

# Healthcare Cost for Patients with Chronic Rhinosinusitis with Nasal Polyps and Comorbid Asthma

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## BACKGROUND

Chronic rhinosinusitis (CRS) is a common disease with significant health and economic impact. It is caused by a combination of inflammatory, environmental, and genetic factors. Patients with chronic rhinosinusitis (CRS) may develop nasal polyps (NP) (CRSwNP), a benign inflammatory mass in the mucosa of the nose and paranasal sinuses. Traditionally, intranasal and systemic corticosteroids and endoscopic sinus surgery (ESS) are used as treatment. CRSwNP is commonly comorbid with asthma, however, there is lack of knowledge concerning the economic impact on the healthcare sector for this patient population. Thus, this study aims to describe clinical and treatment characteristics and healthcare utilization resources for patients with CRSwNP with and without comorbid asthma.

## METHODS

Electronic health records of patients diagnosed with CRSwNP between 1.1.2012-31.12.2018 in Finnish healthcare were included in the study. The patients were identified from the Care Register for Healthcare, HILMO and AvoHILMO, from where their diagnoses, procedures, visits, and resource utilization were extracted as well. The data from Care Register for Healthcare was complemented with data from Social Insurance Institution (SII) for reimbursed medications and procedures, and with data from Statistics Finland for vitality status and causes of death (Figure 1). Data from 2000-2012 was used to assess comorbidities and clinical characteristics. The baseline period was set to 36 months prior to first CRSwNP diagnosis.

Costs were reported for respiratory related causes and were derived separately for primary and secondary care contacts and procedures, and medication purchases. Costs were presented for different asthma groups depending on severity. The 95% CI for point estimates were evaluated by bootstrapping the costs.

## RESULTS

A total of 18563 patients had a diagnosis of CRSwNP during the study period (Figure 2). Of the total study population, 27% were having an asthma diagnosis, whereof 6% had severe asthma, and 1.5% had severe uncontrolled asthma (Table 1).

At baseline, the average per CRSwNP patient costs was €742 (95% CI €724-€760). The corresponding point estimates at follow-up for different asthma groups (no asthma, mild to moderate asthma, severe controlled asthma, and severe uncontrolled asthma) were €1744 (€1710-€1779), €4449 (€4313-€4591), €7480 (€7120-€7856) and €12673 (€11393-€13998), respectively (Table 2). For all asthma groups, the largest proportion of respiratory related HCRU was within the secondary care, though, patients with severe comorbid asthma had larger proportion of medication costs compared to patients without comorbid asthma (Figure 3). The mean cumulative respiratory related HCRU costs increased more over time for patients with comorbid asthma compared to patients without comorbid asthma. Similarly, the more severe patients continued generating higher respiratory related HCRU costs after the ESS compared to patients without comorbid asthma (Figure 4).

Table 1. Baseline characteristics of the study population.

	All	No asthma	Mild to moderate asthma	Severe controlled asthma	Severe uncontrolled asthma
Patients, n (%)	18563 (100.0)	13560 (73.0)	3934 (21.2)	786 (4.2)	283 (1.5)
Male, n (%)	11117 (59.9)	8548 (63.0)	2013 (51.2)	427 (54.3)	129 (45.6)
Age, median (IQR)	53.0 (39.0, 65.0)	53.0 (38.0, 64.0)	55.0 (41.0, 65.0)	56.0 (47.0, 65.0)	54.0 (42.5, 64.0)
SCS, n (%)	11633 (62.7)	7337 (54.1)	3282 (83.4)	733 (93.3)	281 (99.3)
ESS, n (%)	8673 (46.7)	5901 (43.5)	2146 (54.6)	452 (57.5)	174 (61.5)
ESS once, n (%)	7227 (38.9)	5097 (37.6)	1675 (42.6)	332 (42.2)	123 (43.5)
ESS repeated, n (%)	1446 (7.8)	804 (5.9)	471 (12.0)	120 (15.3)	51 (18.0)
CCI, n (%)					
0	14407 (77.6)	11983 (88.4)	2016 (51.2)	342 (43.5)	66 (23.3)
1	2960 (15.9)	838 (6.2)	1564 (39.8)	376 (47.8)	182 (64.3)
2	845 (4.6)	569 (4.2)	214 (5.4)	43 (5.5)	19 (6.7)
3	253 (1.4)	114 (0.8)	107 (2.7)	19 (2.4)	13 (4.6)
4	50 (0.3)	22 (0.2)	22 (0.6)	4 (0.5)	2 (0.7)
5+	48 (0.3)	34 (0.3)	11 (0.3)	2 (0.3)	1 (0.4)

Abbreviations: CCI, Charlson Comorbidity Index; ESS, endoscopic sinus surgery; IQR, interquartile range; SCS, any systemic corticosteroids use.

Table 2. Respiratory related healthcare resource utilization of CRSwNP patients without asthma, with mild to moderate asthma, with severe asthma, and with severe uncontrolled asthma with 95% CIs at follow-up. Costs are presented in EUR.

	No asthma	Mild to moderate asthma	Severe controlled asthma	Severe uncontrolled asthma
Medication purchases	353 (344-363)	1604 (1552-1661)	3611 (3446-3781)	4790 (4355-5249)
Primary care	202 (196-207)	357 (330-397)	424 (383-468)	746 (620-890)
Secondary care	1190 (1160-1220)	2487 (2386-2591)	3445 (3186-3719)	7138 (6211-8110)
Total costs	1744 (1710-1779)	4449 (4313-4591)	7480 (7120-7856)	12673 (11393-13998)

Figure 1. Data sources and cohort generation

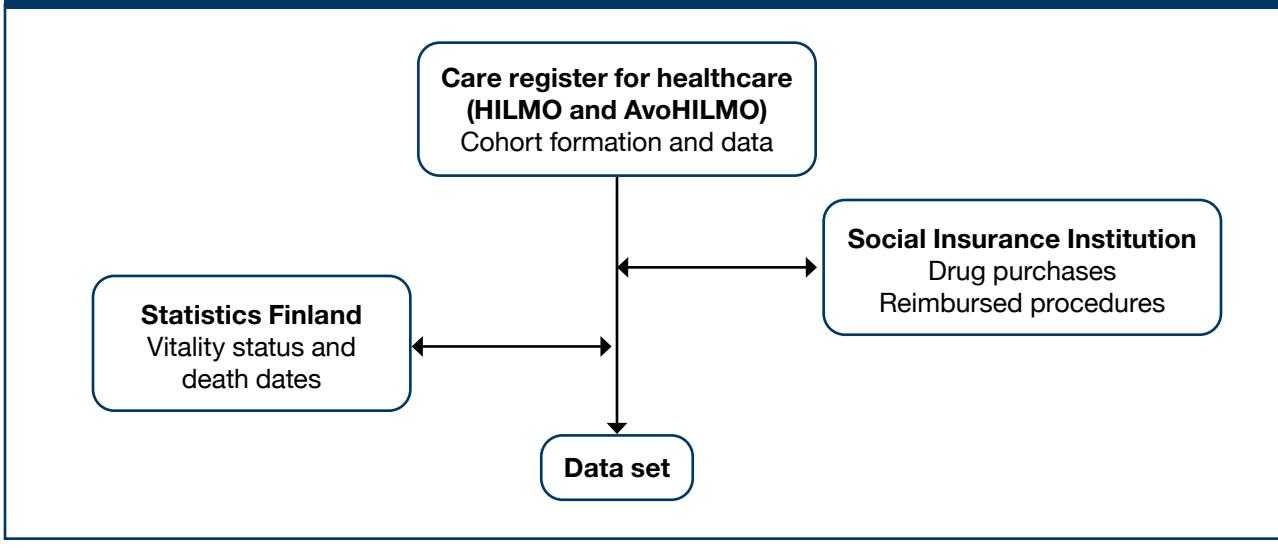


Figure 2. Cohort information work flow

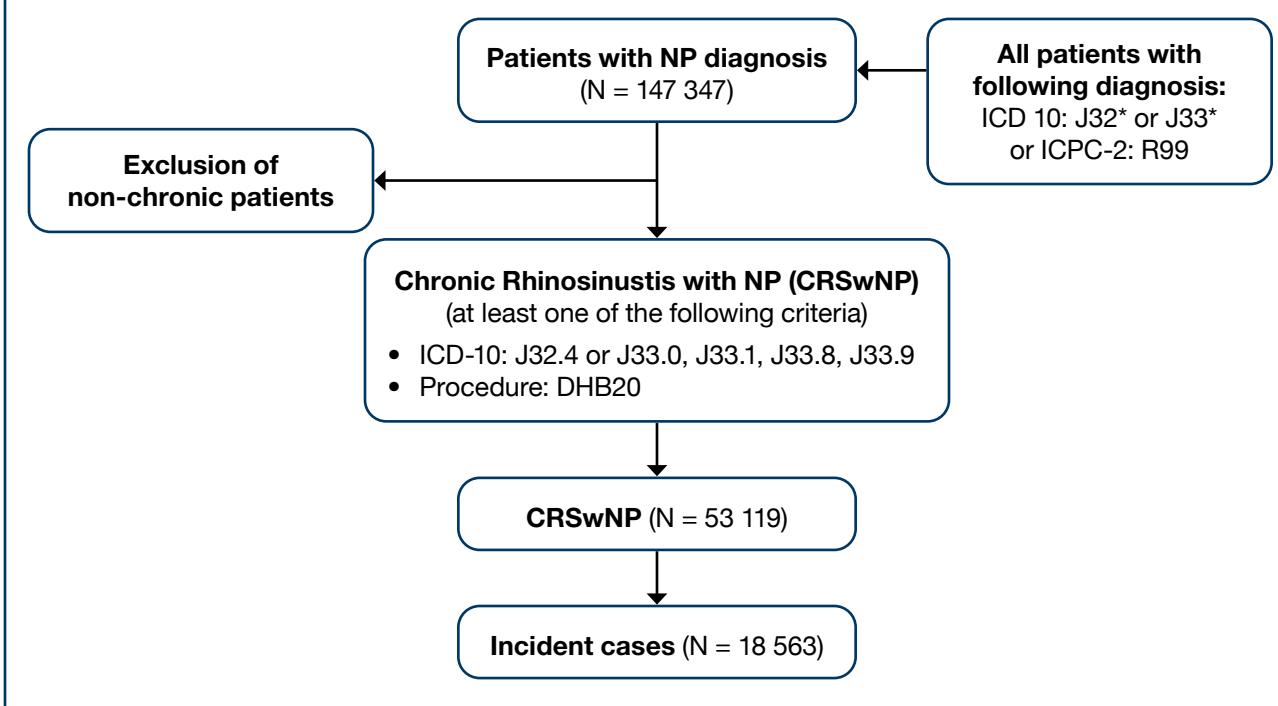


Figure 3. Proportion of respiratory related costs by in patients with CRSwNP asthma status (a) no asthma, b) mild to moderate asthma, c) severe controlled asthma, d) severe asthma and severe uncontrolled asthma).

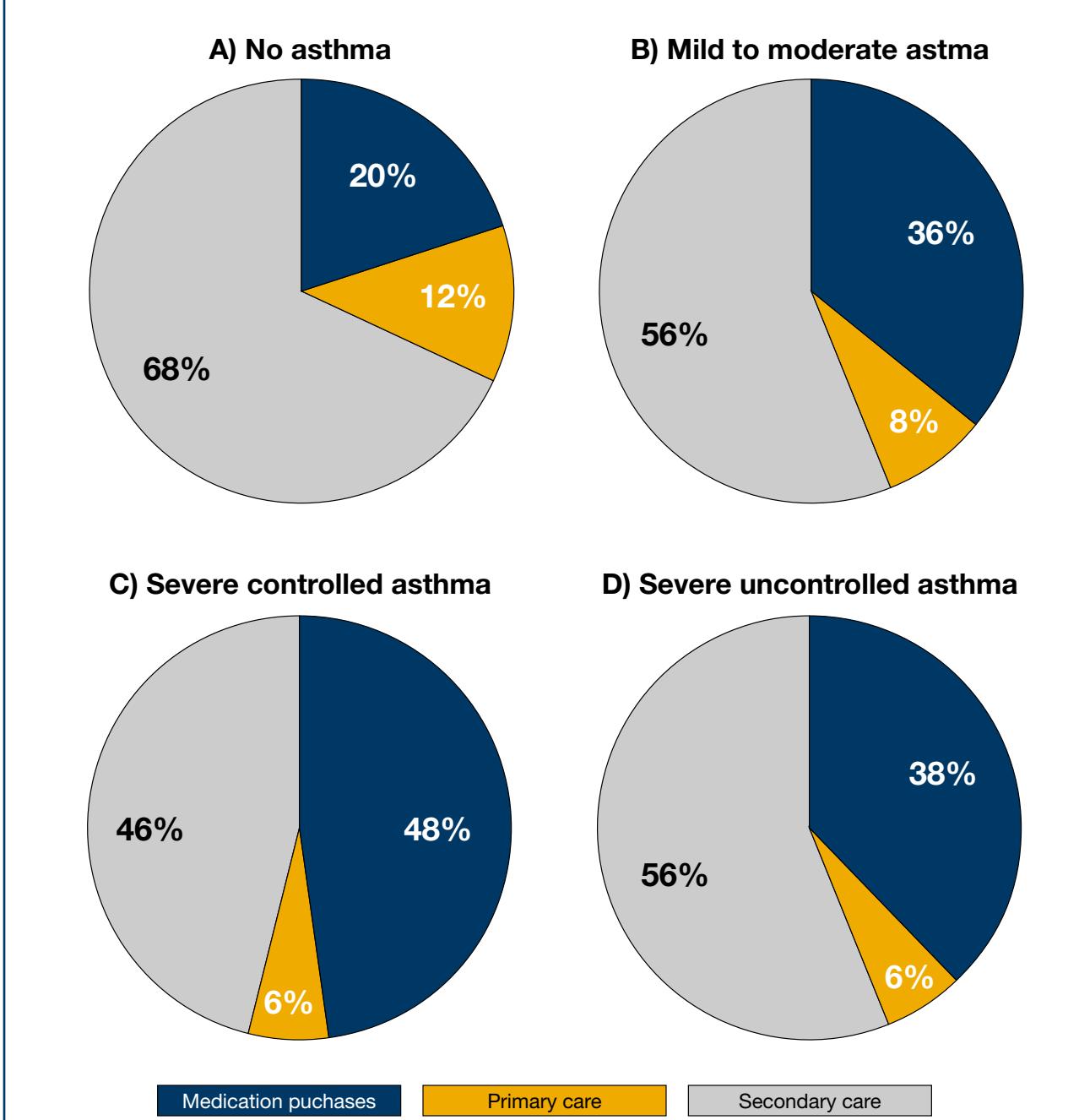
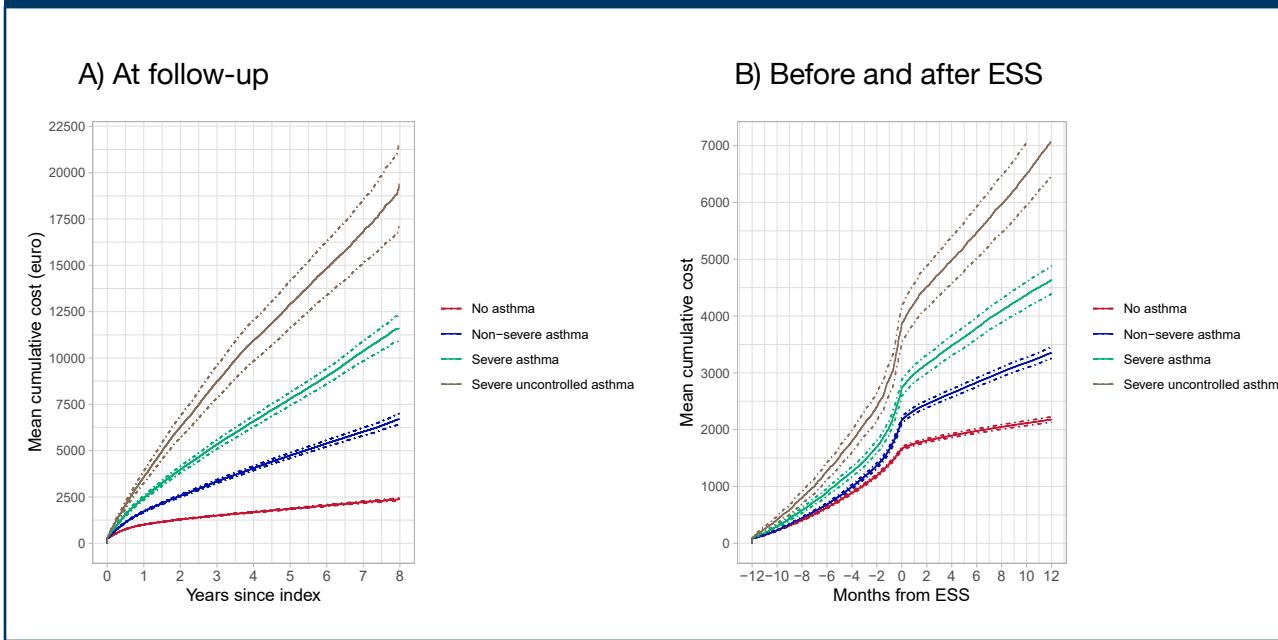


Figure 4. Mean cumulative costs of respiratory related contacts in patients with CRSwNP by asthma status (no asthma, mild-moderate asthma, severe (non-severe) asthma, severe asthma and severe uncontrolled asthma) (a) at follow-up, and (b) one year before and after endoscopic sinus surgery. Costs are presented in EUR.



## CONCLUSIONS

CRSwNP patients with more severe asthma comorbidity generated higher economic burden on the healthcare sector compared to patients without comorbid asthma. ESS did not decrease the mean cumulative costs for CRSwNP patients with comorbid asthma.