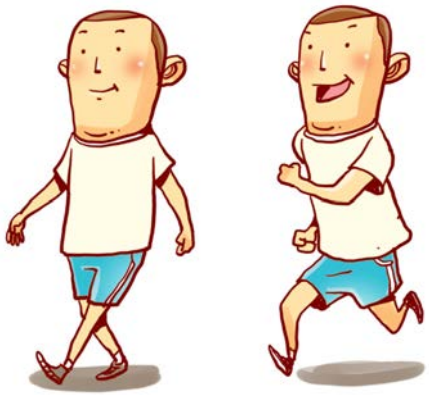
Physical activity

for patients with diabetes

A noncommunicable disease education manual for primary health care professionals and patients



World Health Organization
Western Pacific Region

보건복지부
Ministry of Health and Welfare

건강동행 Dr.G

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The Noncommunicable Disease Education Manual for Primary Health Care Professionals and Patients results from the contributions and hard work of many people. Its development was led by Dr Hai-Rim Shin, Coordinator, and Dr Warrick Junsuk Kim, Medical Officer, of the Noncommunicable Diseases and Health Promotion unit at the WHO Regional Office for the Western Pacific (WHO/WPRO/NCD) in Manila, Philippines.

WHO graciously acknowledges the intellectual contributions of Dr Jung-jin Cho, Co-director, Community-based Primary Care Project Committee and Professor, Department of Family Medicine, Hallym University Sacred Heart Dongtan Hospital, Republic of Korea; Dr Hyejin Lee, Volunteer, WHO/WPRO/NCD (currently PhD candidate, Department of Family Medicine, Seoul National University, Republic of Korea); Ms Saki Narita, Volunteer, WHO/WPRO/NCD (currently PhD candidate, Department of Global Health Policy, Graduate School of Medicine, University of Tokyo, Japan); and Mr Byung Ki Kwon, Technical Officer, WHO/WPRO/NCD (currently Director, Division of Health Promotion, Ministry of Health and Welfare, Republic of Korea).

Many thanks to Dr Albert Domingo, Dr Sonia McCarthy, Ms Marie Clem Carlos, Dr Katrin Engelhardt, Mr Kelvin Khow Chuan Heng and Dr Roberto Andres Ruiz from the WHO Regional Office for the Western Pacific and Dr Ma. Charina Benedicto, Physician-in-Charge, Bagong Barangay Health Center & Lying-in Clinic, Pandacan, Manila, Philippines for reviewing the draft publication.

Financial support for this publication was received from the Korea Centers for Disease Control and Prevention, Republic of Korea.

No conflict of interest was declared.

This is a translation of a manual published by the Ministry of Health and Welfare and Community-based Primary Care Project Committee in the Republic of Korea. Some of the content has been adapted, with permission, to align with current WHO recommendations and policies. However, the views expressed in the manual do not necessarily reflect the policies of the World Health Organization. The source publication was developed under the leadership of Dr Jung-jin Cho (also mentioned above); Mr Hyunjun Kim, Co-director, Community-based Primary Care Project Committee and Director General, Bureau of Health Policy, Ministry of Health and Welfare, Republic of Korea; and Dr Sunghoon Jung, Deputy Director, Division of Health Policy, Ministry of Health and Welfare, Republic of Korea.

All illustrations were provided by the source publication.

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Noncommunicable disease education manual for primary health care professionals and patients

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- Module 2 Healthy lifestyles
- Module 3 Healthy eating habits
- Module 4 Low-salt diet
- Module 5 Physical activity
- Module 6 Medication and management of associated diseases
- Module 7 Complication prevention

Part 2 Prevention and management of diabetes

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- Module 2 Healthy lifestyles
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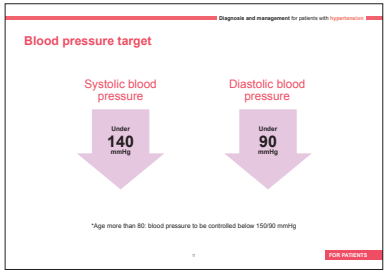
- Module 4 Healthy eating habits 2
- **Module 5 Physical activity** ◀ YOU ARE HERE
- Module 6 Taking care of yourself in daily life
- Module 7 Complication prevention

Part 3 Quit smoking

How to use this manual

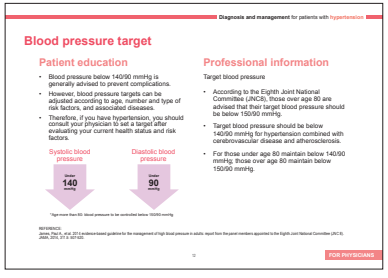
This book is one of fifteen modules of the “Noncommunicable disease education manual for primary health care professionals and patients”. This manual is intended to provide health information on the prevention and control of hypertension and diabetes.

This will be used in the form of a flip chart for health professionals to educate their patients with either hypertension or diabetes.



FOR PATIENTS

On one side of the flip chart is the ‘**For patients**’ page. This side has simple images and key messages that are easy to understand. However, health professionals may need to provide education for patients to fully understand the content.



FOR PHYSICIANS

On the other side of the flip chart is the ‘**For physicians**’ page. This side includes information that the health professional can read out to the patient during counselling. Professional information is also provided for further understanding. A small image of the ‘For patients’ side is included so that the health professional is aware of what the patient is looking at.

This publication is intended to serve as a template to be adapted to national context. Images and graphs that have been watermarked should be replaced with images or graphs that represent the national situation. If assistance is required, or if you have any questions related to the publication, please contact the Noncommunicable Diseases and Health Promotion unit at WHO Regional Office for the Western Pacific (wproncd@who.int).

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Effects of physical activity on patients with diabetes

Why exercise?

- Helps to maintain healthy body weight
- Decreases risk factors
  - reduces blood pressure
  - reduces blood cholesterol levels
  - enables better blood sugar level control
- Prevents complications
  - prevents atherosclerosis
  - prevents angina, myocardial infarction and stroke
- Improves quality of life and relieves stress

Effects of physical activity on patients with diabetes

Patient education

- When a patient with hypertension or diabetes exercises regularly it decreases blood pressure, blood sugar levels and blood cholesterol levels, preventing the development of atherosclerosis and stalling development of ischaemic heart disease (such as angina or myocardial infarction) and stroke.

Professional information

- The average reduction by physical activity alone is 7.4 mmHg for systolic and 5.8 mmHg for diastolic blood pressure.
- When diastolic blood pressure is decreased by 5–6 mmHg, stroke risk is decreased by 35–40% and cardiovascular disease risk by 20–25%.
- Therefore, physical activity prevents atherosclerosis and therefore stroke and cardiovascular diseases.

Why exercise?

- Helps to maintain healthy body weight
- Decreases risk factors
  - reduces blood pressure
  - reduces blood cholesterol levels
  - enables better blood sugar level control
- Prevents complications
  - prevents atherosclerosis
  - prevents angina, myocardial infarction and stroke
- Improves quality of life and relieves stress

REFERENCE:
Anish, Eric J., Chris A. Klenck. American College of Sports Medicine's Primary Care Sports Medicine 2nd Edition. 2007.

Before you start physical activity (1)

Do you have any of the following?

- Heart disease
- Bone or joint problems that could be made worse with vigorous physical activity
- Chest pain
- Dizziness
- Age of 65 years or older
- Uncontrolled hypertension
- Any other reasons why you should not do physical activity

Before you start physical activity (1)

Patient education

Do you have any of the following?

- Cardiovascular disease
- Bone or joint diseases that will be worsened by physical activity
- Pain in your chest when doing any activities
- Dizziness
- Are you aged over 65 and have not done any intense activity recently
- Uncontrollable hypertension
- Any other physical problems that prevent you from exercising

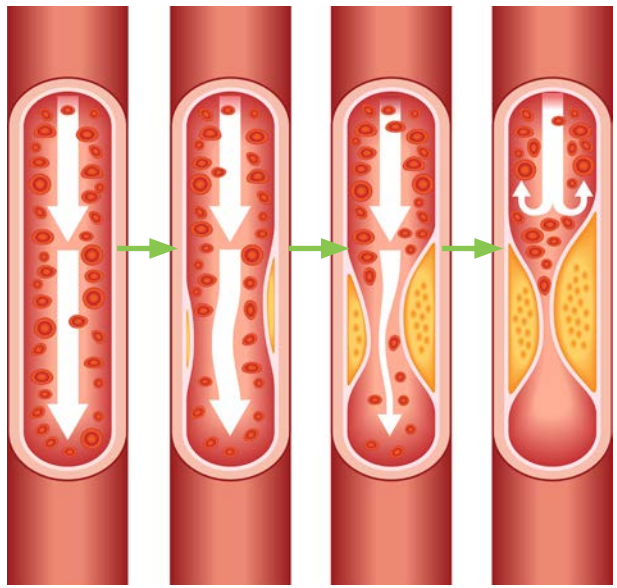
Professional information

- This list is part of Canada's Physical Activity Readiness Questionnaire (PAR-Q), designed to identify those who have problems before starting any physical activity.
- You can find other specific details in PAR-Q, which is an updated version of PARmed-X (Physical Activity Readiness Medical Examination) available from: http://icord.org/wp-content/uploads/2015/08/PARmed-X.pdf

REFERENCE:
Canada - Physical activity readiness questionnaire. 1st ed. 2016 (http://icord.org/wp-content/uploads/2015/08/PARmed-X.pdf, accessed 28 September 2016).

Before you start physical activity (2)

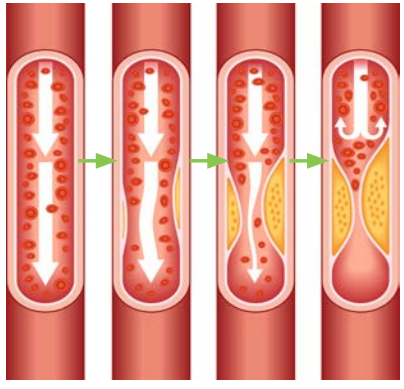
How do you assess cardiovascular disease risk?



Before you start physical activity (2)

Patient education

- Consult your doctor about any cardiovascular risks that may occur during exercise.
- See the WHO/ISH cardiovascular risk prediction charts for more information (www.who.int/cardiovascular_diseases/guidelines/chart_predictions/en).



REFERENCE:
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015.

Principles of physical activity in patients with diabetes

Start with low intensity, short duration workouts.

- Gradually increase intensity and time

Restrict physical activity when you have any of the following conditions:

- uncontrolled hypertension
- severe autonomic nerve dysfunction
- severe peripheral neuropathy
- history of foot problems
- severe proliferative retinopathy

Principles of physical activity in patients with diabetes

Patient education

- It is recommended to start exercising at low intensity, for a short duration.
- Gradually increasing the intensity and duration of exercise is important.
- Be careful if you already have any severe associated conditions of diabetes.

Professional information

- If there is any reason to restrict physical activity (uncontrolled hypertension, severe autonomic nerve dysfunction, severe peripheral neuropathy, history of foot problems, severe proliferative retinopathy), light to moderate intensity physical activity is recommended.

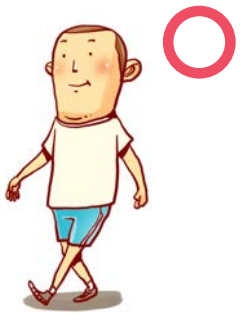
Start with low intensity, short duration workouts.
- Gradually increase intensity and time

Restrict physical activity when you have any of the following conditions:
- uncontrolled hypertension
- severe autonomic nerve dysfunction
- severe peripheral neuropathy
- history of foot problems
- severe proliferative retinopathy

REFERENCES:
Diabetes basic physical activity course. Centers for Disease Control and Prevention, Republic of Korea. 2016. (http://www.kncd.org/down/sub09/01/9_1_2_5.pdf, accessed 28 September 2016).
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015\.

Types of physical activity

Aerobic



Walking

Cycling

Swimming

Muscle strengthening (weight-bearing)

Do not lift weights that are too heavy

X

Should be light enough to lift at least eight times comfortably

Types of physical activity

Patient education

- There are two kinds of physical activity: aerobic and muscle-strengthening.
- Examples of aerobic exercises include walking, swimming and cycling.
- Examples of muscle-strengthening exercises include weight-bearing exercises such as weightlifting and dumbbells.

Professional information

- If the patient does not have uncontrolled diabetes or severe complications, it is recommended to conduct muscle-strengthening exercises like any healthy adult.

Aerobic

Walking

Cycling

Swimming

Muscle strengthening (weight-bearing)

X

Do not lift weights that are too heavy.

Should be light enough to lift at least eight times comfortably

REFERENCES:
Cornelissen, Véronique A., et al. Impact of resistance training on blood pressure and other cardiovascular risk factors a meta-analysis of randomized, controlled trials. Hypertension, 2011, 58.5: 950-958.
Physical Activity Guidelines Advisory Committee, et al. Physical activity guidelines advisory committee report, 2008. Washington, DC: US Department of Health and Human Services, 2008: A1-H14.
Mancia, Giuseppe, et al. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). Blood pressure, 2013, 22.4: 193-278.

Moderate-intensity aerobic physical activity

- I can talk while I do them, but I cannot sing.
- I breathe harder than usual.

Brisk walking

Hand mopping

Badminton (leisure)

Cycling (leisure)

Swimming (leisure)

- At least 150 minutes/week OR
- At least 30 minutes/day, five days/week
- Do not rest for more than two consecutive days

Moderate-intensity aerobic physical activity

Patient education

- It is recommended to do at least 30 minutes of moderate-intensity aerobic exercise a day, 5–7 days a week.
- Alternatively, you may do 150 minutes of moderate-intensity aerobic exercise a week.
- Examples of moderate intensity aerobic physical activity are brisk walking, hand mopping and badminton, swimming or cycling for leisure purposes.

Professional information

- It is the recommendation of the European Society of Cardiology (ESC) to exercise five times weekly for at least 30 minutes at a time.
- However, the discipline of American College of Sports Medicine (ACSM) still recommends following WHO's guideline which is to exercise more than 150 minutes weekly.
- It has been proven that dividing exercise time into 10 minutes chunks is also effective.

- I can talk while I do them, but I cannot sing.
- I breathe harder than usual.

- At least 150 minutes/week OR
- At least 30 minutes/day, five days/week
- Do not rest for more than two consecutive days

Brisk walking | Hand mopping | Badminton (leisure) | Cycling (leisure) | Swimming (leisure)

REFERENCES:
Ainsworth, Barbara E., et al. 2011 Compendium of physical activities: a second update of codes and MET values. Medicine and Science in Sports and Exercise, 2011, 43.8: 1575-1581.
Mancia, Giuseppe, et al. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). Blood Pressure, 2013, 22.4: 193-278.

Vigorous-intensity aerobic physical activity

- I can only say a few words without stopping to catch my breath.

Jogging/ running | Football (or equivalent) | Martial arts (or equivalent) | Basketball/ tennis | Digging with a shovel

- At least 75 minutes/week

Vigorous-intensity aerobic physical activity

Patient education

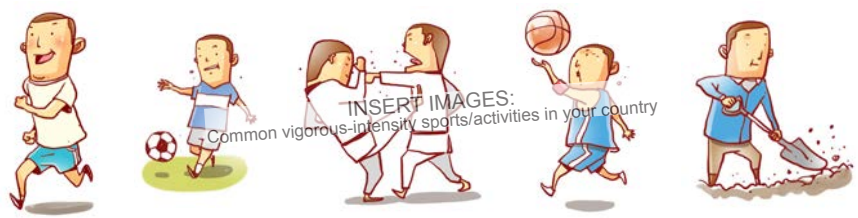
- These are some examples of vigorous-intensity physical activity.
- One minute of vigorous-intensity aerobic physical activity is equivalent to two minutes of moderate-intensity aerobic physical activity.

Professional information

- The simplest way to describe the intensity of physical activity is how hard it is to breathe.
- How much you sweat is not a good indicator since sweating depends on other factors, such as temperature, humidity and the individual.
- Heart rate and pulse rate can also be used, but they can be difficult to use.

- I can only say a few words without stopping to catch my breath.

- At least 75 minutes/week



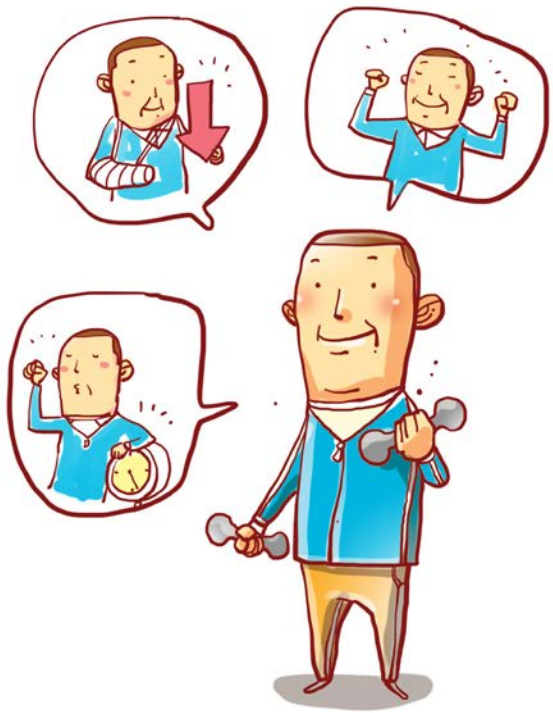
Jogging/ running | Football (or equivalent) | Martial arts (or equivalent) | Basketball/ tennis | Digging with a shovel

REFERENCE:
Ainsworth, Barbara E., et al. 2011 Compendium of physical activities: a second update of codes and MET values. Medicine and Science in Sports and Exercise, 2011, 43.8: 1575-1581.

Muscle-strengthening exercises (1)

Weight-bearing physical activity

- Enhances body flexibility
  - reduces injury risk
- Increases basal metabolic rate
  - helps control weight



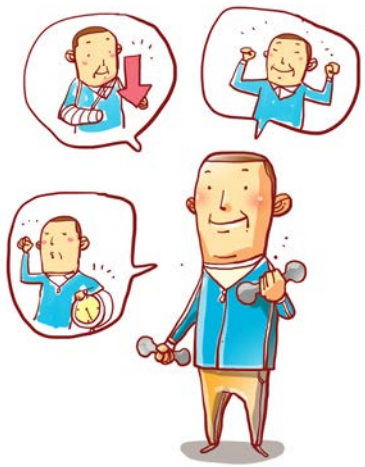
Muscle-strengthening exercises (1)

Patient education

- Muscle-strengthening exercises enhance body flexibility, reducing the risk of injury during exercise.
- It also increases basal metabolic rate, thus helping with weight control.
- Examples of muscle-strengthening exercises include dumbbells, weight-lifting, sit-ups and exercise band workouts.

Weight-bearing physical activity

- Enhances body flexibility
  - reduces injury risk
- Increases basal metabolic rate
  - helps control weight



REFERENCE:
World Health Organization. Global recommendations on physical activity for health. 2010.

Muscle-strengthening exercises (2)

- Two to four times/week
- Involve 8–10 major muscle groups
- Do 8–12 times for each muscle group, repeat 1–3 sets

Types of muscle-strengthening exercises

- Lifting weights, dumbbell exercises, pull-up bar
- Sit-ups, pushups
- Lifting objects
- Weight training equipment in gyms
- Resistance bands

Muscle-strengthening exercises (2)

Patient education

- Muscle-strengthening activities should be done two to four days a week.
- If these exercises are done every day, there is a higher risk of injury, and insufficient recovery time for minor muscle injuries sustained in the course of weight-bearing exercise.

Professional information

- Do some type of muscle-strengthening exercise at least two days/week, using 8–10 major muscles.
- Repeat each move 8–12 times per set, repeat sets once or twice.
- Free weights such as dumbbells, weights, resistance bands, or medicine balls and weight-training equipment can be used.

- Two to four times/ week
- Involve 8–10 major muscle groups
- Do 8–12 times for each muscle group, repeat 1–3 sets

Types of muscle-strengthening exercises

- Lifting weights, dumbbells, pull-up bar
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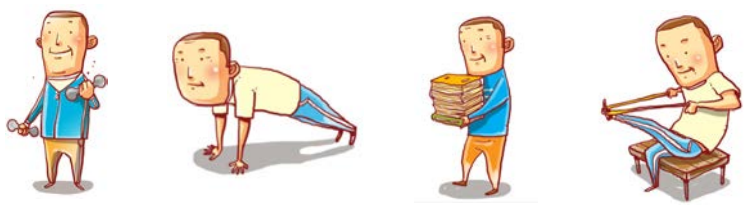


REFERENCES:
ACSM Brochures. American College of Sports Medicine. 2016. (http://www.acsm.org/public-information/brochures, accessed 28 September 2016)
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015.

Physical activity for 65+ year old adults

- Follow the same guideline as for healthy adults and, if needed, adjust as abilities and conditions allow
- In case of poor mobility, you should do exercises to enhance your balance and prevent falls three or more days per week.

Balance enhancement
Standing on one foot, standing on heels, standing with eyes closed, or standing on a sloped surface

Fall prevention
Lower extremity and flexibility exercises

Physical activity for 65+ year old adults

Patient education

- If you are fit enough, do physical activities just as a healthy adult would. Include exercises that enhance body balance and prevent falls, three times a week.
- Examples of balance exercises are standing on one foot, standing on heels, standing with eyes closed, or standing on a sloped surface.
- Lower extremity and flexibility exercises are needed to prevent falls.
- Adjust to your current physical status.

- Follow the same guideline as for healthy adults and, if needed, adjust as abilities and conditions allow
- In case of poor mobility, you should do exercises to enhance your balance and prevent falls three or more days per week.

Balance enhancement
Standing on one foot, standing on heels, standing with eyes closed, or standing on a sloped surface

Fall prevention
Lower extremity and flexibility exercises

REFERENCE:
World Health Organization. Global recommendations on physical activity for health. 2010.

What can I do if I have high blood sugar?

High blood sugar itself is generally not a contraindication of physical activity.

- Hyperglycaemia (high blood sugar) can be a problem for patients with diabetes.
- You can exercise if you do not have any accompanying symptoms or ketosis.
- When you cannot take your insulin injections according to the regular schedule, ketones can accumulate in your body.
- When you are not feeling well or urine and/or blood ketones are positive, avoid vigorous physical activity.

What can I do if I have high blood sugar?

Patient education

- A high blood sugar level does not mean you cannot exercise. You can do moderate exercises, such as walking or brisk walking.
- However, if you have ketosis, avoid vigorous intensity physical activity.
- If you are on insulin, or your doctor has prescribed medications that put you at greater risk of hypoglycaemia, eat biscuits, yoghurt or sweetened drinks before exercising if your blood sugar level is under 100.

High blood sugar itself is generally not a contraindication of physical activity.

- Hyperglycaemia (high blood sugar) can be a problem for patients with diabetes.
- You can exercise if you do not have any accompanying symptoms or ketosis.
- When you cannot take your insulin injections according to the regular schedule, ketones can accumulate in your body.
- When you are not feeling well or urine and/or blood ketones are positive, avoid vigorous physical activity.

Professional information

- Vigorous activity is contraindicated in ketoacidosis.
- If patients do not have ketoacidosis, and physical performance is good, they can exercise with hyperglycaemia.
- Insulin or insulin secretagogues increase the risk of hypoglycaemia.
- Patients at high risk of hypoglycaemia should reduce dosage of insulin/oral medication before exercises and eat snacks before exercising.
- If blood sugar level is less than 100 mg/dL before exercising, eat carbohydrates.

REFERENCE:
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015.

Beware of hypoglycaemia (low blood sugar)

If you are on insulin injections or oral insulin secretagogues:

- check your blood glucose level before exercise; and
- if it is under 100 mg/dL (or 5.5 mmol/L), grab a snack.

If you have a high chance of developing hypoglycaemia:

- reduce your dose of insulin or medication as guided by your doctor; and
- eat a small snack before you start exercising.

Beware of hypoglycaemia (low blood sugar)

Patient education

- If you are on insulin injections or are taking oral insulin secretagogues, it is safe to eat a small snack if your glucose level is lower than 100 mg/ dL (or 5.5 mmol/L) before you start exercising.

If you are on insulin injections or oral insulin secretagogues:

- check your blood glucose level before exercise; and
- if it is under 100 mg/dL (or 5.5 mmol/L), grab a snack.

If you have a high chance of developing hypoglycaemia:

- reduce your dose of insulin or medication as guided by your doctor; and
- eat a small snack before you start exercising.

Professional information

- Those on insulin injections or taking oral insulin secretagogues may experience hypoglycaemia while exercising.
- Inform patients to check their blood sugar level before and after exercise to see how it changes.
- If the patient is at high risk of hypoglycaemia, educate how to reduce the dose of insulin/ medication or eat a light snack before exercise.
- If the patient's glucose level is lower than 100 mg/dL (or 5.5 mmol/L) before starting exercise, it is safe to eat a light snack to prevent blood sugar from falling too low.

REFERENCE:
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015.

Actions for specific complications

Conditions	Actions
Proliferative retinopathy/severe non-proliferative retinopathy	Avoid vigorous aerobic exercise/ muscle-strengthening exercise.
Peripheral neuropathy	Examine your feet before and after exercise.
Autonomic dysfunction (increases injury, cardiovascular death)	Consult with your doctor to check for any heart conditions before starting vigorous exercise.
Albuminuria, kidney disease	Avoid vigorous aerobic exercise/ muscle-strengthening exercise.

Actions for specific complications

Patient education

- Always be careful when exercising if you have diabetic complications.

Conditions	Actions
Proliferative retinopathy/severe non-proliferative retinopathy	Avoid vigorous aerobic exercise/ muscle-strengthening exercise.
Peripheral neuropathy	Examine your feet before and after exercise.
Autonomic dysfunction (increases injury, cardiovascular death)	Consult with your doctor to check for any heart conditions before starting vigorous exercise.
Albuminuria, kidney disease	Avoid vigorous aerobic exercise/ muscle-strengthening exercise.

Professional information

- Proliferative retinopathy/severe non-proliferative retinopathy: chance of retinal bleeding and retinal detachment
- Peripheral neuropathy: skin ulcer, infection, Charcot joint destruction is possible.
- Autonomic neuropathy: slow heart reaction, increased risk of orthostatic hypotension, poorly controlled body temperature, vision impairment due to poor pupil response, increased risk of hypoglycaemia.
- Cardiovascular autonomic neuropathy is a risk factor for cardiovascular disease and myocardial infarction.

REFERENCE:
American Diabetes Association. Standards of medical care in diabetes—2015. Diabetes Care, 2015.

Warm-up and cool-down exercises

- Reduce the intensity of main exercise
- Include stretches

Warm-up and cool-down exercises

Patient education

- Warm-up and cool-down exercises are done before and after the main exercise, at half the intensity of the main exercise.
- Stretching should be included to enhance body flexibility and to prevent injury.

- Reduce the intensity of main exercise
- Include stretches

REFERENCES:
Physical activity advanced course. Centers for Disease Control and Prevention, Republic of Korea. 2016.(http://www.kncd.org/down/sub09/01/9_1_1_6.pdf, accessed 28 September 2016).
World Health Organization. Global recommendations on physical activity for health. 2010.

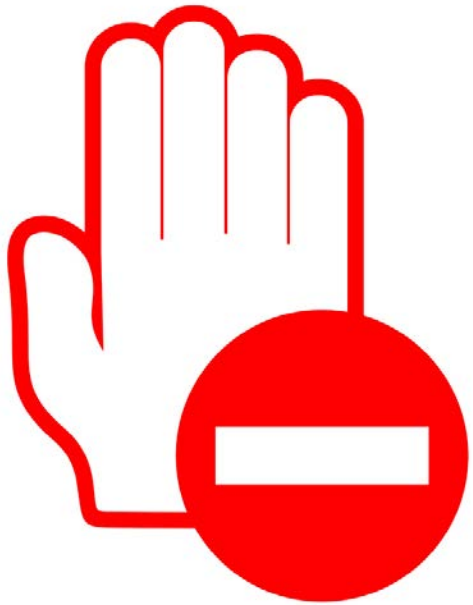
Check before you start exercising

Absolute contraindications

- Heart disease: pathologic arrhythmia
- Acute infectious disease: high fever, pain

Relative contraindications

- Other heart disease
- Blood pressure over 180/110 mmHg
- Severe physical or mental disability



Check before you start exercising

Patient education

- If you have a history of heart disease that is contraindicated for exercise, or if you have uncontrolled hypertension or diabetes, consult with your doctor before starting any kind of physical activity.
- If you have a high fever or severe muscle pain, check with your doctor to ensure you are fit to work out.

Absolute contraindications

- Heart disease: pathologic arrhythmia
- Acute infectious disease: high fever, pain

Relative contraindications

- Other heart disease
- Blood pressure over 180/110 mmHg
- Severe physical or mental disability

REFERENCE:
Exercise Medicine. (http://exercisemedicine.org.au/wp-content/uploads/2011/07/Contraindications-for-physical-activity-and-exercise-v1.0.pdf).

Professional information

The patient must not exercise if there are absolute contraindications as follows:

- recent significant change in resting ECG suggesting significant ischaemia;
- recent myocardial infarction or other acute cardiac event/unstable angina;
- uncontrolled cardiac dysrhythmia causing symptoms or haemodynamic compromise, symptomatic severe aortic stenosis;
- uncontrolled symptomatic heart failure;
- acute pulmonary embolus or pulmonary infarction;
- acute myocarditis or pericarditis;
- suspected or known dissecting aneurysm; and
- acute systematic infection accompanied with fever, body aches, or swollen lymph glands.

Example of a one-day exercise schedule

	Time	Type	Intensity
Warm up	5–20 minutes	Walking, stretching	Light to moderate
Main exercise	20–40 minutes	Aerobic exercise	Moderate to vigorous
	20–30 minutes	Muscle-strengthening exercise	
Cool down	10 minutes	Stretching muscles that were used	Light to moderate

Example of a one-day exercise schedule

Patient education

- This table shows a good example of an exercise schedule.
- Exercise time and intensity may vary depending on what type of physical activity you choose to do.
- First of all, you will start with a 5–20 minute light warm up, such as stretching or walking slowly.
- For the main exercise, a combination of aerobic and muscle-strengthening exercises are recommended.
- Between 20–40 minutes of aerobic exercise followed by 20–30 minutes of muscle strengthening is ideal.
- To end your exercise schedule, stretch the muscles you used for about 10 minutes.

	Time	Type	Intensity
Warm up	5–20 minutes	Walking, stretching	Light to moderate
Main exercise	20–40 minutes	Aerobic exercise	Moderate to vigorous
	20–30 minutes	Muscle-strengthening exercise	
Cool down	10 minutes	Stretching muscles that were used	Light to moderate

REFERENCES:
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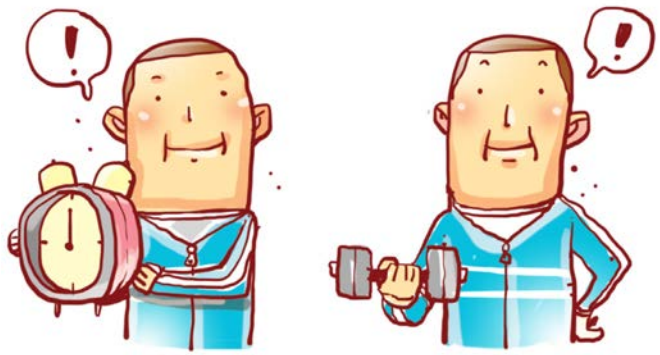
Take-home message
Physical activity

- Check your physical fitness and limitations.
- Drink sufficient fluids.
- Carry light snacks or candies in case of hypoglycaemia.
- Examine your feet after exercising
  - look for injuries: early treatment is important.

Stop exercising and consult a doctor when you feel:

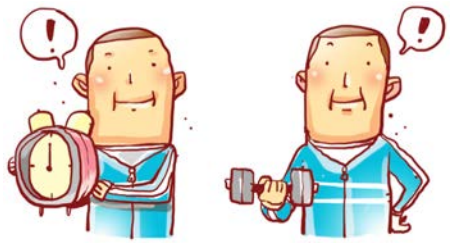
- Chest pain
- Dizziness
- Fatigue



Take-home message
Physical activity

Patient education

- Regular physical activity is important to maintain health and prevent cardiovascular complications.
- However, be cautious of starting new exercises that are beyond your current fitness level.
- If you have diabetes, drink ample fluids, always carry light snacks in case of hypoglycaemic attacks, and examine your feet for injuries after exercising.
- In case of chest pain, dizziness, or severe fatigue during exercise, stop immediately and consult your doctor.



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World Health
Organization
Western Pacific Region


보건복지부
Ministry of Health
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