The use of modern technology and the dietary treatment of Diabetes Mellitus

Charilaos Dimosthenopoulous  MMedSci.PhDc
Clinical Dietitian-Biologist
Dept of Clinical Nutrition
General Hospital of Athens “Laiko”
Managing Diabetes Successfully

Involves three things:

- Nutrition / Diet/Nutritional education
- Exercise
- Medication
(MTN-Medical Nutrition Therapy)
Management of Diabetes

- Insulin Treatment-Assessment & Monitoring Glycemic Control
- Medical Nutrition Therapy
- Treatment of complications/comorbidities
- Psychological Care
- Exercise
### Monotherapy

**Efficacy**
- Metformin: High
- Sulfonylurea: Moderate risk
- Thiazolidinedione: Low risk

**Hypo risk**
- Metformin: Low risk
- Sulfonylurea: Low risk
- Thiazolidinedione: Neutral / Loss

**Weight**
- Metformin: Neutral / Loss
- Sulfonylurea: Gain
- Thiazolidinedione: Edema, HF, Fxs

**Side effects**
- Metformin: GI / Lactic acidosis
- Sulfonylurea: Hypoglycemia
- Thiazolidinedione: Edema

**Costs**
- Metformin: Low
- Sulfonylurea: High
- Thiazolidinedione: High

---

### Dual therapy

**Efficacy**
- Metformin + Metformin: Intermediate
- Metformin + Thiazolidinedione: Intermediate
- Metformin + DPP-4 inhibitor: Intermediate

**Hypo risk**
- Metformin + Metformin: Low risk
- Metformin + Thiazolidinedione: Low risk
- Metformin + DPP-4 inhibitor: Low risk

**Weight**
- Metformin + Metformin: Neutral / Loss
- Metformin + Thiazolidinedione: Neutral / Loss
- Metformin + DPP-4 inhibitor: Neutral / Loss

**Side effects**
- Metformin + Metformin: GI / Lactic acidosis, GU / Dehydration
- Metformin + Thiazolidinedione: GI / Lactic acidosis
- Metformin + DPP-4 inhibitor: GI / Lactic acidosis

**Costs**
- Metformin + Metformin: Variable
- Metformin + Thiazolidinedione: Variable
- Metformin + DPP-4 inhibitor: Variable

---

### Triple therapy

**Metformin + Sulfonylurea + TZD**
- Metformin + Sulfonylurea + DPP-4 inhibitor
- Metformin + Sulfonylurea + SGLT2 inhibitor
- Metformin + Sulfonylurea + GLP-1 receptor agonist
- Metformin + Sulfonylurea + Insulin (basal)

**Metformin + Thiazolidinedione + TZD**
- Metformin + Thiazolidinedione + DPP-4 inhibitor
- Metformin + Thiazolidinedione + SGLT2 inhibitor
- Metformin + Thiazolidinedione + GLP-1 receptor agonist
- Metformin + Thiazolidinedione + Insulin (basal)

**Metformin + DPP-4 inhibitor + TZD**
- Metformin + DPP-4 inhibitor + SGLT2 inhibitor
- Metformin + DPP-4 inhibitor + GLP-1 receptor agonist
- Metformin + DPP-4 inhibitor + Insulin (basal)

**Metformin + GLP-1 receptor agonist + TZD**
- Metformin + GLP-1 receptor agonist + SGLT2 inhibitor
- Metformin + GLP-1 receptor agonist + GLP-1 receptor agonist
- Metformin + GLP-1 receptor agonist + Insulin (basal)

**Metformin + Insulin (basal) + TZD**
- Metformin + Insulin (basal) + DPP-4 inhibitor
- Metformin + Insulin (basal) + SGLT2 inhibitor
- Metformin + Insulin (basal) + GLP-1 receptor agonist
- Metformin + Insulin (basal) + GLP-1 receptor agonist

---

### Combination injectable therapy

- Basal insulin + Mealtimes insulin or GLP-1 RA

---

**Healthy eating, weight control, increased physical activity, and diabetes education**
Lifestyle Changes for Diabetes Management

| Medical nutrition therapy | • Recommended for all individuals with prediabetes, type 1 diabetes, type 2 diabetes, gestational diabetes |
|                          | • Goal: Improve health via diet to help manage weight, glucose, lipids, blood pressure |

| Physical activity        | • ≥150 minutes/week of moderate-intensity exercise |
|                         | • Type 2 diabetes: incorporate flexibility and training exercises |
|                         | • On insulin therapy? Adjust insulin doses and food intake to avoid hypo- or hyperglycemia |

New technology for a better diabetes control

New meters
Insulin pumps
New insulins
CGM
Applications
New technology on diabetes treatment
New technology: Blood Glucose Meters

A circular patch is placed on the upper arm with a special applicator.

How the monitoring system works:

1. A tiny filament measures glucose levels in the interstitial fluid between skin cells.
2. Filament
3. Skin
4. Cells
5. Blood vessel

Readings are sent to a reader via NFC waves - the same technology used for contactless card payments.
New technology:
Continuous Glucose Monitor

- Rechargeable pump
- Insulin patch (208 μl)
  suitable for 3 days
Technology can be used to supplement healthcare provider diabetes care by providing both educational and motivational support.

Education can be provided using technology allowing patients to learn new practices and routines related to diabetes management.

Technology can support daily diabetes self-management activities including blood glucose monitoring, exercising, healthy eating, taking medication, monitoring for complications, and problem-solving.
Intensive insulin therapy & use of pumps: the role of nutrition

- Consider intensive insulin therapy to allow flexibility in meal patterns
- Integrate insulin therapy with usual food intake
- Develop an eating pattern based on person’s usual food intake
Insulin-Pump Therapy for Type 1 Diabetes Mellitus

John C. Pickup, B.M., D.Phil.

Insulin-Pump Therapy for Type 1 Diabetes Mellitus

John C. Pickup, B.M., D.Phil.

Nutritional Education on Diabetes

- Carbohydrate Counting
  - *(American Academy of Nutrition and Dietetics)*
    - Pump Therapy / MDI: in both the treatments there is a need for educational programs provided by specially educated dietitians in order to provide information based on the Insulin to Carbohydrate Ratios

- Useful information on GI & GL
We set as a main target:

- To provide education in counting and calculating carbohydrate intake in MDI/pumps, and
- To identify the blood sugar fluctuations *according to the food intake* and their modification by insulin and exercise

*(LEVEL 2 - Carbohydrate Counting)*
Medical Nutrition Therapy

• Meal plans should be individualized based on:
  
  • nutrition assessment
  
  • medical history
  
  • **type of treatment**
  
  • psycho-social assessment
  
  • treatment goals
Macronutrient Composition

- No absolute percentages any more
- CHO and MUFA should be 60-70% kcals
- SFA < 10% kcals
- Protein intakes of 15-20% kcals
Eating patterns and macronutrient distribution

- Evidence suggests that there is **not an ideal percentage of calories from carbohydrate, protein, and fat for all people with diabetes**.
- therefore, macronutrient distribution should be based on individualized assessment of current eating patterns, preferences, and metabolic goals.
Carbohydrate Consistency

- CHO intake and distribution should be comparable from one day to the next.
- CHO content of meals within the same day can vary.
Type of Carbohydrate

- The **total amount of CHO** eaten is more important than the source or type.

- Clinical studies do not justify the longtime belief that sucrose must be restricted.
CHO Intake

- CHO intake determined after protein and fat intake have been calculated.
- Emphasize on whole grains, starches, fruits, and vegetables
- Fiber same as for nondiabetics (20g to 35g)
- Rate of digestion related to the presence of fat, degree of ripeness, cooking method, and preparation
Carbohydrate Management Tools

- Food Pyramid
- The plate of Diabetes
- Food Labels
- ADA Exchange Lists
- Reference Books
diabetes portion plate

- non-starchy vegetables
- starchy foods
- protein
- fats & oils

- add a 8oz. glass of non-fat or low-fat milk
- add a piece of fruit or a 1/2 cup of fruit salad
Ideal portion size
Ideal portion size

- Fist = 8 fluid oz or 1 cup
- Palm = 3 oz.
- Handful = 1/2 cup
- Thumb = 1 oz.
- Thumb tip = 1 tsp.

Grains/cup

- 3 Servings

Bread/piece

- 2 Servings

Starchy vegetables/cup

- 2 Servings
Meal Planning-CHO counting

- With the older insulins we should set Carbohydrate Intake
  - specific amount of CHO set to match prescribed insulin regimen (less flexible dietary plan-lack of freedom)
- Now with the **intensive insulin therapy** we adjust Insulin to Desired Carbo Intake
  - insulin to carbohydrate ratio
    - 1 unit per 10-15 g carbohydrate
    - 1 unit for every 50 mg/dl elevated above target (above doses may vary)
The rule of 450 OR 500

- Insulin:Carbohydrate ratio = 450 or 500 ÷ total daily insulin dose (TDD)

Example

- TDD = 36 units
- Glucose levels are within target range
- Insulin:Carbohydrate ratio = 500 ÷ 36 = 13.8 (round up to 14)

  Ratio = 1:14
Using the ISF

- ISF = 1500 or 1800 ÷ TDD

**Example**

- TDD = 25 units
- ISF = 1800 ÷ 25 = 72 mg/dl
- Insulin:Carbohydrate ratio = 72 × 0.33 = 23.8 (round up to 24)
  - Ratio = 1:24
1. Exchange List for Meal Planning (exchanges)

- Oldest method for meal planning.
- Based on Dietary Guidelines and My Pyramid.
- Includes a variety of foods.
- Emphasizes label reading and most exchanges are listed under the food label.
2. Carbohydrate Counting (grams)

- Newest method of meal planning.
- Type 1 or Type 2 can use.
- Requires reading the food label.
- Requires constant blood sugar monitoring.
- When reading the food label, look at total carbohydrate grams only.
- Carbohydrates are found in milk, breads/starches, fruit and starchy vegetables
### Calculating carbohydrates (by the methods of grams and exchanges)

<table>
<thead>
<tr>
<th>Food</th>
<th>Quantity</th>
<th>Weight</th>
<th>CHO</th>
<th>exchanges</th>
</tr>
</thead>
<tbody>
<tr>
<td>White flour</td>
<td>1 cup</td>
<td>113 g</td>
<td>87 g</td>
<td>6</td>
</tr>
<tr>
<td>Wholemeal flour</td>
<td>1 cup</td>
<td>111 g</td>
<td>77.7 g</td>
<td>5</td>
</tr>
<tr>
<td>Oat</td>
<td>1 cup</td>
<td>84</td>
<td>55.2</td>
<td>4</td>
</tr>
<tr>
<td>Sugar</td>
<td>1 cup</td>
<td>200 g</td>
<td>199 g</td>
<td>13</td>
</tr>
<tr>
<td>Honey</td>
<td>1 cup</td>
<td>336 g</td>
<td>277 g</td>
<td>17</td>
</tr>
<tr>
<td>Raisins</td>
<td>2/3 cup</td>
<td>100 g</td>
<td>79.1 g</td>
<td>5</td>
</tr>
<tr>
<td>Cocoa</td>
<td>1/3 cup</td>
<td>28 g</td>
<td>12.8 g</td>
<td>1</td>
</tr>
<tr>
<td>Chocolate Chips</td>
<td>¼ cup</td>
<td>43 g</td>
<td>31.3</td>
<td>2</td>
</tr>
</tbody>
</table>
### Methods for calculating CHO

<table>
<thead>
<tr>
<th>Food item</th>
<th>Using CHO in grams</th>
<th>Using CHO in exchanges</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 oz hamburger</td>
<td>0g</td>
<td>0</td>
</tr>
<tr>
<td>2 oz hamburger ψωμάκι</td>
<td>30g</td>
<td>2</td>
</tr>
<tr>
<td>½ cup low-fat cottage τυρί</td>
<td>4g</td>
<td>0</td>
</tr>
<tr>
<td>4 oz φέτες ντοµάτας</td>
<td>5g</td>
<td>0</td>
</tr>
<tr>
<td>1 φλ σαλάτα coleslaw</td>
<td>15g</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>54g</strong></td>
<td><strong>3 ισοδ ή 45g</strong></td>
</tr>
</tbody>
</table>

Ratio insulin:CHO= 1:9

### Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Ποσότητα ινσουλίνης</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHO in grams</td>
<td>54 gr ÷ 9 = 6 units R</td>
</tr>
<tr>
<td>CHO in exchanges</td>
<td>45 gr ÷ 9 = 5 units R</td>
</tr>
</tbody>
</table>
Diabetic Exchanges ("Servings")

- Starch
- Meat/meat substitutes
- Vegetables
- Fruit
- Milk
- Fats
CHO calculation
Food items with CHO
Food items with CHO (sugars)
Factors affecting the absorption of carbohydrates

Same impact on blood sugar:

- 30 grams of carb
  - 1 cup serving

- 30 grams of carb
  - 2 oz. roll

- 30 grams of carb
  - 2/3 cup

Fat/protein  Fibre  GI
Factors to consider: Glycemic index

Different types of carbohydrates have slightly different effects on blood glucose levels in relation with:

- Processing
- Type of cooking
- Presence of fiber
- Mixed meals with fat and protein
High GI e.g. white bread

Low GI e.g. legumes

Blood glucose level

Time

The glycaemic index
Fat and protein???

- Till now the prandial insulin was calculated essentially based on the carbohydrate intake.

- However the other macronutrients (protein, fat) influence postprandial glycaemia and even later, so they should, in some cases, be included to determine and allocate the prandial insulin.

- Fat and Protein Units

Effect of macronutrients on blood glucose levels

- *In patients with long-term T1D, meal-related insulin dosing based on carbohydrate plus fat/protein counting reduces the postprandial glucose levels*
Factors to consider: Fat

- Delays the time that the stomach empties
- Delays the increase of blood sugar
- High in calories
CONCLUSION

- This evidence that dietary fat increases glucose levels and insulin requirements highlights the limitations of the current carbohydrate-based approach to bolus dose calculation. These findings point to the need for alternative insulin dosing algorithms for higher-fat meals and suggest that dietary fat intake is an important nutritional consideration for glycemic control in individuals with type 1 diabetes.
Factors to consider: Fat

**Dietary Fat Acutely Increases Glucose Concentrations and Insulin Requirements in Patients With Type 1 Diabetes**

Implications for carbohydrate-based bolus dose calculation and intensive diabetes management

---

**CONCLUSIONS**—This evidence that dietary fat increases glucose levels and insulin requirements highlights the limitations of the current carbohydrate-based approach to bolus dose calculation. These findings point to the need for alternative insulin dosing algorithms for higher-fat meals and suggest that dietary fat intake is an important nutritional consideration for glycemic control in individuals with type 1 diabetes.

_Diabetes Care_ 36:810–816, 2013
Factors to consider: Protein

- Slight impact on blood glucose levels
- Typically in combination with fat
- Inclusion in insulin units (?)
Factors to consider: Protein

The Impact of a Pure Protein Load on the Glucose Levels in Type 1 Diabetes Patients Treated with Insulin Pumps

In conclusion, the ingestion of a pure protein load does not seem to have a clinically significant impact on glucose levels in adult T1DM patients treated with insulin pumps. Thus, small protein-based snacks do not require prandial insulin bolusing.

Impact of Fat, Protein, and Glycemic Index on Postprandial Glucose Control in Type 1 Diabetes: Implications for Intensive Diabetes Management in the Continuous Glucose Monitoring E...

- For high fat meals (≥ 40 g of fat), as a starting point consider increasing total insulin dose by 30-35% increment using combo bolus with 50/50% split over 2-2.5 h.
- Review late postprandial glucose: adjust total insulin dose as indicated.
- Review early postprandial glucose: adjust split as indicated (if increased early postprandial → more insulin upfront).
- If on injection therapy: consider additional insulin 1 hour after the meal equivalent to 30-35% of pre-prandial dose or, alternatively, consider pre-prandial injection of regular or lispro insulin.

- For protein-only meals containing less than 75 g of protein, insulin may not need to be adjusted.
- For meals containing at least 30 g of CHO and at least 40 g of protein, consider increasing total insulin dose by 15-20%.

- High GI foods require more insulin upfront, less in late postprandial period to avoid hypoglycemia.
  - Consider dosing > 20 min prior to meal or ‘super bolus’ (additional insulin upfront with reduction of basal in late postprandial period).
  - Consider use of Afrezza®.
**Food Insulin Index (FII)**

- Relative measure of the normal insulin demand of a food.
- Insulin response measured in healthy adults.
- Foods measured in 1000kJ portions.
- Relative to a reference food.

\[ FII = \frac{120\text{min } \text{AUC}_{\text{insulin}} \text{ for } 1000\text{kJ of test food}}{120\text{min } \text{AUC}_{\text{insulin}} \text{ for } 1000\text{kJ of ref. food}} \times 100 \]

Food Examples
1000kJ (240kcal) Portions

- Grain Bread
  Carbohydrate: 40g
  Fib: 41

- White Bread
  Carbohydrate: 44g
  Fib: 73

- Boiled Potato
  Carbohydrate: 49g
  Fib: 88

- Low Fat Yoghurt
  Carbohydrate: 38g
  Fib: 84

- Apple
  Carbohydrate: 58g
  Fib: 43

- Mars Bar
  Carbohydrate: 38g
  Fib: 89
Food Examples
1000kJ (240kcal) Portions

Beef Steak
Carbohydrate: 0g
Fat: 37

Poached Eggs
Carbohydrate: 1g
Fat: 23

Chicken
Carbohydrate: 0g
Fat: 19

Food Insulin Demand

\[ FID = \frac{Energy \ (kJ) \times Food \ Insulin \ Index \ (FII)}{1,000} \]

e.g. 200g low-fat strawberry yoghurt (FII = 84)

\[ FID = \frac{770kJ \times 84}{1,000} \]

\[ FID = 65 \]
Insulin Pumps
How does the insulin get into your body?

Insulin in the blood

Flexible tubing delivers insulin from the pump reservoir to the infusion set

Insulin pump

A tiny tube called a cannula is inserted under your skin to deliver insulin
Why insulin pump is better than injections?

MDI with long-acting insulin
120 injections per month*

Insulin Pump Therapy
12 infusion set changes per month*

CSII vs. MDI: 1 Mean HbA1c reduction 3

- 0.62%
Basic rate and physiological insulin needs

Insulin delivery [I.U./h]

Insulin Level / Physiological Needs in basic Insulin

Basic rate and level of insulin using standard insulin
## Basic Rate Programs

<table>
<thead>
<tr>
<th>Units/hr</th>
<th>Hours</th>
<th>Units/hr</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>00:00-04:00</td>
<td>0.8</td>
<td>00:00-04:00</td>
</tr>
<tr>
<td>1.0</td>
<td>04:00-08:00</td>
<td>1</td>
<td>04:00-08:00</td>
</tr>
<tr>
<td>0.8</td>
<td>08:00-20:00</td>
<td>1.1</td>
<td>08:00-12:00</td>
</tr>
<tr>
<td>0.6</td>
<td>20:00-00:00</td>
<td>1.2</td>
<td>12:00-16:00</td>
</tr>
<tr>
<td>18.4</td>
<td>Total in 24 Hrs</td>
<td>1.3</td>
<td>16:00-00:00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26.8</td>
<td>Total in 24 Hrs</td>
</tr>
</tbody>
</table>
Basal Dose Adjustment Overnight

- Rule of 30:
  - Check BG
    - Bedtime
    - 12 AM
    - 3 AM
    - 6 AM
  - Adjust overnight basal if readings vary >30 mg/dL
Basal Dose Adjustment Daytime

- Rule of 30:
  - Check BG
    - Before usual mealtime
    - Skip meal
    - Every 2 hrs (for 6 hrs)
  - Adjust daytime basal if readings vary >30 mg/dL
Calculating dose fast / ultra fast acting insulin

1. Blood sugar before meal
2. How many carbohydrates in a every meal (and protein, fat, fiber)
3. Physical activity after or before meals
4. Active list from previous insulin dose
5. Titrated glucose doses based on postprandial glucose 2 hours after
6. Insulin resistance (imponderable factor)
Use of fast / ultra fast action of insulins

- Blood sugar correction before meal
- 1 IU of fast-acting insulin reduces the blood glucose levels by ~ 30-50 mg / dl
Use of fast / ultra fast action of insulin

1. Blood sugar before meal

2. How many carbohydrate containing meal (and protein, fat, fiber)
IT IS NECESSARY FOR DIABETIC TO HAVE AN ASSISTANCE FROM DIETITIAN

FOR THE MEASUREMENT OF CARBOHYDRATE EXCHANGES (OR GRAMS OF CHO) AND MEAL PLANNING/MODIFICATIONS DURING-BEFORE EXERCISE
The use of Bolus Wizard

How it works without...

And With the Bolus Wizard...

Carb counting...

...Bolus-Estimate!
Three Integrated Components

When the Wizard Estimates

1. Meal Bolus
   ✓ Carbohydrates
   ✓ ICR

   **Example:**
   
   60 grams [60] ICR 1:10
   
   \[ \frac{60}{10} = 6 \text{ units} \]

2. Correction Bolus
   ✓ Current BG
   ✓ Target BG
   ✓ Sensitivity Factor
   ✓ Active Insulin

   **Example:**
   
   BG : 200 mg/dL
   Target: 100
   SF: 50

   \[ \frac{200 - 100}{50} = 2 \text{ units} \]

   Act Ins: 3 u active __unit

3. Estimated Bolus

   Est Bolus: 6 units
Understanding the Paradigm

Bolus Wizard Tracking System

1. **Meal Bolus**
   - Carbohydrates
   - ICR

2. **Correction Bolus**
   - Current BG
   - Sensitivity Factor
   - Target BG
   - Active Insulin

3. **Estimated Bolus**

---

**Active Insulin 2 hrs. post-meal**

**Example:**

- 0 grams
- ICR 1:10

\[
\frac{0}{10} = 0.0 \text{ u}
\]

**Example:**

- BG: 300 mg/dL
- SF: 50
- Target: 100

\[
\frac{300 - 100}{50} = +4.0 \text{ u}
\]

- Act Ins: 3.9 u

- Est Bolus: 0.1 u
Understanding the Paradigm

Bolus Wizard Tracking System

1. **Meal Bolus**
   - Carbohydrates
   - ICR

2. **Correction Bolus**
   - Current BG
   - Sensitivity Factor
   - Target
   - Active Insulin

3. **Estimated Bolus**

**Pre-meal when BG is < target BG**

**Example:**

- Carbohydrates: 60 grams ICR 1:10
  - \[
  \frac{60}{10} = 6.0 \text{ u}
  \]

**Example:**

- Current BG: 80 mg/dL
  - SF: 50
  - Target: 100
  - Act Ins: 1.0 u
    - \[
    \frac{80 - 100}{50} = - 0.4 \text{ u}
    \]

**Est Bolus:** 5.6 u

- Only considers active insulin in response to elevated BG
We have to educate diabetics on which type of bolus to use.
Newest technology = Insulin pump with incorporated CGM

Insulin Pump Technology
(Smart insulin pump with Bolus Wizard®)

REAL-Time Continuous Glucose Monitoring Technology

REAL-Time System
Continuous Glucose Monitoring (CGM)
Continuous glucose monitoring (CGM) technology has the potential to revolutionize diabetes care in the near future because of the real-time feedback it provides about therapeutic interventions and variations in lifestyle or dietary intake.

*Diabetes Spectrum Volume 21, Number 2, 2008*
Does A1C is always representative?

- A1C does not track glycaemic excursions
- 60% of glucose lows may not be revealed with SMBG alone*
- CGM identifies four times more serious glucose excursions than SMBG**

*From: A1C: Definition and significance in the management of patients with Type 1 and Type 2 diabetes. Diabetes Care, 26(12), 2954-2962
The monitoring gives the full picture

It reveals hypoglycemia, hyperglycemia and correlations that could not be perceived only with the finger measurements and examining A1C. There are a growing number of clinical studies that have proved that the Continuous Glucose Monitoring (CGM) as compared to measurements on the finger may be associated with a reduction in A1C without increasing the risk of hypoglycemia.\textsuperscript{1,2,3}
Figure 4—Inappropriate reduction in basal rates in response to hypoglycemia leads to rebound hyperglycemia. BG, blood glucose; RF, rapid
Sensor Daily Overlay by Meal report

Fine-Tuning Meal/Correction Boluses

- 34-y.o. pump user

Breakfast and lunch doses *may* be too low
Dinner dose appears OK
Night-snack dose clearly insufficient
The modern treatment of diabetes requires a complete understanding of glycemic control and the role of diet is crucial for a better glucose control.
Mobiles, apps on diabetic diet
Patients are expected to make immediate therapy adjustments based upon real-time continuous glucose readings displayed every 5 minutes and by viewing a graph with 3-hour and 24-hour glucose trends.*

Thank you for your attention