

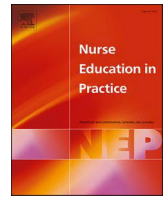
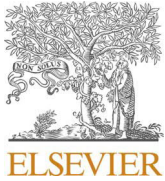
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## Students' perceptions of interprofessional collaboration on the care of diabetes: A qualitative study

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### ABSTRACT

Interprofessional education can promote healthcare professionals' competence to work in interprofessional collaboration, which is essential for the quality and safety of care. An interprofessional approach is particularly important in complex, chronic diseases like diabetes. This qualitative study evaluated changes in medical and nursing students' perceptions of interprofessional collaboration, induced by a novel interprofessional education course on diabetes care with practical elements. Data from focus-group interviews of 30 students before and after the course were analyzed by using inductive and deductive content analysis. The students' perceptions were illustrated as Elements of Collaborative Care (e.g. *Quality of professional care relationship*) and Elements of Interprofessional Collaboration (e.g. *Importance of communication and Valuation of collaboration*). The post-course interviews added one subcategory (*Need of resources*) to the pre-course perceptions, and there was improvement in ten areas of self-perceived competence in performing or understanding interprofessional collaboration on diabetes care. The course improved the students' self-perceived competence and confidence in interprofessional collaboration on the care of patients with diabetes, and their understanding of interprofessional collaboration changed towards a more patient-centred and holistic perspective. The findings support further implementation of IPE with practical elements in future health professionals' education.

### 1. Introduction

As today's health care professionals are facing challenges in a fragmented and constantly changing health care system and treating patients with increasingly complex health issues, interprofessional collaboration (IPC) and interprofessional education (IPE) are highlighted as an essential solution in managing it (World Health Organization, 2010; Roing et al., 2018; Institute of Medicine, 2015). There is a growing body of evidence relating the quality of collaboration and teamwork among health professionals to the quality and safety of health care delivery in acute conditions (e.g. Schmutz and Manser, 2013), as well as in chronic diseases (e.g. Körner et al., 2016; Wagner, 2000). Furthermore, failures in collaboration and teamwork are associated with preventable patient harm, role boundary conflicts, and staff fatigue and

turnover (Kvarnstrom, 2008; Rosen et al., 2018).

An interprofessional collaborative approach is important in the care of complex, chronic diseases like diabetes, which is considered one of the most serious global health concerns of the century (International Diabetes Federation, 2019, 4–5). The key to successful diabetes management is team-based care provided by competent, skillful professionals, who know how to best work together (International Diabetes Federation, 2019, 83; Cuddihy et al., 2011). However, due to the complex nature of the disease, managing diabetes care can be challenging for both the patient and the healthcare team (Ahola and Groop, 2013; Fredrix et al., 2018; International Diabetes Federation, 2019, 83). For example, the vital insulin care of hospitalized patients with diabetes can be a burden for nurses and patients, due to delays in prescribing and reviewing insulin, which could be avoided by coordination and

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communication between and within multiple interprofessional teams (Atsalos et al., 2019; Tingle, 2012).

Implementing IPC in diabetes care has been promoted, in order to provide cost-effective, patient-centred and optimal care for the large group of people with type 2 diabetes, with the aim of reducing diabetes complications and associated hospital admissions (e.g. Tricco et al., 2012; Antoine et al., 2014; Johnson and Carragher, 2018). Nevertheless, insufficient collaboration and teamwork have been shown to adversely impact on the delivery of diabetes care (Stuckey et al., 2015). Education and collaboration are vital for interprofessional healthcare teams to provide successful diabetes management (Johnson and Carragher, 2018; Holt et al., 2013).

In the past few decades, IPE, where “two or more professions learn about, from and with each other to enable effective collaboration”, has been shown to enhance the knowledge and skills necessary for students to master in interprofessional healthcare settings (World Health Organization, 2010). Reeves et al. (2017) reported a positive impact of IPE on the participating students’ collaborative knowledge, skills, and attitudes, but only a minor effect on behaviors, collaborative practices and improvements in patient care. In diabetes management, several IPE programs have been implemented with positive results, such as improvement in students’ knowledge and skills, confidence and motivation in treating patients with diabetes, and in teamwork competency (Kangas et al., 2018). In contrast, IPE’s influence on students’ attitudes towards other disciplines has been more variable (Kent and Keating, 2015; Thistlethwaite, 2016). More research is required to refine education curricula and thereby the competence development of healthcare professionals, to meet the needs of patients and populations (World Health Organization, 2010; Interprofessional Education Collaborative, 2016; Frenk et al., 2010).

Qualitative research has the advantage of gaining holistic understanding of the impact of IPE on current and future healthcare professionals (Institute of Medicine, 2015; Reeves et al., 2017). This study aimed to explore changes in medical and nursing students’ perceptions of IPC on diabetes management after an experimental, voluntary course of IPE with practical content. The study questions were:

1. How do medical and nursing students perceive IPC in the care of diabetes before an IPE course on diabetes management?
2. How do the students’ perceptions of IPC in diabetes care change during an IPE course on diabetes management?

## 2. Methods

### 2.1. Research design

This descriptive study used a qualitative approach to explore students’ perceptions of IPC in the care of diabetes.

### 2.2. Course description and participants

Tampere University and Tampere University of Applied Sciences, Finland, organized a voluntary IPE pilot course called “Interprofessional Care of Diabetes” for 15 fourth year medical students and for 15 second- or third-year nursing students, who had previously finished their mandatory studies in diabetes care. The course aimed to increase participants’ knowledge, skills and ability to work in an interprofessional team in diabetes management. A professor of internal medicine/endocrinology and a principal lecturer of nursing were responsible for the course design, and the content was developed in collaboration with an interprofessional team of diabetes professionals.

The course introduced experts in various areas of diabetes care and in guiding the self-care of people with diabetes, to increase the students’ understanding of the role of different disciplines in diabetes management. Endocrinologists, diabetes specialist nurses, a podiatrist, a social worker, a dietitian, and a geriatrician, delivered interactive lectures on

subjects selected by the students and covering the main areas of diabetes care. Teamwork skills and interprofessional learning were fostered, for example, in small group discussions on IPC in diabetes management, and by participating as a nurse-physician pair of students in two active working visits of half a day each, in a gerontological ward and at a diabetes outpatient clinic. In addition, four 2-h interprofessional seminars were organized, including presentation of patient cases the students had met during their clinic visits. Students participated before and after the course in voluntary focus-group interviews. These were an integral part of the course’s IPE content, enabling the students to share their views of IPC. Elements of interprofessional work, such as interprofessional competences, professional competence, responsibilities and barriers were discussed on these occasions, when appropriate (Fig. 1: Design of the interprofessional course and the associated study on students’ perceptions of IPC in diabetes management.).

### 2.3. Data collection

Eligible students were informed of the course programme, the interviews and the associated study. Thirty voluntary participants were enrolled after the course introduction and after being checked for the entitlement for admission (passed mandatory diabetes education and consent to the related study). Prior to the course, medical and nursing students were mixed in three groups of ten students each. A moderator specialized in qualitative research (T-MR) conducted the focus-group interviews before and after the IPE course, with technical assistance of a second course author (PJ). An open-ended semi-structured interview form designed according to the purpose and goals of the study, was used in all the interviews (Morgan, 1997, 10, 14). The questions concerning the students’ perceptions of IPC in relation to the care of diabetes were: How do you conceptualize teamwork in the care of diabetes? How do you define interprofessionalism in the care of diabetes? How do you describe your competence in the care of diabetes? The participants were encouraged to interact and talk to each other by additional, probing questions, which enabled them to explore and clarify individual and shared perceptions (Holloway, 2017, 123, 133). The duration of the interviews ranged from 52 to 70 min. The interviews were recorded and transcribed to a total of 52 pages of written text (1,5-spaced).

### 2.4. Data analysis

The data gathered before and after the IPE course were analyzed iteratively in two phases, using inductive and deductive content analysis. Firstly, an inductive content analysis was chosen to answer the first study question of pre-course interviews, as it presented a systematic and objective analysis of previously unknown phenomena (Elo and Kyngäs, 2008). Secondly, a deductive content analysis was used to answer the second study question, as it enabled comparing data at different time periods (Elo and Kyngäs, 2008) and can be used when testing previous knowledge in a new context (Catanzaro, 1988). Categories of students’ pre-course perceptions were set in a framework, to be tested against the post-course interviews, aiming at discerning possible changes in the students’ perceptions.

In the inductive phase, the first author (SK) listened to the pre-course interviews and read the transcriptions several times, to obtain an overview of the data. Then, open coding was performed by underlining different meaning units by making notes on different aspects of the content (Bengtsson, 2016.). Repetitive meaning units of the same characteristics were condensed, coded and grouped in subcategories (Table 1). Each code was compared for differences and similarities between subcategories and sorted again to reach agreement of the descriptive content (Graneheim et al., 2017, Graneheim and Lundman, 2004.). Judgements were made on the internal homogeneity and external heterogeneity of the subcategories (Patton, 2015, 555). Finally, subcategories were divided into representative generic categories and named with content-characteristic names. During the analysis process,

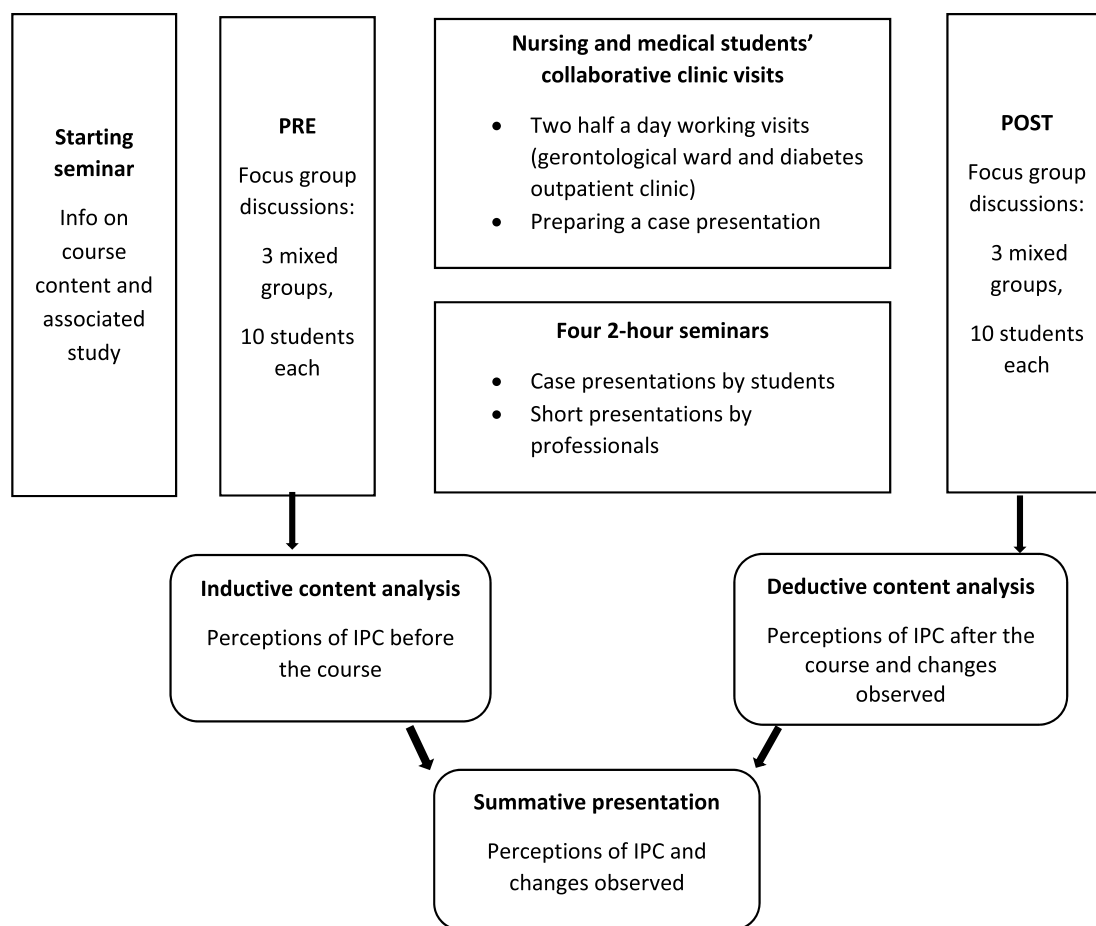


Fig. 1. Design of the interprofessional course and the associated study on students' perceptions of interprofessional collaboration (IPC) on diabetes management.

these stages were revised back and forth to verify the quality and trustworthiness of the analysis (Bengtsson, 2016). The initial coding process of the first author (SK) was reviewed independently by another author (T-MR) and thereafter, an agreement on the categorization was reviewed together in consensus discussions with the authors who conducted the interviews (T-MR, PJ), to foster validity (Elo and Kyngäs, 2008).

In the deductive phase, a structured categorization frame (Table 2) was developed, based on the previous categories derived from the pre-course data (Table 3) (Elo and Kyngäs, 2008). The post-course interviews were, similarly to the pre-course interviews, listened to and compared with the text for accuracy. Thereafter, the interviews were read through several times and all meaningful descriptions of phenomena were systematically identified and coded according to the existing categorization frame. The meaningful units that did not fit in the pre-defined categorization frame were collected separately, to be analyzed inductively. The notions of the students' self-perceived improvements in understanding or managing IPC in the care of diabetes were distinguished in the frame after re-assessing the data. In addition, the initial pre-course codes were compared against the codes in the post-course categorization frame, to reveal changes in the descriptive content. Finally, all these findings were abstracted in a summative presentation (Table 4).

### 2.5. Ethical considerations

The IPE course and the associated study protocol were approved by the University of Tampere Planning Committee of the Licentiate Degree Programme in Medicine. The participants were informed in advance of

the study protocol, of the voluntary focus group interviews, and of their rights of anonymity and confidentiality in the study. The focus group interviews were also considered an educational part of the course, and therefore the course administrators performed the interviews. The corresponding author was not involved in the planning or implementation of the IPE course. No numerical evaluation was performed on the course, which was passed on the basis of attendance.

### 3. Findings

The students' perceptions of IPC on the care of diabetes before the IPE course were classified into two main categories: Elements fostering collaborative care and Elements fostering interprofessional collaboration. Within the main categories, six categories with subcategories were distributed as presented below and in Table 3. The students' interviews after the course added one subcategory (Need of resources), and there were improvements in ten areas of self-perceived competence in performing or understanding IPC on the care of diabetes. The changes and additions in perceptions are summarized in Table 4 and added in the text below.

#### 3.1. Elements fostering collaborative care

The first main category "Elements fostering collaborative care" reflects the students' understanding of IPC in relation to diabetes care focusing on patient care, which is illustrated in three categories: Elements formulating care team, Quality of professional care relationship and Factors enabling a functional process of care.

**Table 1**

An example of the inductive content analysis regarding the students' perceptions of interprofessional collaboration (IPC) on diabetes care before the interprofessional education (IPE) course.

Meaning unit	Condensed meaning unit	Code	Sub-categories	Category	Main Category
- They know their own things better than I do / Somebody who knows better. - Is there something that a nurse would tell better? / There is someone who teaches with time. - I kind of feel that a doctor has very little to give. / When you have no more ways left to handle the situation. - If a doctor doesn't know something. / I could not take care of a patient's feet more than saying: "You need to use different socks". - I don't have to manage that all alone. - In a way you understand the boundaries of your skills. - I don't have time for everything.	Someone knows better  A nurse tells better / Someone tells with time  You have little to give / No more ways left to handle the situation. When you don't know something. / You don't know how to guide the patient for selfcare. No need to manage everything Understanding the boundaries of your skills You don't have enough time	Someone knows better Someone does it better  Your skills are not enough  You don't know  You don't need to know  Understanding the boundaries of skills Lack of time	Awareness of one's own skills and limits	Maximal benefit from professionals' competencies	Elements fostering Interprofessional Collaboration
- I'll ask her; she might have another perspective that I don't have / He really gave good alternative options. - If a doctor doesn't know something, a nurse could help, or the other way round. / I quite often asked what you would do in this situation. - You can learn while you ask / They both can benefit from each other (by asking questions). / I have to know how to take advantage of their competence, and the other way round. - It is better for the patient (professionals asking each other's opinions) - I would have felt lonely without other professionals around me.	Asking others gives you different perspectives. / Others give you alternative options. If you don't know, others can help you, or the other way round. / Asking what others would do.  Learning from others / Equal benefit from asking. / Knowing how to take advantage of each other's competence.  Asking is beneficial for the patient Feeling lonely without others	Others give new perspectives  Asking for others' help Learning from others Benefit from others' competence  Asking benefits the patient Others' presence offers security	Seeing the potential benefit from others		

**Table 2**

An example of a categorization frame.

	Respecting other professionals	Trusting other professionals	Willingness to collaborate
How do students describe their valuation of interprofessional collaboration on the care of diabetes?			

3.1.1. Elements formulating care team

The category *Elements formulating care team* is divided into two subcategories: Competent professionals in liaison and The patient's and the team's role.

*Competent professionals in liaison.* The students understood that the care team in diabetes management required a variety of competent professionals working collaboratively. A common perception was that the core team of care consisted of a pair of professionals, i.e. a nurse and a physician. After the course, the students described their learning about the role of social workers, podiatrists, nutritionists, and physiotherapists. Carrying out the profession-specific responsibilities was evaluated to be the basis of collaborative work in the pre-course interviews: "I think it (teamwork) means that a doctor takes care of the doctor's part and a nurse takes care of the nurse's part." (Pre-course group 1) However, a collaborative perspective was highlighted in the post-course interviews, and it was considered important that "different professionals do not only take care of their own areas, but also discuss various perspectives together." (Post-course group 2) In all the post-course

interviews the students regarded themselves as more competent performing the care of diabetes through added confidence.

*Patient's and team's role.* In the pre- and post-groups the patient's role in the care team was considered to depend on the patient's own motivation and commitment to care. The patient was considered a responsible member of the team, revealing the possibilities and barriers and success of care in his/her context of life. All the groups considered the patient responsible for the success of diabetes management. The pre-interviews revealed descriptions of the team's passive role, as it was considered to be solely the patient's own decision to seek and use, or not use, the competencies the team has to offer: "(The patient) really isn't a member of the team, but the one who seeks professionalism from us. If you don't play together with the team, you are not a part of it." (Pre-course group 2) In the post-course interviews the team's role was described to be more active and responsible. It was noticed that "You need to take more notice of the patient in diabetes care; You should participate in the care on his/her own terms." (Post-course group 2).

3.1.2. Quality of professional care relationship

The category *Quality of professional care relationship* consists of two subcategories: Continuous and responsible professional care relationship and Supportive and holistic professional care relationship.

*A continuous and responsible care relationship* was found important in the care of a chronic disease and could enhance the patient's commitment to care. A continuous professional care relationship was also connected to an aspect of responsibility, when "the patient is really being cared for" (post-course group 1) and it would decrease the attitude "this is none of our business, this (patient) doesn't need to be treated here." (Pre-course group 1).

*A supportive and holistic professional care relationship* was highlighted

**Table 3**

Students' perceptions of interprofessional collaboration (IPC) on the care of diabetes before the interprofessional education (IPE) course on diabetes management.

Subcategory	Category	Main category
Competent professionals in liaison The patient's and the team's role	Elements formulating care team	
Continuous and responsible professional care relationship Supportive and holistic professional care relationship	Quality of professional care relationship	Elements fostering Collaborative Care
Shared goals A clear plan of care pathway An effective care pathway A functional environment	Factors enabling a functional process of care	
Awareness of one's own skills and limits Awareness of others' roles and competencies Negotiation of task distribution Seeing the potential benefit from others	Maximal benefit from professionals' competencies	
Need for open communication Low threshold communication	Importance of communication	Elements fostering Interprofessional Collaboration
Respecting other professionals Trusting other professionals Willingness to collaborate	Valuation of collaboration	

in one pre-course interview, and in all three post-course interviews. It was considered that a good, supportive atmosphere in a professional care relationship would decrease the need for care from other professionals, if the patient were treated holistically, as an individual. The students perceived after the course that their competence in supporting the patients was improved, as they could better empathize with the patient and deal with the different aspects of care. The psychological distress due to a chronic illness was recognized better: "I can empathize, if a patient expresses that he/she would like to talk a bit about having this diabetes, I feel I know more." (Post-course group 3).

### 3.1.3. Factors enabling a functional process of care

The category *Factors enabling a functional process of care* presents students' perceptions of functional process of care in three sub-categories: Shared goals, An effective care pathway, An easy patient referral process and A functional environment.

*Shared goals.* It was stated to be crucial that all the members of the care team shared common goals for diabetes management. "It doesn't really work, if people go different ways; you'll have to have one shared goal to aim at." (Pre-course group 2) After the course, it was added that the goals, as well as the ways to achieve them and to assess the results, should be collaboratively agreed on and evaluated.

*An effective care pathway.* In all the interviews, the students mentioned the need of a clear care pathway, a practice-specific flow chart of the experts available and a policy framework on how to proceed, as the resources and policies of different practices varied. The students expressed in the post-course interviews having an improved clarity of how IP care can be organized. In addition, the process of referring the patient to another expert was expected to be quick and easy, or at best, the referrals would be carried out within the familiar care team, and without any rigid policies.

*The functional environment.* In all the interviews, the students expressed the view that interprofessional care would be ideally organized, if various professionals were situated in same premises. Thereby, the care would be more effective, enabling "simultaneous doing and talking". (Pre-course group 1) Coffee rooms were found to be important in fostering informal exchange of ideas between experts of different professions and building trust towards each other. Additional technical support for quick consultation was suggested to be worthwhile to develop.

*Need of resources.* In the post-course interviews, the students evaluated that IPC might need substantial resources, in order to have several professionals available or to have more time to properly discuss the issues from various perspectives.

### 3.2. Elements fostering interprofessional collaboration

The second main category "*Elements fostering interprofessional collaboration*" illustrates the students' understanding of IPC on diabetes care, focusing on the health care professionals' teamwork in three categories: Elements fostering interprofessional collaboration, Maximal benefit from professionals' competencies, Importance of communication and Valuation of collaboration.

#### 3.2.1. Maximal benefit from professional competencies

The category *Maximal benefit from professional competencies* reflects students' understanding of the usefulness of each other in four sub-categories: Awareness of one's own skills and limits, Awareness of others' roles and competencies, Negotiation of task distribution and Seeing the potential benefit from others.

*Awareness of one's own skills and limits* was considered important in all the discussions. The students addressed the fact that sometimes one's skills are not enough, and it is not even necessary to know everything. In all the post-course interviews students evaluated that they had gained knowledge and skills of various areas in IPC and a more clear and comprehensive understanding of interprofessionality as a whole. They expressed having a deeper understanding of what they can do, and thereby of their limits: "The more knowledge, the more grief; You realize that you actually don't know so much." (Post-course group 2) Once the students reached a better awareness of their competence, they also "understood their own value". (Post-course group 1).

*Awareness of others' roles and competencies.* In all the interviews, the students recognized the importance of understanding profession-specific roles and tasks. When "you know what you are doing and you know what others will do" (Pre-course group 2) and "when we work together according to each one's responsible areas" (Pre-course group 3), it was considered possible to seek for other professionals' help and to collaborate interprofessionally. Before the course, the students expressed some uncertainty of the role of each profession. After the course, they thought they had a better recognition of the roles and competencies of various experts and a better understanding of each other's level of competence and education, as well as their different approaches to diabetes care:

"I did not know before how diabetes was taught to nurses, but now I somehow know it; I have an idea of their level of competence. Our approach to care and the process of thinking is a bit different; it's good to be aware of it." (Post-course group 2).

*Negotiation of task distribution.* The distribution of work tasks was considered important, to increase the efficiency of care and to minimize excessive patient referrals. It was indicated that when there exists "a

**Table 4**

Summary of changes in the students' perceptions of interprofessional collaboration (IPC) on care of diabetes after the IPE course of diabetes management. Areas with changes are presented darkened.

1st MAIN CATEGORY: ELEMENTS FOSTERING COLLABORATIVE CARE			
Pre-interviews	Subcategory	Post-interviews' addition	Category
	<b>Competent professionals in liaison</b>		
Competent professionals operating in their specific areas to benefit the patient (3 groups) <sup>a</sup>	Collaborative perspective was highlighted. Learning of new areas of IP care. Evaluation of one's own improved competence in the care of diabetes through added confidence in diabetes management (3 groups)		Elements formulating care team
	<b>Patient's and team's role</b>		
Patient responsible for diabetes care. Care team as a passive care provider (2 groups)	Understanding the patient's point of view better. Care team more responsible for diabetes care (2 groups)		
	Continuous and responsible professional care relationship		
	<b>Supportive and holistic professional care relationship</b>		
Importance of holistic, supportive professional care relationship (1 group)	Better understanding of the patient's point of view. Stronger perceived competence in performing holistic supportive care. (3 groups)		Quality of professional care relationship
	<b>Shared goals</b>		
Every member of the team knows the common goals to aim at in diabetes care (2 groups)	Understanding that setting goals, planning the ways to achieve them and assessing them must be done in collaboration (2 groups)		Factors enabling a functional process of care
	<b>An effective care pathway</b>		
Need of a clear plan of the care pathway (2 groups)	Achieved clarity of how IP care can be organized in practice (1 group)		
	Functional environment		
	<b>Need of resources</b> (Added subcategory after the IPE course)		
2nd MAIN CATEGORY: ELEMENTS FOSTERING INTERPROFESSIONAL COLLABORATION			
Pre-interviews	Subcategory	Post-interviews' addition/difference	Category
	<b>Awareness of one's own skills and limits</b>		Maximal benefit from professionals' competencies
Importance of recognizing own skills and limits (3 groups)	Active evaluation of one's own competence. Awareness of improved knowledge, skills, limits and own value. More comprehensive understanding of interprofessionality as a whole. (3 groups)		
	<b>Awareness of others' roles and competencies</b>		
Importance of clear tasks. Unawareness of others' roles and competencies (2 groups)	Better understanding of others' roles, competencies and different approaches to diabetes care (2 groups)		
	Negotiation of task distribution		
	<b>Seeing the potential benefit from others</b>		
Seeing others' competence as a benefit. Equal learning from each other's (2 groups)	More targeted help seeking through a better understanding of roles (2 groups)		
	Need for open communication		Importance of communication
	Low threshold communication		
	Respecting other professionals		Valuation of collaboration
	Trusting other professionals		
	<b>Willingness to collaborate</b>		
Importance of collaboration/No need to collaborate. Need to create team spirit (1 group)	Collaboration as a necessity. Need of the right attitude. Improved knowledge facilitates the acceptance of IPC (3 groups)		

clear distribution of tasks in the team (Post-course group 3), then “the same things will not be repeated several times.” (Pre-course group 1).

*Seeing the potential benefit from others.* Finally, all student discussions revealed willingness to see others’ competencies and IPC as an advantage to professionals, and in the end, to patients. The opportunity to consult with various experts when needed highlighted new aspects in diabetes management, leading to the situation where “you can also learn at the same time” (Pre-course group 3) and where “both of them will benefit from each other.” (Pre-course group 1).

### 3.2.2. Importance of communication

The category *Importance of communication* is divided into two subcategories: Need for open communication and Low threshold communication.

*Need for open communication.* It was recognized that open communication, and interaction in general, was the basis of functional collaboration between various professionals. With open communication, professionals should be able to reasonably solve any unclear issues: “If something bothered you in the team, or in the care, or in the physician-nurse teamwork, you could tell about it.” (Pre-course group 2) In addition, good and open communication was regarded as crucially important, when different viewpoints in medical care and nursing care were brought up to be negotiated.

*Low threshold communication.* Students found it helpful to have an environment that supported exchange of views and ideas with a low threshold. A flat hierarchy was noted to enable various professionals “asking criss-cross between each other” (Pre-course group 3) as “there’s no wall between, so you can deal with important things” (Pre-course group 3).

### 3.2.3. Valuation of collaboration

The category *Valuation of collaboration* consists of three subcategories reflecting students’ views of appreciating collaboration: Respecting other professionals, Trusting other professionals and Willingness to collaborate.

*Respecting other professionals.* This category reflects the students’ equal respect for other professionals due to their competencies, and the overall appreciation of the other experts’ presence in the team. Equality between the professionals was highly valued, and the course was regarded as “a good way to decrease a kind of doctor-nurse hierarchy division.” (Post-course group 1).

*Trusting other professionals.* Students also expressed in many ways, how important it was to trust other professionals’ work in IPC. When “you can trust the others’ competence, both ways ... if you kind of trust your team, then everything runs smoothly (Post-course group 3) and thereby you can be sure that “the work won’t be left undone.” (Pre-course group 2).

*Willingness to collaborate.* In one pre-interview (Pre-course group 3), there was a conversation on the meaning of professionals’ willingness to collaborate. Collaboration was considered important and valuable to aim at. After the IP course, all the interviews included the recognition that you need to have the right attitude towards collaboration and towards your colleagues, in order to work successfully. It was mentioned that due to deeper understanding, it was easier to accept that you do not have to work heroically alone, but collaboratively solve the problems the team is faced with.

## 4. Discussion

In this qualitative study, we evaluated the perceptions of undergraduate medical and nursing students, regarding IPC in diabetes care, before and after an IPE course with practical content. After the IPE course, the students’ understanding of IPC in diabetes care and awareness of other professionals’ roles and level of competencies was improved. Furthermore, we found wider perceptions of the students’ self-perceived abilities, confidence and willingness to perform IPC in

diabetes management, as well as a change in their understanding of IPC towards a more patient-centred and holistic perspective.

The findings of the present study are encouraging, firstly because the students seemed to possess a comprehensive baseline understanding regarding the management of diabetes and IPC, even before the IPE course. More importantly, the course enriched the students’ understanding of IPC and self-perceived confidence and willingness to perform IPC in the care of diabetes, thus offering tools for improved coping in the interprofessional circumstances of the healthcare system. Especially noteworthy was the observed change in the students’ perceptions towards a deeper and more holistic understanding of the patient’s perspective in diabetes care, and a stronger self-perceived confidence in delivering holistic, collaborative care.

The improved competence in IPC of future healthcare professionals is likely to benefit not only patients with diabetes, but also other patients. It is noteworthy that these changes relate closely to the International Alliance of Patients’ Organizations’ (IAPO) highly recommended principles of patient-centred healthcare. IAPO highlights patient care, where patients are expected to integrate in their treatment, and where their unique needs, preferences and values are respected. (*International Alliance of Patients’ Organizations, (IAPO), 2006*) In addition, the students’ understanding of the holistic quality of professional care relationship, shared goals, and the patient’s role in the care, will enhance trust building between the future care provider and the patient. This understanding also fosters shared decision-making, an important part of patient-centred care, concerning all patients (*TruglioLondrigan et al., 2012*).

The change in how the care team members were first seen as passive care providers, and after the IPE course as responsible participants in the care process, has similarity with the metasynthesis of *Roing et al. (2018)* on the hierarchical ways of healthcare professionals understanding their work. It is an educational challenge to persuade the individuals to see more aspects relating to the patients’ perspectives and needs (*Roing et al., 2018*). It seems that this IPE course had such an impact, but it is somewhat unclear, which aspects of this relatively short course contributed to such a change. We suppose that the broadened views of the students may stem from the clinical experiences during the course, when patients with variable case histories were encountered in a real healthcare environment, and were discussed afterwards in interprofessional seminars and group discussions. The practical elements in IPE were also seen as a strength in a previous systematic review of IPE in diabetes management (*Kangas et al., 2018*). Furthermore, perhaps the newly included category *Need of resources* in the post-course data may derive from the practical experience, where the students’ previously built vision of IPC was re-adjusted and refined in a busy real-life health care context.

This IPE course deepened the students’ awareness of themselves as professionals and increased their understanding of other professionals’ roles, competencies and different approaches to diabetes care. This is important in order to avoid inappropriate understanding of professions that can interfere with interprofessional communication and collaboration (*Cook and Stoecker, 2014*). In addition, the findings of students’ perceptions of increased competence and confidence to treat patients with diabetes interprofessionally can be related to achieved self-efficacy, originally presented by *Bandura (1977)*. This belief in one’s own capability will most likely be beneficial for students, almost ready to step into working life, because it has a positive association with the individual’s choice of activities, effort, and persistence. Moreover, a strong perceived self-efficacy increases one’s ability to deal with demanding situations (*Bandura, 1977, Artino, 2012*).

Our findings are in several aspects similar to previous IPE outcomes, but some differences exist, as well. Systematic reviews have proved IPE, e.g., to increase knowledge of the roles of other professions (*Kent and Keating, 2015; (Thistlethwaite and Moran, 2010)* and to enhance the learners’ confidence and motivation in diabetes management (*Kangas et al., 2018*). Similarly, Yu and colleagues (2016) reported that an interprofessional, diabetes-focused outreach program of healthcare



teams increased the participants' confidence in themselves and in other team members, and their appreciation of each other, but in contrast, did not affect their self-efficacy. Perhaps the impact of IPE may be more marked on undergraduate students than on experienced professionals, as suggested by the present results, compared to the study of Yu et al. (2016). However, when compared to *Interprofessional Education Collaborative IPEC's (2016)* identification of the core competencies required for interprofessional practices, our findings are in line with these requirements, supporting the students' interprofessional readiness. Most closely, the IPEC's domains were reached in Competence 1: supporting shared values and mutual respect, and in Competence 2: using the knowledge of one's own role and the roles of other professions (*Interprofessional Education Collaborative, 2016*).

#### 4.1. Strengths and limitations

As summarized by Patton (2015, 552), there is no one and only right way to perform a qualitative analysis. The approach to data analysis in the present study is a combination of an inductive and a deductive analysis, aimed at revealing changes in the studied phenomena. It enabled the combination of different data and revealed possible changes with time. When conducting the analyses in the applied manner, the pre-understanding developed in the first analysis was likely to enrich the deductive analysis, as the findings were well digested in the repeated analyses.

A possible conflict of interest may entail, when the course authors are acting as moderators in the interviews. Nevertheless, as Patton (2015, 502) emphasizes, a good interviewer is truly interested in what the participants have to say and, undoubtedly, the authors had a genuine interest in the students' experiences of the pilot course, which they plan to develop further. The analyses were performed carefully, according to strict ethical and methodological principles, to ensure the methodological rigor and trustworthiness of the study (Bengtsson, 2016; *The Finnish Advisory Board on Research Integrity, 2012*). The author responsible for the analysis was not involved in the implementation of the course. The validity of the findings was confirmed, as the authors who conducted the interviews and who, therefore, had preunderstanding of the issue, evaluated the categorizations made by the first author and approved their equivalence with the substance of the interviews (Catanzaro, 1988).

#### 5. Conclusions

In conclusion, the IPE course piloted in this study improved undergraduate students' self-perceived abilities and confidence to perform IPC on diabetes care, and changed their understanding towards a more patient-centred and holistic perspective. The findings support further implementation of IPE with practical elements in future health professionals' education. The sustainability of the observed changes needs to be clarified in further studies.

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#### Declaration of competing interest

None.

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