THE COMMUNITY HOSPITAL MODEL IN NORTHERN SWEDEN

Mante Hedman
To Karin
## Table of contents

Abstract .................................................................................................................. iii
Abbreviations ........................................................................................................ v
Enkel sammanfattning på svenska ................................................................. vi
List of original papers ......................................................................................... 1
Introduction .......................................................................................................... 2
  Rural areas versus sparsely populated regions ............................................ 2
  Rural areas studied in this thesis ................................................................. 4
  Swedish 'sjukstuga' versus community hospitals ........................................ 7
  History of Swedish community hospitals .................................................. 7
  Rural community hospitals internationally ................................................ 9
  Patient groups in CHs .................................................................................... 13
  Aims of this thesis ......................................................................................... 16
Materials and Methods .................................................................................... 17
  Methods in papers I-IV .................................................................................. 20
  Ethical considerations ..................................................................................... 25
Results .................................................................................................................. 26
  Paper I ............................................................................................................. 26
  Paper II .......................................................................................................... 29
  Papers III and IV .......................................................................................... 32
Discussion .......................................................................................................... 41
  Methodological considerations ................................................................. 41
    Paper I and II ............................................................................................. 41
    Paper III and IV ......................................................................................... 44
  Findings in relation to the literature .......................................................... 47
    Paper I .......................................................................................................... 47
    Paper II ......................................................................................................... 48
    Papers III and IV ......................................................................................... 50
Overarching discussion .................................................................................... 54
Future research .................................................................................................... 56
Conclusions ......................................................................................................... 57
Acknowledgements .......................................................... 58
References ........................................................................... 59
Abstract

**Background:** Rural community hospitals (CHs) are vital in delivering healthcare services in sparsely populated regions such as northern Sweden. In Sweden these facilities act as primary care units, staffed by general practitioners (GPs), nurses, and other healthcare professionals. They provide hospital beds, emergency care, and basic diagnostics. The CH model, with GPs responsible for hospital care has not been studied earlier in Sweden.

**Aims:** This thesis aimed to examine the role and practices of the Swedish rural CH model within the healthcare system and the local community. Furthermore, to investigate the perspectives of rural doctors in Sweden and New Zealand (NZ) working within their respective hospital models. Specific aims:

- To characterise patients admitted to hospitals in Norrbotten and Västerbotten Regions and to compare hospitalisations at rural community hospitals and general hospitals (Study I)
- To describe registered care measures carried out in rural community hospitals during episodes of hospital care for patients with heart failure, in comparison with a general hospital (Study II)
- To explore rural hospital doctors’ experiences of providing care in rural hospitals in Southern New Zealand (Study III)
- To explore rural general practitioners’ experiences of providing care in rural community hospitals in northern Sweden (Study IV)

**Methods and results:** Four original papers form the basis of this thesis. In study I, hospital register data from Norr- and Västerbotten Regions were analysed, focusing on hospital admissions of patients enrolled at CHs 2010-2014. We compared CH admissions with general hospital admissions, examining factors such as age, sex, and diagnoses. CH patients were older than those in general hospitals (median age 80 vs. 68 years), and women had a higher likelihood of admission to CHs compared to men. Common diagnoses in the elderly, such as heart failure and pneumonia were more likely admitted to CHs than to general hospitals. Study II utilized hospital register data from Region Västerbotten to describe registered care measures carried out in rural
CHs during episodes of hospital care for patients with heart failure 2015-2019, in comparison with a general hospital. CHs showed documentations by fewer individual doctors, more frequent nursing documentation, and fewer blood tests compared to general hospitals. Radiology, including echocardiography, was performed in general hospitals only but in a minority of cases. Documentation by physiotherapists, occupational therapists, and dietitians was limited in both hospital models.

Studies III and IV involved interviews with rural hospital (RH) doctors in New Zealand (NZ), and rural GPs in northern Sweden, respectively, to explore the role of their RH/CH. In both countries, doctors emphasised advantages with proximity and holistic, patient-centred care for elderly, multimorbid, and end-of-life patients. Their RHs/CHs were described to play a central role in rural patients' healthcare journeys, utilizing small, multidisciplinary teams and collaborating with general hospitals and municipal caregivers. Reported challenges for doctors in RHs and CHs included limited resources and inexperience in handling life-threatening, rare cases, and ethical dilemmas unique to rural practice. Despite this, RH doctors considered RH patient safety similar or better than that in general hospitals. CH doctors prompted the idea of expanding the CH model to urban areas.

**Conclusion:** We conclude that CHs admit elderly and multimorbid patients elsewhere common in general hospitals. Care for patients with heart failure at CHs showed more nursing notes, greater doctor continuity, and less biomedical examinations. Our results suggest potential for further development in the multidisciplinary care in both hospital models. Rural generalist doctors in Sweden and NZ emphasise the central role of CHs/RHs, their proximity to patients, and their holistic, generalist approach, and they suggest advantages in the RH/CH care for the elderly compared to general hospitals. In Sweden, the importance of relational continuity was stressed, as rural GPs are familiar with their CH patients from primary care.

**Keywords:** Rural health service; health services research; hospital; rural; inpatient; health services for the aged; geriatrics; generalist medicine
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>Community hospital</td>
</tr>
<tr>
<td>HF</td>
<td>Heart failure</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product. It is a key economic indicator that represents the total monetary value of all goods and services produced within a country's borders in a specific time period.</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>ICD-10</td>
<td>International Classification of Diseases, 10th Edition</td>
</tr>
<tr>
<td>LOS</td>
<td>Length of stay in a hospitalisation</td>
</tr>
<tr>
<td>MOSS</td>
<td>Medical Officers of Specialist Scale, a non-training position for doctors in NZ who have not yet specialised</td>
</tr>
<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>OR</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>PCU</td>
<td>Primary care unit</td>
</tr>
<tr>
<td>RH</td>
<td>Rural hospital, NZ equivalent to a Swedish community hospital</td>
</tr>
<tr>
<td>SPR</td>
<td>Sparsely populated regions</td>
</tr>
<tr>
<td>QCA</td>
<td>Qualitative Content Analysis</td>
</tr>
</tbody>
</table>
Enkel sammanfattning på svenska

**Bakgrund:** Glesbygdssjukstugor (i Norrbotten även kallade OBS-avdelningar) finns i glest befolkade kommuner i norra Sverige. De är i grunden primärvårdsenheter, bemannade av allmänläkare, sjuksköterskor och annan vårdpersonal som är vanliga vid svenska hälsocentraler. På grund av långa avstånd till närmaste sjukhus tillhandahåller de också vårdplatser och akutsjukvård utöver primärvårdsansvaret.

**Syfte:** Att undersöka vilken roll svenska sjukstugor spelar inom sjukvårdsorganisationen och för lokalsamhället. Dessutom att undersöka hur glesbygdsläkare i Sverige och på Nya Zeeland ser på sin roll läkare vid sådana sjukstugor.

**Metoder:** I studie I analyserades registerdata från Region Norrbotten och Region Västerbotten med fokus på patienter listade vid sjukstugor som vårdades inneliggande antingen på sjukstugor eller vanliga sjukhus 2010–2014. Vi jämförde vårdtillfällena vid sjukstugor med de på sjukhus och undersökte faktorer som ålder, kön och diagnoser.

Studie II använde registerdata från Region Västerbotten för att jämföra olika vårdåtgärder vid sjukstugor med ett vanligt länsdelssjukhus vid inneliggande vård av patienter med huvuddiagnos hjärtsvikt. Vi undersökte utredningsåtgärder och dokumentation i patientjournalerna. Analyserna i studie I och II involverade bland annat användningen av binär och multivariabel logistisk regression.

I studie III och IV genomfördes intervjuer med läkare vid Rural Hospitals (RHs), motsvarigheten till sjukstugor i Nya Zeelands (NZs) glesbygd (studie III) samt läkare vid svenska sjukstugor i Norrbotten och Västerbotten (studie IV). Ämnet för intervjuerna rörde läkarnas uppfattning om deras sjukstugas roll i sjukvårdssystemet och i lokalsamhället, samt även om läkarnas egen roll i vården. Kvalitativ innehållsanalys användes vid sammanställning och analys av intervjuerna.

**Resultat:** Medianåldern på sjukstugepatienterna var högre än de som vårdades vid vanligt sjukhus, 80 år jämfört med 68 år. Kvinnor hade högre sannolikhet att bli inlagda på sjukstuga jämfört med män, även efter justering för ålder. Patienter med diagnoser man vanligen ser hos
äldre multisjuka personer hade högre sannolikhet för inläggning på sjukstuga jämfört med vanligt sjukhus.

Jämförelse av vårdåtgärder för patienter med hjärtsvikt visade att sjukstugorna hade högre läkarkontinuitet, fler omvårdnadsanteckningar och endast en tredjedel av antalet blodprov jämfört med sjukhuset. Radiologi, inklusive ekokardiografi, utfördes uteslutande på sjukhuset och där i en minoritet av vårdtillfällena. Dokumentation av sjukgymnaster, arbetsterapeuter och dietister förekom i låga antal i båda sjukhusmodellerna.


Läkarna betonade den centrala roll deras sjukstugor/RH:s spelade i patienternas vårdkedja, där närhet och ett holistiskt generalistperspektiv sågs som fördel för sjukstugor jämfört med sjukhus i vården av äldre multisjuka patienter. De svenska läkarna betonade vikten av relationell kontinuitet i vården, där de som distriktsläkare även kände sina patienter ifrån primärvården.
List of original papers

This thesis is based on the following papers:


II Hedman M, Sjöström M, Brännström M, Boman K, Wennberg P. Care measures for heart failure at rural community hospitals – a comparison with a general hospital. A register study. In manuscript.


Introduction

In this introduction, definitions on the concept of rural will be discussed. Geographical areas of interest for this thesis (Northern Sweden and South Island, New Zealand) are described to set the basic understanding for where we are. A brief summary of the past and present of Swedish rural community hospitals follows, and a short presentation on rural community hospitals internationally. Some of the most common patient groups in CHs internationally are characterised.

Rural areas versus sparsely populated regions

A rural area is generally ‘a geographic area that is located outside towns and cities, with a low population density and small settlements comprising small towns, villages, and countryside. Agricultural areas and areas with forestry are typically described as rural’ (1). ‘Sparsely populated regions’ (SPRs) is a technical term describing a landscape by its low number of human inhabitants. SPRs are dominant across the world. In 2016, areas with less than 1 inhabitant/km² formed more than 60 % of the land area (2,3). The SPRs worldwide do not fit fully under the rural category as described below (3). Other terms describing SPRs are ‘wilderness’, ‘sparselands’, ‘backland/backcountry’, ‘outback’ and ‘bush’ - encompassing more than just low population density. In addition to this core characteristic, they may suggest aspects like isolation, limited central authority, economic and cultural underdevelopment, as well as the coexistence of diverse societies and ethnic groups (2).

Travel time to healthcare facility

The primary obstacle to healthcare accessibility in rural areas is the time required for individuals to reach the nearest healthcare facility that is adequately equipped and staffed. This duration is influenced by factors such as physical distance, transportation infrastructure, and the availability of motorized transport, among others (4). The accompanying global map visually illustrates the spatial disparities in healthcare access experienced by individuals relying on motorized transportation (4). Numerous regions characterized by extreme cold (alpine and polar regions) and heat (deserts) or rainforests involve travel times exceeding 24 hours. The map leaves readers to ponder travel times for healthcare in open sea emergencies.
Color-coded logarithmic timescale from minutes (yellow) to 24 h (dark purple).

**Figure 1:** The global map of optimal travel time to healthcare with access to motorized transport. From reference (4).
**Glesbygd**

In Swedish, ‘glesbygd’ refers to both rural and sparsely populated areas. The Swedish National Encyclopaedia defines ‘glesbygd’ as the opposite of an urban area (5). Tillväxtverket (the Swedish Agency for Economic and Regional Growth), defines ‘glesbygd’ as an area more than 45 minutes by car to nearest urban centre with more than 3 000 inhabitants. Using this definition, a substantial part of the Swedish area would be ‘glesbygd’. In this dissertation, we have chosen 'rural' as the English translation of 'glesbygd' to distinguish it from urban areas. 'Rural medicine' is the established term in scientific literature for this field, although it may not fully capture the concept studied here, which is characterized by extreme population sparsity.

**Rural areas studied in this thesis**

The aim of this thesis is to examine the role of the Swedish rural community hospital (CH) model within the healthcare system and the local community. In addition, we also performed an interview study in South Island, New Zealand. Details on Swedish CH areas as well as South Island are discussed below.

**Norrbotten and Västerbotten**

Norrbotten and Västerbotten are two vast regions located in northern Sweden, stretching from the coast of the Bothnian Bay into the heart of Norrland. These regions encompass coastal regions as well as inland rural areas. Extensive forested areas in both Norrbotten and Västerbotten contribute to the timber industry and pulp production. Northern Sweden hosts numerous hydropower plants that form a significant component of Sweden's electricity production by harnessing the energy from rivers and waterfalls. Mining, especially in northern Norrbotten, has been central to the economy, with a focus on iron ore mines. Agriculture was traditionally important in these municipalities, but the number of farmers is diminishing and much of the arable land lies fallow.

Norrbotten and Västerbotten are sparsely populated. Especially municipalities with community hospitals (CHs) have exceptionally low population densities (0.7/km²) in contrast to Sweden, which has around 24 people/km², and the EU with 120/km². When compared to many other countries with such population sparsity, access to motorized
vehicles and a stable transportation infrastructure helps shortening travel time to healthcare, as depicted in the global map above. However, transportation time to nearest general hospital can exceed two hours even when the patient falls ill close to a major road. Moreover, when emergencies occur out in the wilderness out of reach for the ambulance, travel time to healthcare can significantly surpass even this timeframe. Notably, demographic disparities exist between the coastal and the inland regions (6), including inequality of living conditions and social
cohesion. Inland regions tend to have an older population, while coastal areas exhibit a more diverse age structure (7–9). Swedish CHs in this thesis are situated in municipalities where the median age in 2022 was 48 years, compared to 42 years in Sweden nationally (10). The public health situation in the inland regions is challenging due to the greater distance from healthcare services and an aging population with specific healthcare needs (11). In contrast, coastal areas often enjoy better access to healthcare. There is one additional CH in northern Jämtland county, which do not contribute to our studies, and which have similarities with CH areas in Västerbotten and Norrbotten regarding above descriptions.

**Sámi people**

The Sámi, an indigenous Finno-Ugric people, inhabit Sápmi, extending across northern Norway, Sweden, Finland, and Russia's Kola Peninsula. Globally, Sámi numbers range from 75,000 to 100,000 (12), with 20,000 to 40,000 in Sweden, predominantly in Norrland (13). Population uncertainty stems from Sweden's restriction on ethnic registration. Traditionally, the Sámi engaged in reindeer herding, fishing, and Arctic-adapted activities. Reindeer symbolize their culture, reflecting a worldview grounded in nature (14). The reindeer holds a central place in Sámi culture. Around 4,600 Swedish Sámi own one or more reindeer, of which over 1,000 work as herders (18% women), organised into 51 communities (15). As an indigenous group and one of Sweden's minorities, the Sámi preserve their identity through cultural and political institutions. The Sámi language includes dialects like Southern, Lule, and Northern.

Globally, indigenous peoples often face worse health outcomes compare to non-indigenous peoples due to the impact of Western culture, leading to a higher prevalence of lifestyle-related diseases (16). Although epidemiological studies on the Sámi people are limited due to ethnic registration restrictions, there are some research in collaboration with Sámi institutions that sheds light on healthcare disparities. Unlike other indigenous groups, the Sámi differs marginally from other Swedes in cardiovascular disease risk (17). However, musculoskeletal issues and work-related strain in reindeer herding (18), along with psychiatric disorders and suicides in young herders (19), have been reported. Sámi individuals in reindeer herding families exhibit significantly lower trust in primary and psychiatric care, influenced by historical traumas, cultural factors, and perceived cultural incompetence among healthcare professionals (20).
In addition to the Sami language, other minority languages such as Meänkieli (Tornedalian Finnish) (21,22) and Finnish (23) have historical significance and influence local culture and traditions in Norrbotten.

**Swedish 'sjukstuga' versus community hospitals**

The Swedish word 'sjukstuga' is a direct translation from ‘cottage hospital’. Globally, the term ‘cottage hospital’ has traditionally denoted small, community-based hospitals akin to those in Sweden and is often interchangeable with ‘community hospital'. Nevertheless, I've opted for the term ‘community hospital’ due to its contemporary nature, highlighting the hospitals' role as all-encompassing healthcare providers meeting the requirements of local communities. However, in New Zealand the rural community hospitals are explicitly named ‘rural hospitals’, so when presenting New Zealand and paper II, I will use this term.

There is not one international comprehensive definition of a community hospital. One definition applicable for the Swedish context is a hospital where ‘the admission, care and discharge of patients are under the direct control of a GP’ (24). In reference (25), alternate definitions are offered, showing minor discrepancies. In New Zealand, rural hospitals were defined as "hospitals staffed by well-qualified and experienced generalist practitioners, including both medical officers and rural GPs, who assume complete clinical responsibility for a broad spectrum of clinical cases" (26).

**History of Swedish community hospitals**

The term ‘hospital’ traces its roots to the Latin word ‘hospitālis,’ signifying hospitality, derived from ‘hospĕs’, meaning guest, stranger, and host (27). In the early Middle Ages, leprosy was prevalent, and the Swedish word for leper, ‘spetälsk,’ abbreviated ‘spital’ often referred to ‘the one in hospital’ (28).

By 1688, provincial medicine began in major Swedish cities, with 9 doctors for the southern and central regions by the early 1700s. They oversaw hospitals, midwives, and pharmacies, and addressed epidemics (29). In 1755, the first provincial physician took up residence in Västerbotten/Norrbotten. Initially based in Piteå, Norrbotten, the position later relocated to Umeå, Västerbotten, where the first infirmary was established in 1784. From 1773 the state administration was responsible for the provincial physicians’ employment. This lasted until
1963, when the county councils took over the responsibility of the Primary Care in Sweden (29).

In Sweden, 'Sjukstuga' (formerly also 'sjukstuva') was first described in the 1521 Stockholm Skottby Inventory as a room or building (often adjacent to a church or monastery) for sheltering and caring for the sick, the poor, and the infirm. In every parish church, there was a sickroom where the needy could find a roof over their heads. Smaller sickrooms served as community or private hospitals, usually designated for the less privileged or indigent individuals (30). In this thesis, the term 'sjukstuga' will henceforth be replaced with community hospital using the abbreviation CH.

During the late 19th and early 20th centuries, awareness of the importance of modern healthcare and preventive measures increased. This led to the establishment of several CHs to meet the growing needs. Many of these were situated in rural areas to provide accessible healthcare to the population (31). In 1901, the 'Sjukstuga statue' stipulated that a CH was limited to 24 beds and followed hospital regulations (30). The initial CHs in South Lapland, Västerbotten, were founded in the late 19th century in Lycksele and Åsele. By the mid-1920s, the Västerbotten County Council had expanded the network by establishing additional rural CHs in Sorsele, Stensele, Vilhelmina, Malå, Dorotea, and Tärnaby (13 in total)(32). A similar development occurred in Norrbotten, Jämtland and other regions. In 1916, there was approximately 80 CHs with a total of 1200 beds in Sweden. Later, under the 1940 Hospital Act, CHs could have up to 30 beds, and with approval from the Medical Board, an additional 20 beds could be added, creating larger CHs. Each CH had a physician service with most doctors having surgical training. Medical services were integrated, combining surgical and internal medicine. The work of provincial physicians, solely responsible for the healthcare in large sparsely populated districts, have an important place in the medical history and is well documented in the novels by the legendary provincial physician in Arjeplog, Norrbotten, Einar Wallquist. After the Second World War and onwards, various reforms and restructuring initiatives took place within the Swedish healthcare organisation. Due to increased professionalization and technological advancements in healthcare, there were – and still are - ongoing closures and restructurings of smaller healthcare facilities and clinics, including CHs, with the goal of concentrating resources on fewer and more specialised units (33). However, CHs that align with the aforementioned criteria continue to exist in areas of extreme sparsity of
people and with long distances to nearest hospital. In Norrbotten the term ‘sjukstuga’ has been exchanged into ‘Health Centre with observation ward’ in the last decades.

**Rural community hospitals in Sweden today**

In the Regions of Norrbotten, Västerbotten, and Jämtland, 15 CHs serve rural municipalities, collectively covering nearly a quarter of Sweden’s land area. These CHs function as local primary care units (PCUs), that offer a broader range of services compared to typical Swedish PCUs, and include hospital wards, X-ray facilities, and emergency rooms. The staff at CHs include general practitioners (GPs), district nurses, registered nurses, nurses' assistants, physiotherapists, occupational therapists, counsellors, and midwives to meet the diverse primary care service requirements. All Swedish CHs are publicly owned and integrated into their regional health care organisations. CHs, along with their GPs, are responsible for providing primary care, hospital inpatient care, emergency care, and adopting a population health approach. The CHs have extended responsibilities compared to all other primary care units in Sweden and are unique in a national perspective. Although the research on rural medicine in Sweden has increased in the last decade, the Swedish rural community hospital model has not specifically been described in scientific research, but CH GPs have participated in an interview study on experiences on emergency medicine in rural areas (34). All Swedish CHs except for the one situated in Strömsund, Jämtland County are included in one or more studies in this thesis.

**Rural community hospitals internationally**

Rural community hospital models in various countries have previously been described and evaluated, although not in Sweden. In a comprehensive review spanning research conducted in Australia, Finland, Italy, Norway, Scotland, and England, Pitchford et al. (25) concluded that community hospitals provide a wide range of services, encompassing the integration of various aspects of health, social, and community care. Quantitative and qualitative studies from other countries including New Zealand (NZ) (26,35–39), and the Netherlands (40), agree with these descriptions on the health care services provided by rural CHs. However, the approaches to this integration vary both within and across different countries (25). In contrast to many modern urban hospitals rural CHs have evolved gradually in response to the needs and resources of the local communities, resulting in a heterogeneity in size and provision of health care (41). This makes
quantitative comparative research troublesome, particularly as CHs are typically small, with small numbers of hospital beds and patients compared to general hospitals.

**Cairns’ Consensus Statement**

In 2013, the Cairns Consensus Statement defined Rural Generalist Medicine by the broad scope of medical care a rural doctor provides. This includes primary care, hospital inpatient care, emergency care and a population health approach to provide services responsive to community needs both locally and at a distance (42). The delivery of services provided by Swedish CH GPs aligns with the definition of Rural Generalist Medicine outlined Consensus Statement.

**Aspects in the understanding of rural medicine**

In spite of differences in size and resources, geographical conditions, and climate, rural CHs seem to share many commonalities, distinguishing them from regular hospitals in their respective countries. In Australia, Wakerman and Humphreys discussed in (43) how rural health is primarily characterised by its geography and related issues of access to health care, but rural areas are also sociologically, culturally, economically and spiritually different from metropolitan areas. These characteristics shape residents' health behaviour, influence their health status, and impact the delivery of health and medical care. Bourke et al. (44) proposed a conceptual framework, drawing on sociological theories, consisting of six key concepts for comprehending rural health practice in Australia. These concepts include geographic isolation, the rural locale, local health responses, broader health systems, social structures, and power. The framework emphasises the spatial and social relations among local residents, along with the actions of health professionals and consumers, within the constraints and opportunities presented by broader health systems and social structures (44). Le Tourneau argues that sparsely populated areas (SPRs), which encompass diverse climates from arctic permafrost regions to tropical forests and high mountain temperate zones share characteristics that justifies their recognition as a distinct geographical environment (2), and that the originality of SPRs comes from their being marginal politically, culturally, socially and economically. Although I never intended to do sociological research such aspects presented by sociologists and cultural geographers encouraged me to put an international perspective in my
New Zealand and Sweden are roughly opposite each other on the globe. Despite this, New Zealand resembles Sweden, in many different aspects. Both are constitutional monarchies with democratic elections for the parliaments, which hold the legislative powers. Both countries are ranked high internationally regarding political stability (45) and democracy (46). Life expectancy in Sweden and NZ is among the top 15 countries (47). Public health care expenditure in NZ in 2022 was 82.0 % of total health care expenditure, compared to 85.8 % in Sweden (48). In NZ total health expenditure cost 11.2 % of GDP in 2022, compared to 10.7 % in Sweden (49). Infant mortality rate was 2.2/1000 in Sweden and 3.9/1000 in NZ in 2020 (50). NZ has a younger population, median age estimated to 37.2 years compared to 41.1 years in Sweden (51). Overall, the population density is 26/km² in Sweden, compared to 20/km² in NZ (2023) (52). A NZ policy document emphasises an estimated increase in hospital bed usage in the coming decades due to an ageing population, and states that the complexity of hospital cases will increase due to multimorbidity and frailty (53).

The Māori, indigenous Polynesian people of New Zealand, arrived in the 13th-14th centuries from Eastern Polynesia, establishing a rich cultural system in Aotearoa, their name for New Zealand. They formed distinct tribes, creating artwork, language, and traditions (54). European exploration began with Abel Tasman in 1642, but sustained contact started with Captain James Cook in 1769 (55). In the 19th century, New Zealand became a British colony, bringing European diseases, land disputes, and social changes for the Māori. Colonization’s impact persists, prompting ongoing efforts to address historical injustices and promote Māori rights and culture. The Māori language (Te Reo Māori) was declared official in 1987 alongside English. Te Reo Māori is spoken and taught within Māori communities and educational institutions, and bilingual signs on streets and official buildings are mandatory (56). Health disparities with a particular focus on Māori health inequities are evident, and include factors such as life expectancy, access to healthcare, and the prevalence of different health conditions (57).
Figure 3: Map of New Zealand
**South Island**

South Island is New Zealand's larger, southernmost island, with a population that is more sparsely distributed compared to the North Island, 7.9/ km², but more similar to the northernmost half of Sweden, Norrland, with a population density 4.9/ km². The primary urban centres include Christchurch and Dunedin. South Island's remarkable sceneries attract visitors from around the world. Therefore, tourism is a significant industry (58). Agriculture, including sheep farming and dairy farming, plays a crucial role in the island’s economy (59).

**Rural hospitals in New Zealand**

In New Zealand, hospitals are classified based on their size (large, mid-sized, and small) and of the range of services they offer, following a six-level continuum from level 1 (community services) to level 6 (supracomplex services) (53). Within New Zealand, there are a total of 33 rural hospitals (RHs), with 20 located in the North Island, 12 in the South Island, and one in Chatham Islands. All rural hospitals are categorized as small and provide services at levels 1 to 3 (60). RHs in New Zealand have adapted over time to address specific local requirements and economic conditions, leading to a diverse range of sizes, services, and ownership models—a mix of public hospitals run by District Health Boards and Community Trusts (26). The medical and nursing care offered within these RHs encompasses a wide spectrum of clinical practice specialties (61). Traditionally in New Zealand, medical care in rural RHs has been delivered by local rural General Practitioners (GPs) and Medical Officers of Specialist Scale, which is a non-training position for doctors who have not yet specialised. However, Rural Hospital Medicine was recognised as a new scope of practice in 2008 and speciality-training programmes adapted for the needs of RH doctors were implemented (60,62). RH doctors would meet the Cairns Consensus Statement’s (42) definition in their work at the RH, but approximately half of the workforce work full time at the RH and not as GPs.

**Patient groups in CHs**

**Elderly patients**

According to international literature, the most prevalent patient groups seen in rural CHs are elderly patients, particularly multimorbid and frail patients (35,40,63,64) and patients in end of life (65,66). This section
provides fundamental information on conditions commonly observed in rural CHs worldwide.

**Patients with multimorbidity**

Multimorbidity, defined as the coexistence of multiple chronic diseases or conditions, is the most common chronic condition in adults (67). It significantly impacts healthcare utilization and expenditure (68). If heart failure (HF) is also present, this financial burden intensifies. The prevalence of multimorbidity in patients with HF ranges between 43% and 98%, and varies among geographical regions (69). Cardiovascular-related conditions are common among patients with HF, but other physical and mental ailments have stronger associations with adverse outcomes (70).

Despite the dominance of multiple chronic conditions, reimbursement systems rely on specific diagnostic ICD-codes (71), failing to address multimorbidity. Specialists focus on individual diseases, overlooking the challenges posed by numerous simultaneous treatments. Clinical decision-making for patients with multiple chronic conditions involves managing uncertain benefits, potential harm, and treatment burden. Quality measurement often neglects the unintended consequences of applying multiple interventions, highlighting the complexities in addressing the diverse needs of these patients within current healthcare structures (72–75).

**Patients with heart failure**

Heart failure (HF) is a clinical syndrome characterized by symptoms and/or signs resulting from structural and/or functional cardiac abnormalities, confirmed by elevated natriuretic peptide levels and/or objective evidence of pulmonary or systemic congestion (76). While uncommon in those under 50, HF escalates with age, posing a major health concern for aging populations (77,78), and is the most common cause for hospitalisation in patients over 65 years of age (79–82). In Europe, 1-2% of the contemporary adult population is estimated to have HF (83), at the cost of 1-2% of the annual healthcare budgets (84). Symptoms like breathlessness, exhaustion, oedema, weight gain, reduced fitness, and loss of appetite are common (82) but can stem from various causes. In Sweden, primary care, guided by national guidelines, manages the majority of patients with HF (79). Acute exacerbations, triggered by factors like infection or uncontrolled hypertension, require urgent hospitalisation (77,85). Multimorbidity in patients with acute heart failure is associated with high mortality, less prescription of
guideline-directed heart failure pharmacotherapy, and increased use of potentially harmful medications (69).

In Sweden hospitalised patients with HF are normally treated in general internal medicine wards (79).

**Frailty**

Frailty is defined as a clinically recognizable state of increased vulnerability due to cumulative age-related declines in multiple physiological systems, that depletes homeostatic reserves and compromise the ability to cope with every day or acute stressors (86,87). Frailty carries an increased risk for falls, incident disability, hospitalisation, and mortality (88–90). Increasing frailty is associated with substantial increases in healthcare costs, driven by increased hospital admissions, longer inpatient stay, and increased general practice consultations (91).

**Why this thesis?**

In Sweden, CHs have played a crucial role as a more accessible alternative to general hospitals in sparsely populated areas for a considerable period. However, unlike similar models in other countries, the Swedish CH model of hospital care has not undergone extensive research concerning the individuals receiving care and the defining characteristics of CH care. Through this thesis, my objective is to bridge this knowledge gap, also with an international perspective, and encourage further investigation into rural medicine in Sweden.
Aims of this thesis

**Overall aim**

To examine the role and practices of the Swedish rural CH model within the healthcare system and the local community. Furthermore, to explore the perspectives of rural doctors in Sweden and New Zealand working within their respective hospital models.

**Specific aims**

1. To characterise patients admitted to hospitals in Norrbotten and Västerbotten Regions and to compare hospitalisations at rural community hospitals and general hospitals (Study I)

2. To describe registered care measures carried out in rural community hospitals during episodes of hospital care for patients with heart failure, in comparison with a general hospital (Study II)

3. To explore rural hospital doctors’ experiences of providing care in rural hospitals in Southern New Zealand (Study III)

4. To explore rural general practitioners’ experiences of providing care in rural community hospitals in northern Sweden (Study IV)
Materials and Methods

Setting in Sweden

The setting of this thesis is Norrbotten and Västerbotten, the two northernmost Regions in Sweden, and South Island in New Zealand.

In Norrbotten and Västerbotten Regions, 14 CHs serve rural municipalities, spanning nearly a quarter of Sweden's landmass. These CHs operate as local primary care units (PCUs) offering extended services compared to typical Swedish PCUs, encompassing hospital wards, X-ray facilities, and emergency rooms. In CH wards, rural GPs manage acute cases, provide post-acute care post-general hospital treatment, and offer end-of-life care. See Figure 4 for the geographical distribution of Swedish CHs. Table 1 illustrates population, area, density, mean ages, distances to hospitals, and the number of CH beds in participating municipalities in Västerbotten and Norrbotten.

Skellefteå Lasarett is a district hospital in Region Västerbotten that serves a population of approximately 75,000 individuals. There are no CHs within the catchment area, so patient groups that would be admitted to CHs in CH areas will in Skellefteå primarily be cared for at the district hospital.

Setting in South Island, New Zealand

South Island, NZ, has a population of 1.1 million dispersed over a geographical area of 150,000 square kilometres. Secondary and tertiary hospital care is provided to the population mainly by the general hospitals in Nelson, Christchurch, Dunedin and Invercargill. These hospitals also serve as supporting base hospitals for their associated RHs, of which 12 are located in South Island. The study took place in rural parts of Otago, Canterbury and West Coast regions in the South Island of NZ. Rural hospitals studied in paper provided 4-24 hospital beds and included level 1-3 services. They were supported by three base hospitals, in Christchurch, Dunedin and Invercargill. Distances from rural hospitals to nearest base hospital were 67-240 km. See figure 4, where all rural hospitals in South Island are depicted.
**Table I:** Population, area, population density, mean ages, distances to hospital and number of community hospital beds in participating municipalities in Västerbotten and Norrbotten.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population 2022 (n)</th>
<th>Area (km²)</th>
<th>Pop Dens 2022 (n/km²)</th>
<th>Mean age 2022</th>
<th>Distance hospital (km)</th>
<th>Distance hospital (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storuman</td>
<td>5747</td>
<td>7304</td>
<td>0.8</td>
<td>47.3</td>
<td>104</td>
<td>77</td>
</tr>
<tr>
<td>Tärnaby (Storuman)</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>229</td>
</tr>
<tr>
<td>Vilhelmina</td>
<td>6393</td>
<td>8048</td>
<td>0.8</td>
<td>45.8</td>
<td>117</td>
<td>89</td>
</tr>
<tr>
<td>Malå</td>
<td>3033</td>
<td>1599</td>
<td>1.9</td>
<td>45.7</td>
<td>83</td>
<td>66</td>
</tr>
<tr>
<td>Åsele</td>
<td>2782</td>
<td>4224</td>
<td>0.7</td>
<td>47.6</td>
<td>88</td>
<td>63</td>
</tr>
<tr>
<td>Sorsele</td>
<td>2565</td>
<td>7368</td>
<td>0.3</td>
<td>47.4</td>
<td>143</td>
<td>106</td>
</tr>
<tr>
<td>Dorotea</td>
<td>2413</td>
<td>2765</td>
<td>0.9</td>
<td>48.7</td>
<td>137</td>
<td>97</td>
</tr>
<tr>
<td><strong>Total CH area</strong></td>
<td><strong>22 933</strong></td>
<td><strong>31 308</strong></td>
<td><strong>0.7</strong></td>
<td><strong>46.9</strong></td>
<td><strong>129</strong>*</td>
<td><strong>95</strong>*</td>
</tr>
<tr>
<td>Norrbotten</td>
<td>249 177</td>
<td>97 257</td>
<td>2.6</td>
<td>44.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pajala</td>
<td>5883</td>
<td>7840</td>
<td>0.8</td>
<td>49.1</td>
<td>184</td>
<td>135</td>
</tr>
<tr>
<td>Övertorneå</td>
<td>4119</td>
<td>2362</td>
<td>2.0</td>
<td>51.3</td>
<td>78</td>
<td>58</td>
</tr>
<tr>
<td>Arvidsjaur</td>
<td>6111</td>
<td>5656</td>
<td>1.2</td>
<td>46.2</td>
<td>125</td>
<td>93</td>
</tr>
<tr>
<td>Jokkmokk</td>
<td>4760</td>
<td>17 614</td>
<td>0.3</td>
<td>47.7</td>
<td>94</td>
<td>71</td>
</tr>
<tr>
<td>Överkalix</td>
<td>3160</td>
<td>2764</td>
<td>1.2</td>
<td>50.7</td>
<td>69</td>
<td>56</td>
</tr>
<tr>
<td>Arjeplog</td>
<td>2667</td>
<td>12 556</td>
<td>0.2</td>
<td>48.3</td>
<td>210</td>
<td>152</td>
</tr>
<tr>
<td>Haparanda</td>
<td>9340</td>
<td>923</td>
<td>10.6</td>
<td>47.4</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total CH area</strong></td>
<td><strong>36040</strong></td>
<td><strong>49 715</strong></td>
<td><strong>0.7</strong></td>
<td><strong>48.3</strong></td>
<td><strong>116</strong>*</td>
<td><strong>86</strong>*</td>
</tr>
<tr>
<td><strong>Sweden</strong></td>
<td><strong>10521556</strong></td>
<td><strong>450295</strong></td>
<td><strong>23.3</strong></td>
<td><strong>41.7</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Based on statistical data published by Statistiska Centralbyran. ** Tärnaby is part of Storuman municipality. *** Mean distances by road.
Figure 4: Map over South Island, New Zealand (left), and Northern Sweden (right). The NZ map indicate all rural hospitals in South Island, colours indicate hospital level 1-3. The Swedish map indicate hospitals with larger dots and community hospitals with smaller dots. Blue dots indicate Region Norrbotten, red dots indicate Region Västerbotten, and grey/black dots indicate Region Jämtland.
Table 2. Overview of design and methods for studies I-IV.

<table>
<thead>
<tr>
<th>Study</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aim</strong></td>
<td>To characterise patients admitted to hospitals in Norrbotten and Västerbotten Regions and to compare hospitalisations at rural community hospitals and general hospitals</td>
<td>To describe registered care measures carried out in rural community hospitals during episodes of hospital care for patients with heart failure, in comparison with a general hospital</td>
<td>To explore rural hospital doctors’ experiences of providing care in rural hospitals in Southern New Zealand</td>
<td>To explore general practitioners’ experiences of providing care in rural community hospitals in northern Sweden</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td>Retrospective registry-based observational study</td>
<td>Retrospective registry-based observational study</td>
<td>Qualitative interview study</td>
<td>Qualitative interview study</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>All hospital admissions occurring 2010-2014, for patients who were affiliated with community hospitals in Norrbotten and Västerbotten Regions</td>
<td>Hospital admissions with heart failure patients occurring 2015-2019, for patients affiliated with community hospitals in Region Västerbotten and with Primary Care Units in areas supported by Skellefteå lasaret</td>
<td>16 rural hospital doctors working in rural hospitals in South Island, New Zealand</td>
<td>15 rural GPs working in rural community hospitals in Norr- and Västerbotten Regions, Sweden</td>
</tr>
<tr>
<td><strong>Data collection</strong></td>
<td>Hospital register data from Norrbotten and Västerbotten Regions</td>
<td>Hospital register data from Västerbotten Regions</td>
<td>Semi-structured interviews</td>
<td>Semi-structured interviews</td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td>Summative statistics t-test χ² test Logistic regression</td>
<td>Summative statistics t-test Mann-Whitney U-test χ² test Logistic regression</td>
<td>Qualitative Content Analysis</td>
<td>Qualitative Content Analysis</td>
</tr>
</tbody>
</table>

Methods in papers I-IV

**Paper I**

**Participants**

In Paper I, we analysed hospital registration data from Region Norrbotten and Region Västerbotten, covering all hospital admissions between January 1, 2010, and December 31, 2014, for patients enrolled at CHs in these regions.
**Study design**

Retrospective register study

**Data collection**

Data were collected by Region Västerbotten. We collected age, sex, admission date, length of stay, and main and secondary diagnoses (categorized using ICD-10 codes (71)) and date of death for patients who were diseased at the time of collection of data. Different dementia diagnoses were consolidated into one code, and subcodes were grouped (e.g., J18.1, J18.2, J18.8, J18.9 into J18). We combined secondary diagnoses 1-5 to calculate total admissions for each secondary diagnosis, excluding additional diagnoses beyond the fifth. Patient deaths occurring on the same day as hospital discharge were labelled as in-hospital deaths. The distribution of ICD-10 diagnosis groups in in-hospital deaths was calculated from the data. (results not presented in the original Paper I).

**Statistical analysis**

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) Version 18 (92), and involved the independent two-sample t-test for continuous variables and the $\chi^2$ test for categorical variables. Logistic regression estimated odds ratios (ORs) for CH admission vs. general hospitals, adjusting for age (Model I) and age and sex (Model II).

**Paper II**

**Participants**

In paper II, we analysed hospital registration data from Region Västerbotten, covering all hospital admissions between January 1, 2015, and December 31, 2019, for patients enrolled at CHs in Västerbotten and for patients enrolled at primary care units (PCUs) in areas supported by Skellefteå County Hospital.

**Study design**

Retrospective register study
Data collection

Data were collected by Region Västerbotten. Inclusion criteria were main diagnosis “Heart Failure” (ICD-10 I50) at discharge and age >18 years. Only hospitalisations in CHs or in Skellefteå County Hospital were included. Hospitalisations were excluded if the patient was treated in more than one hospital clinic before discharge, in the occurrence of patients’ death within 6 months from discharge, and if the patient resided in a municipal nursing home at admittance.

We collected data on patients age, sex, chosen CH/PCU, treating clinic, admission date, length of stay, and total number of diagnoses. Data on care measure-related variables were retrieved, including the number of blood tests, doctor’s notes, nursing notes, and the count of unique doctors during the hospital stay, and were divided by LOS days. Additionally, data on the occurrence of urinary tests, x-ray imaging, CT scans, echocardiogram, intravenous treatment, and notes from physiotherapists, occupational therapists, pharmacists, and dietitians were collected.

Statistical analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) Version 18 (92) and involved the independent two-sample t-test for normally distributed continuous variables and Mann-Whitney U test for non-normally distributed continuous variables. Differences in categorical variables were tested using the χ² test. P-values for associations between variables related to medical procedures and type of hospital were calculated using logistic regression in a crude model and in a model adjusted for age and sex. Sex differences were also calculated using logistic regression adjusting for age.

A sensitivity analysis was conducted to test the robustness in the analysis. A subgroup was formed by excluding hospitalisations with patients falling outside of the 10th to 90th percentile range of age in the CH population. Furthermore, hospitalisations falling outside the 10th to 90th percentile range of length of stay (LOS) were removed. Differences between hospitals in the subgroup were calculated using the same statistical methods as in the main study.
Paper III and IV

To answer the study questions, a qualitative method was chosen, based on semi-structured interviews with doctors who have experience of working in rural CHs in Sweden and rural hospitals in New Zealand, respectively. We used the definition for rural hospital in (24), ‘a hospital in a rural setting at least 30 minutes from a secondary or tertiary level base hospital, where acutely ill patients are usually admitted and cared for by generalist doctors, who may as a consequence, be required to practice in a variety of different vocational domains at any one time.’ Inclusion criteria for the hospitals were chosen to mimic Swedish rural CH conditions: not less than 4 and not more than 16 beds, located between 70-230 km from nearest general hospital, and serving no more than 10,000 inhabitants. In South Island, NZ, 9 rural hospitals and in Northern Sweden 8 rural CHs were selected.

Sample size

The plan was to conduct 10-15 interviews in Sweden and in NZ, respectively, with ongoing evaluation to determine if sufficient richness of data was reached, potentially resulting in adjustments to the number of interviews (93,94). Enough interviews were included when informants that mirror all different inclusion groups had been interviewed and additional interviews did not result in new information of importance for the study (95).

Inclusion criteria for informants:

- GPs AND (in NZ) MOSSs and Rural Hospital Specialists
- Male AND female doctors
- (In NZ) doctors of NZ origin AND representative of doctor from overseas
- Employed no less than 12 months at the unit.
- In order to obtain high information power and reducing the sample size, respondents will if possible be invited that have various degrees of experience.
Recruitment of informants

An invitation letter was sent to managers of rural hospitals (Paper II) and CHs (Paper III) meeting inclusion criteria, to ask for their help in suggesting doctors/informants meeting inclusion criteria. Another invitation letter was sent to these doctors for their informed consent to participate in the study.

Interview study

The interviewer in both studies was the PhD candidate. All interviews were conducted at the informants’ workplace, except one interview that was held in Dep of General Practice and Rural Health, Otago University, Dunedin. Since a deeper understanding was desired, an interview technique permitting an explorative approach was considered favourable. Broad open-ended questions were used to encourage narration. Discussion and mutual interaction between the interviewer and the informant were thought of as useful tools for an explorative approach. Therefore, a narrative interview design was chosen. This means that the interviewer initiated the discussion using a few open interview questions. The informant was permitted to bring up issues and initiatives, but more specified interview questions were when needed used to orient the discussion towards areas of interest for the project. Summarizing and, when needed, clarification by further questions, was used in order to let the informant correct potential misunderstandings during the interview session. The interviews followed an interview guide to ensure that the research questions were well founded (see Appendix). The interviews were voice-recorded, and the interviewer obtained the informants’ consent to the possibility of taking contact after the interview for any further clarifications.

Analysis:

In the NZ study, the research group included the PhD candidate, Swedish supervisor MB¹ and NZ supervisors FD-N and TS. In the Swedish study, the research group included supervisors MB, PW and MS. The interviews were transcribed and analysed according to

qualitative content analysis (93). In the analysis, software program MAXQDA 2018© (96) was used to organise and code data. Transcripts were read through several times in order to get a sense of the whole. The analysis sought to identify meaning units corresponding to the aim. These meaning units were condensed (i.e., shortened with the core message retained) and labelled with descriptive codes. Codes were compared to identify similarities and differences and then sorted into subcategories and categories. Further, in the report descriptions of categories included representative quotes from the informants. During the analysis process the codes, subcategories and categories were discussed in the research group to seek consensus, and subthemes and themes were formulated. In both papers, all co-researchers contributed to the work with manuscripts, with the PhD candidate taking the lead.

Ethical considerations
Study 1, 2 and 3 were approved by ethical committees. Our application for study 4 was not considered for approval by the Research Ethics Board in Västerbotten because it was deemed not to involve sensitive personal data processing. In contrast, study 3 with a similar design but performed in New Zealand required approval from both the Ethics Committee in University of Otago and Te Komiti Whakarite, the Canterbury Māori Health Research committee for Māori consultation and Ngāi Tahu Research Consultation Committee. The participant doctors in both interview studies were limited in number, representing a small number of rural community hospitals, raising the potential risk of identification based on their statements. To mitigate this risk, the drafts were carefully reviewed to avoid the identification of individual doctors. Study 1 and 2 processed sensitive personal register data on hospital patients, but the researchers had only access to pseudonymised personal data as practical data retrieval was performed by statisticians from Region Västerbotten and Region Norrbotten.
Results

Paper I
For full report of results, please consult original paper. We documented 76,837 admissions, with 60,704 in general hospitals and 16,133 in CHs. CH patients were older (median age 80 years vs. 68 years in general hospitals) with longer stays, see Figure 5 and Table 3.

Figure 5. Histogram comparing age distribution between community hospitals and general hospitals presented in 5-year age intervals.

Men received more diagnoses upon discharge in both hospital types. Even after age adjustment, women were more likely to be admitted to CHs (Table 4). The most prevalent main diagnoses in CHs were heart failure and pneumonia. With the 10 most prevalent main diagnoses,
Table 3: Characteristics of patients and admissions in Community Hospitals (CHs) and General Hospitals (GHs), all admissions. Comparisons between male and female patients.

<table>
<thead>
<tr>
<th></th>
<th>Community Hospitals</th>
<th>General Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Number of admissions (n)</td>
<td>8540</td>
<td>7593***</td>
</tr>
<tr>
<td>Age (years, IQR)</td>
<td>81 (74-87)</td>
<td>78 (70-85)***</td>
</tr>
<tr>
<td>Length of stay (days, mean (SD))</td>
<td>5.62 (6.79)</td>
<td>5.30 (6.49)**</td>
</tr>
<tr>
<td>Number of patients (n)</td>
<td>3734</td>
<td>3309***</td>
</tr>
<tr>
<td>Number of diagnoses (mean(SD))</td>
<td>2.22 (1.65)</td>
<td>2.36 (1.80)***</td>
</tr>
<tr>
<td>Number of diagnoses (median (min/max))</td>
<td>2 (0-16)</td>
<td>2 (0-16)***</td>
</tr>
</tbody>
</table>

*Differences between male and female patients: *ns = non significant, **= p<0.01, ***= p<0.001*
Table 4. Odds Ratio for admission to a community hospital compared to a general hospital calculated for sex and age\textsuperscript{a}, all patients > 50 years

<table>
<thead>
<tr>
<th></th>
<th>Crude</th>
<th>Model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages &gt;50 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (female vs male)</td>
<td>1.30(1.25-1.35)*</td>
<td>1.10(1.06-1.15)\textsuperscript{b}</td>
</tr>
<tr>
<td>Age</td>
<td>1.07(1.069-1.073)*</td>
<td>1.07(1.068-1.072)\textsuperscript{c}</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Odds ratios (95\% confidence intervals) for age represent the increase in probability for admission to a community hospital for each year of increase in age. Example: for age > 50 years, crude OR (95\% CI) for 5 and 10 years increase in age are 1.40 (1.39-1.41) and 1.89 (1.85-1.93), respectively.

\textsuperscript{b}OR (95\% CI) for sex (woman), adjusted for age.

\textsuperscript{c}OR (95\% CI) for age, adjusted for sex.

Table 5: OR (95\%CI) adjusted for age and sex for patients to be admitted to CH vs GH according to the most frequent main diagnoses found in CHs. Percentage of total main diagnoses.

<table>
<thead>
<tr>
<th>Main diagnoses (ICD-10)</th>
<th>%</th>
<th>OR adjusted for age and sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Failure (I50)</td>
<td>6.0</td>
<td>2.36 (2.15-2.59)***</td>
</tr>
<tr>
<td>Pneumonia (J18)</td>
<td>5.0</td>
<td>3.32 (2.77-3.98)***</td>
</tr>
<tr>
<td>Atrial fibrillation and flutter (I48)</td>
<td>2.5</td>
<td>1.01 (0.90-1.14)ns</td>
</tr>
<tr>
<td>Abdominal and pelvic pain (R10)</td>
<td>2.5</td>
<td>2.73 (2.39-3.13)***</td>
</tr>
<tr>
<td>Type 2 diabetes mellitus (E11)</td>
<td>2.2</td>
<td>5.82 (4.87-6.97)***</td>
</tr>
<tr>
<td>Urinary tract infection (N30)</td>
<td>2.0</td>
<td>38.13 (24.96-58.25)***</td>
</tr>
<tr>
<td>Orthopedic aftercare (Z47)</td>
<td>1.9</td>
<td>4.52 (3.74-5.46)***</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease (J44)</td>
<td>1.9</td>
<td>2.55 (2.18-2.99)***</td>
</tr>
<tr>
<td>Dizziness and giddiness (R42)</td>
<td>1.9</td>
<td>2.28 (1.95-2.67)***</td>
</tr>
<tr>
<td>Constipation (K59)</td>
<td>1.9</td>
<td>3.32 (2.77-3.98)***</td>
</tr>
<tr>
<td>Dementia diagnosis (F00, F01, F02, F03,F05.1)</td>
<td>1.9</td>
<td>4.37 (3.59-5.32)***</td>
</tr>
</tbody>
</table>

ns = non significant. *** = p<0.001
except atrial fibrillation and flutter, patients had higher odds for admission to a CH than to a general hospital, see table 5.

An additional result not presented in Paper I concerned in-hospital deaths. There were totally 2120 in-hospital deaths, with 724 in CHs and 1396 in general hospitals. The three most common main diagnosis groups in both hospital levels were ICD-10: I (Circulatory systems), C (Neoplasms), and J (Respiratory systems), see table 6. (not presented in original Paper I)

### Table 6: The three most prevalent diagnosis groups for in-hospital deaths in community hospitals and general hospitals.

<table>
<thead>
<tr>
<th>ICD-10 diagnosis group</th>
<th>Community hospitals n=16'133</th>
<th>General hospitals n=60'704</th>
<th>Total n=76'837</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>201 (27.8)</td>
<td>469 (33.6)</td>
<td>670 (31.6)</td>
</tr>
<tr>
<td>C</td>
<td>238 (32.9)</td>
<td>277 (19.8)</td>
<td>515 (24.3)</td>
</tr>
<tr>
<td>J</td>
<td>104 (14.4)</td>
<td>165 (11.8)</td>
<td>269 (12.7)</td>
</tr>
</tbody>
</table>

**Paper II**

*Background characteristics*

For full report of results, please consult original papers. The study included 156 admissions in CHs and 703 admissions in general hospitals (see Table 7). The median age was 86 years in CHs and 81 years in general hospitals. Female patients with HF were more common in CHs, while male patients were more prevalent in general hospitals. However, this sex difference lost significance when adjusted for age. Community hospital patients experienced longer lengths of stay (LOS) and received fewer diagnoses.
The main study hospitals were CHs and Skellefteå County Hospital. Patients with HF from CH areas admitted to nearest general hospital instead of the local CH were 102, see table 9.
Table 8: Hospitalizations of heart failure patients in South Lapland and in Skellefteå County Hospital

<table>
<thead>
<tr>
<th></th>
<th>South Lapland</th>
<th>Lycksele County Hospital</th>
<th>Skellefteå County Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of admissions</td>
<td>156 (72/84)</td>
<td>102 (72/30)</td>
<td>703 (423/280)</td>
</tr>
<tr>
<td>Age, years, median</td>
<td>86 (85/86)</td>
<td>75 (71/82)</td>
<td>81 (79/84)</td>
</tr>
</tbody>
</table>

**Care measures**

Community hospital (CH) admissions included substantially fewer blood tests but showed increased frequencies of nursing and dietitian notes (see Table 8). After adjusting for age and sex, general hospitals exhibited higher occurrences of physiotherapist and occupational therapist notes, as well as intravenous treatment. Radiological exams (x-rays and CT scans), echocardiography, and notes from pharmacologists were exclusively documented in general hospitals, not in CHs. Echocardiography examinations were conducted in 20.1% of patients in the general hospital setting.

**Sensitivity analysis**

The subgroup comprised 484 hospitalizations in total, with a sex distribution of 252 men and 232 women. The difference in median age between CHs and the general hospital decreased from five to one year but a significant age difference remained. Key differences observed in the original study population, such as the number of blood tests, unique doctors per day, nursing notes per day, and prevalence of physiotherapist notes remained, but difference in occupational therapist notes were reduced and no longer statistically significant.
Papers III and IV

With Papers III and IV, interview studies were conducted in South Island, New Zealand (Paper III) and in Northern Sweden (Paper IV). Rural community hospital doctors were interviewed in both countries by the PhD student, and in view of almost identical study designs, I chose to present the most significant results from both papers together, enabling commentaries on similarities and differences in the findings. In Table 9, themes and subthemes from paper III and IV are presented separately. For full report of results, please consult original papers.

Results III and IV

In quotations, ‘CH doctors’ are from the Swedish study and ‘RH doctors’ from the NZ study.

Patients in the CHs/RHs

All interviewed doctors confirmed that elderly multimorbid persons were the most prevalent in-patients in their hospital. They also claim this patient group to be the most suitable for CH/RH care, compared to general hospital care. Their arguments for this will be presented in the following.

The hub in the patient’s health care pathway

In both studies, the CHs/RHs were described as important interfaces between different providers of care, encompassing teams within the healthcare organisation and with municipal nursing care, explaining the term ‘hub’. Teamwork within the CHs/RHs was described as facilitated by the small size and informal collaboration between health care professionals compared to that within a general hospital and stood out as a theme in the NZ study.

‘I think there’s less hierarchy here than in the bigger hospitals. I think it’s much more egalitarian.’ (RH doctor)

Doctors in CHs/RHs reported the need for consultations with hospital specialist doctors regarding transfers between CHs/RHs and general hospitals, and for advice on in-patient treatments. These were normally respectful calls, but in both studies derogatory attitudes were mentioned,
Table 9: Overview of results from paper III and IV

<table>
<thead>
<tr>
<th>Paper III</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-theme</strong></td>
<td></td>
</tr>
<tr>
<td>Providing care close to home and</td>
<td>Applying a holistic perspective to care</td>
</tr>
<tr>
<td>family</td>
<td></td>
</tr>
<tr>
<td>Seeing the whole patient</td>
<td></td>
</tr>
<tr>
<td>Weighing distance issues, between</td>
<td>Striving to maintain patient safety in</td>
</tr>
<tr>
<td>keep or to refer patients</td>
<td>sparsely populated rural areas.</td>
</tr>
<tr>
<td>Handling issues related to sparse</td>
<td></td>
</tr>
<tr>
<td>population</td>
<td>Cooperating in different teams around the</td>
</tr>
<tr>
<td>Working in small teams in flat</td>
<td>patient</td>
</tr>
<tr>
<td>organizations</td>
<td></td>
</tr>
<tr>
<td>Consulting hospital specialists</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-theme</strong></td>
<td></td>
</tr>
<tr>
<td>Maintaining intermediate level of</td>
<td>Being the hub in the patient’s health care</td>
</tr>
<tr>
<td>hospital care</td>
<td>pathway</td>
</tr>
<tr>
<td>Providing local service and feeling</td>
<td></td>
</tr>
<tr>
<td>of safety in the community</td>
<td></td>
</tr>
<tr>
<td>Being an interface between different</td>
<td></td>
</tr>
<tr>
<td>providers of health care and nursing</td>
<td></td>
</tr>
<tr>
<td>care</td>
<td></td>
</tr>
<tr>
<td>Striving to see and understand the</td>
<td>Offering person-centred care far from</td>
</tr>
<tr>
<td>patient in their context</td>
<td>hospital</td>
</tr>
<tr>
<td>Facing advantages and disadvantages</td>
<td></td>
</tr>
<tr>
<td>in rural working conditions</td>
<td></td>
</tr>
<tr>
<td>Making medical decisions and action</td>
<td></td>
</tr>
<tr>
<td>far from hospital</td>
<td></td>
</tr>
</tbody>
</table>
mainly from certain clinics in tertiary hospitals.

‘Things like oncology and paediatrics. We have really good, easy access to the specialists. And they are really personable, and you can ring them about anyone (...) Whereas, orthopaedics, oh my God, it’s like a nightmare. You can never get the same person on the phone, and then you always have to talk to the junior staff, so you can’t actually ask questions about people that might be quite sophisticated...’ (RH doctor)

Many patients had changed nursing needs at discharge, necessitating coordination with municipal needs assessors. The small CH context was seen advantageous, facilitating assessors' proximity to the care process with shorter decision paths and enhanced workflow.

"...spontaneously, most people probably think it's better that (...) you know people, you understand their needs compared to it being bureaucrats making decisions who don't know the individual." (CH doctor)

On the other hand, the doctors recognized that small communities with small teams are vulnerable to staff shortages, discussed later.

**Proximity and familiarity**

Doctors from both countries discussed the multifaceted nature of being ‘close to home’. In rural areas, geographical distance to nearest general hospital is the prerequisite for the existence of CHs/RHs, to enhance access to health care through physical proximity. Patient safety issues with long distances to hospital are discussed further below, while the practical and the emotional sense of ‘close to home’ are discussed here. Practical considerations involved the convenience for patients, as care was nearby, and for relatives who could easily visit without the need to travel to a base hospital.

‘...If your father gets admitted to Dunedin, what do you do? Do you take two weeks off work and stay close to your father, or do you drive up and down twice each day before and after work? (...) It is impractical for the family (...) But if it is here, they could just pop around for five minutes and have a chat and go home, go back to work. Much better for the patients who get to see their family members more.’ (RH doctor)
In NZ as well as in Sweden, rural doctors appreciated the end-of-life care provided by their CH/RH and suggested that they offer better palliative care than general hospitals due to proximity and familiarity.

‘I’m proud of our palliative care; we have a family-friendly room. There’s a very comfortable chair and the option to bring in a bed, and we’re not too picky when it... once there was a request for the cat to be there when someone was dying, and we made it possible through the window, so it didn’t go through the entire health centre.’ (CH doctor)

‘The good deaths, people who are ... they’ve just reached the end of their time. They may be well on in years, they may have been suffering their heart condition or their cancer or whatever, and their family are here. They come into hospital and their symptoms are well controlled, and everybody is happy and accepting. You know, it’s ... if you can call any death a good death. We do have plenty of those.’ (RH doctor)

Local cultural understanding from healthcare staff was seen important for practical reasons – to understand the mentality of the people in the community may be helpful in interpreting symptoms and suggest treatments to the patients.

‘...then there’s this, I understand the culture very well, and I understand the women very well... Because (local) women are special... They're supposed to handle everything, do everything, never seek help, and never complain. But then they crash when their husband is demented, and it simply doesn't work, or when they’re younger, trying to take care of a husband and three or four children while having a full-time job themselves.’ (CH doctor)

In NZ doctors discussed spiritual aspects of close to home for the indigenous Māori people, where dying near their whānau (extended family) was very important. Most Swedish CHs are situated in Sápmi, the historic Sami settlement area. Sami culture understanding and Sami language use in CHs were deemed important in the care of Sami patients, particularly elders.

**Generalist vs organ specialist**

In both countries it was stated that a generalist would have difficulties in refusing patients and admitting tasks beyond their expertise, unlike specialised hospital doctors, who would decline tasks outside their scope of practice.
“We specialize in everything that comes in through the door.” (RH doctor).

General hospital specialists were described as highly specialised, whereas CH doctors, though possessing broader skills, lacked organ-specific expertise. CH patients had complex conditions, benefiting from comprehensive care by CH doctors, who managed diverse medical issues. In a CH, a rural GP might adjust medications for a post-op orthopaedic patient with diabetes whereas in a general hospital, an orthopaedist would consult a diabetes specialist.

**Holistic care**

Both in New Zealand and in northern Sweden, rural doctors emphasised the importance of a holistic generalist approach when managing patients with multimorbidity, considering patients’ well-being, psychosocial context, wishes, and overall quality of life beside mere medical conditions.

‘...you shouldn’t ask the patient ‘what’s the matter with you’; you should ask ‘what matters to you’.” And I feel that’s the essence of what we’re doing.’ (CH doctor)

This approach was perceived as beneficial for the hospital care of multimorbid elderly patients, enhancing the doctor’s understanding of diffuse symptoms. In this sense, they considered a holistic perspective more suitable for the care of multimorbid elderly patients than a narrower biomedical perspective of urban hospital specialists. In palliative cases, discussions about medical limitations, including cardiopulmonary rescue, were considered easier when patients were familiar with the doctor and staff.

‘...you can have a better picture here, where you know the patient, perhaps their own stance and preferences, and you also know the relatives, maybe a bit more about how they think about the patient, like ‘Should we really perform this examination on you?’ So, we might not need to do it; it might be the best option.’ (CH doctor)

**Continuity of care**

Our interview studies differed in that most RH doctors in NZ did not work as GPs in the RH area, whereas in northern Sweden, the CH doctors were the local GPs, often familiar with CH inpatients from primary care. Despite this, RH doctors emphasised continuity of care in
RHs for patients with repeated hospitalisations, due to the limited number of hospital staff and doctors. Patient/doctor relationship throughout the hospital stay was also expressed important. In Sweden, CH GPs are able to observe patients over time in primary care and base medical decisions on more comprehensive information, thereby avoiding unnecessary medical procedures, in contrast to general hospital doctors, that primarily meet patients in acute conditions.

‘...so, when I admit a patient that I’m familiar with, it takes - I believe 5 minutes. I instantly know what the issue is, what I want to do for the stay, what blood tests I want, and I can do the admission right away without a lengthy medical history.’ (CH doctor)

However, these advantages for CH care presumes continuity of regular staff at the CHs, which was not the case in many CHs, with doctors’ and nurses’ vacancies and frequent use of medical locums, see below.

**Patient safety perspectives**

The most frequently reported challenge to patient safety in the Swedish CH care was the widespread shortage of doctors and nurses, replaced by locums and hired nurses, worsening continuity, and work strain for regular staff.

‘...it’s absolutely the worst thing that has happened in primary care during this time. In an operation where the cornerstone is continuity and quality, it has instead led to enormous costs, tremendous inefficiency... this is a completely insane system that has been allowed to flourish.’ (Doctor 13)

Life-threatening situations occur in rural areas far from nearest emergency department, although unfrequently compared to more populated areas. Such ‘high-risk, low-frequency situations’ can be challenging for the CH/RH teams due to lack of training in management of these conditions.

‘I’ve put chest drains in people before. I’ve intubated people before, but not often. Doing those sorts of procedures, I’ll do it if my back is shoved against the wall, and I had to. It’s gonna make me really uncomfortable. Yeah. Some of that stuff is scary’ (RH doctor)
‘You can't be too afraid of emergency care (...) if you're going to work here. Because at some point, something happens, and then it gets a bit intense.’ (CH doctor)

Doctors discussed how these challenges were addressed. In both Sweden and NZ, postgraduate training programmes have been developed and implemented to rural-specific emergency situations, and the interviewed doctors emphasised the importance of these training programmes. But when bad things happen with the patient, coping strategies for adverse outcomes were needed: "If I wasn’t here, it would be even worse" and "I did not make the patient ill, it depends on their having a disease" (CH doctor).

Doctors desired more point-of-care (POC) tests to reduce long waiting times for laboratory results and to avoid unnecessary hospital transfers. In CHs, chest X-ray examinations required radiology nurse competence, so access to these examinations in CHs were infrequent. Some of the CH doctors expressed frustration over this, as many of elderly CH patients needed chest X-ray for differential diagnostics.

‘...so, I believe that we need to step up on all fronts now when we’re providing such advanced healthcare as we do in the ward here.’ (CH doctor)

Despite the challenges in ensuring safe care, RH doctors claimed that patient safety in their rural hospital was high, potentially even surpassing that of a general hospital, as long as they avoid admitting patients requiring a higher level of hospital care. They supported this claim with the advantages of shorter decision paths, earlier examinations by experienced doctors, and a longitudinal understanding of the patient.

‘I’ve been here nearly 10 years, and I can’t think of a specific example of somebody who I’ve thought, “If that happened in central Auckland then they would be alive”, so that must be quite rare, I think it’s safe’ (RH doctor)

**Ethical dilemmas**

In both studies, doctors reported strong overlapping relationships with patients, being not only the doctor but also the relative, neighbour or
friend. This was described as an ethical dilemma in the Swedish study and particularly difficult for doctors working where they had grown up.

Another ethical dilemma lifted in both studies regarded the local ambulance. Doctors described an awareness of the whereabouts of the local ambulance.

‘But if I have got a sick patient who I need to transfer, that’s where I’m worrying for where the ambulance is (...) And if it’s out of town doing a transfer, you’re always aware that it’s out of town doing a transfer.’ (RH doctor)

The ethical dilemma appeared when doctors needed to down-prioritize patient transports where ambulance was recommended to taxi or other transportation, as they felt the risk for the community in the absence of an ambulance for several hours was larger than the risk for the patient.

‘In such a remote healthcare centre, we must... refrain from sending patients too often, or else the day may come when a five-year-old dies needlessly because we can't secure a medical transport.’ (CH doctor)

**Care cost**

CH doctors, but not RH doctors, introduced the concept of cost-effectiveness, suggesting that CH care might be more cost-effective for relevant patients, without referencing any official comparisons. They argued that general hospitals were more expensive, and that CHs saved on costly ambulance transports.

**Hospital closure concerns**

In both studies, discussions revolved around the potential consequences of budget cuts and centralization trends, including the threats of CH/RH closures. These discussions shed light on the further impact on rural communities, particularly concerning the loss of qualified staff.

**CHs in other areas**

CH doctors, in contrast to RH doctors, suggested generalist-provided intermediate hospitals also in urban areas, questioning how elderly patients with complex home situations were placed in highly specialised hospital wards with insufficient expertise on comprehensive care in multimorbid patients.
"...if I were in charge of healthcare in Sweden, I think they should have an equivalent in the cities as well. Especially for this “omnipotent” care, someone who can bridge the gap between specialised care and primary care, that is." (CH doctor)

**Work satisfaction**

Swedish doctors found the diversity of the CH GP-job with emergency care and the ward, more satisfying than working as GPs in town.

‘I enjoy being in the rural areas because there I can work as I have wished to do my entire life... ...you deal with everything, all emergency patients come to you... ... here, you have the space to be a doctor and handle the whole package’ (CH doctor)
Discussion

Methodological considerations

Paper I and II
The methodological discussion in Paper I and II concerns the concepts study design, internal validity, external validity, and precision.

Study design:
It is important to choose an appropriate study design to capture comprehensive insights into what happens in rural CH settings. CHs are heterogenous within and across different countries regarding size, range of services – although typically wide ranges of services – and staffing. They are per definition small units, with only a few hospital beds each. I wanted to examine the role of the Swedish rural CH model within the healthcare system and the local community. I started with no previous information on the characteristics of patients admitted to CHs and of those referred to the general hospital. To obtain this information a register study was the pragmatic choice because extensive data could be gathered on many patients with minimal effort and cost.

Internal validity:
Internal validity refers to a study's accuracy in measuring the intended concept.

So, in study I, did we capture the clinical profiles of CH and general hospital patients? The focus of our data collection was on all hospital stays in general hospitals and CHs over a five-year period in Norrbotten and Västerbotten Regions. We specifically included the hospital stays of patients enrolled in CHs at the time of admission, forming a population representing patients in CH areas with access to either general hospitals or CHs, bolstering the study’s validity – i.e., we investigated the correct population. Most of our register data on patient demographics were robust and with high credibility. Data on age structure, sex distribution, and death rates have low risk of bias. However, the number of diagnoses raised questions. Since 2006 in Sweden, it has been mandatory to classify diagnoses during hospitalisations with diagnoses using the ICD classification system (71). Codes for main and secondary diagnoses and for medical actions constitute primary classifications. Doctors typically suggest main and secondary diagnoses at discharge. In Västerbotten,
medical secretaries review and correct these diagnoses based on information in the patient record, ensuring accuracy that is dependent on documentation quality. In contrast, rural CHs in Norrbotten lacked this review process, leaving diagnoses solely at the discretion of doctors. Prior to the first study, the PhD candidate interviewed a medical secretary responsible for reviewing patient records in Västerbotten CHs. The secretary highlighted significant documentation differences between CH and general hospital doctors, especially when locums were unfamiliar with the computerized patient record. This potential misclassification bias should be considered when drawing conclusions about the number of diagnoses.

Our results on in-hospital deaths ranked neoplasms, circulatory and pulmonary diseases top three as causes of death. Cause of death was not based on official registrations in cause of death registers, but an estimate using main diagnosis from discharge, with possible misclassification analogous to discussion above.

To draw conclusions on LOS we needed to be able to exclude combined hospitalisations, but Norrbotten lacked this information. Consequently, in Paper I we refrained from drawing conclusions on LOS differences between CHs and general hospitals.

*In Paper II*, we included hospital stays in CHs with patients with HF enrolled in CHs in Västerbotten, and as a comparison hospital stays in Skellefteå County Hospital, with patients enrolled in PCUs in the Skellefteå region. By comparing CHs with a nearby general hospital within the same healthcare organisation, we aimed to minimize variations in care practices due to geographical influences. However, an expected finding was that the CH patients with HF would have an older age distribution than those in Skellefteå. We were obviously comparing partly different patient groups, possibly with different diagnostic and therapeutic needs, which must be taken into consideration when interpreting the results. Results from Paper I suggest that CHs admit those patients that do not require all the resources of a general hospital. Background data not presented in the paper showed that beyond the 156 patients with HF hospitalised in CHs, 102 patients with HF from CH areas were hospitalised in Lycksele County Hospital. These patients were younger than patients treated in CHs, suggesting a division of patients with HF between CHs and Lycksele, the former caring for the older patients, see table xxx.

A residual confounder that was difficult to assess was whether the CH was fully occupied or not. This factor may determine which CH patient is
referred to the Lycksele County Hospital and which is admitted to the CH. It is not permitted to overcrowd a CH ward. Therefore, if all beds are occupied, even patients suitable for CH care would be referred to the general hospital.

In our statistical analysis of differences in care measures between CHs and the general hospital we compensated for the major differences in patient characteristics by adjusting for age and sex in the logistic regression analysis. Some variables were sensitive to length of stay and were divided by number of days in LOS.

It is uncertain whether all patients actually had HF, due to diagnostic challenges based solely on clinical symptoms. In a study (97) that included primary care patients with symptoms and signs suggestive of HF only 45% of patients had confirmed HF after echocardiographic examination. In female patients over 80 years only 22% of patients were accurately diagnosed with HF based on their clinical symptoms and signs (97). This uncertainty may contribute to selection bias in both hospital models. Although, this uncertainty may be less in general hospital model, since better opportunities exist to confirm the HF diagnosis with echocardiography. Nonetheless, our study examines care measures for patients treated for HF, regardless of diagnosis accuracy.

In addition to the data presented, we aimed to include additional variables relevant for the hospital care of patients with HF. These data include body weight and ECG, treatment with oxygen and C-PAP (Continuous Positive Airways Pressure) and number of consultant referrals. However, these data were either unavailable or unreliable due to differences in registration methods, teaching us about the difficulties to access registered care measures from patient records. We only captured registered care measures during hospital stays, thereby missing procedures conducted before admission, e.g., in the general hospital emergency department.

**External validity:**

External validity refers to the extent to which the results of a study can be generalized beyond the specific sample or setting under investigation.

**Paper I.** This study represented all hospital stays for patients enrolled at all Swedish CHs except for the CH in Strömsund, Jämtland County, so in a Swedish context, results are highly generalizable. International comparisons align with our findings, with old, multimorbid patients needing acute care, rehabilitation and end-of-life care, suggesting generalizability to other rural CH areas.
**Paper II:** Our study design to use register data to compare care measures between hospitals lacks prior validation and has not been employed in comparable studies, so we cannot refer to other research results. Given the heterogeneity between CHs internationally, our findings should not be considered generalizable to rural areas outside of Sweden, but at least partly relevant for the CHs in Norrbotten and Jämtland Regions.

Precision:

Precision refers to the degree of reproducibility or consistency in the measurements or findings of a study.

In Paper I, the large sample size helped us to detect even small differences in the studied variables with high significance, avoiding statistical type II errors. However, results needed interpretation subject to the relevance of certain measurements discussed above.

In Paper II, including only patients with HF, the sample size was smaller compared to Paper I, but differences in patient characteristics had high significance and were in line with findings in Paper I. This indicated a stability of the results. However, one of the studied care measures, e.g., involvement of dietitian, had sporadic registrations, and despite high calculated significance of difference (p<0.001) we could not rule out statistical type I error due to coincidences.

**Paper III and IV**

Qualitative content analysis (QCA) is a methodology used to examine qualitative data. In both Paper III and Paper IV, we applied QCA with an inductive approach. Various methodological approaches, including grounded theory, narrative analysis, phenomenological research, ethnographic research, and others, are available for qualitative research. Regardless of the analytical approach, descriptions and interpretations exist at different levels of abstraction in every analytical process (98). Sandelowski (99) highlighted that studies are frequently labelled as 'narrative' when exclusively utilizing open-ended interviews, termed 'phenomenological' when reporting solely on participants' subjective experiences, or characterized as 'ethnographic' when involving participants from diverse ethnic groups. When exploring concrete clinical research questions, methodological rules of a 'theory heavy’ methods could be a limitation (100). Our studies aimed to explore rural
doctors’ experiences and their opinions on the role of their hospital. When using an explorative approach in the interviews, the width of possible responses could include concrete descriptions as well as more abstract narrations. QCA centres on the subject and context, emphasizing variations within the text. It allows analysis of both manifest and descriptive content, as well as latent and interpretative content (93).

**Inductive vs deductive approach**

QCA is often conducted using inductive or deductive approaches. The deductive approach progresses from theory to data, relying on existing theories or concepts (101). Since our objective was exploration rather than theory verification, we employed an inductive approach in the analysis of papers III and IV.

In our analyses, data served as the starting point, and we identified meaning units in the transcripts. We labelled them with descriptive codes at a concrete level and examined codes for similarities and differences, sorting them into categories based on content. These categories were still on a concrete descriptive level, answering the question ‘What?’ (102) and they were mutually exclusive. Abstraction involves elevating terms or concepts to a higher logical level (103), while interpretation explains or demonstrates an understanding of a feature (101,103). Red threads were sought to reveal latent contents at a higher level of abstraction, representing the ‘essence’ running through the data and leading to subthemes and themes (102).

All steps, from descriptions of manifest content to interpretations of latent content, constitute a recontextualizing of data through interpretation (101). This aligns with the inductive approach, moving ‘from the data to a theoretical understanding – from the concrete and specific to the abstract and general’ (101).

**Trustworthiness of the research**

To achieve credibility of the research results demands doing the study in a way that makes people believe the results and showing that the research is trustworthy in the reports. We interviewed doctors that were experts in the studied phenomenon and sought diversity in the inclusion of participants to capture variations. Initial intention was to perform 10-15 interviews based on relatively homogenous study populations, and quite narrowly defined interview guide questions (95). Enough interviews were included to add richness to the data, as no additional
information was collected from the last interviews. However, we did not interview patients or other health care professionals and stakeholders. This would have given a broader perspective on a variety of aspects (93). I am a rural GP familiar with Swedish CHs, and I influenced all study steps which may be both positive and negative. On the positive side, since this topic demanded deep knowledge of the CHs from the informants, in-depth discussions in the interviews were possible due to my personal experiences. This could have contributed to richer information. On the negative side, preconceptions from my clinical work and literature studies were guiding in the design of study questions, thereby possibly missing important subjects to discuss. To address this, an explorative interview technique with broad open-ended questions was used to encourage information that was not anticipated in the interview guide. Subsequent analyses of the transcripts were made in cooperation with a diverse research team, representing different fields of medical expertise and of QCA methodology. We ensured inter-coder agreement in our coding and further analysis. Another point to consider is that my mother language is Swedish, and interviews were performed in English with doctors having variable degree of NZ accent. This could potentially lead to a lack of mutual understanding, but upon reviewing the audio recordings multiple times and examining the transcribed dialogues, no indications of misinterpretations were found.

**Dependability** refers to the reliability and consistency of the research findings and interpretations over time and between different researchers (93). It emphasises the stability and trustworthiness of the research process, ensuring that if the study were conducted again or examined by another researcher, similar results and interpretations would be obtained. This prompted us to have a transparent process, presented in the methods section of the paper, so the reader can judge the quality of the study, and to include detailed documentation of the research design, data collection methods, coding procedures, and analytical techniques. For instance, tables with examples of the abstraction process were presented.

To ensure **authenticity** of the findings representative citations were systematically presented in the text, including at least one citation per category. This also helped judging the **conformability**, which refers to how well the results are connected to the collected data (104).

**Transferability** refers to whether the findings would be applicable to other contexts (93,104) but is not synonymous with **generalizability** that is used in quantitative research to extend results from a sample to a broader population. The research context, topic and participants can
limit the transferability of the findings, again emphasizing the importance of transparency of the research process. In our conclusions, we established that application of our findings to other contexts should be made with caution by keeping the heterogeneity of health care organisations and of CHs globally in perspective.

Findings in relation to the literature

Paper I

The main finding in this study is that CHs in Sweden primarily admit the elderly, with diagnoses linked to older age. Additionally, women were more likely to be admitted to CHs than men, even after age adjustment. Moreover, doctors assigned more diagnoses to men than women in both community hospitals and general hospitals.

Age and multimorbidity

Internationally, research on rural CHs is abundant, with findings that typically describes CH patients as old and with multimorbidity (24–26,41,63,64,105). Our findings indicate that elderly patients with chronic diagnoses are directed to CHs rather than general hospitals for more integrated care in rural areas of northern Sweden. This aligns with a review comparing patient outcomes in CHs and general hospitals worldwide (105).

In Sweden, severely ill elderly individuals, representing the multi-morbid and frail elderly group, have double the rate of unplanned readmissions within 30 days compared to all 65+ years patients. The top five diagnoses preceding readmission in 2019 are chronic obstructive pulmonary disease (COPD), heart failure, other urinary system diseases, pneumonia, and femur fractures (106). These were common patient groups in CHs in our study. CHs have been suggested to offer better-integrated care to address the complex needs of older patients with multiple chronic conditions (107,108). Norwegian studies show that CHs reduce general hospital use, including admissions and occupied bed-days (64,109,110). As a result of the 2012 Coordination Reform in Norway, municipalities established acute bed units for short-term stays, aligning with the definition of CHs. An observational study noted increasing admissions to these units concurrently with decreasing admissions to general hospitals (111).
In our study, 21% of all hospital patients from CH areas were admitted to the CHs, the remaining 79% admitted to general hospital. A New Zealand study (35) suggested that ‘approximately 40% of admissions from urban populations to general hospitals could be handled at a generalist level’. Our findings indicate the potential of generalist led CHs in semi-rural and urban areas.

**Sex**

Due to a longer expected lifespan for women than for men (47,112), there were more female than male patients in CHs. However, after adjustment for age the probability remained higher for women to be admitted to CHs rather than general hospitals. Other studies that address these differences in the CH model of care are scarce.

**End-of-life care**

Additional analysis in the thesis revealed that many patients in end-of-life were admitted to a CH, with cancer and cardiovascular diagnoses being the most common main diagnoses in patients that died in the CHs. In our interview studies, papers III and IV, doctors in rural hospitals/CHs reported that end-of-life care formed an important part of the care provided in their hospitals, and this topic will be discussed below.

**Paper II**

The main findings in Paper II were that in CHs there were fewer unique doctors involved in the care, longer LOS, and more nursing notes compared to the general hospital. Radiological examinations including echocardiography were performed with a minority of general hospital patients with HF but were not registered in CH hospitalisations. In the general hospital, number of blood tests was three times higher than in CHs. A sensitivity analysis supported the results.

**Doctor’s continuity**

In our results, there were significantly fewer unique doctors involved in the care but no difference in the total number of doctor’s notes, suggesting better doctor’s continuity during the hospital stays in the CHs. This could be explained by the presence of more doctors in different stages of training in general hospitals, while in CHs there is the rural GP. The positive effect of continuity of care on patient satisfaction is established in primary care (113), but also in hospital inpatient care a
limited number of staff members can be beneficial for the patients’ sense of predictability and coherence (114).

**Length of stay (LOS)**

In CHs patients with HF had longer LOS (mean 6.5 days) compared to the general hospital (mean 5.0 days), also after adjusting for age. In Sweden the mean LOS for patients with HF was close to 6 days in the period 2015-2019. We speculate that the difference in our findings is explained by differences in access to hospital beds. International studies specifically comparing LOS for patients with HF are scarce. For elderly and frail patients, there are risks associated with both excessively short and prolonged LOS, as indicated by increased early readmissions and mortality. A Canadian study demonstrated a U-shaped risk curve for heart failure readmission, highlighting elevated risks for both shorter (1-2 days) and longer (9-14 days) LOS, in comparison to the reference range of 5-6 days (23). Even though a difference, in both hospital levels LOS appears to be within the expected limits.

**Nursing documentation**

In CHs, the number of nursing notes was twice that of the general hospital, an unexpected finding with no comparable research available for validation. Documentation variations could stem from differences in designated documentation time and the preference for oral or written reports between staff. The sheer quantity of notes does not indicate content, so we cannot draw any conclusions about its impact on nursing care quality without a thorough review of patient records.

**Echocardiography and X-ray examinations**

During the hospital stays, no X-ray or echocardiography examinations were performed in CHs, which was expected as CHs in Västerbotten do not perform echocardiography and availability to chest X-ray require the infrequent presence of a radiology nurse. In the general hospital, 20 % of hospitalisations included echocardiography and 6 % included other radiological examinations. We have no information on examinations in the emergency department, but radiology examinations for differential diagnostics may have been performed prior to admission to the general hospital ward.

**Blood tests**

In the general hospital, the daily blood test count was over three times higher than in CHs, a comparison not explored in existing literature.
This disparity may be attributed to several factors. Firstly, general hospital patients may undergo more advanced examinations and receive new treatments requiring close monitoring. Secondly, differences in decision-making for blood tests exist between GPs and hospital doctors, including variations in test analysis availability. In primary care, blood tests are guided by the GP’s clinical assessment, while general hospitals conduct more tests due to the reasons mentioned. This could lead to an insufficient number of blood tests in CHs, especially if they lack emergency testing capabilities. However, our findings suggest discussions on the balanced use of hospital tests. In 2000, Larsson et al. reported that Swedish hospital testing practices vary due to tradition and regional differences, rather than focusing on patient benefit, raising concerns about the costs, potential false results, and subsequent expensive investigations, leading to patient distress (115).

**Multiprofessional teams in the HF care**

HF hospitalisations of elderly, often multimorbid patients may unveil new disabilities, prompting home adjustments, and thorough assessment before discharge. For these patients, prioritizing a multidisciplinary approach for integrated person-centred care is crucial (116). Landefeld et al. showed that multidisciplinary teams in hospital care for acutely ill older patients resulted in improved daily living activities and fewer discharges to long-term care institutions (117). Our study found significantly fewer PT and OT notes in CH hospitalisations compared to general hospitals, indicating limited availability in CH wards for patients with HF. Dietitians were sporadically involved, with more notes in CHs than in the general hospital, but the numbers are low, possibly a random difference. Considering the limited involvement of multidisciplinary teams in the care of patients with HF in both CHs and general hospitals, we propose it as a general area for further development in the hospital care of patients with HF.

Papers III and IV

**The hub in the patient’s health care pathway.**

Globally, an aging population and a rise in chronic illnesses demands affordable quality care (118–121). In Sweden, the “Close Care” initiative (122) aims for patient-centred, integrated healthcare, prioritizing efficiency, and individual needs, with a focus on primary care (122). The findings in our Swedish study, suggest that CHs meet the initiative’s
aims and extend them further to comprise inpatient care for multimorbid patients.

RH doctors believed that their small, informal, and egalitarian teams improved holistic care, simplified easier collaboration, and mitigated the impact of fragmented care caused by a large number of healthcare professionals. A Swedish study on interdisciplinary teamwork in geriatric care emphasised a holistic approach and proactive non-hierarchical interaction (123). Small teams, when built on relationships allowing open communication and error resolution, may not require formal reporting mechanisms (124). However, structured reporting mechanisms are necessary to ensure anonymity in small medical communities (124).

Collaboration with hospital specialist doctors functioned well, but derogatory attitudes were reported. Such attitudes between hospital specialists towards general practise and GPs have been studied primarily in medical school settings, where medical students report hearing derogatory comments from hospital specialists and clinical teachers towards GPs. These attitudes seem to be linked to the medical school culture, and are reported to influence students’ career choices (125–127). In the Swedish and the NZ setting, the tertiary hospitals also host medical schools. This discussion may partly fall out of the subject of the thesis, but such attitudes may negatively impact recruitment of generalist doctors negatively, including in CHs and RHs.

**Proximity and familiarity**

The importance of proximity of hospital care, especially in the case of an emergency is undebated. Indeed, the advantage of a CH close to home as a complement to ordinary hospital care was confirmed in studies involving patient interviews (108,128). The emotional sense of ‘home’ including homeliness and personal connections discussed in our studies have been described in previous CH patient interview studies (65,129). Home is often the preferred place of rural death (66), but long distances in remote areas may make home-based end-of-life care difficult. For rural patients in whom symptom control cannot be offered in their homes, CHs/RHs function as substitutes for hospices, as previously reported (66,130). Rural doctors in both countries suggested that end-of-life care in CHs/RHs was better compared to that in general hospitals. This is consistent with (66), claiming that compared to general hospitals, CHs were better suited for end-of-life care.
Both northern Sweden (131) and New Zealand (132) are areas where the indigenous population (Sami people and Māori people, respectively) have been subject to colonization and historical injustices in the past. However, injustices are still present today. Local cultural understanding from healthcare staff was generally seen important, but in particular for elderly patients and patients in end of life, with emphasis on the extended family, language and traditional food (37,38,133).

**The generalist perspective**

Both in New Zealand and in northern Sweden, rural doctors emphasised the importance of a holistic approach with a generalist perspective in their CHs/RHs when managing old patients with multimorbidity, in contrast to a narrower biomedical perspective of urban hospital specialists, and in agreement with Moffat and Mercer (134). Holistic care is a complex and multifaceted concept, without precise definition (135). It involves a deep understanding of patients and their diverse care needs (136) Holistic care promotes patient satisfaction, encourages self-responsibility, and enhances understanding of the impact of illnesses on patients' responses and true needs (137). The GP is inherently a generalist, equipped to address a broad spectrum of medical concerns. The generalist perspective of a GP extends beyond this, encompassing a holistic approach as described earlier, where patient care is influenced by enduring relationships, i.e., continuity of care (138). The therapeutic relationship is key in the context of holistic care. Such a relationship can be built – or ruined – within one consultation, but may mature with repeated meetings, leading us to discussions on continuity of care.

**Continuity of care**

Continuity of care, notably in primary care, correlates with patient satisfaction and decreased medical procedures, hospital admission and health care costs (77–79). ‘Continuity of care’ refers to the delivery of healthcare services over time with the goal of providing a seamless and integrated experience for the patient (139). There are several types of continuity of care, addressing different aspects of a patient’s healthcare journey. Haggerty et al (114) identified three types of continuity of care: informational continuity, management continuity, and relational continuity. Relational continuity refers to ‘an ongoing therapeutic relationship between a patient and one or more providers’ (114). Our study suggests that relational continuity and familiarity with rural GP and other health professionals also benefits medical decisions and reduces overuse of medical procedures in the CH/RH hospital care, also suggested in (68). Alazri et al presented additional types of continuity of...
Care, including (among other types) team continuity, which emphasises collaboration and communication among members of the healthcare team. Effective teamwork ensures that different healthcare providers work together seamlessly to provide comprehensive care (140). Our interview studies differed in the sense that most RH doctors in NZ did not work as GPs in the RH area, whereas in northern Sweden, the rural GPs were the local GPs, often familiar with CH inpatients. In the RH setting, team continuity could, for patients with repeated hospitalisations, include familiarity with health professional on the ward, and from the RH doctors’ point of view, this continuity was helpful in medical decision-making, particularly as most RH doctors did not work as GPs in the community. Obviously, in the CH setting this team continuity around the patient added to the relational continuity with the CH GP.

**Ethical dilemmas in rural practice**

CH doctors reported experiencing role conflicts due to overlapping relationships, serving as doctors for neighbours, friends, and relatives. This ethical dilemma is specific to sparsely populated rural contexts, where patients may lack alternative healthcare options within a reasonable distance (141). In small communities, complex ethical healthcare dilemmas often arise due to factors such as overlapping roles, confidentiality concerns, cultural considerations, limited resources, access issues, clinical skills, and caregiver strain (141). In both of our studies, doctors shared instances where they felt pressured to extend care beyond their formal training to meet the needs their patients. This could involve addressing life-threatening conditions requiring immediate medical action or resolving non-medical issues. Konkin et al. explored rural doctors' experiences practicing outside their usual scope, revealing six features of what they termed "clinical courage": serving the entire community, accepting uncertainty, understanding and marshalling resources, recognizing personal limits, overcoming cognitive hurdles, and receiving collegial support (142). As a contribution to the medical ethics discussion, Malin Fors (143) introduced the term ‘Potato ethics’ to describe a professional rural health sensibility, using the metaphor of a potato as a useful, humble, and versatile side dish. Potato ethics involve being pragmatic and make oneself useful, contrasting with an approach focused on observing formal rules and assigned tasks (143). Doctors in both of our studies reported actions reflecting these ethical attitudes, whether resembling clinical courage or demonstrating characteristics akin to potatoes.
**Additional patient safety perspectives**

Issues and advantages in the RH/CH models affecting patient safety have been discussed earlier in the thesis. The shortage of doctors and nurses, leading to the costly use of locums, is a significant concern in the CH setting. While there is a common perception that locum doctors may pose greater risks, the limited literature does not strongly support this view (144). The counterargument emphasises the evident patient risk in the absence of doctors and nurses, along with the alleviation of work strain for permanent staff. However, concerns about continuity of care, team function, and cost are raised with the use of locums (144), concerns shared by CH doctors. RH doctors assert good patient safety in RHs. Studies in NZ and internationally have not found any association between rural location and an increased risk of hospital harm. Still, patients in need of interhospital transfers face an elevated risk, as expected with emergency care-sensitive conditions (145,146).

**Overarching discussion**

The overall aim of this thesis was ‘to examine the role and practices of the Swedish rural CH model within the healthcare system and the local community. Furthermore, to investigate the perspectives of rural doctors in Sweden and New Zealand working within their respective hospital models.’

We have found that Swedish CHs admit elderly, often multimorbid patients, and those in need of end-of-life care. These hospitalisations make up more than 20% of all hospitalizations for their population, with the majority admitted to the nearest general hospitals. The most common acute diagnoses in CH patients are infections and exacerbations of chronic diseases, with pneumonia and heart failure being the most frequent. Additionally, elderly orthopaedic patients are admitted for further rehabilitation after fractures. Although these patient groups are commonly treated in general hospitals across Sweden, in CH areas, they are managed in the local CH ward.

The interviewed doctors underscored the importance of proximity to RH/CHs for patients, relatives, and the community. A holistic generalist approach was deemed crucial, especially for elderly multimorbid patients and those at the end of life. This lead to the doctors concluding that, for certain patient groups, hospital care in CHs is preferable to general hospital care.
Using heart failure, the most common main and secondary diagnosis in CHs, as a representative example, we aimed to identify differences in care measures between CHs and a general hospital. Sixty-seven percent of patients with heart failure from CH areas requiring hospital care were admitted to the CH, while the remainder, needing a higher level of hospital care, were referred to the nearest general hospital in Lycksele. The medical decision-making process by rural doctors consistently emphasised a patient-centred assessment leading to either admission to CH or referral to the general hospital. As CH patients are those not in need of the diagnostic tools of a general hospital, there were expected differences in diagnostic care measures on patients with heart failure. In CHs, no echocardiographic or other radiological examinations were performed during the hospital stay, whereas in the general hospital, a minority of admissions included these investigations. Fewer blood tests were ordered in CHs for above reason, and perhaps as access to acute blood testing is more limited in CHs compared to the general hospital. There was greater doctor continuity in CHs during the hospital stay, possibly reinforced as CH doctors are more likely to have a longer relationship with the patient as local GPs.

Rural doctors appreciated the variation in their job and access to a hospital ward. However, staff shortages and frequent locums were considered threats to patient safety and too expensive. Working as rural GPs a long distance to nearest general hospital demands "clinical courage" to occasionally step out of the comfort zone to address patient problems when no one else is available to do it better.

In summary, the role of the CH can be described as the hub in elderly patients' health care pathways, with close connections to other healthcare organizations, the community, the patients, and their relatives.

**Implications for health care planning**

Sweden is undergoing a transition to a comprehensive and accessible healthcare system known as Good and Close Care (143). This initiative aims to provide cohesive healthcare tailored to individual needs and circumstances, emphasizing person-centeredness throughout the patient's care journey. Primary care is expected to play a central role in the Swedish healthcare system, focusing on preventive measures to reduce inpatient care. Implementation of digital technologies for efficiency, enhancing continuity with fixed doctor contacts, promoting interprofessional methods, and enhancing competence development are
crucial aspects (147). An anticipated outcome of Good and Close Care is to mitigate the projected increase in hospital bed utilization driven by an aging population. However, the development of Close Care doesn't bring about new organisational structures or care tiers, including alterations in hospital care. A New Zealand policy document emphasises the necessity for hospitals to collaborate more closely with community services (148). Our Swedish interview study outlines challenges recognized by doctors but also underscores strengths in the community hospital model for elderly multimorbid patients, hinting at the potential for generalist-led community hospitals in urban areas.

The growing interest in Swedish rural healthcare, nationally and internationally, often revolves around digital solutions addressing distance and staff shortages. While this thesis doesn’t extensively cover the digital aspect, it centres on the historical remnants of a phenomenon prevalent in the last century. This model, replaced by large hospitals, still persists in areas with sparse populations. However, there is a potential resurgence, as the CH model appears capable of meeting the goals of Good and Close Care, particularly for patient groups on the rise.

Future research
Globally, research on rural health, health care management, and politics has highlighted problems and raised awareness of needs and deficits in rural areas, leading to a stereotyped perception of rurality as an inherently problematic environment (149). This perspective often stems from an urban viewpoint. Major health care planning decisions are typically made by central administration in larger towns, based on urban normality and experiences. Rural medicine is often seen as a variation of urban medicine, with longer distances, fewer resources, and more challenges. However, in a health care reality of growing restraints and demographic challenges it could be worthwhile to study what has been done in areas where these challenges have already been reality for decades. Questioning the predominant urban perspective, conceptual frameworks emphasizing different concepts needing investigation have been proposed for understanding rural and sparsely populated areas. Le Tourneau demonstrated the similarities among various common aspects of SPRs, such as being politically, culturally, socially and economically marginal (150). While this description appears to focus on the negative aspects and victimise SPRs, it adds depth to the understanding of rurality. Bourke et al. (44) proposed a conceptual framework, drawing on sociological theories, consisting of six key concepts for comprehending rural health practice in Australia: geographic isolation,
the rural locale, local health responses, broader health systems, social structures and power. I suggest that future research on rural health care should take off from an attempt to deepen the understanding of rurality, and that a conceptual framework for the understanding of rural health relevant to a Swedish context should be constructed.

There are numerous areas of interest for further research on the rural CH model. We have indicated the important cooperation between CHs and their nearest general hospital, but it need further exploration. A health economic evaluation of the rural CH model should be performed. We only interviewed doctors in this thesis, but perspectives of patients, relatives, other staff and other stakeholders need to be collected.

Conclusions

- Patients at CHs were predominantly older multimorbid patients with acute worsening in chronic diseases and infections, patients in rehabilitation after surgery and patients needing end-of-life care.

- Care for patients with heart failure at CHs included more nursing notes, greater doctor continuity, and less biomedical examinations. In both hospital models patient record documentation suggested a potential for further development in the multidisciplinary care in both hospital models.

- CHs have limitations in performing diagnostic procedures compared to a general hospital but admit those patients where this level of hospital care is sufficient, referring those that need the full hospital capacity.

- Rural generalist doctors in Sweden and NZ emphasise the central role of CHs/RHs, their proximity to patients, and their holistic, generalist approach, which suggests advantages in their care for the elderly compared to general hospitals.

- Long distances to general hospital care for acute cases were at times considered concerning, and it was acknowledged among doctors that working far from nearest general hospital require them to occasionally step out of the comfort zone to address patient problems when no one else is available to do it better.
Acknowledgements

I want to express my gratitude to persons who have been important to me in my work on this thesis.

Patrik Wennberg, my supervisor and coach.

Margaretha Brännström, co-supervisor.

Kurt Boman, co-supervisor.

Malin Sjöström, co-supervisor.

Lars Lindholm, former supervisor.

Herbert Sandström, former co-supervisor, rest in peace!

All colleagues and fellow teachers at Allmänmedicin, Umeå University.

Fiona Doolan-Noble and Tim Stokes, co-authors in the NZ paper, Department of General Practice and Rural Medicine, University of Otago, Dunedin, New Zealand.

Peter Berggren, my good friend and colleague in Storuman Community hospital, who introduced me to rural medicine, and who was the great inspiration for my decision to set out on this escapade.

Centre for Rural Medicine in Storuman for support and camaraderie.

Storuman Community Hospital, for fantastic colleagues and support.

Gunnar Hjernestam, for being a role model for rural doctors, rest in peace!

National Research School in General Practice for teaching and support.

Karin, my beloved wife, our children Malin, Emma and Per and their fantastic families.

To all others that deserve to be mentioned: Thank you, there are many of you!
References


3. ORNL LandScan Viewer - Oak Ridge National Laboratory [Internet]. [cited 2023 Feb 6]. Available from: https://landscan.ornl.gov/


5. Glesbygd - Uppslagsverk - NE.se [Internet]. [cited 2023 Jan 30]. Available from: https://www.ne.se/uppslagsverk/encyklopedi/l%C3%A5ng/glesbygd


23. Elenius L. Transnational history and language barriers.


28. Hospital och Helgeandshus.


68. Anderson G. Chronic Conditions: Making the Case for Ongoing Care. [cited 2024 Jan 13]; Available from: https://www.policyarchive.org/handle/10207/21756


72. Boyd CM, Darer J, Boult C, Fried LP, Boult L, Wu AW. Clinical Practice Guidelines and Quality of Care for Older Patients With


110. Dahl U, Steinsbakk A, Johnsen R. Effectiveness of an intermediate care hospital on readmissions, mortality, activities of daily living and use of health care services among hospitalized adults aged 60 years and older—a controlled observational study. BMC Health Serv Res [Internet]. 2015 Aug 28;15.


122. Överenskommelse om en God och nära vård [Internet]. [cited 2023 Sep 6]. Available from: https://skr.se/skr/halsasjukvard/utvecklingavverksamhet/naravard/overenskommelseomengodochnaravard.28402.html


Appendix

Other than published papers and manuscripts.

INTERVIEW GUIDE PAPER III and IV

1. Informal introduction
   - The researcher informs about the research project.

2. Formal introduction
   a. The researcher presents the principles for the interview method.
      - The participation is voluntary. It is possible to withdraw at any moment.
      - A predefined interview guide is used as a basis for the discussion.
      - The interview will be taped. Quotes from the interview can be used in an article, but quotes cannot be linked to individuals.
      - The timeframe for interview is one hour.
      - Consent is obtained from the participants.
   b. The researcher presents the background and the objectives of the interview.
      i. Definition of the Rural Community Hospital Model.
      ii. A short background of statistics and data on the respondents’ community hospital collected prior to the interview. Demographics, geography, and distances. The researcher also informs about any important differences found between different community hospitals in South Island as well as differences between Swedish and NZ community hospitals.
      iii. The interview will focus on the informants’ perception of their units’ role in the health care system. Of particular interest will be what they perceive to be challenges and success factors in their organisation for the optimal care of aged patients.

3. The tape recorder is put on.

4. The interview begins.

The researcher ensures that the following predefined main themes are discussed if they have not already been mentioned by the respondent:
About the respondent:

- Respondents’ professional title, experiences in the past. Graduated in NZ or overseas? Different workplaces? Carrier path leading to current job.
- Family or other social bounds
- Positive and negative aspects of living in rural places compared to urban places.

About rural hospitals

- Respondents relation to rural hospital(s) – describe (since how long?)
- Role of the CH in health care system?
  - Patient groups suitable for CH care? – age groups, diagnoses...
  - Which patient groups should not be treated in CHs?
  - Same or different treatment?
  - Ethnic groups? (added in NZ)
- Advantages/disadvantages with CH model
  - Yet untapped uses of CHs
  - Patient safety in CHs?
- Different treatment cultures at CHs compared to GHs?
- What’s to be most proud of?

About working conditions

- Vacancies of doctors? Responsibilities,
- Possibilities for professional development?
- Suggestions for improvement

About medical decision making

- Differences when far from general hospital? Does distance matter? Why?
- Support from hospital specialists
- Important diagnoses

About health care system
• How do you see the future for health care in rural areas?
  o Challenges?
• How do you see the role of the rural hospital in the future?
  o Challenges?
  o GP led small hospitals in urban areas?

About collaboration with nursing homes

• Nursing home capacity and organisation
• Location of the physicians’ offices in relation to the nursing homes
• Organisation of the work on the nursing home

Respondents’ spontaneous reflexions

5. Summary

- The researcher summarizes and the respondent has the possibility to comment on this.
- Does the respondent/informant feel that he/she have opinions, perceptions or nuances that have not been elucidated?

6. Finishing

- The researcher gives contact info to the informant and asks for consent to contact the informant by phone or e-mail later if further questions arise that need to be clarified.
- The moderator informs about further work in the research project and the expected use of the material.

7. Short evaluation