CARDIOVASCULAR SYSTEM IN OLDER AGE

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OUTLINE OF THE PRESENTATION

- General introduction/case report
- Specificity of physiology of CVD in older age
- General approach to older people with (suspected) CVD
- Ischemic heart disease
- Heart failure
- Arrhytmia
- Valvular disease
- Peripheral artery disease/edema of lower extremities
- Prevention
- Summary

CASE REPORT 89y old woman patient

- Presenting symptome: dyspnea, in history moderately significant stenosis of aorta valve + potentially coronary heart disease as a cause(s), documentation of paroxysmal atrial fibrilation.

  RF CVD: non-smoker, DM-0, HT-5 y.

- Others: surgery of carpal tunnels 10 years ago without complicationS, 2 years ago surgery for cataract. Osteoporosis. Attack of a gout 1 year ago, chronic dyspepsia. Delivery/giving birth (2 x) without internal/cardiac complication, without diabetes, 1 x abortus. Cholecystolithiasis, dyspepsia - pyrosis, regurgitation of meals good effect of PPI. No alergies

CASE REPORT 89y old woman patient
CURRENT DISEASE

- **Chief complaint: Dyspnea** associated with chest pain – approx. 2 years ago, suddenly when wearing basket with mushrooms (4 kg). Since then, wheezing + intermittent feeling of arrhythmia dependent on physical activity : approx. 15 minutes of walking on the plane/to the 2nd floor with breaks. No leg edema. Sleeping disturbances, no nycturia.

  Drugs: Prestarium 5 mg 1/2-0-0, Digoxin 0,125 1/4-0-0, Stacyl 100 mg, Furon 40 mg 1/2-0-0, KCl 1-0-0, Prolia 60/Biomin H, Vigantol, Geratam, Oxyphyllin, Neurol 0,025, Milurit 100, Essentiale forte N, Apo-Ome 20 mg, Ascorutin

CASE REPORT 89y old woman patient
PHYSICAL FINDINGS

- Conscious, during longer speech dyspnoic, cooperative, good memory. Appropriate hydration and skin color, without neurological deficit. BP: 144 / 86, 142/82 mm Hg, **???** HR: 68 bpm, ULE: 140/80 mm Hg. Head - ALC, operation of the cataract, otherwise normal. Neck – normal venous filling, bruits above both carotid arteries, otherwise normal. Lungs - clear. Heart: regular rhythm, 2 sounds, systolic murmur above the aorta spreading to both carotids, harmonic systolic murmur above the cardiac apex, without propagation. Abdomen: liver + 2 cm, otherwise normal findings. LE: no swelling, trophic/inflammatory changes, palpable arteries to the periphery.
- Weight: 50.9 kg, Height: 140.0 cm (BMI 26.0 kg/ m^2).
- **ECG:** SR, HR-61/min, transition intervals within physiological limits, without specific changes.
- **Laboratory** (III/2015): moderately elevated total cholesterol 5.4, LDL-3.2 mmol/l, otherwise values within limits incl. blood count.

CASE REPORT 89y old woman patient CONCLUSION/RECOMMENDATION

- Dyspnea caused by left ventricular insufficiency in the combination aortic stenosis and ischemic/coronary heart disease, otherwise despite a certain polypragmasia without other major diseases; patient's biological age is significantly less than chronological. Not confirmed paroxysms of atrial fibrillation.
- TTE/TEE + ultrasound of carotid arteries. Recommended medication: Prestarium 5 1/2-0-0, **Stop Digoxin 0,125 1/4-0-0**, Stacyl 100 mg, Neurol 0,025, Milurit 100**, substitute hydrochlorothiazide/amilorid for furosemide + Kalium, stop *Prolia 60/Biomin H, Vigantol, Geratam, Oxyphyllin, Essentiale forte N***, Apo-Ome 20 mg, Ascorutin. + Sortis 10 1-0-0, betablocker in smaller dose (metoprolol 2x12.5 mg), isosorbitdinitrate 100 mg, …

CASE REPORT 89y old woman patient FOLLOW UP

- After the first day BP -90/50 with symptoms: beta blocker stopped, izosorbitdinitrate divided 1/2-1/2-0 - good effect. Because of discomfort during urination hydrochlorothiazide stopped- good effect. Other medications unchanged. Moderate decreases of dyspnea, but still attacks of dyspnea accompanied by chest pains during moderate exertion. A slow walk along the plane without significant difficulty will take about 1 km.
- **Physical findings:** BP: 138/74, 138/80 mm Hg, HR-66 bpm. Otherwise no change.
- **Laboratory findings:** Na 132.3 mmol/l**; K 5.28 mmol/l**; bil_tot 11.3 umol/l; bil_dir 4.5 umol/l; AST 0.55 ukat/l; ALT 0.45 ukat/l; ALP 1.14 ukat/l; GGT 0.97 ukat/l; uric acid 229 umol/l; urea 5.1 mmol/l; creatinine 71.4 umol/l; CK 1.66 ukat/l; **total chol. 4.0 mmol/l; HDL_chol 1.27 mmol/l; LDL chol 1.6 mmol/l**; TG 2.46 mmol/l; fasting glycemia 4.73 mmol/l; HbA1c 41.0 mmol/mol. Blood count: leuco 6.8 x10^9/l; ery 4.31 x10^12/l; Hb 128 g/l; Hct 0.365 ob.podil; MCV 84.7 fl; MCH 29.7 pg; MCHC 351 g/l; RDW 13.7 %; tromboth 241 x10^9/l; objem thr 10.2 fl; trombo hkt 2.50 ml/l;

CASE REPORT 89y old woman patient coronary angiography

HR: 58 bpm, LV BP **205/18 mm Hg**, aorta **177/69/108** mmHg

Angiography of the left ventricle: Non-dilated LV with normal kinetics, EF more than 60 %, calcification of the mitral valve without apparent regurgitation, calcification of the **aortic valve with a med. gradient of 27 mmHg**. Aorta: triangular Ao flap, limited opening of the flaps, borderline severe aortic stenosis, no regurgitation. Coronarography: **RIA: 80 % stenosis**, RIA periphery without stenosis. RD I gracile, RD II significant stenosis, poor periphery. RIM large branch with a **tight 80% stenosis**, the periphery only with surface irrgularities. RC massive, RMS I and II without stenosis, on a large RPL sin **is significant 75% stenosis**, periphery without stenosis. ACD: tandem significant stenoses: proximal **tight 85% stenosis** extending to the central part of the **ACD where above 70%,** another double stenosis before RIV, with irregularities and gracile. Balanced type.

CASE REPORT 89y old woman patient
FOLLOW UP

- Sortis (atorvastastin) increased to 40 mg/day, otherwise medication unchanged. If hypertension/systolic BP above 180 mm Hg captopril 25 mg 1/2-0-0 once.

CONCLUSION: Dyspnea in left heart insufficiency and borderline stenosis of aortic valve and ischemic heart disease/diffuse coronary heart disease.

- **Next step(s) ?**
- **CABG, AVR ?? – increased (peri)operative risk but …** .

CASE REPORT 89y old woman patient

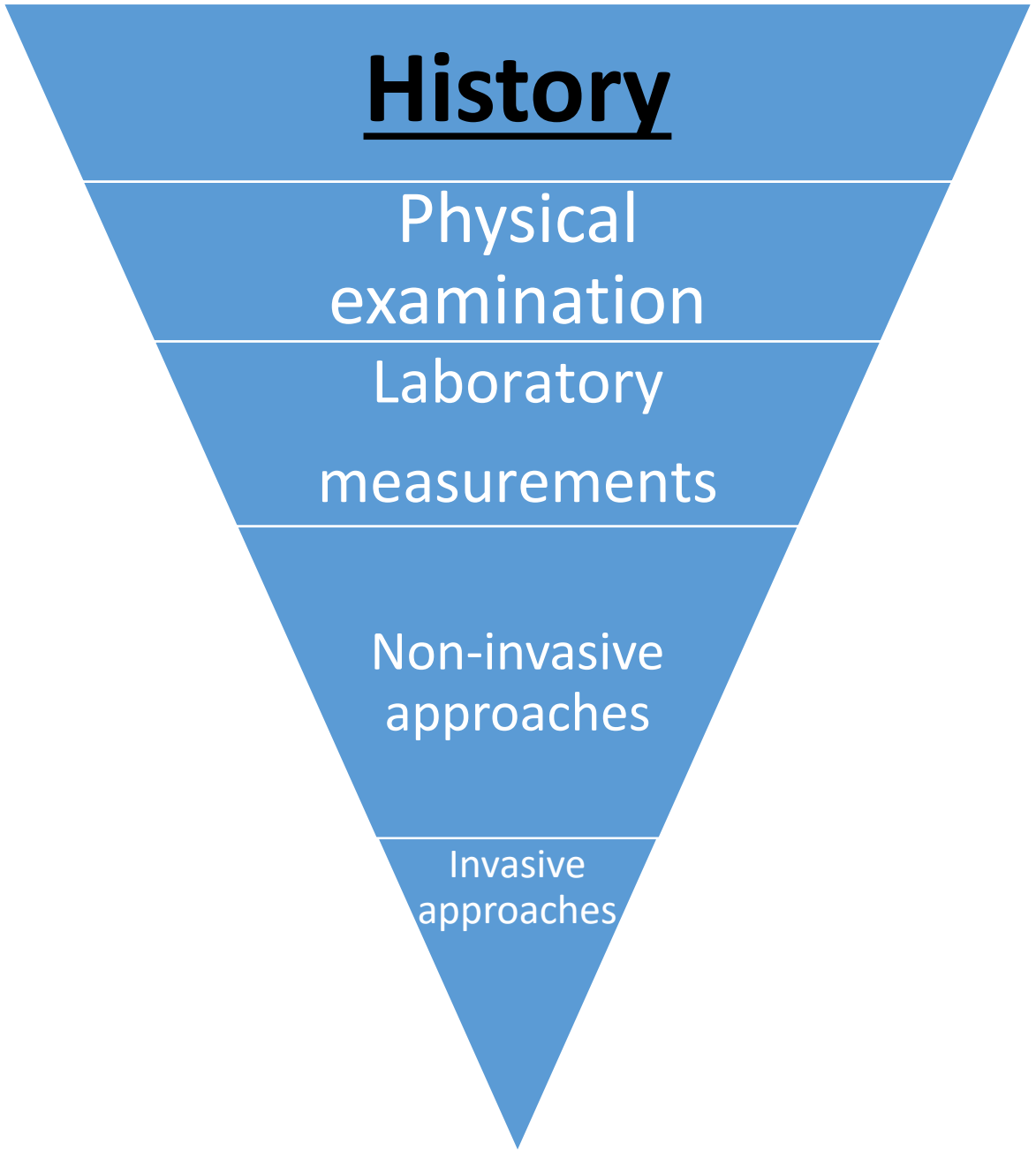
…

- Persistent problems: **CABG, AVR**

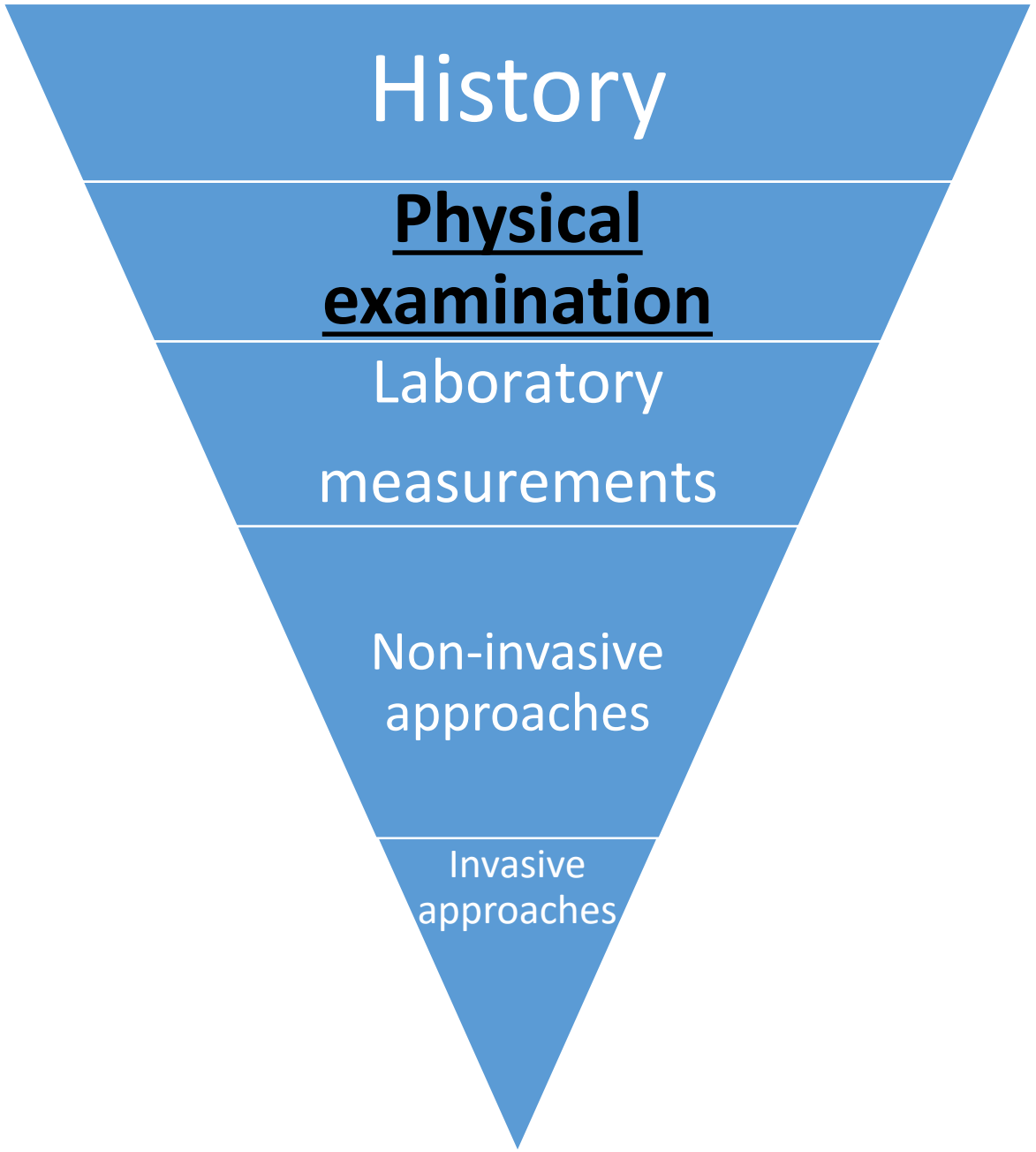
Good effect, but decline of cognitive functions

GENERAL RULES WHEN EVALUATING DISEASE:

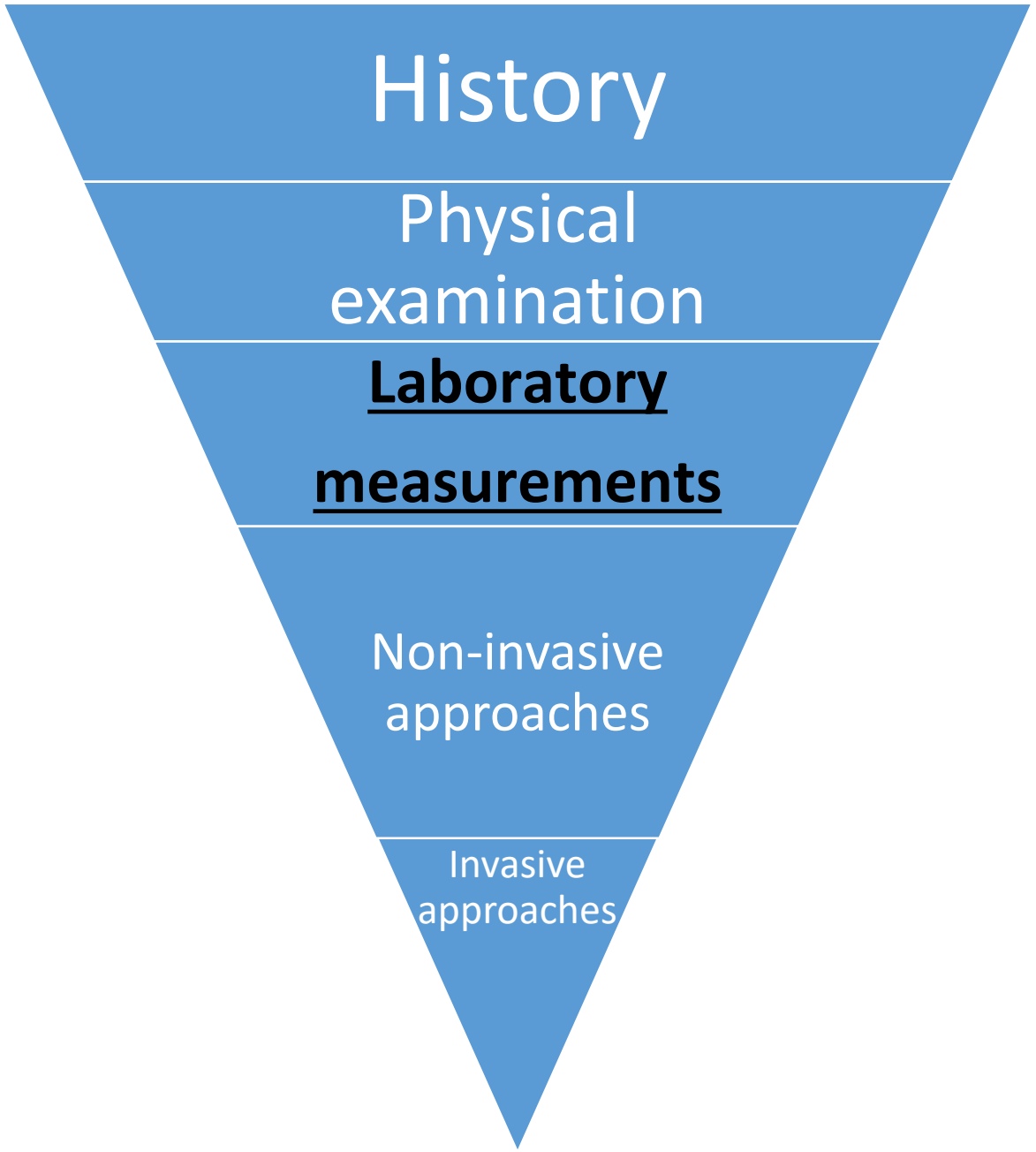
- **Definition**
- **Importance/prevalence/incidence**
- **Patophysiology**
- **<u>Strategy of examination – diff. dg.</u>**
- **Solution: admission to ICU, hospital, referral, out-patient management, …**
- **Pitfalls – special groups (elderly, diabetic population, …)**



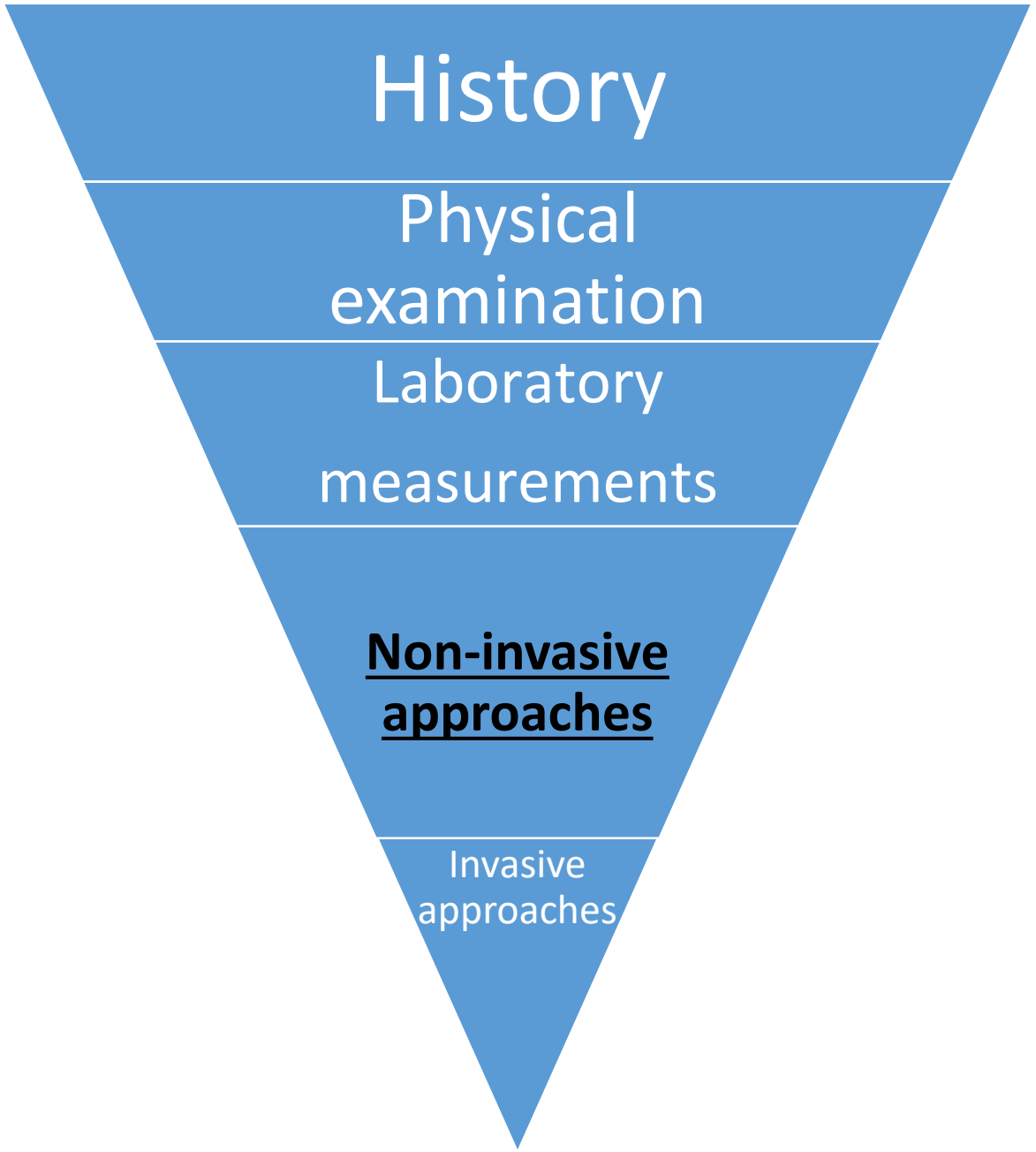
1. **What and where is the main problem (only 1)**
2. **<u>Provocating/alleviating situations/maneuvres</u>**
3. **<u>Accompanying signs/risk factors, …</u>**
4. **Intensity**
5. **Location**
6. **<u>Time course/duration</u> – new, long-lasting, worsening**



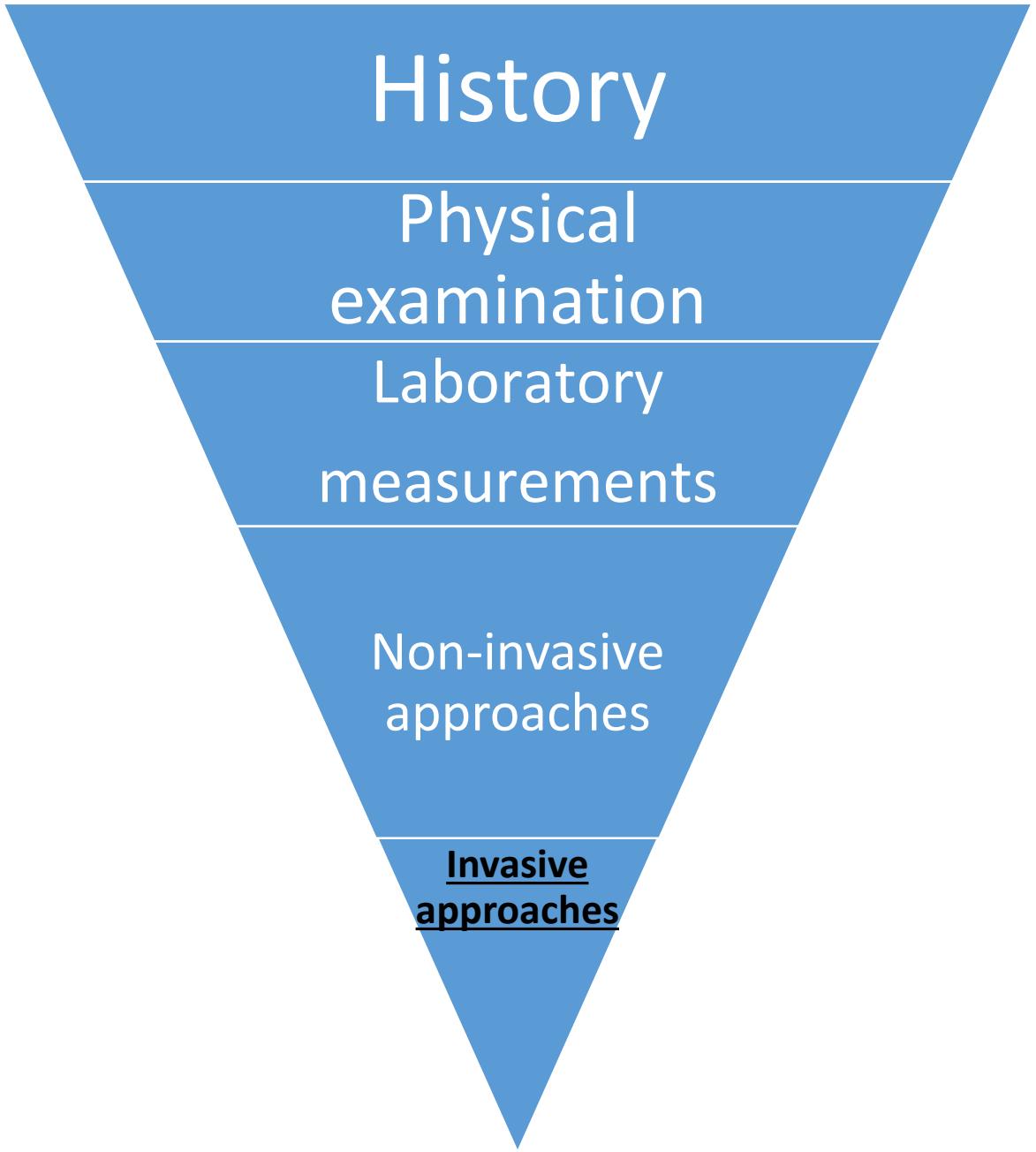
1. **General outlook – well, about to die, …**
2. **Hydratation, color, …**
3. **Vital sings Bl. Pr., Pulse Rate, Respiratory Rate, Temperature, Saturation (02)**
4. **Location**
5. **Focus on suspicious area (auscultation, …)**



1. **Glycemia**
2. **Blood gases (pH, pCO2, Po2, ...)**
3. **Cardiospecific markers**
4. **Blood count**
5. **Inflammatory markers: Sed. Rate, C-reactive protein, procalcitonine, interleukin-6, …**
6. **Minerals (Na, K, Cl, Ca, P, …)**
7. **Renal function – creatinine, urine analysis …**
8. **Status of coagulation INR/QUICK, aPTT, D-Dimers**
9. **Liver tests, bilirubin, amylases, albumin, …**
10. **Toxicology (unconsciousness of unknown origin …)**
11. **Bacteriology, parazitology**
12. **Other specific tests – hormonal status, imunology, ….**



1. **ECG**
2. **Monitoring of ECG, Blood pressure**
3. **X-ray, ….**
4. **Ultrasound studies (echo in the case of heart)**
5. **Computer tomography (CT)**
6. **Magnetic resonance (MR)**
7. **Scintigraphy**
8. **Pozitron emission tomography (PET)**
9. **Functional tests– bicycle/treadmill ECG, tilt test, walking test**
10. **Combine 1-9, …**



1. **Measurment of right heart pressures(CVP), intraarterial BP**
2. **Fibroscopy- gastro, broncho, …**
3. **Angiography**
4. **Electrophys. Studies**
5. **Laparascopy**
6. **Sternal puncture**
7. **Biopsy**
8. **Lumbal puncture**
9. **Invasive imaging of body spaces**
10. **...**

Causes of chest pain according to location and importance/urgency (could be similarly used in dyspnea and other conditions).

	Imminent threat to life	Less urgent
Cardiac	Acute forms of ischemic heart disease Dissection of (thoracic)aorta	Stabile angina pectoris Pericarditis Mitral valve prolapse Stenosis of aortic valve
Pulmonary	Hemodynamicaly signifficant pulmonary embolism Tension pneumothorax	Hemodynamicaly non-significant pulmonary embolism Non-tension pneumothorax Pleuritis
Other	Mediastinitis (rupture of esofagus, ...) Rupture/penetration of gastric ulcer	Anemia, Gastroesofageal refflux, Costochondritis Vertebrogenic origin, ...

Changes of CVS in older persons + clinical equivalents

MORPHOLOGICAL/TISSUE CHANGES	Thicker, less elastic walls of arteries, which more tortuous, increased peripheral resistance.	Fibrosis, deg. changes in SA node	Decreased resting heart rate (10%); even more on exertion (25%)	Dilatiton of left atrium/left ventricle, hypertrophy of cardiomyocyte increased fibrous tissue	Decreased contractility of cardiomyocyte	Increased catecholamines in circulation, decrease of adrenergic receptors (betaadrenergic)	Decreased oxygen consumption.
CHANGES OF FUNCTION	Increased systolic blood pressure	Slower and less stabile conduction of el. signals	Decreased cardiac output mainly during exertion.	Disturbed conduction Potential/vulnerability to reentry	Cardiac output less flexible during exertion.	Decreased reserve in stress	Variable decrease by oxygen consumption by 0-60 %
CLINICAL FINDINGS	Systolic hypertension, end-organ damage (CNS, myocardium)	Bradycardia (AV) blocade	Less prone to tachycardia Decreased efficiency	More vulnerable to atrial fibrillation	Decreased reserve in acute illnesses – more prone to cardiac insufficiency		

GENERAL COMMENTS:

Signs of CVD frequently different than in younger patients

- **Decreased tolerance to febrile illnesses, diarrhoea**
- **Clinical picture of CVD strongly modified by already implemented treatment**
- **Different dynamic/kinetic of drugs**
- **+ Caution – drugs associated with frequent falls (zolpidem tartas).**
- ***Major surgery in last years ? Complications - BP, ischemia, heart failure …***

MORE GENERAL COMMENTS:

- DECREASED CV RESERVE
- DECREASED MOBILITY
- DECREASED COGNITIVE FUNCTIONS
- CONCOMMITANT DISEASES
- CONCOMMITANT MEDICATION
- DECREASED LIVER/RENAL FUNCTION/CHANGED PHARMACODYNAMICS/PHARMACOKINETICS
- DEPENDENCE ON OTHER PERSONS

HISTORY:

<u>Chest pain (IHD) modified:</u>

- **Decreased mobility**
- **Chronic diseases, affected sensory systems (diabetes mellitus, transplantation of heart, imunosuppression, alcohol)**
- **Drugs including analgetics**
- **Frequently instead of chest pain – dyspnea, confusion, exhaustion**

HISTORY:

<u>Dyspnea:</u>

- **Decreased mobility**
- **Completely different signs – confusion, adynamy, reverse of sleeping cycle/pattern, nycturia ?**

GENERAL THOUGHTS IN PHYSICAL FINDINGS:

- **Vital signs: standing BP/heart rate, respiratory rate, temperature**
- **Cognitive abilities**
- **Hydration**

ADDITIONAL TESTS:

- **ECG – often already present abnormalities for longer periods – critical is comparison with older findings**
- **<u>Imaging methods</u> – Chest X-ray, echocardiography, sonography**
- **<u>Laboratory methods:</u> often cornestones for diagnosis – myocardial damage, aggravating factors (…), hydration**

GENERAL THERAPEUTICAL APPROACHES:

- **Lifestyle measures**
- **Pharmacotherapy**
- **Instrumental/surgical therapy**

ISCHEMIC HEART DISEASE – diagnosis

- Acute x chronic forms
- Different/strange manifestation: confusion, modified by other (more frequently encountered) illnesses.
- Physical findings – therapy
- Critical laboratory methods: troponine
- Important to establish aggravating factors: aortic stenosis, anemia, tachycardy/bradycardy

ISCHEMIC HEART DISEASE – therapy

- **Lifestyle measure – diet (?), …**
- **Pharmacotherapy: statins, antiaggregants, betablockers, ACEinhibitors in dysfunctional left ventricle, nitrates**
- **Instrumental therapy: angioplasty/stents, aorto-coronary bypass, …**
- **+ correction of aggravating factor(s) (aortal stenosis, anemia, …)**

HEART FAILURE

- **Systolic**
- **Diastolic**
- **Underlying factors (IHD, valvuvar disease, DCMP) and aggravating/triggering factors (arrhytmia, anemia, hypertension)**
- **Pericardial effusion**
- **Pulmonary disease/Pulmonary hypertension/Pulmonary exsudate**

HEART FAILURE – examination

- **ECG**
- **Chest Xray**
- **Echocardiography**
- **Laboratory tests – brain natriuretic hormone (BNP), troponine, blood count, renal function, minerals, thyroid function**

HEART FAILURE – URGENCY/ACUTE

- **START WITH (loop) DIURETICS**
- **VASODILATORS ACEinhibitors, AT II blockers, nitrates according to blood pressure; Betablockers; Spironolactone; Digoxin**
- **+ICD + correct aggravating factors (anemia, hyper-, hypothyreosis, drugs – non-steroid antiinflammatory drugs, reduce water/salt supply).**

TRICKY QUESTIONS/SITUATIONS

- **Renal failure x heart failure**
- **Hypohydratation x hyperhydratation**
- **In general: try, wait and watch – low and slow**

  diuretics/betablockers, …

ATRIAL FIBRILATION

- IN OLDER PERSONS MOSTLY CHRONIC
- FREQUENTLY ASYMPTOMATIC
- EXCLUDE UNDERLYING DISEASE (THYROID, IHD, …)
- RHYTHM x RATE CONTROL

Arhytmia –asymptomatic ?

- Repeated falls
- Pacients with multiple large bruises, reported as clumsiness, accidents, …
- Exhaustion
- Vertigo
- Cognitive deffects
- Worsening of ischemic symptoms, heart insufficiency

ATRIAL FIBRILATION - diagnosis

- **Signs – polyuria (?), often relatively slow rate (bellow 100/min, SA, AV block), rather aggravating factor – (left, …)heart insufficiency**
- **Despite asymptomatic arrhythmia, exclusion of organic heart disease (IHD, vavluvar disease/defect, heart insufficiency), pulmonary emboli, hypertension + dilation of left atrium, hyperthyrosis, mineral dysbalance (hypokalemia - indapamide)**

ATRIAL FIBRILATION – treatment

- Anticoagulation, rate control
- Once el. version recommended (according to the size of the left atrium)
- Control of rate x control of rhythm
- Exclude other causes: not well compensated hypertension, pulmonary emboli, hyperthyrosis, hypokalemia (potassium optimally more than 4 mmol/l)
- Radiofrequency ablation ?

ATRIAL FLUTTER similar approach as in ATRIAL FIBRILLATION

But:

MORE FREQUENTLY UNDERLYING ORGANIC HEART DISEASE

RFA MORE SUCCESSFUL

BRADYCARDIA

- **Frequently symptomatic (even whem left ventricle function is normal) – syncope, tiredness**
- **Frequently iatrogenic: therapy lowering heart rate, … hypokalemia**

BRADYCARDIA – examination

- History : falls, confusion, decreased stability , pharmacotherapy – digoxin, verapamil, betablockers.
- Physical examination: stability, sings of injury, BP/HR standing !!!
- ECG – sinus bradycardia, AV block, SiSiSy, normal
- 24h ECG, treadmill ECG

BRADYCARDIA – TREATMENT

- **IMPROVE/CORRECT THERAPY**
- **Symptomatic – atropine, isoprenalin inf. (not generally recommended)**

… <u>Pacemaker</u>

VALVULAR DISEASE

- **Mostly degenerative**
- **Most often aortic valve involved – stenosis/insufficiency**

+ Mitral/tricuspid insufficiency

- **Cave endocarditis – temperature/unclear septic status + (new) murmur – mostly from aortic/mitral area – mostly insufficiency**

Valvular diseases

Valvular defect	Symptoms	Complications	Therapy	Intervention
Aortic valve stenosis	Angina pectoris Dyspnea Unstability Syncope Sudden death	Endocarditis Pulmonary edema	Symptomatic of heart insufficiency ATB prophylaxis – recently reduced indications	Clinical picture tests/echocardiography ECG Transcatheter Aortic Valve Implantation) + coronarography
Aortic valve insufficiency	Dyspnea Palpitations Atypical chest pain	Endocarditis Pulmonary edema	Diuretics ATB prophylaxis – recently reduced indications	Progression of symptoms Dilation LV to 55 mm End-Systole
Mitral insufficiency	Tiredness, Dyspnea Palpitations Atypical chest pain	Endocarditis Pulmonary edema **Atrial fibrillation /Stroke**	Anticoagulation Rhythm/rate control Diuretics ATB prophylaxis …	Progression of symptoms Dilation of left atrium

PERIPHERAL ARTERY DISEASE

- **Patients at high risk of fatal manifestation of ischemic heart disease**
- **Symptoms less reliable – decreased mobility**
- **Ankle/brachial/index could be higher because of decreased compliance of arteries**

PERIPHERAL ARTERY DISEASE- diagnosis

- **History of rest pain !**
- **Trophical changes !**
- **Less compliant arteries – arteficially higher ankle brachial index, similarly as in diabetic patients (less than 0.9, but also more than 1.3).**

PERIPHERAL ARTERY DISEASE– treatment

- **Symptomatic – analgetics/opiates**
- **Revascularization if safe and feasible**
- **Quit smoking, walk, symptomatic: cilostasol, naphtidrophuryl,**
- **!!! Correction of all manageable cardiovascular risk factors including use of statins, antihypertensive drugs, antiaggregans.**

PREVENTION OF IHD/PAD at older age ?

- **Yes according to biologic age and presence of CVD risk factors**
- **Hypolipemics/statins**
- **Antihypertensive drugs**
- **Antiaggregans (only secondary – manifest disease)**

Leg edema

- Frequent
- Often only dependency establishe as a cause
- If symmetrical cardiac cause is to be excluded
- If asymmetrical, thromboembolic disease
- If no cause established – exercise, compression stockings, assurance

Summary – caveats of CV therapy

- Drugs controlling heart rate - betablockers, verapamil
- Proarrhythmic drugs - all antiarhytmic drugs with exception of betablockers
- Dehydration/hypotensive drugs - diuretics
- Blood softeners – antiaggregants, anticoagulants, their combination
- Hypoglycemic
- Drugs eliciting/aggravating confusion, unstability: hypnotics, sedatives, …

CAVE particular drugs

- Digoxine
- Amiodarone
- Nitrates
- Antiaggregans/anticoagulants
- Antihypertensive dd. – ACEinhibitors, betablockers, …
- Oral antidiabetics
- Analgetics, sedatives (benzodiazepins, zolpiden tartas)

Summary:

- Suspect (ischemic, …) heart disease also when atypical signs
- Focus more on potential diastolic dysfunction of left ventricle, renal artery stenosis
- More stress on laboratory tests, especially cardiac markers
- More cautious/sensitive diagnostic and therapeutic approaches
- However, do not abstain from interventional treatment just for age could be at least similarly effective as in younger persons (revascularization procedures)

MORE GENERAL COMMENTS:

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- CONCOMMITANT MEDICATION
- DECREASED LIVER/RENAL FUNCTION/CHANGED PHARMACODYNAMICS/PHARMACOKINETICS
- DEPENDENCE ON OTHER PERSONS