

UMG 200-03 – Diver Cardiovascular Risk Screening and Primary Prevention

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References:

- A. UMG 100-01 ([link](#))
- B. FSG 600-01 Aircrew Cardiovascular Risk Screening
- C. Canadian Cardiovascular Society's Dyslipidemia Guidelines 2021 ([link](#))

Record of Amendments

Date (DD/MM/YY)	Reason for Change	Fully Reviewed (Y/N)
23/11/23	Creation of UMG	Y
31/10/24	Clarification diver disposition	N
20/06/25	Update risk level classification, primary screening algorithm, risk factor intervention, addition of Undersea Factor	Y

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APPLICATION

1. The purpose of this UMG is to provide direction to all Canadian Forces Health Services Group (CF H Svcs Gp) personnel regarding the cardiovascular screening and risk factor mitigation for divers. This UMG applies to all CAF personnel, Department of National Defence (DND) Public Servants, contractors and sub-contractors who provide health services to CF members.

BACKGROUND

2. Flight Surgeon Guideline (FSG) 600-01 Aircrew Cardiovascular Risk Screening provides a thorough review of cardiovascular risk screening considerations in aircrew. Many of these principles also apply to CAF divers and is a helpful resource.

3. Cardiovascular disease (CVD) screening, and in particular screening for coronary artery disease (CAD), remains a significant requirement from an undersea medicine perspective as many individuals may have no warning symptoms prior to their first major adverse cardiac event.

4. Undersea/Hyperbaric environment concerns with respect to CVD may include sudden or subtle incapacitation during diving operations as well as the impact of diving operations on the medical condition.

- a. CAF Diving and its associated activities places increased demands on the cardiovascular system through the physical stresses of immersion, swimming against current, exposure to cold water, movement of heavy equipment as well as stressors of potential threats.
- b. Decreased exercise tolerance may impact mission completion and the ability to complete emergency procedures for themselves, or for their diving buddy.
- c. Decompression diving can be performed by CAF deep water divers – Clearance Divers and Port Inspection Divers. The impact of acute coronary syndrome (ACS) symptoms with onset during a bounce dive can be devastating, but for the diver with a decompression obligation, it places an added risk of DCS or delay to treatment.

5. Similar to aerospace medicine, the two objectives of the Diver CV Risk Screening program are:

- a. Primary prevention – identification of individuals with risk factors that may increase the risk of CVD development, with implementation of appropriate risk-reduction intervention.
- b. Stratified screening – identification of individuals at high risk for a coronary event based on presence of risk factors, with subsequent enhanced screening to determine presence of coronary disease.

PRIMARY RISK FACTOR SCREENING

6. As per the UMG 100-01, for Groups A divers, risk data will be collected once every 4 years to the age of 40, then ever two years after the age of 40. For Group B divers, risk screening will be completed on their Type 1 dive PHA.
7. Risk factor data includes:
 - a. Risk factors on history:
 - i. Traditional CV risk factors such as smoking history, family history of premature CAD in a first-degree male relative under 55 or female relative under 65
 - ii. Other associated atherosclerotic risk factors including peripheral vascular disease, cerebrovascular disease, erectile dysfunction, gestational hypertension/diabetes etc.
 - b. Risk factors on Part 1 and investigations:
 - i. Height, weight, and waist circumference
 - ii. Blood pressure
 - iii. Resting ECG
 - iv. Lipid profile
 - v. Fasting for initial dive PHA, non-fasting thereafter
 - vi. Total cholesterol, HDL cholesterol, LDL cholesterol, Triglycerides, Non-HDL cholesterol
 - vii. A1C
 - viii. High sensitivity CRP
 - ix. Fasting glucose – at initial dive PHA
 - x. Lp(a) – one-time only (at initial dive PHA or subsequent PHA if not on file. Result can be referred to in future re-evaluation without repeating each time)
 - xi. ApoB – at initial dive PHA, then subsequent PHA if triglycerides >1.5mmol/L

CALCULATING CARDIOVASCULAR RISK

8. For the purposes of the initial screening, the CFHS/Force Health Protection Framingham Cardiovascular Disease Risk Calculator/FHP, Epidemiology Branch (FHP/CDRC) is to be used ([link](#)). This tool was adapted for CAF personnel and provides both a 10- and 30-year risk.
 - a. The 10-year risk is relevant in identifying moderate or high-risk individuals who may require further screening and/or risk mitigation.
 - b. The 30-year risk is relevant in identifying younger individuals who may benefit from risk factor intervention even if the 10-year risk is currently low.

Table 1 Classification of Cardiovascular Risk Levels

	Any of the following:
High Risk	- FHP/CDRC risk $\geq 20\%/10$ years - Established diagnosis of atherosclerotic disease (including peripheral vascular disease) - Diabetes - Chronic renal disease - Individuals with intermediate CDRC risk 10-19%/10 years and any one of the following: - Metabolic syndrome - Family history of CAD in a first degree relative (male < 55 or female < 65 years old) - Persistently elevated hs-CRP >3mmol/L in the absence of other known inflammatory processes - Elevated Lp(a) and over 40 years old
Intermediate Risk	- FHP/CDRC risk 10-19%/10 years - Individuals with low CDRC risk <10%/10 years and any one of the following: - Metabolic syndrome - Family history of CAD in a first degree relative (male < 55 or female < 65 years old) - Persistently elevated hs-CRP >3mmol/L in the absence of other known inflammatory processes - Elevated Lp(a) and over 40 years old
Low Risk	FHP/CDRC risk <10%/10 years

PRIMARY SCREENING FOR CVD

Fig 1. GP A DWD: Clearance Divers and PIDS

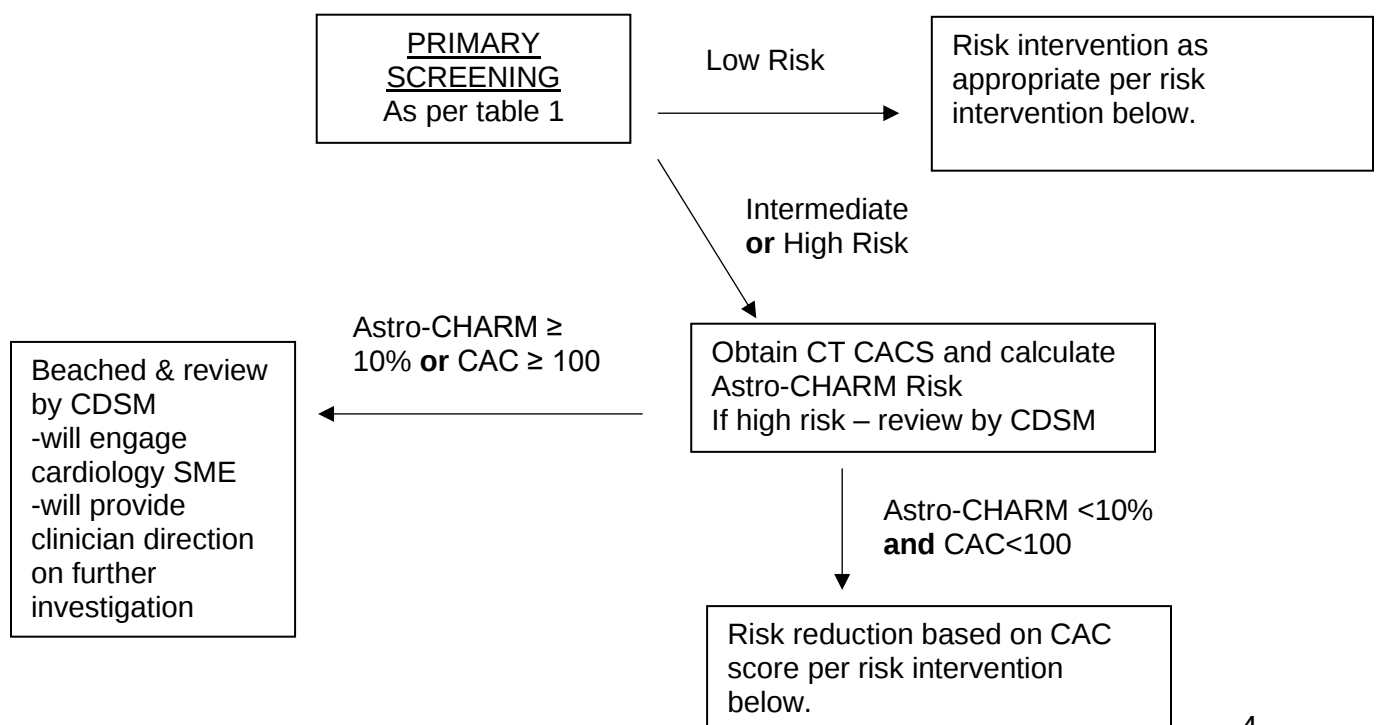
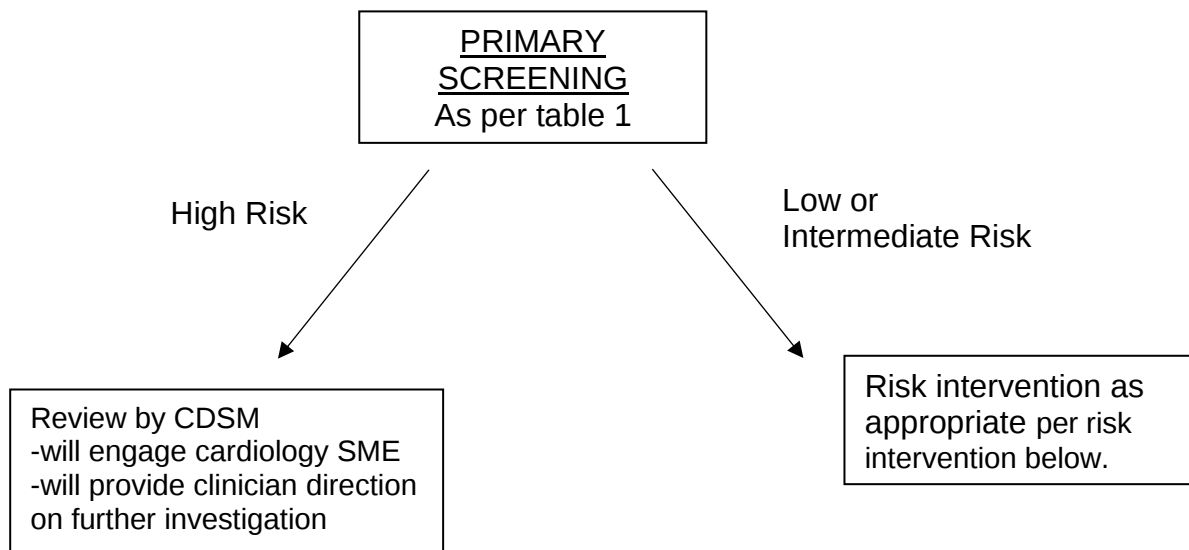


Fig 2. Gp A SWD and Gp B Divers



RISK FACTOR INTERVENTION

9. All divers should be counselled on risk factor mitigation as appropriate. This becomes particularly important in those who are identified as moderate/high risk or those with an elevated 30-year risk. These may include:

- a. Smoking cessation.
- b. Blood pressure management.
- c. Insulin resistance management.
- d. Metabolic syndrome management.
- e. Dyslipidemia management:
 - i. Life-style modifications including healthy eating habits, regular physical activity, maintenance of a healthy weight.
 - ii. Pharmacotherapy threshold and treatment targets based on risk-stratification as per table 2 below.
 - (1) Initial pharmacotherapy is based on statins, with atorvastatin or rosuvastatin being preferred over lower efficacy statins.
 - (2) To achieve treatment targets, an add-on therapy ezetimibe may be required.

Table 2 INDICATIONS FOR STATIN TREATMENT

	Treatment Indications	Treatment Targets
High Risk	• All those identified as high risk	• LDL-C $\leq$ 2.0 mmol/L • ApoB $\leq$ 0.8 g/L • non-HDL $\leq$ 2.6
Intermediate Risk with	• LDL-C $\geq$ 3.5 mmol/L or • non-HDL $\geq$ 4.2 mmol/L or • ApoB $>$ 1.05 g/L or • CACS $>$ 0 or • With presence of other risk modifiers (hsCRP $\geq$ 2.0 mg/L, Lp(a) $\geq$ 50 mg/dL ($\geq$ 100 nmol/L), positive family history)	
Low Risk with	• LDL $\geq$ 5.0 mmol/L or • Non-HDL-C $\geq$ 5.8 mmol/L or • ApoB $\geq$ 1.45 g/L or • FHP/CDRC risk 5-9.99 with: ○ Lp(a) $\geq$ 50 mg/dl ($\geq$ 100 nmol/L) or ○ LDL $\geq$ 3.5 mmol/L // non-LDL $\geq$ 4.2 mmol/L // ApoB $\geq$ 1.05 or ○ FHx + in first degree relative $<$ 60 or ○ CACS $>$ 0	• LDL $\leq$ 2.5 mmol/L or $>$ 50% reduction • Apo B $<$ 0.85 g/L • Non-HDL $<$ 3.2

10. For low risk – while it is recommended that the diver should consider pharmacologic management with a statin, they can remain fit for diving duties with non-pharmacologic risk reduction and monitoring.

11. For intermediate risk divers who decline a statin Obtain a CT CACS. If modifiable risk factors are expected to have a positive impact on risk level, consider non-pharmacologic management for up to 6 months and repeat risk calculation. If remains intermediate risk, obtain a CT CACS.

- CACS = 0, can continue with non-pharmacologic risk reduction and monitoring
- CACS 1-99, they should strongly consider taking a statin to remain on dive status. Review with CDSM.
- For CACS $>$ 100, will require pharmacologic treatment as well as CTCA and stress perfusion imaging. For CDSM review.

DISPOSITION OF DIVERS DURING INVESTIGATION AND INITIAL INTERVENTION

12. In the absence of worrisome clinical features (i.e. angina symptoms), an operational diving restriction/beaching is generally not required during periodic risk screening and stratification. However:

- a. Interventions for risk factor modification may require a brief beaching or restriction during initiation of therapy (e.g., initiation of anti-hypertensives, anti-dyslipidemics, or smoking cessation aids).
 - b. A DWD with CACS ≥ 100 or Astro-CHARM $\geq 10\%$ will be beached/restricted from diving and file sent to CDSM while additional investigations are arranged and completed (fig 1). Additional investigations may include CT or clinical coronary angiography and secondary screening for inducible ischemia [stress test with imaging])
13. Gp A SWD or Gp B assessed as high risk as per table 1 will require CDSM review IOT provide clinician direction on further investigations or management required (fig 2).
14. A diver with medical employment limitations impacting dive fitness will require an Undersea (U) Factor of U3 (undersea operator with an undersea environment restriction) or U7 (undersea operator medically unfit to carry out MOSID-specific duties) depending on MELs required.