

## The Effect of Thyroid Function on Clinical Outcome in Patients with Heart Failure

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### Background:

Thyroid function is known to affect cardiovascular function and hypothyroidism is a risk factor for developing heart failure (HF). Data regarding the clinical significance of thyroid stimulating hormone (TSH) levels as a predictor of outcome in patients with HF is sparse. We evaluated the significance of TSH on clinical outcome in a large cohort of patients with chronic HF.

### Methods:

Patients with a diagnosis of HF at a health maintenance organization (N=5,599) were followed for cardiac-related hospitalizations and death.

### Results:

Median TSH levels were 2.2 mIU/L (IQR 1.4-3.5). 15.1% had an abnormally high TSH ( $\geq 4.7$ ) while 1.4% had a low TSH ( $\geq 0.2$ ). Median follow-up time was 434 days. Overall mortality rate was 13.2%. Both a high TSH as well as a low TSH was associated with an increased mortality rate by Kaplan Meier survival analysis (Figure A). Cox regression analysis after adjustment for other significant predictors demonstrated that the highest TSH quartile was associated with increased mortality compared to those with the lowest mortality (2nd quartile: TSH 1.4-2.2 mIU/L), hazard ratio 1.36, 95% confidence interval 1.08 -1.71, P=0.01. TSH was also an independent predictor of cardiac hospitalization as well as the combined clinical end point of death and cardiac hospitalization. Analysis of patients without levothyroxine treatment, 78% of the cohort (N=4348), demonstrated that TSH was an even stronger predictor of increased mortality (HR 1.54, 95% CI 1.17 -2.03, P=0.002). Further analysis based on established clinical cutoffs of TSH demonstrated that increasing levels of TSH above normal was independently associated with increased mortality (Figure B) and cardiac related hospitalizations.

### Conclusions:

Increased TSH levels are associated with worse clinical outcome in patients with HF.

The data emphasizes the importance of thyroid imbalance in HF and suggests that treating subclinical hypothyroidism may be beneficial in HF. Further randomized studies are needed.

