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INTERPROFESSIONAL EDUCATION DURING UNDERGRADUATE MEDICAL AND HEALTH CARE STUDIES
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Abstract

The two universities in Oulu developed an interprofessional (IP) curriculum by implementing the theory and training periods for different undergraduate medical and health care students. The aim was to investigate how interprofessional education (IPE), use of collaborative learning methods and innovative learning environments will promote students’ IP competencies. Furthermore, the aim was to understand how the patients and families experienced the students’ receptions in the training periods.

Students’ readiness and attitudes towards interprofessional learning (IPL) were investigated with the Readiness for Interprofessional Learning Scale (RIPLS) and their learning experiences after the courses and training periods with a structured questionnaire. The patients and families filled in the feedback questionnaire after the reception. The data was collected between 2007 and 2015.

Almost all students indicated, according to RIPLS great importance towards teamwork and collaboration, and felt their professional identity promoted. The medical students evaluated their roles and responsibilities significantly lower than the other health care students. After the first semester, IP course students’ learning outcomes correlated linearly with their own activity and collaboration with the IP group in the e-learning platform. During the training periods in the outpatient diabetes clinic, as well as in the preventive maternity and child health clinics, they performed well with IP competencies such as patient-centeredness, communication and teamwork. Students were well briefed to take responsibility as an IP team of the patients’ visit. The care plan was finalized with the facilitators. In the reflection session, learning outcomes were summarized. Students got an overview of primary and preventive services and their professional roles there. Patients and families were very satisfied with their experience with the students.

IPE programs have positively changed the overall attitudes to IPL, both with students and the educators and professionals. In addition, students’ professional and IP clinical competencies have developed and the trust in working together has increased. Feedback from patients and families has been very positive. It showed the importance of IPE and the development of collaborative practice in the service system to stakeholders. IP teamwork experience benefits current and future health care professionals in organizing patient-centered care in collaboration with educational organizations and their working life partners.

Keywords: collaborative competencies, interprofessional education, patient-/family-centered care, public health, undergraduate medical and health care studies
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**Tiivistelmä**

Oulun yliopiston ja ammattikorkeakoulun yhteistyönä kehitettiin lääketieteen ja terveydenhuollon eri perustutkinto-ohjelmille moniammatillinen opetussuunnitelma. Koulutus sisälsi teoriaopintoja sekä harjoittelua hyvinvointikeskuksessa. Tavoitteena oli tutkia, miten moniammatillinen oppiminen, osallistavien opetusmenetelmien käyttö sekä innovatiiviset oppimisympäristöt edistävät opiskelijoiden moniammatillisia taitoja. Tavoitteena oli myös kuvata potilaiden ja perheiden kokemuksia moniammatillisesti toteutetuista vastaanotoista harjoittelujaksoilla.


Opiskelijoiden asenteet moniammatillista oppimista kohtaan olivat positiivisia yhteisten opinnojen alussa ja kehittyivät entistä positiivisemmiksi harjoittelujaksojen myötä. Samanaikaisesti opiskelijoiden ammattialakohtaiset sekä moniammatilliset taidot kehittivät ja luottamus yhdessä työskentelyyn lisääntyi. Potilaiden ja perheiden antama erittäin myönteinen palautte on osoitus päätäjilleen ja palvelujärjestelmille moniammatillisen koulutuksen ja työväentäjöiden kehitämisen merkityksestä. Moniammatilliset tiimityötäidot hyödyttävät sekä nykyisiä että tulevia terveysalan ammattilaisia toteuttamaan ja kehittämään asiakaslähtöistä työtä yhteistyössä korkeakoulujen ja työelämän palveluorganisaatioiden kanssa.

**Asiayan tarkoitus:**

Oulun yliopiston ammattikorkeakoulun yhteistyönä kehitettiin moniammatillinen koulutus, joka koostuu moniammatilliseen koulutukseen sekä tilaisuuksiin, joissa opiskelijat oppivat moniammatillisia taitoja, kuten potilaskeskeyttäjyttä, kommunikointia ja työskentelyä. He saivat kokonaiskuvan terveyskeskustyöstä ja ennaltaehkäisevästä palveluista sekä omista ammatillisista rooleistaan liian. Potilaat ja perheet olivat erittäin tyytyväisiä saamaansa palveluun opiskelijavastaanottoilla.
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Abbreviations

ANTS The anaesthetists’ non-technical skills
BEME Best Medical Education
BMI Body Mass Index
CIHC The Canadian Interprofessional Health Collaborative
EIPEN European Interprofessional Practice and Education Network
HEL Health, Ethics and Learning
HR Heart rate
ICT Internet and computer technology
IP Interprofessional
IPC interprofessional collaboration
IPE interprofessional education
IPEC American Interprofessional Education Collaborative Expert Panel
IPL Interprofessional learning
MEC Finnish Ministry of Education and Culture
NIPNET Nordic Interprofessional Network
RIPLS Readiness for Interprofessional Learning Scale
RR Blood pressure
WHO World Health Organization
Original publications

This thesis is based on the following publications, which are referred throughout the text by their Roman numerals:


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1 Introduction

Health professionals’ education and the health care service system currently have many challenges: an aging population, increased life expectancy, chronic illnesses, complex health issues and social exclusion. There is a need to manage the increasing cost of health care and at the same time ensure patient-centered safe and qualitative services. The Lancet Commission (Frenk et al. 2010) reported that globally, health professions education has not prepared graduates for addressing the health challenges of the twenty-first century, largely because of fragmented, outdated and static curricula.

Health professionals’ education has traditionally been conducted in silos that focus on discipline-specific contents (Lennon-Dearing et al. 2009). In order to prepare a collaborative practice-ready workforce and to improve health care services and outcomes it is important to learn interprofessional (IP) teamwork skills during undergraduate studies (WHO 2010; Bridges et al. 2011; Hammick et al. 2007). In interprofessional education (IPE), students with different educational backgrounds learn with, from, and about each other during certain periods of their education, with interaction an important goal (Barr et al. 2005; WHO 2010; WHO 2013).

There is evidence that IPE can help break down the stereotypical views that professionals hold about one another, and can result in an increased understanding of the roles, responsibilities, strengths and limitations of other professions (Parsell & Bligh 1999; Barr et al. 2005). Health care delivered by nurses, physicians, and other health professionals working in teams not only improves quality, but also leads to better patient outcomes, greater patient satisfaction, improved efficiency, and increased job satisfaction for health professionals (Frenk et al. 2010).

The effects and evidence of IPE has been systematically reviewed in the Best Medical Education (BEME) Guide No. 39. (Reeves et al. 2016). The results showed positive outcomes of IPE. In general, the learners responded well to IPE, their attitudes towards collaborative learning improved, and they gained the knowledge and skills necessary for collaborative practice. The findings indicated faculty development, prepared facilitators, reflection to students’ current and future practice and pedagogy for interprofessional learning (IPL). Further, connections to health care systems, cost effectiveness of services and collaboration between the institutions should be taken into account. The future challenge is to develop robust tools for measuring the impacts and long-term outcomes of IPL in education and practice.
The World Health Organization (WHO) first reported the need of IPE in the Alma Ata Declaration (1978). Later, in a separate WHO (1988) report “Learning together to work together for health” the effectiveness of IP teamwork in influencing people’s health was highlighted. Learning and education were seen as important roles. According to the WHO report (2010) “Framework for Action on Interprofessional education and collaborative practice” there is sufficient evidence to indicate that effective IPE enables effective collaborative practice. The WHO issued guidelines in 2013 to transform and scale up health professionals’ education and training to address issues of quality and the population’s health needs. Health professionals’ competencies will strengthen by further revising and updating curricula on primary health care. IPE should be integrated into undergraduate studies’ learning collaborative competencies, to improve the effectiveness, quality, and patient safety services based on local health needs and aimed outcomes.

Important targets of the Finnish public health program (Kaste 2012) are to reduce inequalities in wellbeing and health, and organize the services in a client-oriented way. The focus has shifted from the treatment of problems to preventing and promoting physical, mental, and social wellbeing across the entire population. The ongoing health care and social welfare reform in Finland is based on the Kaste targets, aiming to ensure equal, patient-centered, and qualitative health and social services to all. IP and multidisciplinary collaboration among the professionals and authorities will strengthen, and the cost-effectiveness will improve (Health care and social welfare reform 2016). The reform aims at strengthening both the primary and preventive services. According to the Finnish Health Care Act (2010) people’s own ability to promote health and functional capacity should be strengthened and new skills and knowledge of self-care are needed to support this goal. However, it is not enough to focus only on structures. New competencies, research, knowledge, and action models are needed to strengthen collaboration between education and community- and population-oriented health care service systems to answer present and future health care challenges (Frenk et al. 2010).

The actions to introduce IPE into undergraduate level in medical and health care education in the University of Oulu Faculty of Medicine and Oulu University of Applied Sciences started in partnership with the Nordic Interprofessional Network in 2002 (www.nipnet.org). The next step was to join the European Union-funded European Interprofessional Practice and Education Network (EIPEN) project 2006–2009 (www.eipen.eu). In the EIPEN project, the task of the Finnish partners was to develop IP studies for undergraduate students. At the same time,
the Finnish Ministry of Education and Culture (MEC) started the structural development program in higher education. The aims were to develop better collaboration and synergy between the universities and their degree programs and to foster joint qualitative research and development projects. Oulu was one of the pilot areas. The common steering group was established with the MEC program for health care education and EIPEN project. Based on curricula analysis of medical, nurse, public health nurse and midwifery degree programs, the first IPE pilot studies were started. Common contents were found in areas of public health, acute care, and first aid, as well as in dental care.

The need, according to the national public health program (Kaste 2012) was to strengthen students’ clinical and IP teamwork competencies in primary and preventive care. The current study is based on the process designing the IP model and developing the IP curriculum for public health, including theoretical studies and training periods in outpatient primary care. According to the plan, IP studies were implemented in the beginning, the middle, and the final part of the study programs. This was based on the Linköping IP curriculum model (Wilhelmsson et al. 2009). The first semester IP course for several degree programs, “Public Health and Interprofessional collaboration”, was implemented for the first time in Autumn 2007. Next, in collaboration with the health care center of Oulu, the patient-centered IP training with public health problems and the preventive care in maternity and child health care clinics, were implemented in the middle and final part of the studies.

The aim of the study was to investigate how IPE, use of collaborative learning methods and innovative learning environments would promote undergraduate students’ IP competencies. IP competencies are needed in health promotion and for providing patient- and family-centered care in current and future health and social services. Students’ readiness and attitudes towards IP learning were investigated with the Readiness for Interprofessional Learning Scale (RIPLS) (Parsell & Bligh 1999). Students’ learning experiences and patients’ and families’ feedback were collected with a structured questionnaire including open comments.
2 Interprofessional education responding to the local and global health needs

The WHO report (2010) pointed out that IPE is a necessary step in preparing a “collaborative practice-ready” health workforce with better capacity to respond to local health needs. According to this report, health professionals are trained too narrowly, implying that most of the learning is very discipline-specific while the complex problems we face in society requires the need for IP collaboration. Frenk et al. (2010) recommended instructional changes to health professional education. The challenge is to change from traditional education and pedagogy to curricula that are competency-based and adapted to answer the rapidly changing needs of society, people, and the service system.

IPE occurs when students from two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes (WHO 2010; Barr et al. 2005; Figure 1). Traditional pedagogy is not serving effective collaboration between the students and training the teamwork skills. Modern pedagogy and IP learning environments are needed to get the students from different disciplines to cooperate, learn, and work together.

![Image of IPE and strengthened health system](image)

**Fig. 1.** IPE and strengthened health system (according to WHO 2010)

The history of societies and traditions of cultures have formulated the service systems and health professional education in different countries. The Lancet commission (Frenk et al. 2010) stated that the health profession’s education and
the health system’s actions could collaborate more actively with working life and synergistically develop services. The local context should be taking in account when planning the services and education (Figure 1). At the national level, educational organizations should be more actively integrated in health workforce planning and also in policymaking level (WHO 2010).

In Finland, every permanent citizen in the sparsely populated country has access to an extensive set of services, yet the total per capita health care costs remain lower than in most comparable countries. Finland has focused on disease prevention and health promotion activities in services and professional education. Life expectancy rates have risen markedly, especially over the last few decades (Nykänen et al. 2008). Infant mortality in Finland is one of the lowest in the world (1.7 deaths per 1,000 live births). The maternity and child health clinic system was established as early as in the 1920s, and bound by law 1944 to cover most of the country geographically to provide municipal maternity and child health clinics and municipal care personnel (finlandcare.fi). Health counseling, including health education, contraception advice, maternity and child welfare, and medical examinations, are provided for free in preventive clinics to families and family members. In addition, nationwide health programs have hugely improved patient outcomes in cases of chronic disease such as asthma and diabetes. According to Teperi et al. (2009) easy access and equity will remain necessary characteristics of optimal health care systems, but they are insufficient goals in terms of improving quality and achieving financial sustainability. In 2015 in Finland, the cost of increasing numbers of patient accidents and hazards was almost 300 million euros. Problems with communication between professionals was the reason for 65% of the care hazards and deaths (Snellman 2009).

Health care professionals’ education should develop knowledge, skills and values to improve the health and safety care of patients and population (Frenk et al. 2010). In order to answer to the national and international health and wellbeing challenges, education needs to supply a capable workforce. In people-centered care, people are not only recipients of the services but active participants and professionals of their lives. When developing IP curricula, collaborative learning methods, interactive learning environments, and use of modern educational technology are needed to learn people-centered, safe and qualitative care (Frenk et al. 2010).
2.1 Interprofessional competencies are needed to work together for health

According to Roegiers (2007), a competency enables the learner to master those situations they will have to deal with in their professional or private life. Professional competencies in health care, according to the Interprofessional Education Collaborative Expert Panel (IPEC 2016), are integrated enactments of knowledge, skills, values, and attitudes that define the areas of work of a particular health profession applied in specific care contexts. When defining, competencies students should be able to demonstrate in practice rather than only show what they knows (Thistlethwaite et al. 2014).

Health professionals’ education has traditionally been organized into profession-based programs and its unique based culture and competencies. Students are learning most how to function with their own professional area and with minimal exposure to the practices and perspectives of the other health professions. Miscommunications and misunderstanding are possible in the real-world situations without knowing the other professionals’ area and competencies during the studies (Educating Nurses and Physicians: Toward New Horizons 2010).

The health and wellbeing problems today are getting more complex, hard to pin down and define. The service system and the professionals have unique, often multidimensional problems to solve and there are pressures from service users for professionals to communicate and collaborate with each other (Hean 2015; Walsh et al. 2005). Furthermore, these complex issues also need communication and collaboration between specialized hospitals, primary care, and higher education institutes in order to share expertise and develop future services (Cox 2015; Jaruseviciene et al. 2013; Wood et al. 2009). IPE and IP practice have identified a solution to provide better health care through collaboration (Bradshaw et al. 2003).

In Finland, as in several European countries, health professionals’ education and curricula are based on competencies. According to the Bologna process the aims, common and professional core competencies, evaluation criteria, etc., are defined according to the demands and needs of the service systems and patients (Huttunen 2015; Frenk et al. 2010).

Barr (IPEC 2011) distinguished between types of competence from an IP perspective. According to Barr, common or overlapping competencies are those expected of all health professionals. They are helpful for most professionals but not necessary to all health professions. Interprofessional, collaborative competencies are those that each profession needs to work together with other professionals,
patients, families, with non-professionals and voluntary, and within organizations, communities, and in society level (Figure 2).

Fig. 2. Core competencies for interprofessional collaborative practice by Barr (IPEC 2011)

IP competencies in health care (IPEC 2016) means that knowledge, skills and attitudes are integrated across the professions, with other health care workers, patients, families and communities, to improve health outcomes in care contexts. Being interprofessional means that students or workers need to learn and work together. According to Hammick et al. (2009), being interprofessional consists of first, knowing what to do and thinking what action is needed and why, second, having the skills to do what needs to be done and practicing correctly, and third, conducting oneself in the right way during performance, including appropriate attitudes and values.

Interprofessional collaboration (IPC) starts with learning to know the other coworkers or students. There is evidence that IPE and IPC can help to break down stereotypical views that professionals hold about one another and can result in an increased understanding of the roles, responsibilities, strengths and limitations of other professions (Parsell & Bligh 1999; Barr et al. 2005).
Bainbridge et al. (2010) pointed out that IPC is increasingly recognized as a means of improving patient outcomes and the cost effectiveness of care in a variety of settings in patients’ care chain from primary health care to acute care. In a healthcare environment, faced with patient safety issues, human resource shortages, and populations with increasingly complex health care needs, health professionals must be able to work collaboratively in IP teams or groups in order to ensure consistent, continuous, and reliable care. In preventive care IPC as well as collaboration with all the societal sectors through the patients pathway is needed.

In the next section, five examples of IP models, the core elements and competence domains are presented. The Canadian model CIHC and the model of American expert panel IPEC includes elements which are important in public health point of view and for that they are chosen to more detailed inspection. The Interprofessional Capability Framework (CUILU, Walsh et al. 2005) and Linköping metacognitive framework of IP competencies (Wilhelmsson et al. 2012) are models, which focus on students’ IPL processes. The ANTS model (ANTS 2012; Flin et al. 2010) includes the behavior rating tool of non-technical skills, which are almost similar with IP competences. The model and the rating tool are usually used in simulation education, but in this study we utilize it in the IP training periods in the health center.

2.2 The Canadian Interprofessional Health Collaborative (CIHC) model

Health organizations, health educators, researchers, health professionals, and students across Canada, established the CIHC. The CIHC has developed an IP Canada-wide competency framework for IPC. The framework will help to make sense of the IP learning process, specify and differentiate matters by relevance, apply learning to practice, and integrate the IP elements in learning outcomes (Orchard & Bainbridge 2010).
The Canadian National Interprofessional Competency Framework is based on a review of the literature related to competencies and competency-based education, as well as existing competency frameworks. Orchard and Bainbridge (2010) describe six IP competency domains: (1) IP communication, (2) patient-centered care, (3) IP role clarification, (4) IP conflict resolution, (5) IP collaborative leadership, and (6) IP team functioning (Figure 3).

The students or practitioners are able to follow the framework and the competencies at any level of their educational program or professional experience. Each competency can be utilized in every new experience or relevant situation in practice. Two domains are supporting the others, IP communication and patient-/family-centered care are always influencing the other four domains, role clarification, IP conflict resolution, collaborative leadership, and team functioning. When IP teams are working together across the institutional roles, more effective quality and patient safety issues are addressed in any context – simple or complex (Orchard & Bainbridge 2010).

The framework serves several possibilities for different users. Students from different degree programs, for example, should be able to find themselves in the framework and assess where they fit along a continuum of competence, educators...
can use it as a guide to plan the IP curriculum, and practitioners use it for measuring their own behavior (Bainbridge et al. 2010).

2.3 American Interprofessional Education Collaborative Expert Panel (IPEC) IP competency model

IPEC, consisting of professionals from six health professional associations, worked on the IP competencies and reported, “Core competencies for IP collaborative practice: Report of an expert panel” (2011). The expert panel had the vision of IP collaborative practice as being key to the safe, high quality, accessible, patient-centered care desired by all. As part of the learning process, health profession students are able to achieve the vision of developing their IP competencies, so that they enter the workforce ready to practice effective teamwork and team-based care. IPE, however, requires moving beyond these profession-specific educational efforts to engage students of different professions in interactive learning with each other to reach the IP competencies. The report indicated that although the accrediting standards of most professions reviewed contained content about interdisciplinary teams, few of these were outcomes-based competency expectations.

The principles of their work were patient-centeredness and a community/population orientation. The argument for that was that in primary care the focus was on expanded accountability for population management of chronic diseases. Health care delivery professionals, jointly with public health professionals, shared roles and responsibilities for addressing health promotion and primary prevention needs related to behavioral changes. Public health professionals worked in collaboration with others on behalf of people, families and communities, in maintaining healthy environments, including responding to public health emergencies (IPEC 2011; D’Amour & Oandasan 2005).

The expert panel identified principles of the IP competencies that faculties could access, share, and build on overall guidelines to strategize and develop study programs, which are general IP competency statements, but contextualized to individual, professional, clinical, or institutional circumstances. The model (Figure 4) is process-oriented and outcome driven, linked to learning activities, educational strategies, and behavioral assessments. Processes in teamwork and team-based health care will be improved by evidence-based research and efforts of 21st-century technologies (IPEC 2011).
The IPEC Board (2016) aims to strengthen the original competencies, ground the competency model firmly under the singular domain of IPC, and broaden the competencies to better integrate population health approaches across the health and partner professions to enhance collaboration for improving both individual care and population health outcomes.

### 2.4 Capability, metacognitive models of IP competencies and the anaesthetists’ non-technical skills (ANTS)

Domains or models of IP competencies have been presented by, for example, Walsh et al. (2005) and Wilhelmsson (2011). Similar domains are also defined in medical simulation pedagogy, named “non-technical” skills (Flin et al. 2010; ANTS 2012).

Walsh et al. (2005) created the *Interprofessional Capability Framework* (CUILU model) that will guide students to common learning achievements. Capability is, according to Walsh et al. (2005), extension to competence, to which a student or worker can apply, adapt and synthesize new knowledge from experience and so continue to improve their own performance. The four domains of IP capabilities are: (1) ethical practice, (2) knowledge in practice, (3) IP working, and (4) reflection. The ethical practice domain consists of capabilities that IP team
members develop, promote and practice understanding and respect for others. The knowledge in practice domain is the capability to integrate understanding of the legal frameworks and requirements, to know the team structures and effective functioning as well as decision-making. Capability of IP working is leading or participating in the IP team, assessment and planning the care, communication and IP skills, sharing uniprofessional knowledge and peer support to the others. Reflection is the capability to work in partnership, to utilize supervision in team development, problem-solving skills and professional life-long development.

Wilhelmsson et al. (2012) created the metacognitive framework of IP competencies. The five important competency domains in the model are: (1) teamwork and group processes, (2) communication, (3) shared knowledge or general common knowledge base, (4) ethics and (5) reflection. The goals and the ethical code is of major importance. The model is based on the learning process at individual level, team level and organizational level. During their education, students must learn to reflect on their knowledge, skills, personal learning style, personal norms, values, ethics and attitudes, to become personally competent. However, the learning process for becoming interprofessionally competent cannot be separated from the process of becoming professional. It will require shared knowledge with the IP team members, common language for communication, and general working methods. The IP team will be enabled to find common tools and understanding to be a team. Therefore, evaluation, reflection, and coaching to find the tools are important (Wilhelmsson 2011; Wilhelmsson et al. 2012; Hean 2015).

Similarities in competence domains are also found in tools that are developed for simulation education, where students or practitioners are working in health care teams as in reality. The ANTS (ANTS 2012) taxonomy and behavior rating tool is applied in relation to training and research. Non-technical skills can be defined according to Flin et al. (2010) as cognitive, social, and personal resource skills that complement technical skills and contribute to patient safety and efficient task performance. The rating tool was formulated to meet a set of design criteria, such as suitability for practical use in theatre or a simulation setting. The ANTS program helps trainees acquire the necessary knowledge, skills and values that will enable them to meet the challenges of the practice. The domain areas are situation awareness, decision-making, teamwork, leadership, and task management.

Situation awareness is gathering information, recognizing and understanding, and anticipating. Decision-making is identifying and selecting options to balance risks and to re-evaluate. Team working consists of coordinating activities and sharing information with team members, utilizing authority, assessing capabilities.
and supporting others. Teamwork also includes confirming roles and responsibilities and communicating and cooperating actively with others to achieve goals. Task management in patient care includes, for example, planning and preparing, and utilizing resources (Flin et al. 2010; ANTS 2012).

Reflection plays an important role in competence evaluation. The ANTS model (2012) emphasizes effective communication of the professionals or students to help them develop abilities in both the real workplace or simulated work environment. The competency-based approach is not only acquiring the individual components but being able to integrate them effectively in providing solutions to clinical challenges (Flin et al. 2010). The ANTS tool, even though it is developed for anesthetists, is a practical tool to be utilized in IP training situations.

2.5 Summary of IP core competencies

Different IP competency frameworks have, according to Thistlethwaite et al. (2014), much to offer when developing IP curricula, despite the differences. The educators can get advice on how to support the students to be effective health care team members in their future practice. The challenge is how to integrate the learning of IP competences to students’ practical training and how to assess the learning outcomes.

The IP competencies of the presented frameworks or models are listed and summarized in Table 1. A lot of similarities in IP competence areas are found in all of the frameworks. IP teamwork, role clarification and IP communication were the main domains in all of the frameworks. The other IP competence areas are domain areas or contained in them. Patient-centered care and ethical issues are integrated in the qualitative care. Shared knowledge, leadership skills, decision-making and conflict resolution are important competencies for all health care professionals. Flin et al. (2010) have integrated these in ANTS system.
Table 1. Interprofessional core competencies from different models

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<td>Patient-/client-/family-/community-centered care</td>
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<td>Values/ethics for IP practice</td>
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<td>Shared knowledge</td>
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<td>Leadership/management/conflict resolution/decision-making</td>
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<td>Reflection</td>
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++ The main competence area in the model
+ The competence is included in the model

When taking the first steps in IP curriculum development and setting IP learning aims it is important to start slowly, awake the motivation for collaborative learning and define the common goal (Walsh et al. 2005). IP communication and patient-/family-centered care are important in the Canadian IP framework (Orchard & Bainbridge 2010). In the IPEC model (2011; 2016) community orientation and public health were important, as in the Linköping model. The ethics and reflection (for example, Wilhelmsson et al. 2012) are core competencies for all health care workers to learn.

IP competence-based approaches are important to put into clinical practice. According to Flin et al. (2010), the goal is that students learn to solve clinical challenges together. Developing the services and educating health professionals for the future requires active collaboration with educational institutions and service system (Frenk et al. 2010). Furthermore, complex public health problems need communication and collaboration between specialized hospitals, primary care and
higher educational institutes in order to share expertise and develop future services (Cox 2015; Jaruseviciene et al. 2013; Wood et al. 2009).

IP training periods in different levels of service system or environments provide possibilities for students to learn to work together in IP teams, sharing roles and responsibilities, knowledge and competencies, effectively providing holistic and safe patient-centered care (Orchard & Bainbridge 2010; Flin et al. 2010). In health promotion and primary prevention, the common goal is to strengthen competencies related to a behavioral change of health habits (IPEC 2011; D’Amour and Oandasan 2005). To become a capable team player a student will be able to apply, adapt and synthesize the knowledge and experience and to improve their own performance (Walsh et al. 2005).
3  Boundaries and bridges to start IPE

IPE is assumed to enhance IP practice. The evidence of the efficacy of IPE is important to prove. The first step is to assess students’ attitudes and readiness towards IPL and changes in those areas during studies (Darlow et al. 2015). According to Barr, Fleeth and Hammick (1999) one of the aims of IPE is to change attitudes and perceptions by countering prejudice and negative stereotypes.

It is important to take students’ and teachers’ attitudes into account when starting the IPE development process. Professionals need to be able to work together with patients and other health care professionals. When the needs of the patients or families are placed at the center of health care provision, then the knowledge, skills and attitudes needed to work effectively should be identified and acquired (Parsell & Bligh 1999). However, boundaries to implementing and developing IP learning (IPL) can be negative attitudes or ignorance of the roles and duties of the other professionals (Parsell, Spalding & Bligh 1998; Parsell & Bligh 1999).

The characteristics and conditions needed for IPL have been identified. Parsell & Bligh (1999) grouped them in four dimensions: (1) the relationship between different professional groups, including the values and beliefs of people, (2) collaboration and teamwork, as well as the needed knowledge and skills, (3) roles and responsibilities in people’s work, and (4) benefits to patients. Finally, the most important result is the outcome in professional practice and personal growth during studies and providing patient centered qualitative care as a member of an IP team.

The rating instrument RIPLS was developed to measure the effects of educational interventions on students’ attitudes at undergraduate level. The scale consists of three factors with 19 items. The three factors are teamwork and collaboration, professional identity, and roles and responsibilities. The scale assesses perceptions of health care students’ knowledge, skills and attitudes towards readiness to learn with other health care professionals (Parsell & Bligh 1999; Binienda 2015). In this study, RIPLS has used to investigate students readiness and attitudes towards IPL.

The RIPLS was one of the first instruments to assess IPL among health care students from different degree programs. The tool is available free to download and can be adapted to any particular type of health care student or setting. It has been used a lot to assess attitudes towards IPL, to demonstrate the effectiveness and impact of IP training programs, as well as a tool to develop or refine IPL experiences. It has been translated into several different languages and has been
subjected to rigorous reliability and validity studies using a variety of methodology (Cloutier et al. 2014; Mahler et al. 2014; Tamura et al. 2012; Williams, Brown & Boyle 2012; Lauffs et al. 2008; McFayden, Webster & Maclaren 2006).

The reliability and validity of the RIPLS subscales varies. The Teamwork and Collaboration Professional Identity subscales demonstrated the highest reliability and validity, while the Roles and Responsibilities subscale was often found to be much lower. However, Binienda (2015) pointed out that the subscale items in Roles and Responsibilities are focusing on actual clinical practice while the students who participated in the validity studies were in the pre-clinical phase of their training.

The results of the research provide support to start IPE in the beginning of the health professionals’ education to prevent negative attitudes in future IP collaboration in working life. Coster et al. (2008) used RIPLS to evaluate students’ attitudes and readiness for IPE in the baseline and the changes during their studies. Their findings showed differences in subscales between the groups. High scores in the beginning of the studies decreased the later scoring in more or less all of the subscales with all of the disciplines. Coster et al. (2008) concluded that negative attitudes to IPE in baseline might further reinforce the negative attitudes. Williams, Brown and Boyle’s (2012) results showed a positive development of attitudes towards shared learning and IP teamwork and collaboration. Students’ knowledge from the other professions and their roles increased during the studies. Differences between the professional groups were found. McFadyen et al. (2010), Medves et al. (2013) and Ruebling et al. (2014) got similar findings in their research. They all recommended early entrance IPE and varied opportunities for learners to communicate and collaborate to improve collaborative practice and patient-centered care.

Institutional support for participants and creating positive expectations are important when planning IPE programs (Hean & Dickinson 2005). An important point of view is the faculty development. The learning atmosphere should be cooperative. Anderson, Cox and Thorpe (2009) pointed out the importance of the changed role of the teachers and tailored professional’s opportunities to IPE for them. The role of teachers is to facilitate students to learn with, from, and about each other. Moreover, Hindered et al. (2016) concluded that the faculty development, competence and attitudes are essential in the implementation of IPE. When educators become more aware of IPE opportunities, programs can continue to grow.

To summarize, the first steps towards IP competencies are taken with positive attitudes to work together with the IP team in the same direction for health in a
patient-centered way. In practice, there are several barriers to be overcome. The values and beliefs in the faculty can be against change from IPE. Key people are needed from universities and service organizations to be ambassadors for change in the long uniprofessional tradition. Effective IPL also requires development of active learner-centered pedagogy. Finally, change is a process and attitude change needs time.
4 Developing an IP curriculum

There are different possibilities for integrating IPE in curricula (Barr et al. 2005; Curran & Sharpe 2007). At undergraduate level, shared learning sequences across professional education at an early stage of the studies, and then continuing throughout curriculum with regular reinforcement is recommended (Curran & Sharpe 2007). Several IPE models or curriculum frameworks have been developed and delivered (Lennox & Anderson 2004; Curran & Sharpe 2007; Wilhelmsson et al. 2009; Grant, Bainbridge & Gilbert 2010; Bridges et al. 2011; Steketee et al. 2013; Teodorchuk et al. 2016).

Health professionals need preparation and support to work in collaborative practice teams, a requirement brought about by an aging population and increases in chronic and complex diseases (Thistlethwaite et al. 2014). Health professionals’ education today is outcome-driven and competence-based, aimed at safe and capable future practitioners who are able to meet the future health care needs of people and society. Besides the program-specific professional competencies, common competencies for all (for example, balance between disease management and disease prevention/health promotion, professional and ethical behavior in practice, optimal use of resources and consciousness of well-being of self and colleagues) and IP collaborative competencies are needed. Brewer and Jones (2013) noted that the curriculum frameworks today generally make reference to being client-centered and to the safety and quality of care, and locate IP collaborative practice as the central theme or objective. In the next section, Linköping’s IP curriculum model and Griffith’s IP curriculum model which is based on Australian curriculum framework are presented. These models were selected in order to find a good model for the development of the IP public health curriculum for local needs in the northern Finland.

4.1 IPE curriculum development in Linköping University

Linköping University in Sweden is the pioneer of IPE in the Nordic countries. Based on the WHO’s Declaration of Alma Ata (1978), and after the WHO’s report “Learning together to work together for health” (1988) IP, problem-based education, was designed and delivered in Linköping University. The development of IPE curriculum was built on four future trends of Swedish society (Wilhelmsson 2011; Figure 5). One of the core challenges was also to strengthen primary health care.
Wilhelmsson (2011) pointed out that the basic idea of the Linköping model was the development of students’ own professional identity to meet other health and social professions already in their undergraduate studies. IPL was defined as a process over time, including several integrated stages to gain IP competence, skills required to work together interprofessionally in practice.

In the first ten weeks the IPE module, with problem-based learning (PBL), was introduced in the beginning of the studies for students from all health science programs. The aims were first, introduce PBL and critical thinking, and second,
learn about health and wellbeing of people of different ages and their healthy lifestyle factors. The students learned to work as a team to develop a common frame of reference and progress of communication. The next step for the students from medical, nursing, social care, biomedical science, physiotherapy and occupational therapy programs was a two-week placement at an orthopedic ward with real patients. The student team assumed the overall responsibility for patient care and treatment with the support of supervisors. Specific medical and nursing care and rehabilitation were responsibilities for the respective professions (Areskog 1994; Areskog 1995; Wilhelmsson 2011).

The next step in the IP model was taken when the first student ward was launched 10 years after the first initiated model (Wahlström, Sandén & Hammar 1996; Wahlström, Sandén & Hammar 1997; Wahlström, Sandén & Hammar 1998) based on earlier experiences of the clinical team training in hospitals and primary care. According to Wilhelmsson (2011), in the training ward the students exercised their own professional role as well as learned about the skills of other professions, while taking responsibility for the patients’ needs.

Fig. 6. Comprehensive three steps Linköping IP model (by Wilhelmsson 2011)

The next revised form of the IP module was built in themes: health, ethics, and learning (HEL) (Figure 6). The first part of the IPE model was decreased to an eight-week module (HEL I) and a new 2-week IPE module (HEL II) was launched later in the curriculum. The expanded focus on HEL I was on public health and epidemiology. It included theory and practical field study on health, risks and illness in the local community. The students from all programs participated during the 4th and 5th semesters in the new part of the model, HEL II, to gain
complementary professional competences, testing and consolidating their own professional identity in IP settings. The common subject was sexuality: what was processed from different professional perspectives in groups as well as in presented role-plays. The third part of the model, HEL III, was a 2-week training placement on the IP student training ward late in the curriculum. The purpose was to test and establish collaborative and IP competences in a realistic environment (Wilhelmsson 2011).

4.2 IP curriculum framework and model of Griffith University in Australia

Steketee et al. (2013) described the theoretical framework (Figure 7) for curriculum development of health professional education in Australia. The curriculum framework connected education directly to the political, social, and economic issues surrounding the professions. The purpose of the framework is to assist educators developing, reviewing or reshaping health professional courses in higher education and to prepare graduates for the complexities of the present and future health workplace. The model consists of elements, which are important in public health promotion and takes in account both future needs of the service users, the service system, stakeholders and pedagogical aspects.

The framework (Figure 7) enables and requires educators to integrate the dynamic interplay among the four dimensions in curriculum development. Dimension 1 focuses on the future and aspects of the health policy and its implication for education (WHO 2010; Frenk et al. 2010). Dimension 2 allows educators to ask critical questions about the learning outcomes, competences and attitudes. Dimension 3 is concerned with the actual design of learning assessment activities and broader questions of the future health system produced though the education. Dimension 4 loops reflectively and systematically back to the past to see the bigger picture of the future university and curriculum (Steketee et al. 2013). The framework is one of the tools used to expand IPE in Australian health professionals education (Boyle 2014).
Griffith University in Australia had taken steps to create their IP curriculum. IPE are organized (Health IDEAS 2011–2014; Teodorczuc et al. 2016) within the three-phase framework across the curriculum (Figure 8). The first phase of the studies will expand the definition of the professional roles and responsibilities, understand the history and theoretical underpinnings of the major professional roles, as well as one’s own. The aim is to break down the professional stereotypes in the early phase. The second phase consists of IP communication skills workshops using multimethod simulations with simulated patients and caregivers through extended immersion. The aim is to reflect and discuss each other’s specific skills and roles in the team to prepare students for collaborative practice in future. The first phase prepared the students to the second phase. In the third, later phase, IPE is applied in real patient care. The second phase prepared the students to work as an IP team member with real patients. This three-step IP curriculum is a continuum following the learning process of the students, and their professional growth. There are similarities with the Linköping model. These structures were used when starting to develop the Oulu IPE curriculum as well.
Teodorczuc et al. (2016) introduced the practical guide to assist in developing an IPE curriculum. It starts with forming the IP planning group and continues with eight steps to evaluate, review and update the curriculum regularly. Important points are setting the aims, defining the outcomes and competencies, and training the trainers.
5  Designing an IPE model and curriculum for public health studies in the Universities of Oulu

Both of the universities had earlier experience of IPE in postgraduate level. In the 1990s, University of Oulu Faculty of Medicine started to develop a medical degree program towards a more comprehensive family-oriented model. Furthermore, they launched postgraduate education for general practitioners with the IP primary health and social care teams. The education was based on the biopsychosocial and family-oriented model (Larivaara et al. 2000; Larivaara & Taanila 2004).

Oulu University of Applied Science was one of the first established universities of applied sciences in Finland in early 1990s. The goal was to develop modern IP pedagogy in close collaboration with municipalities and working life partners. The curriculum was based on holistic people-centered care. Students and teachers worked on projects and a training hospital was established to foster IP teamwork skills as well as develop holistic thinking (Lämsä, Hietanen & Lämsä 1994). After a very enthusiastic beginning, IPE at undergraduate level developed slowly, but at postgraduate level IP education and projects continued successfully. The two neighbor universities founded the same challenges in developing undergraduate IPE (Barr 2015).

Designing IPE for undergraduate degree programs in the universities of Oulu continued in the 2000s. The long-term goal was to develop curriculum, which would prepare students to become capable IP team players in their professional future. The common goal was to create the IPE curriculum continuum model, including studies from the beginning to the end. Linköping IP model is based on this idea of the IPL continuum, and their good experience of IPE (Wilhelmsson 2011) helped to form the Oulu curriculum plan.

5.1 Oulu IP public health curriculum and education model

The development of the Oulu curriculum model was an innovative process. It proceeded step-by-step forward and while a while steps backwards were taken. The principles of IPE and the contents of public health were the starting points. IPE at undergraduate level in outpatient primary care is less implemented and researched than IPE in hospital settings. According to the Finnish public health strategies (Kaste 2012), the need is to strengthen preventive and primary care and prepare
students for the future health and wellbeing challenges. The Oulu IPE model of public health studies (Figure 9) was designed as a continuum, including theory and practical training in outpatient primary care. The model is based on patients and family-centered holistic care, promoting public health, and the goal is to enhance collaborative learning and IP competencies towards safer and qualitative care.

Fig. 9. Oulu IP public health curriculum and education model

IPE studies in the early stages of the curriculum help to develop students’ own identity when interacting with other health and social professionals (Wilhelmsson et al. 2009). Early IPL experiences can help students to establish effective, collaborative and appreciative relationships with health professionals (Ateah et al. 2011; Ruebling et al. 2014). Early entrance of IPL familiarizes learners with IP values (Anderson & Thorpe 2008; Coster et al. 2008).

5.2 Public health and IPC course

The common three credits (1 credit = 27 hours student’s work) course “Public health and interprofessional collaboration” was planned for the first semester health care students. The content of the course was planned so that students familiarize themselves with the premises of health promotion and the possibilities of IPC, challenges of public health, functioning of national health and social welfare systems, as well as national public health strategies.

The course architecture for the IP course was built on blended methods (Sung, Kwon & Ryu, 2008; de Jong et al. 2014) and it consisted of three parts. The students learned and worked together in IP groups in various environments, processing the idea of IP patient-centered care, sharing responsibilities and building the trust
between the client and the professionals (McMurtry, 2010). Figure 10 describes the contents and progress of the course.

The first part of the course included keynote lectures for all. The second part was an interactive e-learning phase based on fictitious family cases with different kinds of everyday health and wellbeing problems. Weekly discussion tasks focused on children under school age, pupils and students, parents and elderly people of the family (Figure 10). During the e-learning period, the students from several degree programs (altogether 250-350 per year) were divided into ten groups. The task was to discuss together and find out solutions for what kind of primary services the families can get and how the IPC of the service providers (public, private, third sector) helped to solve the everyday problems of the family and family members. Each group (~30–35 students) had a tutor teacher. Below is one example of the family cases.

Fig. 10. Course architecture

**Family case: Virtanen**

The family Virtanen lives in a Finnish suburb. The mother of the family had passed away due to breast cancer three years earlier. **Father Raimo** (47 years) is an IT engineer and works in a local IT company. He has health problems, including depression, and his use of alcohol has increased. He visits occupational health service when needed. **Son Miika** (16 years) is in upper secondary school. He likes to sit and play on his computer. He is overweight and bullied at school. The school nurse and the teacher have been in contact with the father about these issues. **Daughter Tiia** (11 years) has diabetes type 1. She takes good care of her medication and tests and her blood sugar levels
are in balance. She has a lot of friends. Tiia visits a diabetes nurse in primary care regularly and has yearly visits in the pediatric policlinic at the university hospital. The oldest daughter is Anniina (18 years). She lives in a flat nearby with her boyfriend Petteri (20 years) and their child Kiira (2 years). Both parents are unemployed without any vocational education and have social problems. They visit a primary care and child health clinic, from where they have got, for example, extra help at home. Kiira attends kindergarten three days a week. Raimo has a brother (Jouni, 56 years), who is single. After he had a myocardial infarction a couple of years ago he retired, and he is now taking care of his elderly parents who suffer from dementia. They live in Lapland in an old rural house.

Next, the students prepared themselves for the student conference, first by searching information concerning the health and social strengths and problems of the family, and then writing an individual essay. Students were divided in small groups based on the similar contents of the essays, and finally, the group together wrote a common abstract for the student conference. The student conference was the final part of the course. It was organized like a scientific conference, including opening, plenary session, parallel sessions with oral and posters presentations, best poster award and closing of the conference.

Written information material of the tasks, duties of the students and tutors, deadlines, compensatory tasks, forms of essays and abstracts, and practical advice of the student conference were prepared. Prior to the course, pedagogical training of IPE and participative methods were organized for the tutors (Curran & Sharpe 2007). The tutors held regular meetings together during the course.

After the courses, each year since the first pilot in Autumn 2007, students’ feedback was collected with structured questionnaire (Appendix 2.). Students readiness and attitudes towards IPL were investigated with RIPLS in years 2008-2011. According to the students’ feedback, improvements were made to the implementation and methods of the course. One improvement was to start the grouping process right at the beginning and improve the teamwork facilities. The interactive workshops based on video clips were developed and integrated in the course and the number of lectures was diminished. A web test of essential contents of the lectures and workshops was taken in use. Group sessions at the beginning of the course and weekly face-to-face meetings during the e-learning were arranged. The e-learning period was shortened from five to four weeks. The family cases and discussion tasks were developed and the groups were divided in five smaller
discussion groups of 5–7 students. Besides oral and poster presentations, different formats of presentations, such as drama and video, were taken up in the student conference.

5.3 IP training in maternity and child health clinic

The next step in IPE development was taken when the city of Oulu started the planning process of the “learning health center”. The first IP training pilot in primary preventive care, in maternity and child health clinics, was innovated and implemented in collaboration with the universities, the Health Care Centre of the City of Oulu and Oulu University hospital. Fifth-year medical students and fourth-year public health nurse students took part in the training periods during the years 2010–2012. Two separate training days were arranged during each semester, one in maternity and the other in child health clinic. Feedback was collected from all the students and the clients, after which, the procedures were developed.

The Health Care Centre and its clients formed the training environment. Detailed programs and timetables for the one-day training periods were made in collaboration with the partners. The health centre recruited clients and provided the facilities. Both universities recruited the students to the IP training. IP training was an option to the students as a part of their compulsory practical training. Orientation material (theory, new protocols, examination programs, etc.) was prepared for students. The doctor and the public health nurse from the Health Care Centre gave a lecture on the Finnish child health service system and examination protocols before the training.

The IP student pairs had different tasks: to plan the procedure of the visit, and to examine the client. In addition, they observed and reflected the work of the other pairs. One nurse-doctor pair took independently care of the visit while the other pair observed using the observers’ tool. A tool for observers was modified from The Anaesthetists’ Non-technical Skills (ANTS 2012; Flin et al. 2010). It consisted of several content areas, including task management, team working, situation awareness and patient–centeredness, and professional decision-making. The visit was finalized with the client, the pair and the facilitators. Observers’ evaluation and direct feedback on the facilitators were given after each visit. The roles of the student pairs were switched so that all pairs completed all of the tasks. In total, six clients were examined during one half day. Facilitators, doctors and nurses were available throughout to guide and help.
The IP training continued in the preventive clinics while new ideas were planned to expand the training pilots in the area of public health diseases. The next step was taken when the new IP wellness center was opened on the same campus area of the universities and university hospital. An IP planning group was created. The participants were an endocrinologist from Oulu University Hospital, a general practitioner and a diabetes nurse from the Health Center of Oulu, a clinical teacher and an educational coordinator from University of Oulu, Faculty of Medicine, and a senior lecturer from Oulu University of Applied Sciences.

5.4 IP training in outpatient primary care with diabetes type 2 patients

Diabetes type 2 is one of the most common chronic illnesses in Finland as well as globally. The significance of diabetes to public health is mainly based on the complications associated with the disease. People with diabetes run a significantly higher risk of cardiovascular diseases (Niemi & Winell 2006). The city of Oulu is located in northern Finland and has about 200,000 inhabitants. It has been calculated that ten% of the citizens account for 81% of the social and health care expenditure (Leskelä et al. 2013). Moreover, it is reported that eleven% of these heavy service users have diabetes and cardiovascular diseases. According to Niemi and Winell (2006) the overall cost of diabetes and its complications has increased markedly. A key component to improve acute, chronic and preventive evidence-based care and self-care support of the patient is to build effective IP teams in primary health care (Bunniss & Kelly 2008; Delva, Jamieson & Lemieux 2008; Janson et al. 2009). In diabetes type 2 care, patient-centered collaboration between primary and specialized hospital services is essential.

In half a day’s training two medical students and one nurse student planned and carried out an outpatient visit of a patient with diabetes type 2. Two IP student groups were working simultaneously. Facilitators prepared pre-material for the students, such as recommendations of the evidence-based care and guidelines for patient examination. Health centre personnel gave general info to the students about practical issues in the health centre and the health recording system. Students familiarized themselves with the patient history and agreed on the team tasks. Student teams interviewed and examined the patients. They performed physical examinations, including RR, HR, BMI, diabetic foot evaluation (monofilament, vibration tuning fork), and measured F-glucose. Student teams reviewed nutritional status and gave guidance to the patients. They discussed the findings with the
facilitating doctor and nurse and made treatment and care plans together. The visit was finalized with the patient, the team, and the facilitators. Students added the documentation to the electronic patient recording system.
6 Research questions and aims of the study

The first aim of the study was to investigate how IPE during undergraduate studies, using collaborative learning methods and innovative learning environments, promotes medical and health care students’ readiness and attitude towards IPL and learning to work in patient- and family-centered ways in collaborative IP teams. The second aim was to collect feedback from the patients and families after the students’ receptions in the training periods.

Research questions:

1. How IPE, use of collaborative learning methods and innovative learning environments will promote undergraduate students’ interprofessional competencies?
   a) What kind of attitudes and readiness towards IPL and teamwork medical and health care students have in the different stages of their studies? (Study 1, 2, 3)
   b) What kind of learning experience the students have after the IP public health course in the first semester and after the IP training periods in the middle and final stages of their study programs? (Study 1, 2, 3)

2. How the patients experienced the students’ receptions?
7 Design and methods of the study

This research is connected to the development process of the IPE Public Health curriculum, including theoretical and practical studies. The first part of the designed IP studies was the “Public health and interprofessional collaboration” course. This study is reported in Original Paper 1. The first pilot course was carried out in Autumn 2007. The course architecture and pedagogical solutions were developed according to the students’ learning experience and feedback (Figure 11).

![Fig. 11. The study process and data collection in 2007-2015](image)

Other parts of studies consisted of IP training in outpatient primary and preventive care. The study of collaborative diabetes training in outpatient primary care is reported in Original Paper 2, and the study of collaborative learning in maternity and child health clinics in Original Paper 3.

The development process of the IP curriculum in public health started in 2007 when the first pilot course, “Public health and interprofessional collaboration” was carried out.

The IPE curriculum development process progressed step-by-step. The training periods started as pilots and expanded in collaboration with the construction of Kontinkangas Interprofessional Health and Wellness Center of Oulu, where all the basic health and social services are under the same roof. The doctors and nurses are working as pairs in acute reception. Services for families with children, social services, elderly services, mental health services, services for the disabled and drug abusers, are there as well.

The geographical location promoted the collaboration between the partners and the development of IP training in IP health and the wellbeing center. It was easy to
arrange meetings between the partners and for the students to change the training environment from the hospital to the health center.

7.1 Study design and data collection

Students’ readiness and attitudes towards IPL were investigated yearly in the beginning of the public health course in the years 2008-2013 using the RIPLS (Parsell & Bligh 1999) (Figure 10) (Appendix 1). The original scale was first translated in Finnish by the author and the supervising professor. Then the versions were compared, finalized and piloted with the participants of the first course in 2007. Reliability of the scales was comparable to the original scales.

Learning experiences were collected with pre-tested structured questionnaire (Tervaskanto-Mäentausta & Vaaramo 2007). The original questionnaire was developed and used for evaluation of learning in e-learning course. The author used the questionnaire in her pro gradu studies. The questionnaire was modified to this study (Appendix 2). The feedback questionnaire consisted of 38 statements under five categories: (1) lectures and workshops, (2) e-learning platform, (3) discussion and collaboration in the group, (4) evaluation of my learning, and (5) student conference. The evaluation was based on the Likert scale 1-5 (1 – totally disagree to 5 – totally agree).

After the training periods, students’ attitudes and readiness towards IPL were investigated with modified RIPLS. Three original statements were changed to three pair work statements. Two open questions for students’ learning experiences were added to the questionnaire. (Appendix 3). The same questionnaire with added questions concerning clinic skills were used after the diabetes training. Students’ perceptions of their clinical skills were investigated using a structured questionnaire that consisted of eight statements in contents of communication, patient examination, professionalism and decision-making (Appendix 4). This questionnaire was developed by Duodecim (https://www.duodecim.fi/english/), a Finnish society for medical doctors.

The patients gave oral feedback on the visit and filled in a structured questionnaire. The feedback questionnaire for clients consisted of three parts: (1) background (age of the respondent, focus of health care visit), (2) experiences of the visit (14 statements, with the scale 1–5), and (3) evaluation of the treatment and service (five out of twenty adjectives to choose) (Appendix 5). They was given the feedback questionnaire after the visit and they filled it voluntary. They dropped the filled anonymous questionnaires in the box which was in the lobby.
The summary of the study procedures in the three original papers, learning objectives, the study aims and used methods and materials are presented in Table 2.

**Table 2. Summary of the learning objectives, study aims and materials and methods**

<table>
<thead>
<tr>
<th></th>
<th>Paper I</th>
<th>Paper II</th>
<th>Paper III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning objectives</strong></td>
<td>The students learn</td>
<td>The students learn</td>
<td>The students learn</td>
</tr>
<tr>
<td>To respect each other’s professional area IP teamwork skills the strengths of IP collaboration.</td>
<td>To work as an IP team.</td>
<td>To work as an IP pain/team.</td>
<td></td>
</tr>
<tr>
<td>The challenges of public health. How primary health and welfare service system works.</td>
<td>To carry out as an IP team an outpatient visit of a patient with diabetes type 2.</td>
<td>To carry out as an IP pair preventive checks of a pregnant women/couple and a child under school age.</td>
<td></td>
</tr>
<tr>
<td>To share tasks, responsibilities and decision-making.</td>
<td>The patient pathway in the specialized and primary care services.</td>
<td>To follow the evidence-based guidelines of the preventive checks. To share the tasks, responsibilities and decision-making.</td>
<td></td>
</tr>
<tr>
<td><strong>Study aims</strong></td>
<td>What kind of attitudes and readiness towards IPL students from different health professions have in the beginning of their studies?</td>
<td>What kind of attitudes and readiness towards IPL students from different health professions have in the middle of their studies?</td>
<td>What kind of attitudes and readiness towards IPL students from different health professions have in final stage of their studies?</td>
</tr>
<tr>
<td></td>
<td>What kind of learning experience the students have after the IP public health course in their first semester?</td>
<td>What kind of learning experience the students have after the IP training in outpatient primary care in the middle of their studies?</td>
<td>What kind of learning experience the students have after the IP training in preventive maternity and child health clinics in final stage of their studies?</td>
</tr>
<tr>
<td><strong>Methods and materials</strong></td>
<td>Students RIPLS at the beginning of the course. Structured questionnaire of the learning experience after the course + open comments.</td>
<td>Students Modified RIPLS + questions of pair work and clinical skills + open comments.</td>
<td>Students Modified RIPLS + questions of pair work + open comments.</td>
</tr>
<tr>
<td></td>
<td>Patients Structured feedback questionnaire after the visit.</td>
<td>Patients Structured feedback questionnaire after the visit.</td>
<td>Patients Structured feedback questionnaire after the visit.</td>
</tr>
</tbody>
</table>
7.2 Participants of the study

In total, 1781 first semester university students from ten different degree programs of health care education participated in the IP public health course during the years 2007–2013 (Table 3). The number of medical students was 720 and the dentistry students 360. In this study they formed the group of medical students (N=1080). The group of health care students (Health N=701) consisted of the dental hygienists (N=115), midwifery (N=150), nurse (N=174), paramedic (N=45) and public health nurse (N=130) students. The occupational therapist students (N=25) joined the course from 2011. In 2013 the students in this group included also radiography (N=34) and biomedical laboratory science students (N=28). The yearly number of the participants increased from 220 to 350.

Table 3. Participants in the public health course

<table>
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</thead>
<tbody>
<tr>
<td><strong>Group Med</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Dentistry</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Medicine</td>
<td>120</td>
<td>120</td>
<td>120</td>
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<td>120</td>
<td>120</td>
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<tr>
<td><strong>Group Hel</strong></td>
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<td></td>
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<tr>
<td>Dental health</td>
<td>20</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Midwifery</td>
<td>-</td>
<td>30</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>Nursing</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>-</td>
<td>30</td>
<td>84</td>
</tr>
<tr>
<td>Occupational therapy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Paramedics</td>
<td>-</td>
<td>20</td>
<td>5</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public health nursing</td>
<td>-</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Radiography</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>34</td>
</tr>
<tr>
<td>Biomedical lab science</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>28</td>
</tr>
</tbody>
</table>

During the years 2007–2013, the learning experience and feedback was collected from all of the students after the course (response rate 83.6%) (Table 3). At the beginning of the course students attitudes and readiness towards IPL was investigated during the years 2008–2011 (2008 N=261, 2009 N=366, 2010 N=237, 2011 N=239) (response rate 89%). The number of participants in 2009 included a group of nurse students who started the course later on the study year.
Altogether, 225 students (Med N=165, Nurse N=56) took part in the training periods in outpatient primary care. In 2010–2012, 101 medical and 31 public health students took part in the study. Two separate training days were arranged during each semester, one day in maternity and the other in a child health clinic. The medical students trained half a day and the new group continued the other half day, while the same public health nurse students trained the whole of the day. Around 12–18 clients were examined during the day. Altogether, 94 (N ~190) of the clients answered the feedback questionnaire.

In diabetes training the students trained in small groups (2 medical and 1 nurse). Two patients were examined and cared for during the half day and the number of patients increased when the model was tested. Altogether, 64 medical and 23 nurse students took part in the study in the years 2013–2015. The patients gave oral feedback at first, and later eight of them answered feedback questionnaires.

7.3 Data analysis

The quantitative data was analyzed using IBM SPSS Statistics, version 21 (1989, 2012). Statistical indicators were described first with direct and percent distributions. The analysis was continued with means, medians and sum squares of the subscales and questions radiators. Then, the differences between medical and nurse students in these subscales were investigated by Analysis of Variance (ANOVA). The results of the public health course were also compared over different cohorts during these years. The open questions and comments were classified into three classes, positive learning experience, critical comments and suggestions to develop the course (Krippendorff, 2013).

The attitudes and readiness of the students for IPL were investigated using the three subscales of RIPLS (teamwork and collaboration, professional identity, roles and responsibilities) presented by Parsell and Bligh (1999), as well as the added questions of pair work. The students’ feedback on the course structure and learning experience was investigated using the sum of the variables in main categories: lectures and workshops, e-learning platform, discussion and collaboration in the group, evaluation of learning, and student conference. Students’ perceptions of their clinical skills were analyzed in each statement by percentage distributions. Patients’ feedback was analyzed by direct distributions.

The results are presented with boxplots, bar charts, tables and straight quotations. Students’ open comments were classified and are presented with most common authentic comments and suggestions.
8 Findings

The first step of the study was to investigate students’ attitudes and readiness towards IPL in different levels of their studies during the years 2007–2015. For the second step, students’ learning experience was investigated. The interest was to evaluate the development of students’ IP competences in patient-/family-centered holistic care in theory and practice. The learning experiences are presented and compared between the groups. The third step was to find out the feedback from patients and families after the students’ receptions.

8.1 Students attitudes and readiness towards IPL

At the beginning of the studies, students’ readiness and attitudes towards IPE was positive, improved year by year, and stayed very positive. The most remarkable positive change was in the year 2010 (Figure 12). Teamwork and collaboration were highly valued in groups of medical students and health care students. Similar development was seen in the subscale of professional identity with both of the groups. A tendency for these latter two subscales among health care students was slightly stronger compared to medical students. Statistically significant differences between the groups were seen in the subscale of roles and responsibilities (p=0.000). Interestingly, medical students evaluated it as being a similar and lower level than the health care students during the years (Figure 12).

Fig. 12. Longitudinal inspection of the readiness and attitudes towards IPL compared with the students groups in the beginning of their studies
Next, the readiness and attitudes of the students were investigated in more detail. Results were compared between the groups in 2008 and 2010, when the biggest change to a more positive direction was seen. Comparisons were made between statements, where the variation was the most notable.

In the subscale teamwork and collaboration, all students highly evaluated the patient-centered care and solving patients’ problems together (agreed Med 91.4–93.3%, Health 93.0–95.9%). Communication skills were evaluated as important too (agreed Med 59.8–78.2%, Health 66.6–76.8%) (Table 4).

Evaluation in trusting and respecting each other was agreed by 91.9–93.9% of medical students and 97.0–98.7% of health care students. The variations in opinions between the groups was not high, but the health care group evaluated these statements a little higher (Table 4). The trend in evaluation in the subscale professional identity appeared similar. In the opinions of the statement “Shared learning will help me to clarify the nature of patients’ problems” there was a clear difference between the groups. In 2008, 34.7% of the medical students and 60.8% of the health care students agreed with it. In 2010, the results were M 54% and H 68% (Table 4). The differences between the groups were most prominent in the subscale roles and responsibilities. In 2008, 43.4%, and in 2010, 57.6% of the medical students disagreed that the function of nurses and therapists was assistants to doctors. Health care students’ opinion changed from 65% to 69.4%. The statement “I’m not sure what my professional role will be” was disagreed with by 70.5–70.7% of the medical and 78.5–80.4% of the health care students (Table 4).

Table 4. Medical and health care students' attitudes towards IPE comparing groups 2008 and 2010 (RIPLS) (Disagree 1–2,Partly agree 3,Agree 4–5)

<table>
<thead>
<tr>
<th>Statements from the subscales</th>
<th>Likert</th>
<th>Med% (N=162)</th>
<th>Med% (N=165)</th>
<th>Health% (N=99)</th>
<th>Health% (N=72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork and collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients would ultimately benefit if health care students worked together to solve patients’ problems.</td>
<td>Agree</td>
<td>91.4</td>
<td>93.3</td>
<td>93.9</td>
<td>95.9</td>
</tr>
<tr>
<td></td>
<td>Partly agree</td>
<td>7.4</td>
<td>3.6</td>
<td>5.1</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>1.2</td>
<td>3.0</td>
<td>2.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>
**In the middle of the studies** after the diabetes training both student groups highly valued teamwork and collaboration (Figure 13). The perceptions of nursing (N, n=23) students (mean 4.361) were slightly stronger than medical (M, n=64) students (4.498; p=0.353). Similar results were seen for professional identity (M 4.089, N 4.218; p=0.348), and pair work (M 4.138, N 4.040; p=0.311), but the tendency for these scales among medical students tended to be slightly stronger when compared to nursing students. Roles and responsibilities (M 3.032, N 3.810; p<0.0005) was evaluated slightly lower than the other scales in both groups. Statistically significant differences between the groups were only seen in this subscale, and perceptions of medical students were lower than nursing students.
The statements were also examined separately, and the most distinct statements were further analyzed. The teamwork and collaboration subscale showed highly positive perceptions in several statements. Both medical and nursing students agreed strongly (68.1%) that it is in the patients’ best interest for professionals to work as a team. The statement “learning with students from other programs will help me to become a more effective member of a health care team” was agreed with by 87% of both student groups. The statement “communication skills should be learnt with other health care students” was agreed with by 78.7% of medical students and 86.3% of nursing students. There was also a strong agreement with the statements of the subscale professional identity. The statement “patients would ultimately benefit if health care students worked together to solve patient problems” was agreed with by 80% of both student groups. The subscale roles and responsibilities showed that nursing students (60%) felt stronger that their role is not only to be an assistant to the doctors when compared with medical students (40%). The statement “pair training clarified the overall view of preventive and
holistic health care” was agreed with by 78.1% of medical students and 77.3% of nursing students.

According to the results in the final part of the studies, the students’ readiness and attitudes towards IPE were very positive in general (Figure 14). Working as an IP team was highly valued in both of the student groups (medical students, n=101: M=4.07, SD=0.56; nurse students: M=4.21, SD=0.48; p=0.194). Statistically significant differences between medical and nurse students (n=31) were seen in the subscales of roles and responsibilities (M=3.18, SD=0.81 vs. M=4.06, SD=0.80; p<0.001). A tendency for a professional identity among medical students was slightly stronger compared with nurse students (M=3.86, SD=0.59 vs. M=3.87, SD=0.42, p=0.947), although the difference was not statistically significant.

Fig. 14. The readiness and attitudes to IPL using RIPLS in the final part of the studies (1 – totally disagree to 5 – totally agree)

Next, the readiness and attitudes of the students towards IPL were investigated in more detail. Considering questions of teamwork and collaboration, over 90% of the students thought that learning with other degree students will help them to become more effective team members. Teamworking skills were considered essential for all health care students to learn. In addition, about 90% of the students agreed that
a patient ultimately benefits when the health care students worked together to solve a patient’s problems. Almost all of the students agreed that trust and respect for each team member are needed. Most of the students agreed that IPL before qualification will improve relationships after qualification, but there was some variance between the groups. When evaluating the learning of the clinical or communication skills, more differences between the medical and nurse students were found (Figure 15(a) and Figure 14(b)). Nurse students seemed to learn more clinical skills (Figure 15(c)) whereas the medical students thought that this type of training could improve the communication skills (Figure 15(d)).

![Graphs showing differences in students' perception of teamwork, collaboration, professional identity, roles and responsibilities.](image)

Fig. 15. Differences in students’ perception of teamwork (a), collaboration (b), professional identity (c), roles and responsibilities (d)
8.2 Students’ learning experience of the IP competence and clinical skills

At the beginning of the studies, students’ feedback of the IP course structure and learning experience were investigated using the sum squares of main categories of the questionnaire: Lectures and workshops, e-learning platform, discussion and collaboration in the group, evaluation of my learning, student conference (Figure 16). The course structure was modified yearly according to the students’ feedback. Students’ opinions seemed to divide into three groups. One part of the students evaluated their learning and the used methods negatively in each variable and the other part very positively. The biggest group was moderately satisfied with the course, its methods and their learning. The learning results in average stayed in good level (Figure 16).

![Fig. 16. Feedback and learning experiences between the students’ groups](image)

The traditional part of the course was lectures. Participation during the first day of the course and keynote lectures was obligatory. The other sessions were organized as team teaching with lecturers from both universities or using special experts. The problem was that students participated in the lectures in low numbers. Feedback from the students was that the lectures were too medically-centered. The number of the lectures thus diminished and interactive workshops with video clips were kept instead (Figure 16). A web test of essential contents of the lectures and workshop was taken up. Two thirds of the evaluated students felt that they learnt moderately well during the lectures and workshops.
The most critical group of the students did not like the e-learning method at all and the most satisfied students felt that e-learning and online discussions were the best part of the course. The first important modification was to keep face-to-face meetings once a week during the e-learning part (Figure 16). The uniformed guidelines to the tutors were made for these meetings. The students familiarized themselves with each other and got to know both campuses as well. This led to more active online discussions and mutual collaboration. The second alteration was to split the discussion groups in smaller subgroups of 5–7 students. Each subgroup had their own case family. Most of the students were of the opinion that the cases helped them to learn how the health and social system works and the importance of IP teamwork. The value of e-learning increased in both of the groups, but especially among the medical students during these years.

The task of writing the essay and abstract focused on preparing the students for the student conference. Students evaluated that it was difficult to perform both tasks and tutors also found it very time consuming to evaluate and give feedback on both tasks. The task of the personal essay was thus discontinued and only the small group abstract task was left. The students evaluated the support they got from instructors during the course as good. Year by year, the methods of the conference presentations got more creative in form, rather than traditional oral or poster presentations. The learning outcomes correlated linearly with students’ own activity and collaboration with the others on e-learning platform. Those students who took an active part in web and group discussions, search and shared knowledge, learned the most.

After the diabetes training, students’ perception of their clinical skills were analyzed in eight statements with three options (poor skills, intermediate skills, excellent skills) (Figure 17). About 60% of the students evaluated their skills in proposing relevant questions and noticing patients’ nonverbal communication as excellent. In addition, about 60% of them evaluated skills in respecting, creating a trustable atmosphere and working in a team as excellent. About 40% of the students evaluated their skills as poor when analyzing all risks and resources while making the care plan in a team, as well as when performing clinical examination, and making treatment and care plan (Figure 17).
Fig. 17. Learning of clinical skills and IP competence in diabetes training in the middle of the studies

The students commented on open questions about their learning experience. The comments were clustered in three clusters: positive learning experience, critical comments and suggestions for future. Most of the students felt that team support made the situation more relaxed. While working in the team they complemented each other, and learned about the value of IP teamwork. They appreciated the holistic and patient-centered approach during the visit. Almost all found diabetes patients educational, the tasks were clear and the facilitation was excellent. Some students struggled in the beginning in finding their role in the team, and some wished they had more time to read the patient files before the visit. In debriefing sessions, students commented that taking responsibility of the whole visit helped them to understand the “big picture” of the outpatient care of the diabetes type 2 patients in primary care, and the importance of collaboration between primary and specialized health care. Almost all wished they had more of this kind of learning and training possibilities. In the first training periods, patients gave oral feedback. They were very satisfied of the care.

In the final part of studies, in the preventive clinics, the students considered IPL important during the pair training. According to the assessment, it seemed that the training promoted pair work skills of the students. (Figure 14). The students considered that they learned preventive and holistic patient- and family-centered care. Positive experiences promoted learning but some of the students felt that they did not have enough previous experience to fully benefit from this type of training.
and that they had not been prepared enough. The professional roles of both professions were better understood and the students learned how to support each other. Overall, the students became familiar with the preventive health care system during the training session.

In students’ open comments the value of the IPL was clearly seen:

“I got good experiences of how the public health nurse and the doctor can support each other’s work.”

“Collaboration with the nurse students guided me to think from a different point of view.”

The focus of the training was on holistic care of the patients and the whole families. IP pair work during the whole visit was a new model to train students in the patient- and family-centered manner.

“It was challenging to work in a team and at the same time to keep the focus on the patient during the visit.”

“It was important to remember to support the parents and the family.”

### 8.3 Patients’ and families’ feedback

The patients’ and families’ feedback was collected after the IP visits. When the diabetes training started the number of patients was so low that they gave only oral feedback for ethical reasons. From autumn 2015, the patients completed the feedback questionnaire as well. In general, patients were very satisfied with the visit. They felt that the atmosphere was trustworthy and patient-centered, and that the staff respected each other and worked professionally. Patients appreciated that they had enough time to be heard, and commented that the reality was much better than expected.

The first part of the feedback questionnaire consisted of statements of the visit. The feedback of the visits through the statements was strongly agreed as being excellent. The other part consisted of adjectives the patients had to select the appropriate five to describe the visit. None of the eight patients gave negative feedback after the visit. The adjectives to describe the atmosphere during the visit are presented in Figure 18.
Fig. 18. Patients’/families’ feedback (%) of the student receptions (N=102; Health clinics n=94, Diabetes n=8)

After the maternity and child health visits, 94 of the clients answered the feedback questionnaires. Almost all of them agreed that the treatment was friendly, they were listened to, the atmosphere was positive and the staff respected each other’s expertise. Most of them agreed that they got answers to their questions and that the guidance was understandable, staff performance was trustable and the examinations were done professionally and thoroughly. The staff worked with good cooperation. The feeling after the visit was good and they knew the care plan until the next visit.
9 Discussion

The focus of this research was to investigate IPL in undergraduate medical and health care studies in order to develop IP curriculum focusing on public health and primary and preventive care. During the development process, IPE was integrated in the beginning, the middle and the final part of the medical and health care education. The Oulu IPE model was modified according to the learning outcomes and feedback of the students. Students’ attitudes and readiness towards IPL were investigated in longitudinal perspective.

Health professionals’ education is criticized for being fragmented. IP teamwork skills and better communication are needed to improve patient safety and cost-effective qualitative care (Frenk et al. 2010; WHO 2010; Jaruseviciene et al. 2013). Training future health care providers to work in IP teams will improve the health care outcomes of the patients (Bridges et al. 2011). The link between professional education, health conditions and the service system is crucial, and there is a growing need to develop a curricula of competencies to patient and population needs (Frenk et al. 2010; WHO 2010). Hean (2015) pointed out that with the increasing specialization of services, efforts for collaboration between individuals, and integration between services, is required. In this study, the strength was the close collaboration between the educational and service organizations. The driving force developing IP curriculum for undergraduate medical and health care studies has been as well as the networking with Nordic and European partners and the ongoing Finnish health care reform. The geographical proximity of the organizations, as well as the enthusiasm of key people, made the collaboration, research and development process successful.

IP teamwork has been emphasized as a key feature to organize health care services in a more safe, efficient and patient-centered way (Finn, Learmont & Reedy 2010). According to Bridges et al. (2011) training teamwork skills in primary care will focus improved health care outcomes for patients and families. A team-based approach to organize primary health care has been investigated and developed in many countries in professional level (Jaruseviciene et al. 2013; Goldman et al. 2010; Bunniss & Kelly 2008).

In this study, at the beginning of the public health course in the first semester, students’ attitudes and readiness towards IPL were positive in all of the RIPL subscales. The highest scores were evaluated in teamwork and collaboration also in Williams et al.’s (2012) study. The statements “Patients would ultimately benefit if health care students worked together to solve patients problems” and “Shared
learning will help me to clarify the nature of patient’ problems” were scored high in this study and a remarkable increase was seen in the attitudes of both of the groups in longitudinal inspection.

In the longitudinal perspective, the attitudes developed more positively in both of the groups, even though the students participating in the courses were different every year. The overall tendency of attitudes and readiness of the medical students was slightly lower than the health care students’. The medical students’ evaluation of their roles and responsibilities stayed constant at the same level during the researched years. The difference between the groups was significant.

The contents of the course included public health, health promotion, health and social service system, public health strategies and patient-/client-/family-centered care. These themes are typically used in IP curriculum in preclinical level (Curran & Sharpe 2007; Oandasan & Reeves 2005). The use of family cases helped the students to familiarize with the public health state of the Finnish, to public health programs and strategies and patient-centered orientation, as well as the meaning of shared responsibilities to improve public health. Darlow et al. (2015) indicated in their study that even the short IP course improved attitudes of IP team working and collaboration towards patient-centered care. In our study, some of the students were of the opinion that the course content was too difficult to learn at the beginning of the studies. They felt that learning IP skills should be organized in a real life context. Other students were of the opposite opinion and considered the course content and collaborative learning important. Coster et al. (2008) found that it is important to introduce IPL at the beginning of the studies. Nevertheless, IP teams must have at least a basic level of understanding of each other’s disciplines and the roles within the health care system (Ateah et al. 2011; Curran & Sharpe 2007). Based on the findings of Hofseth Almås & Vasset (2015), students in their second year gave a more positive description of their IPL.

Based on students’ feedback, participative methods gradually replaced the traditionally methods such as lectures. The online group discussions about health challenges of the different age of family members helped the students to learn about public health issues and the importance of sharing responsibilities with professionals and clients. The use of blended learning methods and environments and real life cases activated collaborative learning and seeing the bigger picture of the service system (Carbonaro et al. 2008; Salomon et al. 2010; Lindqvist et al. 2005).

Online learning was effective when students took an active part in discussions on the e-platform. The learning outcomes correlated linearly to students’ active
communication and collaboration. Family cases helped them to face the real life situations and the importance of IPC. Salomon et al. (2010) had similar findings of using real life scenarios and IP problem solving in an online IP course. The role of facilitators was important in making the discussions more explicit and open-minded to IP thinking. De Jong et al. (2014) also pointed to the importance of clear rules and technical support in e-learning.

According to students’ wishes, face-to-face group meetings were integrated once a week in the e-learning period. Those group meetings were evaluated as being important in order to get to know each other and about each other’s professions. Carbonaro et al. (2008) found that blended instructional formats, e-learning and combining face-to-face, provide pedagogical evidence to IPL.

The courses ended with the student conferences. The students evaluated the conferences good on average. The students became familiar with the scientific writing and working. Over the years, new ideas to the conference presentations were found, such as critical videos, socio-dramas, interviews of clients, etc. Student conferences have also been successfully organized in Queen’s University Canada (2016), with a focus on improving connections within health care and to demonstrate client-centered, collaborative teamwork.

The diabetes training in the middle of the studies was the first IPL experience in a clinical setting for both medical and nursing students involved in this study, and it was received with great enthusiasm, shared by the patients, teachers and local primary health care workers. The result showed that students complemented each other well. They valued the mutual learning experience and felt comfortable working together. This was seen in attitudes and readiness towards IPE, which were scored high in RIPLS and in pair work. The situation was challenging for undergraduate students, but working in an IP team encouraged the students to share knowledge and skills. The lowest scoring in RIPLS was in the subscale roles and responsibilities, where medical students scored significantly lower compared with nursing students. Medical students involved in the training were third-year students, thus they were in their first clinical year. Nursing students were more experienced in clinical skills. RIPLS is validated and widely used, but the subscale roles and responsibilities has been criticized as having the lowest reliability (Parsell & Bligh 1999). Binienda (2015) pointed out that the subscale items in roles and responsibilities are focusing on actual clinical practice, while the students who participated in the validity studies were in the pre-clinical phase of their training.

Students performed well with team-based competencies such as patient-centeredness, communication and team functioning. These competencies were
defined as being valuable in the Canadian IP competency model (Orchard & Bainbridge 2010). Paquette-Warren et al. (2014) also highlighted the importance of team education to improve the care of chronic illnesses in primary health care. The patients described the visit with positive adjectives and felt they had received qualitative care. According to Barwell, Arnold and Berry (2013), IPL increased the idea of each other’s roles, gave understanding of interpersonal skills and created teams that work better together and improved patient experience. The link between practice and education systems was essential in order to build relevant IP competencies that students require (Hean 2015; Legare et al. 2011).

IP diabetes training was an innovative new model to organize IP training in the primary care sector, which is increasingly responsible for patients with major chronic public health issues. Collaboration with the different professionals in outpatient primary care and specialized hospital care, as well as health care educators, was highly valuable. Most difficult challenges we encountered were administrative issues, for example, the access to patient recording systems was time limited. Time management was challenging for the planning and implementing team too, but since all parties involved recognized the importance of IP sessions, despite the busy schedules mutual time slots were found for planning meetings. The outpatient training periods of patients with diabetes type 2 gave valuable models to further organizing and developing IPT in the primary health care sector.

For the training in preventive clinics in the final part of the studies, the students worked in pairs as equal health care professionals. They thought that they needed to trust and respect each other and this showed good readiness for IPL and IPC. The active role of the patient and family as equal partners included in the training as well. Elements of collaborative practice include responsibility, accountability, coordination, communication, cooperation, assertiveness, autonomy, and mutual trust and respect (Bridges et al. 2011). The students learn with, from and about each other (Barr et al. 2005).

Both medical and nurse students considered teamwork and collaboration important. Morison et al. (2004) had similar findings in their study for undergraduate fourth-year medical and third-year nursing students. Williams et al. (2012) also had similar findings with 418 students from seven health care programs. According to both of these studies, the patients clearly benefited from IP teamwork.

The students learned about their own professional identity during the training. Over 90% of the students thought that learning together with other health care students before qualification is very beneficial. The training to work as an IP pair succeeded well and students considered this type of training a positive learning
experience. In addition, they had put much more skills and knowledge in use compared with the situation where they had to work alone. Working with the pair during the visit also gave confidence to meet the client. Our findings were more positive than in the study by Morison et al. (2004). Training together increased understanding of the roles and skills of the other health care professionals. Differences between the medical and nurse students were seen in attitudes and readiness to solve clinical problems and to learn communication skills when working with other health care students. Similar differences were seen in the previous study, although the difference between the medical and nurse students was clearer (Morison et al. 2004).

The aim of IPT (Pare et al. 2012; Medves et al. 2013) is to learn patient-centeredness in practice. Bridges et al. (2011) found that an IP team has to have common goals and they have to plan their work together to improve patient outcomes. Collaborative interactions were achieved through sharing skills and knowledge to improve the quality of patient care. According to the feedback from clients, their expectations were fulfilled. To provide comprehensive client care, the clients thought that the students and staff worked in good collaboration as a team. The feeling after the visit was confident. They were listened to and cared for, thoroughly and carefully.

According to the results, the three-step Oulu model of IPE was effective to learn IP teamwork and communication competencies in all stages of studies. The public health course was an introduction to patient- and family-centered thinking. Students had different forums to discuss and reflect the problems of the case families, as well as to find out how the service system could help the families. The ethical questions were also discussed. Learning outcomes were moderate and the active and student-centered methods divided the opinions.

Students evaluated the practical IP team training as important. They wished that the training periods in primary care would expand. They learned collaborative competences such as working and communicating in an IP team, the strengths and roles of the other professions became familiar, as well as working in a patient-/family-/community-centered way. Student teams had to reflect and solve real life problems. They felt comfortable when they could work together and share the knowledge and skills, for example, when making decisions about the future care plan of the patient. The patient's path in the service system became more familiar as well as their professional roles in different positions. Reeves et al. (2016) found the developed behavior in organizational practice and benefits of the patients.
Based on our results, the positive feedback of the students and patients and families positively influenced the attitudes of the professionals and partner organizations.

During the study and the development process of the IP curriculum the collaboration between the partner organizations was important. It was a learning process for all of them. The findings showed the positive change of students’ attitudes towards IPL. Students’ learning outcomes were good or excellent. According to clients’ and patients’ feedback, they got qualitative care of the students’ IP teamwork. During the study, the commitment of key people from the partner organizations was important. They took part in the planning, making timetables, implementing and informing the participants and patients.
10 Conclusion

The IP education model, including theoretical and practical parts, was developed and implemented during the study. IP courses and training promoted both students and teachers to open collaboration, developing curricula and making use of team-based learning and working methods. The trend of readiness for IPL developed positively during the years of the study. The best results were obtained from the IP diabetes training, which was the last training program in the schedule. In students’ opinion, more practice and common clients/patients are needed to learn working fluently in IP teams, and at the same time, keep the clients’/patients’ needs and service in focus.

IPE aims to promote active student-centred learning and requires innovative and motivating learning methods and environments. Today, the use of ICT is common in different levels of education. The possibilities of ICT-supported learning tools in improving learning environments are enormous, but it is important to listen to both students’ and teachers’ opinions when utilizing the ICT-supported learning. Based on our results, group work in the e-learning platform motivated students more when they had met face to face and got to know each other. Using student-centered methods, for example, solving health problems of the case families, activated the students to discuss. They shared experiences, searched knowledge of patient-centered care, and possibilities of collaborative practice to improve the services. This is an important issue to take into account when developing IP courses in future.

The other issue that needs more careful planning is timing: when to start IPE. There is evidence that early entrance of IPE is important. In our study, the IP public health course was just in the beginning of the first semester. Some of the students felt very insecure with the course content. When the beginning of the studies is past there is more time to concentrate on learning the professional contents.

The results of our research have been used to develop the primary care training environment in collaboration with the Health and Wellbeing Centre of the City of Oulu and with the both universities of Oulu. Collaboration between primary and specialized health care providers is important when developing health professionals’ education. Education has to provide solutions for the future and rapidly changing needs of the patients and the services. The results of the current study can be utilized in health and social care reform and for future development of patient-centered care in Finland. For example, the patients with chronic public health diseases are beneficiaries of the collaborative teamwork of the professionals. The IP teamwork
experience also benefits both current and future health care professionals to better organize the primary and specialized health care in a patient-centered way. Based on the positive results of this study, IP training in outpatient primary care has expanded to a larger number of students and to different patient groups.

The students participating in the study were different each year. It would be important to perform a longitudinal study and follow the development of readiness and learning of the same students during their studies. Still, it was interesting that positive attitudes towards IPL increased over the years. New IP courses have been started using simulations as method. All of these IPE programs have positively changed the overall attitudes to IPL within students but also within the educators and professionals. Patients’ and families’ feedback has been very positive, and that showed to the stakeholders the importance of IPE and the development of collaborative practice in the service system.

The developed IPE model for undergraduate medical and health care education was the first one in Finland. Our findings were a promising experience of delivering IPE in undergraduate medical and health care curricula. Collaboration with the service system was important. Linking the studies to national and local health care strategies was also important. In Finland, collaborative competencies and patient orientation are strongly recommended in health and wellbeing policies and programs, but there is not any legislation nor requirement in national frames of curricula about IPE in health care education.

Further studies are needed to investigate how IPE and collaborative IP competencies in practice will enhance clients’/patients’ care in future. It is important to investigate the effectiveness of patient care. It means better health, quality of life, and working ability. One aim of the Finnish health and welfare reform is to save cost, but at the same time to ensure the equal and qualitative services for all. Future IPL research in medical and health care education needs focus on the development of learner-centered pedagogy and training environments at different levels of the services.
References


### Appendix 1

RIPLS Finnish version/ Likert scale 1 totally disagree – 5 totally agree

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yhdessä oppiminen muiden terveydenhuollon ammattilaisten kanssa auttaa minua olemaan tehokampi työryhmän jäsen</td>
</tr>
<tr>
<td>2</td>
<td>On asiakkaan parhaaksi, että ammattilaiset yhdessä ratkaisevat asiakkaan ongelmia</td>
</tr>
<tr>
<td>3</td>
<td>Oppiminen yhdessä muiden terveydenhuollon opiskelijoiden kanssa lisää taitoa ymmärtää kliinisiä ongelmia</td>
</tr>
<tr>
<td>4</td>
<td>Yhdessä opiskelu ennen valmistumista auttaa terveydenhuollon opiskelijoida solmimaan yhteistyösuhteita valmistuttuaan</td>
</tr>
<tr>
<td>5</td>
<td>Kommunikaatiotaiteita tulee opiskella yhdessä muiden terveydenhuollon opiskelijoiden kanssa</td>
</tr>
<tr>
<td>6</td>
<td>Yhdessä oppiminen auttaa minua ajattelemaan positiivisesti muista ammattilaisista</td>
</tr>
<tr>
<td>7</td>
<td>Voidakseen työskennellä pienryhmässä terveydenhuollon ammattilaisten täyttyy luottaa ja kunnioittaa toisiaan</td>
</tr>
<tr>
<td>8</td>
<td>Kaikkien terveydenhuollon ammattilaisten täyttyy oppia tiimityön taidot</td>
</tr>
<tr>
<td>9</td>
<td>Yhdessä oppiminen auttaa minua ymmärtämään omat rajoitukseni</td>
</tr>
<tr>
<td>10</td>
<td>En halua hukata aikaani opiskelemaalla yhdessä muiden terveysalan opiskelijoiden kanssa</td>
</tr>
<tr>
<td>11</td>
<td>Terveytsalan opiskelijoiden ei välttämättä tarvitse opiskella yhdessä ennen valmistumista ammattiin</td>
</tr>
<tr>
<td>12</td>
<td>Kliinisiä ongelmanratkaisutaitoja voi oppia vain yhdessä oman ammattialan opiskelijoiden kanssa</td>
</tr>
<tr>
<td>13</td>
<td>Yhdessä oppiminen muiden terveydenhuollon opiskelijoiden kanssa auttaa minua kommunikoimaan paremmin asiakkaiden ja muiden ammattilaisten kanssa</td>
</tr>
<tr>
<td>14</td>
<td>Olen iloinen mahdollisuudesta työskennellä pienryhmäprojektissä muiden terveysalan opiskelijoiden kanssa</td>
</tr>
<tr>
<td>15</td>
<td>Yhdessä oppiminen auttaa selkiyttämään asiakkaiden ongelmien luonnetta</td>
</tr>
<tr>
<td>16</td>
<td>Yhdessä oppiminen ennen valmistumista auttaa minua tulemaan paremmaksi tiimityöntekijäksi valmistuttuani</td>
</tr>
<tr>
<td>17</td>
<td>Hoitajien ja terapeuttien rooli on pääasiassa tukea lääkäreiden työtä</td>
</tr>
<tr>
<td>18</td>
<td>En ole varma mikä minun ammatillinen roolini tulee olemaan</td>
</tr>
<tr>
<td>19</td>
<td>Minun täytty oppia paljon enemmän tietoja ja taitoja kuin muut terveydenhuollon ammattilaiset</td>
</tr>
</tbody>
</table>
### Appendix 2

**Students evaluation of their learning in IP public health course**

Likert scale 1 totally disagree – 5 totally agree

<table>
<thead>
<tr>
<th>Lectures</th>
<th>The contents of the lectures responded to my expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The implementation of the lectures responded to my expectations</td>
</tr>
<tr>
<td></td>
<td>The lectures included new knowledge for me</td>
</tr>
<tr>
<td></td>
<td>I can utilize the knowledge in my studies and in my professional growth</td>
</tr>
<tr>
<td></td>
<td>The workshops supported my learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>eLearning platform</th>
<th>The links in the platform promoted my learning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The learning tasks were clear</td>
</tr>
<tr>
<td></td>
<td>It was easy to log in the course homepage</td>
</tr>
<tr>
<td></td>
<td>The structure of the course homepage was clear</td>
</tr>
<tr>
<td></td>
<td>The link paths in the homepage were clear</td>
</tr>
<tr>
<td></td>
<td>The volume of the information was suitable</td>
</tr>
<tr>
<td></td>
<td>I followed the schedule of the course</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>The discussions helped me to learn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The learning tasks which we solved together, promoted my learning</td>
</tr>
<tr>
<td></td>
<td>I felt to belong united to the same group with the others</td>
</tr>
<tr>
<td></td>
<td>I participated actively to the web discussions</td>
</tr>
<tr>
<td></td>
<td>I got feedback from the other students</td>
</tr>
<tr>
<td></td>
<td>I had a possibility to give feedback to the others</td>
</tr>
<tr>
<td></td>
<td>The students in the group were committed to work together</td>
</tr>
<tr>
<td></td>
<td>Many different and new points of views of the contents came out in the discussions</td>
</tr>
<tr>
<td></td>
<td>My collaboration competencies developed during the course</td>
</tr>
<tr>
<td></td>
<td>I was able to express my own thoughts written and orally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning</th>
<th>I was able to solve the practical and actual public health problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The study tasks helped me to analyze my earlier understanding of the contents</td>
</tr>
<tr>
<td></td>
<td>To study in the course supported the development of my professional identity</td>
</tr>
<tr>
<td></td>
<td>My professional competencies developed</td>
</tr>
<tr>
<td></td>
<td>I evaluate how well I had reached the learning objectives of the course</td>
</tr>
<tr>
<td></td>
<td>The learning material in web platform connected to my earlier knowledge and studies</td>
</tr>
</tbody>
</table>
I was able to utilize my earlier knowledge
I myself was responsible of my learning
The things I learned have helped me in practice
The study enhanced my understanding of the contents
The things I learned will be beneficial in my future studies

Support
I got personal feedback from the tutor of making the tasks
I got peer-support from the other students
It was easy for me to connect to the other students
I got the feedback quickly
The feedback I got was encouraging
The feedback was constructive and critical

Congress
My opinion of the contents of the student conference was ....
The conference day was...
I learned new things during the conference day...
I can utilize the knowledge I learned during the conference in my future studies and in my professional growth
Appendix 3

The feedback questionnaire for the students consisted of background questions, structured statements according to RIPLS (Parsell & Bligh, 1999) and three statements of pair training (scale 1 totally agree –5 totally disagree) and two open questions.

### PART I

**Background**
- Age
- Degree program
- Earlier experiences of IPE
- Learning with other students will help me to become a more effective member of a healthcare team
- Patients would ultimately benefit if healthcare students worked together to solve patients problems
- Shared learning with other healthcare students will increase my ability to understand clinical problems
- Learning with healthcare students before qualification would improve relationships after qualification
- Communication skills should be learned with other healthcare students
- For small group learning to work, students need to trust and respect each other
- Team-working skills are essential for all healthcare students to learn
- Shared learning will help me to understand my own limitations
- I don’t want to waste my time learning with other healthcare students
- It is not necessary for undergraduate healthcare students to learn together
- Clinical problem-solving skills can only be learned with students from my own department
- Shared learning with other healthcare students will help me to communicate better with patients and other professionals
- Shared learning will help me to clarify the nature of patients’ problems
- Shared learning before qualification will help me to become a better team worker

**Teammwork and collaboration**
- From original scale statements
  - 1 - 5, 7 - 9

### PART II

**According RIPLS**
- Professional identity
  - From original scale statements
  - 10 - 13, 15 - 16
- Roles and responsibilities
  - From original scale statements
  - 17, 19

### PART III

**Pair training**
- Training together promoted pair work skills
- Pair training helped to understand the importance of IPC
- Pair training clarified the overall view of preventive and holistic healthcare
- Personal learning experience
- Suggestions to develop IP training

### PART IV

**Learning experiences**

**Open questions**
Appendix 4

Patients feedback questionnaire

Likert scale (1 totally disagree – 5 totally agree)

PART I Background
• Age of the respondent
• Focus of health care visit (pregnancy, child health care, diabetes)

PART II Experiences of the visit
• Attitude towards me was friendly
• They listened to me
• I got answers to my questions
• The guidance was understandable
• They put their minds to my issue thoroughly
• The staff worked reliable
• All examinations and procedures were made professionally
• The visit met my expectations
• The atmosphere was positive
• The staff acted well as a team
• The staff respected professional skills of each other’s
• The staff was proficient
• After the visit, I had a clear impression of the future health care plans
• The staff worked without hurry

PART III Evaluation of the treatment and service
• Five out of twenty adjectives to choose (10 positive, 10 negative)
## Evaluation of clinical skills

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A lot to learn, 2. Intermediate skills, 3. Excellent skills</td>
<td></td>
</tr>
</tbody>
</table>

**Interview:**
Proposing relevant questions and noticing patient’s verbal and nonverbal communication

**Patient’s examination:**
Performing clinical examination and using all available knowledge to make the treatment and care plan

**Professionality:**
Respecting, listening and creating trustable atmosphere

**Decision making:**
Analyzing all risks and resources while making the treatment and care plan together with the team

**Collaboration:**
Discussing with the patient in an understandable and empathic way

Working in an IP team

**Work management:**
Managing time, utilizing all strengths and knowledge

Prioritizing
Original publications


Reprinted with permission from European Scientific Institute (publication I), Taylor & Francis (publication II) and Scientific Research Publishing (publication III).

Original publications are not included in the electronic version of the dissertation.
1440. Hagnäs, Magnus (2018) The association of cardiorespiratory fitness, physical activity and ischemic ECG findings with coronary heart disease-related deaths among men
1441. Huhtaniska, Sanna (2018) The association between antipsychotic and benzodiazepine use with brain morphology and its changes in schizophrenia
1442. Sundquist, Elias (2018) The role of tumor microenvironment on oral tongue cancer invasion and prognosis
1449. Kajula, Outi (2018) Periytyvän rintasyöpäalttiusmutaation (BRCA1/2) kantajamiesten hypoteetinen perinnöllisyysneuvontamalli
1452. Capra, Janne (2018) Differentiation and malignant transformation of epithelial cells: 3D cell culture models
1453. Panjan, Peter (2018) Innovative microbioreactors and microfluidic integrated biosensors for biopharmaceutical process control
1454. Saarela, Ulla (2018) Novel culture and organoid technologies to study mammalian kidney development

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