

Quality Improvement at thepatientclinic.ca

The multi-faceted approach to diabetes care has been shown to be highly effective in reducing the mortality and morbidity in type 2 diabetes. From the STENO-2¹ study, an intensive, multi-factorial intervention reduced the absolute risk of death from any cause by 20% among patients with type 2 diabetes and microalbuminuria who received intensive therapy over the course of 13.3 years (7.8 years of multifactorial intervention and an additional 5.5 years of follow-up) compared with those who received conventional therapy. The absolute risk of death from cardiovascular causes was reduced by 13% among those receiving intensive therapy. Intensive intervention to address multiple risk factors was also associated with lower rates of nephropathy (by 56%) and retinopathy (by 55%) over 13 years relative to conventional therapy.

Multiple risk factor reduction is the standard for diabetes care today. Delivering the care for addressing these risk factors remains a large challenge given the resource-intensive requirements. We have identified the following modifiable risk factors and markers of diabetes care to improve the current care provided at Vancouver Coastal Health using the novel electronic health record system (EHR), thepatientclinic.ca.

Within thepatientclinic.ca, information from a patient's history, physical examination, and investigations are entered with respect to the established markers of diabetes care:

Weight/Body mass index

Glucose control (Hemoglobin A1c)

Blood Pressure

Serum lipids (LDL-c)

Smoking status

Ophthalmologic care

Furthermore, this EHR is able to flag the above markers within an individual's her that do not meet defined targets (by default those recommended by the Canadian Diabetes Association).. There is increasing evidence showing that informatics-supported care, using algorithms based on current practice guidelines, improves health outcomes^{2,3,4}. This document outlines quality improvement measures that may be employed by the EHR in order to improve mortality and morbidity within the diabetic population in British Columbia.

Weight and Body Mass Index

There is extensive literature to suggest modest weight reductions lead to improved

¹ Gæde P, Vedel P, Larsen N, Jensen GV, Parving HH, Pedersen O: Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. *N Engl J Med* 348:383–393, 2003

² Ziemer DC, et al. An informatics-supported intervention improves diabetes control in a primary care setting. *AMIA Annu Symp Proc.* 2006:1160.

³ Miller CD, et al. Use of a glucose algorithm to direct diabetes therapy improves A1c outcomes and defines an approach to assess provider behavior. *Diabetes Educ.* 2006 Jul-Aug;32(4):533-45.

⁴ Bosworth HB, et al. Take Control of Your Blood Pressure (TCYB) study: a multifactorial tailored behavioral and educational intervention for achieving blood pressure control. *Patient Educ Couns.* 2008 Mar;70(3):338-47. Epub 2007 Dec 31.

mortality and morbidity outcomes in pre-diabetics^{5, 6} and diabetics(ref 7?). Intentional weight loss seems to have a positive effect for diabetes outcomes in the long term, particularly if maintained. This long-term commitment seems to be more successful if multifaceted interventions are used that combine diet, physical activity, and behavioral therapy. The current evidence is that lifestyle interventions are more effective than pharmaceutical interventions in preventing T2DM for some individuals. However, the evidence is mainly for those individuals who are already obese.

Interestingly, certain other behaviors have been associated with a lower BMI, including regular self-weighing and breakfast consumption⁷. Because there are such complex interactions between an individual's psyche, their environment, and their available resources to follow through with weight loss regimens, it makes sense to have a broad range of options for weight loss offered to an individual, and to work on their individual preferences for establishing a plan they can live with.

When the clinicians at thepatientclinic.ca assess the patient, their BMI is calculated automatically from the height and weight measured at the initial visit. If the BMI is elevated, the physician will then have to address the problem with a three-step approach:

1. Assess diet
2. Assess physical activity
3. Develop concrete action plan and goals for lifestyle change

Aim:

Currently ___% of patients have a BMI over 25. Using the diet and physical activity interventions, we hope to reduce each overweight/obese patient's BMI by 5% over one year.

Diet

Diet is a cornerstone in diabetes management that can produce absolute reductions in A1c of 1.0-2.0%. However, diet can be difficult to assess due to a patient's recall bias. In order to gauge a patient's dietary habits, the clinician needs to determine whether a patient has sound nutritional knowledge and is actually using that knowledge in their dietary habits. As the CDA guidelines state, "Nutrition therapy should be based on individual needs, be regularly evaluated and reinforced in an intensive manner and be part of self-management programs." An EHR can aid the clinician by both identifying which areas the patient is lacking knowledge, and provide an area where the patient can record their food consumption for the assessment team.

Intervention:

The patient will be given an electronic questionnaire at registration to assess their baseline nutrition in the form of a 24 hour food recall, which the patient may also fill out

⁵ J. Tuomilehto, J. Lindstrom, J.G. Eriksson, T.T. Valle, H. Hanalainen and P. Ilame-Parikka et al., Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance, *N Eng J Med* 344 (2001), pp. 1343-1350.

⁶ X.R. Pan, G.W. Li, Y.H. Hu, J.X. Wang, W.Y. Yang and Z.X. An et al., Effects of diet and physical activity in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study, *Diabetes Care* 20 (1997), pp. 537-544.

⁷ Raynor HA, Jeffery RW, Ruggiero AM, Clark JM, Delahanty LM, the Look AHEAD (Action for Health in Diabetes) Research Group: Weight loss strategies associated with BMI in Overweight Adults with Type 2 Diabetes at Entry into the Look AHEAD (Action for Health in Diabetes) Trial. *Diabetes Care* 31:1299-1304, 2008

online prior to the visit. This questionnaire information will be directly implemented into the EHR. The questionnaire will also assess their basic nutrition knowledge (Appendix A) and was developed using instruments from the Sanford University Patient Education Research Center⁸.

The physician will then review the questionnaire with the patient and check the appropriate assessment tick box under the nutrition section for either:

- Not meeting nutritional goals
- Meeting nutritional goals

If the patient is not meeting nutritional goals, the doctor will gauge the patient's motivation and what type of help they are seeking from the questionnaire, and then point the patient to appropriate treatment/resources (Also Appendix A). The patient will also be given an eating-well nutrition package, which will also be available on thepatientclinic.ca based on CDA patient handouts. The doctor will then develop an action plan and goal with the patient based on the patient's preferences and record this in the nutrition goal section of the EHR. If the patient is incapable of making a realistic goal or does not know where to start, the patient will be referred to a dietitian and/or a diabetes case manager.

If the patient cannot read the package due to language barrier, the patient will then be assigned a diabetes case manager who will spend more time and go through the package with the patient and any supportive family members who can translate/VCH translator. If the patient is Chinese/Vietnamese/Spanish/Punjabi speaking, they will be referred to the language-specific diabetes program available through the local health authority.

The most consistently effective method of diet-based weight loss, regardless of macronutrient composition, is calorie restriction⁹. There is a lack of long term outcome data with regards to extreme macronutrient diets, however, it is clear that adherence to such diets is poor, even in the short term. As evidenced by the multi-billion dollar diet industry, there is no one-fits-all diet plan. However, there are approaches and educational strategies to get people to understand and comply with calorie restriction. If the patient continues to struggle with meeting nutritional goals despite the above interventions, the patient will then be formally referred to one of the following plans based on the patient's financial situation:

Healthiest Winner VCH Program

DASH www.thedashdiet.org

Weight Watchers www.weightwatchers.com

Jenny Craig www.jennycraig.com

Physical Activity

Physical activity counseling tends to be an area neglected by internal medicine physicians because of lack of knowledge in patient counseling¹⁰. A systematic review and meta-

⁸ <http://patienteducation.stanford.edu/research/>

⁹ Sacks, Frank M., Bray, George A et al. Comparison of Weight-Loss Diets with Different Compositions of Fat, Protein, and Carbohydrates. N Engl J Med 2009 360: 859-873

¹⁰ Rogers LQ, Gutin B. et al. Evaluation of internal medicine residents as exercise role models and associations with self-reported

analysis found that supervised programs involving aerobic or resistance physical activity improved glycemic control in adults with type 2 diabetes¹¹. Using these principles, a patient's physical activity background and capacity to perform physical activity will be assessed using a physical activity questionnaire that has been developed by Healthy Living BC. (See Appendix C). This questionnaire will then allow the EHR to match up whether the patient is meeting recommendations for physical activity as suggested in the CDA Practice Guidelines 2008.

Intervention:

If the patient is meeting physical activity targets, the EHR automatically records this in the physical activity section. If the patient is not meeting physical activity targets, the physician will then identify whether where the patient is suited to a physical activity regimen. Under the physical activity section, there will be a fitness assessment checklist:

- autonomic neuropathy
- severe peripheral neuropathy
- preproliferative or proliferative retinopathy
- angina

If any of those conditions are present, the clinician will order a stress test or other appropriate investigation/referral before commencing physical activity.

If the patient is suitable for a physical activity plan, a physical activity action plan will be determined using the following algorithm based on the WalkBC program¹²:

1. Assess patient's motivation to follow a physical activity regimen.
2. If the patient is not motivated at all to change their habits, a formal referral to a recreation therapist/diabetes case manager will be made.
3. If a patient has some motivation to start a program, they will be given a pedometer with an aim of reaching 10000 steps/day. The EHR will allow the patient to upload their steps and track their progress. For patients that are less comfortable with technology, a phone system will allow the patient to call in with their results once a week.
4. If the patient does not meet the goal within 6 weeks, a diabetes case manager will be identified and follow up with the patient to investigate why goals are not being met.

Follow Up:

The EHR will allow the patient to log his/her weight and calculate the BMI as frequently as the patient wishes. The recommendation will be that the patient track his/her own weight on a weekly basis. If there is no reduction in BMI after 6 months of lifestyle modification, the patient will be automatically identified by the EHR and a follow up appointment will be made to discuss the reasons for the lack of progress and to start pharmacological therapy for obesity at that time.

counseling behavior, confidence, and perceived success. *Teach Learn Med.* 2006 Summer;18(3):215-21.

¹¹ Boulé NG, et al. Effects of physical activity on glycemic control and body mass in type 2 diabetes mellitus: a meta-analysis of controlled clinical trials. *JAMA.* 2001 Sep 12;286(10):1218-27.

¹² Nayor, PJ. British Columbia Parks and Recreation Pedometer Pilot Project. 2006. www.walkbc.ca

Outcome measures:

The patient's dietary motivation and progress will be measured each visit using the nutrition assessment. Physical activity will be assessed using pedometer measurements, exercise times and where available VO2 max. Weight and BMI will be measured at baseline and at one year's time for each individual patient.

Glucose Control

Aim:

A lower A1c has been shown to be associated with fewer diabetic microvascular complications (reference UKPDS, ACCORD etc – see attachment CONTROL paper in my email to you) and potentially for macrovascular complications (reference CONTROL paper itself). The current recommendation is to target a A1c of less than 7.0. Currently _____% of Dr Elliott's patients have a A1c above 7.0. We wish to reduce this number by 50% over the course of one year.

In the EHR, the A1c is automatically categorized once the patient's bloodwork is entered in the system. This number will be graphed with the previous measures. The A1c will be flagged if it is above 7.0, and the EHR will give the clinicians a choice of options:

Lifestyle management

Medication

Other: Please specify _____

The first treatment goal centers on lifestyle changes, as outlined above. If a patient's initial consultation A1c >9.0, pharmacological therapy will be initiated (if not already) in addition to lifestyle changes. Should the patient not have any reduction in A1c over 3 months of initiating lifestyle changes, pharmacological therapy will be suggested based on an algorithm from the CDA 2008 Practice Guidelines (see Figure 1). The physician will then record the choice of therapy in the EHR.

To try and reduce clinical inertia, this Glucose Control section will require an action by the physician every time an A1c is uploaded to the system by the laboratory.

Outcome measures:

A1c will be measured at baseline and 1 year from baseline.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Blood Pressure

Currently ___ % of patients in Dr. Elliott's practice are not meeting the recommended systolic blood pressure target of 130 mmHg (level C evidence) and a diastolic blood pressure target of 80 mmHg (level B evidence). Using a hypertension flow sheet embedded in the EHR, we hope to reduce this number to 25% over the course of 1 year.

At present, patients have their blood pressure measured at each visit.

Blood pressure targets according to the Canadian Diabetes Association and the Hypertension Society of Canada have been set at 130/80mmHg.

Intervention:

In the EHR employed by Dr. Elliott, the blood pressure measurement is recorded with each visit. This number will be graphed with the previous measures. If the mean systolic blood pressure over the last 3 visits is over 130 mmHg or if the diastolic blood pressure is over 80mmHg, the EHR will prompt the clinician to take action by either:

Lifestyle management

Medication

Other: Please specify _____

Lifestyle Changes

For the lifestyle component, patients will be given information on how to achieve the CDA guidelines on physical activity and nutrition.

Medications

As recommended by the CDA guidelines, the following algorithm will be implemented with a set of drop down menus showing recommended medication options. There will be a blank option that the clinician may alter should the options not reflect his or her medication of choice in that setting.

For persons with diabetes and normal urinary albumin excretion without chronic kidney disease, with BP >130/80mmHg despite lifestyle intervention, any of the following medications is recommended with special consideration to the ACE inhibitors (ACEi) and angiotensin receptor blockers (ARB), given their additional renal benefits:

- ACEi
- ARB
- Dihydropyridine calcium channel blocker (DHP-CCB)
- thiazide

If the listed medications cannot be tolerated, a cardioselective beta blocker or non-

dihydropyridine calcium channel blocker (non-DHP CCB) may be substituted. Additional antihypertensive drugs should be used if target BP levels are not achieved with standard dose monotherapy. Add on drugs should be chosen from the first line choices to reach target.

For persons with diabetes and albuminuria ($ACR \geq 2.0$ mg/mmol in men and ≥ 2.8 mg/mmol in women), and ACEi or ARB is recommended as initial therapy. The EHR will automatically identify the patient as being higher-risk, and automatically address whether the patient is on an ACEi/ARB, and if not, a reason must be given. If BP remains elevated after 3 months of starting monotherapy, additional medications should be used to obtain optimal BP control.

For persons with diabetes and normal urinary albumin excretion rate with no chronic kidney disease and with isolated systolic hypertension, a long active DHP-CCB is an alternative choice to an ACEi/ARB/thiazide.

Alpha-blockers are not recommended as first line agents.

Outcome measures:

The rates of patients achieving systolic and diastolic blood pressure targets will be reassessed one year after initiating this EHR system.

Serum Lipids

Aim:

Currently ___% of the type 2 diabetics in Dr. Elliott's practice are on a statin medication. At present, the CDA recommends that patients with additional cardiac risk factors or established vascular disease be on statin therapy, with a target LDL cholesterol of less than 2mmol/L. Using a dyslipidemia flow sheet embedded in the EHR, we hope to reduce this number to 25% over the course of 1 year.

Intervention:

An EHR algorithm will be developed. Firstly, there will be a list of tick boxes for vascular risk factors in the medical history. If more than one box is marked, the EHR will automatically identify and flag the patient as being higher risk and this will prompt the physician to address the lipids using one of three options marked in tick boxes:

Lifestyle management

Statin (drop down menu with specific drugs and dosages)

Other: Please specify _____

If not on statin, specify reason (drop down menu specifying myositis/increased liver enzymes/anaphylaxis/pt refusal)

Outcome measures:

The rate of statin usage in diabetic patients with one other vascular risk factor will be measured at the end of one year. Furthermore, specific information will be collected on

why the patient cannot tolerate a statin, which will allow analysis which may give information on further QI projects.

Smoking status

Aim:

Currently ____% of Dr. Elliott's patients are smokers. There is no consistent method for addressing smoking in the clinic at present. We aim to decrease this number by 50% over the course of the next year.

Intervention:

A comprehensive British Columbia government-funded program entitled "QuitNow" exists for any smoker or ex-smoker requiring motivation and advice on how to quit smoking. The program has 2 components: QuitNow By Phone and Quitnow.ca. The telephone program is run via "QuitNow councilors" who take the phone calls from patients through an established telephone protocol. QuitNow.ca is a comprehensive smoking cessation online resource, which includes education, motivation through message boards and electronic contact with QuitNow councilors, and a "medication wizard" which helps the patient decide whether pharmacotherapy is suitable. This program has been shown to be effective

As a quality improvement strategy, current smokers will be identified and the EHR will require an action to be taken. Under the EHR, if the smoker box is marked, there will also be a box which quantifies the number of cigarettes smoked daily by the patient. A drop down menu will appear and have the following management options:

Refer to QuitNow By Phone

Refer to QuitNow.ca

Medication

Patient refuses treatment

If the patient is referred to QuitNow, they will be instructed to follow up with the endocrinology clinic in 1 month's time regarding their progress, as tracked by number of cigarettes smoked daily. Re-evaluation of their smoking status and medications will be reviewed in a follow-up visit. If there is no reduction in cigarettes smoked daily, a follow up appointment will be booked to address the barriers to change.

Outcome measures:

Data will be collected regarding smoking status on a quarterly basis through automated telephone calls or online reminders, based on patient preference.

Role of a Diabetes Case Manager

The physician will identify patients not meeting 3 or more of the above indices and assign a diabetes case manager. The role of the diabetes case manager will be to focus on patient self-management principles, ensure appropriate follow up is made, and that investigations are carried out before patients are seen in follow up. Diabetes case managers will be trained in the Vancouver Coastal Health Chronic Disease Management course. They will also be trained in motivational interviewing, and telephone intervention. A successful telephone intervention based on chronic disease self-management principles has recently shown to be effective in not only reducing blood

pressure, but also A1c¹³.

Diabetes Report Card

Our intervention aims to educate the patient about their individual situation, and then offer a tailored, multi-faceted approach to improve their diabetes care. A patient's knowledge of his or her situation is the first step in establishing goals of care—a patient must be aware of what needs to change in order to change it. It is thus concerning to know that many patients do not know their own A1c levels¹⁴ or blood pressure targets^{15, 16}. It has also been shown that knowledge of a patient's diabetic status and cardiovascular risk alone does not change behaviours or outcomes¹⁷.

There is an increasing evidence that engaging the patient as an active manager of their health improves health outcomes¹⁸. Specifically, giving patients goals and “involving patients with their numbers”, allows the patients to visualize and action plan¹⁹. Patients will be able to view all elements of their Diabetes Report Card, and other health factors, online through a free patient subscription to thepatientclinic.ca. Through this subscription they will be able to share their EHR with all members of the “circle of care”, those involved in their health care including physician, Diabetes Case Manager, Nutritionist, exercise therapist, pharmacist. Furthermore they will be able to engage actively with the circle of care through telephone, and secure on-line email through the Q&A facility of thepatientclinic.ca.

In the diabetes report card, patients are educated about key measures and given graphical information tracking their progress on:

- Blood pressure
- A1c
- Weight/BMI
- LDL cholesterol

Using the graphical feedback, the members of the circle of care can reinforce the goal levels to the patient. Using self-management practices, the physician will then develop an action plan with the patient and record one behavioural change the patient agrees to embark on in order to reach the target level.

With regards to ongoing smoking, the patient will have a choice of methods to quit

¹³ Powers BJ, et al. The effect of a hypertension self-management intervention on diabetes and cholesterol control. *Am J Med.* 2009 Jul;122(7):639-46.

¹⁴ Heisler M, Piette JD, et al. The relationship between knowledge of recent HbA1c values and diabetes care understanding and self-management. *Diabetes Care.* 2005 Apr;28(4):816-22

¹⁵ Subramanian U, Hofer et al. Knowledge of blood pressure targets among patients with diabetes. *Care Diabetes.* 2007 Dec;1(4):195-8. Epub 2007 Oct 31.

¹⁶ Wong N, et al. Blood pressure control and awareness among patients with diabetes and hypertension attending a tertiary ophthalmic clinic. *Diabet Med.* 2009 Jan;26(1):34-9.

¹⁷ Shojania, K. et al. of Quality Improvement Strategies for Type 2 Diabetes on Glycemic Control: A Meta-Regression Analysis. *JAMA.* 2006;296(4):427-440.

¹⁸ Barnes CS, et al. Increasing patient empowerment and improving diabetes care by utilizing a computer-based patient "roadmap". *AMIA Annu Symp Proc.* 2006:852.

¹⁹ Ziemer DC, et al. An intervention to overcome clinical inertia and improve diabetes mellitus control in a primary care setting: Improving Primary Care of African Americans with Diabetes (IPCAAD) 8. *Arch Intern Med.* 2006 Mar 13;166(5):507-13.

smoking. If the patient is not contemplating to quit smoking, the patient will still be encouraged to connect with QuitNow for further education about the dangers of smoking.

There will also be a reminder for the patient when their next ophthalmology follow up is.
(See Appendix D)