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Module:	8 - Cardiovascular Diseases for Employees working in Agriculture
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8 Module 8 - Cardiovascular Diseases for Employees working in Agriculture

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8.1 Introduction

Agriculture workers have long been linked with a healthier lifestyle, a lower overall morbidity and mortality than that of urban or other non-farming population (Demos K, 2016).

However, EUROSTAT indicates that farming, despite accounting for large parts of the economy of many European countries (representing >10% of total employment in 5 EU member states: Romania – 31.4%, Bulgaria 19.4%, followed by Poland, Greece and Portugal have the highest rates), is mostly self-employed (more than 50% in most countries), and the vast majority of farmers have a low income. (EU agricultural briefs, 2013)

Thus, due to these factors, together with a constantly aging labor force in agriculture compared to the rest of the economy (57% of farmers have an age between 40 and 65 years), unhealthy regional lifestyle habits (high fat and salt intake, drinking, harsh working condition), and a more mechanized labor process, agriculture workers are prone to an increased number of cardiovascular risk factors, and hence a greater incidence of cardiovascular diseases.

Cardiovascular diseases (CVD), according to WHO, are the number one cause of death globally, 17.5 million people dying from CVDs in 2012 (31% of total global deaths) – 7.4 million due to ischemic heart disease and 6.7 million due to stroke.

More importantly, ¾ CVDs death occur in low and middle income countries (Pauncu EA, 2015).

Most data regarding incidence of cardiovascular diseases in farmers are contradictory, however, recent data shows a higher incidence of CVD in this particular population.

A Greek study performed by Konstantinos Demos et all showed that the incidence of hypertension and other cardiovascular diseases was higher in farmers than in non-farmers. (Desmos K, 2016)

An Irish study performed by Van Doorn et all showed that 83% of farmers had at least 4 risk factors for CVDs, 46% of them being hypertensive. (van Doorn D, 2017)

A Finnish study regarding the impact of social economic incidence of acute myocardial infarction showed that lower rank workers (farmers) had significantly higher age adjusted risks of AMI than man in higher rank occupation. (Mujahid MS, 2016)

Pedagogical objectives

The aim of this module is to highlight the main risk factors for cardiovascular disease that can be related to agricultural work, the main cardiovascular diseases found in farmers, emphasizing on prophylaxis and early detection, as well as explaining the possible course of treatment and its impact on agricultural worker.
The first part of the module focuses on Cardiovascular Statistics in farmers, and Risk Factors, while the second part focuses on the main cardiovascular diseases found in agricultural workers:
  – Arterial hypertension

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- Coronary disease
- Heart failure
- Peripheral vascular diseases

The third part focuses on Cardio Pulmonary Resuscitation, and the main skills the trainee has to obtain in order to assure good-quality CPR.

Knowledge, skills and attitude objectives:

The trainee should be able to:

- identify the main risk factors for cardiovascular diseases related to agricultural work, as well as the most important prophylactic measures to minimize the deterioration of health status caused by these risk factors.
- correctly assess the 10 year risk of developing fatal cardiovascular diseases, using the SCORE chart
- know how prevalent cardiovascular diseases are in agricultural workers, as well as the particularities regarding prophylactic measures in this active working group.
- properly identify and grade hypertension (correct BP measurements, diagnosis, treatment goals), as well as the main targets of prevention.
- correctly diagnose coronary artery disease, congestive heart failure and peripheral vascular diseases , as well as how to treat and prevent them.
- correctly perform CPR.

8.1.1   Glossary

Term	Definition
AED	Automated External Defibrillator, portable electronic device that automatically diagnoses and treats shockable life-threatening cardiac arrhythmias (ventricular fibrillation and pulseless ventricular tachycardia)
BLS	Basic life support, algorithm for the management of several life threatening conditions, including cardiac arrest
CPR	Cardiopulmonary Resuscitation, comprising of immediate measure to assure circulation of blood in cardiac arrest victims (Compression-ventilation ratio without advanced airway-endotracheal tube or laryngeal mask (1 or 2 rescuers): 30 compressions for 2 ventilations)
Congestive Heart Failure	Clinical syndrome due to structural/ functional cardiac abnormalities, resulting in a reduced cardiac output at rest or during physical effort.
Dyslipidemia	A level of total Cholesterol > 190 mg/dl (4,9 mmol/l), LDL Cholesterol > 115 mg/dl (*3,0 mmol/l*), HDL Cholesterol < 40 g/dl (*1 mmol/l*) and/or TGL> 150 mg/dl (1,69 mmol/l)
Hypertension	Elevated arterial Blood pressure, greater than 140/90 mmHg
NSTEMI	Non–ST-segment elevation myocardial infarction (Acute coronary syndrome)
Obesity	as a Body Mass Index > 30 kg/m²
PAD	Peripheral artery disease, mainly due to obstruction of arteries as a result of atherosclerosis
STEMI	ST-segment elevation myocardial infarction (Acute coronary syndrome)
SCORE chart	Systematic COronary Risk Evaluation chart : screening tool for assessing 10 year cardiovascular mortality based on risk factors.

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8.2 Cardiovascular risk factors in farmers

Despite once leading a supposedly healthier lifestyle, agricultural workers of the present day are exposed to many occupational and non occupational risk factors, that hint to a greater need for an adequate level of prophylaxis.

Overall risk for CVDs can be calculated using the ESC (European Society of Cardiology) SCORE (Systematic COronary Risk Evaluation)chart .
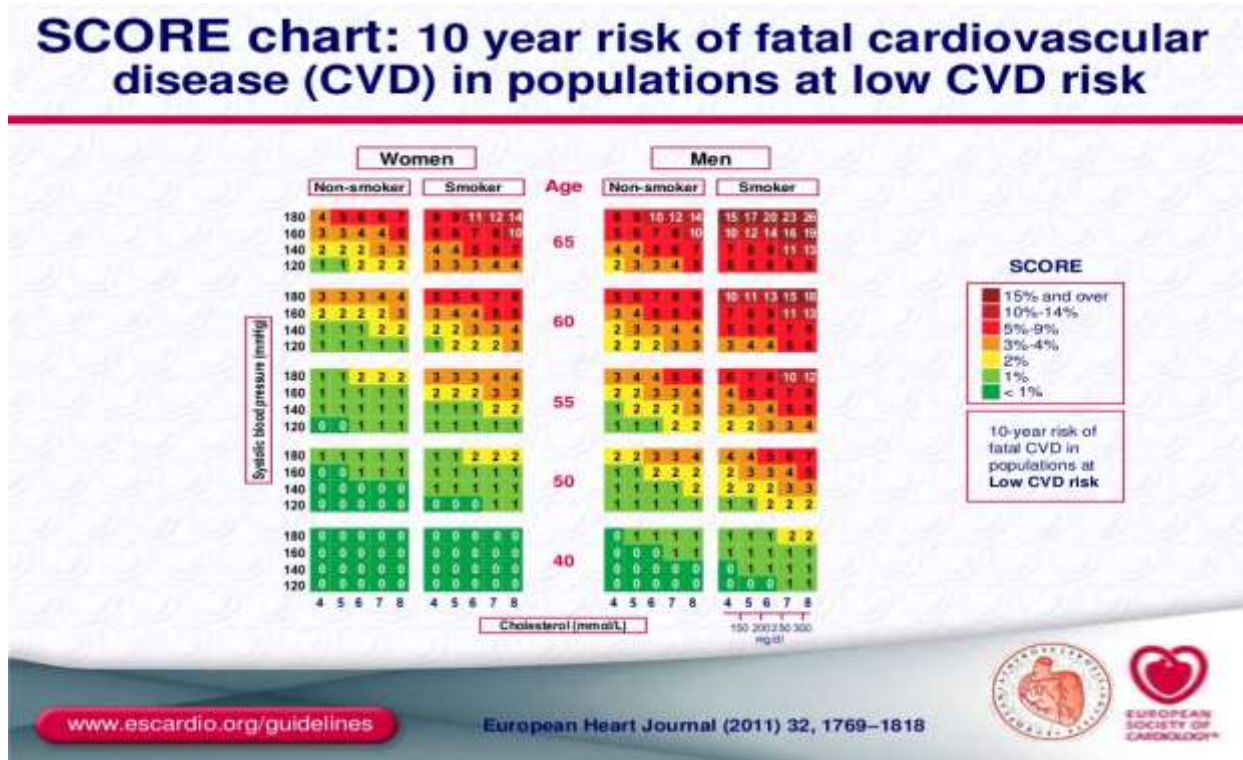

Figure 8-1 SCORE 10 year fatal cardiovascular disease risk chart

Main Cardiovascular Risk Factors found in farmers are as follows:

8.2.1 Aging of the agricultural workforce. Gender and Genetics.

Aging is a non-modifiable risk factor.

It has been shown that the elderly population (with an age greater than 65 years) has an increased risk of CVDs, due to atherosclerosis, diminished vascular compliance, and comorbidities, as well as a lesser compliance to treatment (Pauncu EA, 2015).

Thus, the elderly population, especially the ones involved in agriculture, need a greater level of monitoring of cardiovascular function.

K. Demos et all showed 27.4% of the studied population of farmers had an age of 50-59 years, and the majority (70%) had over 40 years (Demos K, 2016).

The 2012 Census of Agriculture performed by the United States Department of Agriculture demonstrated that the farmers average age is continuously increasing, the mean age being 58.3 years into 2012, compared to 50.5 years in 1992 (ACH,2012).

Gender is another non-modifiable risk factor, females having a lesser global cardiovascular risk until the onset of menopause(risk in women is deferred by approximately 10 years) , but these differences are not well known in the medical community and therefore do not have major impact in medical practice so far (ESC,

2016). Despite farming being predominantly associated with the male gender, the EU agricultural briefs revealed that 57% of farm workers are male. (EU agricultural briefs, 2013).

Genetics are known to play an important role in several cardiovascular diseases (hypertension, dyslipidemia), however ESC recommends the SCORE chart as a primary prevention and screening tool. (ESC, 2016)

8.2.2   Smoking and alcohol consumption

Smoking is one of the most important modifiable cardiovascular risk factors. Smoking promotes atherosclerosis, thus increasing the risk of ischemic heart disease and consequently arrhythmias, stroke and obliterant artheriopathy, as well as *cor pulmonale*, through COPD. (Pauncu EA, 2015)

Demos et al showed that the percentage of non-smoking farmers was slightly higher than that of non-smoking non-farmers however heavy smokers were far prevalent in the agricultural work force (Demos K, 2016).

Alcohol consumption is a risk factor for heart failure through dillatative cardiomyopathy, as well as arrhythmias. It can also influence compliance to treatment. Moderate alcohol consumption implies no more than 15 units/week, for both men and women (1 unit of alcohol= 10 ml of pure alcohol, or: 250 ml beer (4%), 76 ml wine (13%), 25 ml whiskey (40%). (Pauncu EA, 2015) Demos et al showed that the number of heavy drinkers is more prevalent in agricultural communities.

8.2.3   Dyslipidemia

Dyslipidemia is another major modifiable cardiovascular risk factor. Through atherosclerosis, it increases the risk of ischaemic heart disease and stroke.
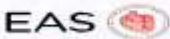
Dyslipidemia is defined as a level of total Cholesterol > 190 mg/dl (4,9 mmol/l)**,** LDL Cholesterol > 115 mg/dl (3,0 mmol/l), HDL Cholesterol < 40 g/dl (1 mmol/l) and/or TGL> 150 mg/dl (1,69 mmol/l)(5). The 2016 ESC guidelines for the management of Dyslipidemias recommend LDL-C levels as the main target of treatment, through lifestyle modifications, dietary modifications and lipid lowering treatment(statins and fibrates). (ESC, 2016)

Demos et all showed median total Cholesterol levels in farmers was 169 mg/dl, as oposed to 166 mg/dl in non-farmers. . (Desmos K, 2016).Despite a lesser significance, these results confirm that rural areas have a predisposition for high fat intake, and need close monitoring of cholesterol levels.

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Treatment goals for low–density lipoprotein–cholesterol

Recommendations	Class	Level
In patients at VERY HIGH CV risk, an LDL-C goal of <1.8 mmol/L (70 mg/dL) or a reduction of at least 50% if the baseline LDL-C is between 1.8 and 3.5 mmol/L (70 and 135 mg/dL) is recommended.	I	B
In patients at HIGH CV risk, an LDL-C goal of <2.6 mmol/L (100 mg/dL), or a reduction of at least 50% if the baseline LDL-C is between 2.6 and 5.2 mmol/L (100 and 200 mg/dL) is recommended.	I	B
In subjects at LOW or MODERATE risk an LDL-C goal of <3.0 mmol/L (<115 mg/dL) should be considered.	IIa	C

EAS
www.escardio.org/guidelines
European Heart Journal 2016; 37:2999–3058 - doi:10.1093/eurheartj/ehv272
Atherosclerosis 253 (2016) 281-344-d oi:10.1016/j.atherosclerosis.2016.08.018

Figure 8-2 Treatment goals for LDL-cholesterol

8.2.4   Obesity

Obesity is defined as a Body Mass Index > 30 kg/m². The 2016 ESC Guidelines definition for abdominal (central) obesity-the one with greater cardiovascular impact- is a waist circumference > 94 cm in men and >80 cm in women. (ESC, 2016)

Obesity increases the risk of hypertension, ischemic heart disease, stroke, and heart failure.

Demos et all showed that farmers, as opposed to non-farmers, have a greater likelihood of being overweight (56.7% as opposed to 56,5%). (Demos K, 2016). As mentioned before, despite lesser statistical significance, due to an unhealthy regional lifestyle, farmers should benefit from close monitoring of the BMI.

8.2.5   High levels of physical effort

ESC recommends 2.5-5 hours of moderate to vigorous activity/ week, physical effort having an important role in maintaining cardiovascular health (examples: brisk walking, cycling or practising other forms of light exercise -fishing, gardening, hunting). (ESC, 2015)

However it has been demonstrated that intense and prolonged physical effort can have a negative impact on the cardiovascular system, particularly lifting heavy weights and working in non-ergonomic, unnatural positions. Studies have shown that intense physical effort is associated with increased blood pressure and cardiac frequency.(Pauncu EA, 2015)

A Swedish study regarding morbidity among self-employed farmers in Norway indicated that among farmers with the highest work related morbidity were those who were physically exhausted at the end of the day. (Almås R, 1985)

8.2.6   Temperature and microclimate variations

It has been proven that both cold spells and particularly heat waves are associated with an increased risk of cardiovascular death (Deng M, 2014).

Heat waves increase the risk of a cardiovascular collapse through dehydration, and stroke. Cold spells are related with a higher rate of myocardial infarction. (Pauncu EA, 2015)

A study on the impact of the added effect of heat waves on cardiovascular mortality in Beijing showed that older group ages (>65 years), as well as females, are mostly affected, and a duration greater than 5 days increases the risk.(Dong W, 2016)

Farmers, through the nature of their work are frequently exposed to both microclimate variations.

8.2.7   Low socioeconomic status and stress

A low socioeconomic status (and hence greater stress) can be associated with a higher risk of developing cardiovascular diseases because of an unhealthy lifestyle, diet and a lesser degree of medical compliance, as well as a lesser degree of access to healthcare.

Demos et all showed that farmers have lower income levels than non-farmers, low percentages of attendance to secondary or higher degrees of education and were more likely to have 3 or more children. (Desmos K, 2016)

A fluctuating economic environment further increases the risk of poor physical and mental health. (Desmos K, 2016)

8.2.8   Noise, vibrations, long hours of work

Data from epidemiologic studies show that environmental occupational noise (≥ 55 dB) is associated with an increased incidence of arterial hypertension, myocardial infarction, and stroke, through the increase of the heart rate (Munzel T, 2014).

Studies also indicate that vibrations have a harmful effect on the cardiovascular system and are associated with a higher incidence of hypertension. (Dzhambov AM, 2016)

Long hours of work , greater than 48 hours/week, that generate stress and lead to physical exhaustion, are also a risk factor for CVDs.

Farmers, through the nature of their profession, are exposed to all 3 afore-mentioned risk factors.

8.2.9   Other comorbidities

Certain comorbidities, especially diabetes can be associated with a greater cardiovascular risk. Diabetes can lead to cardiovascular complications through macroangiopathy (myocardial infarction, peripheral arterial disease, stroke) and microangiopathy.

However, studies showed that the prevalence of diabetes is lower in farmers than in non-farmers. Despite this, complications may be more frequent in the rural setting due to a lesser compliance. (Pauncu EA, 2015)

Mental disorders (including depression and anxiety disorders) can also be related with a poor cardiovascular outcome, due too unhealthy lifestyle, high levels of stress, and poor compliance and understanding of medical treatment. Moreover, studies have demonstrated that depression is associated with a greater risk of cardiovascular diseases (Ormel S, 2007). Despite Demos et al showing a lower incidence of depression in farmers, due to increasing stress through the fluctuating economic environment, farmers are exposed to a greater risk of suffering from depression than their predecessors (Desmos K, 2016; Pauncu EA, 2015).

> **REFLECTION**
> − Think about yourself as an occupational medicine physician, or about an organization with which you are familiar, from the *agricultural setting*.
> − When have you been involved in a risk assessment performed amongst last time, what role have you played?
> − How much emphasis did the organization put on the cardiovascular risk assessment?
> − How great was the proportion of employees who were physically exhausted during their shift, or felt that tasks assigned to them were inadequate?
> − How many of them had cardiovascular comorbidities?

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8.3   Arterial hypertension

Hypertension is one of the most prevalent cardiovascular diseases, an estimated 45% of Europe's population being affected, incidence rising with aging. (ESC, 2016).
Hypertension is both a pathological entity, as well as a risk factor for cardiovascular morbidity and mortality.

Untreated or incorrectly treated hypertension is the main risk factor for ischemic heart disease, stroke, heart failure and peripheral vascular disease.

Monitoring as well as self-monitoring of hypertension and its correct treatment is uncomplicated, however, despite a sufficiently high number of treated cases, controlled hypertension is less frequent, even more so in rural areas.(Pauncu EA, 2015). Desmos et al showed a higher, statistically significant ($p<0.001$) incidence of hypertension in farmers (27,1%) as opposed to non-farmers (12,7%). (Demos K, 2016)

Hypertension is defined as a systolic blood pressure (BP) values> 140 mmHg or a diastolic blood pressure value> 90 mmHg, persistently elevated during two separate measurements during two different visits using a validated device. Patients must be in the sitting position. (ESC, 2016)

Tabel 8-1 Hypertension Grading as defined by ESC (ESC, 2016)

Category	Systolic BP		Diastolic BP
Optimal	<120	and	<80
Normal	120-129	and/or	80-84
High Normal	130-139	and/or	85-89
Grade 1 Hypertension	140-159	and/or	90-99
Grade 2 Hypertension	160-179	and/or	100-109
Grade 3 Hypertension	≥180	Category	≥110
Isolated Systolic Hypertension	≥180	and	<90

Etiological classification (Pauncu EA, 2015):
  − Primary Hypertension (95%)
  − Secondary Hypertension: (must always be ruled out)
      ▪ Renovascular Hypertension: atherosclerotic, (uni- or bi-lateral renal artery stenosis) or fibrous dysplasia
      ▪ Renal parenchymal hypertension: chronic pielonephritis, chronic or acute glomerulonephritis .
      ▪ Endocrine hypertension: feocromocitoma, Conn 's and Cushing's disease, hyperthyroidism.
      ▪ Aortic Coarctation Hypertension.

Risk factors in hypertension include: age, male sex, smoking, dyslipidaemia, glucose intolerance, obesity and family history of premature CVD.
Asymptomatic organ damage mainly involves left ventricular hypertrophy, evidence of vascular damage and microalbuminuria.

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Other risk factors, asymptomatic organ damage, or disease	Blood Pressure (mmHg)			
	High normal SBP 130—139 or DBP 85—89	Grade 1 HT SBP 140—159 or DBP 90—99	Grade 2 HT SBP 160—179 or DBP 100—109	Grade 3 HT SBP ≥180 or DBP ≥110
No other RF		Low risk	Moderate risk	High risk
1—2 RF	Low risk	Moderate risk	Moderate to high risk	High risk
≥3 RF	Low to moderate risk	Moderate to high risk	High Risk	High risk
OD, CKD stage 3 or diabetes	Moderate to high risk	High risk	High risk	High to very high risk
Symptomatic CVD, CKD stage ≥4 or diabetes with OD/RFs	Very high risk	Very high risk	Very high risk	Very high risk

BP = blood pressure; CKD = chronic kidney disease; CVD = cardiovascular disease; DBP = diastolic BP; HT = hypertension; OD = organ damage; RF = risk factor; SBP = systolic BP.

Figure 8-3 Hypertension Risk Grading by BP values, risk factors and organ damage, European Heart Journal 2013; 34:2159-219

Diagnostic evaluation of Hypertension includes: (ESC 2016):
- Standard BP measurements: at least two separate measurements, 1-2 minutes apart, on two different occasions, using validated devices. Repeated measurements are required when values significantly differ. Patient must be seated, after a 3-5 minute period of rest. Out-patient monitoring rules out white-coat hypertension, masked or nocturnal hypertension, suspected hypotension, treatment resistant hypertension.
- Patient history (past BP values, family history, risk factors) and clinical symptoms associated with organ damage (Pauncu EA, 2015):
  - Brain: Headache, dizziness, impaired vision and sensory/motor functions
  - Heart: Palpitations, chest pain, dyspnoea, oedema.
  - Kidney: Poliuria, nicturia, hematuria
  - Peripheral arteries: intermittent claudication, cold feet.
- Stratification of cardiovascular risk.
- Paraclinical investigations for risk factors: Total Cholesterol, TGL, LDL-C, HDL-C, Glucose level, HbA1C.
- Paraclinical investigations for assessing organ damage:
  - Heart: EKG (ventricular hypertrophy), echocardiography, Holter monitoring, exercise testing depending on clinical findings.
  - Kidney: serum creatinine and estimation of glomerular filtration rate, assessment of urinary protein level
  - Peripheral arteries: ankle-brachial index , carotid and peripheral ultrasound, pulse wave velocity.

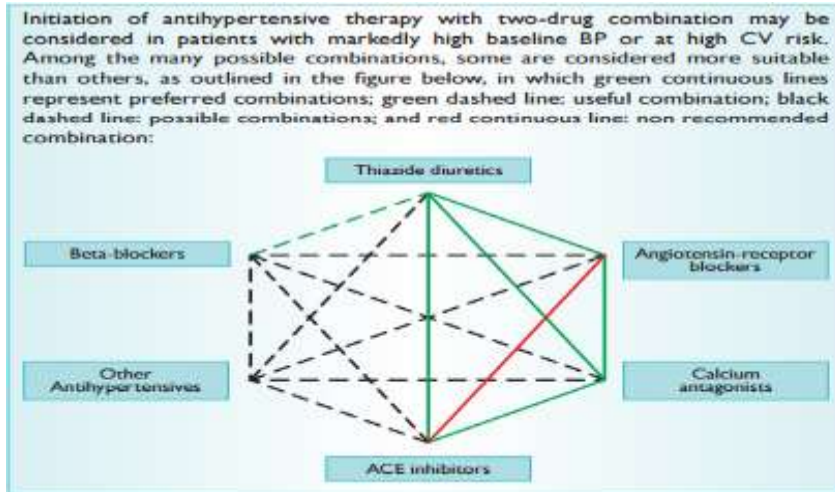**Treatment of hypertension includes the following:**

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Figure 8-4 Treatment of Hypertension European Heart Journal 2013; 34:2159-219

Targeted values of **BP:**

>**<140/90 mmHg in general population,**
>**<140/85 mmHg in diabetics**.

In elderly patients the target systolic BP is 140-150 mmHg, or 140 for fit elderly.

REFLECTION BOX- *Hypertension in Farmers- Prophylaxis*
1.Smoking cessation.
2.Limiting or excluding intense physical effort.
3.Regular monitoring of BP. Encouraging ambulatory and home measurements.
4.Limiting work-related stress.
5. Improving lifestyle (5):
-Normal BMI (18.5-24.9 kg/m²)
-Reducing salt intake (<5 g/day)
-Reducing alcohol intake (20-30g/day in men, 10-20g/day in women)
-Reducing fat intake.
-Regular physical activity (2.5-5 hours of moderate vigorous activity/ week)
How often does your organization provide employees lifestyle advice? Is this/would it be useful?

8.4 Coronary artery disease

Coronary heart disease or Ischemic heart disease is the leading cause of death worldwide.

The main aetiology is represented by the progressive stenosis of the coronary arteries through atherosclerosis.

Coronary artery disease can be divided in two main entities: Stable coronary artery disease (SCAD) and Myocardial Infarction (MI).

Demos et al showed that, while dyslipidemia levels where close to that of non-farmers, farmers had a much higher incidence of hypertension (which promotes atherosclerosis) and other cardiovascular diseases, including coronary artery disease (8.8% as opposed to 4.6% in non-farmers).(Desmos K, 2016)

As highlighted by a Chinese 20 years population based study, there has been an upward trend on the incidence of acute coronary events in Chinese farmers, especially in the 35 to 39 year age group in males and 50-54 year age group in females. (Deng M, 2014).

Risk factors such as dire, unhealthy working conditions, including exposure to cold, stress, the higher incidence of hypertension and a constantly more unhealthy lifestyle, together with an aging population expose farmers to a higher incidence of coronary heart disease.

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8.4.1   Stable coronary artery disease (SCAD)

SCAD can be defined as a fixed or dynamic stenosis of the epicardial coronary arteries, due to stable anatomical atherosclerosis and/or functional alterations of epicardial vessels and/or microcirculation, that can lead to effort induced angina (with a higher prevalence in the 50-60 years age range). (ESC 2016, Pauncu EA, 2015)

Risk factors for SCAD include smoking, age, male gender, dyslipidemia, comorbidities such as hypertension and diabetes.

The symptoms of typical angina are: **constrictive retrosternal chest pain, radiating to the left shoulder and cubital margin of the left arm. Atypical radiation includes pain in the jaw, epigastrum ,or both shoulders**. (Pauncu EA, 2015)

Figure 8-5 Canadian Cardiovascular Society(CCS) grading of angina severity

SCAD-Diagnostic Work-up

Diagnostic work-up includes (ESC, 2016; Pauncu EA, 2015):

– Patient history , including risk factors, and Clinical features suggestive for SCAD-**angina**, CCS Class.
– Non-invasive tests:
  ▪ EKG in all patients. (12 lead)- horizontal or descending ST segment depression, T wave abnormalities, arrhythmias.
  ▪ Analysis including Glycaemia, Lipid profile, serum creatinin.
  ▪ Resting transthoracic echocardiogram to evaluate LVEF, sistolic function and exclude alternative causes of angina.
  ▪ Chest X-ray.
  ▪ Exercise EKG.
– Invasive: coronary angiography.

SCAD-Treatment (ESC,2016):

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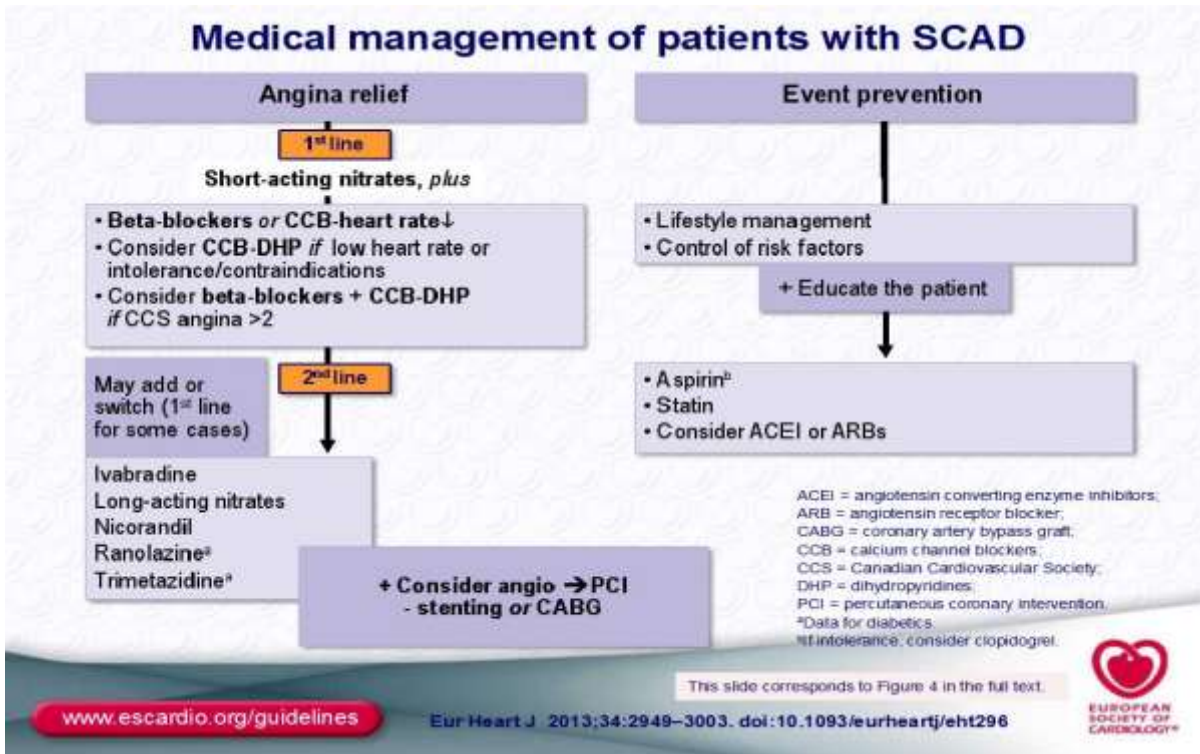Erasmus+ Programme
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Figure 8-6 Management and Treatment of stable coronary artery disease

Prevention of SCAD through:

- Smoking cessation.
- Lifestyle improvements (Low fat intake, Normal BMI).
- Limiting intense physical effort.
- Limiting exposure to extreme temperature variations, particularly cold.
- Well treated and monitored comorbidities (Hypertension, Diabetes)
- Excluding persons with SCAD from farming activities involving intense labour.

8.4.2   Acute Coronary Syndromes

Acute Myocardial Infarction is defined as myocardial cell death due to prolonged ischemia (mainly as a cause of atherosclerosis), vasospasm or stent thrombosis. (ESC, 2016).

It is important for the occupational health therapist to recognize Acute Coronary Syndromes in order to provide first aid and take a proper course of action.

Acute coronary Syndromes, typically manifested through **angina**, can be classified as Unstable Angina, NSTEMI (Non–ST-segment elevation myocardial infarction) and STEMI (ST-segment elevation myocardial infarction), depending on EKG modifications and serum biomarker levels.

Unstable angina is defined as angina at rest, new onset exceptional angina (<2 months), recent acceleration of angina (<2 months), or post revascularization angina. It can evolve to stable angina, NSTEMI or STEMI. (ESC, 2016; Pauncu EA, 2015)

NSTEMI (incomplete occlusion of coronary arteries- subendocardial damage) and STEMI (complete occlusion of a certain coronary-subepicardial damage) are mainly differentiated by EKG modifications.

Diagnostic criteria for acute myocardial infarction (ESC, 2016): detection of a rise (and/or fall of cardiac biomarkers (preferably high specificity Troponin or, when the later is unavailable, creatine phosphokinase-MB), with at least on of the following:

- Ischemic symptoms: angina: constrictive retrosternal chest pain, radiating to the left shoulder and cubital margin of the left arm. Atypical radiation includes pain in the jaw, epigastrum ,or both

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shoulders. In STEMI, chest pain does lasts more than 30 min, does not cease upon nitrate treatment. STEMI can be classified according to associated dyspnoea and symptoms.(Kilip Classification) (Pauncu EA, 2015)

– ECG changes of new ischemia (new ST-T – ST changes: elevation, depression and T wave depression; recent Left Bundle Branch Block). ECG must be performed in the first 10 minutes upon admission,
– Development of pathologic Q waves in ECG.
– Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality (TransThoracic Ecography)
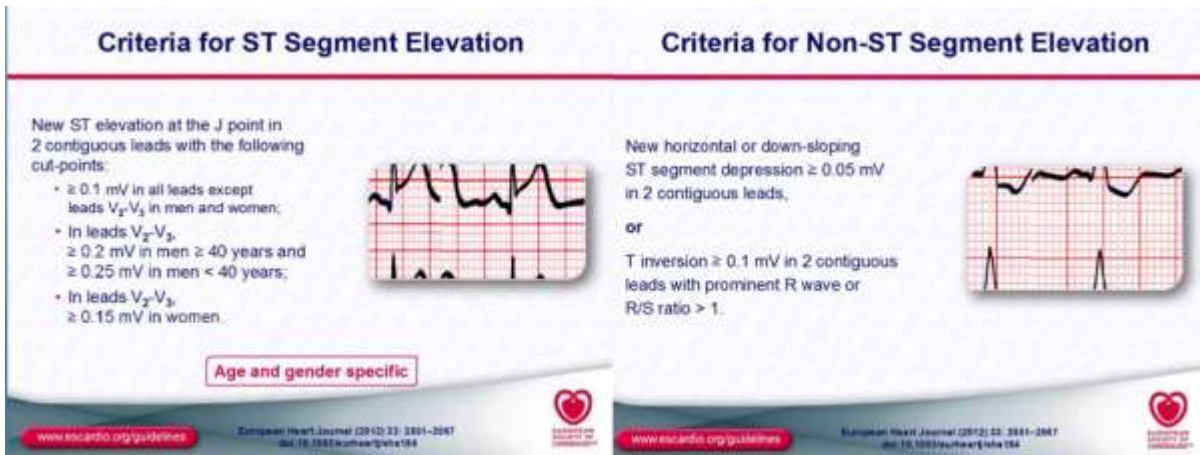– Invasive Imaging: Identification of an intracoronary thrombus by angiography or autopsy.

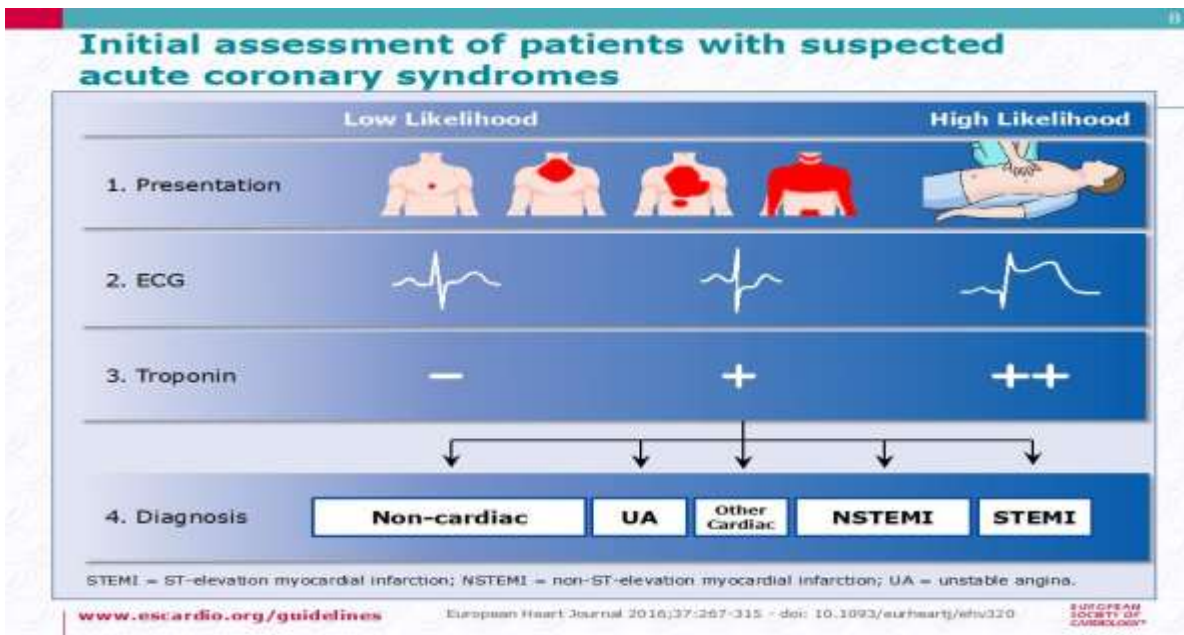*Figure 8-7 EKG criteria for evaluating acute coronary syndromes*

Figure 8-8 Initial assessment of patients suspected with acute coronary syndromes

Treatment of ACS
NSTEMI:
– Initial treatment: Oxygen, Nitroglycerine, Aspirin (150-300mg),Morphine in case of severe pain.
– Anti-ischemic treatment:
  ▪ beta-blockers,
  ▪ nitrates,

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- Ca channel blockers,
- platelet antiaggregants (**75-100 mg/day Aspirin, , lifelong,** associated with 75 mg/day Clopidogrel, for 1 year.
- Anticoagulation (associated with dual antiaggregants, in initial emergency setting).
  - Invasive revascularisation: Percutaneous transluminal coronary angioplasty (**PTCA**) and Coronary artery bypass grafting (**CABG**)

STEMI:
  - Non-specific: pain relieving medication, oxygen, cessation of any type of effort, intubation/ inotropic agents where needed.
  - Specific :
    - Nitroglycerine (where possible) and antiaggregants
    - Anticoagulants: unfractionated heparin/enoxaparin.
    - **Immediate assisted transport to a interventional cardiovascular unit/ fibrionlysis where PTCA/CABG not performed in first 120 min.**

8.5 Congestive heart failure

Definition (ESC, 2016): Clinical syndrome due to structural/ functional cardiac abnormalities, resulting in a reduced cardiac output /elevated intracardiac pressure at rest or during **physical effort**.

Etiology: Pressure overload (Hypertension, aortic stenosis), Volume Overload (mitral stenosis), Low Cardiac output due to all pathologies affecting the myocardium (ischaemic heart disease, cardiomyopathy, myocarditis), Reduced compliance (pericarditis, restrictive cardiomyopathy). (Pauncu EA, 2015)

Diagnosis Criteria(ESC, 2016; Pauncu EA, 2015):
  - Typical Symptoms: *Dyspnoea, Orthopnoea/Paroxysmal Nocturnal dyspnoea, Fatigue, Reduced exercise tolerance, Oedema.*
  - Signs: *elevated jugular pressure, pulmonary crackles, gallop rhythm, weight gain > 2kg/week.* Transthoracic ecocardiography: LVEF, relevant structural heart disease/ diastolic dysfunction.
  - Blood tests: elevated levels of natriuretic peptides

Pharmacologic Treatment (Pauncu EA, 2015):
  - ACE-Inhibitors/ aldosterone blockers, β-Blockers, aldosterone receptor antagonists.
  - Ivabradine, Digoxin, Diuretics.
  - Anticoagulants where needed (AFib)
  - Treatment of aggravating comorbidities!

Non-Pharmacological:
  - Smoking cessation
  - Low salt intake (3-4.5 g/day)
  - Reduced alcohol intake (10-20 g/day)
  - Weight loss.
  - Easy/moderate physical effort.

Occupational measures:
  - Intense physical effort must be avoided at all cost.
  - Avoid exposure to intense microclimate variations.
  - Lowering of work load.
  - Stress management

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8.6 Peripheral vascular diseases

8.6.1 Peripheral artery disease (PAD)(Pauncu EA, 2015)

Definition and Ethiology: Acute or Chronic Ischemic pathology of the inferior limbs mainly due to atherosclerosis (other causes: inflammatory and autoimmune arteriopathies).
Risk Factors: dyslipidemia, hypertension, smoking, male gender, comorbidities such as diabetes.
Symptoms: ranging from intermittent claudication, cold limbs, to ulcerations of the inferior limbs. Can lead to amputation.

Diagnostic Evaluation:
  − Ankle brachial pressure index (ABPI/ABI): PAD present if ABI < 0,9. Easy to perform screening.
  − Vascular ultrasound, CT angiography.
  − Treatment:
    ▪ Revascularization, including asymptomatic patients.
    ▪ Pharmacological treatment: peripheral vasodilators, platelet antiaggregants, statins.

Due to the high socioeconomic impact of intermittent claudication/loss of limbs, as well as the fact that farmers are at high risk, it is greatly advised to monitor high risk patient for PAD.

8.6.2 Chronic venous insufficiency (Pauncu EA, 2015)

Definition: incapacity of the venous system of the leg to assure antegrade flow of blood, mainly due to venous valvular incompetence.
Risk factors: female gender, **age >60 years, prolonged orthostatic position, obesity**, pregnancy, family history.
Diagnosis:
  − Physical examination (ranging from tortuous veins to ulceration : Clinical, Etiologic, Anatomic and Pathophysiologic-CEAP classification), Trendelenburg test.
  − Vascular Doppler Ultrasound.
Pharmacological treatment: diosmin and hesperidin
Nonpharmacological treatment:
  − Lifestyle changes:
    ▪ **Reduce time in orthostatic position**
    ▪ **Weight loss**
  − Surgical treatment.
Chronic venous insufficiency is relevant to the occupational health doctor due to discomfort and pain caused to farmers, who are at high risk of developing it.

8.7 Cardio pulmonary resuscitation-basic life support

Due to the current rise of incidence of cardiovascular diseases in this specific, active population group, cardiac arrest is a risk that all occupational health physicians must be prepared to tackle.
Farmers, through the nature of their work, and through the predominance of small household farms, are exposed to periods of isolation, and thus might not benefit from immediate recognition of cardiac arrest and start of CPR. It is important to train all farm employees/ family members how to perform CPR.
Sudden cardiac death is defined as the unexpected death due to a cardiac cause, in patient with or without cardiac disease, which occurs within one hour from the appearance of the first clinical symptoms (ESC, 2016)

Summary of high quality basic life support steps (AHA CPR, 2015):
  − Scene safety: Make sure the environment is safe for both rescuers and victim

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- Recognition of cardiac arrest: Check for responsiveness, breathing and pulse (breathing and pulse can be checked for simultaneously) . Patient is in cardiac arrest if unresponsive, is not breathing, and CPR provider cannot feel pulse within 10 seconds.
- Activate emergency response system: If alone and you have no phone, leave victim in order to activate the emergency response system, obtain AED before starting CPR (if AED is available, eg: large, industrial farms). Otherwise, start CPR immediately and let bystanders activate emergency response system. Use AED as soon as possible.
- CPR rules: Compression-ventilation ratio without advanced airway-endotracheal tube or laryngeal mask (1 or 2 rescuers): 30 compressions for 2 ventilations- 30:2
- CPR rules: Compression-ventilation ratio with advanced airway (1 or 2 rescuers): 100-120 continuous compressions/minute, 1 breath every 6 seconds (10 breaths/minute)
- Compression depth: at least 5 cm (2 inches), but no more than 6 cm (2.4 inches)
- Hand placement: 2 hands on the lower half of the sternum
- Chest Recoil: Allow full recoil after each compression
- Minimising interruptions: Limit interruptions in chest compressions to less than 10 seconds.

Cardio Pulmonary Resuscitation-Basic Life Support
Using the Automatic External Defibrillator:

- If rhythm is shockable, apply 1 shock. Resume CPR immediately for 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
- If rhythm is non-shockable, resume CPR immediately for 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move

It might be reasonable to administer epinephrine as soon as feasible after the onset of cardiac arrest due to an initial non-shockable rhythm.

CPR TRAINIG TOOLS
Visit https://life-saver.org.uk/

8.8   Conclusions and Recommendations

Take Home Message-Conclusions

- Main Risk Factors for cardiovascular diseases in the farming population are:
  - Aging of the agricultural workforce, Gender, Genetics (non-modifiable).
  - Smoking and alcohol consumption (modifiable)
  - Dyslipidaemia (modifiable)
  - Obesity (modificable)
  - High levels of physical effort (can be adapted)
  - Temperature and microclimate variations
  - Low socioeconomic status and stress (can be improved)
  - Noise, vibrations, long hours of work (can be improved in certain cases)
  - Comorbidities (particularly Diabetes mellitus-can be controlled)
- Hypertension is both a disease and risk factor for other cardiovascular diseases. Its incidence in a farming population with greater age, decaying health, and increased number of risk factors is rising, and greater than in the non-farming population. Prophylaxis is paramount. (see recommendations below) .
- In coronary artery disease (Stable Coronary Artery Disease & Acute Coronary Syndromes-STEMI and NSTEMI), the main etiology is represented by the progressive stenosis of the coronary arteries through atherosclerosis. The most typical symptom is angina, whilst ECG changes (ST segment elevation/depression), echocardiography and biomarkers (troponin) can confirm diagnosis. Due to increasingly unhealthy lifestyles, farmers are exposed to a greater risk of developing coronary artery disease. Prophylaxis through reduction of risk factors is paramount (see recommendations below).

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- Congestive Heart Failure is clinical syndrome resulting in a reduced cardiac output /elevated intracardiac pressure at rest or during physical effort (main symptom-dyspnoea,oedema). Must be recognized and treated adequately.
- Peripheral Vascular Diseases can have a high socioeconomic impact through pain and discomfort and must be recognized and treated adequately.
- Farmers, through the nature of their work, and through the predominance of small household farms, are exposed to periods of isolation, and thus might not benefit from immediate recognition of cardiac arrest and start of CPR. It is important to train all farm employees/ family members how to perform CPR (see recommendations bellow).

Take Home Message-Prophylaxis& Recommendations
- The SCORE chart must be used as a primary prevention tool.
- Smoking cessation is paramount for prophylaxis of all CVD.
- Limiting or excluding intense physical effort can lead to lesser cardiovascular strain.
- Adapting workload to persons with a greater risk of CVD.
- Significant microclimate variations (heat waves, extreme cold) must be avoided. Heat waves lead to aggravation of heart failure, cold spells lead to a rise in incidence of ACS or SCAD.
- Regular monitoring of BP. Encouraging ambulatory and home measurements.
- Ankle brachial pressure index (ABPI/ABI) measurement for screening of PAD.
- Limiting work-related stress.
- Potentially aggravating comorbidities for the cardiovascular system should be strictly monitored and adequately treated.
- Stress should be managed by adequate counseling where needed.
- Treatment of the rural outpatient should be adequately explained and closely supervised, due to poor compliance.
- Improving lifestyle (5):
  - Normal BMI (18.5-24.9 kg/m²)
  - Reducing salt intake (<5 g/day)
  - Reducing alcohol intake (20-30g/day in men, 10-20g/day in women)
  - Reducing fat intake. Optimizing treatment of dyslipidemia(LDL-C levels <115 mg/dl)
  - Regular physical activity (2.5-5 hours of moderate vigorous activity/ week)
- In case of recognized cardiac arrest, CPR should be started immediately after activating emergency response system. Without advanced airway, compression/respiration rate is 30:2. With advanced airway, rescuers must perform 100-120 continuous compressions/minute, 10. breaths/minute. Use AED as soon as possible (where available)

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