FSG 900-01

METABOLIC SYNDROME AND DIABETES IN AIRCREW

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REFERENCES:

A. CFHS P&G 4000-16 Periodic Health Examination – Aircrew
B. Flight Surgeons Guideline 600-01 - Aircrew Cardiovascular Risk Screening
C. Flight Surgeons Guideline 1900-01 - Medications and Aircrew
D. 2013 Canadian Diabetes Association Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada
E. Canadian Task Force on Preventive Health Care, Screening for Type 2 Diabetes in the Adult Population 2012
F. NIH Adult Treatment Panel III 2004
G. Dietary Approaches to Stopping Hypertension

RECORD OF AMENDMENTS:

Date (DD/MMM/YY)	Reason for Change	OPI/SME	Fully Reviewed (Y/N)

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PURPOSE

1. The purpose of this Flight Surgeon Guideline (FSG) is to provide information regarding:

   a. Screening recommendations for Metabolic Syndrome (MetS) and Type 2 Diabetes (DM2) in aircrew;

   b. Diagnostic criteria for these conditions;

   c. Clinical approach to aircrew with these conditions including collaborative team care, lifestyle and pharmacologic therapy, targets of intervention, assessment for associated conditions and monitoring; and

   d. Administrative management including medical category, limitations and approach to CFHIS coding.

2. This FSG should be applied in conjunction with Refs A, B, and C.

ABBREVIATIONS

3. The following table contains abbreviations used in this guideline.

Abbreviation	Term in Full
1 Cdn Air Div	1 Canadian Air Division
1 Cdn Air Div Surg	1 Canadian Air Division Surgeon
A1C	Hemoglobin A1C
AGEs	Advanced Glycemic End-Products
AUMB	Air Undersea Medical Board
BMI	Body Mass Index (weight Kg/height in m^2)
CAD	Coronary Artery Disease
CFEME	Canadian Forces Environmental Medicine Establishment
DM2	Type 2 Diabetes Mellitus
ED	Erectile Dysfunction
HDL	High Density Lipoprotein
HSCRP	High Sensitivity C-Reactive Protein
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance on an oral glucose tolerance test
LDL	Low Density Lipoprotein

MetS	Metabolic Syndrome
OGTT	Oral Glucose Tolerance Test
OSA	Obstructive Sleep Apnea
SMBG	self-monitoring blood glucose device
TG	Triglycerides
PVD	Peripheral Vascular Disease
WC	Waist Circumference

INTRODUCTION

4. Industrialized countries are experiencing an epidemic of obesity, Metabolic Syndrome (MetS), Type 2 Diabetes (DM2) and consequent macrovascular and microvascular disease complications. These conditions are also prevalent in the CAF and represent a significant medical problem with potential impact on operational capability. A 2006 review of 1132 aircrew medical charts confirmed an overall prevalence of MetS of 13.7%, ranging from zero in SARTechs, less than 10% in pilots and ACSO, but greater than 20% in FEs, AESOps, and ACOps.

5. Obesity is an independent risk factor of early mortality and, along with its metabolic consequences it is associated with Obstructive Sleep Apnea (OSA), various cancers, and increased risk of altitude decompression sickness. Obesity management in aircrew will be addressed in a separate FSG (pending).

6. Impaired Fasting Glucose (IFG), Impaired Glucose Tolerance (IGT), and Diabetes Mellitus Type 2 (DM2) represent a spectrum of deranged glucose metabolism, the hallmarks of which include insulin resistance and dysglycemia. Inflammation, oxidative stress, and glycation end products (AGEs) are associated with this spectrum and contribute to endothelial dysfunction, atherosclerosis and aging. The combination of IFG and IGT carries the same macrovascular risk as DM2. DM2 is associated with a five-fold increase in risk of coronary artery disease (CAD), a two-fold increase in risk of stroke, a 17-fold increase in Peripheral Vascular Disease (PVD) and a three-fold increase in Alzheimer's disease. 80% of those with DM2 will die from vascular disease.

7. Controversy remains regarding the operational definition of the MetS and whether the risks associated with this syndrome are greater than the sum of its constituent risk factors. It is not yet clear which factor or combinations of factors comprising MetS are most important, but there is compelling evidence that increased waist circumference (WC) and fasting triglyceride (TG) levels; sometimes called the "HyperTriglyceridemic Waist", are the critical elements of risk in MetS. Pre-diabetes and Hypertriglyceridemic waist are not routinely incorporated in CV risk calculators (e.g., Framingham), and several studies have confirmed that these factors pose independent and additive risk to that derived from conventional calculators. Therefore, this guideline will continue to reference MetS.

8. The management approach to MetS and DM2 in CAF aircrew requires a programmatic, co-ordinated response at multiple levels. The operational aerospace medicine community (RCAF Surg, Air Div Surgeon, other AUMB members, Flight Surgeons, BAvMed providers) plays an important role in this response. Critical components include:

a. Education: Lifestyle medicine principles regarding nutrition, healthy weight and body fat maintenance, exercise, and stress management are important for both prevention and management of these conditions;

b. Screening: Aircrew periodic assessments must be sensitive for detection of these conditions while also being cost-effective and evidence-based; and

c. Interventions: Evidence-based standard approaches to management of Pre-Diabetes, MetS, DM2 exist and will be used. This FSG is based on Ref D and E which have been extensively updated since 2003. Note that although Ref D deals with both DM Types 1 and 2, the present FSG addresses only the latter. The Aerospace and Undersea Medical Board (AUMB) regards DM1 as a much more serious aeromedical occurrence, and patients are grounded upon diagnosis, and subsequently handled on a 'case-by-case' basis in consultation with the Medical Consult Services at CFEME and AUMB.

SCREENING AIRCREW FOR METS AND DM2

9. Please also refer to algorithm at Annex A

10. As per current PHA directives (Ref A), height, weight, BMI and waist circumference at the umbilicus will be recorded on all aircrew PHAs.

11. When Aircrew BMI exceeds 30, or waist circumference > 102 cm in males or 88 cm in females, the Diabetes Risk Calculator (Annex B) will be completed at the time of a Type I or Type II aircrew PHA.

12. Glycosylated hemoglobin (A1C) is the preferred method for screening for dysglycemia. A1C will be performed on aircrew PHAs as follows:

a. On every other Type 1 aircrew PHA (i.e., every four years) with concurrent cardiovascular screening tests (Annex A);

b. For any aircrew with a risk score exceeding 15 on the Diabetes Risk Score Calculator (see item 2) on Type I or Type II PHAs; and

c. For aircrew newly diagnosed with:

(1) Metabolic Syndrome

(2) Hypertriglyceridemic Waist Syndrome (TG > 1.7, WC > 102 cm in males, 88 cm in females).

13. Aircrew with A1C of 6% or higher, or A1C of 5.5% - 5.9% <u>plus any one</u> additional factor (see Annex C), require further assessment including:

a. OGTT;

b. Fasting lipids; and

c. HS-CRP.

DIAGNOSIS OF METS AND DM2

14. The diagnostic criteria for MetS will be in accordance with the US National Cholesterol Education Panel: Adult Treatment Program III (US NCEP:ATPIII) criteria. (Ref F, and Annex D) Note that certain populations (Native Canadians and South Asians) have lower thresholds for waist circumference (80 cm vs 88 cm in women and 90 cm vs 102 cm in men).

15. The diagnostic criteria for dysglycemia will be in accordance with Ref D (re-printed at Annex D). A1C of 6.5% or greater may now be used to diagnose DM2. A1C of 6% - 6.4% is diagnostic of Pre-Diabetes.

CLINICAL MANAGEMENT OF METS AND DM2

Team Approach

16. Interdisciplinary medical teams composed of a Flt Surg or BAvMed trained CAF resource, pharmacist, nursing officer, registered dietitian, exercise physiologist / kinesiologist and stress management specialist are advocated to assist with education and monitoring of patients with these lifestyle based problems.

Lifestyle Modification

17. In health promotion literature, it has been shown that several combined elements are required to effect sustainable behaviour change that leads to improved long-term health. These include:

a. Team Approach (see above);

b. Group-based interventions, since individuals rarely make changes without the support of their family, peer group, work group or community;

c. Experiential training. Behaviours that are experienced first-hand, and facilitated by an expert are much more likely to be repeated and ritualized;

d. Education; and

e. Regular follow-up and guidance.

18. **Nutrition**: Extensive research has been conducted on the ideal macronutrient composition of diets in various settings. Dietary advice to aircrew with MetS and DM2 needs to be personalized to the individual based on health status, culture and taste. The goals of nutritional intervention are to achieve and maintain the ideal weight and to control blood pressure, glycemia and lipids. Healthy diets consist of high intakes of vegetables, fruit and fiber, controlled portions of high-quality protein, limited amounts of saturated fats, high-glycemic and refined carbohydrates and ideally no processed or trans-fat containing foods. There is good evidence to recommend the DASH diet (Dietary Approaches to Stopping Hypertension) for those with hypertension (Ref G). Variants of the Mediterranean diet, PALEO or Ancestral

diet and others that are based on reduced intake of refined carbohydrates are also evidence-based.

a. All aircrew diagnosed with MetS or DM2 should be referred to the CAF Weight Wellness programme and/or a Registered Dietitian;

b. Severely calorie restricted diets or weight loss approaches that involve intermittent fasting and ketosis are under study, but are not supported in aircrew because of potential effects on hydration and cognition;

c. Aircrew with Class 2 (BMI = 35 – 40 kg/m2) or Class 3 obesity (BMI > 40 kg/m2) and MetS or DM2 may benefit from medication (orlistat/Xenical) or bariatric surgery, the latter of which has been demonstrated to normalize glycemia the most rapidly. However, discussion with AUMB / CFEME specialists is recommended on a case-by-case basis regarding these specific obesity treatments.

19. **Exercise**: In MetS and DM2, supervised exercise programmes have been particularly effective in improving glycemic control, reducing the need for anti-hyperglycemic agents and insulin, and producing modest but sustained weight loss. Both aerobic and resistance exercise are beneficial and it is optimal to do both types of exercise. At least 150 minutes per week of aerobic exercise, plus at least two sessions per week of resistance exercise is recommended. Aircrew with metabolic derangement should be referred to staff trained in exercise supervision. Those deemed to be high cardiac risk require exercise stress testing prior to initiating exercise training.

20. **Stress and Sleep Management**: High levels of stress leading to a chronic sympathetic response and poor quality or quantity of sleep are both associated with worsening metabolic indices as well as weight gain. OSA is commonly associated with MetS and DM2 due to underlying obesity. Appropriate history taking and referral to an expert in stress and / or sleep and OSA management is recommended.

21. **Education**: Aircrew diagnosed with DM2 will be referred to a community or hospital-based Diabetes Education Programme.

22. **Smoking Cessation**: Referral to the Butt Out programme or equivalent should be considered for any aircrew diagnosed with MetS or DM2 who continue to smoke. Use of medications: Bupropion (Zyban), Verenicline (Champix), to aid in smoking cessation is acceptable when necessary but should be in accordance with the FSG on Medications in Aircrew (Ref C).

Therapy – Medications

23. **Goal**: It is recommended that lifestyle modification and medication(s) be used as necessary to ameliorate metabolic derangements and, in particular, reach A1C targets within three to six months. Medication use in DM2 will be in accordance with Ref D (see Annex E).

24. **MetS**: Aircrew with pre-diabetes based on results of impaired fasting glucose (IFG), impaired glucose tolerance (IGT) or A1C (level between 6 – 6.4%) should receive metformin in conjunction with lifestyle modification. Metformin has been

shown to reduce progression to diabetes by up to 35%. Combinations of anti-hypertensive and lipid modifying agents are also frequently required in this group and should be used in accordance with Ref C.

25. **DM2**: Ref D now advocates for individualization of Diabetes treatment based on characteristics of the:

a. Patient

(1) Degree of hyperglycemia – Initial use of multiple agents is suggested in those with initial A1C > 8.5%;
(2) Risk of hypoglycaemia – IMPORTANT IN AIRCREW – Use of insulin secretagogues (Meglitinides and Sulfonylureas) and insulins other than basal are not first line in aircrew. Metformin remains the drug of choice for initial pharmacologic therapy. There is evidence that the most effective second line agents with the lowest risk of hypoglycemia are the “Incretins” liraglutide (Victoza) and sitagliptin (Januvia);
(3) Weight – Obese diabetics respond best to Metformin and Incretin agents and these should be used preferentially. Thin diabetics may require insulin;
(4) Co-morbidities (renal, cardiac, hepatic); and
(5) Preferences.

b. Agent

(1) Glucose lowering efficacy and durability;
(2) Risk of inducing hypoglycaemia (highest with short and intermediate acting insulin and insulin secretagogues) see Annex E;
(3) Effect on weight;
(4) Contraindications and side effects;
(5) Cost and coverage.

26. **A1C Targets**: Ref D also advocates for individualization of target glycemia.

a. Most DM2 should maintain an A1C below 7%, however, in CAF Aircrew it is desirable to further lower the risks of diabetes complications by targeting an A1C level of 6.5% or less in those without confirmed coronary artery disease. This must be balanced against the risk of hypoglycaemia.

b. A1C targets in MetS have not been established; however, less than 5.7% is reasonable as this has been shown to minimize the risk of incident diabetes, macrovascular disease and cognitive impairment.

Other Considerations

27. **Cardiac Risk Screening / Vascular Protection**: Those diagnosed with MetS or DM2 have increased risk of vascular disease. History and physical examination should be directed to identifying symptoms and signs of coronary artery disease (angina), peripheral vascular disease (intermittent claudication, Erectile

Dysfunction(ED)), cerebrovascular disease (transient ischemic attacks, stroke) and renovascular disease (increased microalbumin / creatinine ratio). Ref A describes the approach to formal screening and management of cardiovascular disease in aircrew. The ABCDEs recommendations for Vascular Protection (Ref D) include:

a. A – A1C optimal glycemic control (< 6.5%);

b. B – BP –optimal blood pressure control (<130/80 mmHg);

c. C – Cholesterol – LDL-C < 2.0 mmol/L if decision made to treat;

d. D – Drugs to protect the heart (ACE Inhibitor or ARB, Statins, ASA if indicated) See Ref D algorithm (re-printed at Appendix G);

e. E – Exercise – Regular physical activity, healthy diet, achievement and maintenance of healthy body weight;

f. S – Smoking cessation; and

g. See Annex F for the algorithmic approach to vascular protection.

28. **Diabetes Complications**: Aircrew with diabetes should have the following assessments on an annual basis (or as directed by local specialists):

a. Ophthalmologic exam with dilation to assess for retinopathy;

b. Microalbumin / Creatinine ratio to detect nephropathy;

c. Peripheral sensory exam, ideally with a standard monofilament to detect neuropathy; and

d. Examination of the feet for hygiene, signs of infection, ulceration or vascular insufficiency. Referral to a foot specialist if indicated.

29. **Hypogonadism & Erectile Dysfunction**: Male aircrew with MetS and DM2 are at significant risk for developing symptomatic hypogonadism (reductions of libido, lean muscle mass, Hgb, bone density as well as ED). Erectile dysfunction is often multi-factorial, caused by vascular disease, neuropathy AND testosterone deficiency or peripheral conversion of testosterone. Use of 5-PDE Inhibitors (Viagra - Sildenafil etc) in aircrew should be in accordance with Ref C. However, they should be prescribed only after due consideration and management of the underlying factors contributing to the ED. Metabolic and vascular assessments are suggested in aircrew seeking 5-PDE Inhibitors.

Monitoring

30. **MetS**: Aircrew diagnosed with MetS merit follow-up every three to four months until targets are achieved, and annually thereafter.

31. **DM2**: Initially, aircrew diagnosed with DM2 need to be followed closely by the multi-disciplinary team, at a minimum of every 2 months. Fasting laboratory testing (glucose, lipids) along with A1C and blood pressure, weight, waist circumference are

recommended at each of these visits. Once stabilized and at targets, diabetic aircrew may be assessed every 6 months.

32. **Capillary Glucose Monitoring**: At Ref D, the use of self-monitoring blood glucose (SMBG) devices has been relaxed and is individualized to type of anti-hyperglycemic agents, level of control and risk of hypoglycaemia. Most diabetics on diet and metformin alone do not need to self-monitor. However, for Aircrew with safety sensitive positions, it is recommended that regular SMBG be done, at least once daily on work days regardless of treatment. Aircrew on short-acting insulins or oral insulin secretagogues, who have increased hypoglycaemia risk, should perform SMBG multiple times through the day, especially prior to and during flight duty and under the supervision of their flight surgeon.

ADMINISTRATIVE MANAGEMENT OF METS AND DM2

Medical Category/ Limitation

33. **Aircrew Selection**: The diagnosis of MetS is a disqualifier for aircrew selection and for occupational transfers to aircrew MOSIDs until the individual demonstrates normalization of metabolic parameters through sustained lifestyle change. The diagnosis of DM2 is a disqualifier.

34. **Trained Aircrew:** Aircrew s with the diagnosis of DM2 should be temporarily grounded during investigations and initiation of treatment. If control is established with diet and exercise alone, or with the addition of metformin if necessary, aircrew with DM2 with no evidence of complications may be returned to unrestricted flight duties after A factor review by ASCS at 1 Cdn Air Div Surg. Aircrew with diabetes requiring more than one medication to achieve target glycemia should be reviewed at AUMB. The use of multiple hypoglycaemic agents may require an Air Factor MEL, e.g., to fly with or as co-pilot. The presence of complications will require restriction or grounding as assessed by the Air Div Surg or AUMB. A temporary G factor facilitates full investigation of cardiac status, etc., and a subsequent permanent G factor will be considered by DMedPol that reflects the requirement for periodic medical follow-up and medications.

CFHIS Coding

35. Those meeting the ICDA10 diagnostic criteria for relevant metabolic abnormalities should have those codes entered into CFHIS (see Annex G). Note that there are no ICDA codes for Pre-Diabetes (Impaired Fasting Glucose, mild elevation of HbA1), low HDL cholesterol, or MetS itself. See Annex G for recommended coding.

ANNEX A – ALGORITHM FOR AIRCREW SCREENING: DIABETES

NB. This testing pattern applies regardless of age. The diabetes risk calculator is completed if BMI or WC criteria are met. HbA1 is performed with every Type 1 medical. Fasting blood glucose and lipids are performed every 4 years or when A1C criteria are met.

YEAR	PHA TYPE	RISK CALC.#	HbA1	F BG / LIPIDS
1	1	X * +	X *	X
2	2	X		
3	1	X		
4	2	X		
5	1	X	X	X
6	2	X		
7	1	X		
8	2	X		
9	1	X	X	X

Etc.

Diabetes Risk Calculator to be completed if BMI is found to be > 30 or WC ≥ 102 cm in men or ≥ 88 cm in women.

* If at any time the risk calculator indicates Very High Risk, then HbA1 and fasting labs should be done. If DM is not confirmed at that time, then HbA1 is recommended annually thereafter for early detection of diabetes (50% risk over 10 yrs in this category).

\+ Ques. 2 of Risk Calculator: Overweight = BMI 25.1 – 30 Obese = BMI > 30
Ques. 7 of Risk Calculator: High Blood Glucose is ≥ 6.0 mmol/L

ANNEX A

Canadian Task Force on Preventive Health Care
www.canadiantaskforce.ca

Should you be screened for type 2 diabetes?

Type 2 diabetes is a disease in which your body cannot produce enough insulin or properly use the insulin it makes.
Determine your risk level by using our Risk Calculator (below) and use your results in the flow chart on page 2.

SCREENING FOR TYPE 2 DIABETES IN THE ADULT POPULATION 2012

A **Type 2 Diabetes Risk Calculator for Clinicians** is available if you require help from your healthcare provider answering some of the questions.

Please note: These recommendations are for screening adults without symptoms of diabetes. They **do not** apply to those already diagnosed with type 2 diabetes, those at risk for type 1 diabetes, or those with symptoms of diabetes.
Symptoms of diabetes include: unusual thirst, frequent urination, weight change (gain or loss), extreme fatigue or lack of energy, blurred vision, frequent and recurring infections, cuts and bruises that are slow to heal, and/or tingling or numbness in the hands or feet.
It is important to recognize, however, that many people who have type 2 diabetes may display no symptoms.[1]
Please speak to your family physician or primary health care provider if you are experiencing one or more of these symptoms.

Type 2 Diabetes Risk Calculator for Patients[2]

1. How old are you?

- ☐ 18-44 years (0 POINTS)
- ☐ 45-54 years (2 POINTS)
- ☐ 55-64 years (3 POINTS)
- ☐ 65 years and older (4 POINTS)

2. What is your body-mass index (BMI) category? - (See Appendix 1 for a BMI chart.)

- ☐ Normal (0 POINTS)
- ☐ Overweight (1 POINT)
- ☐ Obese (3 POINTS)

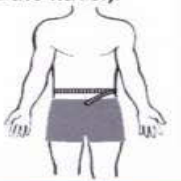
3. What is your waist circumference? Waist circumference is measured below the ribs (usually at the level of the navel).

MEN

- ☐ Less than 94 cm (less than ~37 inches) (0 POINTS)
- ☐ 94-102 cm (~37-40 inches) (3 POINTS)
- ☐ More than 102 cm (~more than 40 inches) (4 POINTS)

WOMEN

- ☐ Less than 80 cm (less than ~31 inches) (0 POINTS)
- ☐ 80-88 cm (~31-35 inches) (3 POINTS)
- ☐ More than 88 cm (~more than 35 inches) (4 POINTS)



4. Are you physically active for more than 30 minutes every day? This includes physical activity during work, leisure, or your regular daily routine.

- ☐ Yes (0 POINTS)
- ☐ No (2 POINTS)

5. How often do you eat vegetables and fruits?

- ☐ Every day (0 POINTS)
- ☐ Not every day (1 POINT)

6. Have you ever taken medication for high blood pressure on a regular basis?

- ☐ No (0 POINTS)
- ☐ Yes (2 POINTS)

7. Have you ever been found to have high blood glucose (e.g. in a health examination, during an illness, during pregnancy)?

- ☐ No (0 POINTS)
- ☐ Yes (5 POINTS)

8. Have any members of your immediate family or other relatives been diagnosed with diabetes (type 1 or type 2)? Check all that apply. This question applies to blood relatives only.

- ☐ No (0 POINTS)
- ☐ Yes: grandparent, aunt, uncle, or first cousin (3 POINTS)
- ☐ Yes: parent, brother, sister, or own child (4 POINTS)

Continue to page 2

[1]Source: Canadian Diabetes Association
[2]Source: Finnish Diabetes Risk Score (FINDRISC) questionnaire by Adjunct Professor Jaana Lindström, Diabetes Prevention Unit, Department of Chronic Disease Prevention, National Institute for Health and Welfare, Helsinki, Finland and Professor Jaakko Tuomilehto, Center for Vascular Prevention, Danube-University Krems, Krems, Austria

ANNEX C – RISK CRITERIA TRIGGERING ADDITIONAL ASSESSMENT(S)

1. Aircrew found to have A1C abnormalities require the following:

    a. OGTT (Oral Glucose Tolerance Testing);
    b. Fasting Lipids (if not already done);
    c. HS-CRP (if not already done);
    d. Cardiac risk calculation (CHIP, Reynold's or UKPDS) see Flt Surg GL for Cardiovascular Risk Screening and Interventions; and,
    e. Possible referral for cardiac assessment

DEFINITION OF HbA1 ABNORMALITY

1. A1C > 6% OR

2. A1C 5.5 – 5.9% AND any ONE of the following:
    a. Hypertension on repeated measures (BP > 135/85);
    b. Elevated Waist Circumference (Men > 102 cm, Women > 88 cm);
    c. Elevated Triglyceride (> 1.7 mmol/L);
    d. Reduced HDL-Cholesterol (Men < 1.1, Women < 1.3 mmol/L);
    e. Elevated LDL or APO-B (> 3.4 mmol/L or > 0.8 mmol/L);
    f. Elevated HS-CRP (> 3 mmol/L);
    g. Uric Acid above upper normal lab range or clinical history of gout;
    h. Elevated microalbumin : creatinine ratio;
    i. History of fatty liver or hepatic steatosis;
    j. History of erectile dysfunction;
    k. History of sleep apnea;
    l. History of urolithiasis; or,
    m. Strong family history of diabetes or vascular disease.

ANNEX D – METABOLIC SYNDROME DIAGNOSTIC CRITERIA:US NCEP ATP III

Any Three of the Following

Measure	Categorical cut points	
Elevated waist circumference (population and country specific cutpoints):	Men	Women
• Canada; USA.	≥102 cm	≥88 cm
• Europids; Middle-Eastern; Sub-Saharan African; Mediterranean	≥94 cm	≥80 cm
• Asians; Japanese; South and Central Americans	≥90 cm	≥80cm
Elevated TG(drug treatment for elevated TGis an alternate indicator†)	≥1.7 mmol/L	
Reduced HDL-C (drug treatment for reduced HDL-C is an alternate indicator†)	<1.0 mmol/L in males; <1.3 mmol/L in females	
Elevated BP(antihypertensive drug treatment in a patient with a history of hypertension is an alternate indicator)	systolic ≥130 mmHg and/or diastolic ≥85 mmHg	
Elevated FPG (drug treatment of elevated glucose is an alternate indicator)	≥5.6 mmol/L	

DIAGNOSIS OF PRE-DIABETES & DIABETES (DM2)

Test	Result	Dysglycemia Category
FPG (mmol/L) No caloric intake for 8 hrs	6.1 – 6.9 > 7.0	IFG DM2
2hPG in a 75 g OGTT (mmol/L)	7.8 – 11.0 > 11.1	IGT DM2
A1C (%) Standardized, validated assay in the absence of factors that affect its accuracy and NOT for suspected Type 1 diabetes	6.0 – 6.4 > 6.5	Prediabetes DM2
Random PG (mmol/L)	> 11.1	DM2

If asymptomatic, a repeat confirmatory test (FPG, A1C, or a 2 hr PG in a 75 g OGTT) must be done. If symptomatic, diagnosis is made, and begin treatment.

ANNEX E – BLOOD GLUCOSE LOWERING THERAPIES

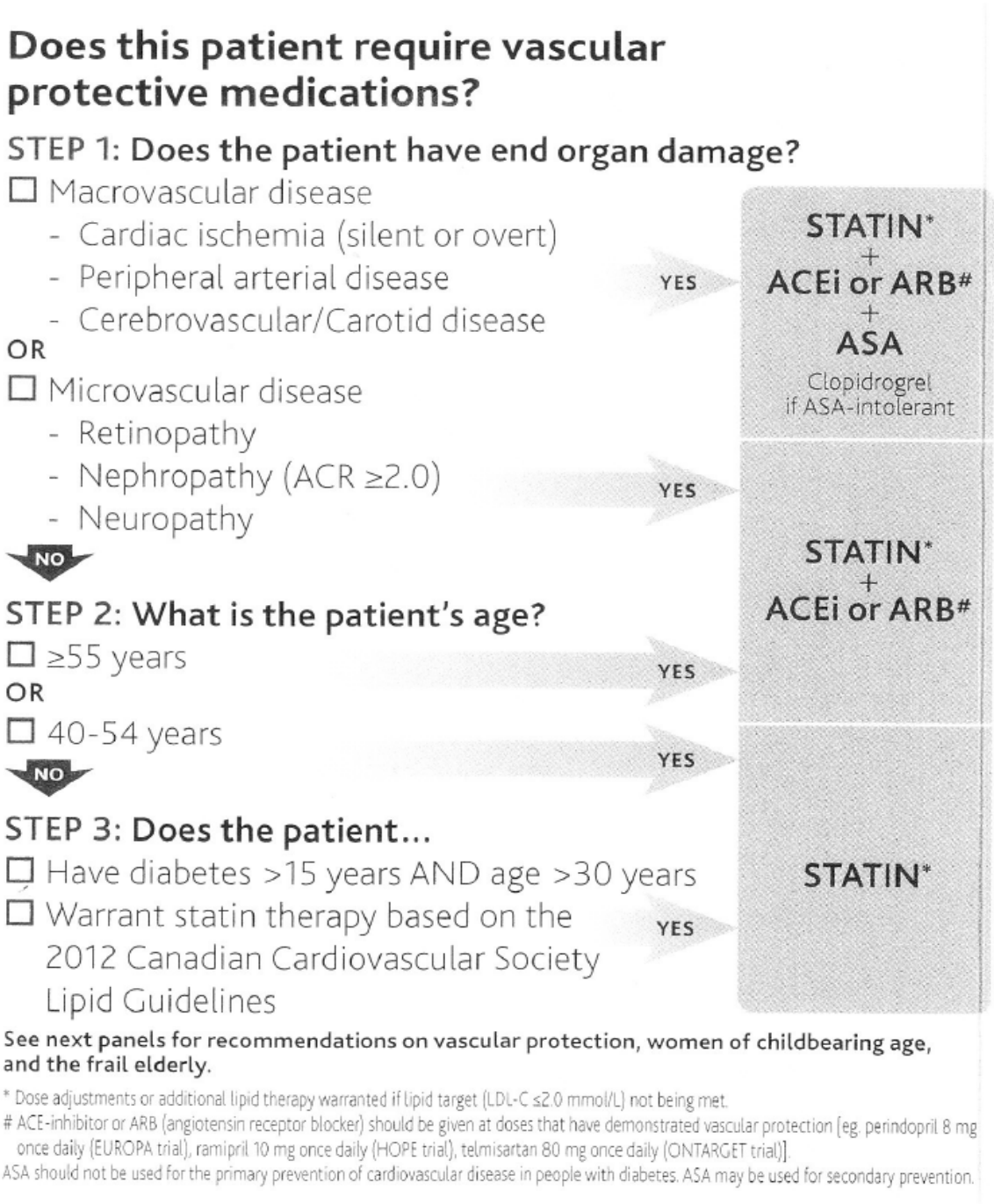
Add an agent best suited to the individual (agents listed in alphabetical order):

Class	Relative A1C lowering	Hypo-glycemia	Weight	Other therapeutic considerations	Cost
Alpha-glucosidase inhibitor (acarbose)	↓	Rare	neutral to ↓	Improved postprandial control, GI side effects	$$
Incretin agents:					
DPP-4 Inhibitors	↓↓	Rare	neutral to ↓		$$$
GLP-1 receptor agonists	↓↓ to ↓↓↓	Rare	↓↓	GI side effects	$$$$
Insulin	↓↓↓	Yes	↑↑	No dose ceiling, flexible regimens	$-$$$$
Insulin secretagogue:					
Meglitinide	↓↓	Yes	↑	Less hypoglycemia in context of missed meals but usually requires TID to QID dosing	$$
Sulfonylurea	↓↓	Yes	↑	Gliclazide and glimepiride associated with less hypoglycemia than glyburide	$
TZD	↓↓	Rare	↑↑	CHF, edema, fractures, rare bladder cancer (pioglitazone), cardiovascular controversy (rosiglitazone), 6-12 weeks required for maximal effect	$$
Weight loss agent (orlistat)	↓	None	↓	GI side effects	$$$

HYPOGLYCEMIA RISKS & PROPOSED ORDER OF THERAPIES – (P & T COMMITTEE)

DRUG CLASSIFICATION	HYPOGLYCEMIA RISK	Weight	COST	EXAMPLE
Biguanides	Very low	neutral	$	Metformin
TZDs – thiazolidinediones	Low	increase	$$	Pioglitazone (Actos)
DPP4 Inhibitors – gliptins	Low	Neutral	$$$	Sitagliptin (Januvia)
GLP1 receptor agonists – Incretins	Low	Decrease	$$$$	Liraglutide (Victoza)
Basal insulins	Moderately low	Increase	$$$$	Detimir (Levimir);glargine(Lantus)
Sulfonylureas	Moderate	Increase	$	Gliclazide (Diamicron (lower hypo risk) Glyburide (Diabeta) (higher hypo risk)

ANNEX F – Algorithmic Approach to Vascular Protection (Ref D)



See next panels for recommendations on vascular protection, women of childbearing age, and the frail elderly.

* Dose adjustments or additional lipid therapy warranted if lipid target (LDL-C ≤2.0 mmol/L) not being met.

ACE-inhibitor or ARB (angiotensin receptor blocker) should be given at doses that have demonstrated vascular protection [eg. perindopril 8 mg once daily (EUROPA trial), ramipril 10 mg once daily (HOPE trial), telmisartan 80 mg once daily (ONTARGET trial)].

ASA should not be used for the primary prevention of cardiovascular disease in people with diabetes. ASA may be used for secondary prevention.

ANNEX G – CFHIS ICDA 10 CODING GUIDELINES FOR METS & DM2

1. Pre-Diabetes (IFG, Mild elevation A1C) — R73.9 (hyperglycemia)

2. Metabolic Syndrome — No Code
   - Recommend using individual components of the syndrome
   a. Overweight (BMI 25 – 30) — E66.3
   b. Obesity (BMI > 30) — E66.0
   c. Hypertriglyceridemia — E78.1
   d. Essential Hypertension — I10.0
   e. Low HDL – no specific code, use — E90
   (Metabolic Disorders in Diseases Classified Elsewhere)

3) Type 2 Diabetes — E11.909

Free-texting the terms Metabolic Syndrome, Pre-Diabetes, and Low HDL is an additional option, but should not be done in place of the coding above, as the latter is searchable.