Tampere University

TUIJA RASKU

Community Paramedicine

An integrated care model in a Primary health care setting

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ACADEMIC DISSERTATION
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Responsible supervisor and Custos	Docent Katja Joronen Tampere University Professor University of Turku Finland	
Supervisor	Professor Marja Kaunonen Tampere University Finland	
Pre-examiners	Docent Päivi Kankkunen University of Eastern Finland Finland	Professor Jouni Kurola University of Eastern Finland Finland
Opponent	Professor Gina Agarwal McMaster University Canada	

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When it was clear that the journey towards my PhD would start, I printed out a picture of an old ship. It has followed me through all this time. Without the encouragement from my supervisory team, family and friends, this ship would have stayed in the harbour. My sabbatical time in Australia in 2016 gave me the most crucial push towards PhD studies. The colleagues Elizabeth Thyer and Paul Simpson convinced me that it would be worth it to struggle these years studying something near my heart – emergency medical services, home care and families in the jungle of social- and healthcare.

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Tampere, January 10, 2022
Tuija Rasku

ABSTRACT

The aim of this study was to explore the core components of Community Paramedicine (CP), how CP is implemented in Finland, and the factors associated with the Finnish Community nurse-paramedics' (CNP) decision-making when patient remained at home or needed transportation to the hospital. Additionally, the aim was to describe the CNPs' experiences of the novel sphere of practice in primary health care setting. Finally, the findings of the three sub-studies were adapted to the Rainbow Model of Integrated Care (RMIC) as a parent model.

The mixed methods were used to collect data in four phases. Data were collected through a scoping review, a retrospective review of patient charts, an ethnographic observation, and semi-structured interviews with Finnish CNPs in three hospital-districts (HD). Inductive data analysis methods and statistical analyses including multivariable logistic regression were used.

According to the results, the core components of CP were community engagement, multi-agency collaboration, patient-centred prevention, and outcomes of programme: cost-effectiveness and patients' experiences. With the CNPs' decisions of the patient's care continuum associated five independent factors: the hospital district, if the patient could walk, the nature of the task, whether the troponin test was performed, and physician was consulted. The CNP needs a new way of thinking, has a broad group of patients, the broad way to provide care, the diversity of multidisciplinary collaboration, and tailored support from the organisation.

This study demonstrates the adaptation of CP model as integrated care model with macro-, meso- and micro-levels of Rainbow model of integrated care. The results can be used by organisations, educators, health care professionals and policy planners accountable for driving more integrated services in local health care system through the design and implementation of CP.

CP can provide the needed help for the overgrounded health care and offer proactive patient assessment there where it is best to find the holistic view for the patient care continuum – at home. Further studies are needed to explore the CP patients' and allied health team members' views and experiences about CP. The integrated CP model created in this study is to be tested and developed further in primary care settings.

Key words: Community paramedicine, integrated care, Primary Health Care, health system integration

TIIVISTELMÄ

Tutkimuksen tarkoituksena oli kuvata alue-ensihoitomallin ydinkomponentit sekä tutkia, miten alue-ensihoitomalli on toteutettu Suomessa. Lisäksi tarkoituksena oli tutkia, mitkä osatekijät ovat yhteydessä alue-ensihoitajan päätöksentekoon jääkö potilas kotiin vai tarvitseeko hän ambulanssikuljetuksen sairaalaan ja miten alue-ensihoitajat kuvaavat kokemuksiaan uudenlaisesta toimintamallista. Edellä mainittujen osatutkimusten tuloksista johdettiin alue-ensihoitotyön malli Valentijn (2013) integroidun hoitotyön mallin avulla.

Tutkimus toteutettiin monimenetelmällisenä tutkimuksena neljässä vaiheessa. Tutkimusaineisto koottiin kirjallisuuskatsauksen, retrospektiivisen rekisteritutkimuksen, etnografisen havainnointitutkimuksen, ja puolistrukturoitujen haastattelujen avulla. Tutkimukseen osallistui suomalaisia alue-ensihoitajia kolmesta sairaanhoitopiiristä. Aineisto analysoitiin induktiivisella sisällönanalyysillä ja tilastollisessa analysoinnissa käytettiin logistista regressiota.

Saatujen tutkimustulosten mukaan, alue-ensihoidon ydinkomponentteja ovat alueellisuus, moniammatillinen toiminta, potilaan ennaltaehkäisevä hoito ja alue-ensihoitoprojektien lopputuloksina esitetyt kustannustehokkuus ja potilaiden kokemukset saamastaan hoidosta. Alue-ensihoidon yhteistyökumppanit ja potilaiden hoidon tarpeet vaihtelivat sairaanhoitopiireittäin. Yllättävän paljon alue-ensihoitajan tehtäväkuvaan kuului puhelimitse tehtyä hoidon tarpeen arviointia ja kollegiaalista konsultaatiota. Eniten alue-ensihoitajat saivat tehtäviä kotonaan tai hoivakodissa asuvien potilaiden luokse. Alue-ensihoitajien päätöksentekoon vaikuttavina yksittäisinä tekijöinä nousivat sairaanhoitopiiri, potilaan liikkumiskyky, potilastehtävän luonne, vierianalytiikan käyttö, ja keskustelu lääkärin kanssa. Kotona tai hoivakodissa olleista alue-ensihoidon potilaista yli puolet ei tarvinnut ambulanssisiirtoa sairaalan päivystykseen. Haastateltujen mukaan, alue-ensihoitajan tulee osata ajatella eritavoin kuin aiemmin ambulanssiyksikössä toimiessaan, hänen potilasryhmänsä on laajempi, hoidon toteutus on monipuolista, ja moniammatillinen yhteistyö edellyttää diplomatiaa. Tärkeinä kehittämiskohtina koettiin uuden hoitomallin markkinoiminen, yhteisten asiakas- ja potilastietokantojen kehittäminen, maksuperusteiden tarkistaminen ja organisaatiolta tulevan tuen lisääminen.

Tutkimus tarkastelee alue-ensihoitomallia integroituna hoitomallina, joka ulottuu systeemitasolta (makrotaso), organisaatio- ja ammattikuntatasolta (mesotaso) yksilön (hoitaja, hoidettava) ja hoidon toteutuksen tasolle (mikrotaso). Teoreettisena pohjana käytetty integroidun hoidon Sateenkaari-malli (Valentijn, 2013) auttoi järjestämään pirstaleisen hoitomallin ja tarjoaa alue-ensihoidon suunnittelulle, kouluttamiselle ja toteuttamiselle osa-alueita, joiden avulla voidaan kehittää alue-ensihoitoa osana perusterveydenhuollon integroitua hoitotyötä ja perhehoitotieteellistä tietoperustaa

Tutkimuksen johtopäätöksenä voidaan todeta, että alue-ensihoito asettaa vaatimuksia sekä alue-ensihoitajalle että alue-ensihoidon suunnittelijoille ja ylläpitäjille. Alue-ensihoito voi tuottaa tarpeellista apua kuormittuneeseen terveydenhuoltoon ja tarjota ennaltaehkäisevää hoidon tarpeen tunnistamista siellä missä tarve on parhaiten tunnistettavissa – potilaan luona. Lisätutkimusta tarvitaan alue-ensihoidon potilaiden, perheiden ja muiden yhteistyökumppaneiden näkemyksistä ja kokemuksista. Tutkimuksessa kehitettyä perusterveydenhuollon integroitua alue-ensihoidon mallia on testattava ja kehitettävä edelleen.

Avainsanat: ensihoitopalvelu, alue-ensihoitaja, yhden henkilön hoitoyksikkö, perusterveydenhuolto, integroitu hoitotyö, osallistuva havainnointi, potilaskertomusanalyysi

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ABBREVIATIONS

ABCDE	Airway-Breathing-Circulation-Disability-Explore approach
ALS	Advanced Life Support
CHINAL	The Cumulative Index to Nursing and Allied Health
CI	Confidence interval
CNP	Community Nurse-Paramedic
CP	Community paramedicine
CRP	C-reactive protein
ED	Emergency Department
e.g.	exempli gratia (for example)
ECTS	European Credit Transfer and Accumulation System
EMS	Emergency Medical Services
HD	Hospital District
ICPC2	the International Classification of Primary Care 2
ICD-10	the International Classification of Diseases 10
i.e.	id est (in other words, that is)
Md	Median
Medline	Medical Literature Analysis and Retrieval System Online
MeSh	Medical Subject Headings
N	Sample size
NAEMT	National Association of Emergency Medical Technicians, USA
n.d	no date
OOH	out-of-hours
OR	Odds ratio
p	Statistical significance
PCAM	the Patient-Centered Assessment Method
POCT	Point-of-care testing
RMIC	the Rainbow Model of Integrated Care
RMIC-MT	the Rainbow Model of Integrated Care Measurement Tool
SPSS	Statistical package for the Social Science
TAMK	Tampereen ammattikorkeakoulu (Tampere University Applied Sciences)
TnT	Troponin-test
WHO	World Health Organisation

ORIGINAL PUBLICATIONS

The summary is based on the original articles based on the three sub-studies listed below and the theory derivation from the results of those sub-studies.

I Rasku, T., Kaunonen, M., Thyer, E., Paavilainen, E., & Joronen, K. (2019). The core components of Community paramedicine – integrated care in primary care setting: a scoping review. *Scandinavian Journal of Caring Sciences, 33(3),* 508-521. https://doi.org/10.1111/scs.12659

II Rasku, T., Helminen, M., Kaunonen, M., Thyer, E., Paavilainen, E., & Joronen, K. (2021) A retrospective review of patient records and factors associated with decisions made by community nurse-paramedics' in Finland. *Nursing Reports, 11, 690-701.* https://doi.org/10.3390/nursrep11030065

III Rasku, T., Kaunonen, M., Thyer, E., Paavilainen, E., & Joronen, K. (2021) Community Nurse-Paramedics' Sphere of Practice in Primary Care; an ethnographic study *BMC Health Services Research*, *21*(1), 1-13. https://doi.org/10.1186/s12913-021-06691-y

1 INTRODUCTION

Primary health care is at a crossroads. Rising health care costs, increased number of patients, patients' multimorbidity, and the shortage of staff for in-home care have added pressure to the existing systems. Health care providers have started to rethink the primary care paradigm, refine innovative, novel possibilities to improve the patients' care and join up care providers' forces. There is a need to insert new models of care into the community and closer to patients' homes, supporting people to live longer independently and empower carers to manage at home. (Berchet & Nader, 2016; WHO, 2018.)

Emergency Medical Services (EMS) have always been at the forefront of helping people in emergencies, but nowadays, the number of non-emergency calls has increased. The OECD has highlighted worry about the health care providers' ability to deliver prehospital care and face new expectations while work with shortages in the workforce (Berchet & Nader, 2016). One intervention has been that, additionally trained paramedics have become one-person units, and EMS has started to provide the home-delivered non-emergency and preventive care. This care mode – Community paramedicine (CP) – has been practiced for decades internationally with positive outcomes offering support to primary care providers. CP could also offer choices for those nurses and paramedics who, having gained experience, want career changes from the EMS episodic patient contacts and emergencies.

The present health care prefers short care episodes and aim at efficiency, and cost-effectiveness in service utilization (Kuluski, Ho, Hans, & Nelson, 2017). A single integrated budget consisting of merged providers of services may offer some help to the future of health care (Lewis, Rosen, Goodwin, & Dixon 2010). The best way to understand the patient's opportunities to stay at home and cope with the illness or multimorbidity is to take time and chat with the patient and their family. Conversely, the transportation to the ED have been very stressful for the patients (Dainty, Seaton, Drennan, & Morrison, 2018), and if unnecessary visits to the ED could be avoided, it could have positive consequences to the patients' and their families psychosocial well-being. This way the patient's active participation increases their commitment and is an essential part of managing the chronic condition (Elissen, Hertroijs, Schaper, Vrijhoef, & Ruwaard, 2016). Better identification of patients' needs, and available health care resources could offer more effective care

pathways for the patients and support for the family (Hujala, Taskinen, Rissanen, Richardson, & van Ginneken, 2017).

According to professor and pioneer in integrated care Nicholas Goodwin (2019), there is a need for the knowledge provided by observing healthcare providers' practices at operational level. The results could help us understand the challenges that can be overcome with the cooperation and increase in qualified and coordinated care for patients by multidisciplinary care teams.

Generally, the CP models aim to decrease the overload on EDs and enable patient management at home. However, many questions remain regarding implementing CP in the Primary health care. This dissertation study investigates the implementation of CP in the Finnish health care system and its aspects as an integrated care model. The health care providers' decision-making has never been fully examined, therefore, the factors associated with the Community nurse-paramedics' decision-making are also now explored. Moreover, the experiences of Community nurse-paramedics are researched and examined, analysing their custom and practice, based on observation and interviews with focus group participants.

2 BACKGROUND FOR RESEARCH

This chapter presents the results of the literature search based on the earlier identified studies and reports to describe what is primary health care, emergency medical service, community paramedicine and integrated care. First, I familiarized myself with the concepts. The data searches were first limited between 2010 and 2017 and later expanded further to original articles. The search was updated in 2020.

2.1 Literature search

In this review, the database searches were carried out four times and a systematic search protocol was used (Figure 1). The database search concerned three scientific databases: CINAHL (Cumulative Index to Nursing and Allied Health Literature), Medline (National Library of Medicine) EBSCOhost, and Medline PubMed. The inclusion criteria were articles available in the English or Finnish with abstract and full text accessibility and peer-reviewed status. The following keywords were searched, both individually and in various combinations, *Primary health care, Community care, Emergency medical services, EMS, Prehospital, Community paramedicine, Community paramedic, Extended care paramedic, Integrated care,* and *Collaborative care*.

A manual search was performed for some primary studies and older reports and original articles were included in some cases. Some basic literature and sources from the World Health Organization (WHO) were used. The review was conducted in three steps. First, the titles of articles were reviewed. Second, the selected abstracts were assessed. Third, the articles were selected based on their full-text relevancy. The articles and reports (N=65) were reviewed to form an understanding of primary health care, EMS, community paramedicine, and integrated care. The research articles, reports, and results concerning this literature search are presented in Appendix 1.

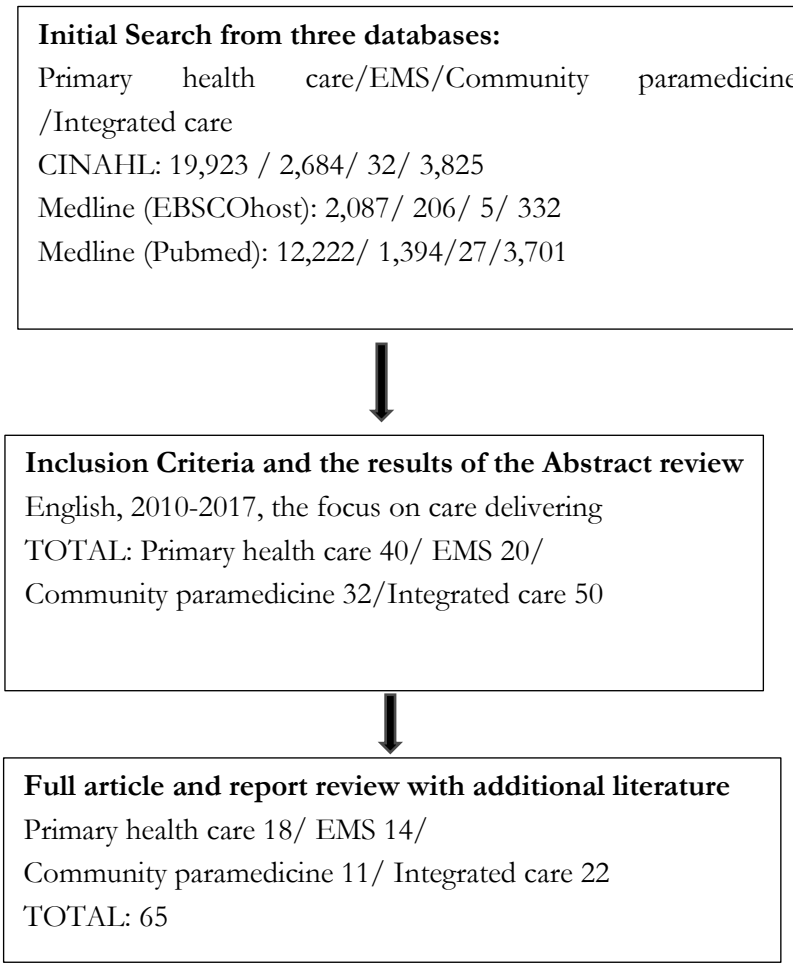

Figure 1. Search strategy and mapping process

2.2 Primary health care

Primary Health Care (PHC) and *Primary Care* (PC) are considered the cornerstones of any health system. PHC (a collection of policies and principles) includes PC services to population and a family doctor- service to citizens. (Muldoon, Hogg, & Levitt, 2006; Valentijn, Schepman, Opheij, & Bruijnzeels, 2013.)

The declaration of Alma-Ata (WHO, 1978) elaborated that PHC is the first contact with the national health care system and accessible to all individuals and families at the cost of the community or country. Its services are preventive,

promotive, rehabilitative, and curative (Valentijn et al., 2013). As preventive care, PHC combines health care services (nursing and medical) with public health education programs and preventive care. The citizen could participate in the care planning and can receive health services day and night. Since 2018, in Astana, World Health Organisation (WHO) has changed the focus of PHC from the health care process and services to people's needs including preventive care, nursing and rehabilitation close the people's ordinary surroundings. (WHO, 2018.)

PC is narrower, person-focused, rather than disease-oriented care. It is care over time, sustains partnership with patients, and does not reference system-level functions (e.g., universal access, public participation) (Muldoon et al., 2006). PC's core value includes integrated social, biomedical, and psychological dimensions of health and well-being and it refers close to the user providing continuity. (Valentijn et al., 2013.) PC has four noticeable functions. First, it is the first contact within the health system. Second, it offers continuous care over time. Third, PC services are comprehensive because they are tailored to support, cure, and rehabilitate aiming to promote health and prevent diseases. Fourth the patient can refer horizontally or vertically to other care or cure providers in coordinated care. (Starfield & Shi, 2002; Valentijn et al., 2013.) The shortage of physicians has required the development of multidisciplinary cooperation (e.g., mental health, social care, and nursing). The nurse can visit the patient first and if needed, the nurse has consulted physicians leading to decreased hospital admissions. (Kringos, Boerma, Hutchincon, & Saltman, 2015.)

In PC, multidisciplinary teams are built to deliver care for the citizens' differing care needs. For example, in Ontario, the Family Health Team -model has included registered nurses, nurse practitioners, family physicians, physician assistants, dietitians, pharmacists, social workers, psychologists, occupational therapists, and respiratory therapists, challenging the common culture of care (Brown, Ryan, Thorpe, Markle, Hutchison, & Glazier., 2015; Tortajada, Giménez-Campos, Villar-López, Faubel-Cava, & Donat-Castelló, 2017). In the Hospital at Home -unit in Spain, the primary care teams and the nurse case managers have focused on the discharged patients' follow-ups providing a comprehensive assessment (current clinical and psychosocial status and background, social history, and care support) (Tortajada et al., 2017). The multidisciplinary model has given the potential to understand different aspects of PC (Brown et al., 2015). For the holistic patient assessment, the Patient-Centered Assessment Method (PCAM) has been created to identify and manage the social dimensions of patients' health needs (Pratt, Hibberd, Cameron, & Maxwell, 2015). This method allows the nurse practitioners to address patients' psychological and social domains and refer them to a broader range of services. Collaborative team relationships within a health care delivery system have

emphasized integrating mental and physical health care (Reiss-Brennan, Brunisholz, Dredge, Briot, Grazier, Wilcox, & James, 2016).

The holistic vision of PC has offered population-based and person-focused care (Valentijn et al., 2013; Valentijn, 2016). Nowadays, health problems are not considered only as medical diagnoses or biological terms (Valentijn, 2016). After 2010s', the patient assessment started to additionally include the patient's other health issues like inadequate nutrition, repeated acute illnesses, occupational disease, osteoporosis, or chronic renal failure (Starfield, 2011). Subsequently, the diseases have been seen to encompass social, medical, and psychological problems. Person-focused care base on a person's meaning of his/her needs, illness, and values. Population-based care on the other hand attempts to find the defined population's health-related needs. With the population-based person-focused views, PC can help understand how social and health problems are jointly associated. (Valentijn, 2016.)

The Finnish health services are divided into primary health care and specialised medical care. Primary health care services operate in health centres organized by municipalities and is financed by taxes. Specialised medical care is usually provided at hospitals. In this research, according to the Finnish Health Care Act No. 1326/2010 (FINLEX, 2010), PHC means public health services provided by local authorities and related provision of health counselling and health checks, environmental health care and emergency medical care, home nursing and at-home hospital care.

Primary care is expected to be patient-centered responding 24 hours a day, seven days a week. Most OECD health systems have reported challenges to provide out-of-hours (OOH) services in primary care when physicians are not available, mostly after 5pm on weekdays, weekends, and holidays (Berchet and Nader, 2016). These challenges could lead patients' unnecessary hospital visits. *Emergency Medical Services (EMS)* is the health care providing system, which is available every day, every hour.

2.3 Emergency medical services (EMS)

One of the earliest descriptions of the EMS is from the battlefields of the Italian campaign of the French revolution, in 1794, where the trained medical personnel treated and transported the wounded to a field hospital (Pozner, Zane, Nelson, & Levine, 2004). More recently, the period of 1960-1970 is considered "the decade of modern time EMS", and in 1970 the first curriculum for emergency medical technician -paramedic was published (Pozner et al., 2004; Edgerly, 2013). The conventional picture of EMS has been the acute, episodic patient care and

transportation to the Emergency Department (ED) (Pozner et al., 2004; Edgerly, 2013; Kizer, Shore, & Moulin, 2013).

Changing scopes of practice (assessment, triage, and treatment skills) from the acute patient care to non-emergency patient assessment, the EMS providers might help to manage the increasing demands of health care. This is considered as a powerful way to increase out-of-hours primary care capacity. Globally, as well as in Finland, EMS system could contribute the social services and healthcare system as an integrated component of healthcare providers (Kurola, Ilkka, Ekstrand, Laukkanen-Nevala, Olkinuora, Pappinen, Riihimäki, Silfvast, & Virkkunen, 2016).

In England, paramedics have undertaken additional training and work with Primary Care physician providing effective response for elderly patients with acute minor conditions. Most patients treated at home have been satisfied (Mason, Wardrope, & Perrin, 2003; Halter, Marlow, Mohammed, & Ellison, 2007). In Australia and in New Zealand, the extended care paramedics have treated low-acuity patients and became first-line primary health care providers facilitating care for communities in rural areas (Hoyle, Swain, Fake & Larsen, 2012; O'Meara et al., 2015). In the Unites States, the community paramedics have provided prehospital and post-hospital health care for patients at home (Kizer et al., 2013). However, as in Canada, there is no consensus what community paramedics should do (Bigham, Kennedy, Brennan & Morrison, 2013).

The novel care model has had positive outcomes. In Germany, Slovenia, Greece, the Netherlands, Chile and Slovenia, nurse practitioners and physician assistants have been used to fill the gap of provided health care services in out-of-hours. The nurse-manned single responder unit has enabled the more effective use of EMS resources in Sweden (Magnusson, Källenius, Knutsson, Herlitz & Axelsson, 2016). In Switzerland the paramedics assess and carry out small treatments with physician in the out-of-hours setting. (Berchet & Nader, 2016.)

In Finland, EMS is organised by 20 hospital districts (HD). The HDs can manage EMS themselves or in collaboration with the fire and rescue services or another hospital district or buy the service from private EMS providers. Five of the HDs have an additional responsibility to also organise Helicopter Emergency Medical Services.

Throughout Finland, the emergency response center (tel. 112) dispatchers assess the urgency of the task and dispatch the appropriate EMS team to the scene according to the risk assessment or if needed dispatch fire, rescue, or police units. All EMS calls are divided into four categories of urgency (A, B, C and D). Life-threatening task shall be in category A, when B means that there is an unknown but potentially high-risk task. When using category C, the dispatcher has come into the conclusion that the task is urgent but considering the information from call, there is

not life-threatening situation. If there is non-urgent but acute situation the call comes to the EMS unit with category D.

After patient assessment and emergency care, the EMS unit can either transport the patient to the Health Care Center, Emergency Department, or allied Health care unit (mental health, substance abuse units) or the unit can make the non-transportation decision based on the EMS protocols or after consulting an EMS physician or PC doctor. In Finland, the EMS system and EMS units providing emergency and non-emergency care could be named more after the Franco-German EMS system where the health care professional is brought to the patient than the Anglo-American EMS system, where the patient is brought to the health care provider. (Dick, 2003, Kurola et al., 2016.)

Since 2010, EMS have been an essential part of health care system providing emergency and non-emergency care, focusing on reactive and proactive patient care delivering patient assessment, preventive, and follow-up care. The use of EMS professionals and their sphere of practice together with the other health care professionals with the medical supervising could improve patients' access to primary care and possibilities to stay at home as long as possible. (Kurola, et al., 2016.) The non-emergency health care service provided by EMS is called community paramedicine (Kizer et al., 2013; Choi, Blumberg, & Williams, 2016).

2.4 Community Paramedicine

From paramedicine to community paramedicine

A novel health care model, called community paramedicine (CP), provide patient assessments and care at home and in community under physician supervise. This model aims to facilitate the use of additional trained paramedics and enhance access to primary care. (Berchet & Nader, 2016.)

The first CP program was provided in 1992, in the rural town of Red River (New Mexico, the United States of America) where it was 60 minutes to the nearest hospital. The paramedics provided preventive health education and chronic disease control for the citizens. They were licensed to administer medications (e.g., antibiotics) and performed small treatments (e.g., wound therapy). (Hauswald, Raynovich, & Brainard, 2005; Choi et al., 2016.) In Canada, the Long and Brier Island CP program (Nova Scotia) was created in response to the short of physicians (O´Meara, Stirling, Ruest, & Martin, 2016). The three-year program provided health

care service around the clock by the clinical team (a nurse, paramedics, and a family physician). The team provided follow-up appointments for the patients and performed the blood pressure and blood glucose level controls. The team assessed the medication compliance, administered antibiotics, vaccinated, organized fall prevention for seniors, and first aid education. During the program, the ambulance transportation (by ferry to the mainland) reduced by 25%, and Emergency Department (ED) visits decreased by 40%. (Martin-Misener, Downe-Wamboldt, Cain, & Girouard, 2009; O´Meara et al., 2016.)

The CP programs could be divided into community, prehospital, or posthospital health care programs (Kizer, Shore & Moulin, 2013). Prehospital CP programs focus on ED avoidance and the reduction of repeated calls to emergency call centres. Posthospital CP programs aim to reduce patient readmissions. The goal is to provide the required patient care at home or to refer the most appropriate locations (public health agencies, mental health care facilities, hospice, addiction treatment centres). Depending on the focus of the CP program, the medical supervision involves physicians like geriatricians, general internists, community health care physicians, or emergency medicine physicians. (Bigham et al., 2013; Kizer et al., 2013; Agarwal, Angeles, Pirrie, Marzanek, McLeod, Parascandalo, & Dolovich, 2017; Ruest, Ashton, & Millar, 2017.) In Fort Worth, Texas, the CP program focused on 21 citizens (800 times transported to a local ED during the last 12 months). Community paramedics visited these citizens, assessed their care needs and risks, and, if needed, referred them to the primary care physician. The hospital admissions of those patients decreased by 47%. (Kizer et al., 2013.)

The general goal of the CP programs is to fill the identified gaps in local health care collaboratively. The aim is to use the region's health care resources effective and get the patient the adequate care. Most CP programs have focused on elderly adults with chronic diseases like asthma, heart disease, or diabetes. (Heinelt, Drennan, Kim, Lucas, Grant, Spearen, & Morrison, 2015; Brydges, Denton, & Agarwal, 2016.) However, the CP program in Indianapolis/USA focused on decreasing pediatric asthma patients' readmissions to the hospital (Choi et al., 2016).

The patient assessment is one of the community paramedics' basic skills. The community paramedic also assesses the patient's possibility to manage at home, including the risk assessment of the environment. To recognise the patient's main risks to stay at home, during a CP program was developed the PERIL (Paramedics assessing Elderly at Risk for Independence Loss) tool (Lee, Verbeek, Schull, Calder, Stiell, Trickett, Morrison, Nolan, Rowe, Sookram, Ryan, Kiss & Naglie, 2016, O´Meara et al., 2016.) The PERIL considers questions about the patient's medication, home safety, and the patient's 911 calls. If patient has challenges with daily medication, or if there were any risk with the home safety or if the patient has

called 911 during last 30 days, the patient could have a 93% chance of an adverse outcome within 30 days and will need the transportation to the hospital. (Nolan, Gale, Ruest, Emon, McNab, Clock, & Sparen, 2015; Lee et al., 2016.)

From paramedics to community paramedics

In the United Kingdom, the "Reforming emergency care" -document pointed out in 2003 that paramedics need additional intermediate care training for older people (Mason et al., 2003). This additional training included three weeks of theory and 45 days of clinical practice (in the elderly clinic, community services, minor injury unit and ED) (Woollard, 2006). The goal was to achieve the patient assessment competencies and treatment skills to the same level as the emergency nurse practitioners (Mason et al., 2003). After two years, these primary care paramedic practitioners provided treatments with evidence-based guidelines. They could navigate patients to primary care, ED, mental health, or substance abuse treatment centres if the care could not be provided at home. (Ball, 2005.)

CP providers have been described as additionally trained paramedics, extended skills paramedics, extended care paramedics, community paramedics or prehospital nurses (Hoyle et al., 2012; Jensen, Travers, Marshall, Leadlay, & Carter, 2014), who are working under the local medical control (Kizer et al., 2013). The name of the CP provider changes, but the expected competencies are approximately same. They work independently providing high-level patient assessment of patients of all ages considering holistic method of patient health care (Mason et al., 2003; Ball, 2005).

In Finland, the community paramedic is a nurse-paramedic or a nurse who has been additionally trained for prehospital care. The Community Paramedic Response Unit is staffed with one community nurse-paramedic. The education for a nurse-paramedic are full-time studies in the University of Applied Services (four years, 6 480 h/240 credits (ECTS). The curriculum follows the Nurses European Union directive requirements (5 670h/210 credits (ECTS)) and the additional studies of 810 h/30 credits (ECTS) about paramedicine/prehospital acute care. The nurse-paramedics complete a bachelor's degree and become registered as nurses. (TAMK, 2021.) The Finnish hospital districts have locally organised additional training for those nurse-paramedics who have been chosen to work as community nurse-paramedics.

According to the Finnish legislation, the one-nurse responder unit provides patient assessment for patients with non-emergency needs and works as a back-up unit for the other ambulance units (FINLEX, 2017). The CP vehicle is equipped as an Advanced Life Support (ALS) unit, with the point-of-care testing

(e.g., C-reactive protein, Troponin) but without a stretcher or immobilization equipment. These units have different names in different HDs. However, for this study, they all are named as CP units, and those care providing nurse-paramedics are called community nurse-paramedics (CNP).

2.5 Integrated Care

The etymology of integration comes from the Latin word integer, meaning to complete, and as an adjective, integrated means, for example, reunited parts of a whole (Kodner & Spreeuwenberg, 2002). When the care is integrated, the health care professionals and organisations are connected with other service systems (social or housing services) to improve patients' satisfaction and program outcomes (Goodwin, Stein, & Amelung, 2017). Integration includes the set of methods and models to fund, organise, or deliver service. It describes relatedness and association between care providers and aims to increase cost-effectiveness, users' satisfaction, and quality of life (Kodner & Spreeuwenberg, 2002).

According to Leutz (1999), all services cannot be integrated for all people and the providers of integrated care need additional training to understand the specialties of different patient groups. There could be challenges if the integration happens only by one person or by one profession. For example, the physician might have a geriatric orientation but could also need knowledge of the patient's housing, or social care cultures (Leutz, 1999; Leutz, 2005). Integration needs the focus and coordination to fill the needed care gap, for example, offering palliative care in the rural area. Other differences could be the urgency of the intervention (today, next week), the duration of the patient's care need (one visit, weekly follow-up), severity of the patient's conditions or families' need of support.

When new services are implemented, the costs of start-up, staff and support systems should also be considered before it deemed to be cost-effective (Leutz, 2005). Therefore, extra funding will be needed to facilitate the integration as well as an appropriate level of time, tools, and efforts from the administrators of the integration.

Integrated care has been considered as an umbrella term (Valentijn et al., 2013), and it has as many meanings as citations (Leutz, 1999; Lewis et al., 2010; Goodwin, 2013; Valentijn et al., 2013; WHO, 2015; Hujala et al., 2017). Over 175 explanations and terms have been found linked with integrated care (Armitage, Suter, Oelke, & Adair, 2009). However, the integrated care hypothesis promotes quality improvement for fragmented care and is based on health care service users (Goodwin et al., 2017; Hujala et al., 2017).

According to Leutz (1999), integrated care can be seen throughout the intensity of organisational solution, divided into three levels: *linkage*, *coordination*, and *full integration* (Fig.2). The integration is linked (even virtually) when the organisations have agreed to collaborate and refer the patient to the suitable unit at the right time. Responsibilities are clear, but the costs do not shift. When integration is coordinated, the organisations have connected structures and processes to reduce fragmentation. With full integration, the resources are pooled with multidisciplinary teams, and information is shared with common records. (Leutz, 1999.)

The goal of integrated care is to improve patient care with better coordination. It is essential to decide the intensity and goals of integration and estimate the enablers and the blockers of the progresses. The movement between the different intensities of integrations (Fig.2) can happen both ways. Central to the integration is the patients' experience, and the model is modified according to the context, the setting, and circumstances. The measurement of outcomes and costs helps to identify what has been and what needs to be improved. (Shaw, Rose, & Rumbold, 2011.)

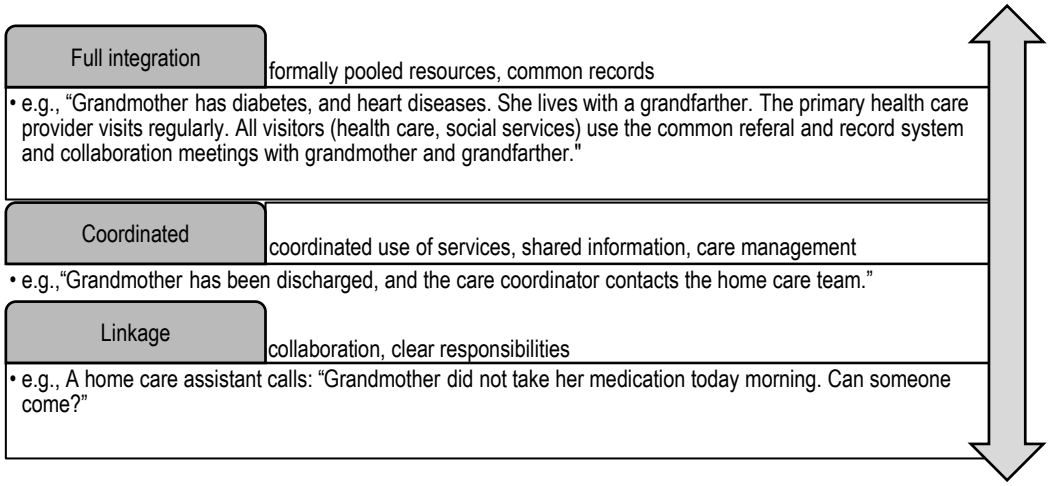

Figure 2. The intensity of integration (Modified from Leutz,1999)

Integrated care models have provided a comprehensive assessment for people with diagnosed dementia and memory impairment. The end-of-life care model has integrated primary, secondary, and community health services. With horizontal integration, the models have connected the physician and community services, or vertically the specialist care has involved community hospitals and primary care services. The virtual interventions have included virtual meetings with the dementia

team, including the patients' risk assessments and care planning. For care management, the integrated teams have identified at-risk populations. (Lewis et al., 2010; Ling, Brereton, Conklin, Newbould, & Roland, 2012; Roland, Lewis, Steventon, Abel, Adams, Bardsley, & Lingl., 2012; Busse & Stahl, 2014; Briggs, Valentijn, Thiyagarajan, & Araujo de Carvalho, 2018.) The crucial elements for delivering integrated care have been the governance and finance arrangements, the repertory of services, personal relationships between organisations and multidisciplinary teams, and shared information (Lewis et al., 2010; Goodwin et al., 2017; Briggs et al., 2018).

The integrated care providers have mainly been nurses, general practitioners, social workers, and physiotherapists. (Mulvale, Embrett, & Razavi, 2016; Kuluski et al., 2017; Low, Tay, Tan, Chia, Towle & Lee, 2017; Briggs et al., 2018). However, Low et al. (2017) added into the care teams occupational therapists, speech therapists or speech pathologists (to assess swallowing and communication disorders and training to minimize aspiration risk), and pharmacists (for medication reconciliation and assessing the drug interactions). They managed to achieve a statistically significant reduction in ED visits of patients and their 30-day readmissions (Low et al., 2017). An integrated care team's challenge had previously been the persistent orientation towards long-time and long-term care planning and solutions (Kuluski et al., 2017). A team with shared aims, standard quality processes, shared information, and support had achieved and improved care collaboration and integration (Mulvale et al., 2016). In this thesis, the focus of integration is on the process of integrated care describing community paramedicine in the Finnish Primary Health Care (PHC) setting.

The Rainbow Model of Integrated Care

The Rainbow Model of Integrated Care (RMIC) combines Primary Care (PC) functions with integrated care dimensions. In this model, integrated primary care has been divided into *system, organisational, professional,* and *clinical integrations*. The scope of integrated primary care is both *population-based* and *person-focused* care. The dimensions of integration are connected by *functional* and *normative integration*. The model helps to understand and interrogate the multi-dimensional nature of integrated care and a complex health system strategy. (Valentijn, 2016; Nurjono, Valentijn, Bautista, Wei, & Vrijhoef, 2016; van Rensburg & Fourie, 2016; Boesveld, Bruijnzeels, Hitzert, Hermus, van der Pal-de Bruin, van den Akker-van, Steegers, Franx, de Vries & Wiegers, 2017.)

In the RMIC, the integration levels of care have named as a macro (system integration), meso (organisational and professional), and micro (clinical) levels (Valentijn et al, 2013). Macro-level includes *System integration*, which includes the political environment (the rules and policies) where the structures, processes, techniques, and the provided services have been tailored according to the stratified needs of an entire population, thus providing continuum of care. The perspective of system integration is to improve access to the health care system and follow healthcare services' quality and continuity. (Lewis et al., 2010; Valentijn, 2016.)

Meso-level includes *Organisational* and *Professional integration*. In organisational integration, the bureaucratic structures of multiple organisations, the levels of expertise, funding mechanisms, and the regulations are clarified (Valentijn, 2016). Voluntary based network-like collaboration can also help to achieve organisational integration. Professional integration can be a partnership between(inter) and within (intra) organisations. It can be vertical or horizontal (for example, sharing guidelines and protocols as clinical integration) considering integrating care in the processes. (Lewis et al., 2010; Valentijn et al., 2016.) The challenges and demands of organisational integration could be the financing and regulation encouragements, which can empower the stakeholders' relationships with clarity about roles and responsibilities. However, respect and formal and informal communication are crucial to maintaining those relationships and require continuous negotiation and assessment of the collaboration outcomes. (Curry & Ham, 2010; Lewis et al., 2010; Valentijn et al., 2013.)

Micro-level includes *Clinical integration,* which is the primary process of care delivered to individual patients. It has a person-focused perspective linked with the patients' needs. Thus, it tends to be disease focused. (Valentijn et al., 2013; Boesveld et al., 2017; Hujala et al., 2017.) Clinical integration aims to the navigation for seamless care. The patient is considered as a coworker, and when the planning is done with the patient's careers and family, the result can be continuous, comprehensive, and coordinated (Curry & Ham, 2010; Valentijn et al., 2013; Hujala et al., 2017). All levels of integrated care are described in Figure 3.

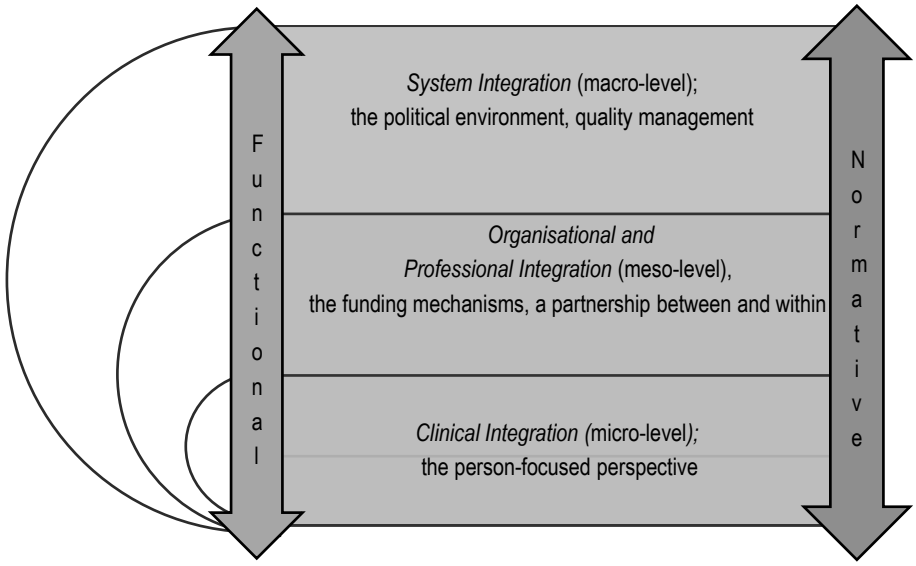

Figure 3. The Rainbow Model of Integrated Care (Modified from Valentijn, 2016)

Functional integration includes financial management, strategic planning, human resources, and information management (for example, electronic patient records) as an essential part of the quality of integrated care (Lewis et al., 2010; Valentijn et al., 2013; Valentijn, 2016; Boesveld et al., 2017). It supports and links the micro- and meso levels within a system integration (macro-level) (Valentijn, 2016). *Normative integration* bases on shared values, culture, professional behaviors, and attitudes. It reaches across individuals, professionals, and organisations for coordination and collaboration, for example, the interdisciplinary meetings (Valentijn et al., 2013; Hujala et al., 2017). Normative integration could achieve population-based care when the stakeholders have a clear mission and vision reflecting medical and non-medical professionals' cultures (Curry & Ham, 2010; Lewis et al., 2010; Valentijn et al., 2013).

A person-focused perspective underpins the citizens' experiences. The centre of their care plan is their medical, psychological, and social needs including, for example, the understanding of the patient's meaning of an illness. (Valentijn et al., 2013; Lüdecke, 2014, Valentijn, 2016.) *Population-based care* includes health-related economic, social, environmental, and political characteristics of a defined population's care needs (Valentijn et al., 2013; Valentijn, 2016). Table 1 presents the levels of the RMIC, the contextual dimensions, and the accompanying components of the model.

Table 1. The Levels, Contextual Dimensions and Accompanying Components modified from Valentinj's (2013, 2015) Rainbow Model of Integrated Care

Level of Integration	Contextual Dimensions	Components
Macro level/ System integration	The alignment of rules and policies within a system	The political environment, a tailor-made combination of structures, processes, rules
Meso level/ Organisational integration	Inter-organisational relationships (e.g., strategic alliances, knowledge networks)	Collaboration between organisations, pooling the skills and expertise from different organisations
Professional integration	Partnership within (intra) and between (inter) organisations	Collaboration and collective responsibility, shared communication, and care
Micro level / Clinical integration	Person-focused coordination including process across discipline, time, and place.	The care delivery to individual patients, to improve patient's overall well-being, patient as a co-creator in the care process
Functional integration (linking the micro, meso, and macro levels)	Support functions and activities coordinating decision-making between organisations and professionals.	Technical preconditions (ICT-facilities), financial, management and information system
Normative integration (linking the micro, meso, and macro levels)	Population-based care with shared social preconditions.	Social preconditions as shared mission, vision, culture, trust

2.6 Summary of the background for research

The literature review highlighted the demands and needs of patient care in the prehospital settings and the possibilities of EMS to provide non-emergency services fulfilling the emerged gaps in health care. Table 2. presents the definitions of central concepts in this study.

Community paramedicine is a novel health care model which bridges EMS and Primary health care. The CP models are very differently implemented based on the population's needs and resources. Internationally, some of the CP programs have ended, although the outcome of the programs has been positive. There are few scientific studies on this care model in Finland, and the principles of integrated care could provide the needed structure for the fragments of CP. A better understanding of the core components of CP, the implementation of it could provide better possibilities of sustainability of this care model in Primary health care.

Table 2. Definitions of central concepts in this study

Concept	Definition
Primary health care / Fnnish Health Care Act 1326/2010	Public prehospital health services provided by local authorities and related of patients' or clients' health counselling and health checks, environmental health care assessment and emergency medical care, home nursing and at-home hospital care.
Community Paramedicine / Kizer, Shore et al. (2013)	"A community-based, locally designed collaborative model of care leverages paramedics skills to address care gaps identified through community-specific health care needs assessment."
Integrated care / Kodner and Spreeuwenberg (2002), Leutz, (2005) & Valentijn (2013)	An organized principle to provide care and coordinate the health care system with other service systems (e.g., social care, housing services, education). The aim is to improve clinical outcomes, health care efficiency and patients' satisfaction. Integrated care identifies three levels with four dimensions: Macro (systemic level), Meso (organisational and professional levels), and Micro (clinical level).

3 AIMS OF THE STUDY

This study explores the components of Community paramedicine internationally and derives a synthesised model of Finnish community paramedicine as integrated care in a Primary health care setting.

The model gives a structure for the CP, and the study also provides evidence-based data for the planning and development of the CP model's opportunities to bridge the gaps in primary health care.

The research aim was to answer the following questions:

Phase I

1. What are the core components of Community paramedicine? (Article I)

Phase II

2. How is Community paramedicine implemented in Finland? (Summary)
3. Which factors are associated with the Community nurse-paramedics' decision-making processes, when the patient remained at home or needed transportation to the hospital by ambulance? (Article II)

Phase III

4. What is the Finnish CNPs experience of their novel sphere of practice? (Article III)

Phase IV

5. How does the community paramedicine model adapt to the Rainbow Model of integrated care? (Summary)

4 MATERIALS AND METHODS

4.1 Mixed methods research design

The study used a mixed-methods design. In Finland, CP is a novel model, and the mixed-method design allows both an exploratory perspective and a broad understanding of the phenomenon (Polit & Beck, 2012; Doorenbos, 2014). It enables the study of health care in a complex, diverse environment (McManamny, Sheen, Boyd, & Jennings, 2015). Along with space triangulation (Halcomb & Andrew, 2005), the data were collected from three hospital districts.

Phase one (article I) contained a scoping review from 803 initial articles, of which 21 articles met the inclusion criteria. They were analysed by inductive content analysis to derive the core components of CP. For the second phase (article II), the data were collected from 450 CP patient records in three hospital districts. Multivariable logistic regression was used to examine the impact of variables on the CNPs' decisions making. In the third phase (article III), the qualitative data combined 317 hours of observation and 22 semi-structured interviews in the same three hospital districts. The data were collected during 2017-2019. In the fourth phase, a novel CP model was derived from phases I, II, and III using the RMIC as a parent Model. The path of the research is presented in Table 3.

Table 3. An overview of the Phases I-IV of this thesis

	Phase I 2017-2018	**Phase II** 2019 spring	**Phase III** 2019 summer	**Phase IV** 2020 summer
Study questions	What are the core components of Community paramedicine?	Implementation of CP in Finland. Factors associated with the CNPs' decision-making when the patient remained at home or needed transportation to the hospital by ambulance.	What is the Finnish CNPs experience of their novel sphere of practice?	How does the CP model adapt to the RMIC?
Aim of the study	To identify and describe the core components of CP and identify research gaps for further study.	To describe the cases handled by CP units and examine the factors involved in CNPs' decision-making processes.	To explore the CNPs' experiences in their new sphere of practice.	To present a novel model for use in CP research
Data collection	803 articles and reports of CP reduced to 21 that fitted the inclusion criteria.	450 CP patient records, including 339 cases in patient's homes or elderly care homes	317 hours with nine CNPs & 22 interviews	The results of Phases I-III and the RMIC as Parent Model
Methods	Qualitative approach Scoping Review by Arksey and O´Malley	Quantitative approach a retrospective review of patient records	Qualitative approach A descriptive ethnographic study (participant observation and semi-structured interviews)	Theory derivation
Analysis	Inductive content analysis	Descriptive statistics multivariable logistic regression model	Inductive content analysis	Walker and Avant's theory derivation's procedures

4.2 Scoping review of the core components of Community Paramedicine

The first phase included the scoping review (Rasku, Kaunonen, Thyer, Paavilainen, & Joronen, 2019), which achieved its aim to identify and describe the core components of CP. CP is a new model of providing Health Care services in Finland but it has a more extended history abroad (Armstrong, Hall, Doyle, & Waters, 2011; Choi et al., 2016). A scoping review provides a structured approach and a map of the existing literature without quality assessment or extensive data synthesis by gathering background information from a novel concept (Arksey & O'Malley, 2005; Armstrong et al., 2011).

According to Arksey and O´Malley (2005), the scoping review had a five-stage approach: (1) the research questions were identified; (2) the potentially relevant studies were identified; (3) the eligible studies were selected; (4) the data charted; and (5) the results collected, summarised, and reported. A consultation exercise is an optional step (Arksey & O'Malley, 2005). For the relevant studies in this study was consulted two EMS field managers and an international EMS researcher.

Data collection

The research question was: *What are the core components of Community paramedicine?* It included peer-reviewed articles from five electronic databases, reference lists, existing networks (e.g., International Roundtable on Community Paramedicine (IRCP), reports of the relevant organisations (e.g., WHO), conference presentations and grey literature. The search was conducted between September 2017 and June 2018, and the preliminary search started in the electronic databases Medline (Ovid), CINAHL, Academic Search Premier, PubMed, and the Cochrane Library. The challenge was that the term community paramedicine or paramedicine are not included in the MeSH terms. The search was limited to material written in English and published between 2005 – June 2018. Year 2005 was selected because the international organisation of CP was established in 2005 (Wingrove, O'Meara, & Nolan, 2015). A total of 21 articles met the inclusion criteria. The detailed literature review process is described in Article I.

Data analysis

The data were analysed by inductive content analysis. The aspects contained were grouped by open coding into subcategories and categories ending up with the main categories as core components (Arksey & O'Malley, 2005; Elo & Kyngäs, 2008; Levac, Colquhoun, & O'Brien, 2010). Table 4 presents an example of the content analysis for the core components of CP. The analysis process is explained in Article I.

Table 4. Example of content analysis for the Core components of Community paramedicine

Open coding	Main category/ the core component	References
*Assessment of local health care needs *Bridging the gaps of community health care *The gaps between primary health care and hospital emergency *Community-based response *Community-focused *Targeted needs from the community *Linked to the community	**Community engagement**	Stirling et al. (2007), Mulholland et al. (2009), O'Meara et al. (2012), Bigham et al. (2013), O'Meara et al. (2014), Brydges et al. (2015), Brydges et al. (2016), Patterson et al. (2016), Pearson&Shaler (2017), Dainty et al. (2018)

4.3 A registry-based study of the Finnish community paramedicine

The second phase included a retrospective review of patient records and factors associated with decisions making by Finnish CNPs (Rasku, Helminen, Kaunonen, Thyer, Paavilainen, & Joronen, 2021), which aimed to describe the Finnish CP and examine the factors involved in CNPs decision-making processes when the patient remained home or were transported to the ED by ambulance.

Study setting

Finland covers 338 000 km² with a population of 5.5 million, and its 21 hospital districts (HD) provide specialised medical care, has a central hospital and a municipal health care centre. Their EMS organisations are four-tiered including First responders, Basic life support (BLS), Advanced life support (ALS), and physician-led units. In Finland, the CP units are part of the EMS system. In selected three HDs, the CP model has provided non-emergency health care services longer than one year with allied healthcare and public safety workers (police, firefighters, and personal alarm responders[1]).

The size of the HDs in this study is approximately the same (inhabitants from 130 000 – 190 000), including a general (secondary level) hospital, and the distance to the nearest university (tertiary level) hospital is 140 – 230 km. These HDs were selected purposely because they have had the CP model longer than one year.

[1] *Personal alarm responder:* When a client has a personal alarm pendant, it is connected to the base unit, where the triage assistant will identify what kind of help is needed and either call the contact person, or send a personal alarm responder, emergency medical service or community nurse-paramedic.

Finnish community nurse-paramedics

The participating HDs were similar size (populations from 130,000 – 190,000), each one covered both rural and urban areas and have a CP model going on. The HDs have one CP-unit with five to eight CNPs rostered to staff the unit and all staff have worked longer than five years as an advanced level nurse-paramedic. They have also undertaken additional education to work as a CNP. Most of them work partly in CP-unit and partly in an advanced level ambulance unit.

Data collection

The data were collected from the CNPs' patients' records (N=450) using convenience sampling; the consecutive CNPs' patients' records from the beginning of the second year of each CP model. Because the CP model has started in different year in each HDs (2016, 2017, and 2018) the second year of the local model was selected as a common timeframe for the patients' records. The information was extracted directly from the patient charts to the computerized abstraction form created by the researcher from previous EMS documentation studies and the Finnish EMS patient chart (SV210). Direct recording into the computer by the same researcher minimised the number of mis-transcribed or omitted entries (Worster, 2004). The document included four parts: the general information of the patient, prearrival information, information about the initial contact with continuous assessment, and the conveyance decision. The data (N=450; Appendix 2) were used to answer the overarching question: Implementation of CP in Finland. The detailed data collection is described in Article II.

The sub-data of this phase were the 339 patients assessed by telephone or face-to-face by the CP unit in the patient's home or elderly care home. The research question for the sub-data were Factors associated with the CNPs' decision -making when the patient remained at home or needed ambulance transportation to the hospital. From the main data (N=450) 111 records (24.7%) were excluded considering other clients than patients at home or elderly care home. The research data were deidentified with safeguards to prevent individual recognition and patient confidentiality (Worster, 2004), and it was downloaded into Microsoft Excel™.

Three variables (the calls from the patient's home, the time of day, and the patient's age) were recoded. The time of day was divided into the dayshift (9:00 am-8:59 pm) and the nightshift (9:00 pm-8:59 am). The calls from the patient's home (made by the patient, family member, personal alarm responders, nurses) or from the elderly care home were summarized as one variable: Call from home. The

patients' ages were first split into five categories according to the protocol from Finnish Government (0-17 y., 18-24 y., 25-64 y., 65-74y., and >75y.) (Sitra, 2017). However, after data analysis, only one patient was under 18 years old, so the age variable was summarised into four categories: under 64 years old, 65-74 years old, 75-84 years old, and over 85 years old. The International Classification of Primary Care (ICPC-2) system developed by Okkes, Jamoulle, Lamberts, & Bentzen (2000) was used to categorise the patient's reasons for encounters, and the type of problem addressed.

Data analysis

Of 339 patient records, 303 records (85.1%) had complete data. Missing data relating to patients' gender or age were obtained and entered the data file as one sub-group. Missing details from patient's gender or age, and the ABCDE-protocol approach were coded as documented or not documented and, the point-of-care tests and ECG were coded as performed or not performed.

The data were analyzed with SPSS statistical software for Windows, release 25 (SPSS, Chicago, Illinois, USA). The primary data (N=450) were described with frequencies, percentages, means and medians and patients were dichotomized into two groups: "remain at home" and "need transportation to the hospital by ambulance". All variables and the dichotomized patients' groups were cross tabulated for comparison. For the intergroup associations was run a chi-square test. Missing data (from the patient's gender, age, the patient's position) were treated as independent variables groups.

Logistic regression analysis was chosen to test the independent (predictor) variables associations with the dichotomous dependent variable (Sperandei, 2014; Cipher, 2016). For the second research question, each predictor variable underwent univariable logistic regression analysis and were tested one by one (univariable models) (Sperandei, 2014). Those variables with a significance of $p<0.05$ were included in the multivariable model. A multivariable logistic regression model was used to assess the factors associated with the CNPs' decision-making process. The analysis process is explained more detailed in Article II.

4.4 Finnish CNPs' Sphere of Practice in Primary Care; An Ethnographic Study

The third phase was an ethnographic study exploring the CNPs' experiences in their new sphere of practice (Rasku, Kaunonen, Thyer, Paavilainen, & Joronen, 2021).

Data collection

The data were collected through participant observations, informal discussions, and semi-structured interviews between May – September 2019 in each HD. The researcher rode along with nine CNPs (total 317 hours) and interviewed 13 CNPs, and nine allied health care providers (nurse-paramedics, EMS team leaders or field managers, and a care coordinator) involved in the CP model. The HDs were in different parts of Finland to give a multifaceted understanding of this novel health care model and CNPs' roles, foci, and perceptions.

The ethnography approach was chosen to map the cognitive world sharing meanings and semantic rules (Cook, 2005). According to Thomson (2011), the participants need to have worked in the setting to hold unique and expert knowledge about interaction processes. All participating CNPs had worked in the model since the beginning. Because the total number of working CNPs was limited (totally 13), the purposive (criterion-based) sampling (Holloway & Galvin, 2017c) was used, meaning that all CNPs were selected for the research. All participants signed an approval for their participation. The ethnographic approach offered a valuable opportunity to explore the social context of the CNPs, their patients, and coworkers.

For the observations, the CNPs provided the written informed consent and the patients, and family members at home were informed about the study purpose, the researcher's role, and their right to deny the researcher being present with the CNP. None of the CNPs, patients or family members refused. The long travel time from one patient to another was a natural time for asking the questions and talking with the CNPs (Thomson, 2011). The researcher spent 2-5 work shifts with each of the nine CNPs. A work shift was from 10 to 12 hours in duration. Those informal discussions with CNPs formed an essential component of the observational phase of the data collection process. The CNPs practices, and the researcher's feelings and responses were noted (Holloway & Galvin, 2017c), balancing participants' reality and scientific interpretation. The result is that there is a pile of memo books with drawings, phrases, and paragraphs. These notes were transcribed immediately after each shift. (e.g., Table 5.) The data collection is explained in more detail in Article III.

Table 5. Verbatim example from the field notes

We drove here 35 minutes. A very pail patient opened the door, and her walk was very bad. The painkiller pump needs the change of the cassette. The patient sounds thrilled to see the CNP. She changed the cassette, and they went through the caring plan for the weekend. "Granny,98 said, "I have many opinions about the Finnish health care system, but this is great service – these CNPs are always light of my day…I live alone, you know…."

Data analysis

The data from field notes were sorted, anonymized, and interviews were transcribed by the researcher, which helped to understand the data from the outset. For the ethnographic 'thick' description (Holloway & Galvin, 2017c), the authentic comments were used to elicit the credibility of the emerged categories and put them into context. The analysis was used in the line-by-line qualitative coding method and an inductive approach (Holloway & Galvin, 2017c). The transcript was read comprehensively to avoid the risk of focusing overly only parts of the data.

The original expressions were converted to open codes (N=213), and the codes were coloured to identify closely linked material. The codes were interpreted to subcategories (N=56), compared for differences and similarities, and classified into 14 generic categories. Finally, five main categories unified the content from the generic categories. The re-reading was a reminder of the hermeneutical circle when, after each reading, reflection, and discussion with the researchers' team, there was a deeper meaning for the descriptive themes was questioned (Graneheim, Lindgren, & Lundman, 2017). According to LeCompte (2000), data interpretation was like building up a puzzle without the picture yet. Joint review and discussions with the research group helped to resolve any inconsistencies. The observation engaged the researcher through summer 2019. The Article III shows the detailed phases of this inductive content analysis.

4.5 Community Paramedicine as Integrated Care

The phase IV aimed to investigate how the CP-model adapts to the Model of integrated care. The model must be tested empirically and validate that it reflects CP's reality before it can be used. Until that, this innovation stays as a model, not a theory (Walker & Avant, 2014).

The concepts for the CP model emerged from Phases I – III. Phase I offers the international core components of CP, and phase II adds the more specific details of Finnish CP. The data were enriched with the results from Phase III.

Walker and Avant's derivation process (2014) is recommended when needing a new and innovative perspective. Their process includes five steps: (1) to familiarise the topic of interest; (2) to read another field to find valuable congruences; (3) to choose a parent theory that sheds light on the concepts of interest; (4) to identify the useful content or structure from the parent theory; and (5) to modify or reformulate new concepts or statements in terms (Walker & Avant, 2014). Theory derivation provides a structural way to represent the relationships of the different concepts and outcomes from the sub-studies (Walker & Avant, 2014).

The Rainbow Model of Integrated Care (RMIC) was used as a parent theory. The results of the CP sub-studies were identified, redefined, and transposed with the dimensions from the parent model. The RMIC (Valentijn et al., 2013) re-examine the integrated care in the primary care setting, the same environment where the CNPs are working. The six dimensions, systemic, organisational, professional, clinical, formative, and normative, operate on three levels (macro, meso, micro) and offer CP's theoretical and structural model. The dissimilarities and similarities of the parent field and CP were considered (Walker & Avant, 2014).

The model was conducted through the five steps from Walker & Avant (Walker & Avant, 2014):

1. The development and research of CP were studied to evaluate the scientific usefulness, structure, concepts, and context. (Chapter 2.4 and Phases I-III)
2. International research about primary care, and integrated care were studied. (Chapter 2.2 and 2.5)
3. The RMIC was selected as a parent theory for derivation (in Chapter 2.5) because it provided a helpful analogy.
4. The content and structure of the RMIC were used.
5. Some statements and new concepts from the content of the parent model were redefined. The concepts borrowed from the RMIC were modified so that they come meaningful in CP. This step gives the sense for the model in the Finnish CP (Chapter 5.5)

5 RESULTS

The results are reported according to the study phase. Table 6 presents the study questions and the main results from these study phases (articles I-III and theory derivation).

Table 6. An overview of the main results of this study

	Phase I	**Phase II**	**Phase III**	**Phase IV**
Study questions	What are the core components of Community paramedicine?	Implementation of CP in Finland. Factors associated with the CNPs' decision-making when the patient remained at home or needed transportation to the hospital by ambulance.	What is the Finnish CNPs' experience of their novel sphere of practice?	How does the CP model adapt to the RMIC?
Main results	The core components were community engagement, multiagency collaboration, patient-centered prevention, and outcomes of the programs: cost-effectiveness and patient experiences	CP models varied in each HDs. Elderly care, the collaboration with police and psychiatric nurses, and telephonic care were an essential part of CNPs' duties. Five factors were associated with the CNPs' decisions: Hospital district, the patient's position, the troponin test, consulting a physician and the nature of the CP task.	The CNP needs to think in a new way, has a broad group of patients, and a new way to provide care. The challenges of implementing CP could be the diversity of multidisciplinary collaboration and the need for tailored support from the organisation.	CP model has dimensions from systemic, organisational, professional, and clinical levels. The RMIC offered the structure for CP and could be considered when planning and developing this model of care.

5.1 The Core Components of Community Paramedicine

Four core components of CP emerged from the 21 included studies: (1) Community Engagement, (2) Multiagency collaboration, (3) Patient-centred prevention and (4) Outcomes of the program: cost-effectiveness and the patients' experiences.

With the *Community Engagement*, the CP-programs were trying to fill or bridge the gaps in local health care delivery built from the patients' health care risks and needs in primary care. The aim initially emerged from long distances to the nearest physician (Kizer et al., 2013). Afterwards, the programs expanded to more detailed risk assessments of the patient's health, environment, and social needs as the preventive health care programs (Stirling, O'Meara, Pedler, Tourle, & Walker, 2007; Nolan et al., 2015; Patterson, Coulthard, Garberson, Wingrove, & Larson, 2016; Pearson & Shaler, 2017; Agarwal, Angeles, Pirries, Marzanek, Parascandalo, Mcleod, & Lehane, 2018).

The CPs shared the responsibility and the resources with other local health care providers or volunteers. Their *multiagency collaboration* teams include participants from home health agencies, nursing homes, EDs and fire departments (Mulholland, O'Meara, Walker, Stirling, & Tourle, 2009; O´Meara et al., 2012; Nolan et al., 2015; Patterson et al., 2016; Pearson & Shaler, 2017). Some of the CP units could transport the patient, and some Community paramedics could refer the patient directly to other health or social care providers (Choi et al., 2016, NAEMT, 2018). Thus, the collaboration has had many advantages; there have been doubts against this novel caring model and care providers. The informal and formal information was highlighted as a crucial tool to enable the program's management and lower prejudices (Mulholland et al., 2009; Choi et al., 2016; Pearson & Shaler, 2017).

By assessment, coaching and encouragement, the Community paramedics tried to find different solutions for the patient. They empowered him/her and the family to manage at home, and to avoid the stress and maybe a very short trip to the ED or rehospitalization. The *patient-centred prevention* included the assessment of the patient's physical and social needs, the risks of falls, minor treatments, and coaching on medicine administration and care instructions (O´Meara et al., 2012; Brydges, Spearen, Birze, & Tavares, 2015; NAEMT, 2018).

The reviewed articles and reports highlighted the cost-effectiveness and the patients' experiences as crucial *outcomes of programs*. The programs have managed to reduce the non-urgent emergency calls, and ambulance transportations to the EDs, and hospital attendances (Kizer et al., 2013; Choi et al., 2016; Pearson & Shaler, 2017). Only one CP program was used and created a formula for the costs of the CP model (Pearson et al., 2014). The patients highlighted the relaxing atmosphere and individual care during the Community paramedics' visits (Martin, O'Meara, &

Farmer, 2016; Dainty et al., 2018). The core components are described more detailed in Article I.

5.2 Finnish Community Paramedicine

The primary data included 450 CP patient records from three HDs. The median age of all documented CP patients was high; 78 years (range 1 to 103), and 113 patients (25.1%) had reached the age of 85. The patients were classified with the International Classification of Primary Care -2. From all data (N=450), the three most common patient groups were the patients with signs and symptoms of alcohol abuse (15.6%, n=70), the patients with general and unspecified signs and symptoms (12.4%, n=56) and the patients with chest pain (7.3%, n=33).

The CP patients varied in participating HDs. In HD1, most (60.7%, n=91) of the patients were men, and the CNPs received the most (53,0%) calls via police. In HD2, most of the calls came from the patient's home (50.7%, n=108). In HD3 had the oldest patients (48.2% over 85 years, n=53). However, in HD3, 75.3% of the CP patients remained at home after CNPs' assessment and treatment.

The CNPs provided help and patient assessment for 153 (34.0%) patients by phone, and 67.6% (n=304) of the patients (N=450) did not need transportation to the ED by ambulance. The associations between the patient's age, time of day, the contact by phone or visit, the nature of the CNPs' task, the ICPC-2 classification, and patients' remaining at home were statistically significant ($p \leq 0.05$). The characteristics of all (N=450) CNPs' call outs are shown in Appendix 2.

5.3 Factors associated with the CNPs' decision-making process

From all CP patients, 75.3% (n=339) were CP patients at home or in the elderly care homes. The CNP assessed 132 (39.2%) patients by phone, and after CNPs' assessment, 51.1% (n=68) of them could remain at home (p=0.023). The CNP documented the home care patients' position very well (96.8%, n=328), but the ABCDE approach's documentation varied. The time spent with a patient was between one minute to three hours, 49 minutes.

In the multivariable logistic regression, five statistically important factors were found to be associated with the CNP's decision-making: Hospital district, the patient's position, the Troponin-test, the consultation of physician and the nature of the task. The detailed study is described in Article II.

5.4 The Finnish CNPs' Sphere of Practice

From the CNPs' sphere of practice five themes emerged: (1) The new way of thinking, (2) The broad group of patients, (3) The way of providing care, (4) The diversity of multidisciplinary collaboration, and (5) Tailored support from the organisation.

The new way of thinking included an appropriate attitude and the need to think broader than before in ambulance unit. The CNPs felt that they have needed to change their mind-set from episodic care thinking to the navigation of a longer-term solution. Second-level thinking highlights the way to include more holistic details while assessing the patient's care needs. The interviewed CNPs emphasized that they need to use their 'marketing' skills while working closely with the other health care providers.

The broad group of patients includes new patient groups like the discharged patients from the care coordinator, the palliative care patients, the clients at the police station or in custody and care of carers and families. For example, the CNP had organised care for the spouse at home after the ambulance unit took the wife/husband to the hospital.

The way to provide care has created many roles for the CNPs as clinicians, therapists, navigators, and advocators. The luxury of time has enabled to better understand and create a holistic picture of the patients' and families' possibilities to manage at home. The CNPs indicated that while providing assessments, they can practice their former nursing skills and acquire new competencies like assessing the patient's nutrition level or providing telephone triage. Sometimes loneliness was encountered as part of the CP work. According to one participated CNP, "The disappointment is a burdensome feeling when you have to tell negative news at someone's home."

The diversity of multidisciplinary collaboration included new team members like the care coordinator from hospital, the social care workers, the staff from custody, and the personal alarm responders. The novel care model and the required collaboration can be sensitive. At the beginning of the CP model, there were rumours and suspicions of the CNPs roles which needed early intervention in all HDs. Afterwards, when the CNPs worked together with the psychiatric nurses at the patient's home, both were learning from each other.

Tailored support from the organisation included the marketing of the model, the reimbursement of the service, and the sharing of information (spoken and documented). The premarketing of the model (formal and informal) was considered an essential part to avoid the rumours and misunderstandings of a novel caring model. There was a need for development in the reimbursement of the CP services and for the shared information between primary and special

health care. The CNPs underpinned the importance of access to the patient's health records. Sometimes, the doctor's call was made because the physicians alone were able to read the patient's charts and help the CNP find the solution. The sphere of CNPs' practice is shown in Figure 4 and more detailed in Article III.

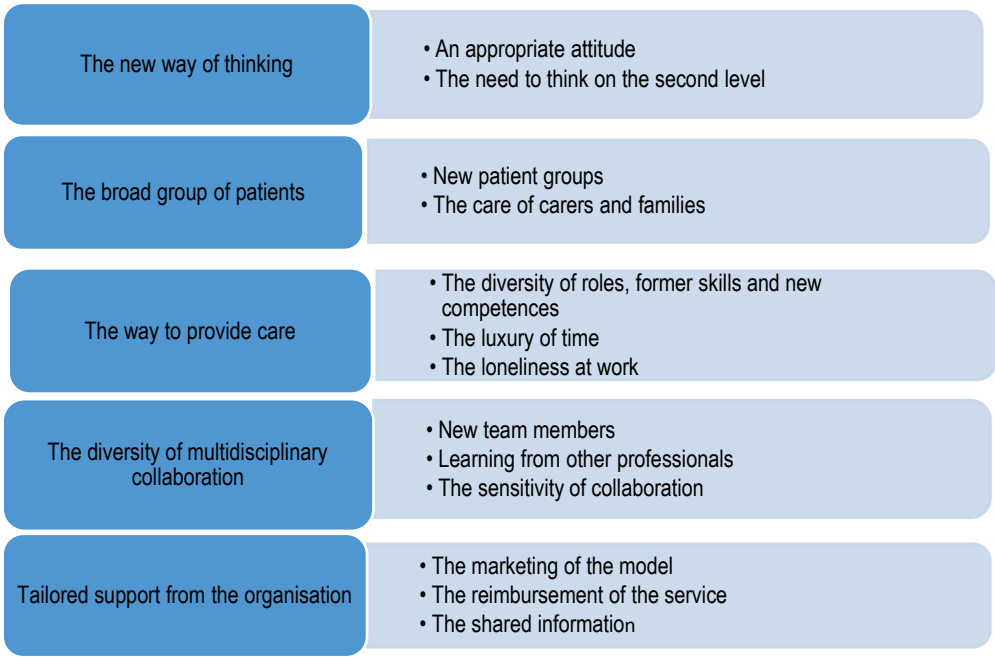

Figure 4. The Community nurse-paramedics' sphere of practice

5.5 Community Paramedicine as Integrated Care

Walker and Avant's (2014) theory derivation procedures verified that the parent model (Valentijn's Rainbow Model of Integrated Care, 2013) could provide the dimensions and structure for the CP. The main components from the parent model, tailor-made structures, population-based care, coordination of services, inter-organisational relationships, the continuum of care, pooling the skills and expertise, and shared responsibility with the patient, were analogous with the results from the

sub-studies. Table 7 lists the fundamental assumptions of the RMIC next to the researcher's derivations for CP.

Table 7. Assumptions of the Rainbow Model of Integrated care and the Adaptation of Community Paramedicine

Assumptions in Rainbow model of Integrated Care (Valentijn, 2016)	**Researcher's Derivations for CP**
Macro-level *Systemic Integration* refers to the alignment of rules and policies within a system, including population-based care.	**Community engagement** of the CP model based on the local health care needs (Phase I). The CP **reimbursement and documentation systems** inquire new forms (Phase III).
Meso-level *Organisational Integration* includes the inter-organisational relationships, the common governance mechanisms, and how it is possible to deliver comprehensive services to a defined population. *Professional Integration* includes partnerships between professionals both within (intra) and between (inter) organisations.	**Multiagency collaboration** is a core component of CP (Phase I). The cost-effectiveness of CP model is challenging (Phase I). The **co-workers varied** in HDs (Phase II). **Tailored support** from the organisation includes formal (premarketing, monitoring, feedback) and informal support (Phase III). The **multidisciplinary collaboration teams** of HD varied (Phase II) The **physician's consultation** associates with the CNPs' decision making (Phase II). The diversity of multidiscipline collaboration gives opportunities and can be sensitive (Phase III).
Micro-level *Clinical Integration* The coordination of person-focused care in a single process across time, place, and discipline. *Functional integration* Support functions and activities coordinating decision-making *Normative integration* Population-based care with shared social preconditions (mission, vision, culture, trust)	**Patient-centered preventive care** (Phase I) is one of the core components of CP. **CP patient assessment** starts with the patient's position, included minor treatments, and needed advanced diagnostic (Phase II). The provided **CP varied** in different HDs (Phase II). **Telecare (Phase II)** was an essential part of the CNPs' work. The CNP needs a new way of thinking, has a broad group of patients, and demands and deliverers when providing care (Phase III). There is a need for tools to collect **the patients' experiences** (Phase I). The shared CP **patient documentation** needs development (Phase III). **Formal and Informal meetings and interprofessional training** could be efficient tools to share the common mission and trust (Phase III)

On the macro-level, Systemic integration indicates that the political environment with rules and policies enable the effective delivery of care. The care provided aims towards the long-term solutions and care continuum for patients. Community engagement of CP (Phase I) includes the assessment of the population's care needs. For those emerging needs, the political environment with its rules and policies should enable the best care solutions. In Phase III, the interviewees saw the CP model as a positive part of the EMS services provided by society. However, the interviewees wished for more targeted focus, organisational support, a reconsidered reimbursement system, and quality management to ensure the future for CP.

On the meso-level; organisational integration highlights the collaboration between organisations**.** In the CP models of this study, organisational integration includes many health care providers and safety organisations (Phase I, Phase II, Phase III). In these researched CP models, the CNPs managed to get the patients' medical history in very different ways. The CNP could not read the patients' medical history from the primary care records or hospital care records in every HD. The concept of shared information from the standard health care plans and the sharing of care was often mentioned in the CNPs' interviews. As seen, in Phase II consultation was an essential factor of the CNPs' decision-making process.

Also, on the Meso level, professional integration in the Parent Model includes the collaboration between professionals. The CNP's closest partner in Primary health care was a home care nurse. The ambulance staff and EMS field managers gave positive feedback and underpinned the CNP's role as the flexible, advanced aid for the other ambulance units. In two HDs, the personal alarm responders are included in the CP teams, and the interviewed CNPs highlighted their essential role in the citizens' safety team. The interviewees were concerned about the marketing of the CP model in the community, to other health care providers, and inside EMS services.

On the Micro level, Clinical integration refers to the provision of care and how the care services are coordinated. Integrated care aims to change the loop from disease-oriented to patient partnership. Patient-centered preventive care (Phase I) is one of the core CP components. The interviewed CNPs underlined the need to prevent emergency events before they have chance to occur (Phase III). The interviewed CNPs highlighted the luxury of time and the possibilities for holistic in-home assessment offering the psychosocial bonding with the CP patients and their families (Phase II, Phase III).

According to Walker & Avant (2014), the concepts were modified to align with the results of this study. Table 8 describes the refined and additional components from the content of the parent model of the RMIC.

Table 8. Adaptation of the Rainbow Model of Integrated Care's Level to the Community Paramedicine

Parent Model		**Author Derivations**	
Levels of integration	**Components**	***Refined Component**	**+Added Component**
Macro-level *Systemic Integration* Rules and tools for the system	Rules, policies Tailor-made structures Processes and techniques Population-based care	*Economy *Reimbursement system *Community engagement	+ICPC-2 classification +Shared documentation +Local care need assessment + Education system
Meso-level *Organisational Integration* Information and management	Inter-organisational relationships Network-like coordination and governance Clarity about roles and responsibilities	*Management and premarketing of the model	+ Measurement tools (cost-effectiveness, quality) +Formal and informal support + Day-and-night service
Professional Integration Collective responsibility	Partnership; pooling the skills and expertise Collective responsibility The continuum of care Communication Entrepreneurial professionals	*Learn from each other *Shared information, consultation *The attitude and competencies of CP provider	+Informal and formal meetings
Micro-level *Clinical Integration* Individual empowerment with patient's care and health goals	The coordination of person-focused care Patient's definition of the need Shared responsibility with the patient	* Patient-centered prevention * Patient's and family experiences	+ Family-centered care + Holistic patient assessment + Social determinants of care +Telephone care + Advanced diagnostics
Functional Integration	Communication mechanisms and tools	*Shared information (patient, care)	
Normative Integration	Shared mission, vision, values, and behaviour	*Informal and formal meetings	

The macro level of the CP model could include community engagement, economy, and the refined reimbursement system. However, the ICPC-2 classification, the need for shared documentation, and local care need assessment could be added as novel components into the integrated model of CP. For *the meso level* of the CP model were refined the premarketing of the CP model, tailored support, and informal and formal meetings with measurement tools as added components. Family-centered care and social determinants of care offered novel components for CP as an integrated care model *at the micro-level*. All these integration levels of CP dimensions could use functional integration (IT and communication service) and normative integration (the shared culture and values). (Fig.5.)

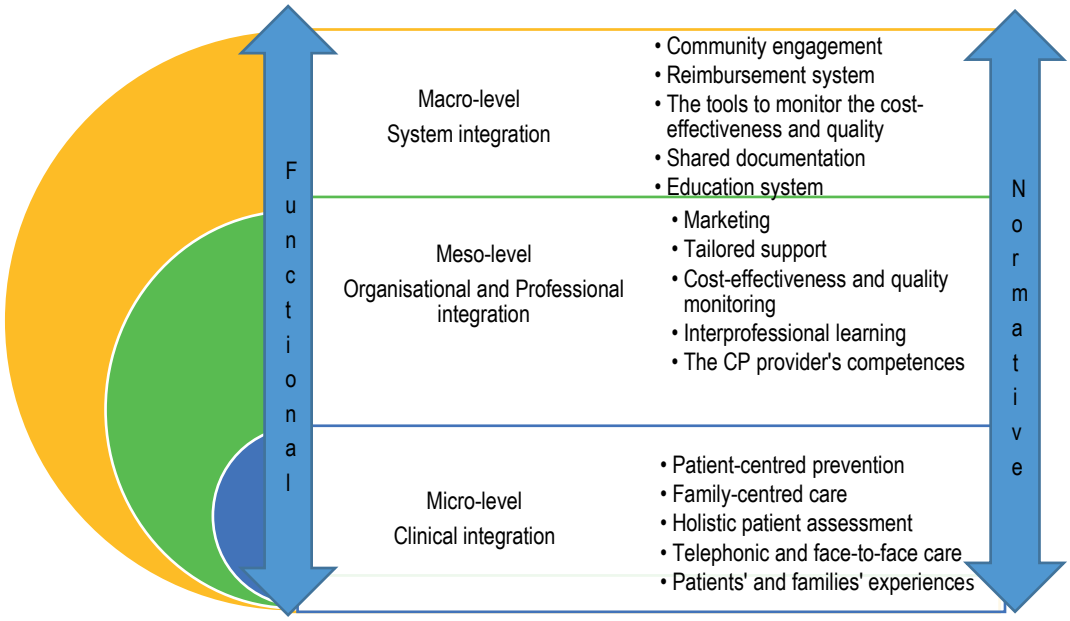

Figure 5. The Integration Levels of Community paramedicine modified from Valentijn (2013).

6 DISCUSSION

6.1 Discussion of the results

6.1.1 The core components of community paramedicine

In Finland, the CP model is a novel care model (Rasku et al., 2021a). Abroad however, CP has responded for decades to the growing demands on the healthcare system and needs to provide home-delivered non-emergency care (Pang, Litzau, Liao, Herron, Weinstein, Weaver, & Miramonti, 2019). To understand the CP model's barriers and facilitators, Phase I explored the core components of international CP.

The community-engaged CP model/program is tailored to the local population and fill or bridge the care needs maximizing the success of the CP care model. The findings of this study indicate that the CP model cannot be replicated directly from one hospital district to another. The CP programs have extended from rural and remote areas to urban areas (Ashton, Duffie, & Millar, 2017; NAEMT, 2018; Chan, Griffith, Costa, Leyenaar, & Agarwal, 2019; Gregg, Tutek, Leatherwood, Crawford, Friend, Crowther, & McKinney, 2019). It is challenging to identify the care gaps and provide the risk assessment, which create the pressure to plan and monitor the CP model or programme.

Multiagency collaboration enables the CP's network, provides the care continuum for the patient and supports the rest of the family. Consistent with other studies (Faddy, McLaughlin, Cox, & Muthuswamy, 2017; Chan et al., 2019), the collaboration of CP has expanded from multiagency into multidisciplinary collaboration. Effective collaborative care needs clear roles, responsibilities, and shared information with open communication for providers and from providers enabling coordinated care for the person, family, and community.

The CP programs either focus on a particular group of patients (for example, the frequent EMS callers or visitors in ED) or are tailored programs like CP@clinic (Chan et al., 2019; Gregg et al., 2019; Adio, Ikuma, Dunn, & Nahmens, 2020; Agarwal, Pirrie, Angeles, Marzanek, Thabane & O'Reilly, 2020). The CP programs have achieved a patient-centred holistic approach focused on improving health outcomes, supporting good life at home as *preventive patient-centred care*, consistent with

previous studies (Ashton et al., 2017; Pang et al., 2019; Agarwal et al., 2020; Martin & O'Meara, 2020; Abrashkin, Zhang, & Poku, 2021; van Vuuren, Thomas, Agarwal, MacDermott, Kinsman, O'Meara, & Spelten, 2021). For decades, the CP programs have developed towards advocate programs encouraging and coaching patients with family-centred care and assessing patients' and families' clinical, social and environmental determinants of patient's health at home (Ashton et al., 2017; Gregg et al., 2019; Abrashkin et al., 2021). CP can focus on preventative measures to find the solutions and support patients and families to manage at home as long as possible.

Cost-effectiveness and *patient's experiences* were found to be the desired outcomes of the reviewed CP programs. However, the results of this study underlined how challenging it was to demonstrate the cost-effectiveness. It has previously been measured by reductions of acute care utilization (i.e. ED visits, hospitalizations), program costs, or the results from health preventions (Bennett, Yuen, & Merrell, 2018; Gregg et al., 2019; Martin & O'Meara, 2019; Agarwal et al., 2020). Moreover, it is challenging to define the value of CP in healthcare from the perspective of efficiency consistent with the previous research (Ashton et al., 2017). The quality of care and the long-term effect of the CP providers' care decisions needs more indicators to follow, especially when in-home care means time, treatments, and hundreds of kilometres driven. The CP patients have been satisfied with the CP programs (Ashton et al., 2017; Bennett et al., 2018; Abrashkin, Poku, Ramjit, Washko, Zhang, Guttenberg, & Smith, 2019; Gregg et al., 2019; Agarwal et al., 2020; Hänninen, Kouvonen, & Sumanen, 2020). Unrushed time and discussions together with patient and family at their home could mean better conclusions and long-term care plans for the patient's safety, family's support, and cost savings to society.

6.1.2 Implementation of CP in Finland

The CP models varied in each HD, which underlined the need to assess and focus on local health care gaps and innovations. Generally, most of the patients were female but in HD1 from the documented gender 46.4% were male patients which could be explained with the number of police clients (65%, n=52). From these results, the cooperation with the police emerged a novel group of CP clients, which was not mentioned before in CP studies. The cooperation released the police patrol back to their primary duty and saved the workload in EDs and the unnecessary time of the clients to wait for a blood test taken in ED. The cooperation with the psychiatric nurses from ED enables to provide multidisciplinary care for total 36 patients which was much more than in previous study from Gregg et al. (2019),

where only two patients had a chief complaint of psychiatric problems. However, the interviewed CNPs pointed out the need of additional training for the patients with moderate-to-extreme anxiety or depression.

The Finnish CP models have offered health care for non-emergency patients with all age. In contrast, the previous international CP programmes have delivered care for a targeted group of patients (terminal patients, discharged patients, frequent ED users) (Adio et al., 2020; Agarwal et al., 2020; Abrashkin et al., 2021; Rosa, Dissanayake, Carter, & Sibbald, 2021). The broad group of Finnish CP patients challenges the CP providers, increase the need for additional training, and shed lights on demands in the way to provide care and navigate the right pathway. These findings were supported by previous studies (Kemp, Mertanen, Lääperi, Niemi-Murola. Lehtonen & Castren, 2020; Paulin, Kurola, Salanterä, Moen, Guragain, Koivisto, Käyhkö, Aaltonen, and Iirola, 2020, and Roivainen, Hoikka, Raatiniemi, Silfvast, Ala-Kokko & Kääriäinen, 2020) where suggested that the providers from the health care chain needs new competencies and the patients might require challenging alternative care paths and long-term care plans.

Telephonic care played an essential role in CNPs duties. The phone consultation duty and telephone triage reinforced the CNPs' tasks, and with that they could offer essential support to other health care providers. The importance of the telephonic communication were supported by previous researches (NAEMT, 2018; Abrashkin, Washko, Berkowitz, Poku, Zhang, & Rhodes, 2020; Abrashkin et al., 2021). The CNPs were consulted by home care nurses and assistants or by other EMS units. It may have been easier for other health care providers to consult the CNP than call direct the physician. The consultation of the physician also impacted the CNPs' decision-making. On the contrary, only 5.2% of CP programs studied by Chan et al. (2019) used phone consultation as a part of the CP service. Telephone triage and telehealth visits could be an essential part of the CP service of the future, especially in a post-pandemic landscape, increasing health care capacity (Chellappa, DeCherrie, Escobar, Gregoriou, & Munjal, 2018; Abrashkin et al., 2020; Brittain, Michel, Baranowski, Armour, Poll, & Helmer, 2020; Abrashkin et al., 2021). Furthermore, the CP providers were not trained for telephone triage (Hänninen et al., 2020) and the patient assessment by phone is challenging (Roivainen et al., 2020), which emerge the need for additional training for the CP providers.

6.1.3 Factors associated with the CNPs' decisions-making

Hospital district associated with the CNPs' decision-making processes. The local protocols and provided health care services or the origin of the call could impact on the CNPs' decision-making processes. In HD2, 51.2% of all (N=450) calls came from home, when in HD1 only 9.7% came direct from home.

The patient's position when the CNP first met the patient was documented, and it was one of the factors associated with the CNPs' decision-making processes. Those who could walk mostly needed control blood samples or medication management. Before CP, it could have met a short visit to the ED for the patient. The CP model can decrease the workload in EDs and support the patient to remain at home. More than half (58.7%) of the 339 CNPs' home care patients or patients in elderly care homes received the care and treatment they needed. The CNPs managed to provide the necessary care, and according to the previous study (Hänninen et al., 2020), only 18% of the CP patients sought retreatment in the following 96 h.

The nature of the CP task could have been only the patient assessment or combined with treatment or the CP unit was a back-up unit for other EMS unit. The CNP needs competences being able to provide assessment with minor treatment and the advanced diagnostic tests. From the provided diagnostic tests, *the troponin test* was one of the key factors associated with the CNPs' decision-making process. Internationally, all CP programs do not provide point-of-care testing (NAEMT, 2018). However, point of care testing (POCT) has been reliable, and according previous studies (Blanchard, Kozicky, Dalgarno, Simms, Goulder, Williamson, & Lazarenko, 2019; Heaney, Whiting, Petley, Fry, & Newton, 2020) some results could have stayed unnoticed. One of the barriers to POCT use have been the lack of time (Varzgaliene, Heerey, Cox, McGuinness, McGuire, Cals, & Kelly, 2017). On the contrary, time is one of the CP benefits that the CNPs pointed out, allowing them to provide POCT service and release the patient from excessive travelling for one check-up or follow-up blood test to the hospital.

When the CNP can consult a physician, it positively impacts the CNPs' decisions. On the contrary, Hänninen et al. (2020) wrote that consulting an on-call physician was not associated with the CNPs' decision if the patient remained at home or was transported to the hospital. It benefits if the consulted physician is familiar with the CP model, knows the CNPs' competencies and can enter the patient background information.

All these five factors (the hospital district, if the patient could walk, whether the troponin test was performed, a physician was consulted, and the nature of the task) associated with the CNPs' decision-making positively impact delivery of the right

care at the proper time and saving the patient from unnecessary and stressful travelling between home and hospital.

6.1.4 The CNPs' sphere of practice

For experienced health care professionals, the CP model could offer new goals and challenges. A CNP requires *an appropriate attitude and willingness to think broader* than before as a healthcare provider. Consistent with other studies (Agarwal et al., 2017; Lau, Hollander, Cushman, DuGoff, Jones, Kind, & Shah, 2018; Martin & O'Meara, 2019), the CP providers' essential competencies include interpersonal skills for the relationships with the patient, the family, and coworkers and the understanding of the social determinants of health and benefits of integrated health care. For a nurse-paramedic from the ambulance unit, who is used to an acute, episodic patient response, this *new way of thinking* can be strange and challenging.

The CP patient and the patient's support network (family members, friends) played an essential role in the CP *patients' broad group*. Family members or friends could have crucial information for the patient's care planning. Previous studies revealed that the CP assessment could include the patient and the family assessment about the patient's possibilities to manage at home (Dixon & Round, 2019; Lawless, Marshall, Mittinty, & Harvey, 2020). Into the CP patient's ABCDE-assessment approach, we could add F, reflecting Family or Friends.

Time plays an essential role in the results of this study. The luxury of unhurried time gave the CNPs possibilities for a holistic in-home assessment, including clinical assessment, medical history, medications, and social factors to identify the patient's risks of circumstances. Time with the patient was considered a cornerstone for the quality of care, and shared time built up the trust with the patient consistent with previous researches (Bennett et al., 2018; Leyenaar, Strum, Batt, Sinha, Nolan, Agarwal, Taveres, & Costa, 2019; Sanerma, Paavilainen, & Åstedt-Kurki, 2020; Xie, Yan, Agarwal, & Ferron, 2021). Additional to the clinical assessment, the patient assessment considered a home safety assessment and an adverse events risk assessment or assessment of the relationship between the patient and family members, even extending to assessment of abuse or neglect (O'Meara et al., 2016; Rosen, Lien, Stern, Bloemen, Mysliwiec, McCarthy, & Flomenbaum, 2017; Bennett et al., 2018). This study highlighted the unrushed time with the patient and family, which was also one of the motivators for CP work.

The multidisciplinary collaboration can offer the possibility to learn from and with other health and social care providers. These findings were supported by the previous studies (Lau et al., 2018; Adio et al., 2020; Keefe, Carolan, Wint, Goudreau,

Scott Cluett, & Iezzoni, 2020), where the CP providers wished more skills and competences to take care of patients, for example, with mental health problems. The CNPs in this study practiced their formerly acquired nursing skills with community nurses and studied the new skills, for example, with the laboratory technicians and the mental health nurses. The CNPs could also respond to mental health-related calls with a mental health nurse from ED. The multidisciplinary in-home assessment was considered rewarding. It included respect and shared professional acknowledgement consistent with previous studies (Faddy et al., 2017; Chellappa et al., 2018; Lau et al., 2018; Mulholland, Barnett, & Woodroffe, 2020; Reinhartz, Kearns, Haas, Landau, & Richardson, 2021). Moreover, the CNPs could adopt open communication and deconstruct boundaries. The additional training can also be a part of the marketing of the novel care model, giving correct information and decreasing rumours.

The CP patients had diverse social care needs, and the CNPs felt helpless to find the solutions for them. The CP providers meet people in the realm of the social determinants of health (the results of societal, community and family pressures positively or negatively affecting the patient's health) at the patient's home. The link with them could be the key to a holistic intervention, ensuring the patient's care continuum (Ashton et al., 2017; Bennett et al., 2018; Chan et al., 2019; Adio et al., 2020).

Deploying the CP model involves financial investment and management attention. *Tailored, formal and informal support* from the organisation (coworkers, team leaders, the employer) is needed to strengthen the CP model and the CNPs' wellbeing at work. Leadership formal and informal support, well-marketed goals, clear roles and responsibilities enable a shared understanding of the CP model aims and expectations consistent with previous research (Whalen, Goldstein, Urquhart, & Carter, 2018; Martin & O'Meara, 2020). Changing from an ambulance unit to a CP unit has challenges and advantages. According to Martin & O'Meara (2019), the work in the CP unit is not for every nurse-paramedic/nurse. It includes possibilities and challenges which have impacted the CNPs' job satisfaction, work motivation, and wellbeing. Their work can be lonely, and the feelings of powerlessness and insufficiency are familiar, challenging their social skills. However, at the same time, the CP model offers time, family-centred care and positive feedback from the patients and their families.

6.1.5 Adaptation of Community paramedicine to the model of Integrated care

CP is a multifaceted phenomenon depending on population and environmental factors, improving patients' health across economic and geographic disparities. Figure 5 (p.50) shows the integrated care model of CP.

Systemic integration offers rules and structure for the CP model. It requires the local care need assessment to achieve community engagement. The rules and tools enable population-based care, and the moderated reimbursement policy of CP services could include the travel distance and the time spent with the provided treatments. These, and the national documentation system, could enable integration of patients' health, and social care needs consistent with previous research (Bäck & Calltorp, 2015; Angus & Valentijn, 2018; Bennett et al., 2018; Thurman, Moczygemba, Tormey, Hudzik, Welton-Arndt, & Okoh, 2021). The CP model's economics and leadership can be challenging if it is not clear, carefully planned, and does not have a long-term vision. The CP quality management integrates the commitment of the macro-level integration.

Organisational integration concentrates on the pooled skills and coordinates services between different organisations and could have challenges with shared information. The Finnish CP model is an excellent example of navigating between primary, secondary, and tertiary health care, social care net and security organisations. The integrated care pathways and referral care (Mériade & Rochette, 2020; Brown & Menec, 2021) both require and offer seamless and open-minded cooperation between organisations and professionals. The CP model delivers care across the community navigating the patient pathway within a geographical territory, not an institution, as consistent with other studies (Bäck & Calltorp, 2015; Mériade & Rochette, 2020). The organisational coordination activities have been positively associated with health-related quality of life in a primary care context (Valentijn, Kerkhoven, Heideman, & Arends, 2021). One tool for the CNPs' could be the referral system around the local health and social care services with the patient's socio-economic constraints, aiming to increase the safety and quality of patient care.

Professional integration contributes clarity to the roles and responsibilities of the broad CP network. The formal and informal meetings and interprofessional training offer possibilities to share correct information and diminish rumours consistent with previous research (O'Meara et al., 2015; Auschra, 2018; Mulholland et al., 2020; Minderhout, Baksteen, Numans, Bruijnzeels, & Vos, 2021). Sometimes urgency to cooperate, like during the COVID-19 pandemic, is the best catalyst to provide the shared and best patient care (Minderhout et al., 2021). The implementation of a novel care model includes barriers and facilitators, including providers' willingness.

Patient-centred preventive care, one of the CP core components, describes best the focus of CP *clinical integration*. The holistic assessment and the luxury of unrushed time with the patient and the family were highlighted as essential for the right decisions and one of the CNPs' works benefits. The CP model could offer people-centred care, supporting the patient's self-care possibilities to achieve their own care goals. The patient's participation has helped to understand the patient's self-care possibilities and the family's support needs consistent with previous research (Abrashkin et al., 2020; Crocker, Kelly, Harlock, Fitzpatrick, & Peters, 2020; Lawless et al., 2020). The CNPs' unique position to visit the patient's home and see the natural world around the patient provides the CP model with an essential advantage to create a feasible patient care continuum.

The Rainbow Model of Integrated Care Measurement Tool (RMIC-MT) has been developed for healthcare professionals and patients to evaluate the psychometric properties of integrated care (Valentijn, Pereira, Sterner, Vrijhoef, Ruwaard, Hegbrant, & Strippoli, 2019). The psychometric properties of the RMIC-MT has been evaluated and the tool has good validity and reliability (Valentijn, Angus, Boesveld, Nurjono, Ruwaard, & Vrijhoef, 2017; Fares, Chung, Passey, Longman, & Valentijn, 2019; Huang, Zhu, Chen, Wang, & Valentijn, 2020; Wang, Birch, Chen, Huang, & Valentijn, 2021). The RMIC-MT could be useful for the further research after providing a comprehensive theoretical framework for CP.

According to Goodwin et al. (2017), the RMIC is more process than a patient-centred model. In this study, the adaptation of CP to the parent model offered the required structure and knowledge of necessary elements for future of the CP model as an integrated care model in primary health care.

6.2 Trustworthiness of research

Trustworthiness of the Phase I

A rigorous literature review uses a transparent and systematic process to search for appropriate studies. The purpose of the review for phase I was to clarify the core components of CP. A scoping review is recommended when an area is complex or has not been reviewed comprehensively before (Arksey & O'Malley, 2005; Armstrong et al., 2011).

The strength of this literature review was that it systematically followed the protocol from Arksey and O'Malley (2005). The research question was established (1), the appropriate studies were identified with clear inclusion criteria (2), the study

selection was conducted (3), the data charted (4), and the results were collated, summarised, and reported (5). The inclusion criteria and the process are described in Article I.

Arksey & O´Malley (2005) recommend that, to confirm the scoping review's trustworthiness, expert consultation occurs. Consultation included two EMS field managers and an EMS researcher who confirmed that the process apprehended all notable peer-reviewed studies related to CP. Furthermore, two researchers reviewed the selected articles to comprehensively identify all articles. From the chosen 21 articles, most were from the United States of America, where CP has its roots. This non-emergency EMS healthcare model varies in different countries. The inclusion criteria considered only English language articles, which could mean that some essential non-English articles were not used. The articles reviewed and the flow of analysis are described in Article I.

Trustworthiness of the Phase II

Phase II was a retrospective review of 450 CNP's patient records. Research data collected from records is economic, and the data collection could be done without impacting patients (Polit & Beck, 2012).

Valid content was obtained from three sources: the literature, representatives of the relevant population, and content experts (DeVon, Block, Moyle-Wright, Ernst, Hayden, Lazzara, & Kostas-Polston, 2007). The patient charts abstraction form was built to reduce data collection errors (Matt & Matthew, 2013). The form was collated from the previous EMS documentation research results and Finnish national EMS document (SV210), providing content validity. An expert panel (two CP model team leaders, two EMS educators, and one Information Technology (IT) operator) were consulted to assess that the form was appropriate and accurate (Grove, 2017).

The pilot test of 10 CNPs' patient charts (not included in the data) was reviewed by two CP model team leaders to determine inter-rater reliability. After the pilot test, variables; origin of the call, age, and scene time were redefined. The biostatistician reviewed all statistical tests and the results. The data, analysis, and results were described using appropriate tables.

A particular strength of this study was that the data were collected from three HDs. The convenience sampling method was used because the CP-models have started at different times. The data were collected manually by one researcher and an IT professional from each HD. All information was input directly into the excel platform to minimize the number of absent, unclear, or mistranscribed entries (Worster, 2004). Original documents were handled only inside the organisations.

A weakness of record reviews has been the inability to provide reproducible and valid data. With a retrospective study, the amount of missing information can lead to nonresponse bias. The acceptance depends, for example, on the study question, the type of variable, and the impact on the results. (Worster, 2004.) It was considered that the patient reports were not written initially for research purposes, and therefore there could be a lack of quality.

The study questions considered the implementation of CP and the factors associated with the CNPs' decision-making process. One third (33%) of the missing data (patient's age or gender) were from the telephone triage. One reason could be that the CNP forwarded the call to the ambulance unit, and the ambulance staff documented the information to the patient chart, or the documentation of the telephone triage was not considered as a part of healthcare delivery as it is. However, the participants of this study are from three different HDs from different parts of Finland, and there is a need to consider cultural and societal differences when generalizing results nationally or internationally.

Trustworthiness of the Phase III

The trustworthiness of the qualitative research can be regarded through dependability, confirmability, authenticity, transferability and credibility (Holloway & Galvin, 2017a). The *dependable* findings of this study are consistent and accurate. The adequacy of the decision process, analysis, and conclusions through the study context descriptions are described in Article III.

In the *confirmable* research, the conclusions are not only the researcher's assumptions or preconceptions, and to reach credibility, the researcher must be aware not to give a situation the 'truth' of the findings (Holloway & Galvin, 2017b). The CNPs were freely told their thoughts and feelings. There were no formal interview sessions; thus, the stories and opinions were discussed while driving to the next patient or during the lunch breaks. The field notes and CNPs' opinions and stories were transcribed immediately after the work shift. Member checking was done during the next work shift or by email to respond to the data's interpretation (Holloway & Galvin, 2017a). Many authentic quotes ensured *confirmability*. The data were examined with co-researchers, benefitting by keeping a distance to the material. The reliability and conceptualisation of the data were ensured by returning several times to the original text. After coding and transforming the data, the created sub-, general- and main categories linked with each other and generated recognizable patterns (Holloway & Galvin, 2017c). The themes were discussed with the research team to strengthen the credibility of the study.

By using representative citations, the *authenticity* of the findings was supported. The participants were observed for the ontological authenticity during their work shifts enabling the long discussions. It is possible that during the research time, the CNPs decision-making was enhanced (catalytic authenticity), and this research can empower them (tactical authenticity) to understand their world. (Holloway & Galvin, 2017a.) During the process, while writing the field diary, the researcher could reflect on her own preconceptions and monitor reactions to participants' actions. The findings of this research were partly similar in each of the HDs, which allows the *transferability* of this research. Even with similar situations or participants, one locally designed CP model cannot be directly transferred to another. However, certain concepts originally developed by this study may be carried out in another context.

The Hawthorn effect *(*participants change their actions because they know that the researcher is observing them) can threaten the research's validity (Sutherland, 2017). The acceptance and trust of CNPs were gained by discussing their work and career informally. It was essential to convince them that the researcher was interested in their experiences and thoughts. The work shifts were long (10-12 hours) but full of exciting stories, hundreds of kilometers, and many feelings. The summer of 2019 and those 317 hours with CNPs provided prolonged engagement and helped to raise awareness of the context and gain insight into the setting, thus gaining and improving the trustworthiness of the research (Holloway & Galvin, 2017a).

To achieve *credibility* for the research, the participants must have experiences of the study phenomenon (Graneheim et al., 2017). All CNPs have worked more than five years as emergency or prehospital nurses or paramedics and from the beginning of the local CP model. The pages of field notes, observations, and interviews made an enormous pile of material. The richness of data offers an accurate basis for this research. The 317 hours of participant observation is the strength of this study. It would not be possible to capture the deep and colourful data and understanding from the CNPs' world using another method.

Trustworthiness of the Phase IV

The study aimed to describe how CP adapts to the parent model, the Rainbow Model of Integrated Care (Valentijn, 2013). The new model offers the necessary structure for the process of CP when developing a novel model for health care services.

Theory derivation started from noticing that Valentijn's RMIC (2013) has the same components as those included in the results from the Phases I-III of this study (Walker & Avant, 2005). The RMIC (Valentijn, 2013) was identified as a parent theory. The researcher has considered, inter alia; Boundary Theory, that O'Meara

(2016) has applied to explain the operation and dynamic of CP program or Complex Adaptive system- theory (used by Nugus, Carroll, Hewett, Short, Forero, & Braithwaite, 2010) to analyse integrated care in the ED. Neither of those gave the needed and broad structure for the process of fragmented CP.

The procedures for theory derivation were followed carefully, and it challenged the researcher's creativity to see analogies and modify them. However, at the same time, it offered the prediction of CP as a healthcare process in primary health care. The limit could be that some critical literature on the RMIC is missing. The dissimilarities or dis-analogies between the RMIC and CP could be the theme for further research. The RMIC (Valentijn, 2013) gives the structure and elements for CP concepts and results. In the chapter on Results, the essential concepts of the CP are combined with the levels of the RMIC.

This derived model is constructed" in the context of discovery" (Walker & Avant, 2014) and it needs the empirical testing to explore whether the new concepts and statements mirror reality in CP.

6.3 Ethical considerations

The ethical issues were addressed throughout the selection of the research subject, the study process and reliable reporting of the results (Varantola, Launis, Helin, Spoof & Jäppinen, 2012). All phases of this study were carried out according to the guidelines of the Declaration of Helsinki (WMA, 2018), and following good scientific practice (TENK, 2013). This study has community nurse-paramedics as key informants. The approval for the study was received from the ethics committee of the Tampere University Hospital (R19008H). The research committee and the medical directors of the three participating Hospital Districts gave permissions and approved the use of their electronic patient records.

In previous studies, CP has potentially reduced ED visits among primary care patients using the existing paramedic resources (Andrews, Duren, & Myers, 2014; NAEMT, 2018; Agarwal et al., 2020). Due to the short history of CP in Finland, Phase I was a scoping review from international literature. Phase II provided more specific information about the implementation of CP in Finland. Of the patient's personal information only the year of birth and gender were collected to protect the patient's anonymity. The data were coded with numbers, and the original information stayed in the HDs' register.

For phase III, the CNPs received information about the study, including their right to withdraw from participation or deny the observation at any time (Varantola et al., 2012; Holloway & Galvin, 2017b). Each participating CNPs signed informed

consent. Research information was placed on the noticeboards. On the first day, the CNP introduced the researcher to the rest of the staff. The CNP informed the patient and asked for permission for the researcher to join the situation. The patient and the family were informed that they could decline the researcher's presence at any time, and it would not affect the care. According to Kuula (2011), verbal agreements are adequate when the representative has been informed about the research and the data is anonymised. The research considered the CNPs' actions and not patients' actions. No patient or client and none of the CNPs denied the researcher's attendance. On the contrary, some of the CNPs asked the researcher to stay longer than was planned. Participants were interviewed during observations shifts. After every work shift, the field notes and interviews were transcribed and made anonymous.

During the process, the acquired data from patient records, transcribed data from field notes and interviews, and the consent forms were stored in a locked place and in a personal memory stick as password-protected files to ensure confidentiality. The data stayed in a personal locked place and was used with the personal password-protected computer. All quotes were written so that the original informant cannot be recognised. The participants and EMS services/hospital districts involved in the study remain anonymous for confidentiality. The results of the research have been reported openly and honestly. The research data will be stored 10 years after the study (Data Management Guide, 2021).

6.4 Implications for practice and further research

These dissertation study results have several implications for practice.

For Community nurse-paramedics (CNPs):

1. The choice to work as a CNP needs to be voluntary.

2. The CNPs' varied roles increase their current competencies. Additional training is needed to undertake patient assessment by phone and collaborate in a multidisciplinary team and with other stakeholders.

For EMS team-leaders and employers:

3. Their informal and formal support encourage and engage the CNPs in their independent work.

4. The goals and objectives of the CP model need to be informed and openly discussed with all stakeholders before the model starts.

For the consulted physician:

5. The consulted physician is an essential member of the CP team and needs to be informed of the aim of the CP model and the CNPs' competencies and responsibilities.

For educators:

6. The learning of multidisciplinary collaboration should start from the beginning of social and health care studies.

7. The holistic patient assessment and assessment by phone should be part of additional training.

8. The CP patient assessment with ABCDE-approach should include F, meaning Family, Friends or Future.

For managers and policymakers:

9. CP model aims to fill the gap between heavily loaded primary and special health care and the lack of staff in primary care. The shared information and adequate reimbursement system are enabling factors associated with the future of the CP model.

10. There is a need for appropriate metrics to measure the impact of CP to reinforce its future worth.

This dissertation study results offer several implications for further research.

Integrated care promotes the development of people-centred primary care. More research is needed to explore the CP patients and their families' experiences of CP care and the CNPs' care planning.

The usefulness of the ABCDE approach added with F (meaning Family, Friends or Future) needs additional research. The analysing of this part of the patient assessment offers the needed social and environmental tool for the CP patient's future and care continuum.

This study showed a series of coordinated activities among CNPs that aim to achieve continuity of patient's care and address the complex needs of CP patients. More comprehensive studies of the other members of the CP network are needed within and across hospital districts and countries. Additional research should study the health and social care providers possibilities to unite their resources and implement the CP referral system in and between health and social care services. Qualitative studies would help clarify the risks and protective factors of the cooperation between health and social professionals around the CP patient.

The developed model, "Integrated care model of CP", should be tested in different empirical settings. Both quantitative and qualitative approaches could be used to examine the theoretical model of the integrated CP. CP could bridge the gap between health and social care in the future, which needs the transformation from multiple separate entities to a collectivist mechanism. The RMIC offered help to conceptualise the different domains of CP into a unified, integrated care model. Additional research is needed to evaluate integrated care from CP coworkers, patients, and their families' perspectives. The RMIC measurement tool (Fares et al., 2019) could be one instrument among other measurement tools to monitor the effectiveness of CP.

7 CONCLUSIONS

The following conclusions can be drawn from the results of this study:

Firstly, knowing the core components of international Community Paramedicine (CP) (community engagement, multiagency collaboration, patient-centred prevention, and outcomes of the programme: cost-effectiveness and patients' experiences) may allow for more efficient and cost-effective implementation of a novel care model in Primary health care.

Secondly, the Finnish CP models have been effective, created local models and have multidiscipline networks considering, for example, home care assistants, specialised nurses, police, care coordinators, discharge nurses, and personal alarm responders. Two out of three (67.6%, n=304) of all CP patients (N=450) received the needed care and treatment at home and did not need transportation to the ED. The Community nurse-paramedics' (CNP) additional education could include training for patient assessment by telephone and referral documentation because a prominent part of the CNPs' work included telephonic care and consultations.

Thirdly, the hospital district, the patient's position, the Troponin test, consulting a physician, and the CP task's nature were the independent factors associated with the CNPs' decision-making. Understanding these factors increases care safety, provides a more extended care continuum for the patient, and contributes to delivering the CP model and the CNPs' competencies.

Fourthly, the Finnish CNPs experienced that the CNP should have an appropriate attitude and the willingness to think broader than before. The luxury of time allowed the CNP to concentrate on the patient and the family. Although the independent work can be lonesome, the independence of the work was one of the facilitators. Formal and informal support from the team members and organisation is an essential part of the CNPs' wellbeing at work. Multidisciplinary collaboration is an essential part of the CNPs' work, and it enables them to learn from other health and social care providers or practice the previously learned skills.

Finally, the Rainbow Model of Integrated Care (RMIC) offered the structure for the CP's fragmented nature within the system, organisational, professional, and clinical integration. The created CP model includes either refined components from RMIC or additional components emerged from the results (phases I-III) of this study. System integration includes tools for quality management of the CP model. With the CP model's organisational integration dimensions, the care model could

provide seamless, coordinated services and pooled skills with open-minded cooperation. In the future, the referral system of CP could proactively help find a holistic care continuum for patients and their families in health and social care. Professional integration as multidisciplinary and interprofessional training, regular informal or formal meetings can clarify the CNPs' roles and responsibilities. It helps avoid negative rumours, decrease the barriers, and confirm the active interface between CP and allied patient care providers. Furthermore, the results of this study contribute the knowledge base of community paramedicine research field. The results also provide knowledge of necessary elements for the future of the CP model as an integrated care model in Primary health care.

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APPENDIX

Appendix 1 Summary of the literature search

Primary Health Care (N=18)

Author(s), (year), country	Purpose	Sample	Study design	Main results
Starfield (2011), USA	To clarify is patient-centered care the same as person-focused care	N=57	Literature review	Person-focused care is based on accumulated knowledge of people (health problems and needs, focusing on the whole person). Patient-centered care generally refers to interactions in visits, the management of diseases and uses coding system. Person-focused care requires the response to patient's problems as they experience them, not only as professionals define them.
Valentijn et al. (2013), The Netherlands	A conceptual framework to understand the complexity of integrated care	N=50 articles	A narrative literature review, group meetings and expert panels	The dimensions of integrated care: the micro (clinical integration), meso (professional and organizational integration) and macro (system integration) level which relate to functional and normative integration.
Brown et al. (2015), Canada	To assess teamwork in Primary Care	N=19 Family Health Teams	Mixed method; two quantitative and one qualitative phase	Leadership was pivotal in forging a common philosophy and encouraging team collaboration.
Pratt et al. (2015), USA	To examine the impact of an assessment tool for a complex patient population	1) n=10 nurses 2) n=6 staff nurses, 18 patients	1) Mixed methods prospective cohort study, 2) a qualitative exploratory study	The Patient Centered Assessment Method (PCAM) - helped nurses address psychological and social domains of patients' lives and was highly relevant for use with multimorbidity patients.

Appendix 1 (Continued)

Author(s), (year), country	Purpose	Sample	Study design	Main results
Valentijn et al. (2015), The Netherlands	To refine taxonomy for Rainbow Model of Integrated Care	1) N=79 2) n=24	1) A literature review, 2) A Delphi study	39 appropriate features for achieving integrated care in a primary care setting (seven clinical, six professional, eight organizational, one system (stakeholder management), three functional and nine normative). Integrated service delivery was considered as a ´back-stage´ process for the benefit of clients and patients.
Reiss-Brennan et al. (2016), USA	To assess quality, hospital utilization, and cost outcomes associated with receipt of primary care in team-based care practices	N=113 452 patients	A retrospective, longitudinal, cohort study	Some measures of quality of care were with high rates, some measures of acute care with lower rates, and the delivery system received lower actual payments.
Tortajada et al. (2017), Spain	To evaluate an integrated case management intervention set up	N=714 adult patients	A retrospective cohort study	a significant decrease in the number of ED visits, unplanned hospitalizations, length of stay and an expected increase in the home care hospital-based episodes.
Additional literature related to Primary Health Care				
Starfield & Shi (2002), USA	To determine the robustness of the determinants of health	N= 13 industrialized countries	Review from the characterization of countries primary care	Health is influenced by primary care and by appropriate referral care. A strong primary care orientation within health services systems continues to exert a positive effect. High cost may be a result of more unnecessary specialist care. The stronger the primary care, the lower the costs.
Muldoon et al. (2006), Canada	To explain the difference of Primary Care and Primary Health Care	N=5 of Primary Health Care N=5 of Primary Health	Definition's review	Primary Care describes a narrower concept of "family doctor-type" services delivered to individuals. Primary Health Care describes an approach to health policy and service provision that includes both services delivered to individuals and population-level "public health-type" functions.
WHO (1978)	Report:Declaration of Alma Ata			
Kringos et al. (2015)	Report: Kringos et al. (2015), Building primary care in a changing Europe. European Observatory on Health Sytems and Policies.			
Berchet & Nader (2016)	Report: The organisation of out-of-hours primary care in OECD countries.			

Appendix 1 (Continued)

WHO (2018)	Report: A vision for primary health care in the 21st century: towards universal health coverage and the Sustainable Development Goals.

Emergency Medical Service (N=14)

Author(s), year, country	Purpose	Sample	Study design	Main results
Hoyle et al. (2012), New Zealand	First Extended care paramedic model	N= 1000 patients	Quantitative approach, a retrospective analysis of the ECPs' patients' health records	59% of the patients was treated either at home or in the local community, 5% (n=31) had an acute ED presentation within 7 days
Jensen et al. (2014), Canada	The extended-care paramedics assessment and care on site to long-term care residents	N=21	Qualitative approach; semi-structured interviews	the key themes of the results: 1)program implementation, 2) Extended-care paramedic's process of care 3)communications, 4) End-of-life care
Magnusson et al. (2016), Sweden	To describe a nurse-manned single responders' patient characteristics and assessment level	N=529	Quantitative approach Retrospective review of patient charts	A relatively high level of patient safety and the usefulness of a single responder unit among patients assessed by the dispatcher as low priority. 62% (n=329) attended into the hospital but 32.8% (n=108) of those patients needed the transportation by ambulance.
Lee et al. (2016), Canada	To derive and test the reliability of a clinical prediction rule to identify high-risk older adults	N=764	Intervention study	Inter-observer reliability was good or excellent for 40/43 questions. Four-item rule was derived: 1)Problems in the home contributing to adverse outcomes? 2) Called 911 in the last 30 days? 3) male and 4) lacks social support.

Additional literature related to Emergency Medical Services

Ball, (2005) United Kingdom	To identify paramedic practice in primary care	N=1	Case study	The key is the partnership and the developing alternative points of health service access for those who do not need require a specialist response.
Woollard (2006), United Kingdom	To analyse the novel programs for paramedics	N=4	Content analysis	The successful development and implementation of the advanced paramedic practitioner role requires professional leadership, standardisation of competencies, education, and titles, and a move from vocational training to education in higher education institutions.

Appendix 1 (Continued)

Author(s), year, country	Purpose	Sample	Study design	Main results
Halter et al. (2007) United Kingdom	To evaluate the care provided to patients receiving out-of-hours home visits from ECPs	n=174	A patient survey	All but one reported that they felt that their treatment had been 'right' and/or had followed any advice given and 86.4% reported that they had been clear about their ECP's assessment. Only 58.0% reported that their health was now 'better'
Martin-Misener et al. (2009), Canada	To describe and evaluate the impact of the model of care	N=50 (with a complete data set after 3-years)	Mixed method study; structured questionnaires, interviews	The healthcare costs decreased, access increased, the acceptance and satisfaction were on high level, the collaboration among care providers was effective.
Dick (2003), USA	Anglo-American vs. Franco-Germany emergency medical services system.			
Pozner et al. (2004),USA	An overview of EMS in the United States of America			
Kurola et al. (2016), Finland	Report: National survey on the operation of the Finnish Emergency Medical Service (EMS) system			
Edgerly (2013), USA	The History of the Paramedic			
Nolan (2015),U USA	Report: Paramedic Referral Toolkit			
Tampere University, Finland (2021)	Degree programme in emergency care.			
Community paramedicine (N=11)				
Kizer (2013), USA	To assess the feasibility of developing CP programs	(1) n=3 (2) n=3 N=37 stakeholders	Program reviews Interviews	The CP programs could be divided (1) Prehospital (HOME-team,, Refer or release, frequent 911 callers or visitors to ED) –programs or (2) Post-Hospital or Community health services (discharged patients, support for chronical ill patients, preventive care)

Appendix 1 (Continued)

Author(s), year, country	Purpose	Sample	Study design	Main results
Bigham et al. (2013), Canada	To describe existing CP programs	N=11	Systematic review	There is no consensus what Community paramedic should do
Heinelt et al. (2015), Canada	The efficient of CPs' frequent patient contacts and real-time correspondence preventing patients' emergencies	Case study	Intervention study	Community Paramedics with the physician via real-time electronic medical record could provide care avoiding emergency, unnecessary financial expenditure, or patient's health degeneration.
O¨Meara et al. (2015), Australia	To identify the nature of the relationship between public engagement and the successful integration of a CP program	N= three focus groups (10-20 participants), 34 interviews,	Qualitative approach. an observational, ethnographic research	The CP model (Aging at home -program, paramedic wellness clinics, ad hoc home visiting program and Community paramedic response unit program) facilitated integration between paramedic services and health, aged and social services.
Brydges et al. (2016), Canada	Patients' experiences of CHAP-EMS program	N = 15	Observation + Interviews	Three themes emerged: 1) The CP program was individualized, caring and trusty. 2)Paramedics dual identities: advocate and emergency experts 3) Paramedic's "emergency" role remained important
Choi et al. (2016), USA	The history of MIH-CP	N=36	Literature review	Three main categories: history, outcomes of MIH-CP and training for providers. In 2014 the term "community paramedic" was updated to "community paramedicine provider" because all providers were not paramedics, patient satisfaction score of 4.9/5.
O'Meara et al. (2016), Australia	To identify and analyse how CPs create and maintain new role boundaries		An observational ethnographic case study	A model of care following the mnemonic RESPIGHT: Response to emergencies, engaging with communities; Situated practice; Primary health care, Integration with health, aged care, and social services; Governance and leadership; Higher education; Treatment and transport options.
Ruest et al. (2017), Canada	To describe the impact of CHECUPS program	N=222	Case study	Community Health Evaluations completed using paramedic service (CHECUPS) impact: 24% reduction in 911 activations, 20% reduction in repeat ED visits, 55% decrease hospitalized patients after ED visit.

Appendix 1 (Continued)

Author(s), year, country	Purpose	Sample	Study design	Main results
Agarwal et al. (2017), Canada	To describe the impact of the CHAP-EMS program	N=79	Intervention study + Survey	The Community Health Assessment Program through EMS (CHAP-EMS) has impact on participants blood pressure, lifestyle factors, diabetes risk and EMS calls.
Additional literature related to Community paramedicine				
Mason et al. (2003), United Kingdom	The development plan for a community paramedic practitioner intermediate care support scheme for older people with minor conditions			
Hauswald et al. (2005), USA	To identify paramedic practice in primary care	N= 3345 patient visits	Case study; a review of the records and a survey from 73 residents	One well-documented CP program; 1992 New Mexico, Red River the first, 78 approved protocols, a 980-hour training program. One paramedic left 1997; Program closed 2000.
Integrated Care (N=22)				
Curry & Ham (2010), United Kingdom	To summaries relevant high-profile integrated systems from macro-, meso- and micro-levels	N=19	Program review	The report includes suggestions for clinically integrated systems
Ling et al. (2012), United Kingdom	To identify barriers and facilitators to successful integration of care	N=213	The mixed methods evaluation; interviews and semi-structured questionnaires	Barriers and facilitators related to leadership, organizational culture, information technology, physician involvement, and availability of resources. Leaders' personal relationships between organisations, governance and finance arrangements, the scale of planned activities, support for staff in new roles and stability appeared important for delivering integrated care.
Roland et al. (2012), United Kingdom	To evaluate six integrated care pilots for elderly patients at risk	N=3646 patients and 17,311 controls	Quantitative approach	Emergency admissions increased 9%, patients had a care plan but wished better ability to see a familiar doctor or nurse.

Appendix 1 (Continued)

Author(s), year, country	Purpose	Sample	Study design	Main results
Busse & Stahl (2014), Germany	To exam one care coordination from three countries	N=3	Review	Any care coordination pilot should have a well-designed evaluation to help others learn from experiences. The program targeted 50% of the population in specific area.
Ludecke (2014), Germany	To investigate the control mechanism of collaborative network in the context of integrated care partnerships	N=17	Qualitative approach with interviews	The structure of partnership included patient-centered, economic, and collaborative perspectives underscoring the professional autonomy with reliability and informality.
Nurjono et al. (2016), Singapore	To describe the methodology of the validation process of the RMIC- measurement tool	in Singapore Regional Health System context	Quantitative in two phases	If the measure is valid, the study provides opportunities to measure integrated care within Health System.
Mulvale et al. (2016), Canada	To demonstrate as association between suggested factors and collaborative processes in care team	N=9	Systematic review	Eighteen factors associated with collaboration in primary care. The conceptual model has 13 factors for care teams' decision-making (formal and social processes, team attitudes and structure). Fewer factors were identified for policy, organizational or individual level.
van Rensburg et al. (2016), Belgium	To explore the nature and strategic forms of integrated mental health care	N=5	Review of health policies	The absence of supporting strategies could bar implementation. Lack of normative integration dimensions could be a key omission. RMIC failed to frame regional governance aspects of integration, but it could help to coordinate and support the development of better mental health systems.
Boesveld et al. (2017), the Netherlands	To classify birth centres similar characteristics based on integration profiles	From 23 birth centres n=61 n=69	Mixed methods a survey and interviews	Birth centres were classified mono- or multi-disciplinary-oriented birth centres or mixed cluster of birth centres.
Low et al. (2017), Singapore	To compare special home care team and usual care	N=1, 166 discharged patients	Intervention study	A statistically significant reduction in 30-day readmissions and ED visits

Appendix 1 (Continued)

Author(s), year, country	Purpose	Sample	Study design	Main results
Kuluski (2017), Canada	To investigate key care components to support complex patients and their families in the community	N= 24 care provider	Mixed method: patients' interviews, and two panel sessions with care providers	Support care categories: authentic relationships as the foundation of care, workarounds for desired care; broadening the membership of the care team, communicating across sectors, co-locating health, and social care, address the barriers preventing providers from engaging in these required practices
Briggs et al. (2018), Switzerland & The Netherlands	To identify and describe the key elements of integrated care models for elderly people	N=15	Review of reviews	Multidisciplinary teams, comprehensive assessment, and case management; focusing on micro clinical care integration processes, a lack of the meso organizational and macro system-level care integration strategies
Additional literature related to Integrated Care				
Armitage et al. (2009), Canada	To inform about the planning and implementing of integrated healthcare system	N= 22 articles + 120 documents	Systematic literature review	Integrated health system needs to fit the needs of the population across the continuum of care, not one-size-fits-all integration solution
Leutz (1999), USA	Discussion paper; Five Laws for Integrating Medical and Social Services: Lessons from the United States and the United Kingdom			
Kodner & Spreeuwenberg (2002), USA	Discussion paper: to explore the intellectual territory of integrated care and underscore the need for a patient-centric imperative and meaning. Integrated care is a burgeoning field.			
Leutz (2005), USA	Reflections on Integrating Medical and Social Care: Five Laws revisited.			
Lewis (2010), United Kingdom	Report: What next for integrated care organizations in the English NHS?			

Appendix 1 (Continued)

Shaw et al. (2011), United Kingdom	Report: What is integrated care? An overview of integrated care in the NHS. Perspectives on integration and integrated care.
Goodwin (2013) United Kingdom	Editorial: Understanding integrated care: a complex process, a fundamental principle
WHO (2015)	Report: WHO global strategy on integrated people-centered health services 2016-2026
Hujala et al. (2017), The Netherlands	Policy brief 26/ Report: How to support integration to promote care for people with multimorbidity in Europe? On behalf of the ICARE4EU consortium. Integrated care can offer ideas to coordinate or customize care from "disease oriented" systems organized around single medical specialties. Policymakers need to know that primary care must have full cooperation of specialized care, connections between health and social care are key, holistic approach includes formal and informal care. A culture and development of information to keep new initiatives as part of regular care provide continuum. Integrated care needs tailoring, support and commitment from management, training in collaboration and evaluation.
Goodwin et al. (2017), United Kingdom	What is integrated care? Amlung, V. Stein, N. Goodwin, R. Balicer, E. Nolte & E. Suter (Eds.), Handbook integrated care. pp.3-24.

Appendix 2 Demographic characteristics of the 450 CP call outs

Characteristic	Total % (n)	HD1 % (n)	HD2 % (n)	HD3 % (n)	*p*
Gender					<0.001
female	39.1 (176)	30.1 (53)	23.3 (41)	46.6 **(82)**	
male	43.6 (196)	46.4 **(91)**	18.9 (37)	34.7 (68)	
not documented	17.3 (78)	7.7 (6)	92.3 (72)	0.0 (0)	
Age					<0.001
≤ 24 years	5.1 (23)	**91.2 (21)**	4.4 (1)	4.4 (1)	
25-64 years	15.3 (69)	66.7 (46)	1.4 (1)	31.9 (22)	
65-74 years	15.1 (68)	33.8(23)	32.4 (22)	33.8 (23)	
75-84 years	19.8 (89)	29.1 (26)	14.6 (13)	50.0 (56.2)	
≥ 85 years	25.1 (113)	23.9 (27)	28.3 (32)	47.8 (54)	
not documented	19.6 (88)	8.0 (7)	92.0 (81)	0.0 (0)	
Weekday					0.043
Monday	13.8 (62)	41.9 (26)	32.3 (20)	25.8 (16)	
Tuesday	12.4 (56)	32.1 (18)	37.5 (21)	30.4 (17)	
Wednesday	**13.8 (62)**	12.9 (8)	40.3 (25)	46.8 (29)	
Thursday	**13.8 (62)**	27.4 (17)	30.7 (19)	41.9 (26)	
Friday	14.7 (66)	**39.4 (26)**	33.3 (22)	27.3 (18)	
Saturday	15.1 (68)	**36.8 (25)**	27.9 (19)	35.3 (24)	
Sunday	16.4 (74)	**40.5 (30)**	32.4 (24)	27.1 (20)	
Time of Day					<0.001
09.00am-08.59pm	80.2 (361)	31.9 (115)	39.1 (141)	29.0 (105)	
09.00pm-08.59am	19.8 (89)	39.3 (35)	10.1 (9)	50.6 (45)	
Origin of the Call					<0.001
home	46.0 (207)	**9.7 (20)**	**51.2 (106)**	39.1 (81)	
ambulance unit	10.0 (45)	15.6 (7)	26.7 (12)	**57.7 (26)**	
dispatch center	26.2 (118)	60.2 (71)	3.4 (4)	36.4 (43)	
police	17.8 (80)	**65.0 (52)**	35.0 (28)	0.0 (0)	
The contact					<0.001
by phone	34.2 (154)	12.3 (19)	**46.8 (72)**	40.1 (63)	
visit	65.8 (296)	**44.3 (131)**	26.3 (78)	29.4 (87)	
The nature of task					<0.001
assessment	70.2 (316)	26.6 (84)	31.3 (99)	42.1 (133)	
assess. with treatment	21.8 (98)	38.8 (38)	43.9 (43)	17.3 (17)	
as a back-up unit	8.0 (36)	**77.8 (28)**	22.2 (8)	0.0 (0)	
ICPC-2 classification of the CNPs' patients					<0.001
A-general unspecified	53.1 (239)	28.5 (68)	**40.1 (96)**	31.4 (75)	
K-cardiovascular	12.4 (56)	39.3 (22)	26.8 (15)	33.9 (19)	
P-psychological	8.7 (39)	**92.3 (36)**	0.0 (0)	7.7 (3)	
R-respiratory	5.6 (25)	8.0 (2)	36.0 (9)	**56.0 (14)**	
L-Musculoskeletal	5.1 (23)	21.7 (5)	26.1 (6)	52.2 (12)	
N-neurological	4.7 (21)	28.6 (6)	38.1 (8)	33.3 (7)	
Others	10.4 (47)	23.4 (11)	34.0 (16)	42.6 (20)	

PUBLICATIONS I-III

PUBLICATION I

The core components of Community paramedicine – integrated care in primary care setting: a scoping review

Rasku T, Kaunonen M, Thyer E, Paavilainen E, &Joronen K.

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The core components of Community Paramedicine – integrated care in primary care setting; a scoping review

Tuija Rasku RN (Doctoral Researcher/ Lecturer) [1 2], **Marja Kaunonen** PhD (Professor) [2], **Elizabeth Thyer** PhD (Senior Lecturer) [3], **Eija Paavilainen** PhD (Professor)[2]. **Katja Joronen** PhD (Docent)[2]

[1] University of Applied Sciences, School of Health Care and Social Services, Tampere, Finland
[2] Faculty of Social Sciences, University of Tampere, Tampere, Finland
[3]School of Science & Health, University of Western Sydney, Penrith, Australia

ABSTRACT

Background: Since the beginning of 2000 the primary healthcare services around the globe are challenged between demands of home care and number of staff delivering it. The delivery of healthcare needs new models to reduce the costs, patient's readmission and increase their possibilities to stay at home. Several paramedicine programs have been developed to deliver home care as an integral part of the local healthcare system. The programs varied in nature and the concept of Community Paramedicine (CP) has not been established, demanding clarity. The aim of this review was to identify and describe the core components of CP and identify research gaps for the further study.

Method: A scoping review was performed using five electronic databases: Medline; CINAHL; Academic Search Premier; PubMed and the Cochrane Library for the period 2005 – June 2018. The references of articles were checked, and papers were assessed against inclusion criteria and appraised for quality.

Results: From 803 initial articles 21 met the criteria and were included. Inductive content analysis was carried out. Four the core components of Community Paramedicine emerged a) Community engagement, b) Multi-agency collaboration, c) Patient-centred prevention, and d) Outcomes of programme: cost-effectiveness, and patients' experiences.

Conclusion: The Community Paramedicine programs are perceived to be promising. However, Community Paramedicine research data are lacking. Further research is required to understand whether this novel model of healthcare is reducing costs, improving health, and enhancing people's experiences.

Key words: community paramedic, community paramedicine, emergency medical services, expanded scope of practice, prehospital care, primary healthcare, scoping review

Introduction

The primary care services are challenged between increased demands of home care and number of staff delivering it, because nowadays the patients are discharged sooner from the hospital than before, and more care can be done at home. In Finnish home care, there are approximately 3000 clients more than two years ago and in hospitals there are proximately 2800 beds less than before (1).

Hospital readmissions and frequent non-urgent emergency department visits are huge factors in the rising cost of healthcare. Iezzoni (2) has estimated that about 15% of persons transported by ambulance to Emergency Department (ED) could safely have received care at home. From discharged patients almost one fifth (19,6%) have been hospitalised again within 30 days (3). If a person is taken again to the ED every couple of days, obviously something is incorrect. In United States, the top 50 callers to 911 are on track to make 1,600 calls every year. From these "frequent flyers" more than 70% have chronic medical issues which can increase the strain in- and outside the hospital (4-7).

The changes of providing healthcare, have sparked calls for increased use of allied health professionals and reoriented teamwork to carry out assessments and treatments. Around the world prehospital healthcare providers (e.g., nurses, paramedics) have been an important resource to provide services being uniquely mobile. Historically, Emergency Medical Service (EMS) has focused only on providing emergency treatment in acute medical problems and transporting ill or injured persons to hospital or between hospitals. However, many community-based paramedicine programmes provided by EMS, have been developed to deliver home care as an integral part of the local community healthcare system (8).

The World Health Organization (WHO) defines integrated care having the comprehensive needs (health and diseases) of people and communities at the centre of health services which empowers citizen to have more active role in their own health (9). The role of EMS is in the middle of communities and the EMS health professions (nurses, paramedics, and nurse-paramedics) have trained to assess the patient's health at home and on the scene. Today from EMS providers families and patients are expecting more information to be able to keep up and assist the patient at home while EMS providers themselves have found challenging to confirm and ensure continuity of care instructions (10). New models of EMS as CP could offer one of the solutions for the myriad changes and needs in the health care system (11).

The social and healthcare reforms in Finland and in Norway (The Health & Care 21 strategy) also requires integrated people-centred health services and the new innovations from multi-disciplinary teams support preventive healthcare methods for citizens, which could reduce hospitalization (12,13). Since 2001, when the concept of Community Paramedicine was first described, the CP programs have tried to be part of home healthcare and community paramedics tried to be an integrated part of the healthcare team (2, 8, 14). Despite positive outcomes, there is a lack of a comprehensive review of the core components of Community Paramedicine, to find more possibilities and useful forms of this mobile, and fragmented care in primary care setting.

Aim

The aim of this scoping review was to describe and analyse published empirical studies and program reports describing Community Paramedicine (CP) to find out the core components of CP. This study was conducted to estimate the size and scope of the available literature and to chart the areas requiring further study. The question was: *What is known from the existing literature about Community Paramedicine and its core components?*

Method

Scoping review

A scoping review enables examination of all relevant literature on the topic, regardless of study design or location of publication, also including 'grey literature' published by large organisations instead of peer reviewed (15). The effectiveness or interventions of studies are not attempted to be presented. The review can identify research gaps in the evidence base and summarize findings from existing literature regarding the overall state of research activity (15, 16). The inductive content analysis and descriptive summary was used to identify the research gaps, and to identify the core components of Community Paramedicine.

Literature search

Prior to conducting the literature search, the purpose of the study and a specific question were established, leading to the clarification of the inclusion criteria. The search was limited to papers written in English and produced between 2005 – June 2018. The start day of 2005 was chosen because it is the year when the International Roundtable on Community Paramedicine (IRCP) was founded (17). Inclusion criteria for the current review were that in the article writer/writers were using the concept of Community Paramedicine and/or the topic was directly about EMS and health care programs, primary care setting or non-emergency services.

A systematic search was performed between September 2017 and June 2018. The search terms were mapped and narrowed from a list of approximately 20 terms to: *Community Paramedicine*, Primary Health Care*, Prehospital Care*, Emergency medical services*, Community Paramedic*, and Expanded scope practice**. The search involved electronic databases, reference lists, hand-searching of key journals, existing networks (e.g., IRCP), relevant organizations (e.g., WHO, Ministry of Social Affairs and Health) and conferences. The final version of key concepts was first used on the MEDLINE database and then converted for CINAHL, Academic Search Premier, PubMed, and the Cochrane Library. In addition, two international senior researchers with expertise in Community Paramedicine were consulted to locate relevant articles and studies. The search results downloaded, and references were imported into the web-based bibliographic manager RefWorks where the duplicate articles were removed.

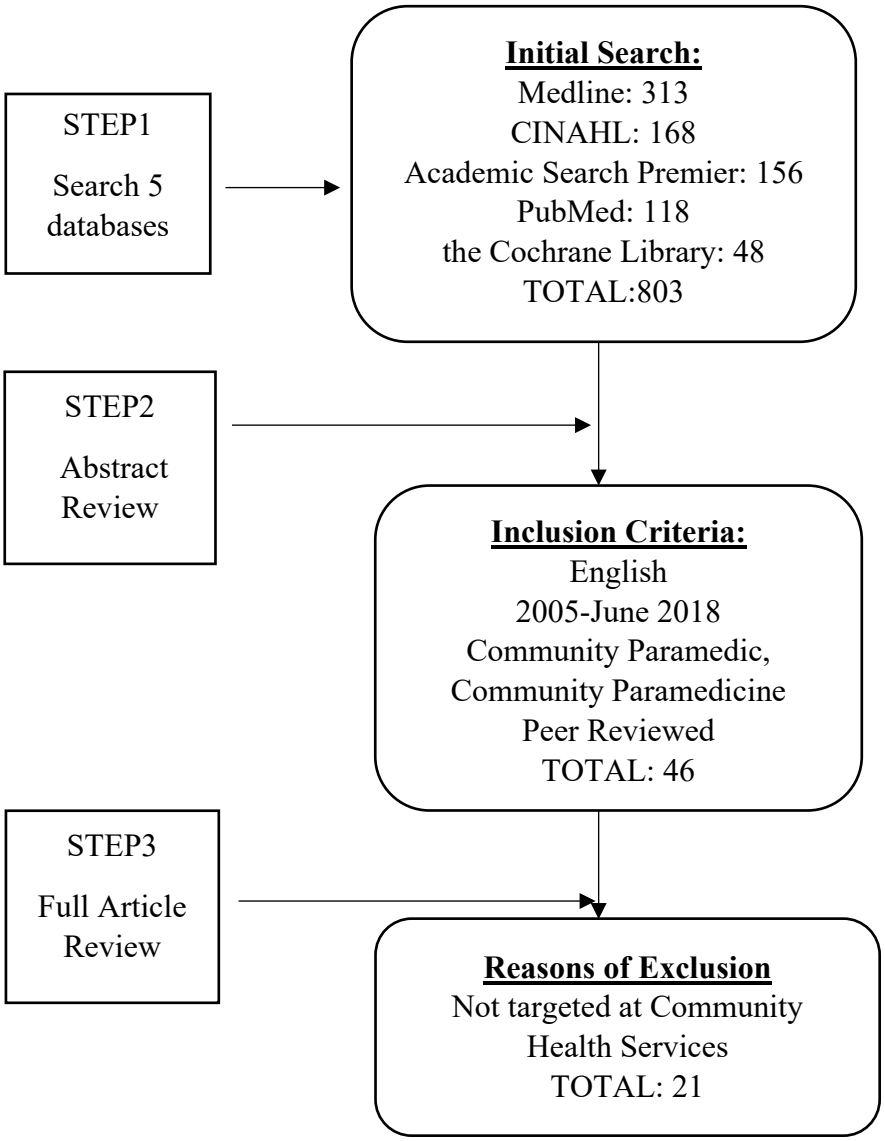

Figure 1 Search Strategy and mapping process

Retrieval of studies

First the titles and then the abstracts were reviewed. The abstracts were sorted by article type; original research articles, review articles, program reports and opinion papers. Finally, opinion papers, and letters to the editor were excluded. The criteria for the inclusion and exclusion were applied during the whole search process.

Table 1 Inclusion and exclusion criteria

Criterion	**Inclusion**	**Exclusion**
Time	January 2005 – June 2018	Any study outside these dates
Language	English	Non-English
Type of article	peer-reviewed research articles, program reports, preliminary data	opinion articles, commentaries, letters to the editors
Target group	non-emergency patients	emergency patients
Study focus	Community Paramedicine program(s) Extended care program (s)	no connected in any CP- or extended care program (s)
Profession	paramedic, nurses, emergency medical technician	other professions

The references of articles were checked to ensure that eligible articles would not be missed. After the review and coding of 803 abstracts, 46 articles were identified for additional examination. After full article review, those articles, which failed to meet the inclusion criteria, were excluded (Table 1). The selection method and search flow for the scoping review are represented in Figure 1.

Analysis of the studies

The information from each article that met the inclusion criteria were analysed and charted in terms of the author(s), the year and country of publication, the purpose of the study, the sample, the study design, and the main results (Table 2). According to Arksey and O'Malley (15) to inform and validate the findings of the scoping review, two EMS field managers and a researcher were consulted to confirm whether the process had captured all significant peer-reviewed studies which are related to Community Paramedicine.

The scoping study provides an overview of all material reviewed but without assessing quality of evidence. Data synthesis is minimal, and the findings provide an overview of the research but not an assessment of the quality of individual studies. (18) After charting the information from studies, the words or sentences were condensed, and those containing aspects related to each other were grouped together into subcategories for the core components of Community Paramedicine.

Results

Description of the studies

A total of 21 studies or program reports were included in the review (Figure1). The selected articles and reports were published between 2005 and June 2018 and covered Australia (n=5), Canada (n=7), and the United States (n = 9). There were four mixed-method studies, thirteen qualitative studies and four quantitative studies. Two of the four quantitative study designs reported an intervention (Table 2).

Core components of Community Paramedicine

During thematic analysis, the core components of CP were identified as a) community engagement, b) multi-agency collaboration, c) patient-centred prevention, and d) outcomes of programme: cost-effectiveness and patients' experiences.

Community engagement

Community engagement was described as an assessment of local healthcare needs, bridging the gaps of community healthcare, and community response and also the gaps between primary health care and hospital emergency (19-29). After the risk assessment, the local healthcare needs were identified, and CP provided care as a tailored program. The needs from the community included the wellness assessment, preventive health promotion, the discharged patient's home safe checking, first aid training or providing care for chronically ill (19, 27-31). Subsidized seniors were visited and their fall risks were assessed, they got health education, and if needed they were connected to other local healthcare resources (32, 33).

Community Paramedicine is a method to fill the gaps in local healthcare infrastructure like limited availability of primary care services due to shortage of primary care physicians or long distances to the nearest hospital (11). Zavadsky et al. (25) identified 111 CP programs in the United States and 46% of them were operating in rural areas. Rural communities have lower availability of primary care, and particularly specialty care. A first CP program (Red River, New Mexico, United States 1995 – 2000) was expanding EMS services to fill healthcare gaps in a town which closest hospital was 60 minutes away. CP providers administered medications, and performed simple procedures (e.g. suturing) (11, 19, 30, 34). A community based CP program allowed paramedics to target their

efforts effectively, preventive and without emergency (11, 19, 28). Additionally, community engagement also meant collaboration with other local healthcare providers, and volunteers sharing of responsibility and the resources (20).

Multi-agency collaboration

The multi-agency collaboration was described in terms of partnership, multidisciplinary, collaboration, and integrated care (11, 14, 19-28, 31, 34-36). Two of the articles and reports identified Community Paramedicine as a model of integrated healthcare (MIH) providing care for patients at home or in other non-urgent settings outside the hospital (25, 34). CP focused on longer period coordinated care than the typical Emergency Medical Service calls, with physicians and primary care including e.g. approval of care plans, and telemedicine consultation (25, 35). MIH-CP was written to be "fully integrated, collaborative, data driven, patient-centred and team-based" (25, 34). MIH-CP activities can provide telephone advice instead of resource dispatch, from preventive and chronic disease management to post-discharge follow-up, transport if needed or referral to other health or social care provider instead of hospital emergency department (25).

Most of the 31 CP programs researched by Patterson et al. (27) were engaged with primary healthcare (67.7%). Other partners were emergency departments, hospitals, home health agencies, nursing homes, substance abuse units, and mental health facilities (20, 21, 27, 28, 31). Furthermore, there was also a requirement to develop a stronger relationship with local social services and faith-based organizations (28). Mulholland (20) identified that informality, the "morning cuppa" with other healthcare providers had an important meaning to establish and develop collaboration. The majority of EMS professionals were willing to attend additional CP education and to perform CP duties as preventive, multi-agency collaboration (37). However, the CP providers could be also seen as competitors and the community paramedics expanded role can cause resistance from other health care professionals (11, 28, 34). The tensions were lower when the CP program team included a delegate from other multi-agency services and collaboration has helped to understand and support CP as the novel model of healthcare (28).

The levels of roles and required attributes in multidisciplinary practice of CP included community involvement, organisational support, professional support, and education and training (the COPE-boat model) (20). Collaborative CP, working seamlessly with other health agencies, provided patient-centered qualified health care (14, 21, 29, 33).

Patient-centred prevention

Patients were described in terms of frequent caller, discharged patient, home-bound, senior and long-term patient (11, 19-24, 2-28, 30, 31, 34-36, 38). The prevention methods of CP varied. During the home visit paramedics assessed the patient's medical and social condition and his/her possibilities to stay at home in the future. The goal was to prevent emergency events before they occur, so the community paramedics encouraged and educated the patient to manage the health and safety risks as advocate, and linked the patient to the primary healthcare provider's support net if needed (21, 24, 25). During periodic checks the discharged patient needed help to follow the medical care regimen, or to schedule the follow-up doctor visits. Telemedicine was used to connect patients with caregivers elsewhere and to provide telephone advice to non-urgent 911 callers instead of sending an ambulance crew (11, 25, 30, 31, 36). Lee et al. (38) created a Paramedics assessing Elders at Risk Independence Loss (PERIL) tool for the risk-assessment during the home visits. The tool includes three questions (about home safety, 911 calls in the last 30 days and patient's medication). Patients had as 93% possibility to have an adverse outcome within 30 days if the answers were yes for all three questions (31, 38).

Community Paramedicine programmes helped community nursing (e.g., immunizations), or navigate patients as care coordinators. The long-term patients have been frequently transported to ED which could have been an uncomfortable and unfamiliar environment, with risks of acute infection including lengthy periods waiting on the uncomfortable ambulance stretcher. Community paramedics either took care of the patient at home or transported him/her direct to receiving unit or department; avoiding waiting time in ED (11, 22, 27, 29, 30, 32-35).

Outcomes of Programme; Cost-effectiveness

One of the CP primary goals was the reduction in non-urgent 911 calls which also reduced the costs of ED care (28). Community Paramedic assessed and, treated the patient as required and then determined whether it was appropriate to refer or release an individual rather than to transport him/her to an ED. If needed, the patient was directly transported to the mental health facility, to the sobering centre, or to the primary care physician (11).

The fixed costs associated with operating and maintaining emergency care services are high. The CP healthcare services are prevention-oriented, and it was difficult to add a cost on this service. However, Pearson, Gale & Shaler (30) have developed a Cost-Avoidance Formula and the Cost-

Avoidance Formula for Hospital Readmission's to calculate the cost savings for preventing hospital readmissions. Additionally, another reimbursement strategy was the cost-avoidance strategy. The CP program did not get paid if the patient was readmitted within 30 days or the service received a percentage of the cost savings of each patient not readmitted within 30 days (30).

CP offered interventions to reduce hospital attendance, to enhance access to primary care and to provide more appropriate use resources as cost-efficient benefit (11, 19, 28, 30-32). The CP program of the non-urgent 911 callers managed to achieve 20% reduction of transports, and patient's satisfaction increased 6% (28). In Nevada, the CP program helped to avoid 1,795 visits to ED, 354 ambulance transports, and 28 hospital readmissions: together USD $7.9 million in charge (34). CP program provided home visits to those 21 patients who had been transported over 800 times in a 12-month period to ED. The patients got education about medication, nutrition, and exercise. Following 12 months the patient's hospital admissions decreased 47% and the ambulance transports to the ED decreased 44% (11).

Outcomes of program; patient's experiences

Patient experiences included trust, care, respect, fun, close relationships, acceptance, increased sense of security, support and empowerment (22, 26, 27, 29, 32). According one participant: "They are like family and that's how they make everyone feel" (26). The participants were thankful for the support, trust, care and respect which they got in their lives from CP providers. Participants felt individually taken care of and during visits they had been able to socialize and have fun while discussing their medical concerns (26). In Ontario, the winter weather made people home bound and workforce shortages prolonged the waiting times for medical appointment. The doctor can generally be seen every three months and distances to appointments were challenging for ageing residents. The CP program provided community paramedics as health advocates with a holistic view of health, dietary concerns, and opportunities for social engagement. The community paramedics were welcomed into people's home and the participants felt that the care provided a sense of support, continuity and security for them (26, 29, 32).

The HOME (Homeless Outreach and Medical Emergency) Team – CP program provided care to the individuals (n=59) who had used emergency services at least four times per month during last 15 months. From the target population 38.0% were homeless, 88.9% has a substance abuse disorder at time of contact, and 83.0% had a history of psychiatric disorder. The main goal was to find frequent users, connect them to community-based care (e.g., medical detoxification, substance abuse

treatment programs, primary care), and advocate for long term care when necessary. This clinical planning brought new long term care placement options for dual-diagnosis patients with both mental health and substance abuse conditions (11).

The results of CP healthcare services had also physiological outcomes. One program focused on inhabitants of a residential building that generated a high volume of EMS calls. Community paramedics, after additional training, visited there weekly and used individualized action plans considering health-risk reduction. The participant's blood pressure was collected one year, and senior's diabetes risk were assessed at baseline and after 6-12 months. The participant's systolic blood pressure decreased significantly by the third visit ($p<0.05$). From the participants 15% managed to drop one Canadian Diabetes Risk assessment (CANRISK) score during the intervention. For two years, the EMS calls from those apartments decreased 25% (33). Abrashkin et al (35) mailed a post-survey to participants and 35% from 329 individuals or caregivers agreed or strongly agreed that CP delivered high-quality services and care.

Discussion

The purpose of this review was to explore the core components of CP. From these 21 articles or reports between 2005 -2017 were identified four core components: community engagement, multi-agency collaboration, patient-centred prevention, and as the outcomes of programme: cost-effectiveness and patients' experiences.

CP has been delivered as pilot healthcare programs. In Australia, Canada, and the Unites States of America there has been a systematic effort to improve the home-delivered non-emergency and preventive care, particularly in rural and remote areas. In Scandinavia same components in CP can be found from non-emergency prehospital nursing but no English language articles were found. In United Kingdom CP components can be found from extended scope of paramedicine (39). Paramedics may practice within an "expanded scope" (applying trained specialized skills and protocols) or "expanded role" (working in non-traditional roles using existing skills) (39). CP and Mobile Integrated Healthcare (MIH) are both prehospital models of health care (14, 35). CP model provider is called community paramedic (paramedic after additional training) (34) when MIH provides services utilizing a range of allied healthcare professionals e.g. nurses, paramedics, physician assistants and physicians (25). These kind of non-emergency, community engaged healthcare models offer possibilities for those paramedics and prehospital nurses which work in modified duty (e.g., injured, pregnant) (36).

The results of this review indicated that the *community engagement* of CP existed and varied. It meant that the risk-assessment helped to find the individual's or community's healthcare needs and gaps. The healthcare providers created the network and provided the services to bridge those gaps. Undoubtedly in rural areas, where the infrastructure has its limits, CP programs have more gaps to fill but also in urban areas the number of home-bound citizens is growing and demand for non-emergency healthcare at home is bigger than before.

Another core component emerging from the data was the strong need to build seamless *multi-agency collaboration* with health and social care providers. To work together means that the roles of team members must be clear. Despite many challenges that likely exist, the providers can find innovative strategies to optimize their energy and possibilities. Behind the success of the CP program is the strong teamwork, clear and active communication, and collaboration with allied healthcare workers. The organisation of out-of-hours primary care in OECD countries (40) has published their concern about the paramedics and nurse practitioners´ possibility to tackle workforce shortages and deliver out-of-hours care, particularly in rural and remote areas. CP can have the vital components for this with establishing integrated partnerships out-of-hospital. However, the challenge is to control costs, keep the quality of care and to coordinate many involved organisations. Integrated care, as defined by Leutz (41) is a broad inter-sectorial system approach that aims to align the healthcare system (acute, primary care) with long-term care, education, and housing services. Integrated care partnerships rely on networks based on professional autonomy in the context of reliability and the relationships are heavily based on informality (e.g., morning tea from the results of this review) (42). The team worker's roles and scope need to be clear and understood to avoid misunderstandings. With the collaboration of healthcare providers, the patient gets the right care for his/her unique needs, in the right time, at the right place.

Based on this review, the *patient-centred prevention* in CP has many fragmentations mostly focused to avoid the readmissions and support for the good life at home. CP is a patient-centred holistic approach focused on the improvement of patient outcomes. Community Paramedics are in a unique position to observe and assess many of the social and environmental determinants of patient's health at home (31). This study highlights that in CP the providers, additional trained community paramedics, had dual roles as advocates for health and wellbeing and as experts in providing emergency care. As an advocate, paramedics support the patients in decision making and representing the patient's concerns or wishes to other healthcare providers. Participants felt safety and it was reassuring to know someone was taking care (26). The interventions targeted to the loneliness can help to avoid ED visits and benefit the well-being of the frail older person (43).

The WHO argue that the future of care requires an equal and reciprocal relationship between clinical and non-clinical professionals together with the individuals using care services, their families, and communities. Alma-Ata Declaration of 1978 emphasized the need to bring a holistic perspective to health while organizing services close to people's homes. The transformation is focusing innovative models to integrate primary health and social care, particularly due to the rising needs of the growing elderly population (44). According Goodwin (45) integrated care represents an approach to the delivery of services seeking to coordinate care with person, family, and surrounding community. The COPD-Home model with joint visits, telephone checks, a support call centre, an individual self-management plan with pharmacological and non-pharmacological interventions can offer needed components and were tailored to meet an individual's specific needs that emerge from their personal social determinants of health (46). The CP models in this review are mostly considering seniors but in the future the demand for preventive family nursing is growing specially families with small children (47). People could have a more active role in his/her own health while using integrated people-centred health services.

Despite the challenges, the Community Paramedicine programs are going forward. Many of the opportunities and challenges discussed above make the CP innovative preventive healthcare model. "*The fire-service-based EMS has always been good at pulling individuals out of the river – and now with Community Paramedicine EMS providers are moving upstream to keep them from falling in to begin with*" (48). However, the CP models must show their *cost-efficiency.* In three of reviewed studies, the cost-efficiency were mentioned but more evidence is needed. The duties of EMS are expensive. First, the Units must be prepared 24/7. Second, this healthcare service must handle routine but also unexpected, sometimes life-threatening problems. As many as 30% - 50% of patients transported to ED by EMS are discharged without significant treatment or referral (39). CP models offered the possibilities to prevent unnecessary visits to ED having the efficient outcomes (25, 27, 28, 35, 36).

Throughout the years 2005 – 2017 there were few studies of *patients' outcomes and experiences* from CP programs (25, 32). CP has an opportunity to influence citizens' expectations and possibilities to take care of their health. This review indicated that patients attended by CP providers were less likely to visit hospital EDs and reduced the need for subsequent referral to unscheduled care services. Most of the patients (86,4%) reported that the CP providers had been clear about their assessment. Over half of the participants (58%) reported having better "health" after assessment and most of the patients treated at home were satisfied with the care provided and had clear desire to be treated at home if possible (49-51). The social and healthcare reform requires the evaluation of

patient's outcomes and experiences and comparison of the costs, quality, and effectiveness of healthcare services. A suggestion for the national performance measurement framework for social and health Services in Finland is based on the Triple Aim framework: costs, effectiveness and quality (accessibility, safety, and customer experience) The Triple Aim (52) has become a guiding force drawing attention to the healthcare improvement initiatives globally and also in Finland. Ultimately, the Triple Aim outcomes entail the domains of quality, cost and experience; not only patients' experiences but also the experiences of providers working in inter professional teams as well (32, 37). However, the researchers have found it difficult to collect the data from participants of CP. Specifically, patient satisfaction surveys are needed from CP; hopefully the use of new collection methods such as tele technique, apps and e-surveys might facilitate this.

Limitations of the review

As with all research, this scoping review has some limitations. The researchers drew on the experience of specialists, reviewed search terms and references lists, and double reviewed the selected 46 articles to comprehensively identify all articles. But because the concept of Community Paramedicine has not been long established and differs between countries, it is possible that some articles have been missed. Only in English language peer reviewed articles, with an abstract and full-text available, were included in the review. Articles on Community Paramedicine could have been published in other languages and are not represented in these findings. Qualification may differ across different countries and for instance Community Paramedicine in one country may have different roles in another and this could have affected the findings (11, 21, 22, 39).

Conclusion

This review identified the core components of Community Paramedicine (community engagement, multi-agency collaboration, patient-centred prevention, cost-effectiveness, and patient's experiences) and presented evidence on how CP programs contributed to healthcare improvement. Community paramedics worked in a broad range of community settings providing care and company that can be targeted towards patients with different aged, different healthcare or social problems. They provide services also as advocate navigating the patient through the most convenient healthcare services. The findings generally support the efficacy of CP programs, although to avoid professional boundary issues, community paramedics need organisational support

to interdisciplinary relations. Community paramedics view CP as a welcomed opportunity to maintain and extend their skills. CP can offer solutions and interventions to the social welfare and healthcare reform to achieve horizontal and vertical integration of person-centered healthcare services. EMS providers and educators can use this information in their practice when developing programs or curriculums. However, further research is needed to explore and analyses the possibilities of these core components of CP to improve patients' experiences, effectiveness, quality and reduce costs in the integrated primary care.

Ethical approval

Ethical approval was not needed as this scoping review consisted of reviewed and collected data from publicly available materials.

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Table 2 Summary of the 21 included articles

Author(s), year, country	*Purpose*	*Participant (n)*	*Study Design*	*Main Results*
Stirling et al. (2007), (19) Australia	To explore community engagement and how the new role of paramedics contribute to primary health care	Informants from EMS (n=17)	Triangulation: Semi-structured interviews, observation of the key processes and events, and the review of documents	The new role of paramedics promotes the health of rural communities in three keyways: increasing community response capacity, linking communities more closely to ambulance services, and undertaking health promotion and illness prevention work at the community level.
Mullholland et al. (2009), (20) Australia	To describe the expanded role for the rural paramedic and determine what factors facilitate this role	Local EMS providers and co-workers (n=17)	Triangulation: Interview, observation, and document review	Rural paramedic practice needs multidisciplinary and community-based response to patient care including **C**ommunity involvement, **O**rganizational support, **P**rofessional support, **E**ducation & Training. These should be rooted in a footing of informality.
O'Meara et al. (2012), (21) Australia	Tto examine the evolution of rural paramedic practice	EMS providers (n=17)	Interview	In small rural communities, the paramedics' role is increasing as the first line primary healthcare providers developing additional responsibilities in the cycle of care. The core components of the new role were rural community engagement, emergency response, situated practice, and primary health care called: RESP-model.
Bigham et al. 2013, (23) Canada	To describe existing community paramedic programs	Articles (n=11)	Systematic review	The scope of CP is tailored to the needs of the local communities. Nontraditional pathways included e.g. protocol-driven referrals to radiography clinics, and district nurses. Outcomes ranged from clinical indicators (ED attendance and length of stay), operational outcomes (time on task, and transport rates) to patient satisfaction scores and economic impacts on health systems.
Kizer 2013, (11) USA	To describe the history, the development, and the current perspectives on CP in California/USA	Program reports (n=6) Stakeholders from different organizations (n=37)	Reviews Interviews	Paramedics are trained to perform patient assessments and to provide care in home and community setting under medical care condition. They are available 24/7/365 and are trusted and respected by the public. CP service programs could be divided prehospital, post-hospital, and community health services. Prehospital services included transport to alternate destination, non-emergency assessment, refer or release the patient, address the needs of frequent 911 callers. Post-Hospital or Community Health Services provided follow-up care for persons recently discharged or support for persons with diabetes, asthma, congestive heart failure, or multiple chronic conditions or community paramedics worked as partner with community health workers to provide preventive care such as flu vaccines or education about injury prevention. EMS is essential to the health care system, but it is not well integrated. The outcomes of CP programs need to be measured and the needs vary in urban or rural. The exchange of information should be better and electronic. The paramedics need additional training and possibilities to maintain their urgent and non-emergency skills. Could there be a new profession: primary care technician?

Table 2 (Continued)

Author(s), year, country	*Purpose*	*Participant (n)*	*Study design*	*Main Results*
O'Meara (2014), (23) Australia	To examine the extent, range, and nature of research activity of the community paramedic role	Literature (n=23)	Scoping Review	The CP literature had three categories: theoretical studies; empirical studies measuring outcomes; and reviews. There are few peer-reviewed articles, a growing number of empirical studies because of program evaluations. Only few reviews are focused on innovations in paramedic practice. There is a need to measure community engagement and integration with other healthcare providers. The empirical studies of CP models need more a theoretical basis.
Pearson et al. (2014), (30) USA	To exam the evidence base for CP in rural communities, the role of Community Paramedic, and the faced challenges	State EMS officials and directors, program coordinators, local EMS, and hospital providers (n=37)	Survey, Interviews, review of state Flex grant applications, and a literature review of peer-reviewed literature focusing on the integration of EMS into local healthcare delivery system	Many rural CP programs are in pilot stages. Most community paramedics work within an expanded role rather than an expanded scope of practice. The sustainability of CP programs has challenges in funding and reimbursement. In Flex Program the CP provider does not get paid if the patient is readmitted within 30 days. Collaboration at local and state level is essential for the success of CP programs.
Brydges et al. (2015), (24) Canada	To explore paramedic experiences with referral programs to identify opportunities and challenges in their practice	Paramedics (n=23)	Interviews	Paramedics experienced the role confusion, and that their knowledge based was inadequate. They have got inadequate feedback and described undefined accountability when their referral moving "off into a black hole", with the "hope" that someone would provide care to the patient. Paramedics sense of their role as patient advocates.
Nolan et al. (2015), (31) Canada	To provide an evidence-based toolkit for EMS/Community referrals	Literature on CP + evolving Community Paramedic initiatives + evaluation of provincial community paramedic toolkit components (n=11) patient referrals (n=4000)	Systematic review Qualitative and quantitative analysis	Existing literature shows feasibility, positive evaluation, and cost-effectiveness. Evidence-based components to support and implement best practices for community referrals are • Education and Training Online • Clinical Prediction Rule: *Paramedics assessing Elders for Independence Loss (PERIL) Assessment Tool *Paramedic and Community Care Team (PAACT) programs *Community Referral from Emergency Medical Service (CREMS) and Electronic Referral A standardized referral form was developed within a collaborative framework. The referral is designed to increase opportunities to mitigate future repeat use of the frequency health care users.

Table 2 (Continued)

Author(s), year, country	*Purpose*	*Participant (n)*	*Study design*	*Main Results*
Zavadsky et al. (2015), (25) USA	To add to the EMS profession's understanding of the development, characteristics, and status of MIH-CP in the United States	EMS agencies that were either known or thought to have an MIH-CP program (n=103)	Survey	54% CP programs operate in urban area. 20% of MIH-CP programs have operated two years or longer. One long-term goal is to reach members of the community before they become frequent users of EMS systems and hospitals.70% of programs are team-based and incorporates multiple providers. 69% of programs received referrals from hospitals. 62% of programs referred patients to Social Service Agencies and 66% to home health. The clinical services included history and physical assessment (89%), laboratory services from glucose checks (70%) to stood collection (13%) and throat swab cultures (12%). 61% of programs included weight checks added respiratory and cardiovascular services. 79% of programs offered the post-discharge follow-up services, 43% offered nutrition assessment and patient education services were from hypertension screening and education (62%) to cancer self-exam awareness (3%). Mostly (89%) the reimbursement was a significant obstacle. 90% of respondents were collecting data and 81% of programs have succeed in reducing costs, 911 use and ED visits.
Abrashkin et al. (2016), (35) USA	To compare a CP model and traditional EMS within an Advanced Illness Management (AIM) program	Individuals/Patients (n=773) Patients and caregivers (n=116)	Observation Mailed survey within one week of the CP response	78% of CP response were treated in the home. From those transported to hospital 82.2% of CP patients were hospitalized and from traditional EMS patients 68.9% were hospitalized. All respondents (agreed or strongly agreed) felt that CP delivered high-quality services and care.
Brydges et al. (2016), (26) Canada	To examine participants' perceptions of paramedics providing a CP program	Participants (n=15)	Observation + Interviews	Three themes emerged: 1) The CP program sessions were individualized, caring and trusty. 2)Paramedics were having dual identities as health advocate and a traditional role as emergency experts.3) Elements of paramedic's "emergency" role remained important and valuable.
Choi et al. (2016), (34) USA	To describe the mobile integrated health care and CP (MIH-CP)	Programs (n=26)	Review	MIH and CP are models of health care delivery that use EMS personnel to fill gaps in local health care infrastructure. In 2014 the term "community paramedic" was updated to "community paramedicine provider" because all providers were not paramedics. A self-assessment tool was developed in 2012 having three major benchmark areas: local need assessment, appropriate policy development, and assurance to fulfill of service obligations (medical oversight, cost-effectiveness, competent workforce). CP provider's additional training should include expanded psychomotor, diagnostic, and triage skills added with the knowledge of cultural sensitivity, chronic disease pathophysiology, and facility with community resources.
Lee et al. (2016), (38) Canada	To derive and test the reliability of a clinical prediction rule to identify high-risk older adults using paramedics' observation	Assessment documents (n=764)	Intervention study	From 43 yes or no questions was derived four-questions rule: 1)Problems in the home contributing to adverse outcomes? 2) Called 911 in the last 30 days? 3) male, and 4) lacks social support. The four-item PERIL could be used by emergency physician and paramedic services to target preventative interventions for seniors identified as high-risk.

Table 2 (Continued)

Author(s), year, country	*Purpose*	*Participant (n)*	*Study design*	*Main Results*
O'Meara et al. (2016), (14) Australia	To identify and analyze how community paramedics create and maintain new role, boundaries, and identities in terms of flexibility and permeability	Community members (patients, family, and carers), paramedics, EMS managers, educators, physician, health economists and health service managers (n=40; focus groups, n=34 interviews)	Observation of practice, informal discussions, interviews and focus groups Thematic analysis and boundary theory to develop a CP model of care	A CP model of care (distinguishing CP from other paramedic service innovations) follows the mnemonic RESPIGHT: Response to emergencies; Engaging with community; Situated practice; Primary health care; Integration with health, aged care and social services; Governance and leadership; Higher education, and Treatment and transport options. Successful CP program is integrated with health, aged care and social services and benefit from strong governance and paramedic leadership. Community engagement and situated practice distinguish CP models of care from other paramedicine and out-of-hospital health care models.
Patterson et al. (2016), (27) USA	To exam goals, activities, and outcomes of 31 rural-serving CP programs	Documents (n=31) Program leaders (n=31)	A systematic review Interviews	Most common goal was managing chronic disease (90.3%), secondly reducing ED visits, hospital admissions/readmissions or costs (83.9%). In programs the targeted groups were chronically ill (90.3%), discharge patients (54.8%), and frequent EMS users (64.5%). Referrals were used mostly with primary care facilities (67.7%). Programs provided assessment, testing, preventive care, and post-discharge services. Only few programs used evaluation methods.
Martin et al. (2016), (32) Canada	To evaluate a CP program through the perceptions and experiences of consumers	Adult consumers (n=14)	Observation, informal discussions, interviews	Three main interlinked themes were identified: improved *health monitoring and primary health care access close to home *sense of security and support for vulnerable residents in the community * consumer education and empowerment for enhanced health management. Consumers had accepted the paramedics in non-traditional preventative health care roles.
Pearson et al. (2017), (28) USA	To describe the possibilities, outcomes and lessons learned from the Maine CP programs	CP programs (n=12) Community Paramedic's home visits (n=3,775)	a case study questionnaire and interview protocols based on the HRSA Community Paramedicine Evaluation Tool (Office of Rural Health Policy, 2012)	Developed an overall cost-avoidance formula and an cost-avoidance formula for hospital readmission **Key lessons learned:** 1)implement requires effort 2)data collection inconsistent 3)the cost savings attributable impossible 4)economic 5)patient satisfaction measurement needed 6)data to provide training and technical assistance
Steeps et al. 2017, USA	to evaluate the perceptions of EMS professionals toward the concept of a CP program	EMS professionals (n=283)	a cross-sectional study e-SURVEY	70% indicated understood what a CP program entails. 58% were ready to additional training and 66% were willing to perform CP duties; women were more willing than men.

Table 2 (Continued)

Author(s), year, country	*Purpose*	*Participant (n)*	*Study design*	*Main Results*
Agarwal et al. (2018), (33) Canada	To determine if a CP program can reduce the number of ambulance calls to subsidized housing for older adults	Of 22 subsidized-housing buildings for older adults In both the intervention and control buildings n=129/ n=129	An open-label pragmatic cluster-randomized controlled trial (RTC) with parallel intervention and control groups	The quality-adjusted life years showed significant improvement for residents in the intervention buildings compared with those living in the control buildings. Systolic blood pressure decreased significantly by the participant's third visit to program and diastolic decreased by the fifth visit. 15% of participants dropped one CANRISK category during the intervention. The number of EMS calls from two years before the program decreased 25% during one year of intervention.
Dainty et al. (2018), (29) USA	To understand the experiences and perspectives of patients and families involved with the Expanding Paramedicine in the Community (EPIC) program	n=30 patients and 10 family members	Interviews from patients and/or family members + 60 hours of observation	A core theme of EPIC program addressed patient vulnerability by providing "safety-net". The participants felt that the program was a source of health education and has a big meaning while building the bridge between the community paramedics and the patients.

PUBLICATION II

A retrospective review of patient records and factors associated with decisions made by community nurse-paramedics' in Finland

Rasku, T., Helminen, M., Kaunonen, M., Thyer, E., Paavilainen, E., & Joronen, K.

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Article

A Retrospective Review of Patient Records and Factors Associated with Decisions Made by Community Nurse-Paramedics' in Finland

Tuija Rasku [1,*], Mika Helminen [1,2], Marja Kaunonen [1,3], Elizabeth Thyer [4], Eija Paavilainen [1,5] and Katja Joronen [6]

1 Faculty of Social Sciences, Health Sciences, Tampere University, Kuntokatu 3, 33520 Tampere, Finland; Mika.Helminen@tuni.fi (M.H.); Marja.Kaunonen@tuni.fi (M.K.); Eija.Paavilainen@tuni.fi (E.P.)
2 Tays Research Services, Tampere University Hospital, 33520 Tampere, Finland
3 General Administration, Pirkanmaa Hospital District, Tampere University, 33014 Tampere, Finland
4 Dean's Unit School of Health Sciences, Western Sydney University, Locked Bag 1797, Penrith, NSW 2750, Australia; E.Thyer@westernsydney.edu.au
5 General Administration, The Hospital District of South Ostrobothnia, 60220 Seinäjoki, Finland
6 Department of Nursing Science, University of Turku, Joukahaisenkatu 3-5, 20520 Turku, Finland; katja.joronen@utu.fi
* Correspondence: Tuija.rasku@tuni.fi

Abstract: Community paramedicine (CP) has extended the role of paramedics and the main goal is to provide non-emergency care, which reduces the visits to emergency departments. The aim of this study was to describe the Finnish CP and examine the factors that were involved in CNPs' decision-making processes. The study was based on data from 450 consecutive CP patient records from three hospital districts. A more detailed analysis was carried out on 339 cases in patients' homes and elderly care homes, and the data analysis included multivariate logistic regression to examine the impact of variables on the CNPs' decisions. These patients' most common health issues were general weakness (15.9%) and fever (10.6%), and over half (58.7%) could remain at home after the CP visit. There were five independent factors associated with the CNPs' decisions of the patient's care continuum: the hospital district, if the patient could walk, whether the troponin test was performed, a physician was consulted, and the nature of the task. CP units played a valuable role in non-emergency care. Understanding the factors associated with CNP decision-making can increase the safety and effectiveness of reducing hospital visits, by providing patient care at home, or in elderly care facilities.

Keywords: nurses; community paramedicine; prehospital care; non-emergency care; decision-making

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1. Introduction

In 2018, the World Health Organization (WHO) launched its vision for primary health care pathways that centre on people rather than services (WHO, 2018). Two years earlier, the Organisation for Economic Co-operation and Development (OECD) had called for paramedics and nurse practitioners to play an enhanced role in tackling workforce shortages and delivering more accessible out-of-hours care [1]. Studies have explored how the extended role of paramedics' has contributed to primary health care [2–5]. Since 2005, community paramedicine (CP) programmes have undertaken health promotion and illness prevention work at community levels in Australia, Canada, the United States of America, and the United Kingdom. They have filled care gaps and decreased pressure on emergency departments (EDs) by dealing with patients who did not need that level of attention [3,5].

Various CP programmes have been provided by pre-hospital and post-hospital or community health services [3]. Pre-hospital CP services include assessing and treating patients, as needed, and referring or releasing them instead of transporting them to the

ED. Many pre-hospital CP programmes address the needs of people who frequently call emergency numbers or visit EDs. [3–5]. Post-hospital and community health services are run by CP programmes and provide follow-up care for recently discharged patients. For example, community paramedics have been reported to help patients with self-care of chronic diseases, and worked with community health workers to provide preventive care [4–6]. Services provided by CP programmes have also been linked with nutritional assistance programmes or behavioural health services such as screening for depression [7]. Feedback on home-based CP programmes have showed that patients were satisfied that they could receive primary health care close to home, it gave them a sense of security and support, and they felt empowered to enhance their health management [5,8].

In 2017, the Finnish government stated that emergency medical services (EMS) could create single responder units to provide non-emergency patient assessments and provide back-up units for emergency ambulances [9]. These single responder units are staffed with an advanced level nurse-paramedic (NP), or a nurse specialized in prehospital emergency care. Single responder-units are allocated cases by the dispatch centre or can respond directly to the staff that provides care in people's homes and elderly care homes. In Finland, the call outs from the dispatch centre are prioritized into four categories: A (the patient might have a life-threatening emergency), B (the patient is stable but might have other urgent), C (the patient needs an acute assessment), and D (the patient has a non-emergency situation). The EMS single responder-units are known by various names in different countries and they even differ among hospital districts in Finland. In this study, we use the term CP units, the staff are Community nurse-paramedics (CNP) and the home-care patient (HCP) means the patient at home or in the elderly care homes.

EMS policies and protocols guide the assessments and decisions made by CNPs, but complex decisions can fall outside the scope of protocols and they have access to physicians for further advice. Halter et al. [10] identified four factors that were considered by EMS staff when they made decisions about patients. They assessed the information provided by the dispatchers before they arrived. On arrival, they carried out an initial assessment to determine whether the patient needed imminent emergency care, or whether it was not an emergency. Medical and social information was gathered from the patient and then, the paramedics decided whether the care they needed could be provided in situ at home or whether they needed to be transported so that they could receive specialist care. The most reported health outcomes of CP programmes have included patients being transported to EDs or patients being admitted to hospitals [5]. The international impact of CP programmes has been described by multiple authors [4,5,7] and the consensus for a standardized patient assessment has been researched [11].

Finland is divided into 21 hospital districts, which organize EMS. The Finnish CP units are part of the EMS system. The EMS includes first responders, basic life support units, advanced life support units, and physician-led units. The basic life support unit is staffed by a firefighter or an emergency medical technician, plus a nurse specialized in prehospital emergency care. At least one member of the advanced life support unit team is a paramedic, who is a registered nurse. These nurse-paramedics have either completed a four-year Finnish Bachelor's degree or have specialized in prehospital emergency care for one year. Both are registered as nurses. The Finnish CP units are staffed by CNPs, who are either advanced level paramedics with many years of experiences or nurses with many years of experiences of emergency care. CNPs also undergo additional training in areas such as advanced diagnostic and medication management. The CP vehicle is equipped in a like to the advanced life support unit, but without a stretcher or immobilization equipment. It does include point-of-care blood testing and 16-lead electrocardiograms. The CP units provide patient assessments, follow-up care, and minor treatments for not-life-threatening emergencies. Sometimes, the CP unit can start the emergency care together with the ambulance units. CNPs can administer broader medication than advanced life support units [12]. In Finland, the patient assessment and care provided by CP units are based on

national and regional treatment protocols and the National Health Care Act. They can also call on the expertise of an EMS physician, as required.

The aim of this CP study was to describe the Finnish community paramedicine and examine the factors associated with CNPs' decision-making processes. The CP model is a novel care model in Finland and to the best of our knowledge, this was the first study to do this.

2. Materials and Methods

This was a quantitative descriptive study based on a retrospective review of CNPs' patient records from CP models in three hospital districts in Finland. We used the SQUIRE checklist when writing our report [13].

2.1. Data Collection and Measurement

This study focused on three hospital districts in different parts of Finland, who had introduced the CP model in April 2016, January 2017, and March 2018. The districts were a similar size, with populations ranging from 130,000 to 190,000, and each one covered both rural and urban areas. During Spring 2019, the researcher (TR) travelled to each three hospital districts and collected the data from the CP units' electronic patient record systems. Hair et al. [14] defined reliability as an assessment of the degree of consistency between multiple measurements of a variable and the recommended sample size can be calculated when the number of variables is multiplied with 5–10 observations. Multiple imputations were applied for the missing data of continuous variable [14]. We multiplied the 19 variables and added 17 for any loss ending up to the sample size of 150 CP patient records from each Hospital District. The CP patient records were the first 150 CP patients contacted at the start of the second year of each three CP models. If a patient appeared more than once in the data, then only the first contact was included.

The information was transferred directly from the patient records to the computerized abstraction form (Table 1). The form was composed using the EMS assessment and decision-making structure from Halter et al. [10] (prearrival information, Initial contact and Continuing assessment and Making a conveyance decision) and the SV210 EMS patient chart from the Finnish Ministry of Social Affairs and Health. The chart comprised five parts: information collected before arrival at the patient's home or elderly care home or before carrying out a telephone assessment, patient data, information from the patient during initial contact, information from the continuing assessment, and deciding whether an ambulance was needed to transport the patient for further specialist care. The continuing assessment was confirmed by using the International Classification of Primary Care, Second Edition (ICPC-2), which was developed by the World Organization of Family Doctors' and revised in 2015 [15].

The time of day was divided into the dayshift (9:00 a.m.–8:59 p.m.) and the nightshift (9:00 p.m.–8:59 a.m.). The patient ages were split into four categories (Table 2). The time spent with the patient was measured in minutes. For face-to-face visits, it related to the moment the patient was first seen to leaving their home or elderly care home. For telephone calls, it was the total length of the call. Several variables were dichotomized based on whether they were documented or not; Airway, Breathing, Circulation, Disability, Exposure (ABCDE)-approach, analysed or not; the patients' blood glucose levels, C-Reactive protein, troponin and prothrombin, and whether an electrocardiogram had been performed and a physician had been consulted.

Table 1. The variables involved in the CNPs' decision-making process.

	Initial contact and Continuing assessment
The patient	10. Contact
1. Hospital district	11. Patient position
2. Gender	12. Airway–Breathing–Circulation–Disability–Explore documented
3. Age	13. Point-of-care test taken for analysis
4. Medication	14. Electrocardiogram performed
Prearrival information	15. Physician consulted
5. Weekday	16. Nature of the task
6. Time of day	17. International Classification of Primary Care-2
7. Origin of the call	18. Contact time
8. Triage code from EMS Dispatch Centre	Making a conveyance decision
9. Priority level from EMS Dispatch Centre	19. Patient able to remain at home or in elderly care home or needed ambulance transport to the emergency department

Table 2. Demographic characteristics of the 339 CP patients.

	Missing	**%**	**(*n*)**		**Missing**	**%**	**(*n*)**
Hospital district				**Patient's gender**	49		
One		27.1	(92)	Female		58.3	(169)
Two		29.2	(99)	Male		41.7	(121)
Three		43.7	(148)	**Patient's age**	54		
Medication				Under 64 years		15.8	(45)
≤5	113	9.7	(22)	65–74 years		16.1	(46)
6–10		31.4	(71)	75–84 years		29.8	(85)
11–19		48.2	(109)	Over 85 years		38.2	(109)
≥20		10.6	(24)	**Origin of the call**		38.2	(109)
Time of Day				From patient's home		55.2	(187)
Dayshift 9:00 a.m.–8.59 p.m.		79.1	(268)	From Dispatch Centre		32.7	(111)
Nightshift 9:00 p.m.–8:59 a.m.		20.9	(71)	From Ambulance Unit		12.1	(41)
Day				**Triage code**	221		
Monday		13.6	(46)	774A-D Weakness		16.0	(54)
Tuesday		13.3	(45)	706A-B Stroke		6.5	(22)
Wednesday		15.3	(52)	704A-D Chest pain		3.3	(11)
Thursday		14.2	(48)	745B-D Fallen down		2.4	(8)
Friday		14.7	(50)	783D Backache		1.8	(6)
Saturday		12.716.2	(43)	703B-C Breathing		1.5	(5)
Sunday			(55)	Other triage codes		3.6	(12)
The contact				**Patient position**	21		
By phone		39.2	(133)	Walking		14.5	(46)
By visiting		60.8	(206)	Sitting		26.1	(83)
ABCDE-approach				in bed		59.4	(189)
Airway, Breathing		70.5	(239)	**Test analysed**			
Circulation		77.9	(264)	Blood glucose test		19.5	(66)
Disability		79.6	(270)	C-Reactive protein test		19.5	(66)
Explore		38.3	(130)	Troponin test		3.5	(12)
Electrocardiogram taken		11.2	(38)	Prothrombin time test		4.4	(15)
Contact time	148			**Physician** consulted		30.4	(103)
under 10 min		25.7	(49)	**Nature of the task**			
11–30 min		24.1	(46)	Patient's assessment		81.7	(277)
31–60 min		15.2	(29)	Assessment and treatment		9.1	(31)
61–120 min		29.35.8	(56)	As a Back up-unit			
over 121 min			(11)	**CNPs' decision**		9.1	(31)
				Patient remained at home		58.7	(199)
				Patient needed ambulance transportation		41.3	(140)

2.2. Data Analysis

The data were analysed with SPSS statistical software for Windows, release 25 (SPSS, Chicago, IL, USA). Descriptive statistics included frequencies, percentages, means, and medians. Age and contact time were categorized for further analyses. Missing data of the patient's background, namely gender, age, and the patient's position when the CNP first saw or spoke to them were treated as independent variables groups. We kept all the variables for the characteristics of the CP patients. The decisions made by the CNPs, including whether a patient remained at home or needed to be transported, were analysed using the chi-square test and described with cross-tabulation. Statistical significance was set at $p < 0.05$.

A regression model was constructed to identify the factors associated with the CNPs' decision making when the patient remained at home or needed ambulance transportation to the hospital. Univariate logistic regression analysis was applied to screen the association between each associated factor with the CNPs' decision making. Each of the predictor variables underwent univariable logistic regression analysis, and those that were significant ($p < 0.05$) were included in the multivariable regression model. Multivariate regression analysis was used to estimate the predictors of the CNPs' decision making. A backward elimination approach was used to fit the final multivariable model. We wanted out model to accurately reflect the key factors of the CP decision-making. Goodness of fit of any final model was tested using Nagelkerke's R^2 test. The final model interpreted the ORs, 95% confidence intervals (CI), and *p*-values to estimate the association between the patient care continuum and the independent predictors of CNPs' decision-making.

2.3. Ethical Considerations

The study was approved by Tampere University Hospital Ethics Committee reference number: R19008H) and the participating hospital districts and their EMS managers. We also needed specific permission from the three patient data registrars. Informed patient consent was not required, as the patients were anonymized to guarantee their privacy and confidentiality. The hospital data analysts collected the information from the patients' records on our behalf, without surnames, birth dates, or addresses. The principal author retrospectively reviewed all the patient data that had been collected. The codes allotted to the patients simply contained a gender code and their birth year. All the data were passed to the first author, handled, and stored in accordance with current legislation and downloaded to Microsoft Excel for Windows 10 (Microsoft Corp, Redmond, WA, USA).

3. Results

3.1. All CP Cases

The CP units received calls from all sources (home care nurses, dispatch centres, EMS field supervisors, police, families). The most common ICPC-2 codes for all patients ($n = 450$), were acute alcohol abuse (15.6%), general weakness or tiredness (12.4%), fever (8.4%), and chest pain (7.3%). Just under a third of the 450 CP patients (32.4%) needed ambulance transport for further assessment and two-thirds (67.6%) were able to stay at the police station or at home or in their elderly care home (Table 2).

3.2. Patients at Home or in Elderly Care Homes

The analysis was carried out after we excluded 111 cases: 80 were clients from the police, nine back-up duties for other EMS units and 22 further contacts with three terminal patients. The analysis was carried out from those CP patients ($n = 339$, 75.3%) who lived at home or in elderly care homes These home-care patients had a median age of 83 years (min 19–max 103) and more than one-third (38.2%) were 85 years or older. In 39.2% of the cases, the CNP provided telephone triage and the remaining patients were assessed face-to-face (Table 2).

Most of the 187 (51.6%) calls from the patient's home were from home care nurses or assistants, 1.5% were from personal alarm call workers, and the remainder were the

patients or their friends or family. The calls to the CP units were relayed from the EMS central dispatch centre using all the priority codes from A to D. The final 12.1% were referred to the CP units by ambulance units, so that the CNP could continue the patient's care and free up the ambulances for other calls (Table 2).

The documentation of the patients' ABCDE assessments varied. The most frequently recorded element was the current medication, which was documented for 226/339 (66.7%) patients. The analysis showed that the median number of medications taken per day was eight (min 0–max 23) and 24 of these 226 patients (10.6%) took more than 20 different medications per day.

Point-of-care tests were used 159 times during the assessments. The physician was consulted about nearly a third (30.4%) of the 339 patients. The contact time was available for 191/339 (56.3%) of the patients. (Table 2) The median (min–max) contact time with the patients was 31 (1–229) minutes and was considerably higher for telephone contact (5, 1–185) minutes than home attendances (63, 5–229) minutes (Table 2). The most frequent ICPC-2 classifications in the 339 patients were general weakness/or tiredness (15.9%), fever (10.6%), transient cerebral ischemia (8.8%), and chest pain (8.3%). Two of the patients were classified with social problems (Table 3).

Table 3. Main categories in which 339 CP home-care patients were placed based on ICPC-2.

ICPC-2 Main Category	*n*	%	ICPC-2 Main Category	*n*	%
A General and unspecified	158	46.5	R Respiratory	28	8.3
B Blood, blood forming organs	2	0.6	S Skin	8	2.4
D Digestive	22	6.5	T Endocrinology	7	2.1
K Cardiovascular	52	15.2	U Urological	6	1.8
L Musculoskeletal	24	7.1	Y Male genital	1	0.3
N Neurological	21	6.2	Z Social Problems	2	0.6
P Psychological	8	2.4			
Total				339	

3.3. Factors Associated with the CNPs' Decision

The univariate analyses indicated 14 predictors that were related to the CNPs' decisions about the patients' care continuum. Having received initial information about the patients, the CNP assessed 133/339 (39.2%) of the patients by phone and in 65 (48.9%) of those cases, an ambulance unit was sent to carry out a further assessment. In the other 68 cases, the patient was able to remain at home. Only seven (15.2%) of the patients, who were able to walk when the CNP arrived, needed to be transported to the hospital by ambulance. There were no statistical differences between the days of the week ($p = 0.084$) (Table 4).

Five predictors were still statistically significant after the multivariable logistic regression analysis and these were hospital district, patient position when first contact was made, troponin test performed, consulting a physician, and nature of the task. Patients had a higher probability of remaining at home in hospital district three (OR 5.5, 95% CI 2.77–11.2, $p < 0.001$) than in hospital district one. The patients' odds for remaining at home were higher (OR 11.6, 95% CI 1.2–110.9, $p = 0.034$) when the CNP provided the troponin test or (OR 3.1, 95% CI 1.7–5.5) consulted the physician. The patient's odds for remaining at home was higher (OR 3.9, 95% CI 1.4–11.0, $p = 0.029$) when the CNPs' nature of task included assessment and treatment, compared to patient assessment only (Table 5).

Table 4. Univariable logistic regression of predictors of CNPs' decisions of patient at home (n = 339).

Characteristics	Patient Could Remain at Home % (n)	Patient to the Hospital by Ambulance % (n)	Unadjusted OR (95% CI) *	p
Hospital district				<0.001
One	38.0 (35)	62.0 (57)	1	
Two	52.5 (52)	47.5 (47)	1.8 (1.0–3.2)	
Three	75.7 (112)	24.3 (36)	5.1 (2.9–8.9)	
Patient's gender				0.001
Male	59.5 (72)	40.5 (49)	1	
Female	65.1 (110)	34.9 (59)	1.3 (0.8–2.1)	
Missing	34.7 (17)	65.3 (32)	0.4 (0.2–0.7)	
Patient's age				0.003
Under 64 years	62.2 (28)	37.8 (17)	1	
65–74 years	60.9 (28)	39.1 (18)	1.0 (0.4–2.3)	
75–84 years	62.4 (53)	37.6 (32)	1.0 (0.5–2.0)	
over 85 years	66.1 (72)	33.9 (37)	1.2 (0.6–2.5)	
Missing	33.3 (18)	66.7 (36)	0.3 (0.1–0.7)	
Day				0.084
Monday	47.8 (22)	52.2 (24)	0.8 (0.4–1.8)	
Tuesday	64.4 (29)	35.6 (16)	1.6 (0.7–3.7)	
Wednesday	53.9 (28)	46.1 (24)	1.1 (0.5–2.2)	
Thursday	77.1 (37)	22.9 (11)	3.0 (1.3–7.1)	
Friday	54.0 (27)	46.0 (23)	1.1 (0.5–2.3)	
Saturday	62.8 (27)	37.2 (16)	1.5 (0.7–3.4)	
Sunday	52.7 (29)	47.3 (26)	1	
Time of Day				
Dayshift 9:00 a.m.–8.59 p.m.	56.0 (150)	44.0 (118)	1	0.050
Nightshift 9:00 p.m.–8:59 a.m.	69.0 (49)	31.0 (22)	1.8 (1.0–3.1)	
Origin of the call				
From Home	66.3 (124)	33.7 (63)	1	0.004
From Ambulance Unit	56.1 (23)	43.9 (18)	0.7 (0.3–1.3)	
From EMS Central Dispatch Centre	46.9 (52)	53.1 (59)	0.5 (0.3–0.7)	
The contact				
By phone	51.1 (68)	48.9 (65)	1	0.023
By visit	63.6 (131)	36.4 (75)	1.7 (1.1–2.6)	
Patient position				
in bed	47.1 (89)	52.9 (100)	1	
Walking	84.8 (39)	15.2 (7)	6.3 (2.7–14.7)	<0.001
Sitting	74.7 (62)	25.3 (21)	3.3 (1.9–5.9)	
Missing	42.9 (9)	57.1 (12)	0.8 (0.3–2.1)	
ABCDE-approach				
AB				0.169
Not documented/documented	66.4 (93)/73.4 (146)	33.6 47/26.6 (53)	1/1.4 (0.9–2.2)	
C				0.008
Not documented/documented	45.3 (34)/62.5 (165)	54.7 (41)/37.5 (99)	1/2.0 (1.2–3.4)	
D				0.004
Not documented/documented	43.5 (30)/62.6 (169)	56.5 (39)/37.4 (101)	1/2.2 (1.3–3.7)	
E				
Not documented/documented	42.3 (103)/73.9 (96)	50.7 (106)/26.1 (34)	1/2.9 (1.8–4.7)	<0.001

Table 4. *Cont.*

Characteristics	Patient Could Remain at Home % (*n*)	Patient to the Hospital by Ambulance % (*n*)	Unadjusted OR (95% CI) *	*p*
Troponin-test				
Not performed/performed	57.5 (188)/91.7 (11)	42.5 (139)/8.3 (1)	1/8.1 (1.0–63.7)	0.046
Electrocardiogram				0.023
Not performed/performed	56.5 (170)/76.3 (29)	43.5 (131)/23.7 (9)	1/2.5 (1.1–5.4)	
Physician consulted				<0.001
No/yes	52.1 (123)/73.8 (76)	47.9 (113)/26.2 (27)	1/2.6 (1.6–4.3)	
Nature of the task				
Patient´s assessed	59.6 (165)	40.4 (112)	1	0.003
Patient assessed and treated	77.4 (24)	22.6 (7)	3.4 (1.5–8.0)	
As a Back Up unit	32.3 (10)	67.7 (21)	0.5 (0.2–1.0)	

* OR = Odds Ratio; CI = confidence interval.

Table 5. Multivariable logistic regression of predictors of CNPs' decisions of patient at home.

Factors	Adjusted OR (95% CI) *	*p*-Value
Hospital district		
One	1	<0.001
Two	1.9 (1.0–3.9)	
Three	5.5 (2.7–11.2)	
Patient position		
In bed	1	<0.001
Walking	7.2 (2.9–18.1)	
Sitting	2.7 (1.5–5.1)	
Not documented	2.9 (1.0–8.2)	
Troponin test		
Not performed	1	0.034
Performed	11.6 (1.2–110.9)	
Physician consulted		
No	1	<0.001
Yes	3.1 (1.7–5.5)	
Nature of the task		
Patient assessed	1	0.029
Patient assessed and treated	3.9 (1.4–11.0)	
Back Up at patients' home	0.8 (0.3–2.1)	

* OR = Odds Ratio; CI = confidence interval. Gender, age, time of day, who called, the contact, documented circulation, disability, or explore, and performed electrocardiogram were controlled as independent variables in the model, but they were not statistically significant.

4. Discussion

The aim of this CP study was to describe the Finnish community paramedicine and the factors associated with CPNs' decision-making. To the best of our knowledge, this was the first study to do that.

The Finnish CP models varied in each Hospital District. However, all three CP models served a population of all ages (range 19–103). The median age of the patients at home or in elderly care homes was high: 83 years. Globally, older patients have been the main population served by 48.4% of CP programmes [6]. Some CP programmes have been used in the wider community [16]. Others have focused on patients with congestive heart failure or diabetes [7], or provided regular visits to older people in subsidized housing [17]. The Finnish CP models could be adapted to provide more tailored programmes that engage with special patient groups as well as the community as a whole.

The CNPs assessed the patient's care need by phone or during the visit. In our study, the care needs of 133 (39.2%) of the home care patients were assessed by phone and less than half (48.9%) of them needed a further assessment by an ambulance unit. Phone

assessment could play a considerable role in assessing and managing non-emergency cases and this has been particularly evident in many aspects of primary health care during the current pandemic. Telemedicine can also help medical staff to reach patients who live some distance from emergency services, but it cannot provide a substitute for face-to-face communication and safe care backed up by other collaborative services.

In this study, advanced diagnostics were a novel part of the assessment and treatment. The troponin and CRP test formed part of the need for follow-up care. Research has shown that point-of-care tests have been a reliable part of the CNP assessment and that critical range discrepancies occurred in less than 1% of cases compared to laboratory tests [18]. Point-of-care tests also detected cardiac damage in 91% of prehospital acute myocardial infarction-patients [19] and the CRP test has been considered an important tool in assisting the care continuum of patients [20]. The CP model means that patients were able to avoid visiting hospitals for one blood test or for the control test, because they could receive the care they needed at home.

Our study results indicate that being able to consult physician had a positive impact on decisions. This contrasted with a previous study, which found that consulting an on-call physician was not associated with whether CP patients were transported to the hospital [12]. Leikkola et al. [21] concluded that consulting physician could be challenging if the physician did not concentrate sufficiently on the phone call or enter the background information that care providers requested into the patient's records. However, the physicians in our study appear to have provided information that enabled the patients to stay at home. The CNPs could discuss treatments and care planning and confirm with the physician that the patients could receive the care they needed at home.

We found that the most common patient ICPC-2 classification was general weakness or tiredness, which was consistent with a previous EMS study [22]. In addition, the high number of medications could point to patients having multiple morbidities. The increased complexity of prehospital care that some patients need has also been highlighted by previous research [23]. One notable finding was that patients' nonspecific complaints or general weakness increased mortality [24], which could increase the challenge of finding patients the right care in the right place. The variety of complaints and multi-morbidities of the CP patients in our study showed the wide-ranging competencies that CNPs need when assessing and progressing a patient's care.

More than half (58.7%) of these 339 patients received the care and treatment that they needed at home or in their elderly care home. This percentage was higher than a previous, comparable study, where 48% of the patients stayed at home after they were visited by a CP unit [12]. One international study reported that the 84.6% of CP programmes used reduced ED visits as an outcome measurement [7]. Another stated that patients found being transported to the ED very stressful [8], thus being able to avoid this could have a positive impact on the psychosocial well-being of patients' and their families. Furthermore, being able to remain at home can help patients avoid hospital acquired infections, which is particularly pertinent during the COVID-19 pandemic.

Based on our findings, the CNPs were more likely to organize transport to hospital during dayshifts than nightshifts. Previous studies have reported that it was better to postpone treatment or an ED visit for a few hours, until it was daylight, than transport the patient there during the night [21,25]. Some hospital districts only operate the CP model during office hours. However, our results underlined the importance of the CP units being available day and night, as they often needed to fill the health-care gap when home nursing was not available during the night or at weekends.

According to Halter et al. [10], EMS staff receive prearrival information from the Dispatch Centre. In our study, mainly (55.2%) the CP calls came direct from patient's home and the CNP needs to triage the patient's care need immediately. The CNP does not have the arrival time or a team member to discuss about the different options for the patient's care continuum. The results in our study underlined the medical focus that drove the CNPs' initial contact and continuing assessment, consistent with the results from

Halter et al. [10]. However, the CP providers were also in a unique position to observe and assess the risks and care needs of patients based on their social and environmental determinants of health [8], as Halter et al. [10] has also highlighted.

One of the strengths of this study is that it provides useful information from CP models in three different parts of Finland. The characteristics of the cases were carefully reviewed and abstracted into a specific form. The patients' signs and symptoms were classified with ICPC-2 codes, and this provided detailed information about their clinical care needs. Factors associated with the CNPs' decision were defined and the multivariate logistic regression analysis provided a declarative model to explore more in further studies. The study was conducted with an experienced research group, and a statistician was consulted.

The study has some limitations, including the retrospective design, and the fact that the registries containing the patient records were not primarily designed for scientific research. Some information was missing on several patients and further research is needed to find out why this occurred. However, we do know that most of the patients with missing documentation were transported to hospital. It may be that the CNP passed the call to the ambulance unit with any information gathered and did not consider that recording two sets of data was useful. According to Porter et al. [26], EMS professionals do not see that their documentations have significant importance, which can have a general impact on the quality of documentation. However, detailed patients' records are an essential part of quality management. We did not assess the patients' follow-up care or outcomes, which would have indicated whether it was right to leave patients at home. Finally, we had three terminal patients that accounted for 22 of the 339 calls, but we only included the first call in our results to avoid skewing the data. Despite these limitations, this study provides a reflection of CP models in Finland and detailed factors associated with the CNPs' decisions, which will be useful for further research.

These results are nationally and internationally important for those who develop and lead EMS systems and primary health care and for those who educate the healthcare providers of the future. Future research will need to identify the patient groups that would benefit the most from CP services, how these services could engage with the local community, and how the CNPs consider their role and challenges with decision-making.

5. Conclusions

This study focused on the work of three CP models in three Hospital Districts in Finland. It describes the five key factors associated with decisions made by CNPs when they assessed home care patients. We believe that the findings from these three CP models could help answer calls from the WHO and OECD for more patient-centered care to be provided at home. This would also enable emergency response services and hospital emergency departments to focus on those patients who have the greatest need for urgent, specialist care.

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Institutional Review Board Statement: The study was approved by The Regional Ethics Committee of Tampere University Hospital (reference number: R19008H) and the participating hospital districts and their EMS managers.

Informed Consent Statement: Informed patient consent was not required, as the patients were anonymized to guarantee their privacy and confidentiality.

Data Availability Statement: The literature sources used to contribute to our conclusions are outlined within the manuscript. The data from the patients' records are not made publicly available due to them containing information that could risk our participants' confidentiality.

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Community Nurse-Paramedics' Sphere of Practice in Primary Care; an ethnographic study

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Community nurse-paramedics' sphere of practice in primary care; an ethnographic study

Tuija Rasku[1*], Marja Kaunonen[1,2], Elizabeth Thyer[3], Eija Paavilainen[1,4] and Katja Joronen[5]

Abstract

Background: Primary care, the principal function of the health care system, requires effort from all local primary health care teams. Community Paramedicine (CP) has managed to reduce the use of Emergency Medical Services (EMS) for non-emergency calls, but for the paramedic to move from traditional emergency calls to non-emergency care will mean new demands. There is a paucity of research exploring nurse-paramedics' experiences and perceptions of their novel roles as community paramedics in Finland. This study aims to explore the community nurse-paramedics' (CNP) experiences in their new sphere of practice.

Methods: A descriptive ethnographic study was conducted, to collect data through participant observation (317 h total) and semi-structured interviews ($N = 22$) in three hospital districts (HD) where the CNPs have worked for at least 1 year. Both data sets were combined, organised, and analysed using inductive content analysis.

Results: Five main categories were developed by applying inductive content analysis: the new way of thinking, the broad group of patients, the way to provide care, the diversity of multidisciplinary collaboration, and tailored support from the organisation. The CNP was identified as needing an appropriate attitude towards care and a broader way of thinking compared to the traditional practice of taking care of the patient and the family members. The diversity of multidisciplinary collaboration teams can be a sensitive but worthwhile topic for offering new possibilities. Tailored support from the organisation includes tools for future CP models.

Conclusions: Our results indicate the CNPs' deep involvement in patients' and families' care needs and challenges with their skills and competencies. Their professional attitudes and eagerness to develop and maintain multidisciplinary collaboration can offer preventive and long-term caring solutions from which citizens, allied health, safety, and social care providers benefit locally and globally.

Keywords: Health services, Primary health care, Community paramedicine, Sphere of practice

* Correspondence: Tuija.Rasku@tuni.fi
[1]Faculty of Social Sciences, Health Sciences, Tampere University, 33014 Tampere, Finland
Full list of author information is available at the end of the article

Background

Primary Care is a pivotal and principal function in the health care system [1]. It is the first contact care; its providers are expected to be comprehensive, and the care needs must be coordinated. Primary Care is person-focused (not disease-oriented) care provided as close to the user as possible, where diseases may cause medical, psychological, or social problems. National primary care strategies need efforts from local primary health care teams. Health services are tailored to meet the populations needs, aiming to establish a continuum of care and contribute to its comprehensiveness [2]. There is an urgent need to create new health care models in the primary care setting to decrease pressure on home-care providers' (e.g., home care nurses and professional caregivers) [3, 4].

Internationally, CP is community-engaged, patient-centred preventive care that includes multidisciplinary collaboration and has many programmes as an integrated part of the primary care setting [5]. To work as a community paramedic means that the paramedic steps out from the traditional emergency role instead of providing patient assessment and non-emergency care with allied prehospital health care providers. In the future, many health care providers' roles might change, and the necessary competencies could be broader, but the care should remain focused on quality and safety [4, 6].

As primary health care endeavours to follow these changes, it is faced with increased demands, which lead to a greater need for allied health professionals to carry out assessments and treatment traditionally delivered by physicians [7]. In some prehospital jurisdictions, paramedics work seamlessly with the allied health care professions, providing the patients with well-organised and high-quality care [4–6, 8–11].

Globally, CP programmes have filled the gaps in local health care delivery and assessed the possibilities for patients to remain at home. The community paramedics have assessed patients, taken advanced blood tests, analysed ECGs, arranged referrals to X-ray or follow-up visits, assisted with medication management, or arranged social support [7, 12, 13]. They have been supported through protocols or have been directed online (telephone or video) by relevant physicians, e.g., geriatricians, general internists, family practitioners, paediatricians, or emergency physicians [14]. The reports and evaluations of CP programmes have underpinned the need for organisational support, long-term planning of the multidisciplinary collaboration and challenges to the economy, or the reimbursement of the provided health care service [14, 15].

The Finnish government regulates customer-oriented and supportive health care services [16]. According to their proposal, one-person EMS units could provide non-emergency patient assessment and minor treatments beyond the emergency services provided by ambulance units. These one-person Finnish EMS units are comparable to CP units around the world. In Finland, EMS staff are mostly nurse-paramedics. Nurse-paramedics undertake 4 years of full-time studies at a university of applied sciences (including 4450 h of theoretical studies and 2025 h of practical training) following the European Union requirements. In the first year of "nursing studies", Finnish nurse-paramedics learn about care for people with chronic conditions concentrating on emergency care in the following years. The graduated nurse-paramedic will be registered as a nurse, and he/she will work under the direct supervision of the EMS physician of the HD [16]. The CNPs' role has developed in response to the shortage of health care providers in primary care and the awareness of their independent skills in assessing patients in challenging circumstances.

Generally, the traditional views regarding the paramedics' role and the competencies they need have changed. In previous studies, paramedics were associated with many different roles, such as clinicians, team members, health and social advocates, educators, reflective practitioners, and professionals. These roles were linked with patient safety, compassion, adaptability, and communication [12, 17]. There is a paucity of research exploring nurse-paramedics' experiences and perceptions of their novel roles in Finland. By conducting an ethnographic study in the context of CNPs, we aim to identify and explore the actions, experiences and perceptions of the Finnish CNPs' sphere of practice. By analysing their responses, we add to the growing body of research into CP, contribute to this health care model's possibilities, demands, and sustainability, and provide policymakers, health care providers, and educators with essential information for future use.

Methods

Methodology

The study aimed to explore the Finnish nurse-paramedics' experiences and perceptions of their work as CNPs. We used an ethnographical research framework because ethnography aims to deepen the understanding of social phenomena in a social setting [18–20], and the ethnographic approach is especially recommended in cultural changes from one stage to another [21]. We wanted to know how the Finnish CNPs experienced changing from a nurse-paramedic to a CNP. Ethnographic research orientation includes fieldwork, the position of the researcher, and the purpose of the study. The researcher is the essential research "device" when the researcher is personally among the participants [20].

Our study design for data collection included participant observation and semi-structured interviews. When taking part in people's lives, listening to their words, and interpreting their actions, we could collect a "thick description" [18], meaning that the researcher reflects social events and actions, and the description and analysis are rooted in reality. Participant observation is the recommended method for gaining an in-depth understanding of a phenomenon [18, 19]. It revealed nuances from the CNPs' daily work, which would not have come to light in interviews alone [22]. The researcher needs to understand the participants' perceptions (the "emic" view), which helps uncover the reasons for their actions. Health researchers have used the outsider's perspective (the "etic" view) when trying to identify and describe patients' problems instead of listening to the patients' ("illness experts") own ideas of their condition, feelings, and perceptions. In an ethnographic study, both emic and etic views, are needed as thy summarise. The participants' insights and words into the language of science [20]. The consolidated criteria for reporting the qualitative research (COREQ) -checklist was used to mitigate the inherent threat of bias and report the essential aspects of the research [23]. An ethics approval was obtained from Tampere University Hospital Ethics Committee (Approval R19008H).

Study setting

Finland is divided into 21 hospital districts (HD) to provide specialised medical care. Every HD has a central hospital and municipal health care centre associated with a university hospital. The research was undertaken in three HDs in different parts of Finland. The size of the HDs was similar (population ranged 130,000 – 190, 000; area 7000–22,000 km^2). These HDs were selected purposely because the CP model ran in them for longer than 1 year. Each HD has one or two CP units providing non-emergency health care services with other health care providers and safety workers such as the police and the safety alarm responders. The nurse-paramedics working as community nurse-paramedics have extensive experience in emergency or prehospital nursing. They have undertaken additional training on risk assessment (risk of chronic disease and falling), assessing the patient's mobility and social needs, advanced diagnostics, medication management (e.g., antibiotics), simple procedures (e.g., suturing), and palliative care.

Study participants

We used purposive sampling, including 13 CNPs, four nurse-paramedics, four team leaders, and one care coordinator ($N = 22$). Purposive sampling is commonly used in qualitative research [20]. The participants received the study invitation and provided informed written consent via email. No participants refused or dropped out. The key participants were from different HDs to give a multifaceted understanding of this health care model and the CNPs' roles, foci and perceptions. All key participants had worked as CNPs since the model was first implemented and hold specialised and expert knowledge about the related history and interaction processes [21].

Data collection

The data collection began in May 2019 and continued until September 2019. The researcher (TR) gathered the data through observations, informal discussions and semi-structured interviews in each HD. Participant observation consisted of riding along with the CNPs, observing their practice, and talking to staff members and co-workers (home care nurses, care coordinators and doctors). The observation (317 h) occurred across all HDs in the same summer and by one researcher (TR) to mitigate the inherent threat of bias. The researcher (TR) had no relationship with any participants before the study. Thirteen CNPs, four team leaders, four nurse-paramedics, and one care coordinator participated in the semi-structured interviews.

This multi-method approach captured the diversity of the CP models within a natural setting and allowed the issues to be studied in-depth. The length of the observational period and the number of interviews were not pre-determined; they continued until the thematic saturation was met.

The participants, patients, and family members were informed about the purpose of the study and the researcher's role. They were reminded that each participant could withdraw at any time, and they would stay anonymous in the data. During visitations, the CNP asked the patient (or the family member or home care nurse if the patient could not speak or understand the question) if the researcher could stay. The patient or the CNP could deny the researcher's presence at any time. The researcher did not take part in the interventions. The observational period included the CNPs' patient assessments by phone or face-to-face visits, training sessions with other health care providers, meetings with allied health care workers, and cooperation with the police and safety alarm providers.

The researcher (TR) spent between two to five 10 12-h shifts with each CNP. There was 1 day between the work shifts while the researcher transcribed the field notes and the interviews. Afterward, in the second round, the researcher (TR) returned to the interviewees to confirm the findings. The observational notes and transcripts were read and discussed with the research team members to ensure the consistency of the

interpretation. The researcher (TR) kept a field diary, where contemporaneous descriptions were extended and detailed after each workday. Informal discussions with the CNPs were an essential component of the observation part of the data collection process. During the observation, the CNPs' practice was noted immediately after patient calls, along with the CNPs' comments.

The observational data were completed with semi-structured interviews. The interviews were conducted following an interview guide (Fig. 1) to ensure that the researcher collected similar data from all participants and gained all their perspectives.

The questions were piloted with two nurse-paramedics and one team leader (led by TR) to assess clarity and potential bias. No changes were needed. The data from the pilot interviews were not included in the analysis. The interviews were conducted with 13 CNPs, and the data were enriched by interviewing four nurse-paramedics, four EMS team leaders, and one care coordinator ($N = 22$).

The interviews were a mix of formal and informal, which is a common practice in ethnographic research [20]. Four of the CNPs and two of the team leaders (involved with the CP model) were on holiday, and because of the distances, they were interviewed by phone. Formal interviews were audio-recorded and later transcribed verbatim, whereas informal interviews sometimes evolved from conversations and were recorded using contemporaneous notes and further descriptions immediately after the interview. The data were organised, the fieldnotes were sorted, and the interviews were transcribed. The interviewees were provided with the "transcript" during the next work shift, and corrections were made as needed [20]. The transcripts were anonymised and stored in a password-protected database.

Data analysis

The data collected using both methods were combined and analysed using inductive content analysis. The inductive content analysis process includes open coding, coding sheets, grouping, categorisation, and abstraction [24]. (Fig. 2).

When words and phrases are classified into the same categories, they share the same meaning [25]. With open coding, notes and headings were added to the text while reading it. The researcher read the written material three times (TR) to avoid the risk of focusing too much on some parts of the data. Reflecting on the meaning of the data allows the codes to emerge from the data. New headings were written in the margins to describe various aspects of the content. Thus, the researcher did not lose sight of the meaning and depth of findings [20].

Two other researchers (KJ and MK) joined the analysis with no prior knowledge of the data. The researchers frequently discussed the coding process and clarified any disagreements in the codes. The original expressions yielded open codes ($N = 213$). The codes were coloured to better identify closely linked material better. After the open coding was completed, the categories provided a means of describing the phenomenon [25]. Each subcategory was labelled using content-characteristic words and then grouped into generic categories, which were further grouped into main categories [24]. Any inconsistencies were resolved by joint review and discussion. Original citations increase the trustworthiness of the research and determine what kinds of original data categories are formulated [26]. Table 1 presents an example of the inductive content analysis process.

Results

In this study, 22 health care professionals participated, 10 of which were female and 12 male. Of the participants, there were 13 CNPs, four nurse-paramedics, four EMS team leaders, and one care coordinator. The participants had all worked longer than 5 years as health care providers and since the introduction of the local CP model. The field period was a total of 317 h, which provided a" 'thick description" of the research area [18]. During the field period, the researcher observed 12 CNPs' practices during 94 patient assessments.

The data from the interviews and observational field notes produced 213 open codes, categorised into 56 subcategories and then to 14 generic categories. The initially identified categories were reduced, and five categories were developed from the data: (1) The new way of thinking, (2) The broad

Interview Guide

- **Main Question:** How do you describe your new role as a CNP?
- Can you describe what has changed?
- What were the changes in the tasks or in the co-worker's team?
- What has changed since the introduction of the local CNP model?

Fig. 1 Interview Guide of Community nurse-paramedics

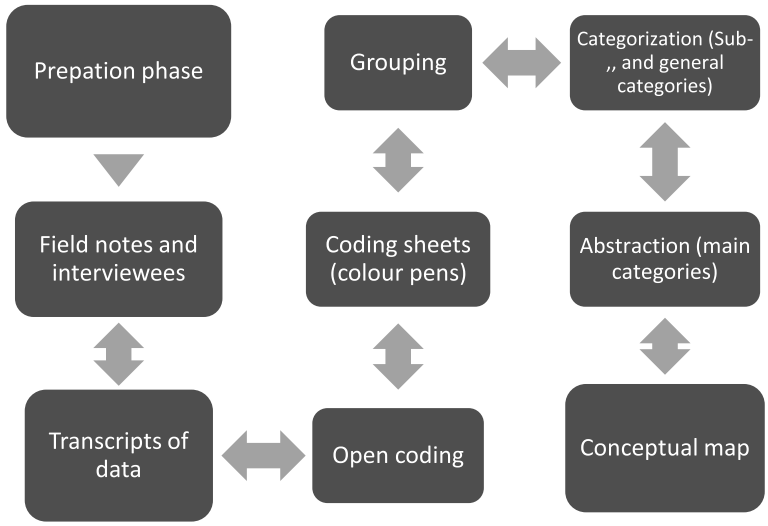

Fig. 2 The phases in the inductive approach of the content analysis process Modified from Elo&Kyngäs (2008)

group of patients, (3) The way to provide care, (4) The diversity of multidisciplinary collaboration, and (5) Tailored support from the organisation (Fig. 3). Each category included coded quotations to illustrate the findings.

The new way of thinking

The interviewees described the CNP's new way of thinking, including *an appropriate attitude* and *the need to think on the second level*.

The CNPs articulated that working as a CNP means a readiness to change the mind from lights and sirens and episodic care into the search for long-term solutions for the patient. The interviews highlighted that the CNP has an appropriate attitude when they voluntarily engage in the new role. The most significant risk is when the CNP behaves wrongly. For various reasons, it could destroy the relationship between the patient and the family and the relationships in the multidisciplinary collaboration team.

Not all of us can work as CNPs. This job is for you when you do not get kicks anymore from the lights and sirens. You must be ready to concentrate on the patient and the family for a longer time than before. In the beginning, it could be very hard. (Excerpt 1, CNP)

The comments related to *the need to think on the second level* indicated that CNPs do not think differently, but they need to think more broadly than before, trying to find a continuum of care with other multidisciplinary team members.

The CNP got a phone call from the home care assistant. Her client, a 92-year-old lady, lives alone and now has low blood pressure. The CNP assessed the patient's care needs by phone and found that the mentioned blood pressure was normal for her from her previous patient records. The lady could stay home but she wanted to go to the shop because the fridge was empty. The CNP

Table 1 Example data extracts demonstrating the hierarchical coding process

Original text	Open codes	Subcategory	Generic category	Main category
*"..it is important that you **sit down with the patient and the family members** and try **to find the solution**, which I think means that there is some **long-term plan** for the person **to survive at** home ..."*	sitting down with the patient & the family finding the solution making the long-term plan	time to sit patient & family solutions long-term planning survey at home	the luxury of time together with the patient & family the aim of the assessment the aim of the care	the way to provide care

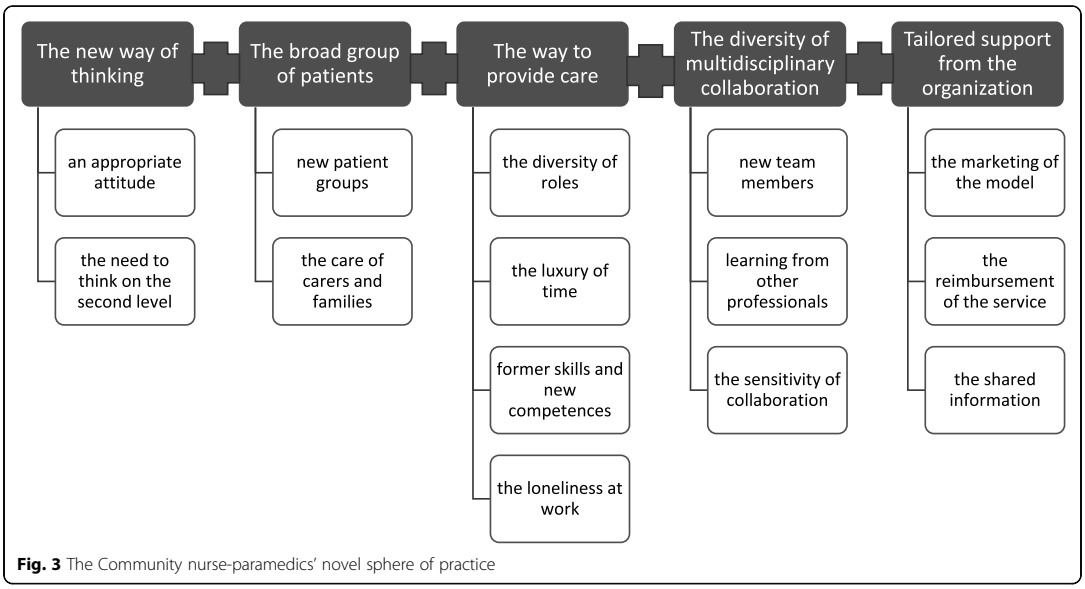

Fig. 3 The Community nurse-paramedics' novel sphere of practice

advised the lady not to go to the shop and called a food delivery service to provide food for the lady. The service will deliver food for the lady immediately, and the home care assistant promised to make an extra visit to the lady in the evening. (Excerpt 2, Observational notes)

The broad group of patients

The interviewed CNPs characterised the broad group of patients as *new patient groups* and *the care of carers and families.*

The CNPs emphasised that most CP patients are old and live either alone or with older or frail spouses. They provide more palliative care to patients of different ages than before and have discharged patients or patients with their families as their new patient groups. The CNPs felt that the need for social support is most often behind many physical considerations.

All of our patients are not clients of home care. A discharged patient might have a wound that could be open and secreting, but the patient does not have any pain medication or is too scared to clean the wound or even go to the shower. The spouse can be very scared and not sleep at all. If we are not visiting there, we (EMS) might have two patients in the morning. We try to explain what "spray the wound" or "take a painkiller when needed" means during our visit. (Excerpt 3, CNP)

We visited a male patient in the elderly care home. He was very drowsy during dinner. The CNP assessed the patient checked the urine sample and read from the patient's history that he has had a couple of urinary tract infections. The patient has a urine infection again, and after consulting the doctor-on-call, the CNP arranged the medication from the local pharmacist. The CNP called the elderly care home in the evening, and the patient felt much better. (Excerpt 4, Observational notes)

CNPs can deliver advanced diagnostics, and they have received additional education on palliative care. With these patients, the CNPs help the at-home nursing mostly at night and on weekends when home care nurses are unavailable. The patients have a direct number to the CP unit.

On Christmas Eve, I called the palliative care physician directly. We decided that the patient could stay at home over Christmas and did not need to go to the hospital to change the medication. I organised it with the local pharmacist, and the family was pleased. (Excerpt 5, CNP)

The CNPs received positive feedback when the patient could avoid the uncomfortable travel to the ED and back, for instance, to control the PCA (patient-controlled analgesia) pump. The CNPs felt that the relationships between the patients and the families were equally rewarding and demanding.

I see more smiles than before. The patients and the families are relieved to remain at home. If I had

eaten all that chocolate and cakes that these grateful patients or family members offered, I would be 30 kg heavier. (Excerpt 6, CNP)

The CNPs noted that their job does not end after the ambulance has taken the patient to the ED. They also take care of the carer (spouse or family member) left at home. The spouse might need help surviving at home while the patient is in hospital. Sometimes the "healthier" spouse needed transportation to the hospital, and the CNP organised a place for them to stay overnight.

The spouse was taken to the hospital, and I saw that the wife was very pale. I sat down with her and asked how she was coping. She started to cry and told me that she was fatigued. They did not have anyone to come, so I managed to get a temporary place for her to rest. Before this CP model, we would have taken the husband to the hospital and ask that the wife cope at home. (Excerpt 7, CNP)

The way to provide care

The interviewees described the CNP's expansive provision of care with *the diversity of roles*, *the luxury of time, former skills and new competencies,* and *loneliness at work.*

The CNPs described having many roles while delivering care. They were advocators, navigators, innovators, developers, therapists, and repairers while working as health care professionals. Their patient assessment started from the front yard rather than upon meeting the patient. They sometimes felt that they worked between the patient and society.

The main thing is not to fix the patient; we like to connect them to the right place and the right people. One idea could be day-care visiting clubs for older adults to see other people because so many are just lonely. (Excerpt 8, CNP)

The CNPs articulated that the most positive addition and enabler to providing care is *the luxury of time*. They can sit down, talk with the patient, and there is no need to rush. Time enables them to obtain a more holistic picture of the patient and the family and offers possibilities to find longer-term solutions.

It is peaceful to sit down on the sofa and discuss the whole family's solutions and challenges. It gives me a deeper meaning in our work if we try to find a solution for tomorrow. (Excerpt 9, CNP)

The interviewed CNPs felt that they experienced a significant demand to rehearse their *former nursing skills*. At the same time, they needed new competencies like providing telephone triage and assessing the patient's fall risks, nutrition level, or signs and symptoms of sepsis.

I have not used some nursing skills since school, like urine catheterisation. Now we need to practice them. Another challenge is that we have excellent blood test machines, but we need to understand more than just the numbers they give us. (Excerpt 10, CNP)

The interviewees emphasised that a large part of their work is telephone triage. Home care nurses consult them, and they consult different specialists or general physicians, and rarely EMS doctors. A substantial number of phone calls include arrangements for the doctor's patients' care and appointments.

Today we visited only one patient, but the CNP got phone calls all day. Most of the calls came from home care, and the CNP assessed the patient's care needs, gave nurses advice, or contact numbers, or organised appointments at the Health Care Centre. Some phone calls sounded more like coaching the family member to cope with the patient. (Excerpt 11, Observational notes)

The interviewees were concerned about maintaining their former emergency skills and still working in the CP unit.

The job rotation between the CP unit and the ambulance unit is excellent. Now I can keep in touch with the emergencies and with these more like psychosocial-physiological CP visits. (Excerpt 12, CNP)

The CNP's work is very independent, but it comes with a degree of *loneliness*, which could be very hard in the beginning. The CNP works alone and makes the decisions alone. Sometimes he/she must advise the patient and his/her family of bad test results facing their sadness and disappointment at their home.

The CNP must be ready to make the right decision and make it there, in front of the family and alone. This job has its loneliness. When you work as a nurse-paramedic, you can talk with your partner during the assessment and immediately afterward, but now you are alone. The consultant doctor is in the hospital, not in front of a little child when you need to tell the family about the decision, which may destroy their trip to the zoo. (Excerpt 13, CNP)

The diversity of multidisciplinary collaboration

The interviewees described the diversity of their multidisciplinary collaboration with *new team members,*

learning from other professionals, and *the sensitivity of collaboration.*

The CNPs worked more intensively with other health care providers and the police than before. Their work teams also included home care nurses and assistants, safety alarm responders, specialised nurses such as psychiatric nurses, and different specialised doctors, including EMS doctors-on-call.

> *Nowadays, we work as the partner for the police patrol. They do not take the driver to the ED for the alcohol level or drug blood test. They call us, and we meet at the police station. The guardian is there with us, and the patrol is free to go back for their actual job. If these people were taken to the ED, as in the old days, these patients could be restless and noisy, so it is a safety matter as well, you know.* (Excerpt 14, CNP)

Through multidisciplinary collaboration, the CNPs were able *to learn from other health care professionals*. For example, if the CP call included information that the patient might have mental health difficulties, the CNP picked up the psychiatric nurse from the ED, and then both professionals assessed the patient at home.

> *I must admit that when I followed how the psychiatric nurse was talking with the patient and how she ends up with the solution, it was something that you cannot learn at school or from the books. The psychiatric nurses want to learn the ABCDE approach when we are there, and I have learned a lot about motivational interviewing from them.* (Excerpt 15, CNP)

> *Today I and a home care nurse decided that we will go together to the patient, who has a new kind of catheter. The nurse taught me how to work with it. Now it is nicer to visit the patient as I saw how the home care professionals are taking care of it.* (Excerpt 16, CNP)

As part of the cooperation, the CNP may telephone the patient and speak with them to relays information about the situation, the patient's condition, or medical history to the ambulance unit.

> *When the CNP calls us about the patient's pre-information, it is much safer to go to the patient. We can use the driving time more efficiently when we have information about the patient's health history.* (Excerpt 17, Nurse-Paramedic)

The interviewees spoke about *the sensitivity of the collaboration*, especially concerning rumours and misunderstandings harming the multidisciplinary cooperation. Some respondents were concerned about how other health care providers would react or if they felt threatened by the CP model and how the CNPs' provide care.

> *So quickly, I think that home care nurses felt that we are taking their place initially. It was not valid. I think the assumptions were easily wrong. It is our job to convince others that we are working together. When possible, I just exchange even some informal words with the home care nurses or social care providers – breaking the ice, you know*. (Excerpt 18, CNP)

Tailored support from the organisation

The participants indicated three support-related factors for the successful implementation and future of CP models. The identified supporting factors were *the marketing of the model*, *the reimbursement of the service*, and *the shared information* (told and documented).

The CNPs underlined that navigating the fragmented health care system requires clarity and more management than before. The interviewees described the need for powerful *marketing of the model* to the community, co-workers, and citizens.

> *This new cooperation is compassionate. In the beginning, somebody should adequately inform people about who we are and what we do – the rumours can harm a lot. Our co-workers could be scared and make assumptions easily. The next thing is that we need a new reimbursement system. It is too much like the old EMS way, where the money comes based on the kilometres driven, not based on the care delivered.* (Excerpt 19, CNP)

The interviewed CNPs pointed out the urgent need *for the shared information* about patient records. Some CNPs could check the patient's hospital records to obtain information about the background about their condition. Some CNPs could use only the patient records from primary care, and others had no access to patient records. The lack of a standard patient record system forces the CNP to plan and decide the patient's care without the necessary information. The CNPs highlighted the importance of the essential and intensive consultation with the physician, which enables receipt of the required information and a guarantee of the patient's continuum of care.

Discussion

This study explored the Finnish CNPs' experiences and perceptions of their CP care and identified the following

critical elements: (1) the CNPs' attitudes need to be appropriate, and their way of thinking needs to be on a new level; (2) the carer of the family member is added to the group of patients; (3) the CNPs' possibilities to provide care are broad; (4) the diversity of multidisciplinary collaboration can require sensitivity; and (5) the CNPs highlighted essential tailored support from the organisation for the future of the CP model. Our findings help fill the gap in the current literature about how CP providers perceive their work.

In this study, we found that the core of the CNP's new way of thinking was the appropriate attitude towards non-emergency care and the ability to think broader than before: "on the second level". Furthermore, the willingness to work as a CNP, possessing excellent interpersonal skills, and having developed extensive experience were highlighted. The result is consistent with a previous study that underlined that not all paramedics want to or should become Community Paramedics [27, 28]. The willingness to participate in a CP programme should be considered during the selection of new nurse-paramedics. The interviewed CNPs highlighted excellent interpersonal skills and wide-ranging experience in their work as critical competencies required for practicing CP.

Our results indicated that the broad group of CP patients included mostly elderly and multimorbid patients living at their own homes or elderly care homes. Internationally, CP programmes for elderly citizens have been successful, and the participants of these programmes have a low risk of returning to the ED or being readmitted to the hospital [29–31]. Additionally, the Community Paramedics have taken part in additional training for palliative care, and the new role has been rewarding [32]. Our study is the first known study where police clients were also included as the CNPs' patients. When the police patrol can avoid visiting the ED with a drunk driver and instead take the driver directly to the police station, it benefits all participants and may further increase safety for others in the ED.

Patient assessment at home is a unique situation, and other family members (the spouse and/or children) play an essential role in enabling the patient's stay at home; sometimes, the spouse or family member needs more support to cope with the responsibility [33–35]. Patients are discharged from the hospital very early, and the family caregiver, sometimes a very old spouse, is given a responsibility that could create an emotional, physical, or financial burden [36]. The CNPs were aware of some spouses' fatigue or fear of being left at home with a frail spouse in our results. A recent study [37] discussed caring for carers and how informal care may result in a "spill over" effect when the pressure is excessively placed on the shoulders of the spouse. Our findings illuminate that the CNPs' patient assessment is now more holistic because they have time to assess the patient and consider the strengths of the other family members or environmental risks ("...now we can check the fridge, kitchen tables, and toilet…") before trying to find a solution. The assessment as a part of the provided care has more dimensions than a primary survey conducted as a nurse-paramedic. The ABCDE approach in the CNPs' primary survey should be expanded to include an F for Future, Family, or Friends as sometimes the actual story or history (e.g., how the patient is coping at home or over the past few days) is heard from someone other than the patient.

This study illuminated how CNPs provision of care is particularly demanding, including different roles, enablers, and challenges. Our findings are consistent with several previous studies that revealed that paramedics have various roles, such as clinicians, health and social advocates, team members, educators, professionals, or reflective practitioners [8, 12, 17]. Based on our findings, the CNPs mostly assumed clinical or health advocacy roles. While delivering care as a clinician, the CNPs use their knowledge, skills, and clinical judgement within the given scope of practice. Advocacy, speaking on behalf of the patient [38], increases the demands on the CNPs as they are challenged to find long-term solutions for how to enable the patient to remain at home as long as possible or how to reach the right place to meet the patient's care needs. According to our study, the participating CNPs did not have just a dual role between emergency and non-emergency services [13], but at least a quadruple role.

The CNPs highlighted the luxury of time as one of the cornerstones to providing functional care. The unhurriedness has been noticed as a significant enabler for client-centred home care services [35, 39]. Our results are consistent with this and signify the CNP's possibility of settling down and spending additional time finding more solutions for the patient's care needs. More time with the patient is also an essential motivator for the CNP to work. Peaceful time with the patient enables home screening and ensures care that includes the medical, social, and psychological assessment of the patient and the family, finally arriving at a better solution to cope at home. In a previous study, the paramedics indicated that the chance to spend more time assessing and understanding patients' unmet long-term needs created a disparity between their traditional values and the requirements of ambulance units to identify life threats and transport all patients without delay [40]. Unhurriedness is a new component in the CNPs' patient assessment, and it can take time for a former nurse-paramedic to learn to use it correctly to provide comprehensive care.

The CNPs are familiar with patient assessment and with providing minor treatments or administering

medication. In this study, the CNPs pointed out that they can rehearse their formerly acquired nursing skills with the community nurses, for example, in wound therapy and urine catheterisation. This finding is consistent with several previous studies investigating multidisciplinary practice in action and highlighting the importance of health professionals' recognition of the needs for informal training with each other [41, 42]. To work in primary care requires specific capabilities and additional education for paramedics [43]. The professional knowledge of paramedics and nurses working in primary care has been compared [44] and the crucial role of education in the sustainable implementation of the CP model has been identified [45]. The Finnish CNPs highlighted a dual advantage in the need for multidisciplinary collaboration. The CNPs could rehearse their nursing skills with community nurses and, at the same time, have the chance to discuss the CNPs' role and the aim of the CP model.

Based on our findings, the CNPs spent a lot of time on the phone consulting the doctor and home care providers. Telephone triage for patient assessment was one of the new and necessary competencies mentioned by the interviewed CNPs. After similar results, some institutes have added this "phone work/telemedicine" into the Community Paramedics' tailored training [46]. The effectiveness of phone assessment has been highlighted in previous research. One-third of people calling the triage nurse were satisfied with the care instructions or guidance from social and health care services [47].

Furthermore, telecare offers new possibilities for patients, especially in rural areas, and it enables other health care providers to advise citizens safely by phone, for instance, during COVID-19 and other outbreaks of contagious disease [48]. Furthermore, the CNP used phone assessment to obtain pre-information before the ambulance unit was sent to the patient. Working by phone contributed to the provided health care for the patient and the caring team members.

The independent nature of the work and the diversity of possible solutions for the patient's needs can create feelings of powerlessness. In our study, the CNPs described that sometimes the independence of the work made them feel lonely. These findings have implications at the organisational level because emotions like loneliness can cause exhaustion, distress, and lower job satisfaction [49], although this is more likely if the employee feels that the work is also without meaning [50]. The CNPs pointed out that previously, there was always another person with whom they could share thoughts and decisions in the ambulance unit. The physical distances between the patients can be very long, and patient visits frequently keep the CNP on the road throughout their shift without seeing any other co-workers during the day. One rewarding, personally relevant, and emotionally salient solution has been for team leaders to meet the team members [50] frequently and to actively share feedback, keeping them engaged in their integrated teams [51]. However, paramedics have stated that they rarely received feedback from patient interactions [40]. In our findings, on the contrary, the CNPs articulated that they received direct and positive feedback almost daily, which is one of the necessary drivers against pervasive feelings of loneliness. Other remedies for loneliness included the luxury of time with the patient and the possibility for long-term solutions. As proposed in this study, the CNPs' possibilities to provide care are broader. However, based on these results, the independent nature of the work creates challenges that must be considered at the managerial and organisational levels.

All participants highlighted the diversity of multidisciplinary collaboration. Collaboration has been defined as one of the keys to the success of the CP programme [5, 52]. The CNPs spoke about the multidisciplinary team and its social and cultural context with the possibility to learn from each team member. The CP teams have included midwives [41], pharmacists [53], and social workers [54]. Our results show that the teams are growing with other EMS providers, staff from the ED, home care nurses and assistants, psychiatric nurses, the police, personal safety alarm responders, and specialised physicians. Nurse-paramedics have a long history of collaboration with EMS doctors-on-call, and in the CP model, the essential partner can be a general practitioner [55]. The interviewed CNPs underlined that the formal and informal meetings with co-workers are essential for receiving and giving the correct information and building up appropriate expectations about the collaboration. The meeting could be an informal meetings according to a previous study [56]; these findings are consistent with our results. The CNPs were worried about the correctness of information about their sphere of practice. They felt that collaboration could be compassionate when different professions work on the same "playground". The expectations of the ED staff can quickly create misinformed perceptions. The CNP models contribute to the health care system. However, health care management and organisation must provide clear and correct foundational knowledge about each of the roles and responsibilities.

Our study identified essential parts of the tailored support from the organisation for CNPs and the CP model. The interviewees specified challenges with planning, management, and reimbursement in the CP model. These results are consistent with previous studies [9, 14, 57, 58], in which the challenges of implementing the CP programmes with other health care models have been underlined. Rumours can harm the future of the model if the model's marketing starts too late. CP funding needs to change to allow payment for care that does not involve the transport of patients to the ED [14, 15]. The

need for an accurate exchange of patient information between CNPs and other primary, specialty, and emergency care providers, or the CNPs' possibility of documenting the care directly in the official patient records enables the sharing of information. The need for the electronic transfer of health information is consistent with the results of previous studies [14, 59]. The opportunity to provide a patient assessment with broader information could improve the CNPs' options for making long-term and correct decisions. Moreover, the availability of electronic prehospital information linked to hospital and primary care information (for example diagnosis) enhances continuous care for individual patients and possibilities for the system-level analyses of the outcomes-based EMS research.

The change from work as a paramedic in the ambulance unit to a one-person CP unit creates challenges and advantages. The dimensions of the new sphere of practice influence the CNPs' job satisfaction, work motivation, and wellbeing. More research is needed on the role, foci and perceptions of the allied health and safety professionals and how they see the future of CP.

Limitations

This study is not without limitations. First, the study was conducted in three Finnish HDs, which, although diverse, are not representative of all CNP models. Therefore, as in ethnographic research, the results represent an interpretation of the observations, experiences, and stories. It is possible that everything was not captured during the observation periods or in the interviews. However, the principal researcher (TR) moved between HDs for the observation periods to address this. Secondly, purposive sampling may lead to bias [20]. However, this sampling ensured that the interviewees have the relevant background.

Thirdly, the data analysis and coding were performed by a single researcher who was also an experienced emergency nurse-paramedic. The researcher's background allowed for assuming the emic perspective to understand the insider's perceptions. The emic perspective is essential in an ethnographic study for a researcher to explain events from the participant's perspective [20]. The long CNP visits allowed the interviewees and the researcher to elicit their views. The authors discussed the quotes, avoiding presenting raw data without analysis. The quotes of the participants in this study are not raw data but purposefully selected by the researchers.

Conclusions

This descriptive ethnographic research of Finnish CNPs provides insight into how the CNPs perceive and experience their novel sphere of practice. The change from emergency and episodic care to non-emergency and holistic care need to be voluntary for the CNP. Professional attitudes, interpersonal skills, and the ability to build and maintain teamwork are essential for nurse-paramedics undertaking this new practice line. Working independently and very closely with the patient and their family gives the CNPs positive feedback and deeper involvement in their lives. Nonetheless, it can be lonesome. The CP collaboration team is broad, and it could challenge the CNPs' social skills, but it also offers the possibility to learn new skills and practice the previously learned competencies. However, CNPs also face challenges (for example, the shared information and reimbursement of the service) that compete with their desire to serve patients and, if left poorly addressed, may threaten the sustainability and future of the CP model. This study includes essential knowledge for health and social care providers, policymakers, and educators when planning and developing the CP model. Further studies are needed to explore the expectations and experiences of the CNPs' co-workers, the CP patients, and families,' which could enhance the implementation of the CP model in communities locally and globally.

Abbreviations

ED: Emergency Department; EMS: Emergency Medical Services; CNP: Community nurse-paramedic; CP: Community paramedicine; HD: Hospital District

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Authors' contributions

TR, MK, and KJ conducted the study and contributed to its design. TR collected the data and led the data analysis with the support of KJ and MK. The first draft of the manuscript was prepared by TR with all authors KJ, ET, MK and EP contributing thereafter, critically reviewed and approved the final version of the manuscript.

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Availability of data and materials

The data that support the findings of this study are not publicly available according to the ethical approval from the Regional Ethics Committee of Tampere University Hospital as it contains information that could compromise research participants privacy and confidentiality. It is deemed that even when no names are attached to the data, the participants may be able to be identified through the interview and observation transcripts which are the data source for this study.

Declarations

Ethics approval and consent to participate

Ethical approval for this qualitative study was sought from the Regional Ethics Committee of Tampere University Hospital (Reference number: R19008H) and from the research boards of the participating Hospital Districts and local EMS managers. The notifications to the patient data registrars at the Central Hospitals were undertaken when the study began. All the data have been treated confidentially and with full disclosure, according to the Declaration of Helsinki in 1995. All participants were provided with information about the study, and they completed a written consent to

participate as per the requirements of the ethics approval, which included a consent for publication with data de-identified.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Faculty of Social Sciences, Health Sciences, Tampere University, 33014 Tampere, Finland. [2]General Administration, Tampere University, Pirkanmaa Hospital District, 33014 Tampere, Finland. [3]Dean's Unit School of Health Sciences, Western Sydney University, Locked Bag 1797, Penrith, NSW 2750, Australia. [4]General Administration, The Hospital District of South Ostrobothnia, 60220 Seinäjoki, Finland. [5]Department of Nursing Science, University of Turku, Joukahaisenkatu 3-5, 20520 Turku, Finland.

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