Course 4

Sports Cardiology

Pre-participation examination, warning signs, sudden death

Learning objectives of the course

Upon completion of this course, the student will be able to:

- Describe the components of the pre-participation medical examination and its role in prevention.
- Recognise functional cardiovascular warning signs (syncope, chest pain, abnormal dyspnoea, palpitations).
- Identify the main causes of sudden death in young and adult athletes.
- Explain the basics of cardiovascular screening and its limitations.

Introduction: why a cardiology course for coaches?

Cardiovascular accidents are rare but dramatic. The most feared is sudden death in athletes. Yet most deaths could be avoided by:

- Appropriate pre-participation screening.
- Rapid recognition of warning signs.
- Immediate response in case of cardiac arrest.
- You are not a cardiologist, but you can save lives if you know when to alert and which signs never to ignore.

1. Pre-participation examination (PPE)

1.1 Definition and objectives

- The pre-participation examination is a mandatory or recommended medical assessment before sports participation. It aims to:
- Detect potentially serious cardiovascular pathology.
- Assess fitness for a given sport.
- Educate the athlete and coach about warning signs.
- Establish a reference medical record.

1.2 Minimal content

Element	Details
Personal history	Personal history: syncope, chest pain, palpitations, excessive breathlessness, known heart murmur
Family history	Sudden death < 50 years, cardiomyopathy, long QT syndrome, hereditary arrhythmias
Clinical examination	Cardiac auscultation (murmur, splitting), blood pressure measurement, search for signs of Marfan syndrome (height, pectus, hyperlaxity)
ECG	Recommended for high-level athletes, controversial in amateurs

(depending on country)	(cost-effectiveness)
Additional tests (if doubt)	Echocardiography, exercise test, Holter ECG

1.3 The coach's role in the PPE

- Ensure the athlete has completed their annual medical check-up.
- Know any possible contraindications (e.g., competitive sport prohibited if certain pathology).
- Report to the physician any symptoms that have occurred since the last check-up.

Practical case: A 17-year-old football player has not had a medical check-up for 2 years. Before returning to training, should the coach stop him from training? → Yes, he must require a recent medical certificate.

2. Functional warning signs – never to ignore

Four signs should prompt immediate cessation of the session and rapid medical consultation.

2.1 Syncope (loss of consciousness)

- **Definition**: brief loss of consciousness, spontaneously resolving.
- **Particularity**: syncope during exertion is always suspicious until proven otherwise (common causes: hypertrophic cardiomyopathy, long QT syndrome, malignant arrhythmia).
- **Action**: do not resume exercise, urgent cardiological assessment.

NB: Do not confuse with post-exertional vasovagal faint (during cool-down, standing, with nausea). The latter is less serious but should also be investigated.

2.2 Chest pain

Possible cardiac origin: retrosternal, constrictive pain radiating to the left arm or jaw, occurring during exertion.

Caution: in young individuals, think of a coronary anomaly; in adults >35 years, think of coronary artery disease.

Action: immediate stop, medical advice. Exertional chest pain should never be trivialised (it is not "just a spasm").

2.3 Abnormal dyspnoea

- **Abnormal means**: excessive breathlessness compared to usual intensity or to peers.
- **Example**: a runner becomes breathless after 200 m while usually running 10 km.
- **Causes**: exercise-induced asthma, anaemia, but also cardiac pathology (heart failure, pulmonary hypertension).
- **Action**: medical assessment, exercise test.

2.4 Palpitations

- Sensation of rapid, irregular heartbeats, or "skipping" beats in the chest.
- **When to alert**: if palpitations are prolonged (>1-2 min), accompanied by dizziness, malaise, or triggered by exertion.
- **Risk**: possible arrhythmia (atrial fibrillation, ventricular tachycardia).
- **Action**: cardiological referral.

2.5 Other less specific signs to mention

- Known or new heart murmur.
- Lower limb oedema.
- Family history of sudden death <50 years.

Golden rule: If an athlete reports any of these signs, the coach must suspend practice and refer to a physician. No excuse (competition, deadline) justifies continuing.

3. Cardiovascular risk factors

They add to personal and family history.

Risk factor	Impact
Age >35 years (man) or >45 years (woman)	Coronary risk increases
Smoking	Promotes atherosclerosis, coronary spasm
Hypertension (BP >140/90 mmHg)	Left ventricular overload
Diabetes (or prediabetes)	Accelerates atherosclerosis
Dyslipidaemia (high LDL cholesterol, low HDL)	Atheromatous plaques
Abdominal obesity	Metabolic syndrome
Previous sedentary lifestyle	Conversely, training reduces risk

What you can do: encourage smoking cessation, monitor blood pressure (if a monitor is available), raise awareness of screening.

4. Sudden death in athletes (SDA)

4.1 Definition and incidence

Definition: natural death occurring within one hour of symptom onset (or within 24 hours after exercise) in an apparently healthy athlete.

Incidence: 1 to 3 / 100,000 athletes per year (higher in males, high-level sport, basketball/football).

In absolute numbers: about 400-500 cases per year in Europe.

4.2 Causes by age

Age	Main causes
Young (<35 y)	Hypertrophic cardiomyopathy (HCM) (30-40%), congenital coronary anomalies (15-20%), myocarditis, long QT syndrome, arrhythmogenic right ventricular dysplasia (ARVD), aortic aneurysm rupture (Marfan)
Adults >35	Atherosclerotic coronary artery disease (>80%), residual cardiomyopathies

4.3 Triggering mechanisms

- Maximal or near-maximal intense effort.
- **Associated factors**: fever (myocarditis), dehydration, use of stimulant substances (doping, excessive caffeine), emotional stress.

4.4 Prevention – levels of action

Level	Action
Primary	Pre-participation screening (history, ECG if recommended), education on warning signs
Secondary	Recognition of precursor signs (pain, syncope, abnormal fatigue) and early cessation
Tertiary	Immediate management of cardiac arrest: CPR, early defibrillator (AED)

To remember: The coach must know the warning signs, even in the absence of systematic screening.

5. On-field emergency response

Even with the best prevention, an accident can occur. The coach must know the chain of survival.

5.1 Chain of survival (4 links)

- Recognition of cardiac arrest (unconsciousness, absence of normal breathing).
- Alert emergency services: provide location, number of victims, condition.
- Cardiopulmonary resuscitation (CPR).
- Early defibrillation with an automated external defibrillator (AED).

5.2 Using the AED – simple steps

- Turn on the device.
- Apply the electrodes to the bare chest (position indicated on the electrode).
- Do not touch the patient during analysis.
- If a shock is advised: clear everyone away, press the shock button.
- Resume compressions immediately after the shock.

Note: The AED cannot "kill" anyone; it delivers a shock only in case of ventricular fibrillation (a shockable rhythm).

Appendix: Field card – Cardiovascular warning signs

Sign	Action
Exertional syncope	Stop definitively, urgent cardiological consultation
Chest pain	Stop, consult if persists or recurs with exertion
Palpitations + dizziness	Cardiological work-up, Holter ECG
Excessive dyspnoea	Check for asthma, anaemia, heart disease
Family history of sudden death <50 y	Cardiological screening even without symptoms