HEART AND STROKE FOUNDATION OF SASKATCHEWAN

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BLOOD PRESSURE MEASUREMENT

Blood Pressure (BP) – The force exerted by the blood against the arterial blood vessel walls. During a normal cardiac cycle, BP reaches a peak (systole) that is followed by a trough (diastole), or low point, in the cycle. The force is measured in millimeters (mm) of mercury (Hg). High blood pressure or hypertension is defined as having a systolic blood pressure greater than 140 mmHg or diastolic of more than 90 mm Hg.

Systolic Pressure – Appearance of sound (Phase I Korotkoff)

Diastolic Pressure – Disappearance of sound (Phase V Korotkoff)

The blood pressure of all adults should be measured by any trained healthcare professional whenever it is appropriate with a mercury manometer or recently calibrated aneroid or a validated electronic blood pressure monitoring device. Aneroid devices should only be used if there is an established calibration check every 6-12 months. Patients/clients should be assessed at all appropriate medical visits to determine cardiovascular risk and monitor antihypertensive treatment.

The following steps are the recommended procedure for the measurement of blood pressure.

1. Consider patient factors
   - No caffeine in the preceding hour.
   - No smoking or nicotine in the preceding 15-30.
   - No use of substances containing adrenergic stimulants such as phenylephrine or pseudoephedrine (may be present in nasal decongestants or ophthalmic drops).
   - Bowel and bladder comfortable.
   - Quiet, warm environment.
   - No tight fitting clothing on arm or forearm.
   - No acute anxiety, stress, or pain.
2. The patient/client should be calmly seated for at least 5 minutes, with his or her back well supported and arm supported at the level of the heart. His or her feet should touch the floor and legs should not be crossed.
3. Explain the procedure to the patient/client and instruct him/her not talk prior and during the procedure.
4. Choose the appropriate cuff size. If the cuff is too small → BP high; too big → BP low.

Arm circumference (cm)	Size of cuff (cm)
From 18 to 26	9 x 18 (child)
From 26 to 33	12 x 23 (standard adult model)
From 33 to 41	15 x 33 (large, obese)
More than 41	18 x 36 (extra large, thigh)

5. Palpate the brachial artery. Position the cuff at the level of the heart by centering the bladder over the brachial artery. Wrap the cuff snugly around the arm so that the edge of the cuff is 3 cm/1-1½" (2 finger widths) above the antecubital fossa (crease of the elbow). The patient/client's arm should be relaxed and therefore must be supported either on a hard surface such as a table or by the person carrying out the procedure.
6. Ensure the sphygmomanometer is at eye level.
7. Determine the level of maximal inflation to exclude the possibility of an auscultatory gap:
   - Palpate the radial pulse.
   - Quickly inflate the cuff until the radial pulse is no longer palpable. Note this pressure on the sphygmomanometer and add 30 mm Hg. This is the maximal inflation level.
   - Rapidly deflate the cuff.
8. Wait 30-60 seconds before reinflating the cuff.
9. Place the diaphragm of the stethoscope gently over the brachial artery. The ear tips should be directed down and forward.
10. Rapidly and steadily inflate the cuff to the maximal inflation level (30 mmHg above the point where the radial pulse disappeared).
11. Release the air in the cuff so that the pressure falls at a steady rate of 2 mmHg per beat
12. Do not reinflate the cuff once the air is being released to recheck either the systolic or diastolic pressure. Wait 30 -60 seconds then repeat the procedure from step 10.
13. Note the systolic pressure at the onset of two (2) consecutive beats and diastolic pressure at the point which sounds disappears. Read the pressure to the closest 2 mm Hg mark on the manometer.
14. Listen for at least 10-20 mmHg below the last sound to ensure that sound has completely disappeared, then deflate the cuff rapidly.
15. If sound continues until 0 mmHg, record when the sound muffles (Phase IV) to indicate diastolic pressure.
16. If sounds are difficult to hear, reposition the arm and relocate the brachial artery by palpation. Repeat steps 9-14.
17. Record systolic/diastolic pressure as well as patient/client's position, cuff size, arm used for measurement. Note any auscultatory gap, or irregular pulse. If sounds are heard close to zero, record both Phases IV and V.
18. Repeat the procedure on the opposite arm.
19. Repeat the procedure in 1-2 minutes on the arm that had the highest reading.

The seated blood pressure is used to determine and monitor treatment decisions. The standing blood pressure is used to test for postural hypotension, if present, which may modify treatment. For patients/clients over age 65, diabetics, and patients/clients being treated with antihypertensives, check if there are postural changes while taking the blood pressure reading, i.e. after 1-5 minutes in the standing position and under circumstances when the patient/client complains of symptoms suggestive of hypotension.

Diagnosis of High Blood Pressure

One elevated BP reading does not mean the person has hypertension. An initial BP reading greater than 180/110 is considered a hypertensive emergency and should be referred immediately to a physician for follow-up. The 2005 Canadian Hypertension Education Program (CHEP) recommendations state patients can be diagnosed as hypertensive based on clinic BP readings if BP is ≥ 160 mmHg SBP or ≥ 100 mmHg DBP at visit 3 OR if BP is 140-159/90-99 mmHg at visit 5 based. If using Ambulatory BP Monitoring, patients can be diagnosed as hypertensive if mean awake BP is ≥ 135 mmHg SBP or ≥ 85 mmHg DBP OR mean 24-hour BP is ≥ 130 mmHg SBP or ≥ 80 mmHg DBP. Finally if using home/self BP measurement, patients can be diagnosed as hypertensive if average BP is ≥ 135 mmHg SBP or ≥ 85 mmHg DBP. Home blood pressure values should be based on duplicate measures done morning and evening for an initial 7-day period. Singular and first day home BP values should not be considered.

Threshold for Initiation of Treatment and Target Values for BP Management

Condition	Initiation	Target
	SBP / DBP mmHg	SBP / DBP mmHg
Diastolic ± systolic hypertension	≥ 140/90	< 140/90
Isolated systolic hypertension	SBP > 160	< 140
Diabetes	≥ 130/80	< 130/80
Renal disease	(≥ 130/80)	< 130/80
Proteinuria > 1 g/day	(≥ 125/75)	< 125/75

Lifestyle Recommendations for the Treatment of Hypertension

1. Healthy diet; high in fresh fruits, vegetables and low fat dairy products, low in saturated fat and salt in accordance with the DASH (Dietary Approaches to Stop Hypertension) diet. The DASH diet is the only diet that has been clinically proven to reduce high blood pressure.
2. Regular physical activity: accumulation of 30-45 minutes of moderate intensity dynamic exercise most of the week days. Canada's *Physical Activity Guide to Healthy Active Living* recommends 30 to 60 minutes of physical activity most, preferably all, days of the week.
3. Low risk alcohol consumption (≤2 drinks/day or less than 14/week for men and less than 9/week for women). One drink = 1 bottle (350 ml) of beer (5% alcohol), 5 oz. (150 ml) of wine (12% alcohol), or 1½ oz. (50 ml) of liquor (40% alcohol).
4. Maintenance of ideal body weight (BMI 18.5-24.9 kg/m2).
5. Restrict salt intake to less than 65-100 mmol/day.
6. Smoke free environment.

Impact of Lifestyle Therapies on Blood Pressure in Hypertensive Adults

Intervention	Targeted Change	SBP/DBP (mm Hg)
Sodium reduction	- 100 mmol/day	-5.8 / -2.5
Weight loss	- 4.5 kg (~ 10 lbs)	-7.2 / -5.9
Alcohol reduction	- 2.7 drinks/day	-4.6 / -2.3
Exercise	30-45 minutes, 3 times/week	-10.3 / -7.5
Dietary patterns	DASH-type diet	-11.4 / -5.5

Result of aggregate and metaanalyses of short term trials. Miller ER et al. J Clin Hyper 1999: Nov/Dec:191-8.