The Diabetes Tool

This was designed to support rational medication choices in the management of type 2 diabetes mellitus.

The choice of medication is a balance of:

-Benefits

-Costs

-Risks/side effects

-Renal function

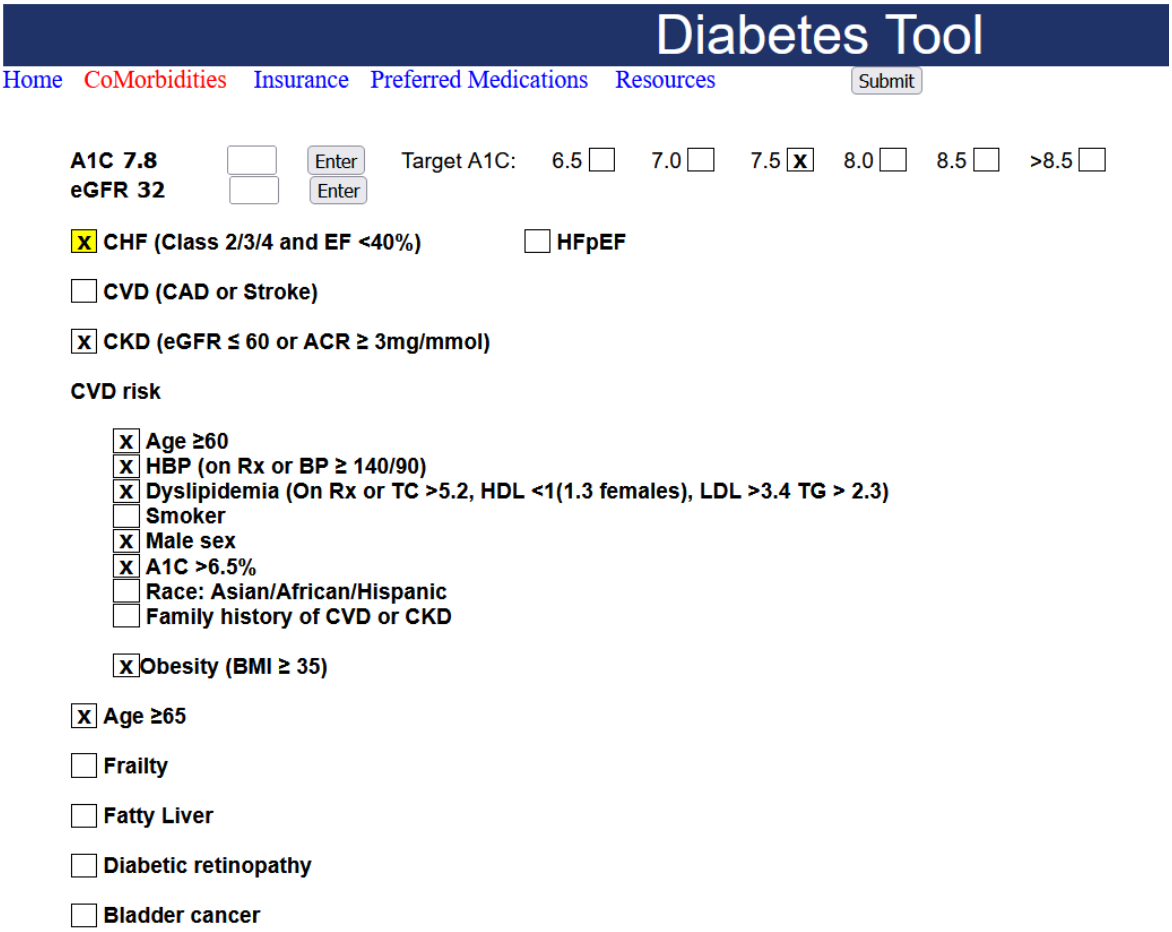
Using the tool:

There are five tabs to navigate on the top of the page

The default is the Home tab but you need to enter information in the next three tabs if you want to get any benefit from the tool.

1) **CoMorbidities**

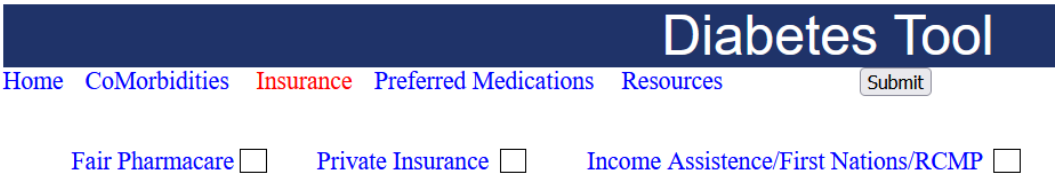
   Most should autopopulate, you may need to review CHF as ICD9 code 428 is non specific. Any change will be remembered.



2) Insurance

The cost, particularly of the newer medications, is a big factor in what patients are prescribed. Understanding insurance is very complex and this tries to simplify this.

First select **ONE** of three insurance groups.

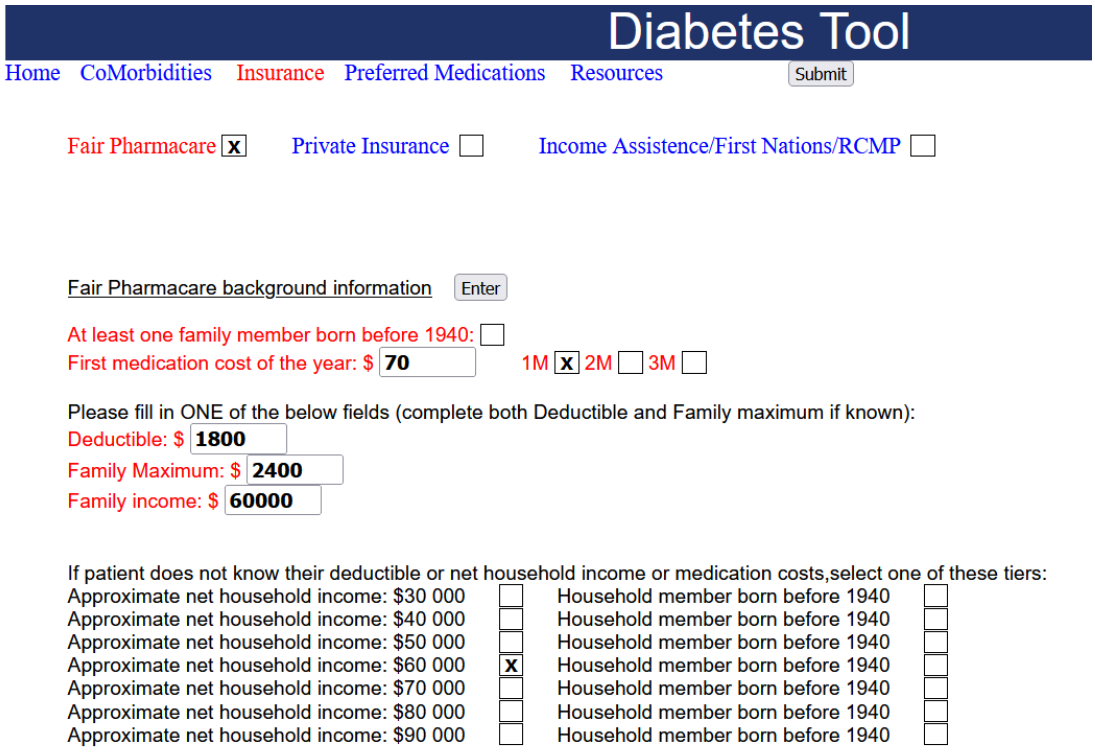


‘Fair Pharmacare’ will likely be the most common insurance

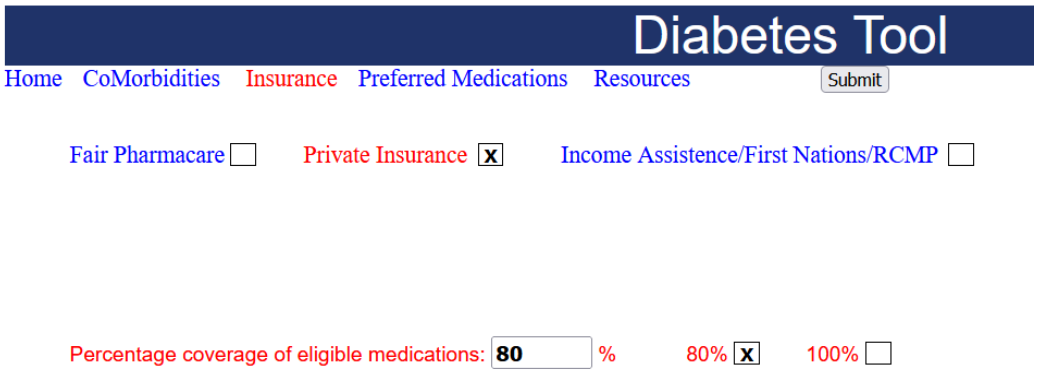
To do the calculations you need to know two numbers:

1) The actual annual cost of the pharmacare approved medications. To estimate this you ask the patient the cost of their medications at the beginning of the year.
2) **One** of Deductible/Family Maximum/Family Income.
3) If unable to get the above you can use one of the income estimate tiers (which uses $70/month as the medication costs).

Once you get these two numbers and input them, the calculator will estimate the cost to the patient of any new pharmacare eligible medications. Below I used one of the estimated income tiers.

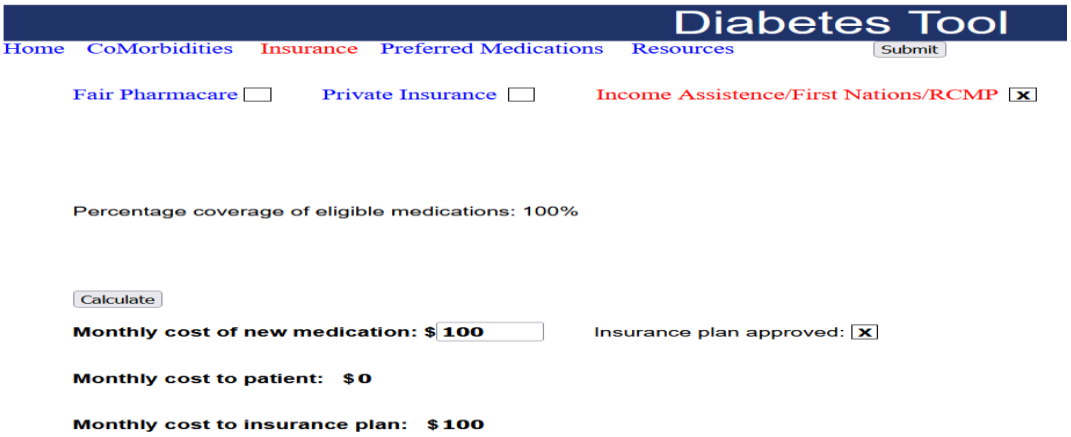


With Private insurance, the commonest coverage is 80% although there are often variable rules. You can put any number into the percentage box or use the quick select options.



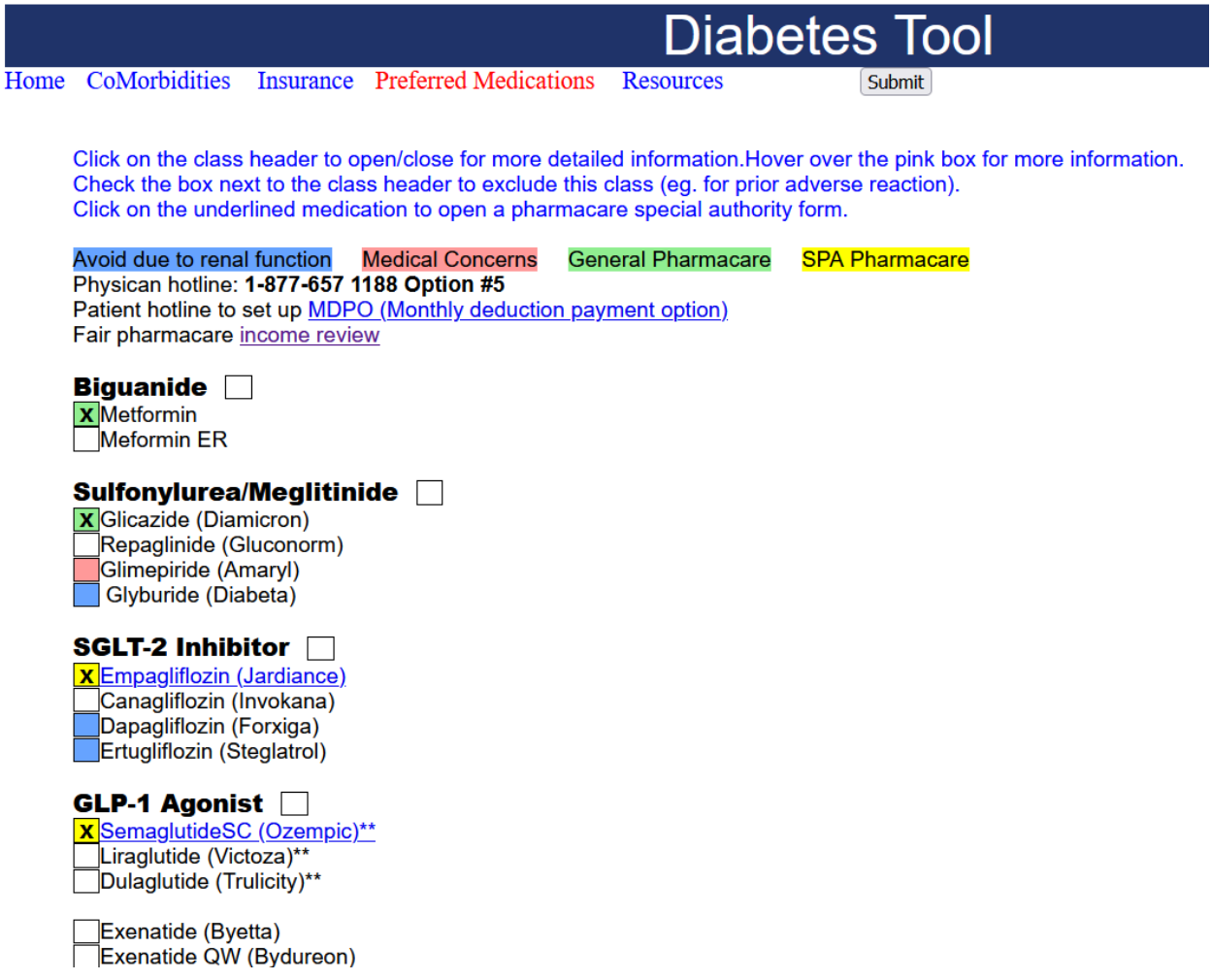
If you select **Income Assistance/First Nations/RCMP** then it is presumed there is 100% coverage for pharmacare approved medications.

At the bottom of each page is a calculator that approximates the patient cost for the medication.

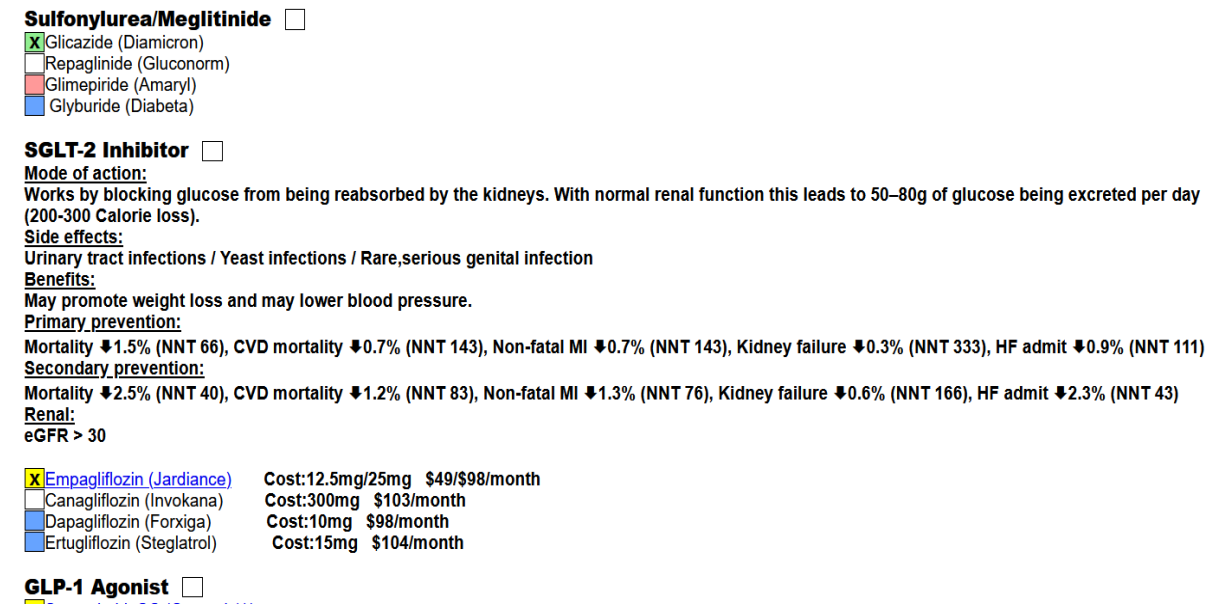


3) Preferred Medications

This is the page where you can select your favorite medication in each class. It comes auto selected and will likely not require change as the choices are driven by pharmacare coverage.
In this example the patient has an eGFR of 32 , so the medications with blue boxes are not recommended. Renal dosing is complicated as there are different guidelines. This tool uses the guideline by Dr Yale (see in resources).



Clicking on the medication class will open up information on the class including approximate medication costs (as of March 2022). In resources there is a link to a website to update costs if needed.



Sulfonylurea/Meglitinide ☐
- [X] Glicazide (Diamicron)
- [ ] Repaglinide (Gluconorm)
- [ ] Glimepiride (Amaryl)
- [ ] Glyburide (Diabeta)

SGLT-2 Inhibitor ☐

Mode of action:
Works by blocking glucose from being reabsorbed by the kidneys. With normal renal function this leads to 50–80g of glucose being excreted per day (200-300 Calorie loss).

Side effects:
Urinary tract infections / Yeast infections / Rare,serious genital infection

Benefits:
May promote weight loss and may lower blood pressure.

Primary prevention:
Mortality ⬇1.5% (NNT 66), CVD mortality ⬇0.7% (NNT 143), Non-fatal MI ⬇0.7% (NNT 143), Kidney failure ⬇0.3% (NNT 333), HF admit ⬇0.9% (NNT 111)

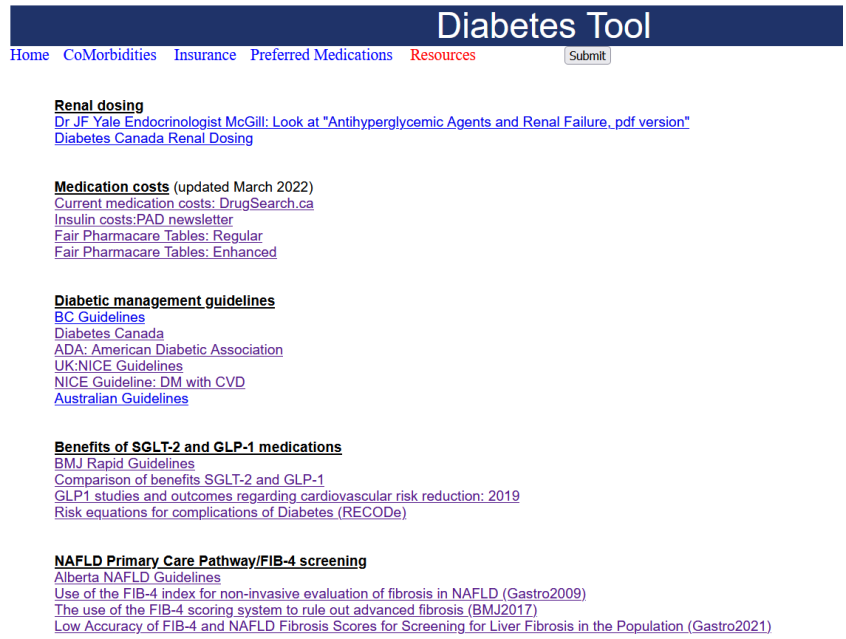
Secondary prevention:
Mortality ⬇2.5% (NNT 40), CVD mortality ⬇1.2% (NNT 83), Non-fatal MI ⬇1.3% (NNT 76), Kidney failure ⬇0.6% (NNT 166), HF admit ⬇2.3% (NNT 43)

Renal:
eGFR > 30

- [X] Empagliflozin (Jardiance) **Cost:12.5mg/25mg $49/$98/month**
- [ ] Canagliflozin (Invokana) **Cost:300mg $103/month**
- [ ] Dapagliflozin (Forxiga) **Cost:10mg $98/month**
- [ ] Ertugliflozin (Steglatrol) **Cost:15mg $104/month**

GLP-1 Agonist ☐

Finally the **Resources** tab provides links to the main resources used to create this tool.



Diabetes Tool

Home CoMorbidities Insurance Preferred Medications Resources Submit

Renal dosing
Dr JF Yale Endocrinologist McGill: Look at "Antihyperglycemic Agents and Renal Failure, pdf version"
Diabetes Canada Renal Dosing

Medication costs (updated March 2022)
Current medication costs: DrugSearch.ca
Insulin costs:PAD newsletter
Fair Pharmacare Tables: Regular
Fair Pharmacare Tables: Enhanced

Diabetic management guidelines
BC Guidelines
Diabetes Canada
ADA: American Diabetic Association
UK:NICE Guidelines
NICE Guideline: DM with CVD
Australian Guidelines

Benefits of SGLT-2 and GLP-1 medications
BMJ Rapid Guidelines
Comparison of benefits SGLT-2 and GLP-1
GLP1 studies and outcomes regarding cardiovascular risk reduction: 2019
Risk equations for complications of Diabetes (RECODe)

NAFLD Primary Care Pathway/FIB-4 screening
Alberta NAFLD Guidelines
Use of the FIB-4 index for non-invasive evaluation of fibrosis in NAFLD (Gastro2009)
The use of the FIB-4 scoring system to rule out advanced fibrosis (BMJ2017)
Low Accuracy of FIB-4 and NAFLD Fibrosis Scores for Screening for Liver Fibrosis in the Population (Gastro2021)

Once the information is entered the user returns to the Home screen. These changes will be remembered on subsequent opening in the patient chart
The recommendations are derived from the comorbidities and renal function.
The recommendations follow more along the British guidelines than North American guidelines as they make more evidence based sense (less emphasis on GLP-1 agents).
The button “SGLT-2/GLP-1 NNT” opens up a useful chart to discuss benefits of these medications with patients and in resources; “BMJ Rapid Guidelines” and “Comparison of benefits SGLT-2 and GLP-1” are helpful online tools.

At the bottom of the Home tab is the original recommendation support which is now depreciated in the tool. You can click either UK or CA to open up the recommendations. This has now been integrated with the regular recommendations
The link button will take you to the actual reference (to UK or CA depending which is active at the time).

Welcome to the diabetes toolkit

Please start by updating the CoMorbidities,Preferred Medications and Insurance tabs above.
Once completed click in the medication selection box below and check the 'next' box to add more medications.

A1C: **7.5** 1M A1C Target: **7** eGFR: **32** 0M Age: **41** FIB-4: **0.96** Fibrosis stage: **0-1**

Medication selection:

Step one: Metformin_Glucophage Next [X] SPA Third DM Med
eGFR 30-44: Maximum 500mg BID

Step two: Glicazide_Diamicron Next [ ]
IR: Start 40mg OD and increase by 40mg weekly to max 160mg BID.
MR: Start 30mg OD and increase by 30mg weekly to max 120mg OD (Renal dosing eGFR <30)

Recommendations A1C not to target Refresh SGLT-2/GLP-1 NNT

Consider starting metformin.

Patient has CHF and CKD.
Recommend addition or substitution with a SGLT-2 medication.

Patient has more than 3 cardivascular risk factors.
Consider addition or substitution with a SGLT-2 medication.

BMI is 38.
If patient is interested in weight loss and can afford it, consider addition or substitution with a GLP-1.

FIB-4 score is negative for advanced fibrosis. Recommend repeat bloodwork every 2 years. Next due May 2024

SGLT-2/GLT-1 specific recommendations UK CA Link
Patients with established cardiovascular or renal disease.
We suggest SGLT-2 inhibitors or GLP-1 receptor agonists.

Clicking next then the empty medication selection box will provide a list of remaining medication options. You can enter up to four diabetic medications.

The insurance for this patient example has been entered as Fair Pharmacare with Family income of $40 000 and current monthly cost of pharmacare eligible medications of $70.

The calculator will work out the approximate extra cost per month of the new medication if pharmacare approved.

Click ‘Refresh’ to see new recommendations once you have made changes.

APPROXIMATE extra monthly cost (AVERAGED over the year) of new medication IF it is covered.

Empagliflozin_Jardiance:
SE:UTI/Vag yeast/⬇BP/⬆Lipids Benefits:⬇CVD/⬇CHF/⬇CKD/⬇Wt Cost:25mg $98/month
Patient cost: **$50/month**

SemaglutideSC_Ozempic:
SE:GIT upset/Pancreatitis/DM Retinopathy/AKI/Thyroid Ca/Cholecystitis/Hypersensitivity
Benefits:⬇⬇A1C/⬇Wt/⬇CVA/⬇CVD Cost: $295/month
Patient cost: **$63/month**

Linagliptin_Trajenta:
SE:Pancreatitis/Joint pain/Modest⬇BS Benefits:Use in CKD Cost:5mg $95/month
Patient cost: **$50/month**

NPH:
SE:Hypoglycemia/ weight gain/ lipoatrophy and lipohypertrophy Cost:1500u $50/month
Patient cost: **$36/month**

For information on screening for liver fibrosis with FIB-4 see the section in Resources- particularly the Alberta Pathway.

Here is the decision support logic:

1) Start with metformin - or insulin if metabolic decompensation evident (weight loss, dehydration, polyuria and polydipsia).
2) Add sulfonylurea if A1C does not reach target*
3) Consider starting with both if initial A1C >1.5% above target
4) Third line medications:**
   If there is CHF or CKD, SGLT2 is recommended (if eGFR >30)

If there is CVD risk consider SGLT2
If there is CVD consider SGLT2 or GLP1
If there is CVD and CKD, SGLT2 is recommended, GLP1 is alternative
If BMI ≥ 28 consider adding GLP1 if weight loss is desired

5) DPP4 are not very effective, but have very few side effects so can be trialed if the others are not tolerated.
6) Acarbose is not used much due to GIT side effects
7) TZD's may be making a comeback especially when there is associated fatty liver disease but are not recommended unless indicated.
8) Try to avoid sulfonylureas in the frail and elderly and when insulin is used (risk for prolonged hypoglycemia).
9) Diabetes is a risk factor for NAFLD which can progress to cirrhosis. FIB-4 testing is a non-invasive test for liver fibrosis that may help to detect patients earlier in this pathway and lead to management to reduce progression of fibrosis.

*Most private plans require patient to submit a request for special authority to pharmacare for the newer agents, and the use of both metformin and a sulfonylurea is a prerequisite so it is best for everyone to have been on both metformin and a sulfonylurea at some point.

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CHF: NYHA 2-4 and EF <40%

CKD: eGFR ≤ 60 or ACR ≥ 3 mg/mmol

CVD risk: 4 of >60yrs/Male/Race/FH /Smoking/Lipids/↑BP/ ↑A1C

CVD: Diagnosed CAD or Stroke