

Pulmonary Arterial Hypertension (PAH) and Chronic Thromboembolic Pulmonary Hypertension (CTEPH) Patients in Finland (FINPAH) – a Descriptive Retrospective Real-World Cohort Study between 2008 and 2020

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INTRODUCTION

- PAH and CTEPH are clinically important subclasses of pulmonary hypertension (PH). PAH is characterized by pulmonary vasoconstriction and remodelling¹, and CTEPH by obstruction of pulmonary arteries with fibrotic material and vascular remodelling². The most common cause of death in PAH and CTEPH is right ventricular failure.
- PAH can be treated with PAH-specific drugs or lung transplant³, and the aim of PAH treatment is the achievement and maintenance of a low-risk profile as determined by a risk assessment instrument.⁴
- CTEPH can be treated with pulmonary endarterectomy (PEA), medication, and/or balloon pulmonary angioplasty (BPA)³.

Rationale

- Nation-wide real-world evidence of clinical outcomes among Finnish PAH and CTEPH patients is lacking. Therefore, a retrospective real-world data study was made to assess patient characteristics, risk groups and patient prognosis, treatment pathways, and responses to treatment strategies in Finland (FINPAH).

Objective

- Describe FINPAH real-world study patient characteristics, and patient prognosis.

METHODS

Setting

- All five Finnish university hospitals (Helsinki, Kuopio, Oulu, Tampere, Turku) participated.
- Patients with PAH/CTEPH-type diagnoses recorded in 2008–2019 were included; their characteristics, clinical information, and resource use were collected as a chart review by expert clinicians using electronic clinical research forms.
- Clinical events were followed until end of 2021, and mortality (until end of 2021) was received from Statistics Finland.
- The secondary use data permit was received from the Finnish Social and Health Data Permit Authority Findata.

Measures and statistics

- Data were checked, managed, descriptively analysed, visualised, and anonymised in a secure processing environment (SPE) before export outside of the SPE. R was used for statistical computing and graphics.
- The following approaches were used:
 - Categories: Number of observations (N), proportion.
 - Continuous variables: N, mean, 95% confidence intervals (95% CI), standard deviation (SD).
 - Less than 5 (non-zero) observations were marked with N<5.
 - Kaplan-Meier (KM) graphs with 95% CIs for mortality and first hospitalization were presented from start of PAH disease (baseline) until end of follow-up.
 - NYHA (New York Heart Association) functional classes describe how severely the patient's functionality is limited during physical activity. From Class I (no symptoms) to Class IV (severe impairment).
 - ESC (European Society of Cardiology) 3-level risk assessment scores were calculated.^{4, 5}

RESULTS

Patient characteristics

- FINPAH covers baseline (N=627), mortality (N=613, mean follow-up 6.1 years), and medication (N=609, mean 4.5 years).
- Patients had PAH (N=364, 58%), CTEPH (N=217, 35%), or other PH type (N=46, 7%).
- 339 patients had incident (i.e., diagnosis after 2008-01-01) PAH, with the idiopathic (37%), associated with connective tissue disease (23%), and associated with congenital heart disease (23%) types being the most common. (Table 1)

Table 1. Incident PAH diagnoses (N=339)

Incident PAH diagnoses	N	%	
iPAH			
Idiopathic	125	36.9	
HPAH			
Heritable	13	3.8	
DTPAH			
Drug or toxin	7	2.1	
APAH			
Associated with HIV	5	1.5	
Portal hypertension	8	2.4	
APAH			
Congenital heart disease	79	23.3	
APAH			
Connective tissue disease	79	23.3	
PVOD/PCH			
Veno-occlusive/capillary	12	3.5	
UNSPEC			
Unspecified	11	3.2	
Total	All	339	100

- 204 patients had incident CTEPH.
- Between 2008-19 in Finland, average annual incidence of PAH was 4, whereas the incidence of CTEPH was 3; both per million inhabitants.
- 43% of PAH and 65% of CTEPH patients were 60 years old or older. (Table 2)

Table 2. Patient characteristics (N=543)

Incident patient characteristics	PAH	CTEPH	
Age	Years (mean)	53.9	62.4
Sex	Women (%)	72.3	50.5
BMI	Body mass index (mean)	27.2	28.8
Working	Full time (%)	24.8	28.2
Pension	Disability (%)	12.9	11.2
Retired	Proportion (%)	44.6	56.5
Smoking	Never (%)	59.9	56.6
	Stopped (%)	30.7	36.0
6MWD	6-min. walk, m (mean)	365	373
NT-proBNP	N-terminal pro-brain natriuretic peptide, ng/l (mean)	2099	1897
O₂	Oxygen saturation, % (mean)	92.1	92.1
RHC	Right heart catheterisation (%)	77.2	84.8
TTE	Echocardiography (%)	96.8	97.5
Comorbidities with over 10% prevalence	Treated hypertension (%)	31.9	48.5
	Rheumatic disease (%)	28.0	4.9
	Lung disease (%)	26.8	26.5
	Thyroid disease (%)	18.0	11.3
	Diabetes (%)	17.1	14.2
	Atrial fibrillation (%)	15.6	8.3
	Valvular disease (%)	12.4	7.8
NYHA	Lung embolism (%)	11.5	92.2
	Deep vein thrombosis (%)	5.6	29.9
	Cancer (%)	8.0	14.7
	Ischaemic heart disease (%)	9.7	10.8
	Class I (%)	7.2	0.0
ESC	Class II (%)	29.9	33.7
	Class III (%)	52.0	55.3
	Class IV (%)	10.9	11.1
	Low risk (%)	32.1	32.8
CTEPH	Moderate risk (%)	61.2	62.7
	High risk (%)	6.7	4.5
	Risk factors (%) ²	-	95.1
Procedures, over time	PEA (%)	0	30.9
	BPA (%)	0	22.5
	Lenus pump implantation (%)	3.2	0
	Atrial septostomy (%)	0	0
	Lung transplant listing (%)	4.7	N<5
	Lung transplant received (%)	1.8	N<5

Overall survival

- Estimated PAH survival was 93% at 1 year and 70% at 5 years.
- Estimated CTEPH survival was 95% at 1 year and 80% at 5 years. (Figure 1)

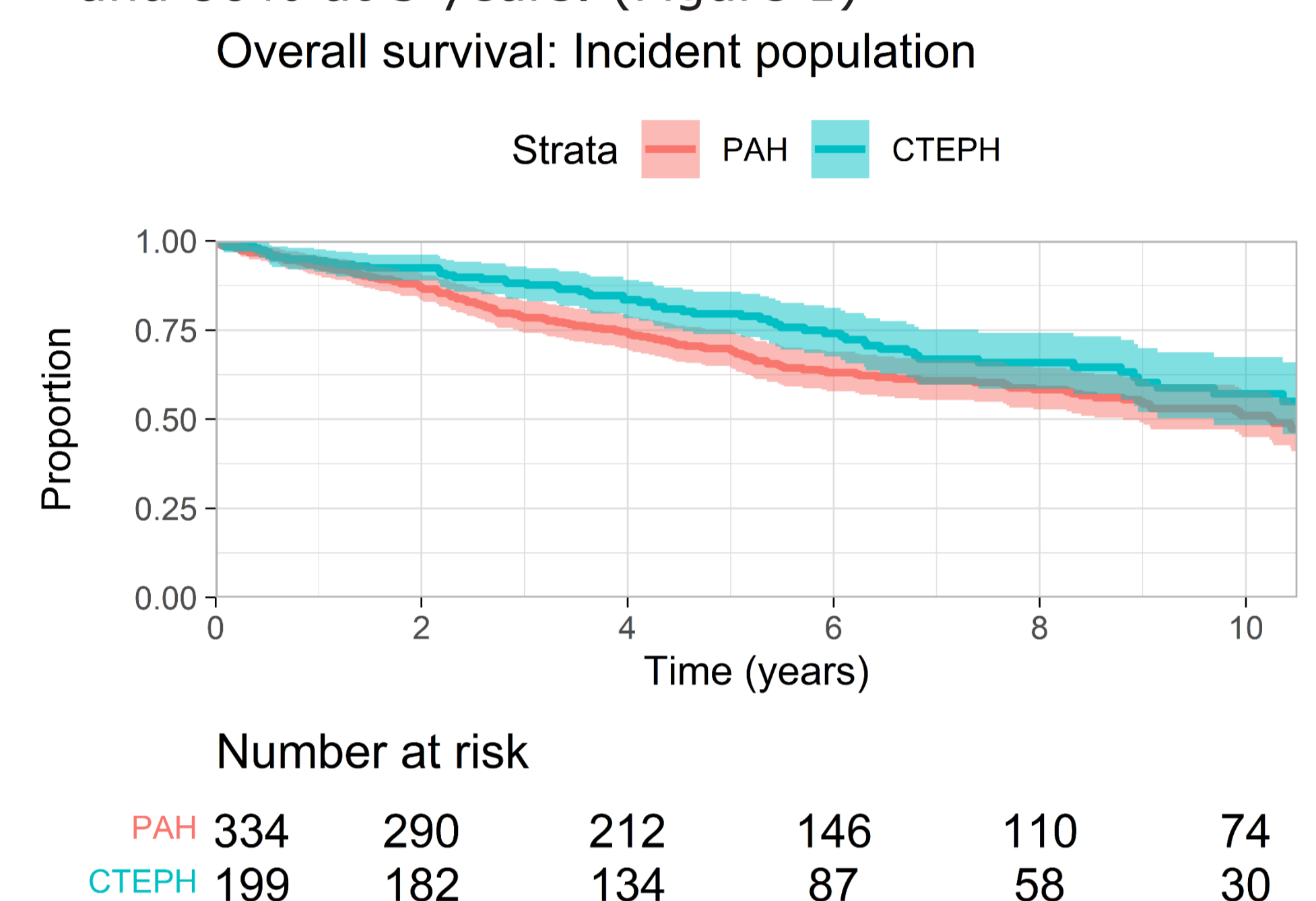


Figure 1. Overall survival over time

Composite outcome

- The composite was defined as the first of two outcomes: death or hospitalization (excluding planned PEA).
- Of PAH patients, 75% were estimated to reach the composite endpoint at 1 year and 44% at 5 years.
- Of CTEPH patients, 76% were estimated to reach the composite endpoint at 1 year and 54% at 5 years. (Figure 2)

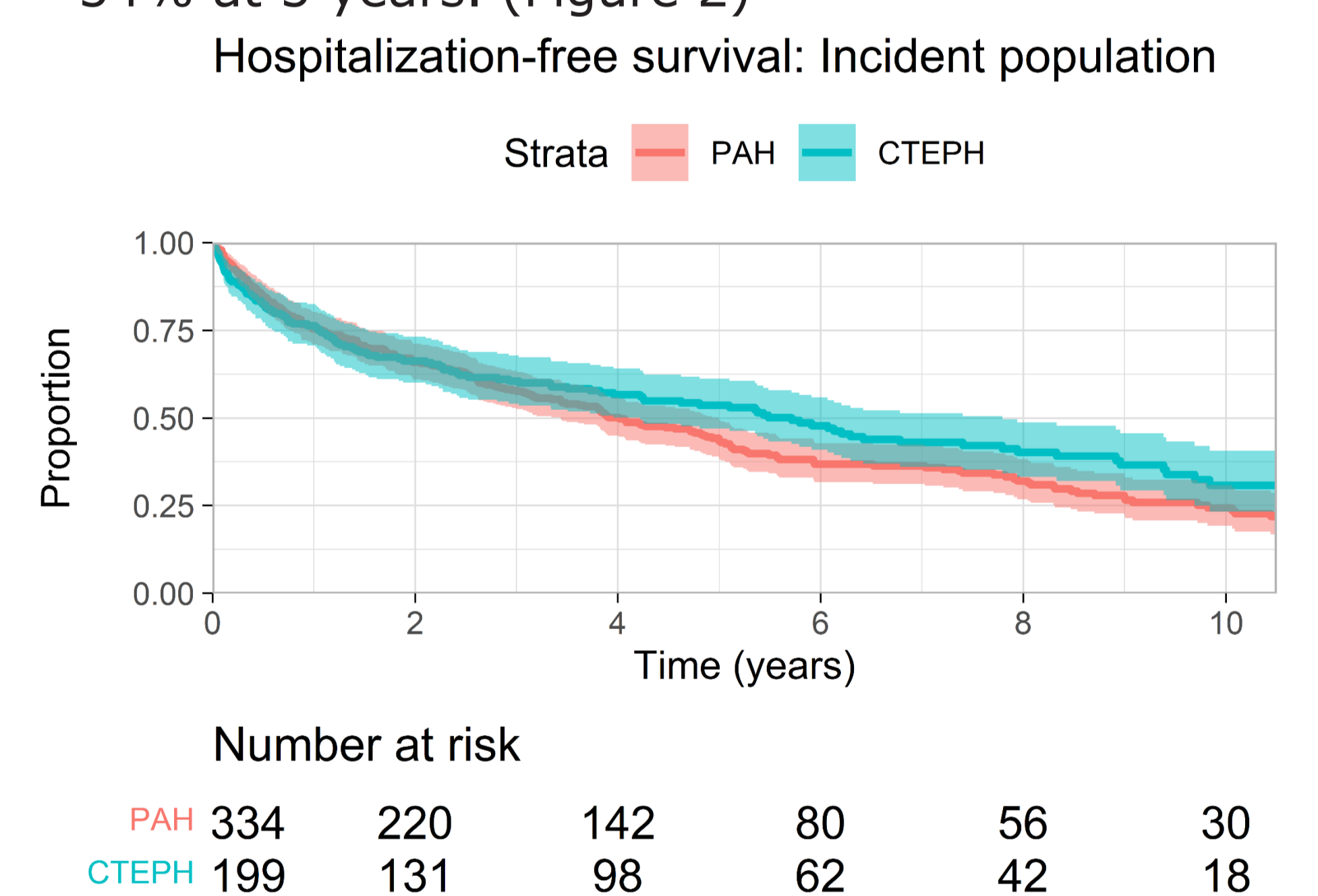


Figure 2. Composite survival over time.

CONCLUSIONS

- The overall survival among PAH and CTEPH seemed higher to previously reported (e.g., SPAHR⁶).
- The FINPAH study enables extensive further analysis within the focus of real-world evidence.

References

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