

Supplementary materials

Overview findings for Finnish Asthma Program

In total, nine records were identified from the literature search for inclusion across the six NHMRC evidence categories. One study assessed level III-2 evidence, five studies level III-3 evidence and three studies level IV evidence. Of these nine studies, all examined hospitalisations as per the pre-specified inclusion criteria.

NHMRC level III-2: Comparative studies with concurrent controls

One comparative study with concurrent controls was identified for inclusion, published between in 2013.

Tabulation of included studies

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
Kauppi 2013 [8]	Finnish Hospital Discharge Register by	n=5,894 people diagnosed with asthma	Finnish Asthma Program using data based on the Finnish Hospital	National Institute of Health and Welfare ICD-10	<ul style="list-style-type: none"> 32,000 hospital days for 5,894 people with asthma in the year 2000 compared to 15,000 hospital days for 2,938 people with COPD (absolute decrease of 54% or 65% when considering 	↑ ↑

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
	the National Institute of Health and Welfare (ICD-10 J45-J46)	n=2,938 people diagnosed with COPD	Discharge Register and National Institute of Health and Welfare ICD-10 codes for asthma (J45-J46)	code for COPD (J44)	<p>the number of patients with asthma in the reimbursement register)</p> <ul style="list-style-type: none"> • Average stay in hospital was reduced from 4.3 days to 4.2 days between the years 2000 and 2010 for people with asthma, while among those with COPD hospital days decreased by 46% 	

Key: Int= Intervention; Com= Comparator; ↑= improvement; ↓= worsening; ↔ = mixed; ≈ = no difference; N/A = not applicable

NHMRC level III-3: Comparative studies without concurrent controls

Five comparative studies without concurrent controls were identified for inclusion, published between 2006 and 2017.

Tabulation of included studies

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
Haahtela 2006 [4]	Surveys and interviews	n=58 primary care chief physicians n=248 asthma coordinating physicians n=431 asthma nurses	Finnish Asthma Program based on questionnaire survey of primary care chief physicians in northern Finland in 2000 (78% response rate). Between 2000 and 2001 asthma coordinating physicians were interviewed in 91% of health centres. In	Registry data from 1993	<ul style="list-style-type: none"> • Number of hospital days for asthma decreased by 54% from 110,000 in 1993 to 51,000 in 2003 (69% in relation to the number of people with asthma, being 135,363 in 1993 and 207,757 in 2003) • Among children, hospital admissions decreased, going from 20.2 per 1,000 in 1995 to a range of 3.1 to 7.4 per 1,000 children in 1999. This range indicates variation in practice for hospitalisation of children due to exacerbations • Absolute number of deaths fell from 123 in 1993 to 85 in 2003 with 10 deaths occurring between 1990 and 2003 for people under 20-years of age • 24% reduction in emergency department visits for asthma based on data from one hospital district between 1995 and 2003, with a 61% reduction among children 	<p>↑</p> <p>↑</p> <p>↑</p> <p>↑</p> <p>↑</p>

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
			2004 asthma nurses were surveyed.		<ul style="list-style-type: none"> Costs decreased from €218 million in 1993 to €213.5 million in 2003, which included compensation for disability, drugs, hospital care and outpatient doctor visits and stopped the previous increasing trend of asthma-associated costs observed prior to 1993 Costs per patient per year decreased by 36%, going from €1,611 in 1993 to €1,031 in 2003 	
Haahtela 2017 [6]	Data from national registries about costs	n=247,583 patients in the Finnish Social Insurance Institution registry as having	Finnish Asthma Program using registry data evaluation, including: National discharge register; Nordic Healthcare	Registry data from 1987	<ul style="list-style-type: none"> Total costs of asthma decreased by 14% from €222 million in 1987 to €191 million in 2013, despite a three-fold increase in patients diagnosed with asthma Annual costs per patient decreased by 72% (€2,656 in 1987 to €749 in 2013) but costs of medication and primary care visits increased 	<p>↑</p> <p>↔</p> <p>↑</p> <p>↑</p> <p>↑</p> <p>↑</p>

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
		physician-diagnosed asthma Other registry n-values not provided	Group benchmarking database (2013); Finnish Medicines Agency; Finnish Social Insurance Institution; Finnish center for pensions registry		<ul style="list-style-type: none"> • Number of hospital days in secondary care decreased from 91,650 in 1987 to 12,050 in 2013 (87%) • 95% decrease in hospital days per patient per year in secondary care from 1.10 to 0.05 says • 90% decrease in hospital days per patient per year from secondary care from 0.54 to 0.05 days • 38% total decrease in secondary care outpatient visits to primary care (79% per patient from 1.64 to 0.34 visits between 1987 to 2013 respectively) • 98% total increase in primary care visits from 1987 to 2013 	
Kainu 2013 [9]	Two cross-sectional postal	n=6,062 participants in 1996 survey	Finnish Asthma Program using two-cross sectional postal surveys in an adult	1994 survey of Finnish Asthma Program in	<ul style="list-style-type: none"> • 3.5% increase in prevalence of physician-diagnosed asthma from 1996 (6.5%) to 2006 (10%; p<0.001) across both genders, but especially among women under 40 years of 	N/A

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
	surveys 10-years apart among random Finnish National Populatio n Registry samples	n=2,449 participants in 2006 survey	population of Helsinki during the Finnish Asthma Program from 1994 to 2004; Initial random sample of 4,000 in 2006; Part of the FinEsS study, being a joint Nordic project between Finland, Estonia and Sweden to evaluate respiratory epidemiology	population of Helsinki; Initial random sample of 8,000 participants in 1996	age (of note, there was no increase in women aged over 60 years) • Smoking rates did reduce but remained high with 39.0% of men and 30.7% of women current smokers in 1996, and 32.9% of med and 24.2% of women current smokers in 2006	

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
Säynäjängas 2007 [10]	Retrospective database analysis using Finnish National Research and Development Centre for Welfare and	n=23,715 asthma admissions with n=13,499 first-time asthma-related admissions identified during this period	Finnish Asthma Program using retrospective database audit of hospitalisation trends from 1996 to 2004	1996 data from retrospective database hospitalisation trends	<ul style="list-style-type: none"> • Between 1996 and 2004 the number of admissions for children aged 0-3 years declined by 42.7% for boys and 53.0% for girls; for those aged 3- to under 5-years by 55.1% for boys and 48.7% for girls, and for those aged 5-15 years by 59.0% for boys and 66.1% for girls • First time admissions decreased from 1,830 in 1996 to 1,084 in 2004, which was consistent across ages and gender • Asthma-related inpatient days reduced from 9,534 in 1996 to 3,634 in 2004 	<p>↑</p> <p>↑</p> <p>↑</p>

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
	Health records					
Tuomisto 2010 [11]	Retrospective medical record audit from Department of Respiratory Diseases, Seinä-joki	n=165 in 1994 n=133 in 2001	Finnish Asthma Program using retrospective medical record audit from Department of Respiratory Diseases, Seinä-joki Central Hospital between 1994 and 2001	2001 data from retrospective hospital record audit	<ul style="list-style-type: none"> Total number of days for non-acute hospital stay before asthma diagnosis in 1994 was 536 and in 2001 was 101; with total number of days in hospital being 594 in 1994 and 127 in 2001 Significantly fewer secondary care visits after diagnosis of asthma in 2001 compared to 1994 ($p < 0.001$) with fewer outpatient visits including non-acute hospital stays (1,208 in 1994 compared to 599 in 2001) 	↑ ↑

Source	Setting	n-values	Description of Int and Com		Outcomes	Effect
			Intervention	Comparison		
	Central Hospital; populatio n of nearly 200,000					

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NHMRC level IV: Case series with post-test or pre-test/post-test outcomes

Three studies using a case series design with post-test or pre-test/post-test outcomes were identified for inclusion, published between 2001 and 2004.

Tabulation of included studies

Source	Setting	n-values	Study description	Outcomes	Effect
Erhola 2003 [1]	Telephone surveys	n=242 GP's	Telephone survey between September 2000 and January 2001 delivered by either a full-time study nurse who specialised in asthma care or a general practitioner. 248 GP's of the 271 health centres were interviewed (91%), with 242 having viable recordings for evaluation (89%).	<ul style="list-style-type: none"> • 83% of health centres had at least one GP and 94% had at least one nurse nominated to work as the local asthma coordinator • 53% of health centres provided systematic advice and counselling to stop smoking, 77% diagnosed adult asthma and 17% diagnosed childhood asthma • All health centres had peak expiratory flow metres and 95% had spirometers • 97% of health centres started medication for recently diagnosed asthma with 75% of GPs aiming for regular (at least annual) follow-up while 88% stated that arranging follow-up was responsibility of the patient 	N/A

Source	Setting	n-values	Study description	Outcomes	Effect
				<ul style="list-style-type: none"> • 98% of health centres used guided self-management • 48% of health centres had asthma-related cooperation with pharmacies • 13% of GPs reported guidance and instruction on inhalation technique was offered in pharmacies • 79% of health centres had regional asthma programs available, 85% of which were being used by GPs 	
Haahtela 2001 [3]	Pharmacy-based surveys	n=500 pharmacies n=2,860 people (59% female)	Questionnaire given to all people purchasing asthma medication for themselves or their children in two consecutive days in June 1998. This was an asthma barometer survey to gauge follow-up of the program at patient level.	<ul style="list-style-type: none"> • 77% had their own asthma doctor who took care of treatments <ul style="list-style-type: none"> ○ 44% were specialists ○ 36% GPs in health centres ○ 10% were occupational health care 	N/A

Source	Setting	n-values	Study description	Outcomes	Effect
Ikäheimo 2004 [12]	Postal self- completion questionnaire based on Finnish Social Insurance Institution registries	n=4,657 (n=1,781 male: 38%; 1,304 of total sample aged 16-44 years)	Postal self-completion questionnaire sent to 6,000 people aged 16+ years who were entitled to special reimbursement for “ <i>anti- asthmatic</i> ” medication (78% response rate from initial random sample; 83% response rate over the whole country)	<ul style="list-style-type: none"> • 62% of participants (n=2,881) and 78% of those with severe asthma had visited a doctor due to asthma in the previous 12-months • 83% had a physician who was responsible for managing their asthma with 75% of these under observation by a primary healthcare physician 	N/A

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Search strategy and results for database screening (n=110)

(n=111 pre duplicate removed; Undertaken 18-02-20)

PubMed n=105

((Finnish[Title]) OR Finland[Title]) AND asthma[Title]

Cochrane Database n=6

((Finnish):ti OR (Finland)ti) AND (asthma):ti

PsychInfo n=0

- 1 Finnish.m_titl.
- 2 Finland.m_titl.
- 3 1 or 2
- 4 asthma.m_titl.
- 5 3 and 4