Medications for Type 2 Diabetes CDE Exam Preparation

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Competency for CDE Exam 3.1.A

Oral Medications for Type 2 Diabetes

- Action
- Indications for Use
- Side Effects
- A1C lowering
- Weight
- Hypoglycemia
- Precautions
- Comments

Competency for CDE Exam 3.1.H, 5.F

Medications for Hypertension

Medications for Cholesterol

Resources

guidelines.diabetes.ca

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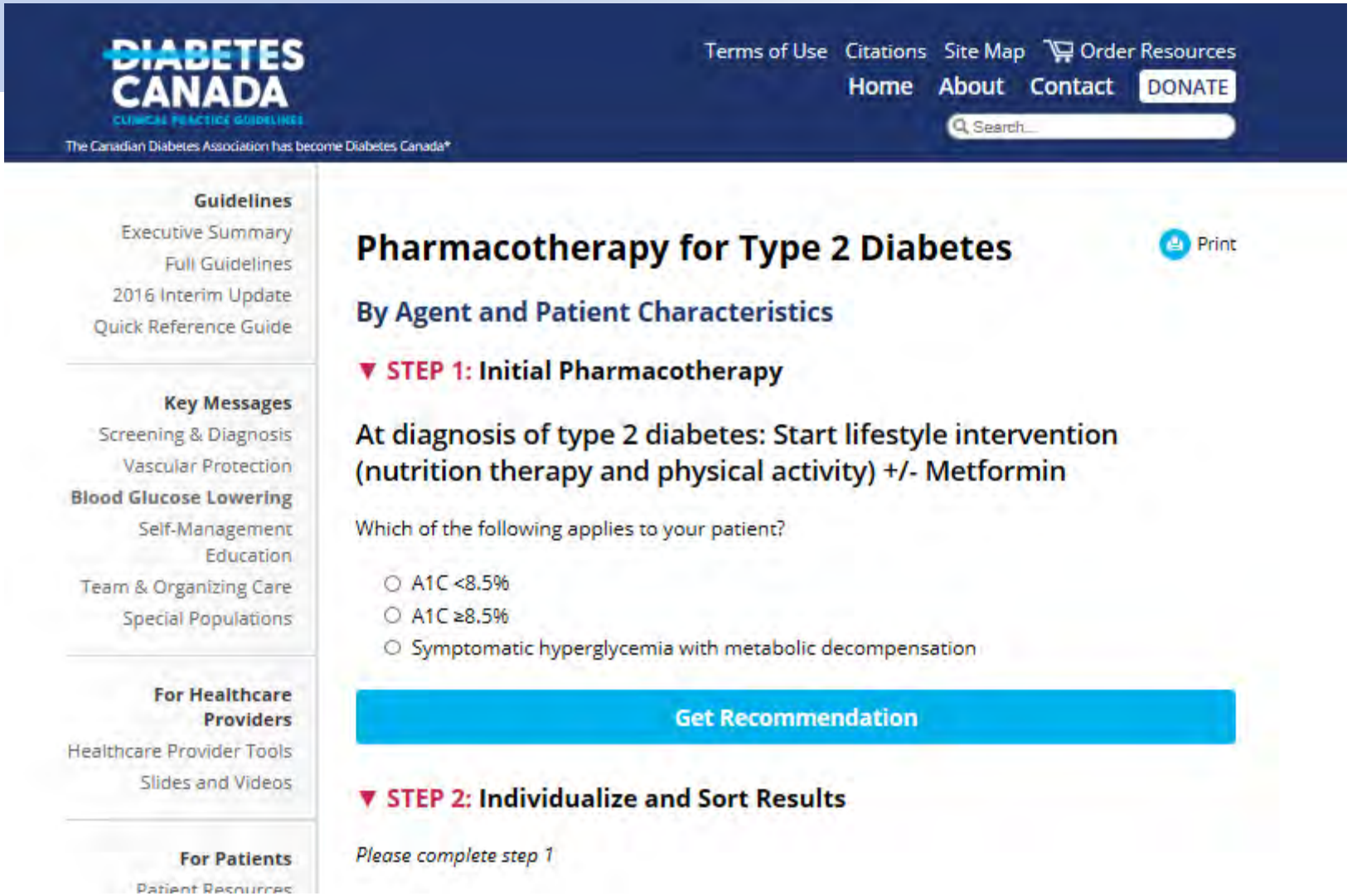
DIABETES CANADA
CLINICAL PRACTICE GUIDELINES
The Canadian Diabetes Association has become Diabetes Canada*
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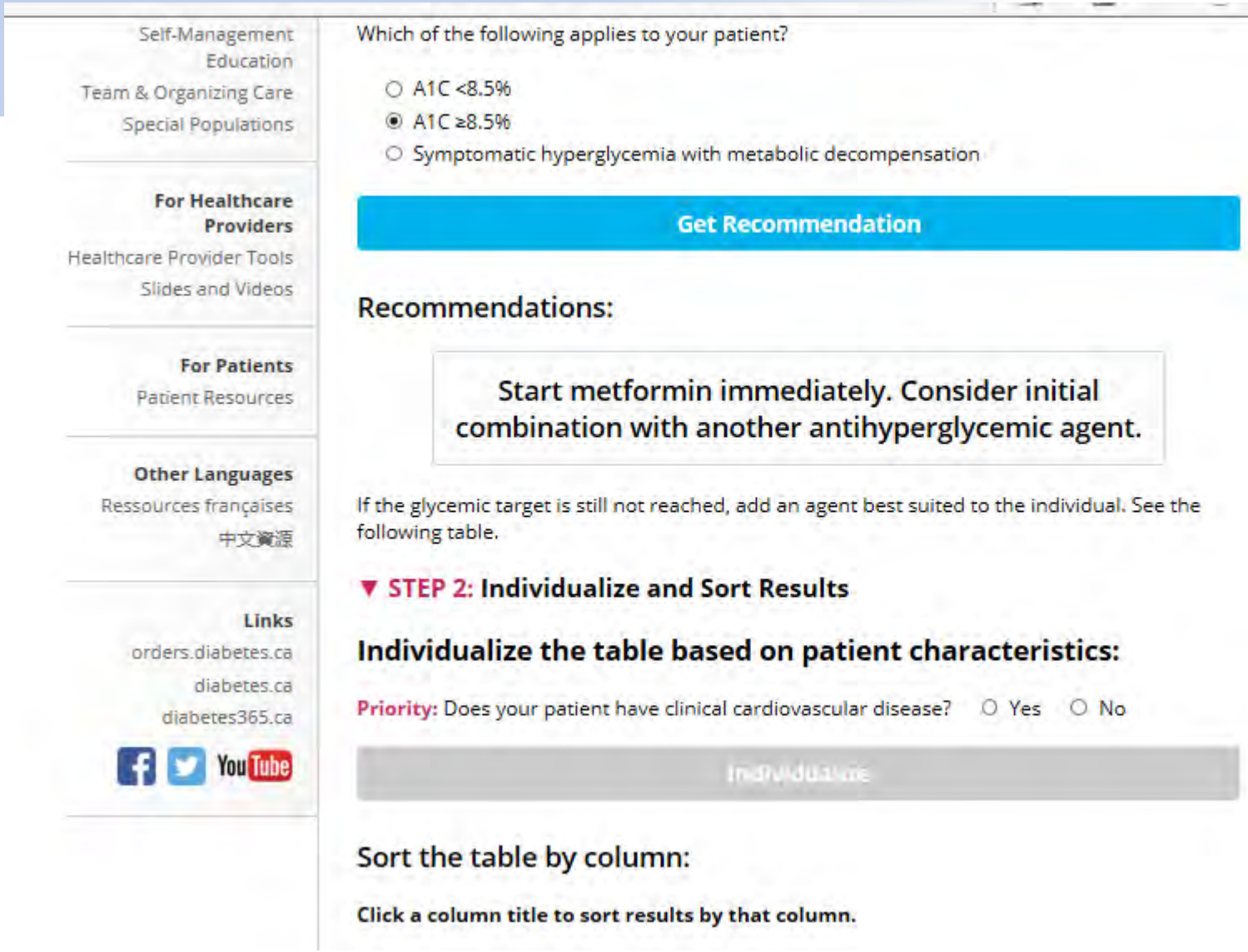
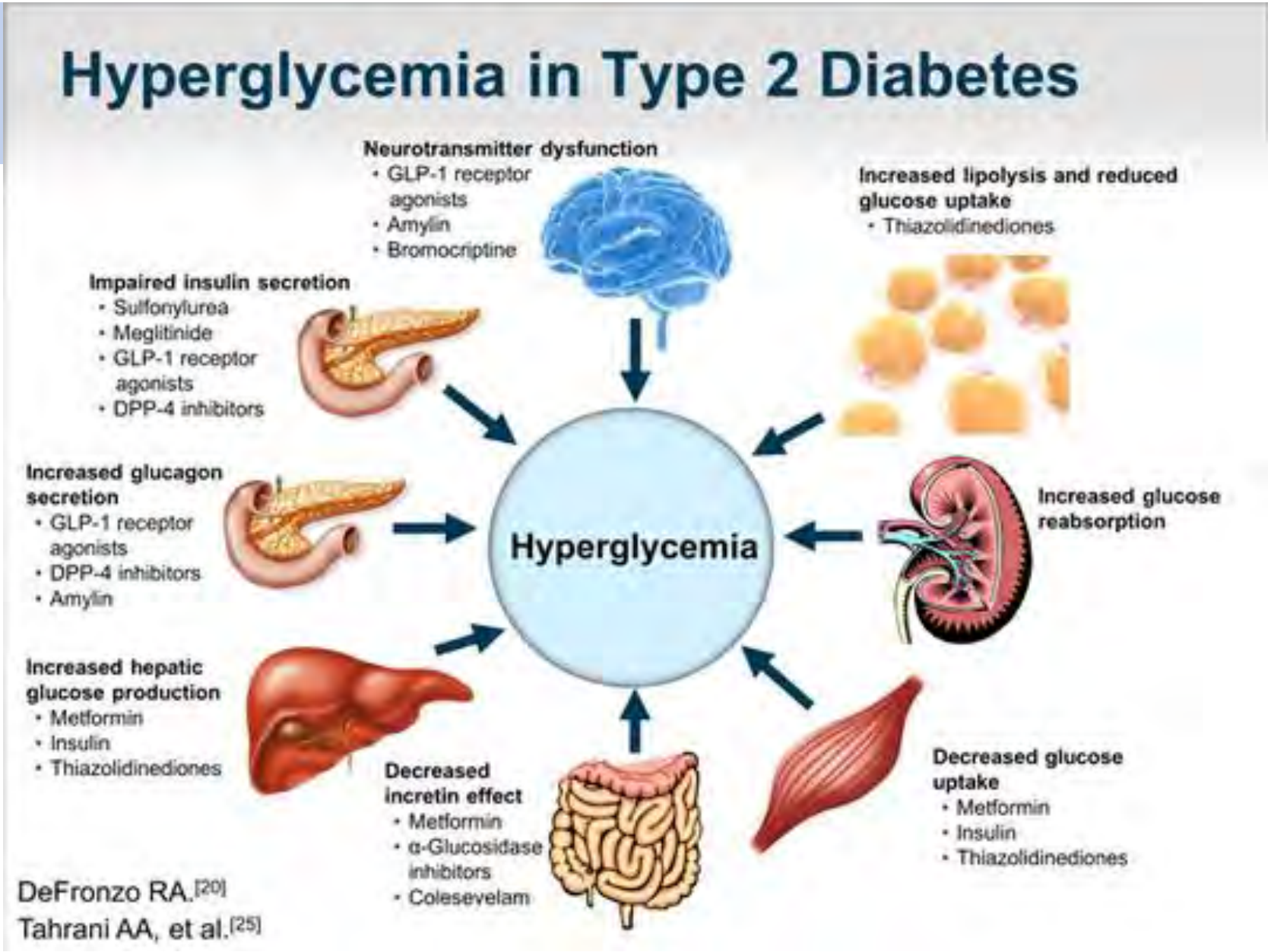
2016 Interim Update
Quick Reference Guide
Key Messages
Screening & Diagnosis
Vascular Protection
Blood Glucose Lowering
Self-Management Education
Team & Organizing Care
Special Populations
For Healthcare Providers
Healthcare Provider Tools
Slides and Videos
For Patients
Patient Resources
Pharmacotherapy for Type 2 Diabetes
Print
By Agent and Patient Characteristics
▼ STEP 1: Initial Pharmacotherapy
At diagnosis of type 2 diabetes: Start lifestyle intervention (nutrition therapy and physical activity) +/- Metformin
Which of the following applies to your patient?
A1C <8.5%
A1C ≥8.5%
Symptomatic hyperglycemia with metabolic decompensation
Get Recommendation
▼ STEP 2: Individualize and Sort Results
Please complete step 1


Self-Management Education
Team & Organizing Care
Special Populations
For Healthcare Providers
Healthcare Provider Tools
Slides and Videos
For Patients
Patient Resources
Other Languages
Ressources françaises
中文資源
Links
orders.diabetes.ca
diabetes.ca
diabetes365.ca
Which of the following applies to your patient?
A1C <8.5%
A1C ≥8.5%
Symptomatic hyperglycemia with metabolic decompensation
Get Recommendation
Recommendations:
Start metformin immediately. Consider initial combination with another antihyperglycemic agent.
If the glycemic target is still not reached, add an agent best suited to the individual. See the following table.
▼ STEP 2: Individualize and Sort Results
Individualize the table based on patient characteristics:
Priority: Does your patient have clinical cardiovascular disease? Yes No
Sort the table by column:
Click a column title to sort results by that column.

Class▲	Relative A1C lowering	Hypoglycemia	Weight	Effect in Cardiovascular Outcome Trial	Other therapeutic considerations	Cost
Alpha-glucosidase inhibitor (acarbose)	↓	Rare	neutral to ↓		Improved postprandial control, GI side-effects	$$
Incretin agent: DPP-4 inhibitors	↓ ↓	Rare	neutral to ↓	alo, saxa, sita: Neutral	Caution with saxagliptin in heart failure	$$$
GLP-1R agonists	↓ ↓ to ↓ ↓ ↓	Rare	↓ ↓	lira: Superiority in T2DM patients with clinical CVD lixi: Neutral	GI side-effects	$$$$
Insulin	↓ ↓ ↓	Yes	↑↑	glar: Neutral	No dose ceiling, flexible regimens	$–$$$$
Insulin secretagogue: Meglitinide	↓ ↓	Yes	↑		Less hypoglycemia in context of missed meals but usually requires TID to QID dosing	$$
Insulin secretagogue: Sulfonylurea	↓ ↓	Yes	↑		Gliclazide and glimepiride associated with less hypoglycemia than glyburide	$
SGLT2 inhibitors	↓ ↓ to ↓ ↓ ↓	Rare	↓ ↓	empa: Superiority in T2DM patients with clinical CVD	Genital infections, UTI, hypotension, dose-related changes in LDL-C, caution with renal dysfunction and loop diuretics, dapagliflozin not to be used if bladder cancer, rare diabetic ketoacidosis (may occur with no hyperglycemia), caution in the elderly	$$$
TZD	↓ ↓	Rare	↑↑	Neutral	CHF, edema, fractures, rare bladder cancer (pioglitazone), cardiovascular controversy (rosiglitazone), 6-12 weeks required for maximal effect	$$
Weight loss agent (orlistat)	↓	None	↓		GI side-effects	$$$

alo=alogliptin; empa=empagliflozin; glar=glargine; lira=liraglutide; saxa=saxagliptin; sita=sitagliptin

Hyperglycemia in Type 2 Diabetes



DeFronzo RA.[20]
Tahrani AA, et al.[25]

Biguanides

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation	Risk of hypoglycemia
Biguanides	Metformin	Glucophage	 500 mg  850 mg	No
Biguanides	Extended release metformin	Glumetza	 500 mg  1000 mg	No

Monitor Vitamin B12 levels

Secretagogues

Meglitinide

- faster acting

Sulfonylurea

- longer duration of action

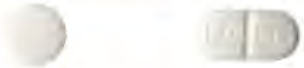
Must be taken with food

Secretagogues

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Amino acid derivate (insulin secretagogues)	Nateglinide	Starlix	 60 mg 120 mg
Meglitinides (insulin secretagogues)	Repaglinide	GlucoNorm	 0.5 mg 1 mg 2 mg

Hypoglycemia Risk

Secretagogues

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Sulfonylureas (insulin secretagogues))	Glimepiride	Amaryl	 1 mg 2 mg 4 mg
Sulfonylureas (insulin secretagogues)	Glyburide	Diaßeta	 2.5 mg 5 mg
Sulfonylureas (insulin secretagogues)	Gliclazide	Diamicron	 80 mg
Sulfonylureas (insulin secretagogues)	Gliclazide modified release	Diamicron MR	 30 mg 60 mg

Hypoglycemia Risk

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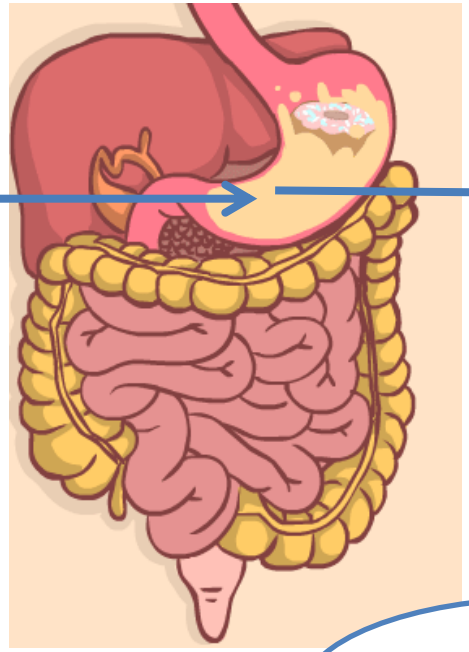
Incretins

Incretins

Meal Ingestion



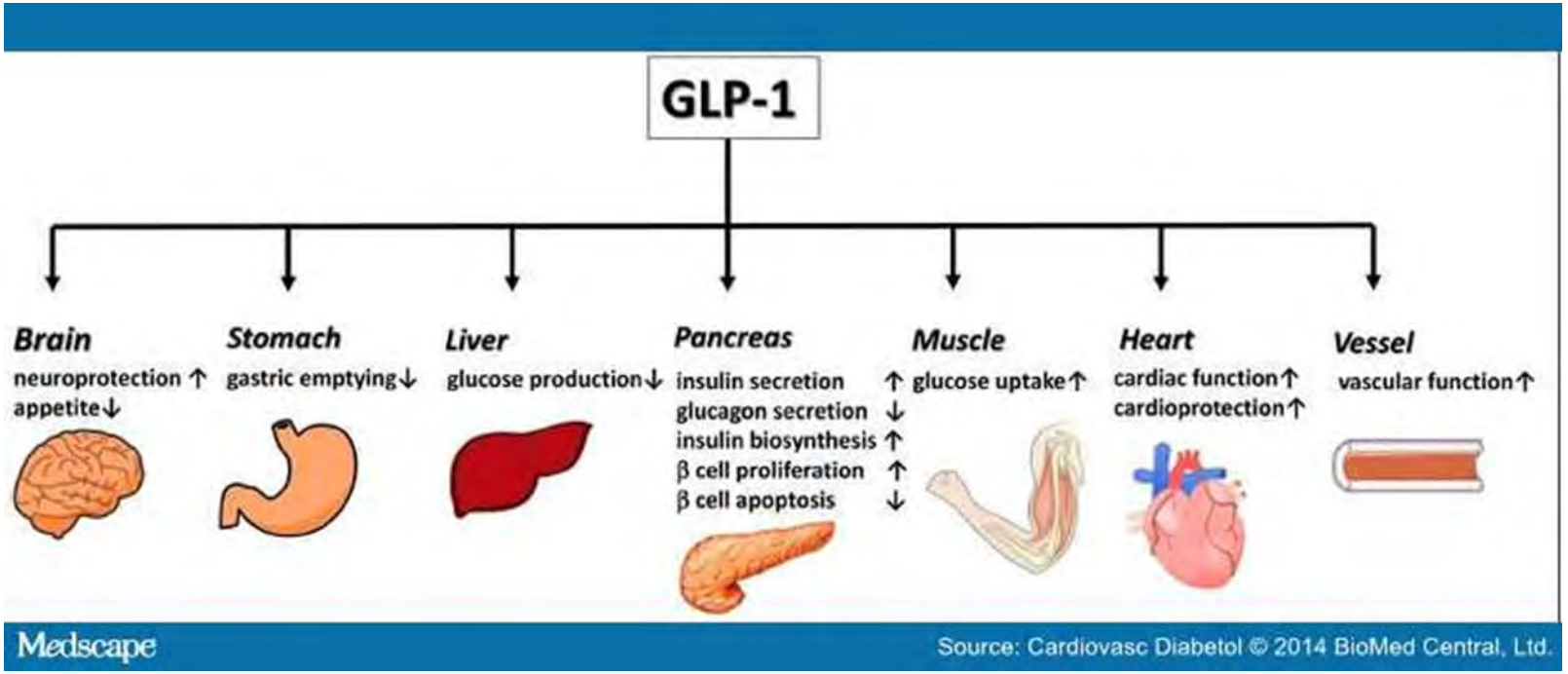
Secretion of active GLP-1 and GIP (hormone)

DPP-4 (enzyme)

DPP-4 Inhibitor

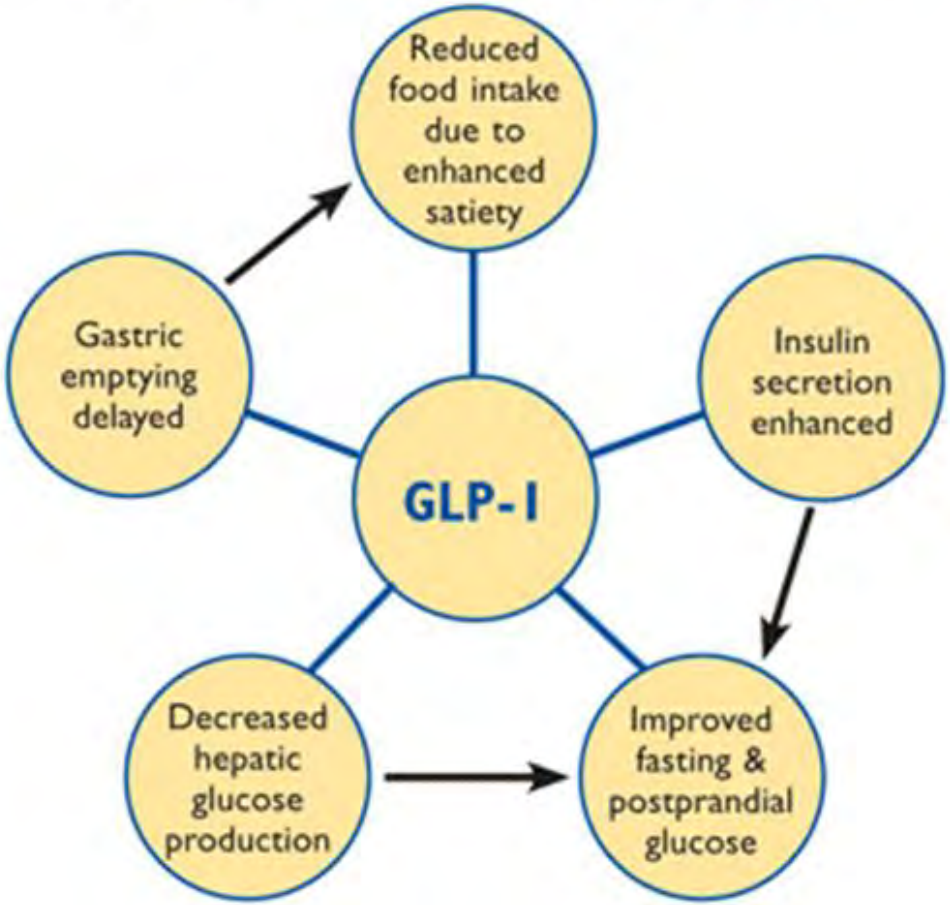
Inactive GLP-1 and GIP

GLP-1


GLP-1
Brain
neuroprotection ↑
appetite↓
Stomach
gastric emptying↓
Liver
glucose production↓
Pancreas
insulin secretion ↑
glucagon secretion ↓
insulin biosynthesis ↑
β cell proliferation ↑
β cell apoptosis ↓
Muscle
glucose uptake↑
Heart
cardiac function↑
cardioprotection↑
Vessel
vascular function↑
Medscape
Source: Cardiovasc Diabetol © 2014 BioMed Central, Ltd.

GLP-1

Figure 3. Mechanism of Action of GLP-1



GLP-1: glucagon-like peptide-1. Source: Reference 32.

GLP-1

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Glucagon-Like Peptide-1 (GLP-1) receptor agonists	Exenatide	Byetta	 5 µg par dose (1 x 1.2mL – 60 doses)  10 µg par dose (1 x 2.4mL – 60 doses)
Glucagon-Like Peptide-1 (GLP-1) receptor agonists	Liraglutide	Victoza	 6mg/mL (1 X 3mL – doses de 0.6mg, 1.2mg, 1.8mg

Not covered by ODB
$168-303/month

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GLP-1

Once per week injectable

Bydureon (exenatide extended release)

Trulicity (dulaglutide)

GLP-1 Weight Loss

Saxenda- liraglutide

Not covered by ODB
Up to $413/ month

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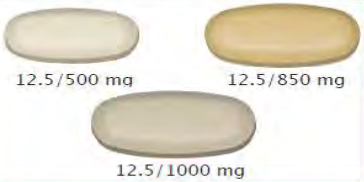
DPP-4 Inhibitors

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Dipeptidyl peptidase-4 inhibitors (incretin pathway)	Alogliptin	Nesina	 6.25 mg 12.5 mg 25 mg
Dipeptidyl peptidase-4 inhibitors and biguanides	Alogliptin and metformin	Kazano	 12.5/500 mg 12.5/850 mg 12.5/1000 mg
Dipeptidyl peptidase-4 inhibitors (incretin pathway)	Linagliptin	Trajenta	 5 mg
Dipeptidyl peptidase-4 inhibitors and biguanides	Linagliptin and metformin	Jentadueto	 2.5/500 mg 2.5/850 mg 2.5/1000 mg
Dipeptidyl peptidase-4 inhibitors (incretin pathway)	Saxagliptin	Onglyza	 2.5 mg 5 mg
Dipeptidyl peptidase-4 inhibitors and biguanides	Saxagliptin and metformin	Komboglyze	 2.5/500 mg 2.5/850 mg 2.5/1000 mg
Dipeptidyl peptidase-4 inhibitors (incretin pathway)	Sitagliptin	Januvia	 25 mg 50 mg 100 mg
Dipeptidyl peptidase-4 inhibitors and biguanides	Sitagliptin and metformin	Janumet	 50/500 mg 50/850 mg 50/1000 mg
Dipeptidyl peptidase-4 inhibitors and biguanides	Extended release sitagliptin and metformin	Janumet XR	 50/1000 mg

$100/ month

Not covered by ODB

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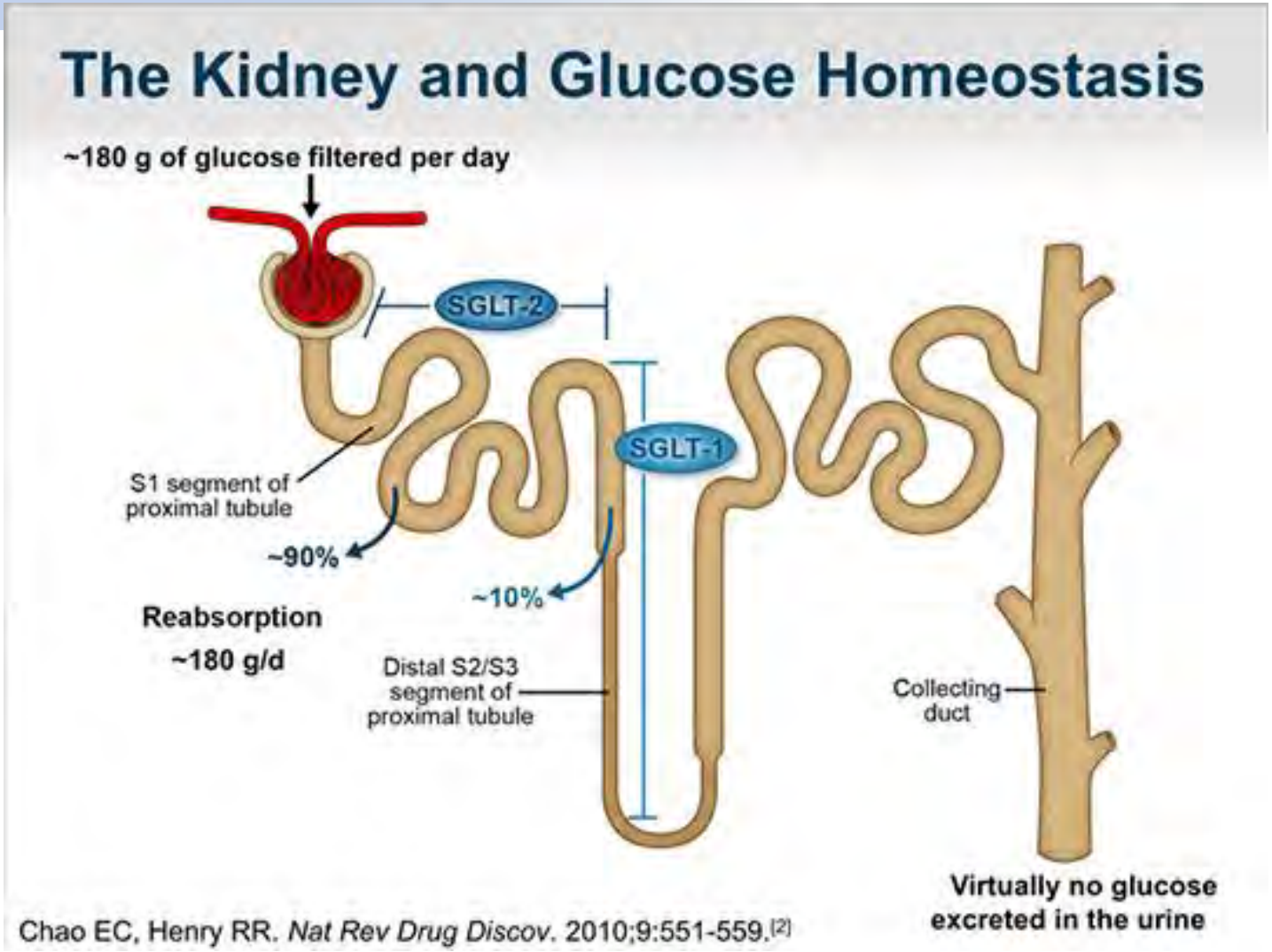
SGLT2


The Kidney and Glucose Homeostasis
~180 g of glucose filtered per day
SGLT-2
SGLT-1
S1 segment of proximal tubule
~90%
Reabsorption
~180 g/d
~10%
Distal S2/S3 segment of proximal tubule
Collecting duct
Virtually no glucose excreted in the urine
Chao EC, Henry RR. *Nat Rev Drug Discov*. 2010;9:551-559.[2]

SGLT2

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Inhibitor of sodium glucose co-transporter 2 (SGLT2)	Canagliflozin	Invokana	 100 mg 300 mg
Inhibitor of sodium glucose co-transporter 2 (SGLT2)	Dapagliflozin	Forxiga	 5 mg  10 mg
Inhibitor of sodium glucose co-transporter 2 (SGLT2)	Empagliflozin	Jardiance	 10 mg  25 mg

$100/ month

Increase fluid intake

TZD

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Thiazolidinediones	Pioglitazone	Actos	 15 mg 30 mg 45 mg
Thiazolidinediones	Rosiglitazone	Avandia	 2 mg 4 mg 8 mg
Thiazolidinediones and biguanides	Rosiglitazone and metformin	Avandamet	 2/500 mg 2/1000 mg 4/500 mg 4/1000 mg

Alpha-glucosidase Inhibitors

Class	Drugs	Brand name (non-exhaustive list)	Commercial presentation
Alpha-glucosidase inhibitors	Acarbose	Glucobay	 50 mg  100 mg

Hypoglycemia Treatment:
Glucose Tablets
Milk

Medications for Hypertension

Target 130/80 mmHg

Medications for Hypertension

Who do you treat?

- Over 55, use an ACE or ARB
- Under 55, with PAD, CVD, microvascular or macrovascular complications, use an ACE or ARB
- Anyone whose Blood pressure is above the target, use an ACE or ARB

Medications for Hypertension

Combination of 2 first line drugs may be considered as **initial therapy if the blood pressure is above target:**

≥ 20 mmHg systolic

or

≥ 10 mmHg diastolic

Three drugs may be required to reach target.

Medications for Hypertension- Monitoring

Monitor serum potassium and creatinine in patients with CKD prescribed an ACEI or ARB.

Combinations of ACEI and ARB are generally not recommended in the absence of proteinuria.

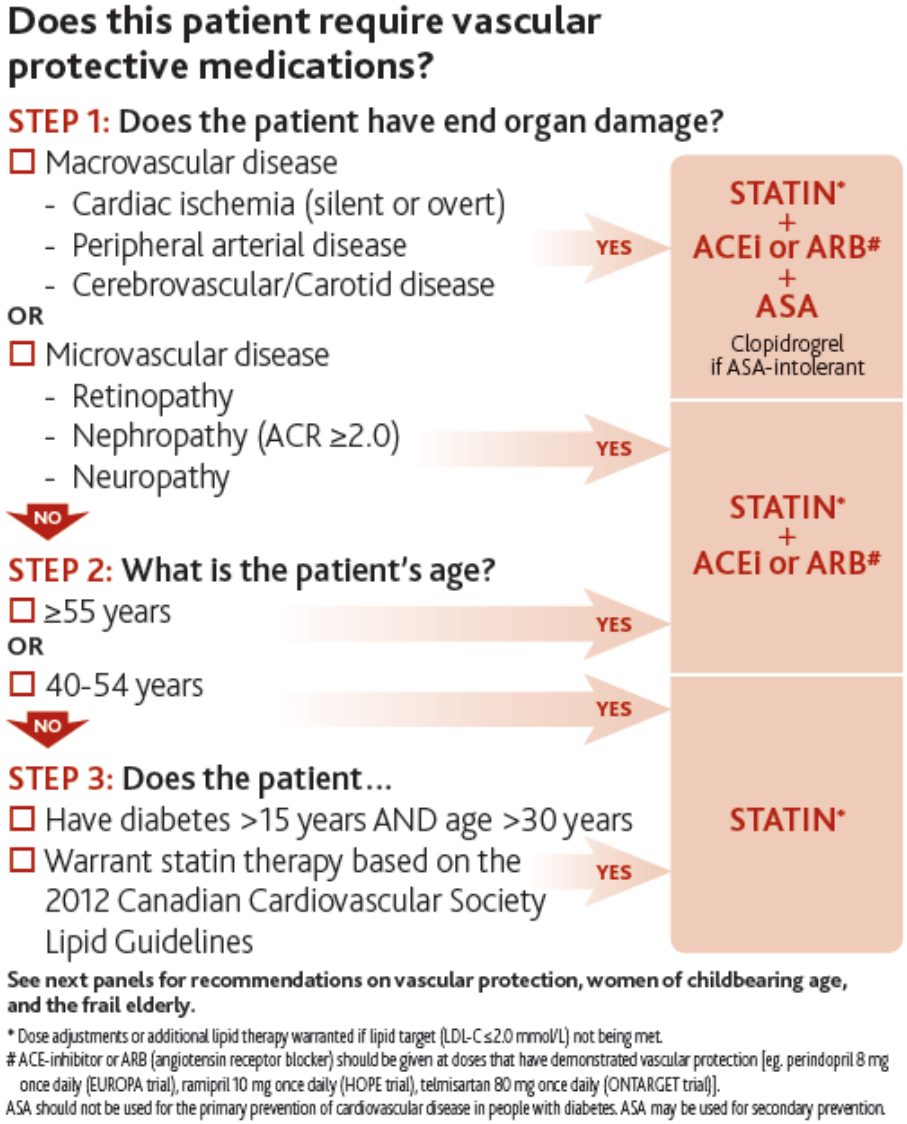
Medications for Hypertension- ACE (Angiotensin Converting enzymes)

Generic Name	Brand Name
Quinapril	Accupril, generic
Ramipril	Altace, generic
Captopril	Capoten, generic
Perindopril	Coversyl
Benazepril	Lotensin, generic
Cilazapril	Inhibace, generic
Lisinopril	Prinivil, Zestril, generic
Fosinopril	Monopril, generic
Enalapril	Vasotec, generic
Trandolapril	Mavik

Medications for Hypertension ARB (Angiotensin II Receptor Blockers)

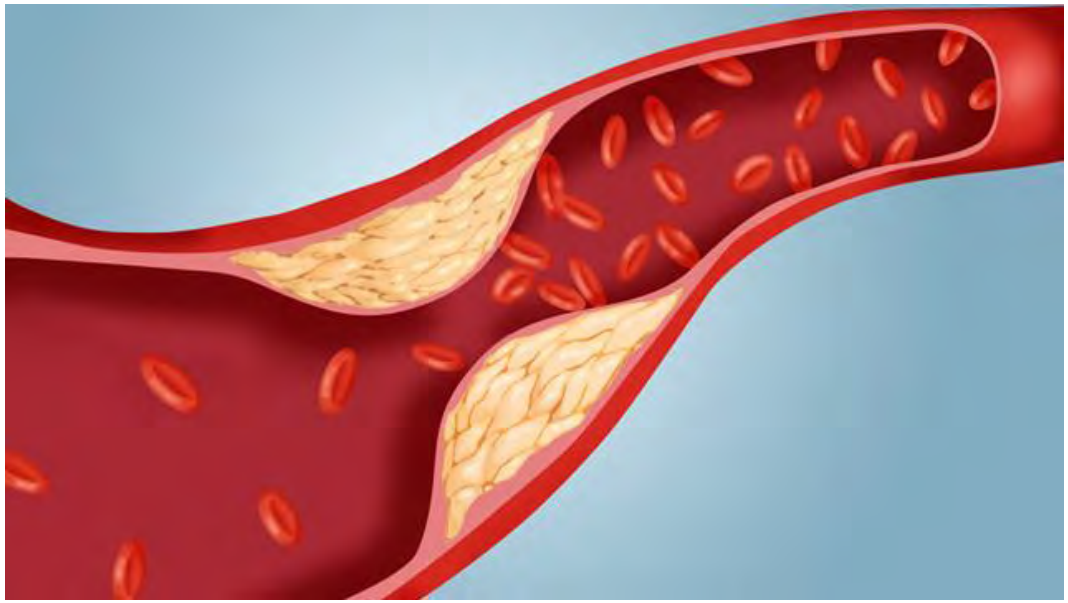
Generic Name	Brand Name
Candesartan	Atacand
Eprosartan	Teveten
Irbesartan	Avapro
Losartan	Cozaar
Telmisartan	Micardis
Valsartan	Diovan
Olmersartan medoxomil	Benicar
Azilsartan	Edarbi

Reducing Vascular Risk



Medications for Hyperlipidemia

Target LDL-C ≤ 2.0mmol/l



Medications for Hyperlipidemia

Statins

Generic Name	Trade Name
Atorvastatin	Lipitor
Fluvastatin	Lescol
Lovastatin	Mevacor, generic
Pravastatin	Pravachol, generic
Rosuvastatin	Crestor, generic
Simvastatin	Zocor, generic

Medications for Hyperlipidemia

Other Medications

- Bile acid seqestrants
- Cholesterol absorption inhibitors
- Fibrates
- ~~Nicotinic acid~~

Medication Changes during Illness

S sulfonylureas
A ACE- inhibitors
D diuretics, direct renin inhibitors

M metformin
A angiotensin receptor blockers
N non-steroidal anti-inflammatory
S SGLT2 inhibitors

Sample Question 1

Seema is presently on glimipride and metformin. Acarbose has been added as the A1C is still elevated.

What would be the most important information to tell her about this change in medication?

a) Acarbose does not cause hypoglycemia

b) Fruit juice is the best way to treat hypoglycemia

c) Hypoglycemia must be treated with glucose tablets or milk

d) Hypoglycemia is best treated with food e.g. crackers

e) If hypoglycemia occurs the metformin should be reduced.

Sample Question 1

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✔c) Hypoglycemia must be treated with glucose tablets or milk

d) Hypoglycemia is best treated with food e.g. crackers

e) If hypoglycemia occurs the metformin should be reduced.

Sample Question 2

Alfred is 75 and has recently returned home after an MI. His eGFR is 60. His present medications include glucophage 1 gm bid, lisinopril 40 mg od, atorvastatin 20 mg. He develops flu-like symptoms and is vomiting. What would you tell him about his medications?

a) Stop all medications as illness will decrease blood glucose
b) Stop lisinopril and atorvastatin
c) Stop glucophage and lisinopril
d) Continue with all medications

Sample Question 2

Alfred is 75 and has recently returned home after an MI. His eGFR is 60. His present medications include glucophage 1 gm bid, lisinopril 40 mg od, atorvastatin 20 mg. He develops flu-like symptoms and is vomiting. What would you tell him about his medications?

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b) Stop lisinopril and atorvastatin

✔c) Stop glucophage and lisinopril

d) Continue with all medications

Sample Question 3

Paula calls her diabetes educator as she has had 2 genital mycotic infections in the last two months. She reports that her blood sugars are in good control with FBS 5.6-7.1mmol/l and postprandial sugars all under 10 mmol/l. Her medications include glucophage 1 gm bid, repaglinide 1 mg tid and canagliflozin 100 mg, candesartan 16 mg. What is the most likely explanation?

a) Glucophage can cause dehydration
b) There is an increased risk of genital infections with canagliflozin
c) Repaglinide and glucophage should not be taken together
d) Repaglinide can cause dehydration and risk of genital infections

Sample Question 3

Paula calls her diabetes educator as she has had 2 genital mycotic infections in the last two months. She reports that her blood sugars are in good control with FBS 5.6-7.1mmol/l and postprandial sugars all under 10 mmol/l. Her medications include glucophage 1 gm bid, repaglinide 1 mg tid and canagliflozin 100 mg, candesartan 16 mg. What is the most likely explanation?

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✔ b) There is an increased risk of genital infections with canagliflozin

c) Repaglinide and glucophage should not be taken together

d) Repaglinide can cause dehydration and risk of genital infections

Sample Question 4

Nasar (age 39) has had type 2 diabetes for 2 years. He has recently immigrated to Canada. His A1c is 8.4% and eGFR 110. He is on glucophage 1g bid. What class of medication would you recommend adding given his limited finances and no drug coverage.

a) DPP4
b) SGLT2
c) GLP-1
d) Sulfonylureas

Sample Question 4

Nasar (age 39) has had type 2 diabetes for 2 years. He has recently immigrated to Canada. His A1c is 8.4% and eGFR 110. He is on glucophage 1g bid. What class of medication would you recommend adding given his limited finances and no drug coverage.

a) DPP4

b) SGLT2

c) GLP-1

✔d) Sulfonylureas

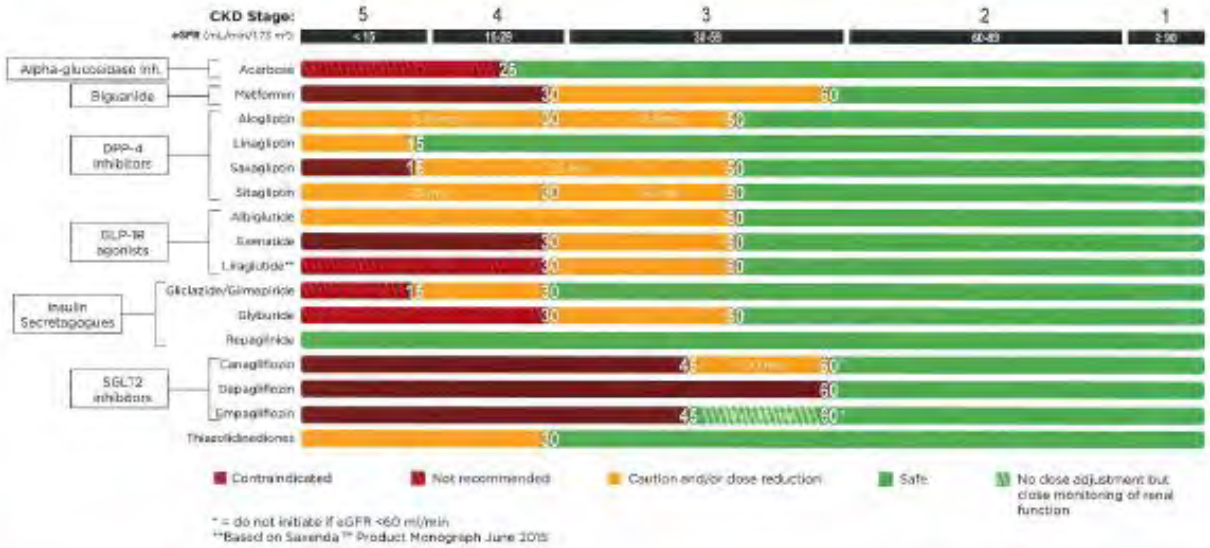
Questions

Contact me at: wendyg@langs.org

Spotlight on SGLT2 Inhibitors

As a thank you for having attended the "Spotlight on SGLT2 Inhibitors" program, here is a summary of key points of the program.

Antihyperglycemic Agents and Renal Function



* = do not initiate if eGFR <60 ml/min
**Based on Saxenda™ Product Monograph June 2015

Adapted from: Product Monographs as of July 2015; Harper W et al. *Can J Diabetes* 2015;39:250-252

Further information:
For key learnings of all FAQs and online versions of some tables included in this program visit: Uendocrine at http://www.uendocrine.com/SGLT2FAQ

For healthcare provider tools and resources visit the Canadian Diabetes Association's Clinical Practice Guidelines Website at: http://guidelines.diabetes.ca/

(The table contains information that has been presented during your participation in the Spotlight on SGLT2 Inhibitors program and ...)

50%