بسمه تعالی

آقای50 ساله کارمند، با شکایت پرنوشی و پر ادراری از پایگاه بهداشت به مرکز بهداشت جامع سلامت ارجاع شده است

از دو ماه قبل علایم ایشان شروع شده است. شبها چند بار برای ادرار کردن از خواب بیدار می شوند طوری که کیفیت خوابشان تحت تاثیر قرار گرفته است.و دچارخشکی دهان هم هستند.

در بررسی تاریخچه پزشکی هم سابقه ابتلا به فشار خون و چربی خون بالا هم می دهد که تحت درمان دارویی می باشد

.آزمایش داده که قند بالا داشته و برای بار دوم آزمایش داده و به مرکز بهداشت مراجعه کرده است .

سوابق دارویی شامل مصرف قرص انالاپریل ۱۰ میلی گرم و آتوروستاتین۲۰ میلی گرم روزانه می باشد.

تاریخچه خانوادگی پدر ایشان سابقه دیابت و فشار خون داشته است.حساسیت دارویی ندارد.

الکل گهگاهی مصرف می کند.فعالیت بدنی کم تحرک می باشد و گاهی پیاده روی نامنظم دارد.پنج سال سیگار مصرف می کرده که از شش ماه قبل ترک کرده است. متاهل و دارای دو فرزند می باشد.

:در معاینه فیزیکی علایم حیاتی به شرح ذیل می باشد

BP=142/88 mmhg , HR=82 bpm , RR=16/min , T= 36.5 c

.چاقی مرکزی مشهود است.بیمار هوشیار ، کمی مضطرب به نظر می رسد

W=92 kg , L=175 cm , BMI =30.06

.شکم نرم و بدون تندرنس یا ارگانومگالی می باشد.معاینه قلب و ریه نرمال می باشد

.پوست بدون ضایعه خاصی می باشد

.حس پا نرمال است.معاینات عصبی نرمال می باشد

LAB FINDING

FBS=192 mg/dl , hb A1C = 8.6 % , 2hpp = 245 mg/dl

total cholesterol = 210 mg / dl

LDL = 130 mg/dl , HDL = 38 mg/dl , TG = 240 mg/dl , CR=1.0 mg/dl ,

eGFR=90 ml/min ,U/A= glu: positive ,TSH= 2.1 miu/l

Pharmacologic Approaches to Glycemic Treatment:

Standards of Care in Diabetes

استاد راهنما

آقای دکتر ابوالفضل زنده دل

متخصص و دانشیار گروه داخلی

ارایه دهنده

رسول اسمی

دستیار پزشکی خانواده

INTRODUCTION

-education, evaluation for micro- and macrovascular complications

-attempts to achieve near normoglycemia

-minimization of cardiovascular and other long-term risk factors

- avoidance of drugs that can exacerbate abnormalities of insulin or lipid metabolism

TREATMENT GOALS

Glycemic management

- A1C value of ≤7 percent (53.0 mmol/mol)
- Every 1 percent drop -improved outcomes over the long term

Cardiovascular risk factor management

smoking cessation; blood pressure control

reduction serum lipids ,diet, exercise, and

weight loss or maintenance,Aspirin [ASCVD]

DIABETES EDUCATION

-self-management education program

-individualized instruction on nutrition, physical activity

- optimizing metabolic control

-preventing complications

Medical nutrition therapy

-avoidance of weight gain

-consistency in day-to-day carbohydrate intake at meals and snacks

-balanced nutritional content

Weight management

Strategies include :

-lifestyle change

-pharmacologic therapy

-metabolic surgery

Body weight loss of 5 to 10 percent =

improve steatohepatitis, sleep apnea, and other comorbidities

Pharmacologic therapy

Metformin , weight loss

Glucagon-like peptide 1 (GLP-1) receptor

dual GLP-1 and glucose-dependent insulinotropic polypeptide (GIP)

Surgical therapy

most frequent sustained remissions of diabetes

Exercise

Aerobic exercise

at least 150 minutes of moderate-intensity aerobic exercise per week

Resistance training

at least twice per week

Intensive lifestyle modification

weight reduction

increasing activity levels

Psychological interventions

diabetes distress

(lifestyle modifications, medication, and blood glucose monitoring [BGM])

Pregnancy planning

potential effects of diabetes

fetal outcomes

INITIAL PHARMACOLOGIC THERAPY

When to start?

A1C at or above target level (ie, >7.5 to 8 percent)

a three-month trial of lifestyle modification

Choice of initial therapy

patient presentation

presence or absence of symptoms of hyperglycemia

comorbidities, baseline A1C level

individualized treatment goals and preferences

the glucose-lowering efficacy of individual drugs

and their adverse effect profile

tolerability, and cost

Summary of glucose-lowering interventions

Intervention	Expected decrease in A1C with monotherapy (%)	Advantages	Disadvantages
Initial therapy			
Lifestyle change to decrease weight and increase activity	1 to 2	Broad benefits	May be insufficient for most within first year due to limited adherence, inadequate weight loss, and/or weight regain
Metformin	1 to 2	Weight loss to weight neutral, low cost, low risk of hypoglycemia, generally well tolerated, well-studied in combination	GI side effects, contraindicated with impaired kidney function (eGFR < 30 mL/min/1.73 m^2)*
		with other agents	
Additional therapy¶			
Insulin (usually with a single daily injection of intermediate- or long-acting insulin initially)	1.5 to 3.5	No dose limit, rapidly effective, improved lipid profile	Hypoglycemia, may require more than 1 daily injection, requires home glucose monitoring, weight gain, analogs are expensive
Dual GLP-1 and GIP receptor agonist (once-weekly injections)	2 to 2.5	Weight loss	Requires injection, frequent GI side effects, very expensive
GLP-1 receptor agonist (oral or daily to weekly injections)	0.5 to 2	Weight loss, reduction in major adverse cardiovascular events (liraglutide, subcutaneous semaglutide, dulaglutide) in patients with established	Most agents require injection, frequent GI side effects, very expensive

		CVD and at high risk for CVD	
SGLT2 inhibitor	0.5 to 0.7	Weight loss, reduction in systolic blood pressure, reduced heart failure and cardiovascular mortality, improved kidney outcomes in patients with nephropathy	Mycotic genital infection, DKA; SGLT2 inhibitors have also been associated with urinary tract infections, bone fractures, and lower limb amputations
Sulfonylurea (shorter-acting agents preferred)	1 to 2	Rapidly effective	Hypoglycemia (especially with glyburide/glibenclamide or chlorpropamide), weight gain
Glinide	0.5 to 1.5$^{\Delta}$	Rapidly effective	Hypoglycemia, weight gain, may require 3 times daily dosing
Pioglitazone	0.5 to 1.4	Improved lipid profile, potential decrease in MI and stroke	Fluid retention, HF, weight gain, bone fractures, and bladder cancer; side effects minimized at doses of 15 to 30 mg
DPP-4 inhibitor	0.5 to 0.8	Weight neutral	Possible increased risk of HF with saxagliptin, expensive
Alpha-glucosidase inhibitor	0.5 to 0.8	Weight neutral	Frequent GI side effects limit use, 3 times daily dosing

Asymptomatic, not catabolic

polyuria, polydipsia , unintentional weight loss

Metformin

as initial therapy

begin 500 mg once daily with the evening meal

if tolerated, add a second 500 mg dose with breakfast

total dose of 2000 mg per day

glycemic efficacy, modest weight loss, tolerability, very low cost

NOT cardiovascular effects,

intolerance of metformin

-slower titration

-taking the medication with food

-switching to an extended-release formulation

patient comorbidities(ASCVD, albuminuric chronic kidney disease)

Established cardiovascular or kidney disease

GLP-1 Aلیراگلوتاید، سماگلوتاید و دولاگلوتاید)

مهارکننده های2 SGLT - empagliflozin ،canagliflozin, dapagliflozin

ASCVD

semaglutide, dulaglutide, or liraglutide

SGLT2 inhibitors

empagliflozin, dapagliflozin, canagliflozin

HF and/or DKD

Albuminuria (urine albumin excretion >200 mg/day)

eGFR <60 but ≥20 mL/min/1.73 m^2

SGLT2 inhibitor - reduce progression of DKD

empagliflozin 10 mg, canagliflozin 100 mg, dapagliflozin 10 mg

eGFR <30 to 45 mL/min/1.73 m2 - not recommended

SGLT2 inhibitors

less glycemic efficacy with eGFR <45 mL/min/1.73 m2

frequent bacterial urinary tract infections

low bone density and high risk for falls and fractures

foot ulceration , diabetic ketoacidosis

held for 3 to 4 days before procedures (colonoscopy)

CKD stage 4 (eg, eGFR <30 mL/min/1.73 m^2)

linagliptin, cautious use of a GLP-1 receptor agonist, insulin, repaglinide, or a short-acting low-dose sulfonylurea (eg, glipizide)

Linagliptin - not require a dose adjustment

GLP-1 receptor agonists

worsening of albuminuria - not related to eGFR

Without established cardiovascular or kidney disease

A1C >9 percent (>74.9 mmol/mol)

insulin or a GLP-1-based therapy

A1C < 9%

SULFONYLUREAS , SGLT 2 I ,DPP4 I , repaglinide, or pioglitazone

Weight management

GLP-1-based therapies or SGLT2 inhibitors

Cost concerns

Short or intermediate acting sulfonylurea, such as glipizide or glimepiride

Symptomatic (catabolic) or severe hyperglycemia

Insulin

fasting plasma glucose >250 mg/dL

random glucose consistently >300 mg/dL

A1C >10

Ketonuria and/or weight loss present

Insulin

No ketonuria or weight loss

insulin or injectable GLP-1 receptor agonists

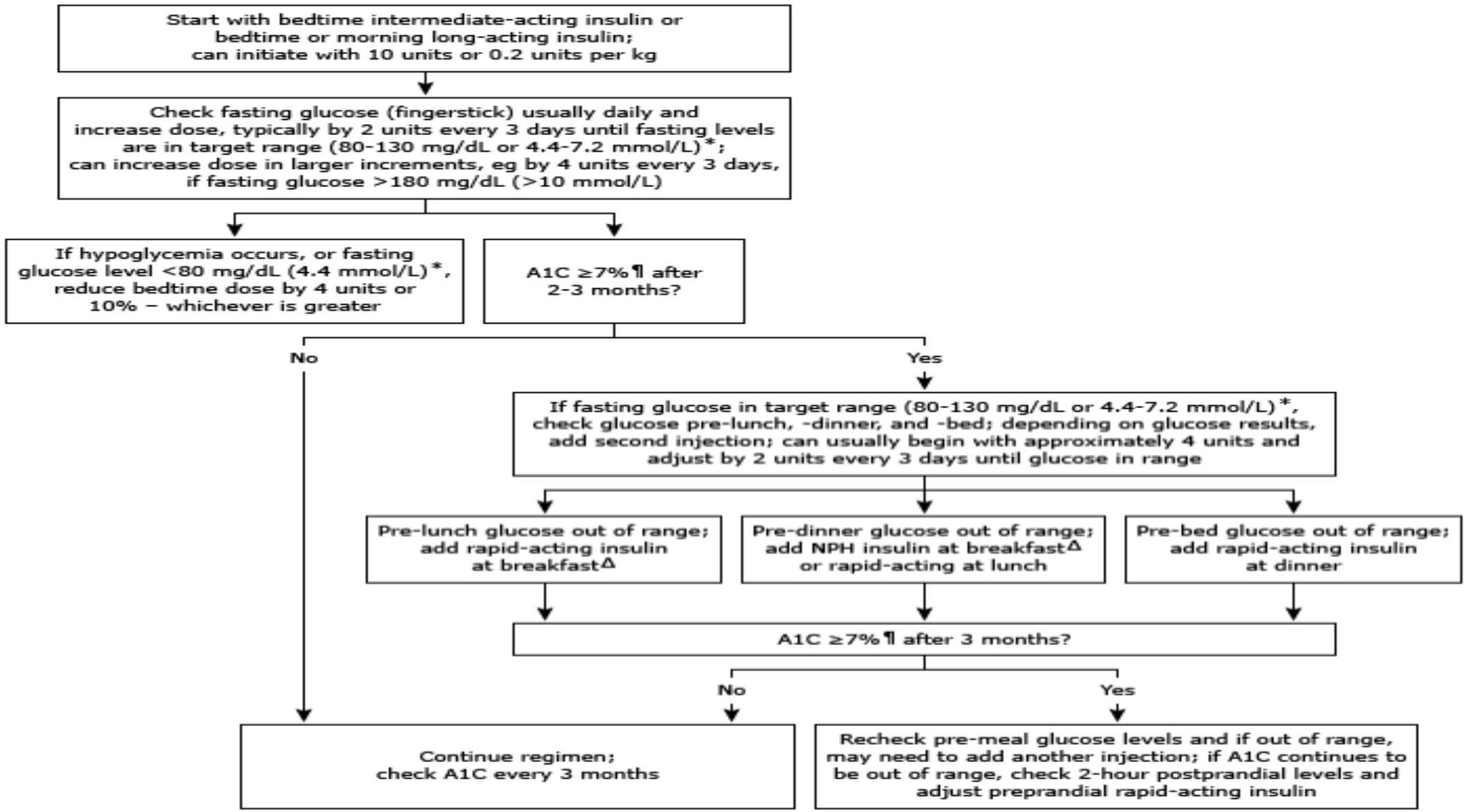
high-dose sulfonylurea

MONITORING

at least twice yearly (meeting glycemic goals)

Quarterly(not meeting goals)

Initiation and adjustment of insulin regimens in type 2 diabetes mellitus



SUMMARY AND RECOMMENDATIONS

Comprehensive diabetes education

Glycemic goals

Asymptomatic, not catabolic

Initial treatment with metformin

Contraindications to metformin

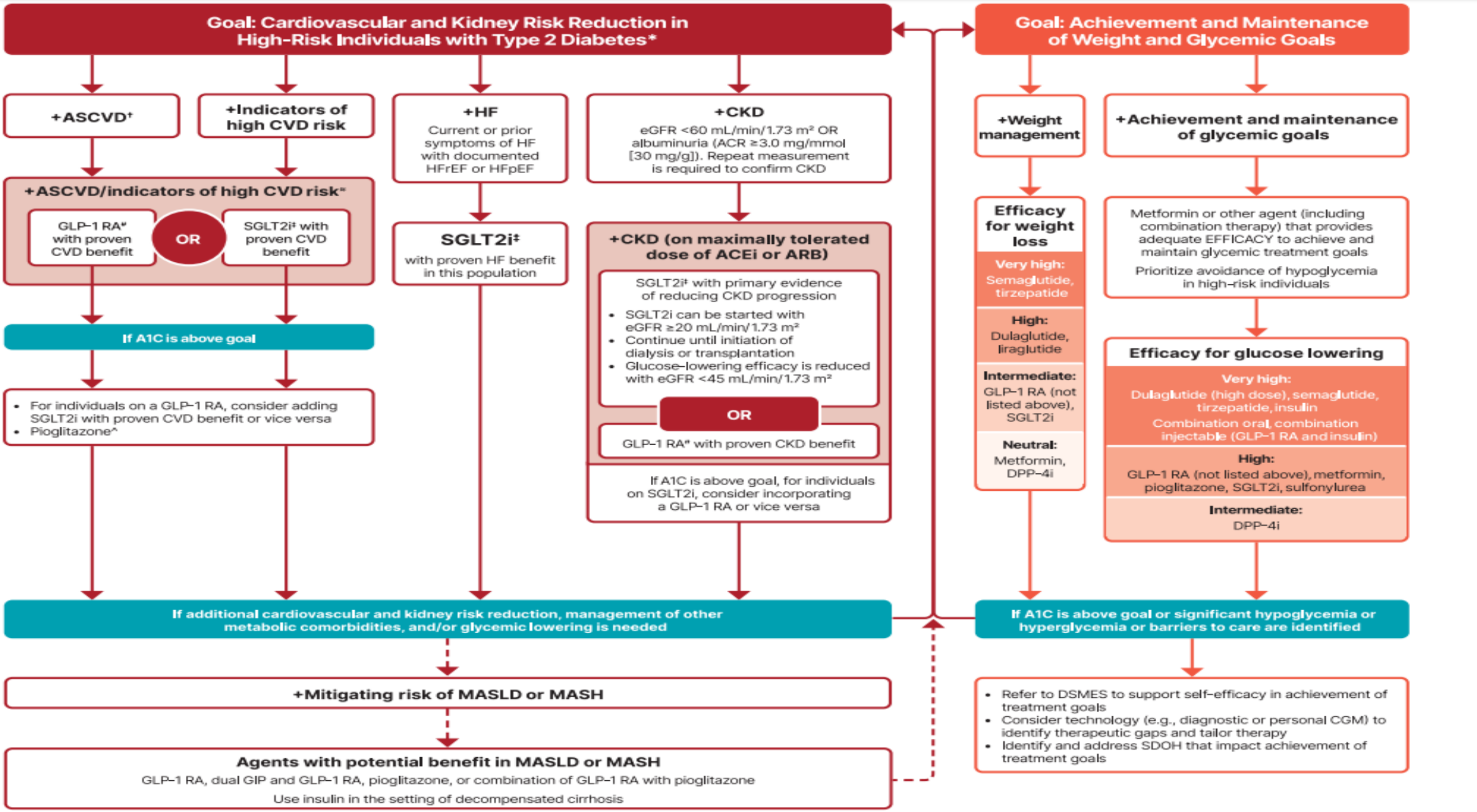
Existing cardiovascular and/or kidney comorbidities

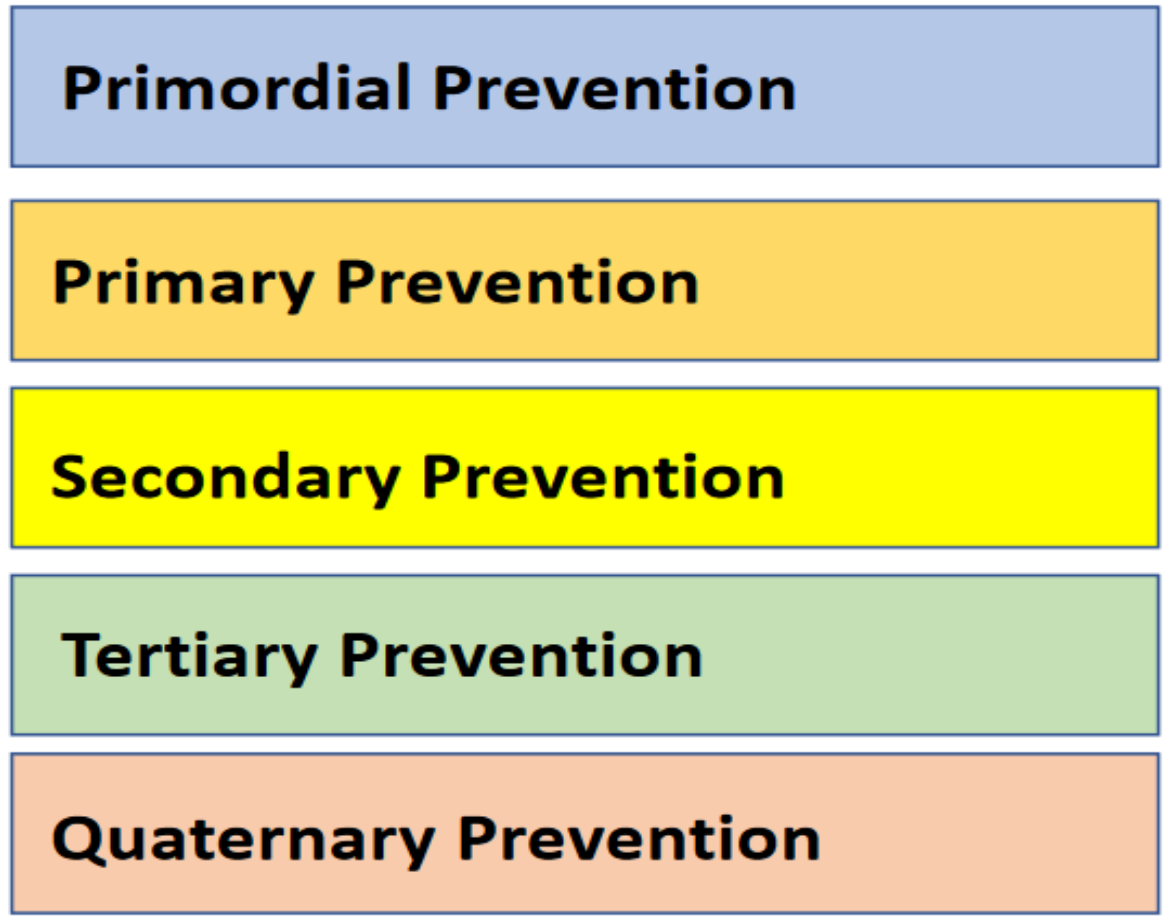
Absence of ASCVD, heart failure (HF), or DKD

Symptomatic or severe hyperglycemia

Monitoring

administration)	efficacy[1]	risk	Weight effects[2]	Effect on MACE	Effect on HF	CKD	Dosing/use considerations[3]	effects	Clinical considerations and adverse effects
Metformin (oral)	High	No	Neutral (potential for modest loss)	Potential benefit	Neutral	Neutral	• Contraindicated with eGFR <30 mL/min/ 1.73 m²	Neutral	• GI side effects: mitigate with slow dose titration, extended-release formulations, and administration with food. • Potential for vitamin B12 deficiency: monitor and replete as appropriate.
SGLT2 inhibitors (oral)	Intermediate to high	No	Loss (intermediate)	Benefit: canagliflozin, empagliflozin	Benefit: canagliflozin, dapagliflozin, empagliflozin, ertugliflozin	Benefit: canagliflozin, dapagliflozin, empagliflozin	• See labels of individual agents for dosage considerations for kidney function • Glucose-lowering effect is minimal at eGFR <45 mL/min/1.73 m² and lower; continue for cardiovascular and kidney benefit until dialysis or transplantation	Unknown	• DKA risk in individuals with insulin deficiency (rare in T2D): discontinue, evaluate, and treat promptly if suspected; be aware of predisposing risk factors and clinical presentations (including euglycemic DKA); mitigate risk with sick-day planning; discontinue before scheduled surgery (e.g., 3–4 days), during critical illness, or during prolonged fasting. • Genital mycotic infections: mitigate risk with genital hygiene and avoid use in high-risk individuals. • Necrotizing fasciitis of the perineum (Fournier gangrene): rare; prompt treatment if suspected. • Intravascular volume depletion: attention to volume status and blood pressure, particularly when ill or fasting; adjust other volume-contracting agents as applicable; monitor kidney function upon initiation.
GLP-1 RAs (SQ; semaglutide also available in oral formulation)	High to very high	No	Loss (intermediate to very high)	Benefit: dulaglutide, liraglutide, semaglutide (SQ) Neutral: exenatide once weekly, lixisenatide	Neutral	Benefit for renal end points in CVOTs, driven by albuminuria outcomes: dulaglutide, liraglutide, semaglutide (SQ) Demonstrated benefit for progression of CKD for semaglutide (SQ)	• See labels of individual agents for dosage considerations for kidney function • No dose adjustment for dulaglutide, liraglutide, or semaglutide • Monitor kidney function when initiating or escalating doses in individuals with kidney impairment reporting severe adverse GI reactions	Potential benefit	• Thyroid C-cell tumors identified in rodents; human relevance not determined. • Ileus: risk level is not well established; provide guidance on discontinuation prior to surgical procedures. • Pancreatitis: acute pancreatitis has been reported, but causality has not been established. Do not initiate if at high risk for pancreatitis, and discontinue if pancreatitis is suspected. • Biliary disease: evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected; avoid use in at-risk individuals. • Diabetic retinopathy: close monitoring of retinopathy in those at high risk (older individuals and those with longer duration of T2D [≥10 years]). • Impact on drug absorption: orally administered drug absorption may be impaired during dose titration (including of oral contraceptives). • GI side effects: counsel on potential for GI side effects; provide guidance on dietary modifications to mitigate GI side effects (reduction in meal size, mindful eating practices [e.g. stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for those experiencing GI challenges. Not recommended for individuals with gastroparesis.
Dual GIP and GLP-1 RA (SQ)	Very high	No	Loss (very high)	Under investigation	Under investigation	Under investigation	• See labels of individual agents for dosage considerations for kidney function • No dose adjustment • Monitor kidney function when initiating or escalating doses in individuals with kidney impairment reporting severe adverse GI reactions	Potential benefit	
DPP-4 inhibitors (oral)	Intermediate	No	Neutral	Neutral	Neutral (potential risk: saxagliptin)	Neutral	• Dose adjustment required based on kidney function (sitagliptin, saxagliptin, alogliptin) • No dose adjustment required for linagliptin	Unknown	• Pancreatitis has been reported, but causality has not been established. Discontinue if pancreatitis is suspected. • Postmarketing concerns about joint pain (consider discontinuing if debilitating and other treatment options are feasible) and bullous pemphigoid (discontinue if suspected).
Pioglitazone (oral)	High	No	Gain	Potential benefit	Increased risk	Neutral	• No dose adjustment required • Generally not recommended in kidney impairment due to potential for fluid retention	Potential benefit	• Increased risk of HF and fluid retention. Do not use in the setting of HF. • Risk of bone fractures. • Bladder cancer: do not use in individuals with active bladder cancer, and use caution in those with prior history of bladder cancer.
Sulfonylureas (2nd generation) (oral)	High	Yes	Gain	Neutral	Neutral	Neutral	• Glyburide: generally not recommended in CKD • Glipizide and glimepiride: initiate conservatively to avoid hypoglycemia	Unknown	• FDA Special Warning on increased risk of CV mortality based on studies of an older sulfonylurea (tolbutamide); glimepiride shown to be CV safe (see text). • Use with caution in individuals at risk for hypoglycemia, particularly if in combination with insulin.
Insulin (human) (SQ; regular insulin also available as inhaled formulation)	High to very high	Yes	Gain	Neutral	Neutral	Neutral	• Lower insulin doses required with a decrease in eGFR; titrate per clinical response	Unknown	• Injection site reactions • Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs • Risk of hypoglycemia and duration of activity increases with the severity of impaired kidney function. • Refer to device-specific instructions for insulins
Insulin									


Goal: Cardiovascular and Kidney Risk Reduction in High-Risk Individuals with Type 2 Diabetes*
+ASCVD†
+Indicators of high CVD risk
+HF
Current or prior symptoms of HF with documented HFrEF or HFpEF
+CKD
eGFR <60 mL/min/1.73 m² OR albuminuria (ACR ≥3.0 mg/mmol [30 mg/g]). Repeat measurement is required to confirm CKD
+ASCVD/indicators of high CVD risk*
GLP-1 RA# with proven CVD benefit
OR
SGLT2i‡ with proven CVD benefit
SGLT2i‡
with proven HF benefit in this population
+CKD (on maximally tolerated dose of ACEi or ARB)
SGLT2i‡ with primary evidence of reducing CKD progression
SGLT2i can be started with eGFR ≥20 mL/min/1.73 m²
Continue until initiation of dialysis or transplantation
Glucose-lowering efficacy is reduced with eGFR <45 mL/min/1.73 m²
OR
GLP-1 RA# with proven CKD benefit
If A1C is above goal, for individuals on SGLT2i, consider incorporating a GLP-1 RA or vice versa
If A1C is above goal
For individuals on a GLP-1 RA, consider adding SGLT2i with proven CVD benefit or vice versa
Pioglitazone^
If additional cardiovascular and kidney risk reduction, management of other metabolic comorbidities, and/or glycemic lowering is needed
+Mitigating risk of MASLD or MASH
Agents with potential benefit in MASLD or MASH
GLP-1 RA, dual GIP and GLP-1 RA, pioglitazone, or combination of GLP-1 RA with pioglitazone
Use insulin in the setting of decompensated cirrhosis
Goal: Achievement and Maintenance of Weight and Glycemic Goals
+Weight management
+Achievement and maintenance of glycemic goals
Efficacy for weight loss
Very high:
Semaglutide, tirzepatide
High:
Dulaglutide, liraglutide
Intermediate:
GLP-1 RA (not listed above), SGLT2i
Neutral:
Metformin, DPP-4i
Metformin or other agent (including combination therapy) that provides adequate EFFICACY to achieve and maintain glycemic treatment goals
Prioritize avoidance of hypoglycemia in high-risk individuals
Efficacy for glucose lowering
Very high:
Dulaglutide (high dose), semaglutide, tirzepatide, insulin
Combination oral, combination injectable (GLP-1 RA and insulin)
High:
GLP-1 RA (not listed above), metformin, pioglitazone, SGLT2i, sulfonylurea
Intermediate:
DPP-4i
If A1C is above goal or significant hypoglycemia or hyperglycemia or barriers to care are identified
Refer to DSMES to support self-efficacy in achievement of treatment goals
Consider technology (e.g., diagnostic or personal CGM) to identify therapeutic gaps and tailor therapy
Identify and address SDOH that impact achievement of treatment goals


Primordial Prevention
Primary Prevention
Secondary Prevention
Tertiary Prevention
Quaternary Prevention

PRIMORDIAL PREVENTION

هدف

جلوگیری از ظهور عوامل خطر ساز دیابت در سطح جامعه

اقدامات

- آموزش همگانی درباره تغذیه سالم در مدارس و رسانه ها

–سیاستگذاری برای کاهش قند و چربیهای مضر در محصولات غذایی

–تبلیغات برای کاهش قند و چربیهای مضر در محصولات غذایی

- مالیات بر نوشابه ها و غذاهای ناسالم

– ترویج فرهنگ شیردهی در مادران

PRIMARY PREVENTION

هدف

جلوگیری از ابتلا به دیابت در افراد در معرض خطر

تمرکز بر افرادی که عوامل خطر دیابت را دارند می باشد مانند چاقی،سابقه خلنوادگی،فشار خون بالا

اقدامات

-غربالگری برای شناسایی افراد پر ریسک(آزمایشات دوره ای قند خون)

-برنامه های کاهش وزن و مدیریت رژیم غذایی

-تشویق به فعالیت بدنی منظم و مدیریت رژیم غذایی

-تشویق به فعالیت بدنی منظم(مثلا" ۱۵۰ دقیقه در هفته)

-مشاوره برای ترک سیگار و الکل

SECONDARY PREVENTION

هدف

تشخیص زود هنگام و درمان به موقع دیابت برای جلوگیری از عوارض

تمرکز روی افرادی است که به دیابت مبتلا شده اند اما هنوز عارضه ای ندارند.

اقدامات

-کنترل دقیق و منظم قند خون(A1C)

استفاده از داروها(متفورمین،انسولین و ...)طبق دستور پزشک

-معاینات دوره ای چشم پزشکی ، قلب ، نفرولوژی و معاینه پاها

-کنترل فشار خون و چربی خون

TERTIARY PREVENTION

هدف

کاهش شدت و معلولیت ناشی از عوارض پیشرفته دیابت و بهبود کیفیت زندگی

تمرکز روی مدیریت عوارضی که قبلا" ظاهر شده است می باشد.

اقدامات

-درمان زخمهای پای دیابتی برای جلوگیری از قطع عضو

-دیالیز یا پیوند کلیه برای نارسایی کلیوی ناشی از دیابت(نفروپاتی)

-تزریق دارو یا لیزر درمانی برای رتینوپاتی پیشرفته برای جلوگیری از نابینایی

-توانبخشی قلبی پس از سکته قلبی

QUATERNARY PREVENTION

هدف

جلوگیری از درمان بیش از حد و آسیبهای ناشی از اقدامات پزشکی غیر ضروری

تمرکز بر محافظت از بیمار در برابر سیستم پزشکی می باشد.

اقدامات

تجویز منطقی داروها و جلوگیری از پلی فارمسی

- اجتناب از آزمایشها یا غربالگریهای بیفایده در بیماران بسیار مسن یا دارای بیماریهای لا علاج

- اولویت دادن به کیفیت زندگی به جای طول عمر به هر قیمت

- ارایه مشاوره اخلاق پزشکی