min 4-6 hours
 Fiasp (aspart) (URAA)	Pens: U-100 (15mL)   Vials: U-100 (10mL)   Cartridge: U-100 (15mL)   PenFill: U-100 (15mL)	28 days (vials & pens +/- fridge)	2.5 min 5-6 hours
 NovoLoq (aspart) (RAA)	Pens: U-100 (15mL)   Vials: U-100 (10mL)   PenFill: U-100 (15mL)	28 days (vials +/- fridge)	15 min 5-6 hours
 Apidra (glulisine) (RAA)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	28 days (vials +/- fridge)	20 min 5-6 hours

Source: Pyxis, ADA Consumer Guide, Clinical Pharmacology

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**TYPES OF INSULINS: SHORT (S) & INTERMEDIATE (I)**

Insulin Name (generic):	Concentration(s) (pack size):	Discard after: room temp unless noted	Onset & Duration:
 Humulin R (regular) (S)	Vials: U-100 (10mL)	31 days (+/- fridge)	30 min 6-8 hours
 Novolin R (regular) (S)	Vials: U-100 (10mL)	Pen: 28 days Vial: 42 days	30 min 6-8 hours
 Humulin N (isophane/NPH) (I)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 14 days Vial: 31 days (+/- fridge)	1.5 hours 14-18 hours
 Humulin R (regular) (I)	Pens: U-500 (6mL)   Vials: U-500 (20mL)	Pen: 28 days Vial: 40 days (+/- fridge)	30 min 13-24 hours
 Novolin N (isophane/NPH) (I)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 28 days Vial: 42 days	1.5 hours 14-18 hours

Source: Pyxis, ADA Consumer Guide, Clinical Pharmacology

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TYPES OF INSULINS: MIXTURES

Insulin Name (generic):	Concentration(s) (pack size):	Discard after: room temp unless noted	Onset & Duration:
Humalog 50/50 (I + RAA) (protamine lispro/lispro)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 10 days Vial 28 days (+/- fridge)	15-30 min 12-24 hours
Humalog 75/25 (I + RAA) (protamine lispro/lispro)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 10 days Vial 28 days (+/- fridge)	15-30 min 12-24 hours
Novolog 70/30 (I + RAA) (protamine aspart/aspart)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 14 days Vial 28 days (+/- fridge)	10-20 min Up to 24 hours
Humulin 70/30 (I + S) (isophane/regular)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 10 days Vial 31 days (+/- fridge)	30 min Up to 24 hours
Novolin 70/30 (I + S) (isophane/regular)	Pens: U-100 (15mL)   Vials: U-100 (10mL)	Pen: 10 days Vial 28 days	30 min Up to 24 hours

Source: Pyxis, ADA Consumer Guide, Clinical Pharmacology

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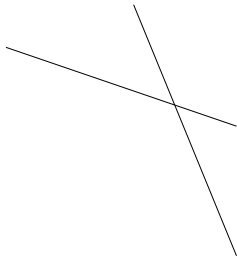
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**OBJECTIVE 3: LOCATE**

1. RESOURCES FOR PATIENTS
2. RESOURCES FOR HEALTHCARE PROVIDERS

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**PATIENT RESOURCES**

American Diabetes Association  
Consumer Guide  
Diabetes Food Hub  
Community Connection  
FreeStyle Libre  
Dexcom  
SUPPORT FORM  
FREE G6 PATCHES  
TANDEM Diabetes Care  
Medtronic

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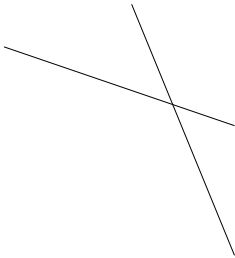
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**OBJECTIVE 3: LOCATE**

- 1. RESOURCES FOR PATIENTS
- 2. **RESOURCES FOR HEALTHCARE PROVIDERS**

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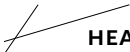
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**HEALTHCARE PROVIDER RESOURCES**

**CGMs:**

- Dexcom:**
  - User guides: [G6](#) & [G7](#)
  - [Trainings](#)
- Freestyle Libre:**
  - User guides & Training:
    - [Libre 2](#)
    - [Libre 3](#)
- Guardian:**
  - [User guide](#)
  - [Training](#)

**Insulin Pumps:**

- Medtronic:**
  - [User guides](#)
  - [Trainings & Webinars](#)
- Omnipod:**
  - [User guides & other handouts](#)
  - [Trainings](#)
  - [Compatible phones](#)
- Tandem:**
  - [User guides & Resources](#)
  - [Trainings](#)

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**REFERENCES**

1. Medtronic – The Basics of Insulin Pump Therapy.
2. ADA Consumer Guide
3. [Dana-Insulin](#)
4. [DiabetesWise Pro – Device Library](#)
5. American Diabetes Association Standards of Care 2024 – 6. Glycemic Goals and Hypoglycemia
6. American Diabetes Association Standards of Care 2024 – 9. Pharmacologic Approaches to Glycemic Treatment
7. [Pylis Drug Information, Insulin Classes and Action Profiles.](#)
8. [Clinical Pharmacology Drug Information, Drug class overview: Insulins.](#)

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