



Update on the Management of Diabetes

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Prevalence of select NCDs in Jamaican, adults 15-74 years old

Disease Condition	JHLS-2000 (%)	JHLSII-2008 (%)
Diabetes Mellitus	7.2	↑ 7.9
Hypertension	20.9	↑ 25.2
Pre-hypertension	29.9	↑ 35.3
High Cholesterol	14.6	↓ 11.7
Depression	-	20.3
Asthma (self-reported)	-	7.0

Mortality Figures for Jamaica

Table 55 Ten Leading Causes of Death among Males 5 Years Old and Over: 2011 and Comparative Figures for 2009 and 2010

ICD 10 Code	Cause of Death	2011	2010	2009
V01-Y89	External Causes	2,092	1,994	1,916
I60-I69	Cerebrovascular Diseases	989	966	920
E10-E14	Diabetes Mellitus	885	823	676
C61	Malignant Neoplasm of Prostate	616	590	587
I20-I25	Ischaemic Heart Diseases	557	563	537
I10-I14	Hypertensive Diseases	553	457	496
C33-C34	Malignant Neoplasm of the Larynx, Trachea, Bronchus and Lung	319	296	369
J40-J47	Chronic Lower Respiratory Diseases	301	317	320
B20-B24	Human Immunodeficiency Virus (HIV) Disease	285	293	256
I26-I51	Other Heart Diseases	283	343	314
	TOTAL	6,880	6,642	6,391

Source: Registrar General's Department

Notes: (i) External causes include sudden and violent cases reported by the police but not yet registered by the Registrar General's Department

Table 56 Ten Leading Causes of Death among Females 5 Years Old and Over: 2011 and Comparative Figures for 2009 and 2010

ICD 10 Code	Cause of Death	2011	2010	2009
E10-E14	Diabetes Mellitus	1,381	1,224	1,103
I60-I69	Cerebrovascular Diseases	1,127	1,087	1,098
I10-I14	Hypertensive Diseases	588	622	602
I20-I25	Ischaemic Heart Diseases	529	481	541
I26-I51	Other Heart Diseases	380	287	336
C44-49, C51-52, C57-60, C62-66, C68-69, C73-81, C88, C96-97	Remainder of Malignant Neoplasm	356	334	352
C50	Malignant Neoplasm of the Breast	294	300	291
V01-Y89	External Causes	290	265	351
C53	Malignant Neoplasm of Cervix uteri	191	158	162
B20-B24	Human Immunodeficiency Virus (HIV) Diseases	178	201	156
	TOTAL	5,314	4,959	4,992

Source: Registrar General's Department

Notes: (i) External causes include sudden and violent cases reported by the police but not yet registered by the Registrar General's Department

DIABETIC COMPLICATIONS

COMPLICATIONS

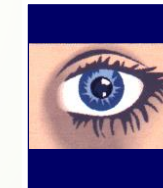
STROKE / TIA



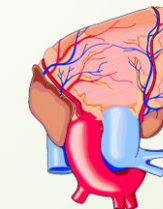
AMPUTATION



BLINDNESS



ISCHAEMIC
HEART DISEASE

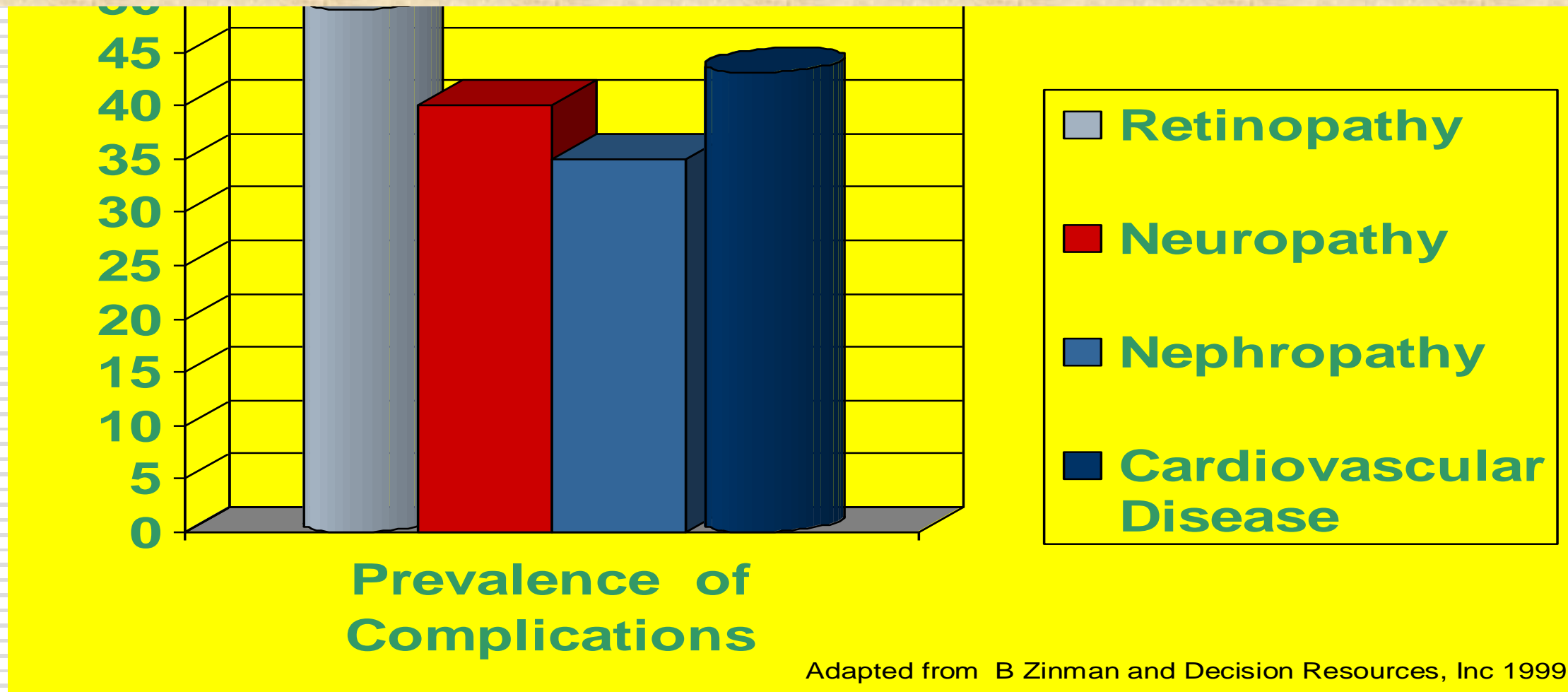


RENAL
INSUFFICIENCY



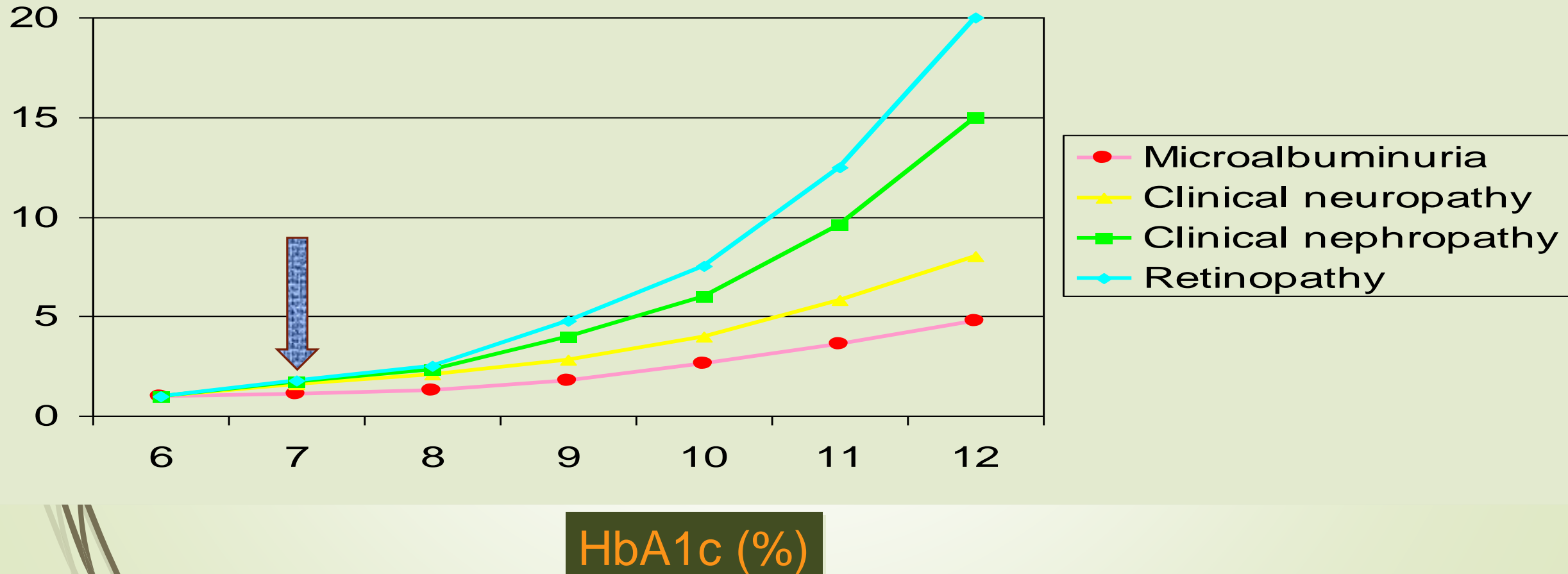
Prevalence of Micro/ Macrovascular complications

PREVALENCE OF DIABETIC RETINOPATHY AT THE UHWI EYE CLINIC OF 78% 1



DCCT: Relative Risk of Developing Chronic Complications of Diabetes in Relation to HbA1c

Relative Risk



Mean Glucose Levels for Specified A1C Levels

A1C%	Mean Plasma Glucose*		Mean Fasting Glucose	Mean Premeal Glucose	Mean Postmeal Glucose	Mean Bedtime Glucose
	mg/dL	mmol/L	mmol/L	mmol/L	mmol/L	mmol/L
6	126	7.0				
<6.5			6.8	6.6	8.0	7.6
6.5-6.99			7.9	7.7	9.1	8.5
7	154	8.6				
7.0-7.49			8.4	8.4	9.8	9.8
7.5-7.99			9.3	8.6	10.5	9.7
8	183	10.2				
8-8.5			9.9	9.9	11.4	12.3
9	212	11.8				
10	240	13.4				
11	269	14.9				
12	298	16.5				

These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92. A calculator for converting A1C results into estimated average glucose (eAG), in either mg/dL or mmol/L, is available at <http://professional.diabetes.org/eAG>.

ADA. 6. Glycemic Targets. Diabetes Care. 2015;38(suppl 1):S35; Table 6.1

TO PREVENT OR DELAY DIABETES COMPLICATIONS

Haemoglobin A1c

A1c percentage point reduction

**KEEP THE HBA1C TO LESS THAN 7
%**


**REDUCE THE CHRONIC
COMPLICATIONS BY 25-
30%**



For every percentage point decrease in HbA1c there is a :

- **25%** reduction in diabetes-related deaths
- **7%** reduction in all-cause mortality
- **18%** reduction in combined fatal and nonfatal myocardial infarction

UKPDS



American Association of Clinical Endocrinologists and American College of Endocrinology Clinical Practice Guidelines for Developing a Diabetes Mellitus Comprehensive Care Plan

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ENDOCRINE PRACTICE Vol 21 No. 4 April 2015

Outpatient Glucose Targets for Nonpregnant Adults

Parameter	Treatment Goal
ATC, %	Individualize on the basis of age, comorbidities, duration of disease, and hypoglycemia risk: <ul style="list-style-type: none">• In general, ≤ 6.5 for most*• Closer to normal for healthy• Less stringent for “less healthy”
FPG, mmol/l	<6.1
2-Hour PPG, mmol/l	<7.8

FPG = fasting plasma glucose; PPG = postprandial glucose.

*Provided target can be safely achieved.

LIFESTYLE MODIFICATION

(Including Medically Assisted Weight Loss)

OTHER CVD
RISK FACTORS

WEIGHT LOSS
THERAPIES

ANTIHYPERGLYCEMIC THERAPIES

FPG > 100 | 2-hour PG > 140

CVD RISK FACTOR
MODIFICATIONS ALGORITHM

DYSLIPIDEMIA
ROUTE

HYPERTENSION
ROUTE

NORMAL
GLYCEMIA

Progression

OVERT
DIABETES

PROCEED TO
HYPERGLYCEMIA
ALGORITHM

1 PRE-DM
CRITERION

MULTIPLE PRE-DM
CRITERIA

Intensify
Weight
Loss
Therapies

Low-risk
Medications

Metformin

Acarbose

Consider with
Caution

TZD

GLP-1 RA

If glycemia not normalized,
consider with caution

Diet

- Nutrition Therapy: AIMS
- To achieve and maintain near normal blood glucose
- To achieve and maintain a healthy body weight
- To achieve and maintain a favourable blood lipid profile
- To minimise complications such as hypoglycaemia
- To provide appropriate nutrition / meeting metabolic and growth needs

Diet

- ➔ CHO 50-60%
- ➔ Added sugars 10%
- ➔ Protein 15-20%
- ➔ Total Fat < 30%
- ➔ Saturated fat < 10%



Parameter	Treatment Goal
Diet	<ul style="list-style-type: none">• Eat regular meals and snacks; avoid fasting to lose weight• Consume plant-based diet• High in fiber• Low calories• Low glycemic index• High in phytochemicals and or antioxidants• Understand Nutrition Facts• Understand Label information

Therapeutic Lifestyle Changes

Parameter	Treatment Goal
Weight loss For the overweight and obese patients	Reduce weight by 5% to 10%

Therapeutic Lifestyle Changes

Parameter

Treatment Goal

Physical activity

150 min/week of moderate-intensity exercise (eg, brisk walking) plus flexibility and strength training



Pharmacological Agents



Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
α -Glucosidase inhibitors	<ul style="list-style-type: none"> Delay carbohydrate absorption from intestine 	Acarbose Miglitol	GLUCOBAY
DOSAGE	<ul style="list-style-type: none"> 50-100MG TDS 		
SIDE EFFECT	<ul style="list-style-type: none"> GI 		

Glucobay

- Affects postprandial hyperglycaemia
- Has some effect on Cardiovascular disease
- Lowers HBA1c by 0.8%
- Avoids hypoglycaemia
- Avoids weight gain
- Main side effect is flatulence (78% of patients) and diarrhoea (14% of patients)
- Not to be used in inflammatory bowel disease or bowel obstruction
- Not to be used in renal failure



Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Amylin analogue	<ul style="list-style-type: none"> • Decrease glucagon secretion • Slow gastric emptying • Increase satiety 	Pramlintide	Symlin <i>SymlinP en 120</i> , <i>SymlinP en 60</i>
SUBCUTANEOUS			

Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Biguanide	<ul style="list-style-type: none"> Decrease Hepatic Glucose Production (HGP) Increase glucose uptake in muscle 	Metformin	Glucophage or generic
SIDE EFFECTS	<ul style="list-style-type: none"> GI LACTIC ACIDOSIS 	NOT TO BE USED IN CKD CCF, AMI , LIVER FAILURE	

Metformin

- May prevent cardiovascular disease in diabetes
- May prevent cancer complications in diabetes
- Low risk of hypoglycaemia
- Weight neutral
- Common side effects include diarrhea, nausea and abdominal pain
- 500mg to 2000mg OD to TDS
- **DRUG OF CHOICE IN OVERWEIGHT / OBESE DIABETICS**



Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Bile acid sequestrant	<ul style="list-style-type: none"> • Decrease HGP? • Increase incretin levels? 	Colesevelam	WelChol

Noninsulin Agents Available for T2D

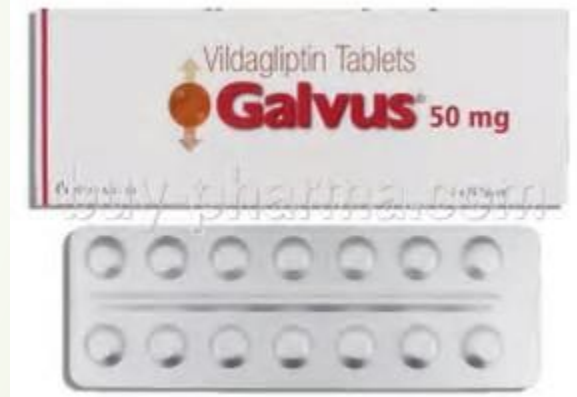
Class	Primary Mechanism of Action	Agent(s)	Available as
DPP-4 inhibitors	<ul style="list-style-type: none"> • Increase glucose-dependent insulin secretion • Decrease glucagon secretion 	Alogliptin Linagliptin Saxagliptin Sitagliptin Valdagliptin	Nesina Trajenta Onglyza Januvia Galvus

DPP-4 = dipeptidyl peptidase; HGP = hepatic glucose production.

Garber AJ, et al. *Endocr Pract.* 2013;19(suppl 2):1-48. Inzucchi SE, et al. *Diabetes Care.* 2012;35:1364-1379.

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- I. Januvia 25-100 mg OD
- II. Galvus 50 mg BID
- III. Trajenta 5 mg OD
- IV. Risk of pancreatitis
- V. Risk of pancreatic cancer
- VI. Weight neutral
- VII. Low risk of hypoglycaemia
- VIII. Can be used in renal failure
- IX. No risk of cardiovascular disease



Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Dopamine-2 agonist	<ul style="list-style-type: none">• Activates dopaminergic receptors	Bromocriptine	Cycloset

Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Glinides	<ul style="list-style-type: none">• Increase insulin secretion	Nateglinide Repaglinide	Starlix Novonorm

REPAGLINIDE 0.5-2.0mg
TDS



NATEGLINIDE 60- 120 mg
TDS



Noninsulin Agents Available for T2D


Class	Primary Mechanism of Action	Agent(s)	Available as
GLP-1 receptor agonists	<ul style="list-style-type: none"> • Increase glucose-dependent insulin secretion • Decrease glucagon secretion • Slow gastric emptying • Increase satiety 	Albiglutide Dulaglutide Exenatide Exenatide XR Liraglutide	Tanzeum Trulicity Byetta Bydureon Victoza

GLP-1 = glucagon-like peptide; HGP = hepatic glucose production; SGLT2 = sodium glucose cotransporter 2.

Garber AJ, et al. *Endocr Pract.* 2013;19(suppl 2):1-48. Inzucchi SE, et al. *Diabetes Care.* 2012;35:1364-1379.

- Subcutaneous (SC) injection in the thigh, abdomen, or upper arm.
- 5 mcg administered twice daily (BID) at any time within the 60-minute period before the morning and evening meals
- Increased to 10 mcg twice daily after 1 month of therapy
- Associated with acute pancreatitis
- Not to be used in creatinine clearance <30 mL/min) or end-stage renal disease

<https://www.drugs.com/pro/byetta.html>



NDC 66780-212-01

Byetta
everalide injection 250 mcg/mL, 2.4 mL

READ ENCLOSED BYETTA MEDICATION GUIDE FOR IMPORTANT SAFETY INFORMATION

10 mcg

Each prefilled pen will deliver 60 subcutaneous doses, 10 mcg per dose **Rx Only**

SUBCUTANEOUS USE ONLY REFRIGERATE - DO NOT FREEZE
DO NOT TRANSFER THIS MEDICATION TO A SYRINGE.

Pen needles not included

Ask your healthcare provider which pen needle length and gauge is best for you
Use 29 (thin), 30, or 31 (thinner) gauge disposable pen needles

AMYLIN Lilly

© 2011 GS

- ➔ Nausea (44%) , vomiting (13%) , diarrhoea (13%)
- ➔ Decreased appetite
- ➔ Decrease HBA1c by 0.9%
- ➔ Decrease weight
- ➔ No hypoglycaemia

<https://www.drugs.com/pro/byetta.html>

NDC 66780-212-01

Byetta
exenatide injection 250 mcg/mL, 2.4 mL

READ ENCLOSED BYETTA MEDICATION GUIDE FOR IMPORTANT SAFETY INFORMATION

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AMGEN Lilly

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Noninsulin Agents Available for T2D

	Primary Mechanism of Action	Agent(s)	Available as
SGLT2 inhibitors	<ul style="list-style-type: none"> Increase urinary excretion of glucose 	Canagliflozin Dapagliflozin Empagliflozin	Invokana Farxiga Jardiance
Not to be used in Chronic Kidney disease	<ul style="list-style-type: none"> Can cause volume depletion, lowered blood pressure and Non-ketotic Diabetic Ketoacidosis 	Causes vaginitis, balanitis, UTI	

GLP-1 = glucagon-like peptide; HGP = hepatic glucose production; SGLT2 = sodium glucose cotransporter 2.

Garber AJ, et al. *Endocr Pract.* 2013;19(suppl 2):1-48. Inzucchi SE, et al. *Diabetes Care.* 2012;35:1364-1379.

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Dose 5-10 mg OD



100 - 300 mg OD

Moderate renal impairment with an eGFR of 45 to less than 60 mL/min/1.73 m².

<https://www.drugs.com/dosage/invokana.html>

Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Sulfonylureas	<ul style="list-style-type: none"> Increase insulin secretion 	Gliclazide Glimepiride Glipizide Glyburide Glibenclamide	Diamicron MR Amaryl Glucotrol Glynase prestab Daonil



Noninsulin Agents Available for T2D

Class	Primary Mechanism of Action	Agent(s)	Available as
Thiazolidinediones	<ul style="list-style-type: none">• Increase glucose uptake in muscle and fat• Decrease HGP	Pioglitazone Rosiglitazone	Actos Avandia



Efficacy of Agents Available for T2D

	Metformin	GLP1RA	SGLT2I	DPP4I	TZD	AGI	Coles	BCR-QR	SU/ Glinide	Insulin	Pram
FPG lowering	Mod	Mild to mod*	Mod	Mild	Mod	Neutral	Mild	Neutral	SU: mod Glinide: mild	Mod to marked (basal insulin or premixed)	Mild
PPG lowering	Mild	Mod to marked	Mild	Mod	Mild	Mod	Mild	Mild	Mod	Mod to marked (short/rapid-acting insulin or premixed)	Mod to marked

AGI = α -glucosidase inhibitors; BCR-QR = bromocriptine quick release; Coles = colesevelam; DPP4I = dipeptidyl peptidase 4 inhibitors; FPG = fasting plasma glucose; GLP1RA = glucagon-like peptide 1 receptor agonists; Met = metformin; Mod = moderate; PPG = postprandial glucose; SGLT2I = sodium-glucose cotransporter 2 inhibitors; SU = sulfonylureas; TZD = thiazolidinediones.

*Mild: albiglutide and exenatide; moderate: dulaglutide, exenatide extended release, and liraglutide.

Continued on next slide

Side effects of Agents Available for T2D

	Met	GLP1R A	SGLT2I	DPP4I	TZD	AGI	Coles	BCR- QR	SU/ Glinide	Insulin	Pram
NAFLD benefit	Mild	Mild	Neutral	Neutral	Mod	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Hypo- glyce mia	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	SU: mod to severe Glinide : mild to mod	Mod to severe*	Neutral
Weight	Slight loss	Loss	Loss	Neutral	Gain	Neutral	Neutral	Neutral	Gain	Gain	Loss

Monotherapy, Dual Therapy, and Triple Therapy for T2D

Monotherapy*

Metformin

GLP1RA

SGLT2I

DPP4I

AGI

TZD[†]

SU/glinide[†]

Monotherapy, Dual Therapy, and Triple Therapy for T2D

Dual therapy*

Metformin (or other first-line agent) plus

GLP1RA

SGLT2I

DPP4I

TZD[†]

Basal insulin[†]

Colesevelam

BCR-QR

AGI

SU/glinide[†]

COMBINATION THERAPY

Metformin and

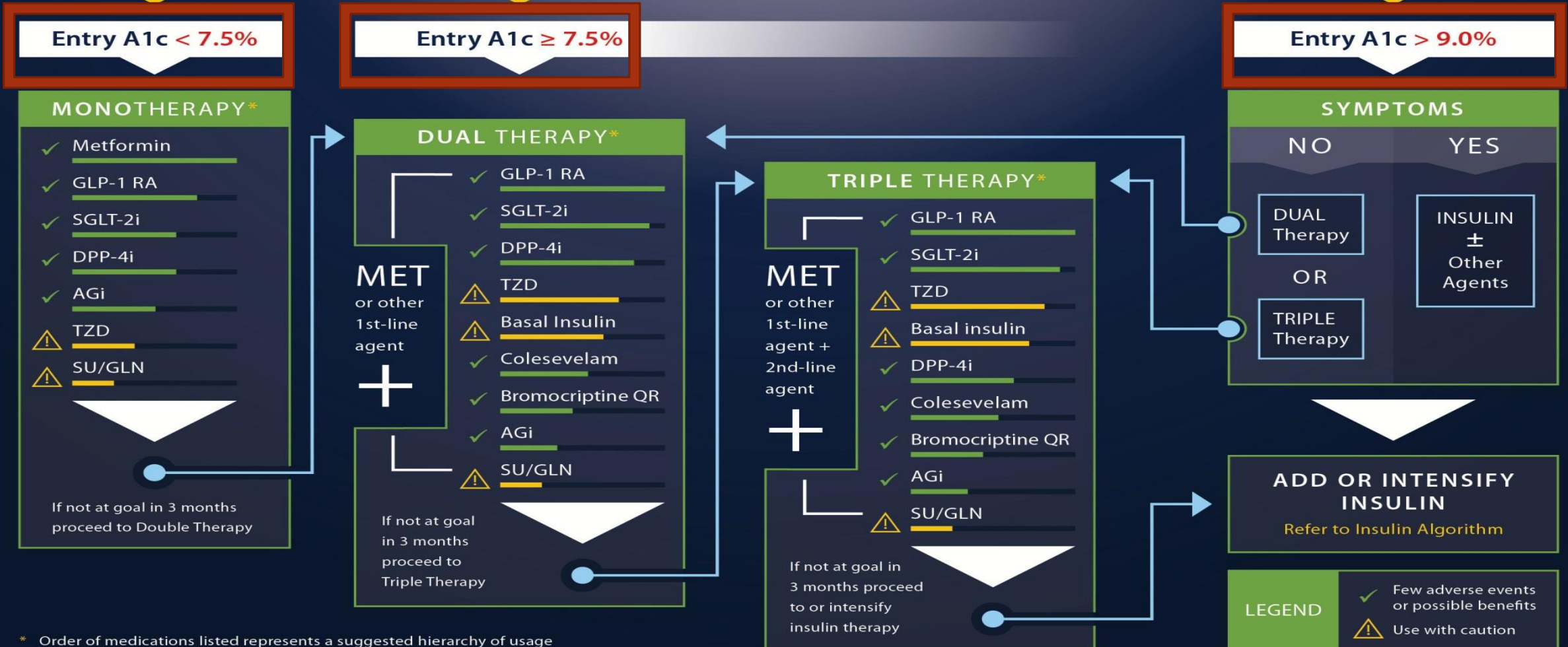


Triple Therapy for T2D

		Triple therapy*
		First- and second-line agent plus
		GLP1RA
		SGLT2I
		TZD [†]
		Basal insulin [†]
		DPP4I
		Colesevelam
		BCR-QR
		AGI
		SU/glinide [†]

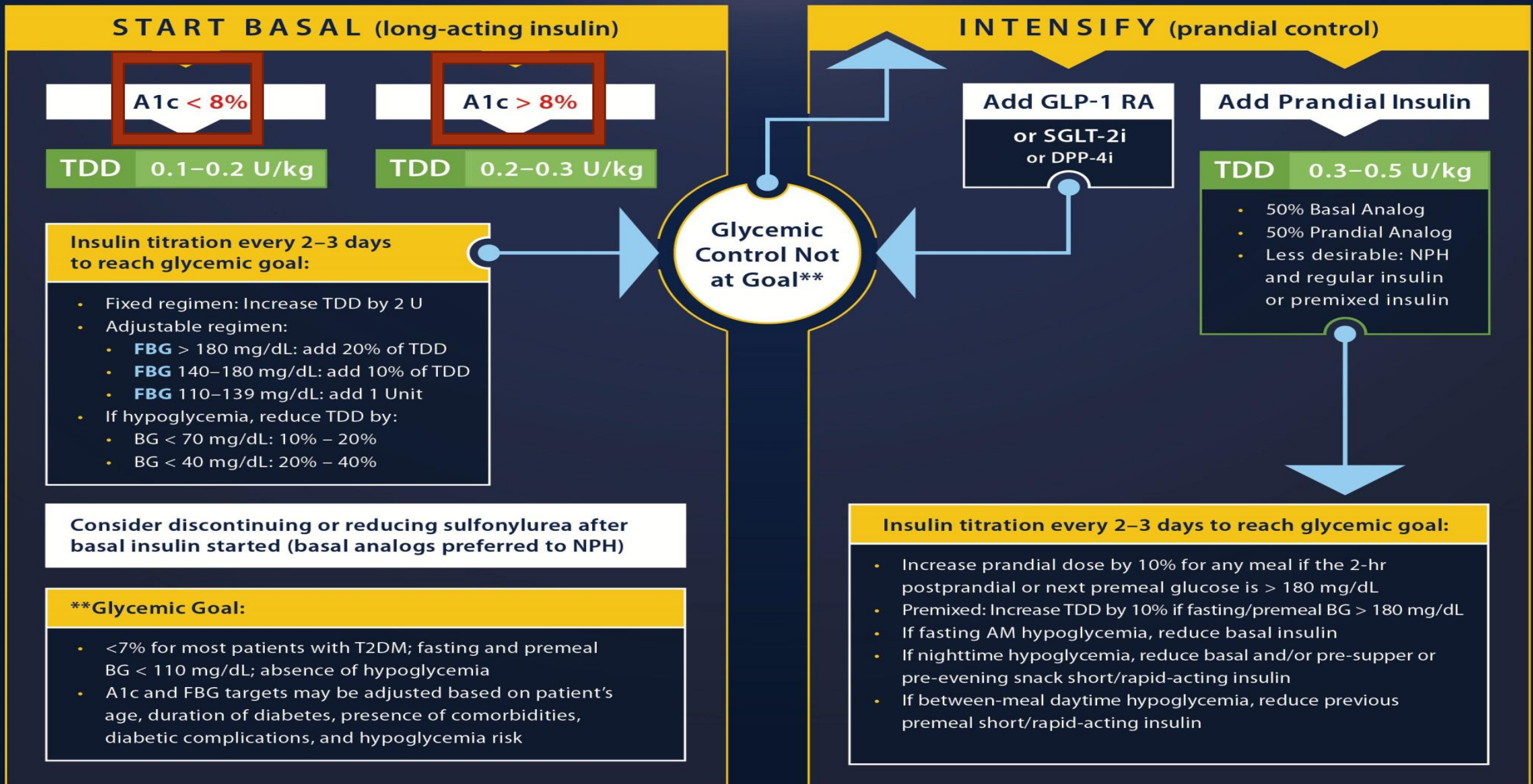
LIFESTYLE MODIFICATION

(Including Medically Assisted Weight Loss)



* Order of medications listed represents a suggested hierarchy of usage

PROGRESSION OF DISEASE →



Insulin Regimens

- ▶ Insulin is required for survival in T1D
- ▶ Physiologic regimens using insulin analogs should be used for most patients

Multiple daily injections (MDI)

- 1-2 injections basal insulin per day
- Prandial insulin injections before each meal

Continuous subcutaneous insulin infusion (CSII)

- Insulin pump using rapid acting insulin analog

Management of Diabetic Retinopathy

- Slow retinopathy progression by maintaining optimal control of
 - Blood glucose
 - Blood pressure
 - Lipids
- For active retinopathy, refer to ophthalmologist as needed
 - For laser therapy
 - For vascular endothelial growth factor therapy

SUMMARY





Thank you