Heart failure in elderly with focus on diagnosis and prognosis

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i Forumsalen, Campus Skellefteå, fredagen den 29 maj, kl. 13:00. Avhandlingen kommer att försvaras på svenska.

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### Abstract

**Background:** Patients older than 75 years with heart failure (HF) are at increased risk for mortality and hospital admissions. Echocardiography and brain natriuretic peptides (BNP, NTproBNP) are important diagnostic tools but sparsely evaluated in elderly PHC patients.

**Aims:** Validate the clinical diagnosis of HF, investigate the types of HF and underlying cardiovascular disorders with focus on sex and age differences. Explore the sensitivity, specificity, negative and positive predictive values (NPV, PPV) of BNP and NT-proBNP in patients with systolic HF. Study the associations of HF or NTproBNP on all-cause and cardiovascular mortality. Study the prognostic value of different biomarkers and HF, on all-cause and cardiovascular hospitalizations.

**Methods:** Patients with suspected HF were recruited from one selected PHC and registered on a prespecified record and referred for an echocardiographic examination and a final cardiologist consultation. Blood samples for natriuretic peptides were stored frozen at – 70 °C. Death certificates were used to register all-cause mortality and cardiovascular mortality. To register hospitalisations, medical records were used and classification was defined according to ICD-10.

**Results** The GPs identified 121 women and 49 men with suspected HF of whom 39% (51 women and 16 men) were above 80 years. Myocardial infarction (OR:4.3, CI: 1.8-10.6) hypertension (OR:3.4, CI:1.6-6.9), atrial fibrillation (OR:2.8, CI:1.0-7.9) predicted a confirmed diagnosis of HF. Confirmed HF was verified in 45% of the patients and was significantly more common in men than women (p=0.02). The best NPV was 88 % for NT-proBNP (200 ng/L) and 87 % for BNP (20 pg/ml). Age and male gender were independently associated with higher levels of NT-proBNP. During the 10-year follow up, 71 out of 144 patients died. In univariate Cox regression analysis, significant associations were found for overall HF (hazard ratio [HR]: 1.86; 95% confidence interval [CI]:1.15-3.01), isolated systolic HF (HR:1.95; 95% CI:1.06-3.61), and combined (systolic and diastolic) HF (HR:3.28; 95% CI:1.74-6.14) with all-cause mortality, but not for isolated diastolic HF. In multivariable analysis, age (HR: 1.11; 95% CI: 1.06-1.17), kidney dysfunction (HR:1.91; 95% CI:1.11-3.29), smoking (HR:3.70; 95% CI:2.02-6.77), and NTproBNP (HR:1.01; 95% CI:1.00-1.02), but not any type of HF, significantly predicted all-cause mortality. During ten years, 136 (80%) patients were hospitalised with 660 and 207 for all-cause and cardiovascular hospitalisations, respectively. Age (OR:1.1; 95% CI:1.01-1.15) and underlying heart disease (OR:3.5; 95% CI:1.00-11.89), significantly predicted all-cause hospitalisation. Overall HF (HR:1.8; 95% CI:1.06-2.94) significantly predicted time to first all-cause hospitalisations. For cardiovascular hospitalisations age (OR:1.195% CI:1.01-1.12), underlying heart disease (OR:3.4;95%CI:1.04-11.40) and NTproBNP ≥800 ng/L (OR:4.3;95%CI:1.5-12.50) were significant predictors.

**Conclusion:** A confirmed diagnosis of HF was present in 45% of the patients. NPV was high, but not as high as in younger patients with HF. Patients with systolic HF had a higher mortality than patients with diastolic HF compared to patients with no HF. Patients with combined HF were at even higher risk for all-cause mortality and cardiovascular mortality. Age, kidney dysfunction, NTproBNP and smoking predicted mortality. Age and underlying heart diseases were predictors for all-cause hospitalisations and together with NTproBNP they also predicted cardiovascular hospitalisations.

### Keywords

Elderly, chronic heart failure, primary health care, natriuretic peptides, prognosis, mortality, hospitalisation.