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CLINICAL IMPORTANCE OF PROPHYLACTIC IN TYPE 2 DIABETES MELLITUS PATIENTS

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INTRODUCTION

According to the International Diabetes Federation (IDF), there are over 350 million people with diabetes in the world. In the overall structure of mortality among non-infectious diseases, diabetes is 3.5%, ranking 5th place. The constant intake of adequate therapy and effective prevention methods, combined with the achievement of compliance between the doctor and the patient, increase the patient's life expectancy for 15-20 years. At the same time, the patient's quality of life is improved.

EPIDEMIOLOGY

- Approximately **463 million adults** (20-79 years) were living with diabetes; by 2045 this will rise to **700 million**
- The proportion of **people with type 2 diabetes is increasing** in most countries
- **79%** of adults with diabetes were **living in low- and middle-income countries**
- **1 in 5** of the people who are above 65 years old have diabetes
- **1 in 2 (232 million)** people with diabetes were undiagnosed
- Diabetes caused **4.2 million deaths**
- More than **20 million live births** (1 in 6 live births) are affected by diabetes during pregnancy
- **374 million** people are at increased risk of developing type 2 diabetes

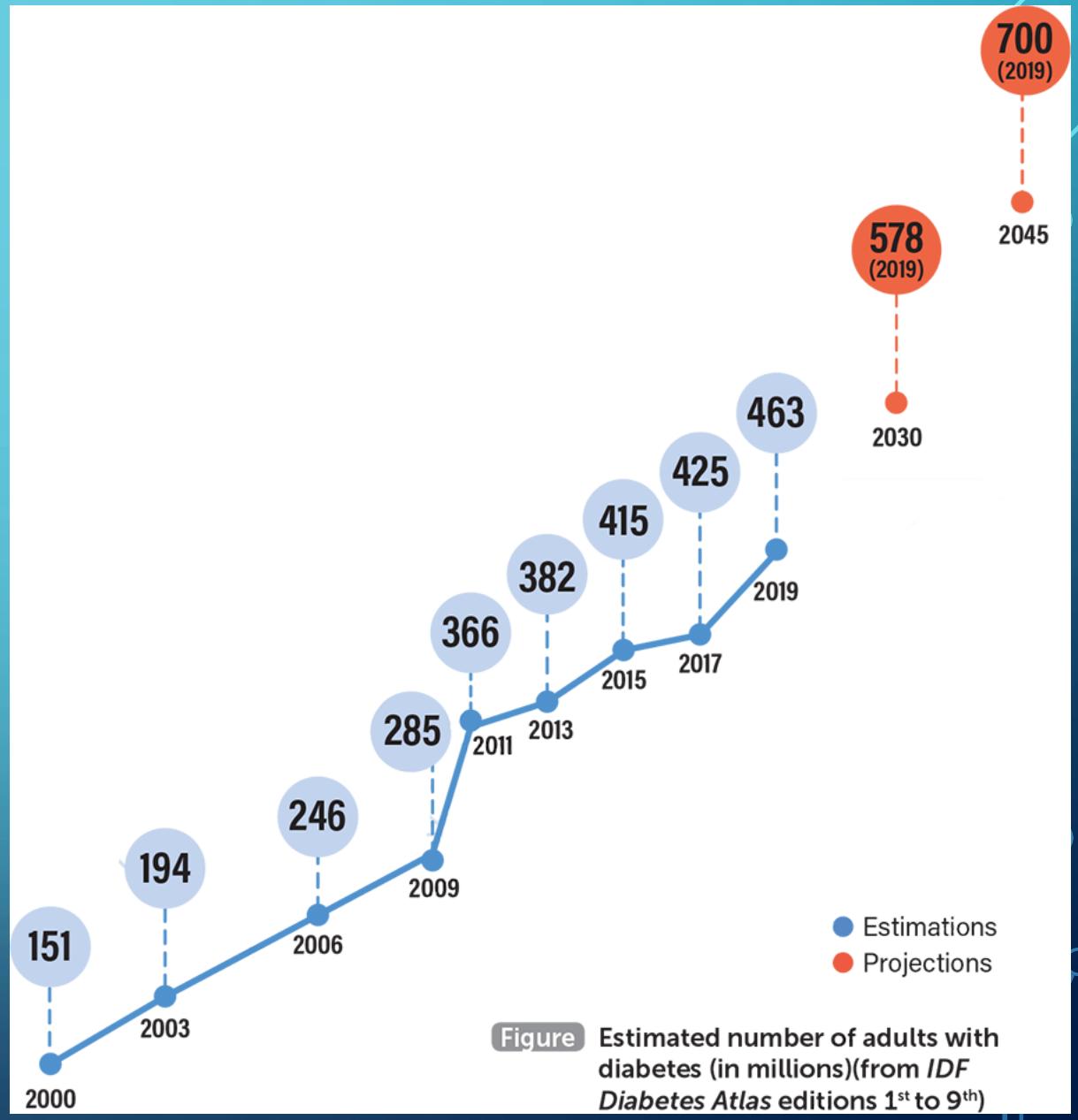
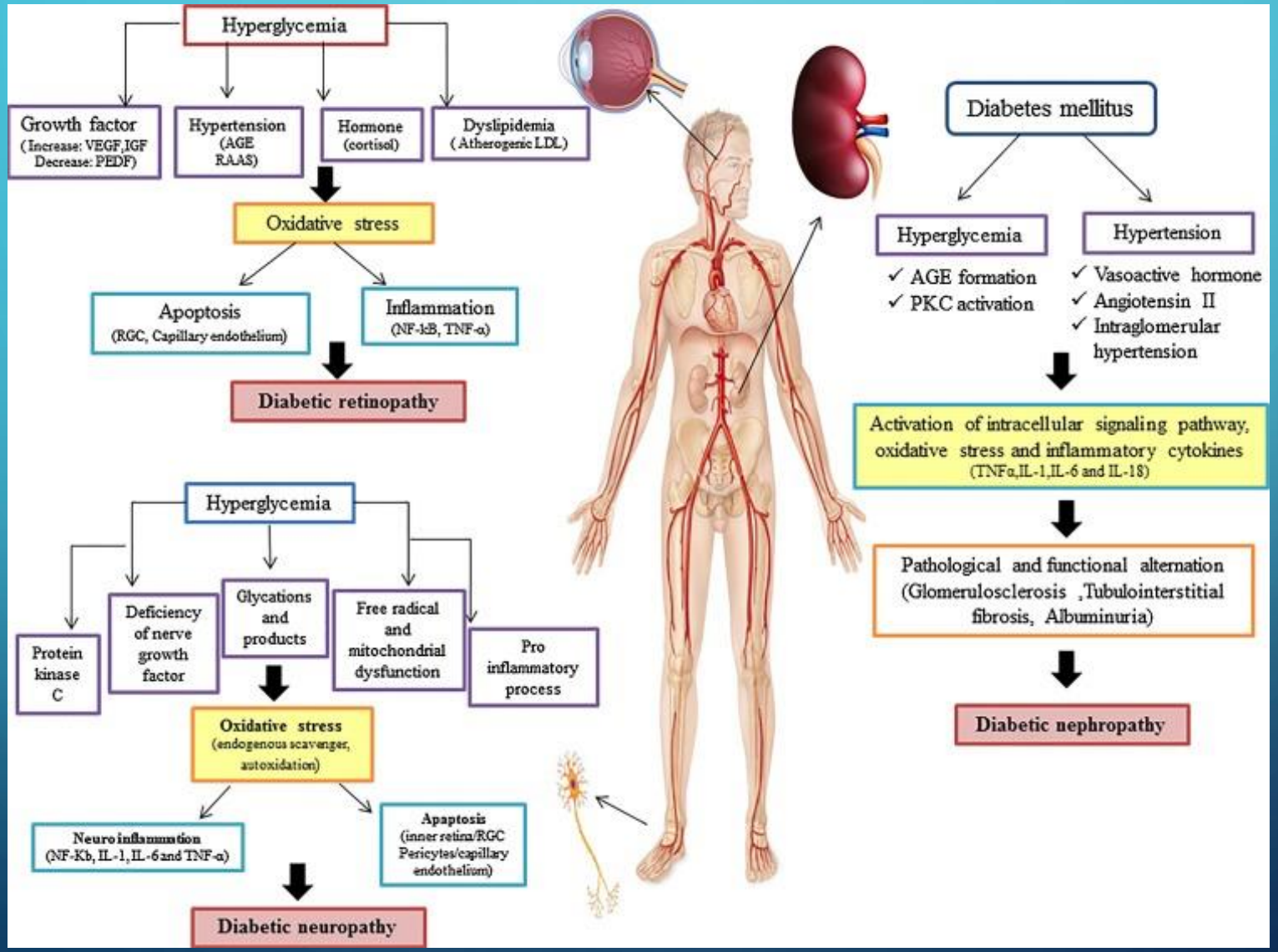


Figure Estimated number of adults with diabetes (in millions)(from *IDF Diabetes Atlas* editions 1st to 9th)

https://idf.org/

MECHANISM OF COMPLICATIONS



https://pdb101.rcsb.org/global-health/diabetes-mellitus/monitoring/complications

Most patients with T2DM have at least one complication, and cardiovascular complications are the leading cause of morbidity and mortality in these patients

https://idf.org/

CHALLENGE

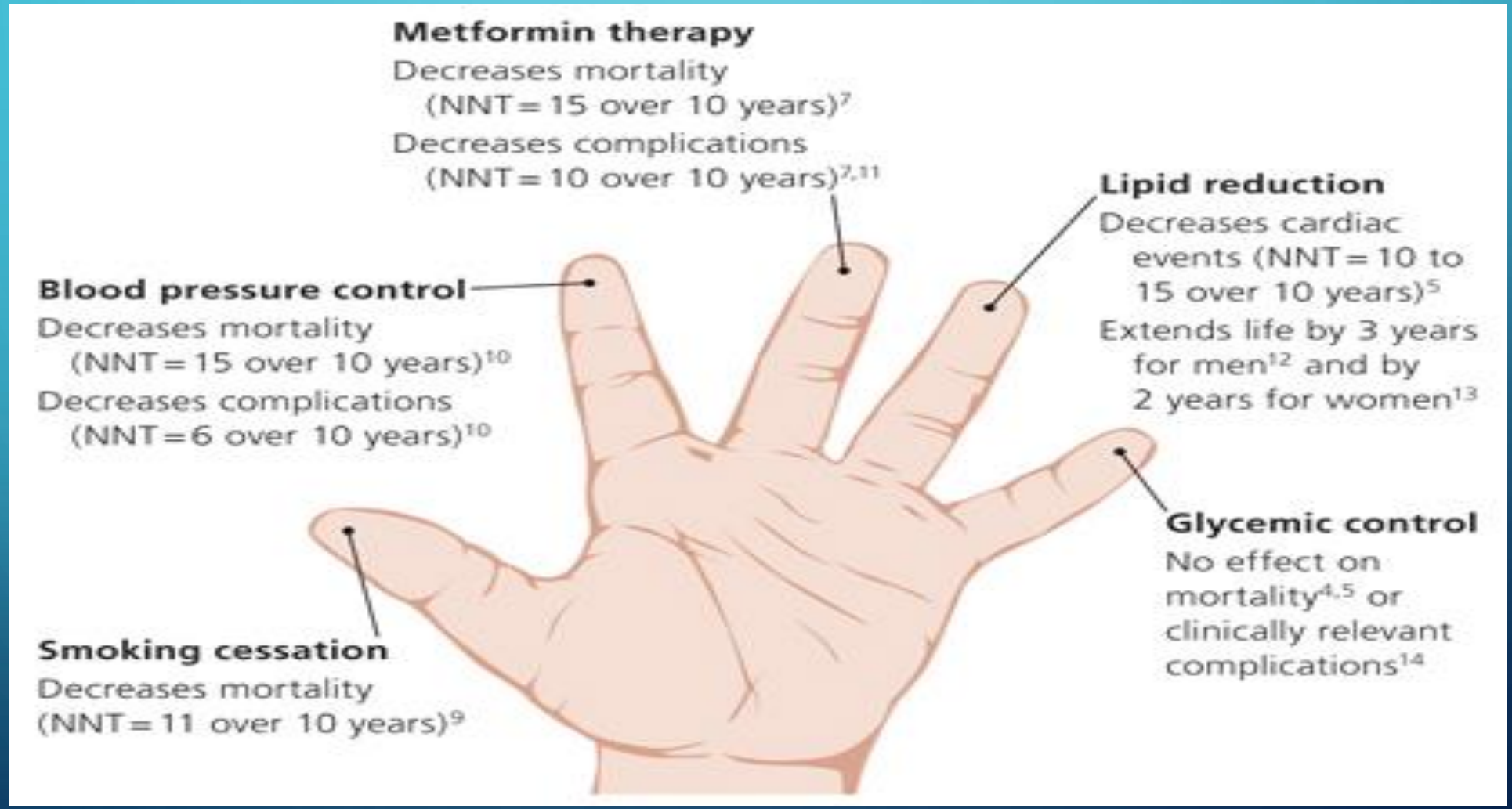
Diabetes is a challenging disease to be managed successfully. Although the care regimen is complex, patients with self-care behaviors can attain excellent glycemic control. However, most of the patients do not achieve good glycemic control and they continue to suffer health problems as a result. Health care providers know that if only their patients adhere to their treatment recommendations, they could do well and avoid diabetes-related complications. The fact that many patients do not, can be very frustrating.

Criteria of DM compensation

Indexes	Level of compensation		
	good	sufficient	insufficient
Fasting glycaemia (mmol/l)	4,4 - 6,7	< 7,8	> 7,8
2 hours after meals	4,4 – 8,0	< 10,0	> 10,0
Glucosurea (%)	0	0,5	> 0,5
Hb Alc (%)	< 6,5	6,5 – 8	> 8
Cholesterol (mmol/l)	< 5,0	5,0 – 6,5	> 6,5
Triglycerides (mmol/l)	< 1,7	1,7 – 2,2	> 2,2
HDL (mmol/l)	> 1,1	0,9 – 1,1	< 0,9
Body mass index (kg/m^2)	males < 25 females < 24	< 27 < 26	> 27 > 26
Blood pressure	< 135/85	< 160/95	> 160/95

chgate.net/figure/World-Health-Organization-diagnostic-criteria-for-DM-or-pre-diabetes-DM-Pre-diabetes_tbl4_258289139

WHAT CAN WE DO?



https://www.aafp.org/afp/2014/0215/p256.html

PREVENTION

https://www.nei.nih.gov/sites/default/files/nehep-pdfs/NDM_SM_Toolkit_2015.pdf

IMPORTANCE OF THE REGIME

Regimen adherence problems are common in individuals with diabetes, making glycemic control difficult to attain. As the risk of complications of diabetes can be reduced by proper adherence, patient nonadherent to treatment recommendations is often frustrating for health care professionals.

http://adultmeducation.com/OverviewofMedicationAdherence_5.html

COMPLIANCE AND ADHERENCE

- Compliance has been defined as “the extent to which a person's behavior coincides with medical advice”
- Adherence has been defined as the “active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result.”

FACTORS RELATED TO ADHERENCE

To improve patient adherence, it is important to understand why nonadherence occurs. A substantial literature has documented several factors related to diabetes regimen adherence problems. It is helpful to consider demographic, psychological, and social factors, as well as health care provider, medical system, and disease- and treatment-related factors.

- 1. **Demographic factors**
- 2. **Psychological factors**
- 3. **Social factors**
- 4. **Health care provider and medical system factors**
- 5. **Disease- and treatment-related factors**

THE AIM OF STUDY

To develop methods for effective prevention of Type 2 diabetes mellitus (T2DM) complications and methods of doctor- patient compliance achieving on the example of a clinical case.

PATIENT B

- Man
- 58 y.o.
- Businessman, ex military officer
- Citizen of Kharkiv
- Married
- 1 adult son

COMPLAINS

- Thirst
- dry mouth
- Weakness
- unstable arterial blood pressure (AP)
- lower extremity cramps
- toe numbness and edema

ANAMNESIS

- Hypertension II degree was diagnosed 4 years ago.
- T2DM was diagnosed 2 weeks ago with glycemia= 14,42 (N=3.3 -5.5 mmol/l)in process of medical checkup
- Diabetic complains was present earlier
- Arterial
- Patient declined prescribed test, diet therapy and doctors' recommendations because of personal unknown reasons.

Patient was hospitalized in the State Institution "V. Danilevsky Institute for Endocrine Pathology Problems of the NAMS of Ukraine"; for extra investigations and choosing treatment tactics.

OBJECTIVE EXAMINATION

- Consciousness - clear,
- state – moderate severe,
- body position – active
- Patient can orient himself in place, time, his personality
- Weight -94 kg, height- 184 cm, BMI- 28
- Pale skin and mucosae
- BR (breathing rate) – 18 /min
- Lung percussion: no clinically-significant changes
- Lung auscultation: Vesicular breathing weakened in the lower parts

OBJECTIVE EXAMINATION

- Heart borders: right - right edge of the sternum; left - 1.5 cm left of middle clavicle line; upper - in 3 rd intercostal space
- Heart auscultation: rhythmic, heart tones –muffled,
- Pulse –rhythmic, 85 bpm;
- Blood pressure (BP) 140/80 mm Hg
- Abdomen - enlarged, symmetric, unpainful;
- Edemas - moderate
- Liver: + 1,5-2 cm, no pain during palpation of right hypochondrium;
- Spleen: normal
- Pasternatsky symptom – negative from both sides

LABORATORY DATA

CBC		N=
Hemoglobin, g/l	120	130-160
Red blood cells, 10^{12}	4,0	4,0-5,0
CI	0,86	0,86-1,05
White blood cells, 10^{9}	5,8	4,0-9,0
ESR, mm/h	15	1-10
Neutrophils		
Bands %	3	1-6
Segments %	60	47-72
Eosinophils%	7	0,5-5
Lymphocytes %	26	19-37
Monocytes %	4	3-11

*ESR increased

LABORATORY DATA

- Glucose profile : 8.4-8.5-6.3-5.4-7.8-6.0 mmol/L (N=3.8-6.2mmol/L).
- Glycolyzed hemoglobin (HBA1C)- 10,9% (N=4,6-6,0)
- Kidney function test

urea	**9,3 μmol/l**	**N= 2,5 -8,33 μmol/l**
creatinine	146 μmol/l	N= 44-88
Glomerular filtration	44 ml/min	N = 60-150

*raised urea and creatinine in the blood.

CKD-EPI= 45 ml/min/1,73m ^{2}

- Clinical urine test: protein – 0,15 g/l, sugar – 20 mmol/l

*proteinuria, glucosuria.

LABORATORY DATA

Total cholesterol (mmol/l)	**5,53**	**N<4,5**
high-density lipoprotein (HDL) (mmol/l)	1,04	N>1,2
atherogenicity index (AI)	4,32	N<3
Triglycerides (mmol/l)	1,94	N<1,7
low-density lipoprotein (LDL) (mmol/l)	3,62	N<2,5
Very low density lipoproteins (VLDL) (mmol/l)	0,87	N<0,76

*combined hyperlipidemia.

INSTRUMENTAL DATA

- Rheovasography: tonus of medium and large vessels is bit increased
- Thyroid gland ultrasound: no pathological changes detected
- Abdominal ultrasound: nonalcoholic fatty liver disease.
- Kidney ultrasound: no pathological changes detected
- ECG: sings of hypertrophy of LV, horizontal electric axis
- Echocardiography: left ventricular (LV) hypertrophy
- Chest X-ray: no pathological changes

CONSULTATIONS

NEUROLOGIST: DIABETIC POLYNEUROPATHY OF THE LOWER EXTREMITIES

https://www.medpagetoday.com/neurology/generalneurology/90437

DIAGNOSIS

Main: Moderate type 2 diabetes mellitus, sub compensated state. Arterial hypertension II degree - very high risk.

Complications: Diabetic polyneuropathy of the lower extremities.

Concomitant diseases: Dyslipidemia.

TREATMENT

- diet therapy,
- physical exercises,
- hydrochlorothiazide -12,5 mg/day
- metformin 1000 mg,
- nebivolol 5 mg,
- valsartan 80 mg,
- thioctic acid 600 mg/day
- rosuvastatin 10 mg.

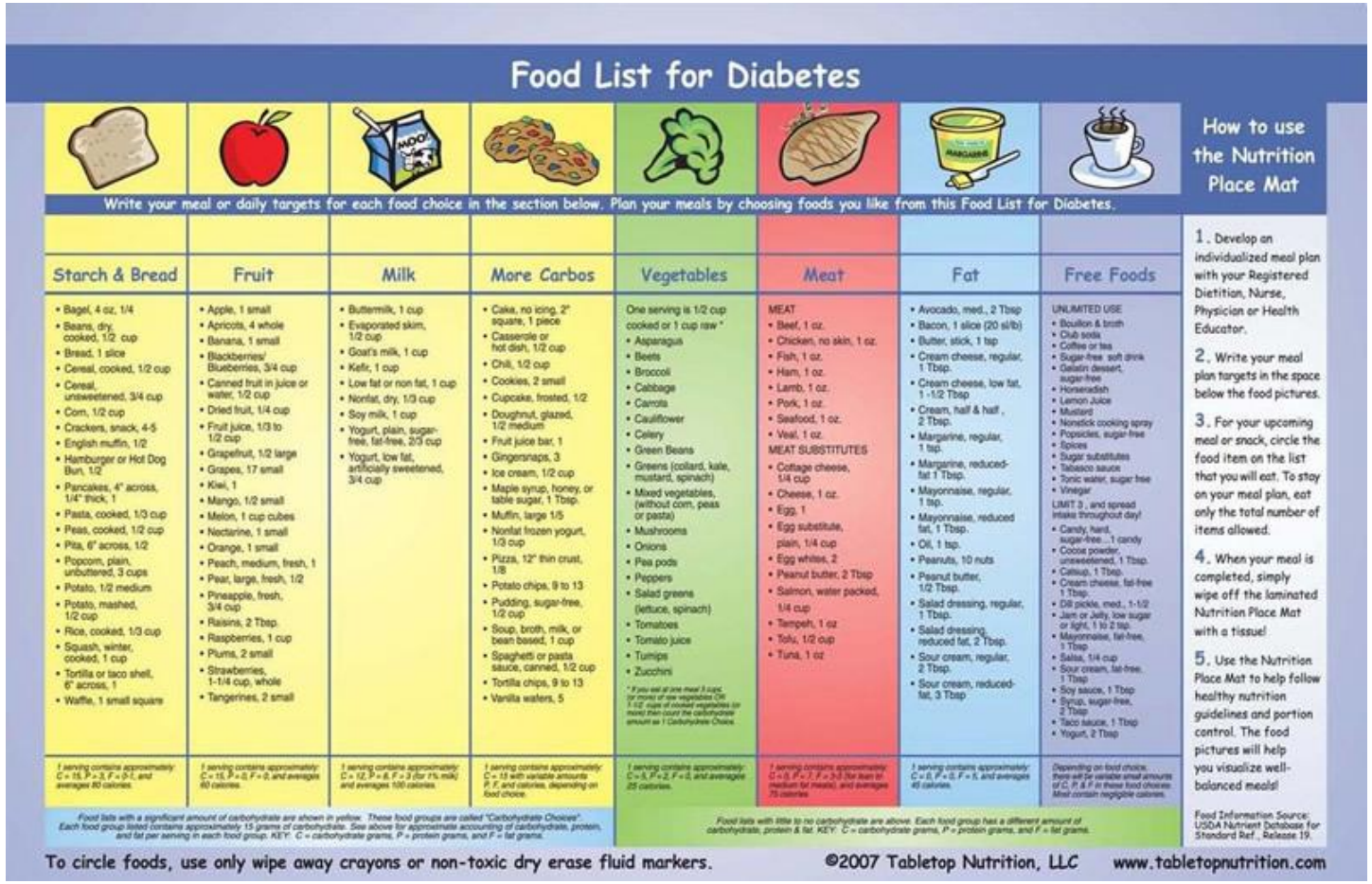
RESULTS

The patient was discharged due to improvements. AP was stabilized while diabetic complains decreased. No glucosuria and proteinuria detected after treatment.

However, toe numbness persisted.

RECOMMENDATIONS

- Diet therapy



Food List for Diabetes

Write your meal or daily targets for each food choice in the section below. Plan your meals by choosing foods you like from this Food List for Diabetes.

Starch & Bread

- Bagel, 4 oz, 1/4
- Beans, dry, cooked, 1/2 cup
- Bread, 1 slice
- Cereal, cooked, 1/2 cup
- Cereal, unsweetened, 3/4 cup
- Corn, 1/2 cup
- Crackers, snack, 4-5
- English muffin, 1/2
- Hamburger or Hot Dog Bun, 1/2
- Pancakes, 4" across, 1/4" thick, 1
- Pasta, cooked, 1/3 cup
- Peas, cooked, 1/2 cup
- Pita, 6" across, 1/2
- Popcorn, plain, unbuttered, 3 cups
- Potato, 1/2 medium
- Potato, mashed, 1/2 cup
- Rice, cooked, 1/3 cup
- Squash, winter, cooked, 1 cup
- Tortilla or taco shell, 6" across, 1
- Waffle, 1 small square

1 serving contains approximately: C = 15, P = 3, F = 0-1, and averages 80 calories.

Fruit

- Apple, 1 small
- Apricots, 4 whole
- Banana, 1 small
- Blackberries/ Blueberries, 3/4 cup
- Canned fruit in juice or water, 1/2 cup
- Dried fruit, 1/4 cup
- Fruit juice, 1/3 to 1/2 cup
- Grapefruit, 1/2 large
- Grapes, 17 small
- Kiwi, 1
- Mango, 1/2 small
- Melon, 1 cup cubes
- Nectarine, 1 small
- Orange, 1 small
- Peach, medium, fresh, 1
- Pear, large, fresh, 1/2
- Pineapple, fresh, 3/4 cup
- Raisins, 2 Tbsp.
- Raspberries, 1 cup
- Plums, 2 small
- Strawberries, 1-1/4 cup, whole
- Tangerines, 2 small

1 serving contains approximately: C = 15, P = 0, F = 0, and averages 60 calories.

Milk

- Buttermilk, 1 cup
- Evaporated skim, 1/2 cup
- Goat's milk, 1 cup
- Kefir, 1 cup
- Low fat or non fat, 1 cup
- Nonfat, dry, 1/3 cup
- Soy milk, 1 cup
- Yogurt, plain, sugar-free, fat-free, 2/3 cup
- Yogurt, low fat, artificially sweetened, 3/4 cup

1 serving contains approximately: C = 12, P = 8, F = 3 (for 1% milk) and averages 100 calories.

More Carbos

- Cake, no icing, 2" square, 1 piece
- Casserole or hot dish, 1/2 cup
- Chili, 1/2 cup
- Cookies, 2 small
- Cupcake, frosted, 1/2
- Doughnut, glazed, 1/2 medium
- Fruit juice bar, 1
- Gingersnaps, 3
- Ice cream, 1/2 cup
- Maple syrup, honey, or table sugar, 1 Tbsp.
- Muffin, large 1/5
- Nonfat frozen yogurt, 1/3 cup
- Pizza, 12" thin crust, 1/8
- Potato chips, 9 to 13
- Pudding, sugar-free, 1/2 cup
- Soup, broth, milk, or bean based, 1 cup
- Spaghetti or pasta sauce, canned, 1/2 cup
- Tortilla chips, 9 to 13
- Vanilla wafers, 5

1 serving contains approximately: C = 15 with variable amounts P, F, and calories, depending on food choice.

Food lists with a significant amount of carbohydrate are shown in yellow. These food groups are called "Carbohydrate Choices". Each food group listed contains approximately 15 grams of carbohydrate. See above for approximate accounting of carbohydrate, protein, and fat per serving in each food group. KEY: C = carbohydrate grams, P = protein grams, and F = fat grams.

Vegetables

One serving is 1/2 cup cooked or 1 cup raw *

- Asparagus
- Beets
- Broccoli
- Cabbage
- Carrots
- Cauliflower
- Celery
- Green Beans
- Greens (collard, kale, mustard, spinach)
- Mixed vegetables, (without corn, peas or pasta)
- Mushrooms
- Onions
- Pea pods
- Peppers
- Salad greens (lettuce, spinach)
- Tomatoes
- Tomato juice
- Turnips
- Zucchini

** If you eat at one meal 3 cups (or more) of raw vegetables OR 1-1/2 cups of cooked vegetables (or more) then count the carbohydrate amount as 1 Carbohydrate Choice.*

1 serving contains approximately: C = 5, P = 2, F = 0, and averages 25 calories.

Meat

MEAT

- Beef, 1 oz.
- Chicken, no skin, 1 oz.
- Fish, 1 oz.
- Ham, 1 oz.
- Lamb, 1 oz.
- Pork, 1 oz.
- Seafood, 1 oz.
- Veal, 1 oz.

MEAT SUBSTITUTES

- Cottage cheese, 1/4 cup
- Cheese, 1 oz.
- Egg, 1
- Egg substitute, plain, 1/4 cup
- Egg whites, 2
- Peanut butter, 2 Tbsp
- Salmon, water packed, 1/4 cup
- Tempeh, 1 oz
- Tofu, 1/2 cup
- Tuna, 1 oz

1 serving contains approximately: C = 0, P = 7, F = 3-5 (for lean to medium fat meats), and averages 75 calories.

Fat

- Avocado, med., 2 Tbsp
- Bacon, 1 slice (20 sl/lb)
- Butter, stick, 1 tsp
- Cream cheese, regular, 1 Tbsp.
- Cream cheese, low fat, 1 -1/2 Tbsp
- Cream, half & half , 2 Tbsp.
- Margarine, regular, 1 tsp.
- Margarine, reduced-fat 1 Tbsp.
- Mayonnaise, regular, 1 tsp.
- Mayonnaise, reduced fat, 1 Tbsp.
- Oil, 1 tsp.
- Peanuts, 10 nuts
- Peanut butter, 1/2 Tbsp.
- Salad dressing, regular, 1 Tbsp.
- Salad dressing, reduced fat, 2 Tbsp.
- Sour cream, regular, 2 Tbsp.
- Sour cream, reduced-fat, 3 Tbsp

1 serving contains approximately: C = 0, P = 0, F = 5, and averages 45 calories.

Free Foods

UNLIMITED USE

- Bouillon & broth
- Club soda
- Coffee or tea
- Sugar-free soft drink
- Gelatin dessert, sugar-free
- Horseradish
- Lemon Juice
- Mustard
- Nonstick cooking spray
- Popsicles, sugar-free
- Spices
- Sugar substitutes
- Tabasco sauce
- Tonic water, sugar free
- Vinegar

LIMIT 3 , and spread intake throughout day!

- Candy, hard, sugar-free ...1 candy
- Cocoa powder, unsweetened, 1 Tbsp.
- Catsup, 1 Tbsp.
- Cream cheese, fat-free 1 Tbsp.
- Dill pickle, med., 1-1/2
- Jam or Jelly, low sugar or light, 1 to 2 tsp.
- Mayonnaise, fat-free, 1 Tbsp
- Salsa, 1/4 cup
- Sour cream, fat-free, 1 Tbsp
- Soy sauce, 1 Tbsp
- Syrup, sugar-free, 2 Tbsp
- Taco sauce, 1 Tbsp
- Yogurt, 2 Tbsp

Depending on food choice, there will be variable small amounts of C, P, & F in these food choices. Most contain negligible calories.

Food lists with little to no carbohydrate are above. Each food group has a different amount of carbohydrate, protein & fat. KEY: C = carbohydrate grams, P = protein grams, and F = fat grams.

How to use the Nutrition Place Mat

1. Develop an individualized meal plan with your Registered Dietitian, Nurse, Physician or Health Educator.
2. Write your meal plan targets in the space below the food pictures.
3. For your upcoming meal or snack, circle the food item on the list that you will eat. To stay on your meal plan, eat only the total number of items allowed.
4. When your meal is completed, simply wipe off the laminated Nutrition Place Mat with a tissue!
5. Use the Nutrition Place Mat to help follow healthy nutrition guidelines and portion control. The food pictures will help you visualize well-balanced meals!

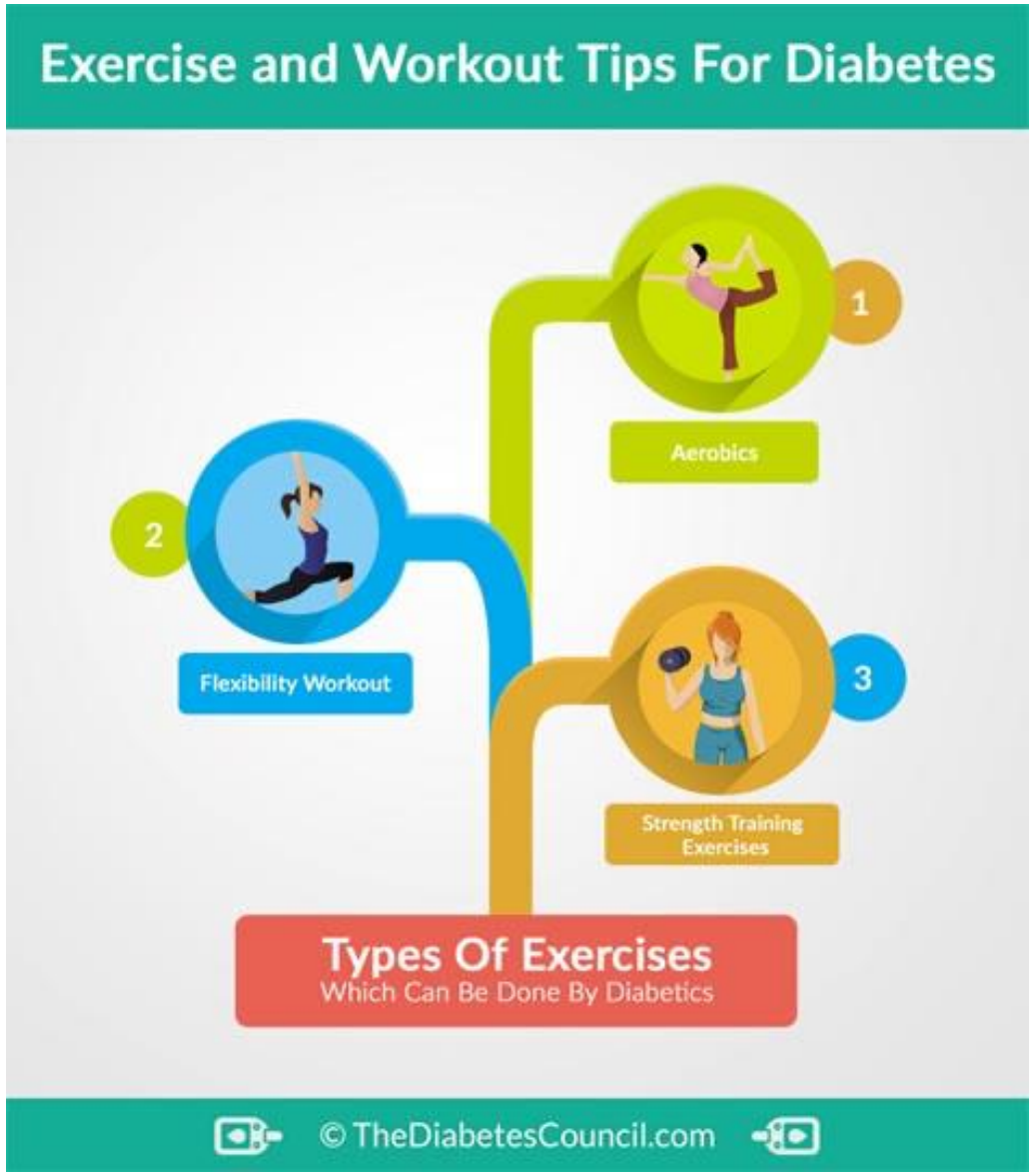
Food Information Source: USDA Nutrient Database for Standard Ref., Release 19.

To circle foods, use only wipe away crayons or non-toxic dry erase fluid markers.

www.tabletopnutrition.com

RECOMMENDATIONS

- Physical activity and behavior modification



RECOMMENDATIONS CONTINUE TAKING PRESCRIBED THERAPY

- Continious taking of prescribed therapy

https://dlife.com/diabetes-oral-medications/

RECOMMENDATIONS

- Control of glucose

RECOMMENDATIONS

- Regular doctors check-up

https://autogear.ru/article/464/778/chem-polezna-dlya-chelovecheskogo-organizma-folievaya-kislota-mgk-preparata-v-den---dostatochno-ili-net/

CONCLUSION

Achievement of target levels of glycemia, lipidemia, blood pressure numbers, prevention or maximum delay of micro- and macrovascular complications, improvement of the quality of life, prolongation of the patient's life are the main therapeutic goals for endocrinologists in management of T2DM patients. The development of individual strategy of preventing complications and self-control, advice about nutrition and exercise are our main weapons in this fight against disease.

THE END