

What is Heart Failure? Why to Treat at Home?



Disclosures

- Unrestricted research grants
 - Roche Diagnostics
 - Novartis
 - Vifor
- Advisory Boards
 - Novartis
 - Roche Diagnostics
 - Servier
 - AstraZeneca
 - Boehringer-Ingelheim
- Collaboration in Interreg project
 - Sananet
 - Neurogames
 - Exploris
- Participation in multicentre trials
 - Boehringer Ingelheim
 - Novartis
 - Actelion
 - Roche Diagnostics
 - Critical Diagnostics

What is Heart Failure? Why to Treat at Home?

- Heart failure – one of the most important chronic diseases
 - Case presentation
 - What makes heart failure one of the most complex chronic diseases?
- Threats to current way of treating heart failure
 - New approaches are required
- The connection between NWE-CHANCE and PASSION-HF

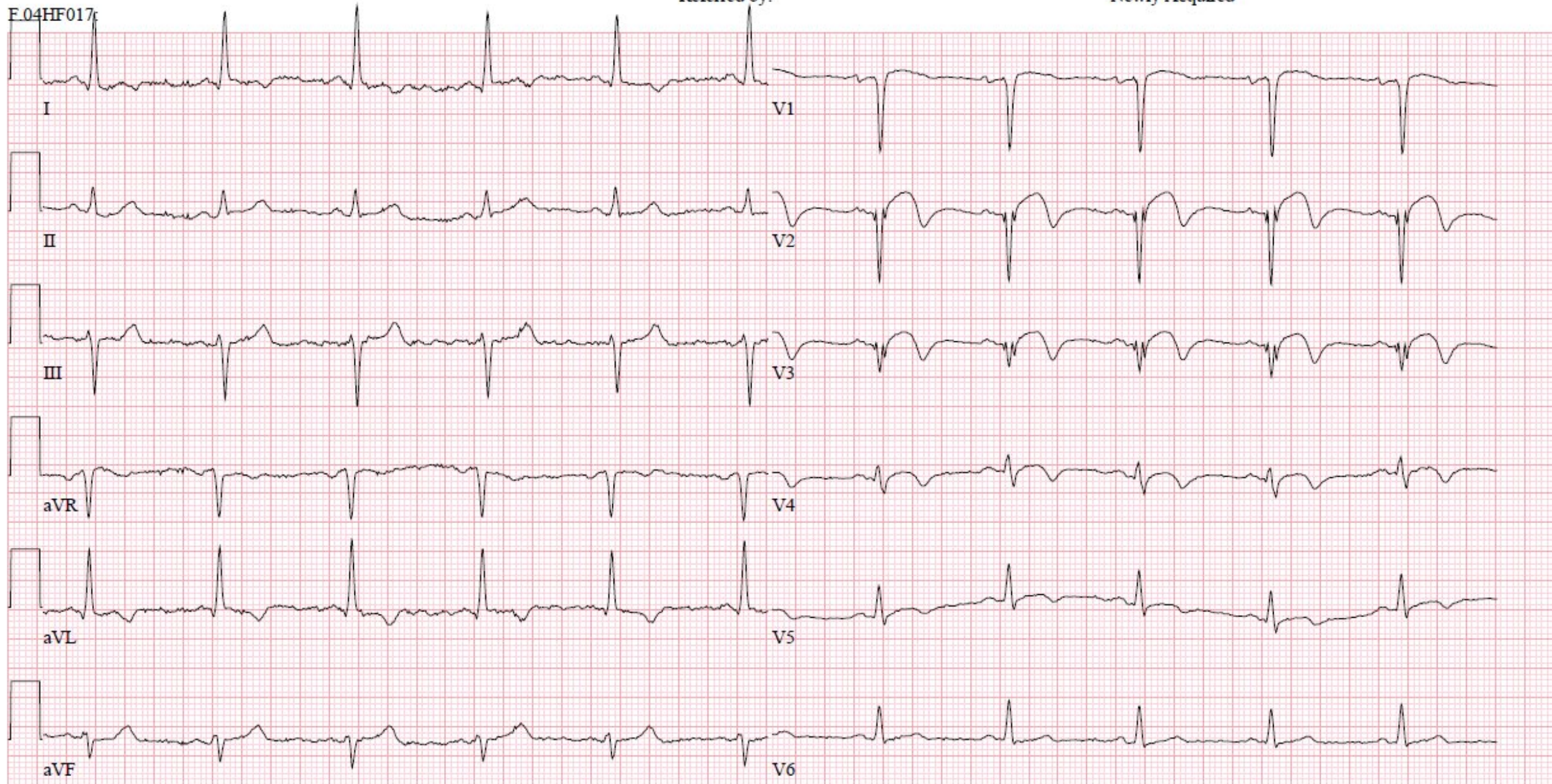
68y old man with increased cardiovascular risk

- Two weeks ago chest pain while walking with radiation to the left arm, shoulders and back
 - During this episode also shortness of breath
 - Perspired, no nausea, no syncope
- Symptoms disappeared within 10 minutes at rest
- After this episode, once in a while chest pain during exercise (max. 5 minutes)
- Somewhat short of breath during exercise since one month
- Sent by the GP for exercise testing

F.04HF017

Referred by:

Newly Acquired

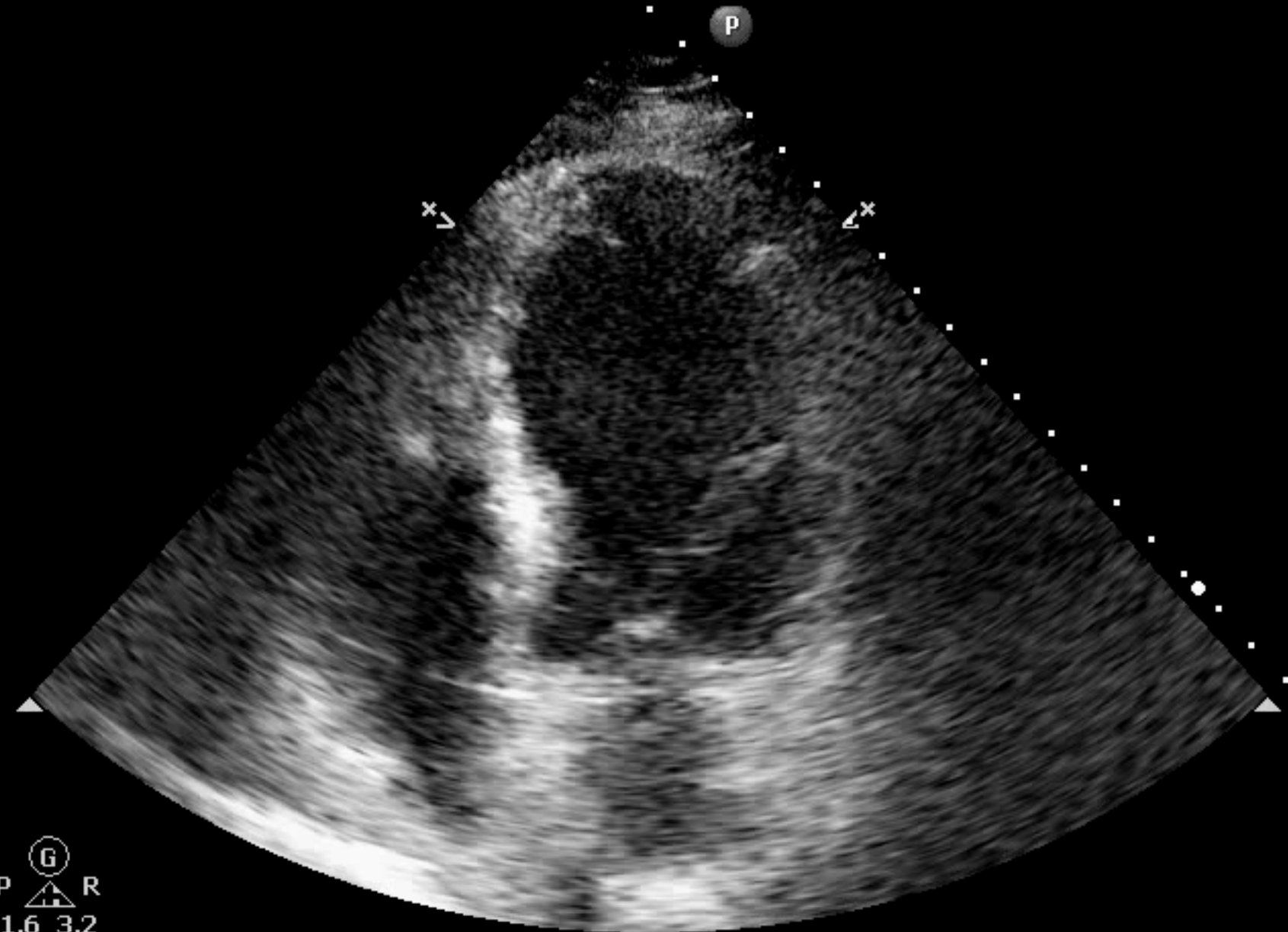


68y old man with increased cardiovascular risk

- Risk profile: HT+, HC+, DM+, smoking 30 y ago stopped, family history + (mother infarction)
- Admission to hospital for angiography
 - Left anterior artery occluded
 - PCI although questionable effect
- Treatment with diuretics due to volume overload after angiography and start carvedilol
- Temporary worsening of renal function

Adult Echo
S5-1
28Hz
19cm

2D
HGen
Gn 78
C 50
3 / 2 / 0
75 mm/s



G
P R
1,6 3,2



63
BPM

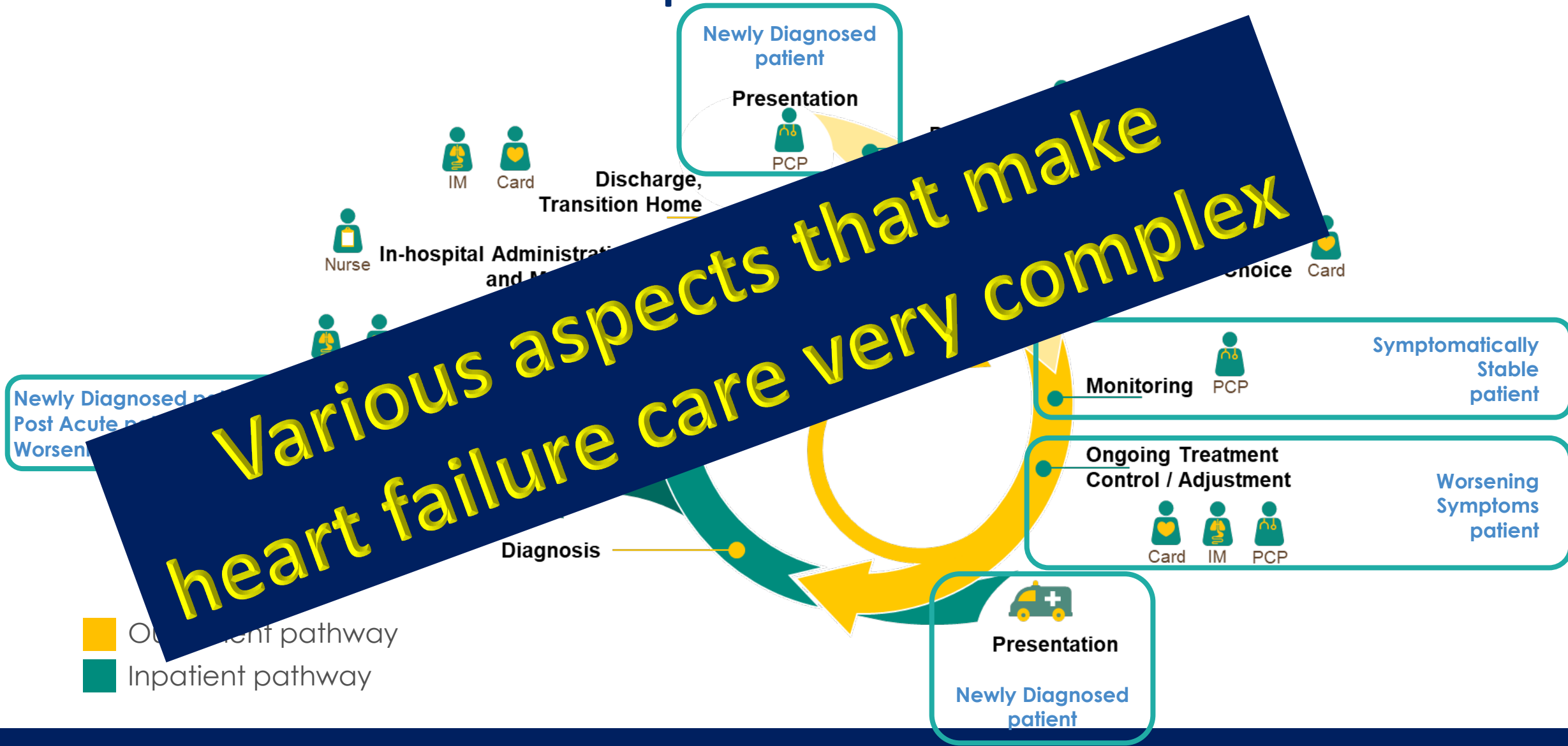
68y old man with subacute anterior infarction

- Medication at discharge (after admission for 7 days)
 - Bumetanide 1mg b.i.d.
 - Carvedilol 3,125mg b.i.d. (reduced due to decompensation)
 - Sacubitril/valsartan 24/26mg b.i.d.
 - Clopidogrel 75mg, atorvastatin 40mg, metformin 1000mg b.i.d.
- Outpatient clinic 2 weeks after discharge with lab testing
 - Start eplerenone 25mg o.d.
 - Later start of empagliflozin 10mg, uptitration of carvedilol to 25mg b.i.d., uptitration of sacubitril/valsartan
 - Total of 3 outpatient visits and 3 phone contacts
- Reevaluation after 3 month regarding ICD implantation
- Readmission due to decompensation 5 months later

68y old man with subacute anterior infarction

- Resource intensive treatment of HF and its underlying disease (coronary artery disease)
- Within 6 months
 - 3 hospitalisations, total of 16 days in hospital, 2 days CCU
 - Initial hospitalisation, ICD implantation, readmission due to ADHF
 - 7 outpatient contacts with HF clinic
 - 1 control of ICD
 - 2 contacts with GP (due to diabetes)
- What could have been done remotely at home? By what means?
- What could be done by the patient himself, now and in future?

Overview of care process in chronic diseases

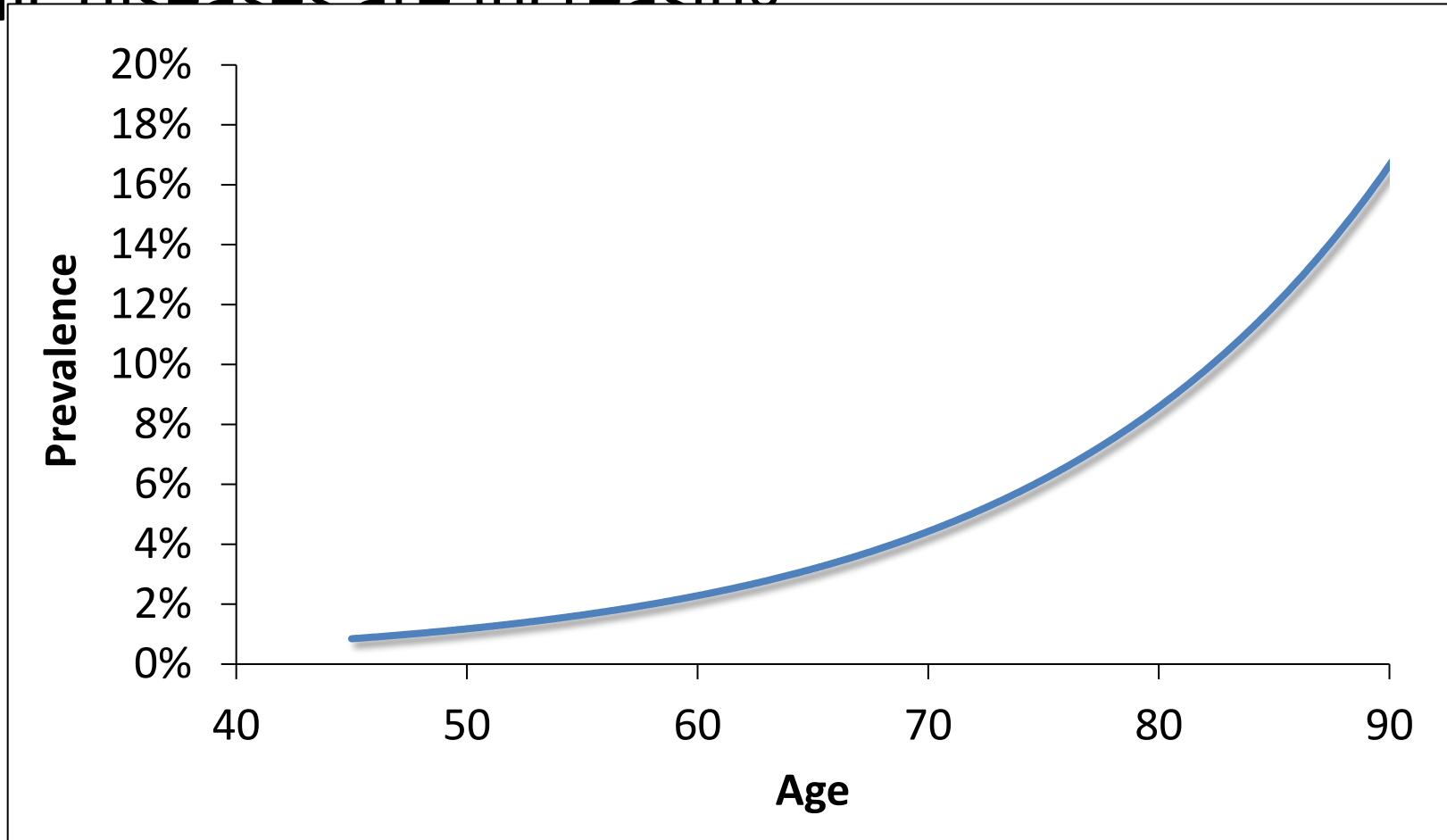


What makes heart failure a complex disease?

- Heart failure is – as most chronic diseases – a disease of the (very) old

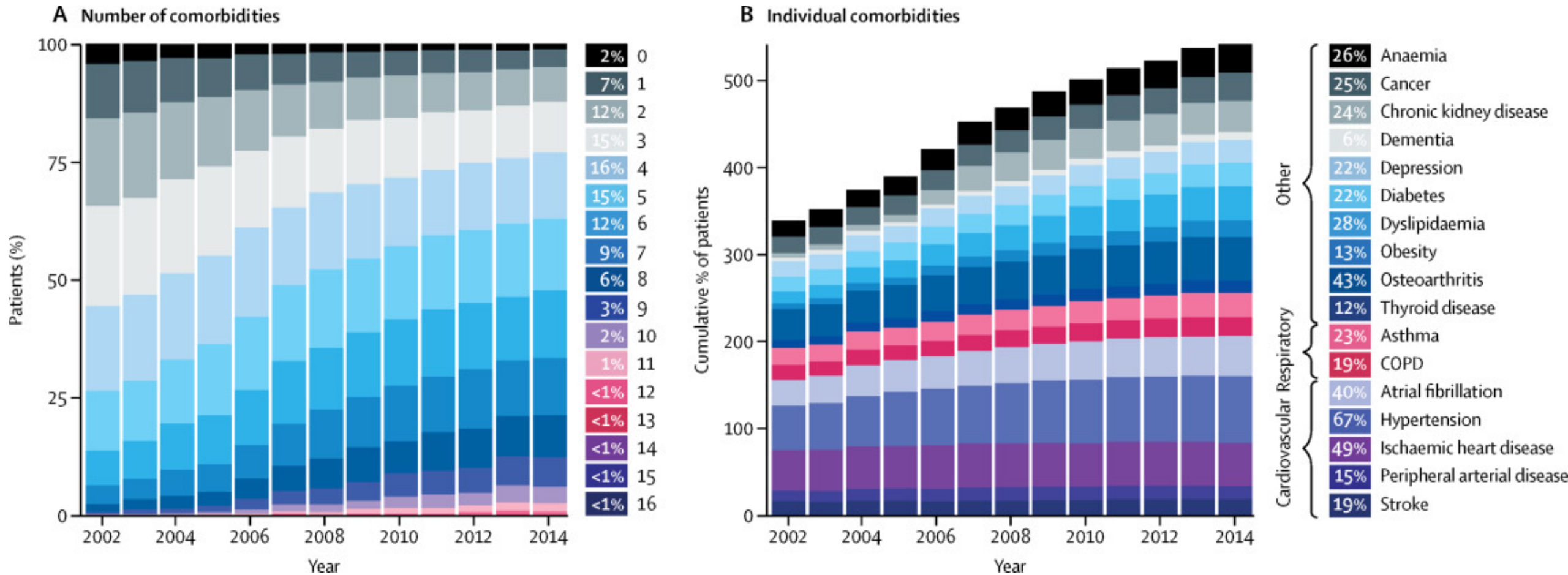
Threat to Future Care

- Chronic diseases are increasing



- Heart in EU expected increase to 3% by 2025 ($\approx 20.000.000$ pts) years),

Comorbidities in Heart Failure



Interaction between co-morbidities and heart failure, independent of LVEF

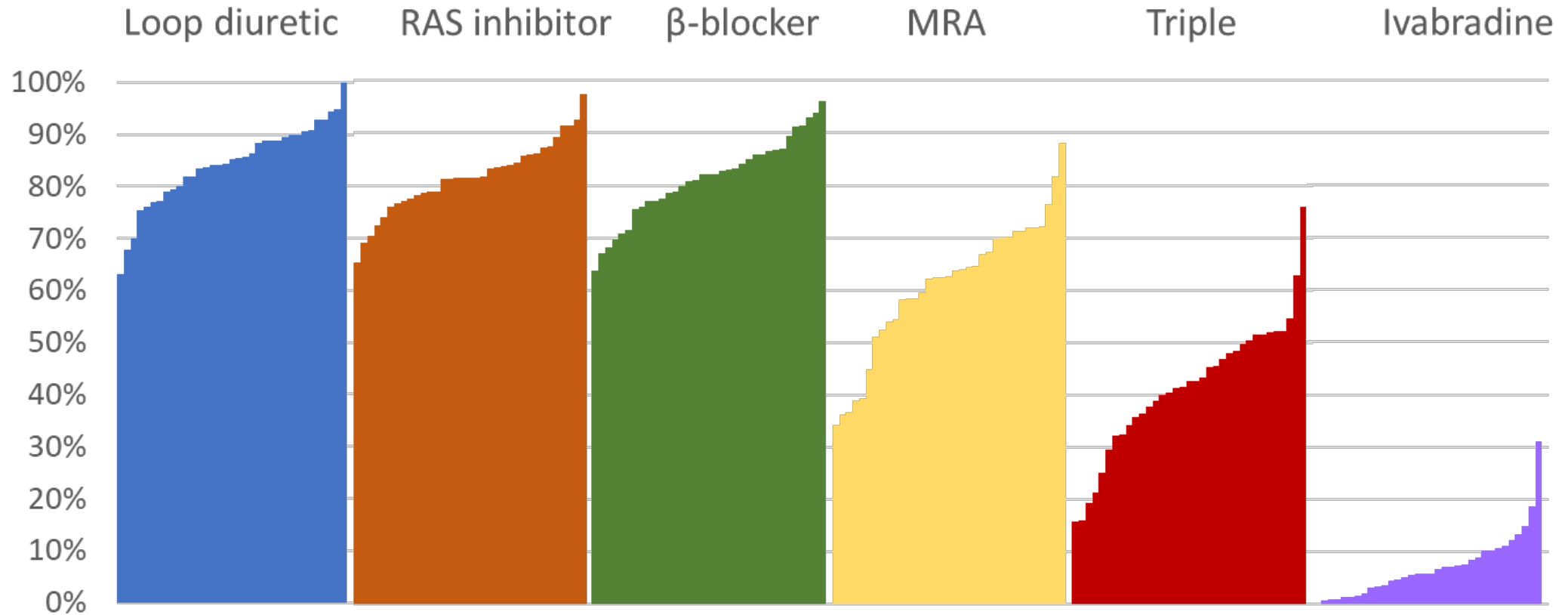
| COMORBIDITY | BIDIRECTIONAL IMPACT ON DISEASE PROGRESSION | HEART FAILURE SPECIFICS |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Chronic obstructive pulmonary disease | <p>Inflammation; hypoxia; parenchymal changes; airflow limitation, leading to pulmonary congestion; abnormal left ventricular (LV) diastolic filling; inhaled beta-agonist cardiovascular effects</p> <p>Elevated LV end-diastolic pressure and beta-blocker use may compromise lung function</p> | <p>More prevalent in preserved ejection fraction (HFpEF), compared to reduced (HFrEF)</p> <p>Higher mortality risk in HFpEF</p> |
| Anemia | <p>Adverse LV remodeling; adverse cardiorenal effects; increased neurohormonal and inflammatory cytokines</p> <p>Inflammation; hemodilution; renal dysfunction; metabolic abnormalities exacerbate</p> | <p>More prevalent in HFpEF</p> <p>Similar increased risk for mortality in both groups</p> |
| Diabetes | <p>Diabetic cardiomyopathy; mitochondrial dysfunction; abnormal calcium homeostasis; oxidative stress; renin-angiotensin-aldosterone system (RAAS) activation; atherosclerosis; coronary artery disease</p> <p>Incident and worsening diabetes mellitus via sympathetic and RAAS activation</p> | <p>More prevalent in HFpEF</p> <p>Similar increased risk for mortality in both groups</p> |
| Renal dysfunction | <p>Sodium and fluid retention; anemia; inflammation; RAAS and sympathetic activation</p> <p>Cardiorenal syndrome through low cardiac output; accelerated atherosclerosis; inflammation; increased venous pressure</p> | <p>Similar prevalence in both groups</p> <p>Similar increased risk for mortality in both groups</p> |
| Sleep-disordered breathing | <p>Hypoxia; systemic inflammation; sympathetic activation; arrhythmias; hypertension (pulmonary and systemic); RV dysfunction; worsening congestion</p> <p>Rostral fluid movement may worsen pharyngeal obstruction; instability of ventilatory control system</p> | <p>Similar prevalence in both groups</p> <p>Unknown mortality differential associated with HFpEF vs. HFrEF</p> |
| Obesity | <p>Inflammation; reduced physical activity and deconditioning; hypertension; metabolic syndrome; diabetes mellitus</p> <p>Fatigue and dyspnea may limit activity; spectrum of metabolic disorders including nutritional deficiencies</p> | <p>More prevalent in HFpEF</p> <p>Obesity paradox; potential for a U-shaped association with mortality</p> |

| Comorbidity | Disease-disease Interaction | | | | Disease-drug Interaction | | | | | | Drug-drug Interaction | Synergistic treatments | Uncertain drugs | |
|------------------------|-----------------------------|-------------------------------------|--------------------|--------------------|--------------------------------------|----------------------------|-------------------|----------------------------------|----------------------------|------|-----------------------|------------------------|-----------------|-----|
| | | | | | CHF and treatment of the comorbidity | | | Comorbidity and treatment of CHF | | | | | | |
| | Risk factor | Functional status / hospitalization | Symptom overlap | Diagnostic workup | Symptom overlap | Caution / contraindication | Safe | Symptom overlap | Caution / contraindication | Safe | Symptom overlap | DDI | | |
| Asthma | * | | * | | (b ₁) | *(b ₂) | (b ₃) | (b ₄) | BB ₃ | | * | * | | |
| BPH | | | | | | | | | | | | | | |
| Chronic back disease | | | | | NSAID ₁ | *NSAID ₁ | | | | | | * | | |
| Chronic kidney disease | * | | | * | | * | | | * | * | | * | | |
| COPD / bronchiectasis | *(a ₁) | (a ₂) | *(a ₃) | *(a ₄) | | * | BB ₂ | | | * | * | * | | |
| Dementia | * | | | * | | * | * | | | | * | * | | |
| Depression | * | | | | | * | * | | | | *(c) | | | |
| Diabetes mell. | * | | | * | | * | *BB ₂ | | * | * | | * | | |
| Hypercholesterolaemia | | | | | | * | | | | | | * | | |
| Hypertension | | | | * | | *BB ₁ | *BB ₂ | | | | * | * | | |
| LRD | | | | | NSAID ₂ | *NSAID ₂ | | | | | | * | | |
| Ocular disorders | | | | | | *BB ₁ | | | | | | | | |
| Osteoarthritis | | | | | NSAID ₁ | *NSAID ₁ | | | | | | * | | |
| Osteoporosis | * | | | | NSAID ₁ | *NSAID ₁ | | | | | | * | | |
| PAD | * | | | | | * | BB ₂ | | | * | | * | | |
| Thyroid disorders | | | * | * | | *BB ₁ | * | | | | | (d) | | |
| <i>Total numbers</i> | 21 | 9 | 12 | 26 | 8 | 60 | 19 | 3 | 12 | 13 | 0 | 12 | 52 | 123 |

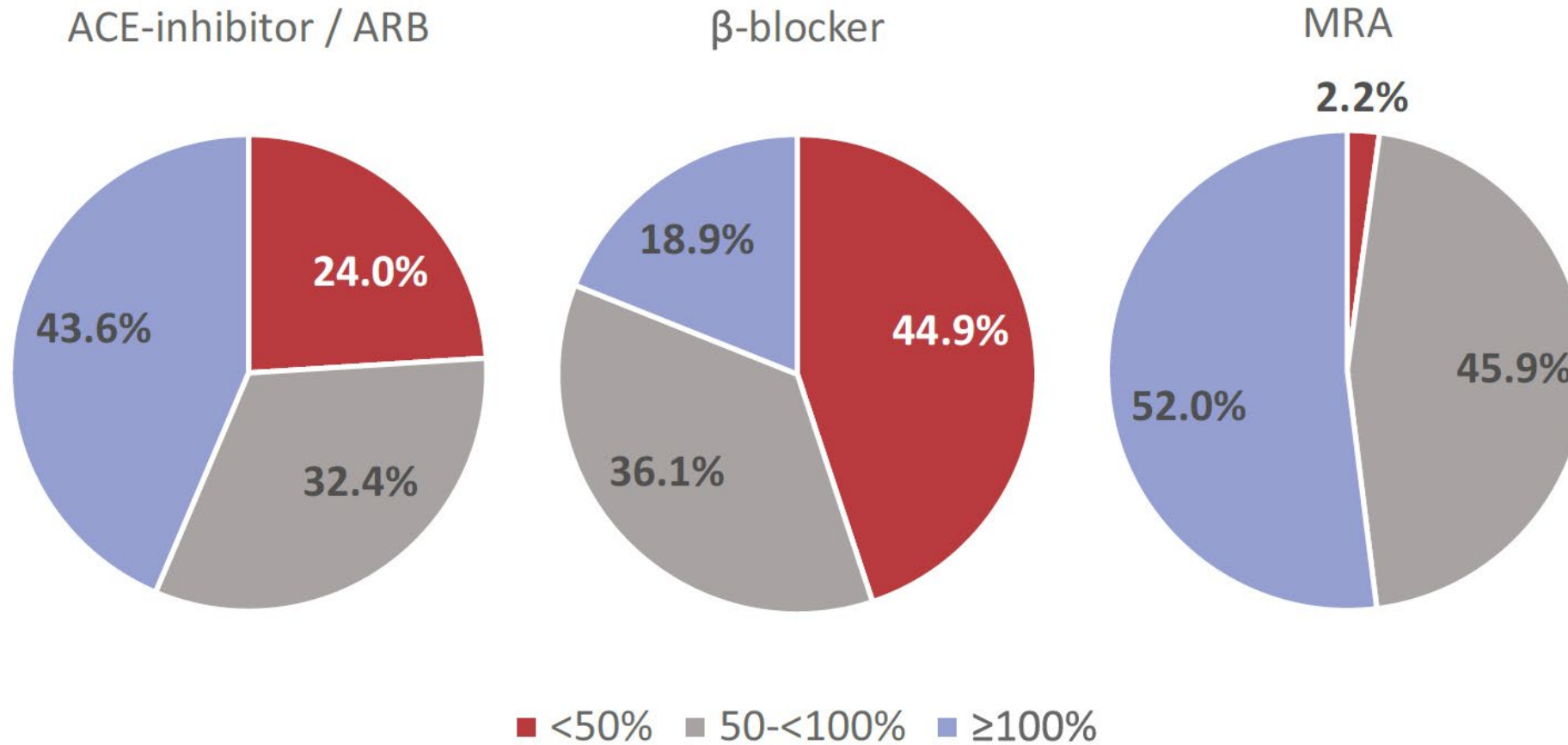
What makes heart failure a complex disease?

- Heart failure is – as most chronic diseases – a disease of the (very) old
- Treatment is not easy and not uniformly applied

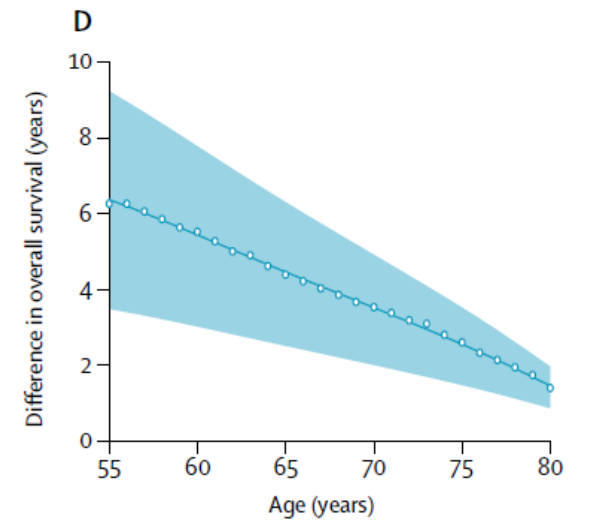
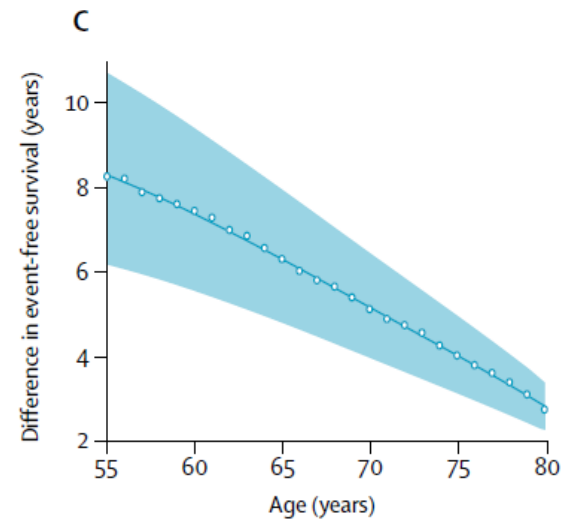
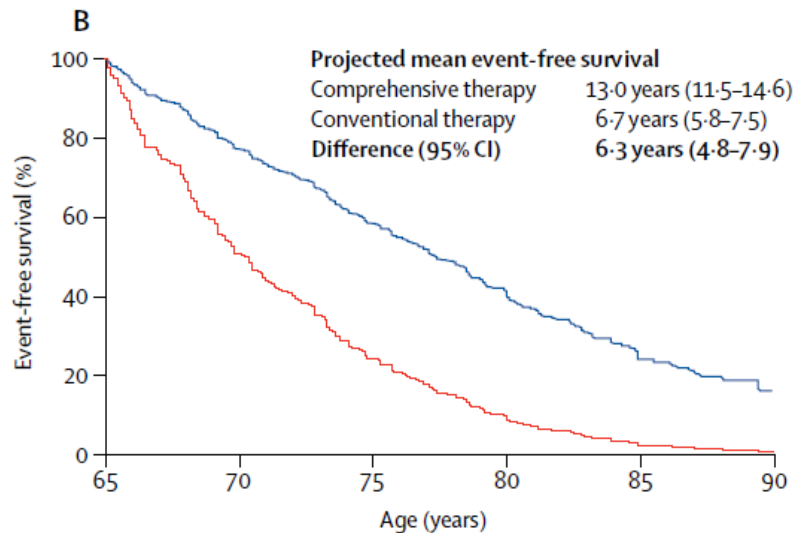
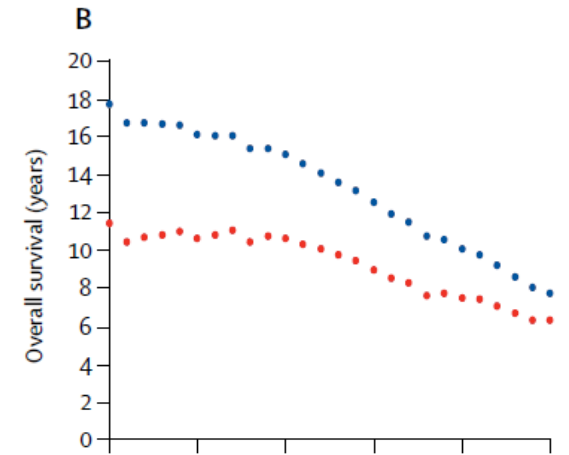
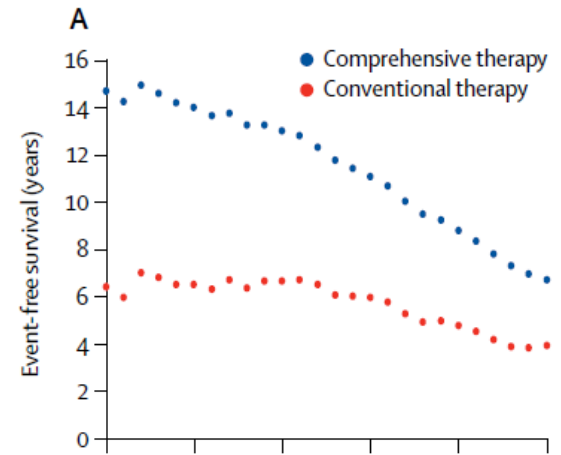
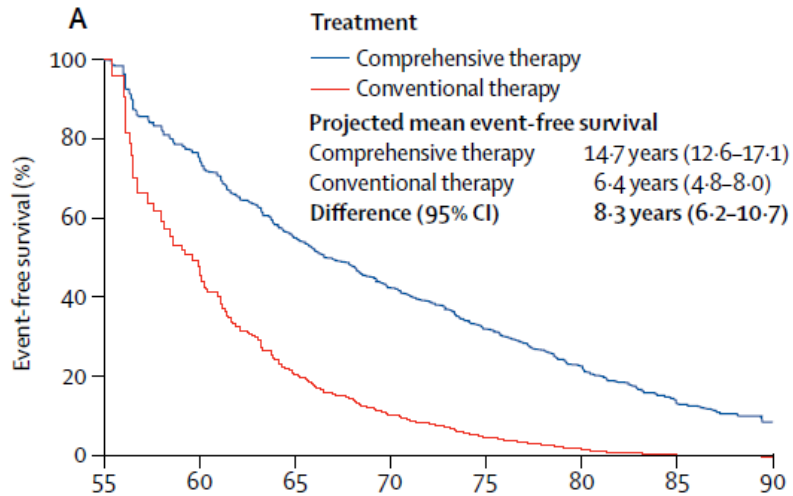
CHECK-HF registry. Differences in treatment between 34 Dutch centres in HFrEF



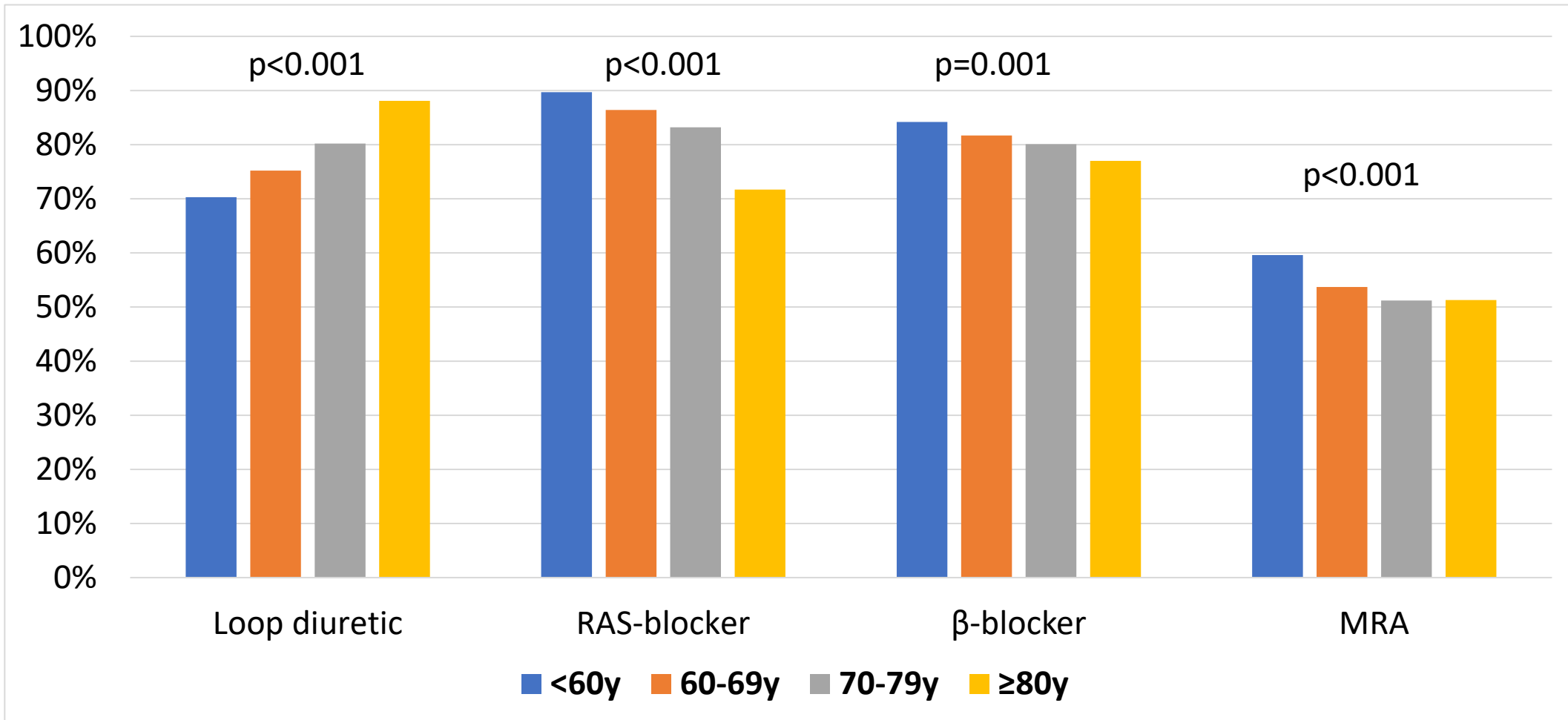
CHECK-HF: dose of evidence based HFrEF therapy



Lifetime effect of modern HFrEF therapy



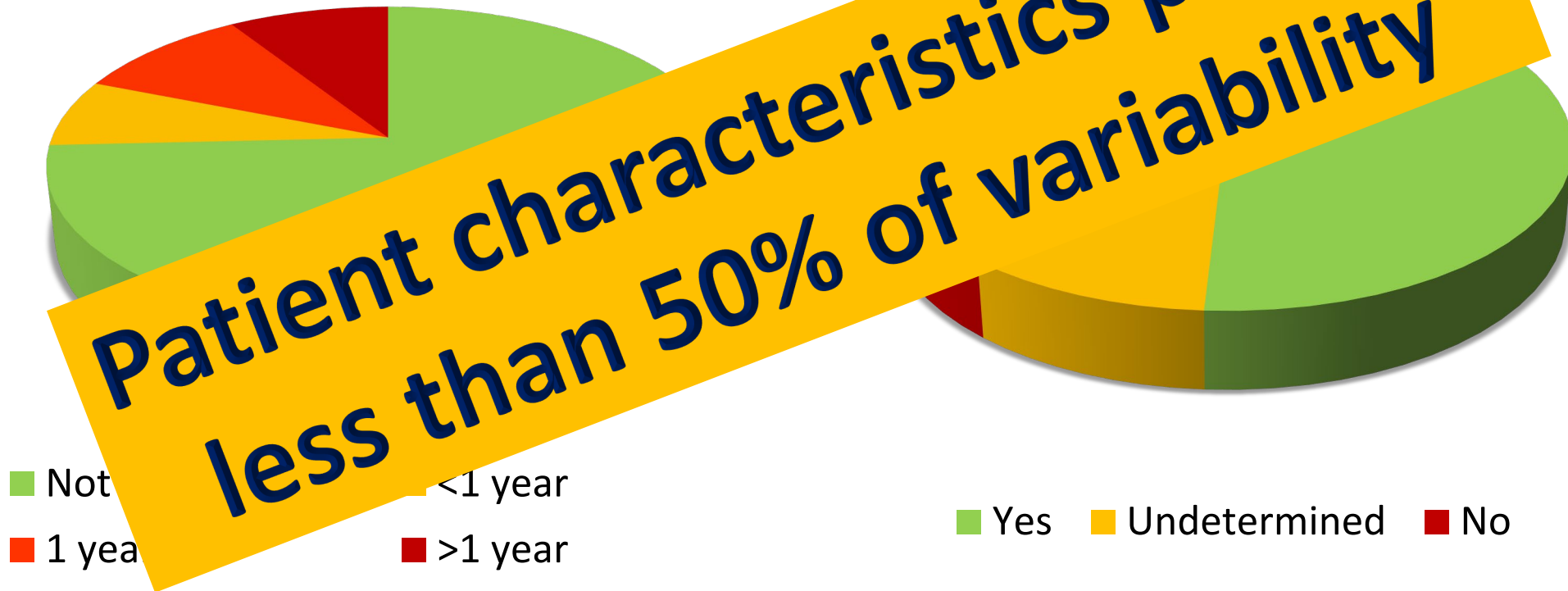
Prescription rate of medication in different age groups



End of Life Preferences of HF Patients

Trade part of remaining lifespan for perfect quality of life?

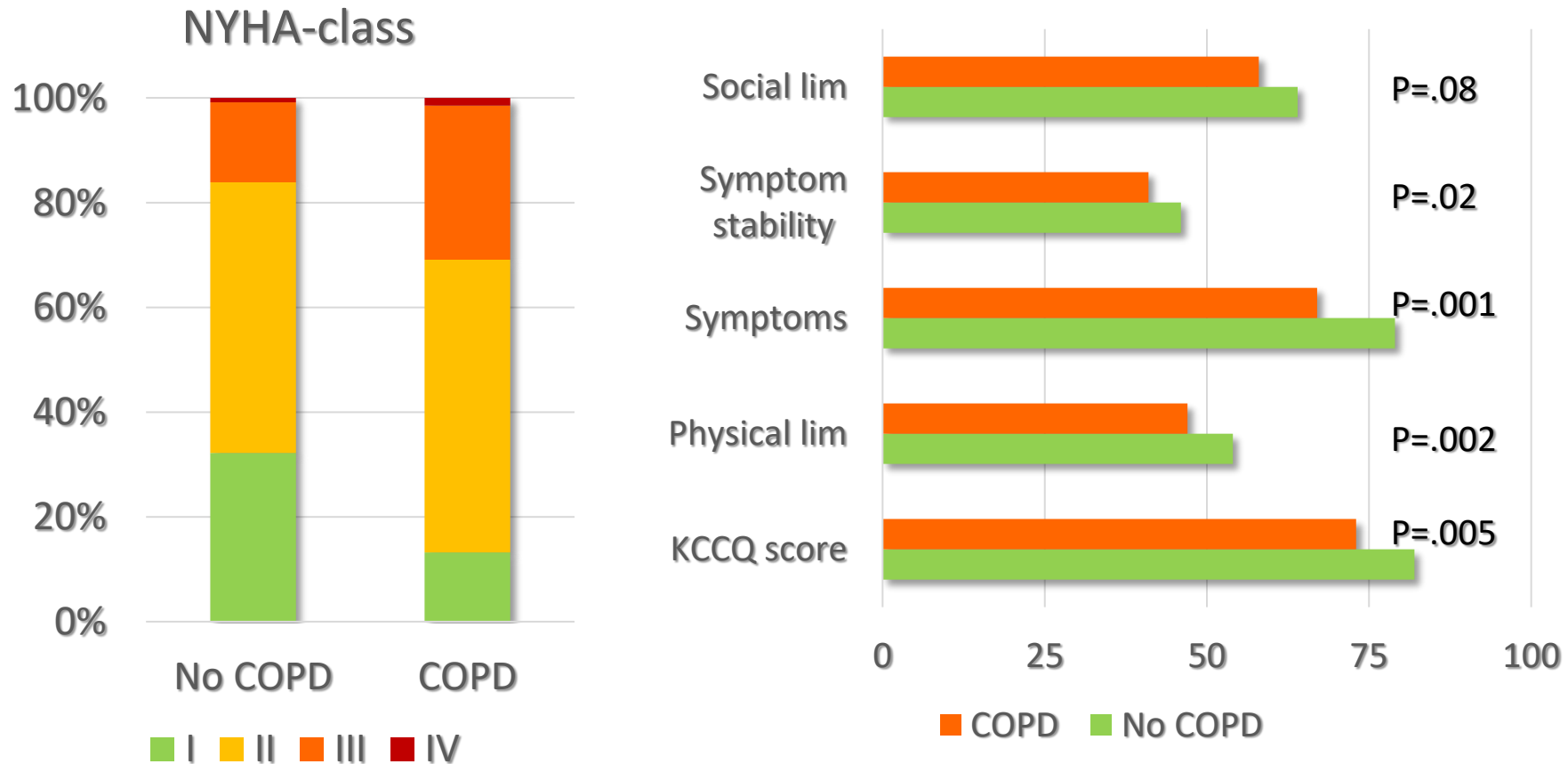
Resuscitation?



What makes heart failure a complex disease?

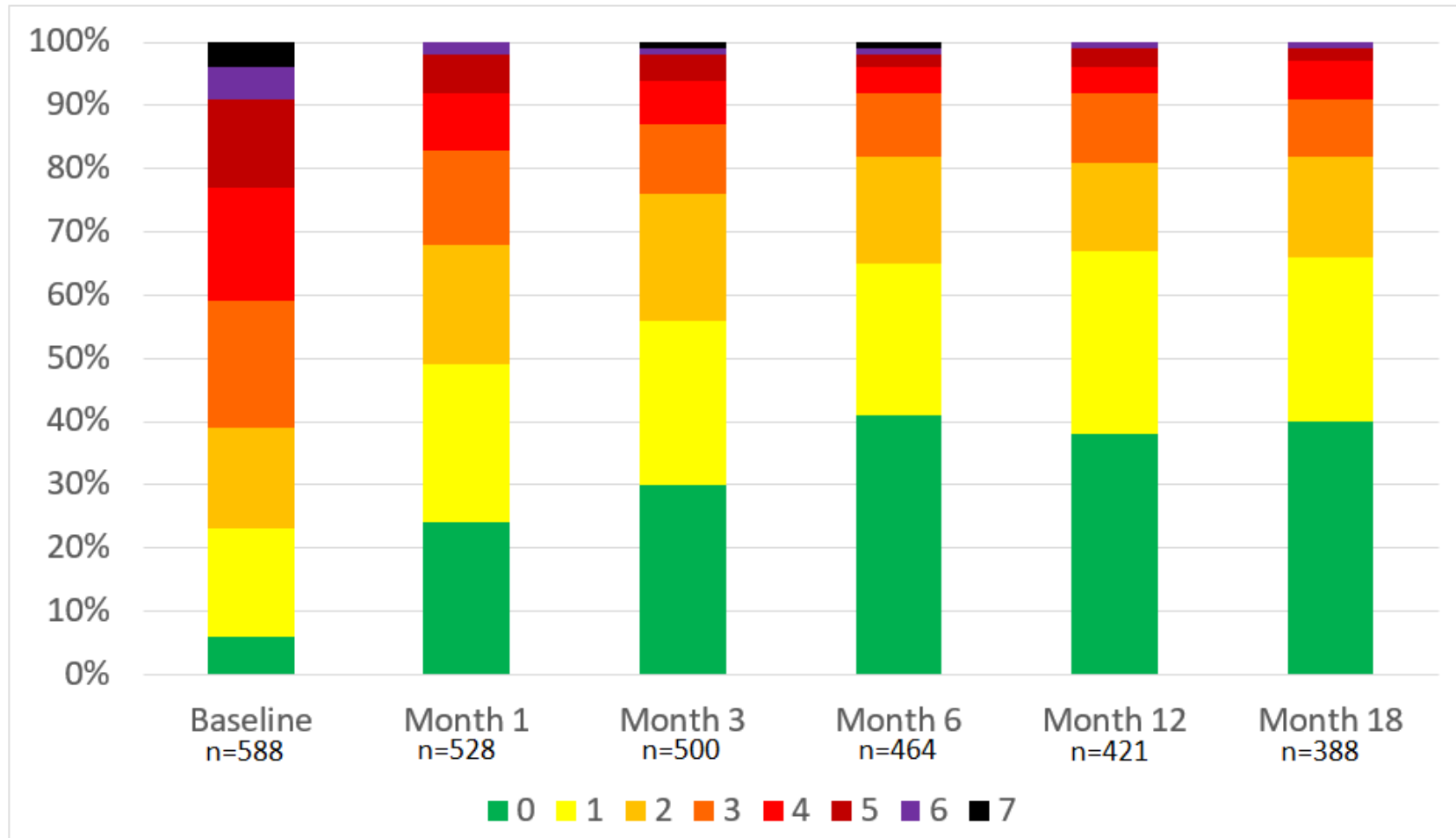
- Heart failure is – as most chronic diseases – a disease of the (very) old
- Treatment is not easy and not uniformly applied
- **Assessment / diagnosis is difficult**

COPD worsens symptoms and reduces quality of life in heart failure patients



Volume overload in chronic heart failure

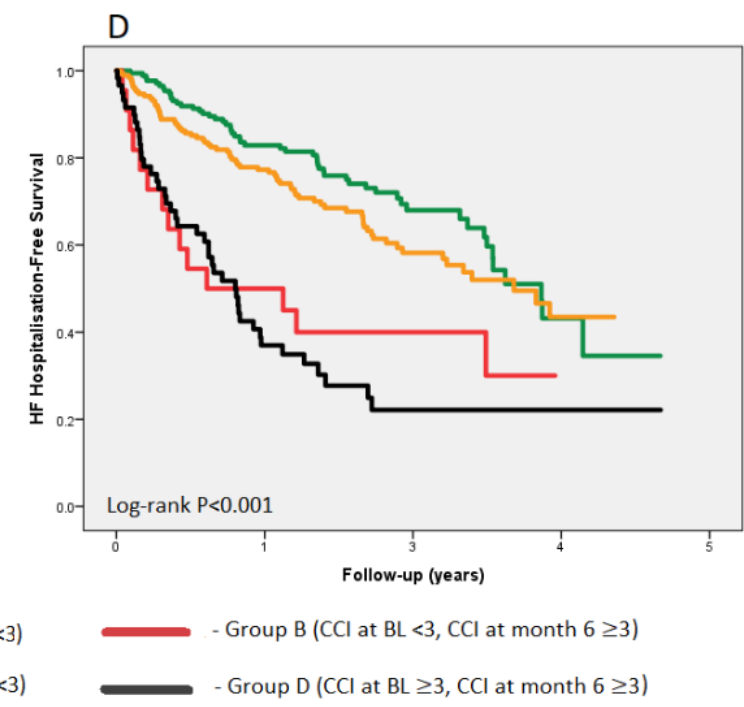
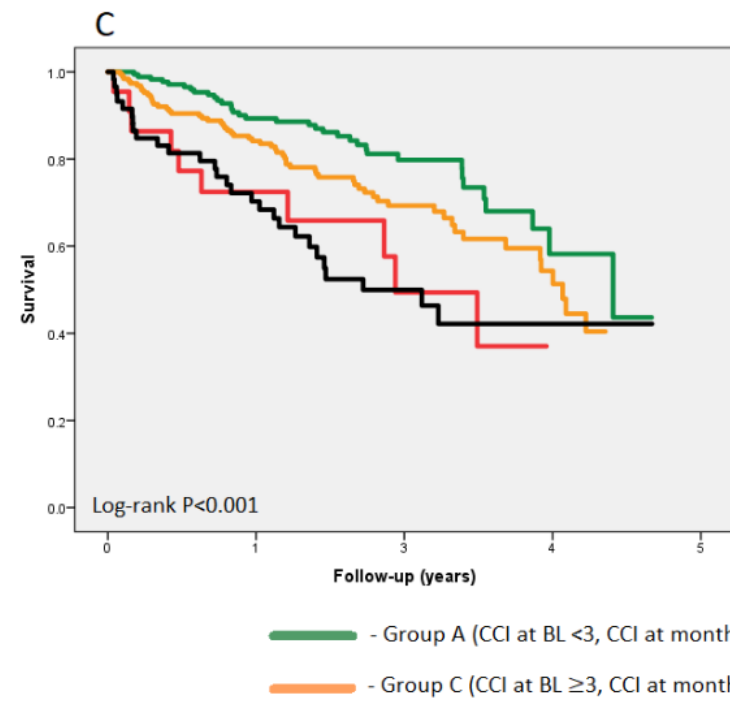
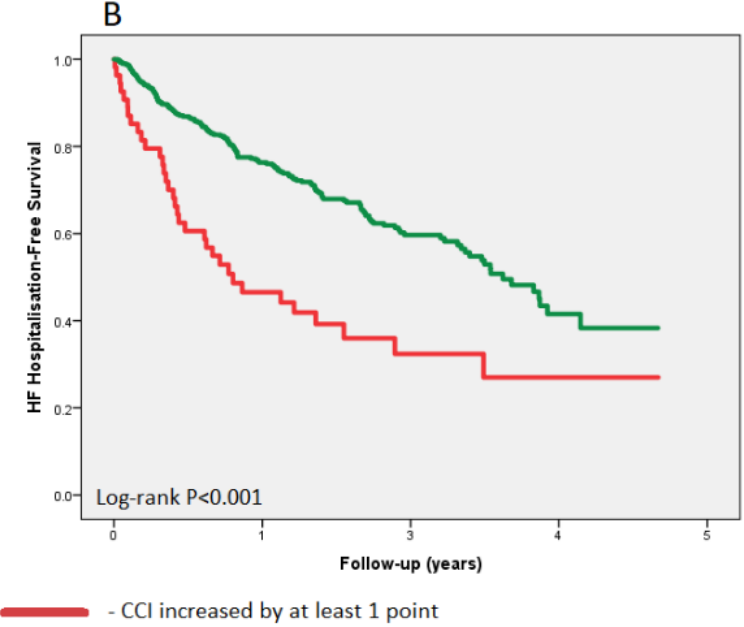
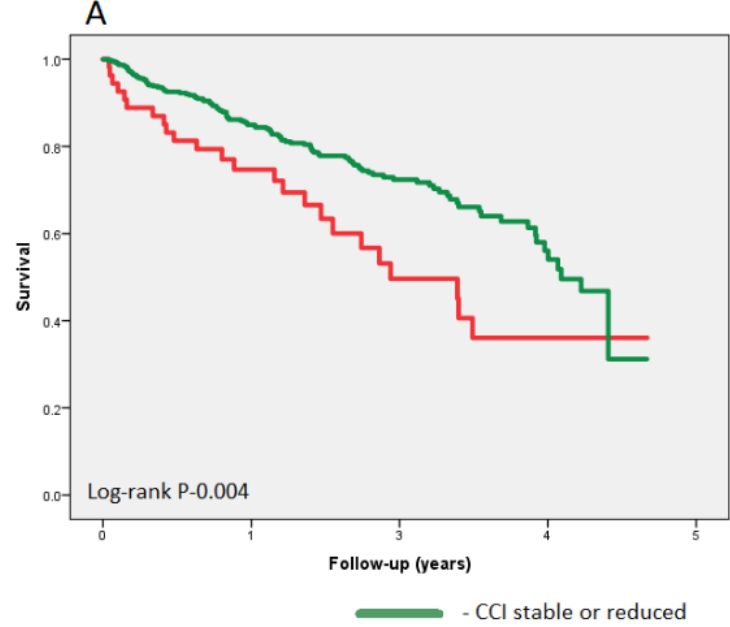
Present in a significant % of patients



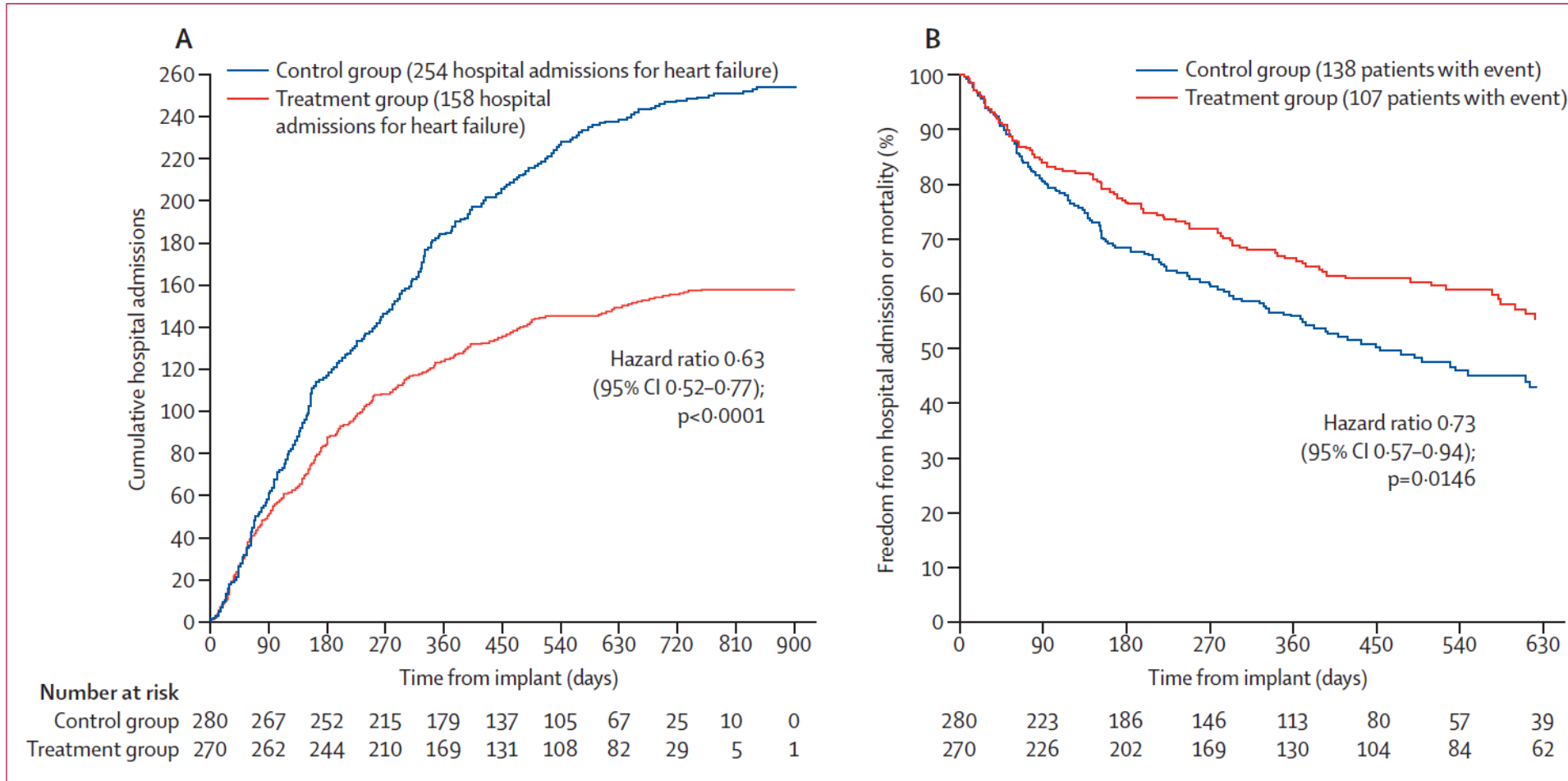
Clinical Congestion Index

- NYHA \geq 3
- Hepatomegaly
- Oedema
- Elevated venous pressure
- Orthopnoea
- Rales
- PND

Persistent congestion is related to poor outcome



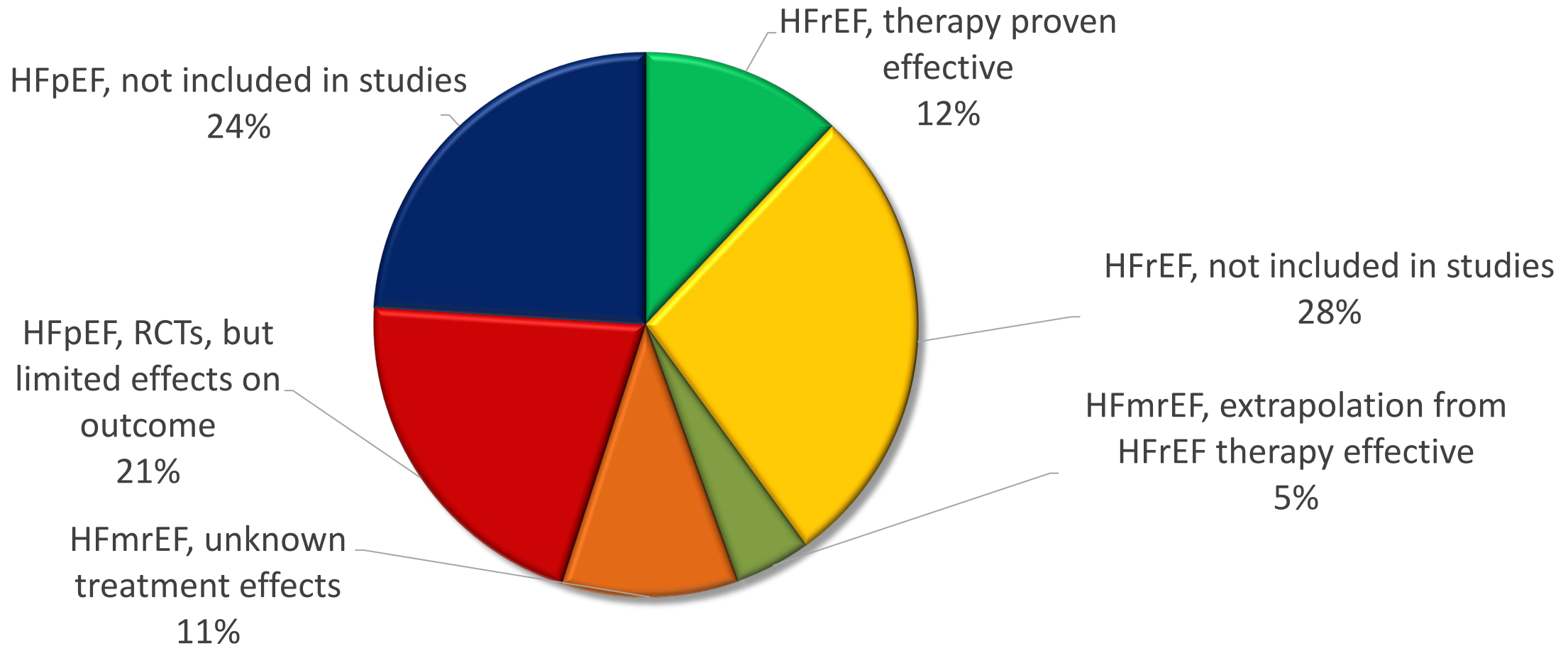
CHAMPION-trial: reduction of HF events by invasive monitoring of congestion



What makes heart failure a complex disease?

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- Treatment is not easy and not uniformly applied
- Assessment / diagnosis is difficult
- Evidence is limited to a relatively small proportion of the entire heart failure population and absent in acute heart failure

In how many heart failure patients is treatment evidence-based?



Implementation of guidelines in all patients with heart failure? We do not know!

Pro

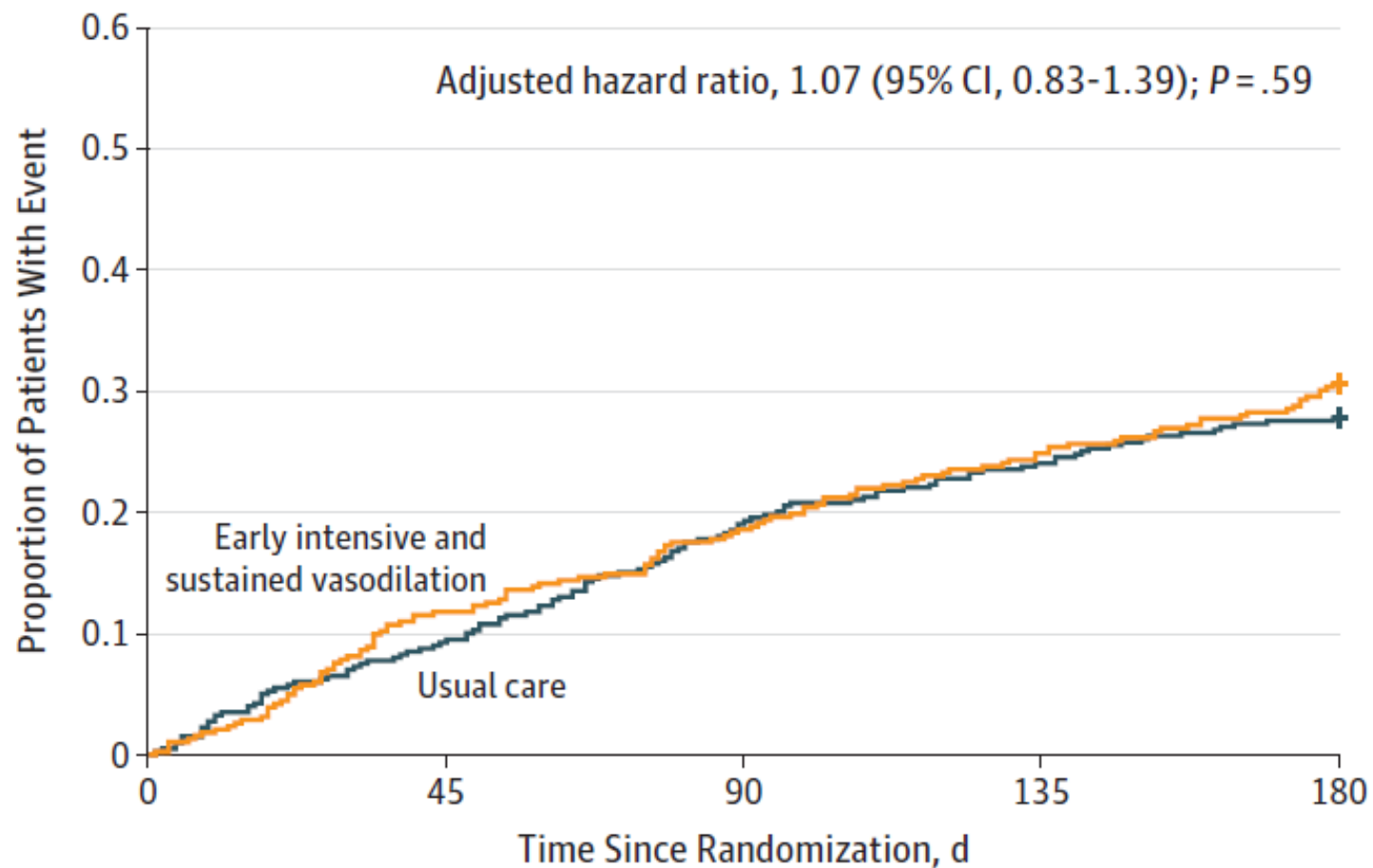
- No clear evidence that some patient groups may not profit from HF therapy
- HF therapy improves aspects of the disease inclusive quality of life
- Analyses of registries suggest positive effects in all patients

Contra

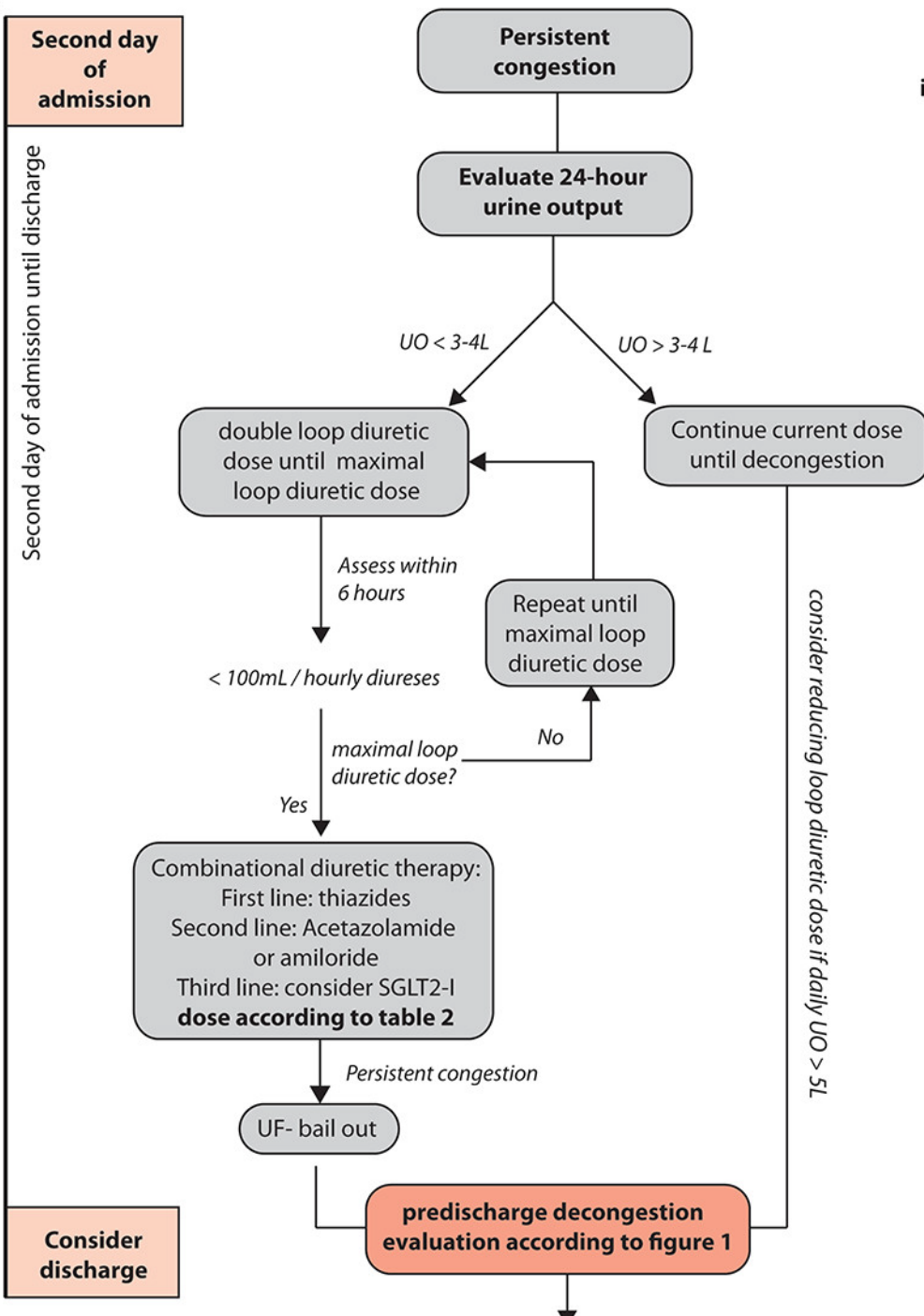
- Patient population, particularly in primary care different than in RCTs
- Patients of older age and (many) co-morbidities were hardly included in RCTs
- Preselection of patients
- Adverse events much less in RCTs as compared to daily practice

Need for more personalised approach

Vasodilation in acute HF does not help



| No. at risk | 0 | 45 | 90 | 135 | 180 |
|--------------------------------------------|-----|-----|-----|-----|-----|
| Early intensive and sustained vasodilation | 382 | 337 | 311 | 287 | 265 |
| Usual care | 399 | 361 | 322 | 303 | 288 |



in

Treatment algorithm in ADHF

If complete decongestion → prepare discharge

1. Stable on oral medication for at least 24h
2. Multidisciplinary disease management
3. Early outpatient follow-up incl. lab (≤2 weeks)
4. Establish discharge loop diuretic dose
5. Clear written form with discharge medication
6. Up- or downtitration protocol
7. Involve primary care in multidisciplinary care

IF COMPLETE DECONGESTION = EVALUATE/PREPARE DISCHARGE

1. Clinical stability on oral medication for at least 24 hours
2. Include in multidisciplinary disease modifying program + education on HF
3. Early ambulatory clinical follow-up (preferably within two weeks)
4. Early ambulatory laboratory follow-up (preferably within two weeks)
5. Establish discharge loop diuretic dose (see text chronic diuretic use)
6. Clear written form with discharge medication + uptitration or down-titration protocol
7. Motivate and involve primary care physician in multidisciplinary care

Parallel evaluation and interventions in ADHF

**Parallel
evaluation**

Standard non-invasive monitoring of heart rate, rhythm, respiratory rate, oxygen saturation and blood pressure. Check for signs of hypoperfusion. Consider invasive BP measurement in case of hypotension. Clearly register baseline weight before diuretics.

**Parallel
interventions**

(1) continue guideline directed medical therapy, (2) consider early use of mineralocorticoid receptor antagonists in case of low potassium, (3) salt and water restriction, (4) IV potassium and magnesium if necessary

What makes heart failure a complex disease?

- Heart failure is – as most chronic diseases – a disease of the (very) old
- Treatment is not easy and not uniformly applied
- Assessment / diagnosis is difficult
- Evidence is limited to a relatively small proportion of the entire heart failure population and absent in acute heart failure
- **High quality care of heart failure (chronic diseases) is threatened – not only because of the HF endemic**

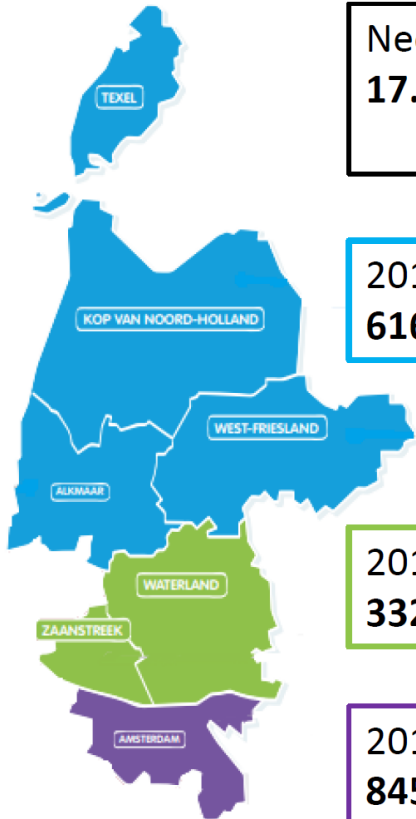
Imminent threats in care of chronic diseases

- Prevalence of chronic diseases is increasing
 - Not only heart failure, but chronic diseases in general
 - Prevention is important, but does not solve the problem
 - We get chronic diseases later in life, but they are only postponed
 - Many patients with multiple chronic diseases (comorbidity)
- Costs of care are rapidly increasing
- Less health care professionals in the future, particularly at remote area's
- Not sustainable without reduction in quality of care

Demographic prediction → 2030

Increasing shortage of healthcare professionals

SIGRA regio



Inhabitants

Nederland
17.081.507 + 5,0 %

2017 2030
616.700 + 1,7 %

2017 2030
332.300 + 6,5 %

2017 2030
845.400 + 15,1%

≥80 year old

Nederland
764.275 → 1.228.670 → + 60,8 %

2017 2030
26.700 → 50.900 → + 90,6 %

2017 2030
7.200 → 12.000 → + 69 %

2017 2030
23.400 → 40.700 → + 73,9 %

Shortage of care professionals in 2021

- 1.950

- 1.100

- 2.600

Future Perspectives in Chronic Disease?

- 2040
 - Increase of 1.7 million people 65+
 - 4.8 million 65+
 - Increase of 1.2 million people with multiple chronic diseases
 - 5.5 million people
 - Increase expense health care NL
 - € 17 billion → € 43 billion (>2.5 fold increase)
- Reduction in health care professionals
 - Major issue not only in developing countries!

Health workforce facts in the WHO European Region

- Health workforce **imbalances and shortages** are a **major concern** in the European Region.
- Although the number of physicians and nurses has increased in general by app. 10% over the past 10 years, it is **unlikely that this increase will be stable and sufficient to cover the needs.**
- **Inequalities** in available physicians (5-times) and nurses (9-times) between countries
- **Not sufficient GPs**; specialist to GP ration up to 3.2
- 1/3 of physicians **older than 55 years**
- Shift to more **women** as physician (currently 52%), who work less hours per week

How to solve this problem?

- Aim: **accessible and affordable top-level care** for all patients with chronic diseases
- What is already happening?
 - Shift of care to primary care
 - Concentration of care
 - Uniforming care
 - Prevention of chronic diseases
- However, these measures will not be sufficient
- New vision care is urgently required
- How?

How to solve this problem?

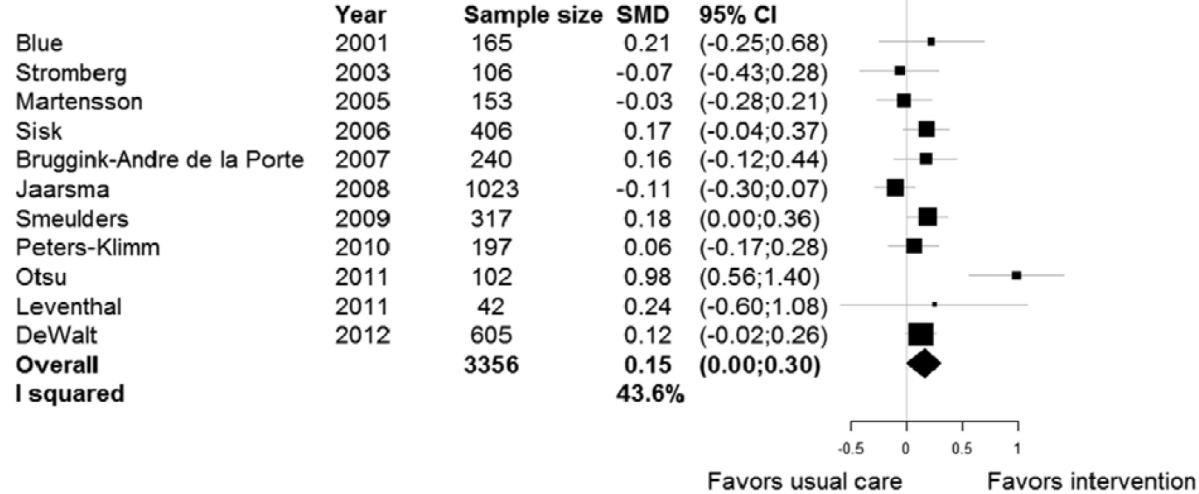
- Involvement of the health care provider that is most motivated

The patient

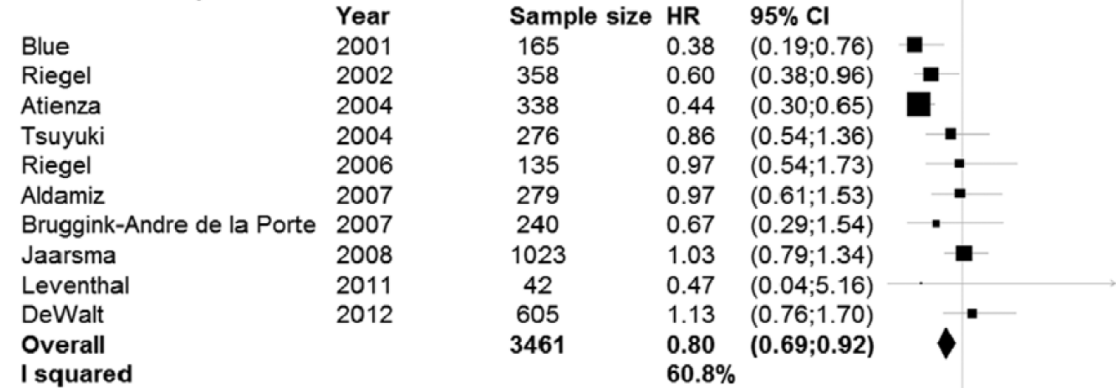
- Remote care and monitoring
- Early and targeted intervention
- Care as close to patient as possible – at home
- Finally, self treatment

Do Self-Management Interventions Work in Patients With HF?

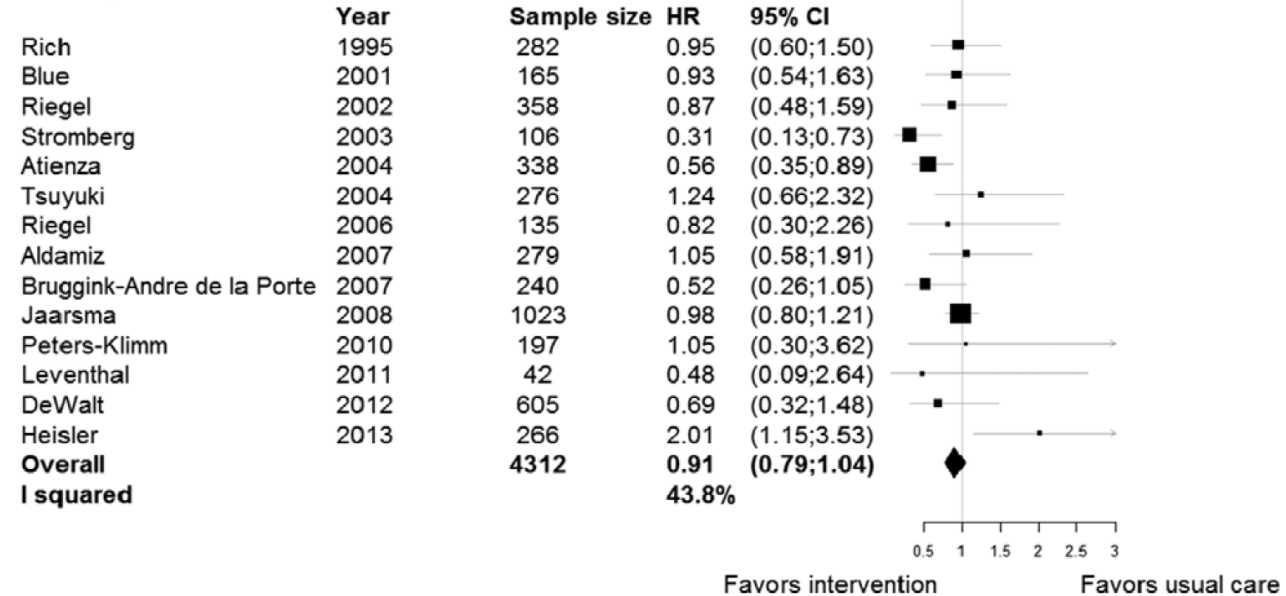
HF-related QoL 12 months



HF-related hospitalization time-to-event



Mortality time-to-event



Individual patient data

N=5,624

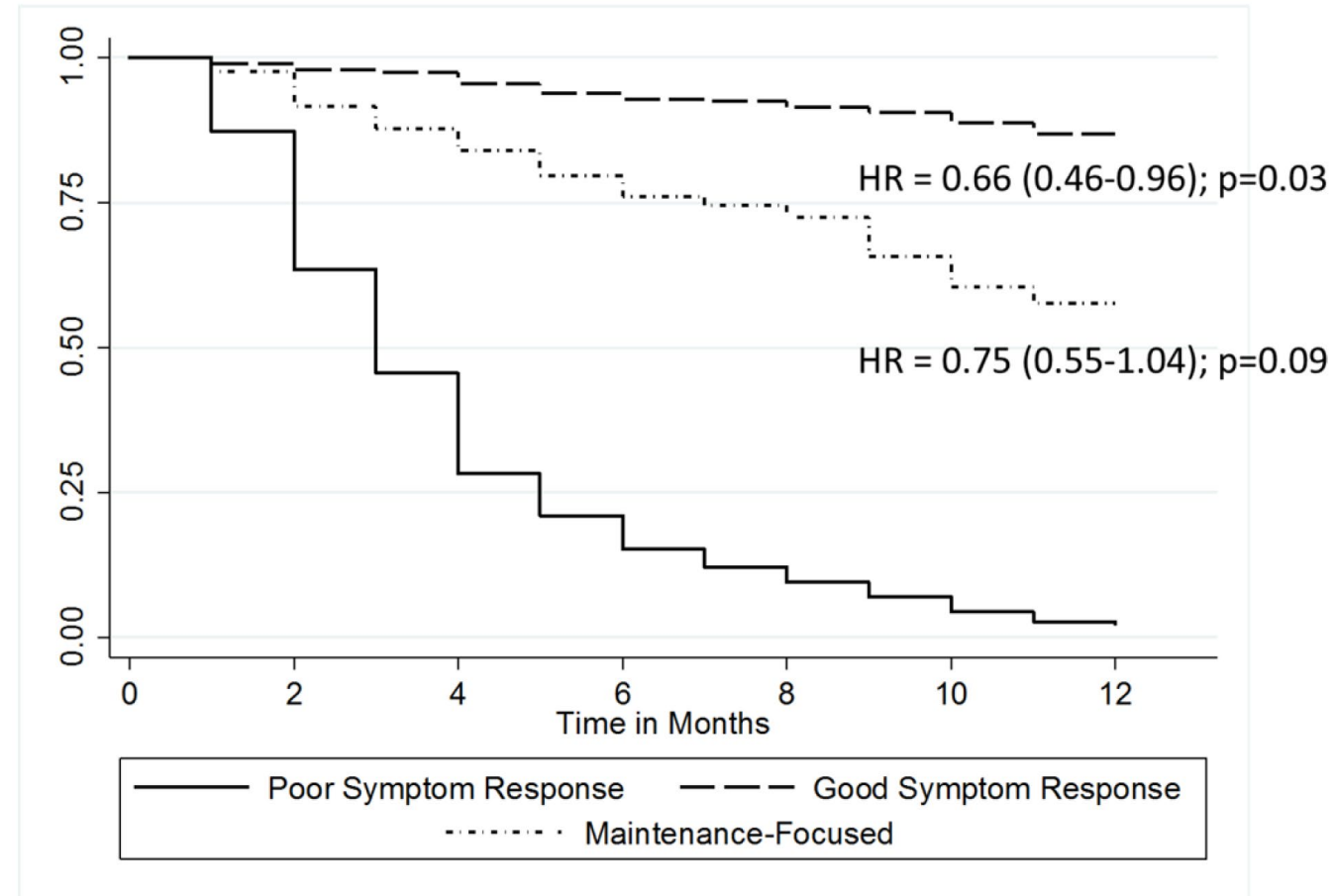
20 studies

Duration of studies: 0.5m to 12m

N per study: 42 – 1,023

Self-care and prognosis in heart failure

- 459 HF patients from Italy
- Recognition of symptoms and adequate response
 - 3 patterns
- Differences between the 3 groups regarding age, education, symptoms, LVEF, medication, co-morbidity, QoL, MMSE



Implementation of (eHealth supported) self-care – What are the consequences?

Patients

- Take responsibility
- Better understanding of disease
- Better monitoring
- More controls, but less by healthcare professionals
- Alert on time



Healthcare professionals

- Let go...
- Support of discharge to primary care
- Less controls in stable patients
- Reduction of consultations, but
- Focus on more complex patients

Acceptance remains challenging

Paradigm shift: Transformation of HF care

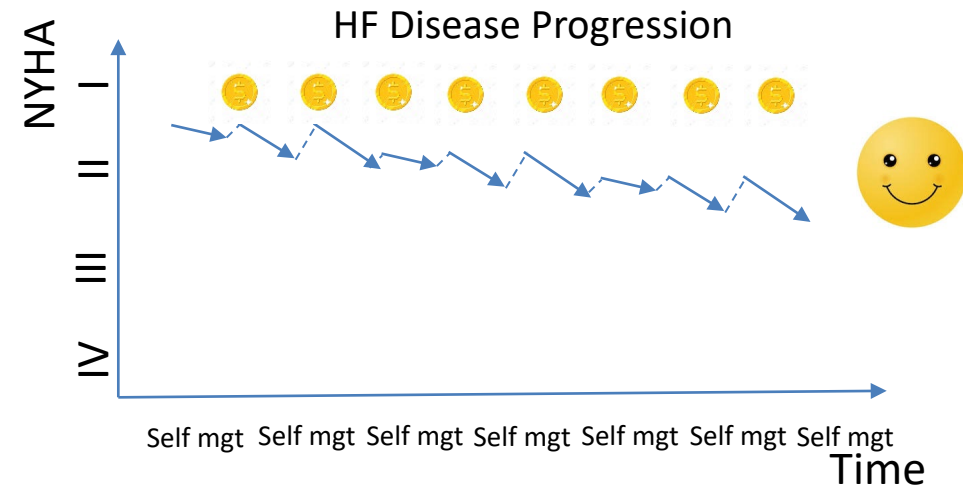
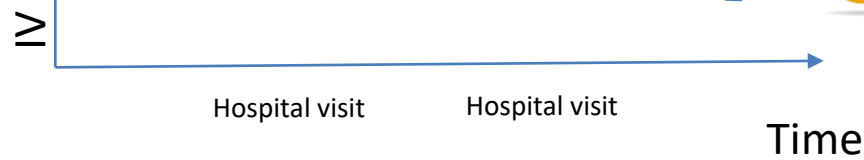
TODAY



TOMORROW



However, not all deterioration can be prevented



What may NWE-CHANCE and PASSION-HF add?

- Both address heart failure, but are complementary
 - Care at home, both inpatient and outpatient
- Self-care as long as it is possible
- Support at home if it is required
- Increasing both quality of care and efficiency of care
- Improving quality of life for patients with heart failure