INTERPROFESSIONAL COLLABORATION:

A CARE MODEL FOR THE FUTURE

SIMON DE GANS

Interprofessional collaboration:

A care model for the future

PhD thesis

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Voor mijn lieve Femke Francisca Emmen

“Op sterren die luisteren, en dromen die uitkomen”

- Sarah J. Maas

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“Two roads diverged in a wood, and I, I took the one
less travelled by, and that has made all the difference”

- Robert Frost (1916)

CHAPTER 1

General introduction

Healthcare around the world will face enormous challenges in the upcoming years. Sustainability and affordability are under pressure due to an increase in age-related multimorbidity,[1-2] increased healthcare utilisation,[3-4] rising costs[3] and a shortage of healthcare professionals[5-6]. An important group at risk is the population of older patients with multimorbidity. Given the current situation of (over)specialisation of healthcare professionals, older patients with multimorbid are at risk of fragmentation of care with negative health outcomes.[7-10] The need for collaboration between healthcare professionals has never been more urgent in the current hospital care landscape.

I believe that we should strive for the highest possible quality of care for older patients with multiple health problems within the resources available. There is room for improvement in the current organisation of care, as illustrated by the example of one patient in Box 1.

Box 1. A patient case illustrating the problem of the current organisation of healthcare.

Mrs Johnson is an 85-year-old patient with congestive heart failure. She was found at home with a delirium after a fall and taken to hospital. She had to wait three hours in the emergency department (ED) before being seen, as the ED is very busy every day. The first doctor to see her was a cardiologist, as she has a history of heart failure. The cardiologist saw a lot of pleural effusion and a small mass on the chest X-ray and called the pulmonologist. The pulmonologist saw her an hour later and concluded that the pleural effusion needed to be treated by the cardiologist before the pulmonologist could assess the small mass. However, Mrs Johnson was delirious, so the cardiologist called the geriatrician. After another hour, the geriatrician assessed the patient and provided a management plan for the delirium, but concluded that the patient should be admitted to the cardiology ward because of her complex heart failure management. The cardiologist followed this advice, but not before briefly consulting internal medicine about her anti-diabetic medication.

Five hours later, and much uncertainty and confusion for Mrs Johnson and her family (they are all doctors, right?), she was in her room on the cardiology ward.

On the ward, Mrs Johnson often sees several doctors a day, each of whom treats only a part of her. No one can solely treat all her health issues, nor can they answer all her questions and they refer her to the other doctor. The result is frustration and confusion.

Treating specialist:

- Heart failure → cardiology
- Fall and delirium → geriatrics
- Small lung mass → pulmonary medicine
- Diabetes mellitus → internal medicine

The problem of the current organisation of healthcare

Miss Johnson presents to the hospital with multiple problems and could be admitted to several specialties. But which specialty will give her the best quality of care during this admission? None of these specialties can provide the highest quality of care, simply because there is not one problem, but several. Therefore, the unfortunate answer is none.

At least, not with the current healthcare system in the Netherlands. It could be argued that a hospitalist ("ziekenhuisarts" in Dutch) or a geriatrician could be the solution, but in the current system there are far too few of these specialists to treat all older patients with multiple problems in the hospital. It is estimated that 63% of all patients admitted to the hospital can be defined as older patients with multiple health problems.[11]

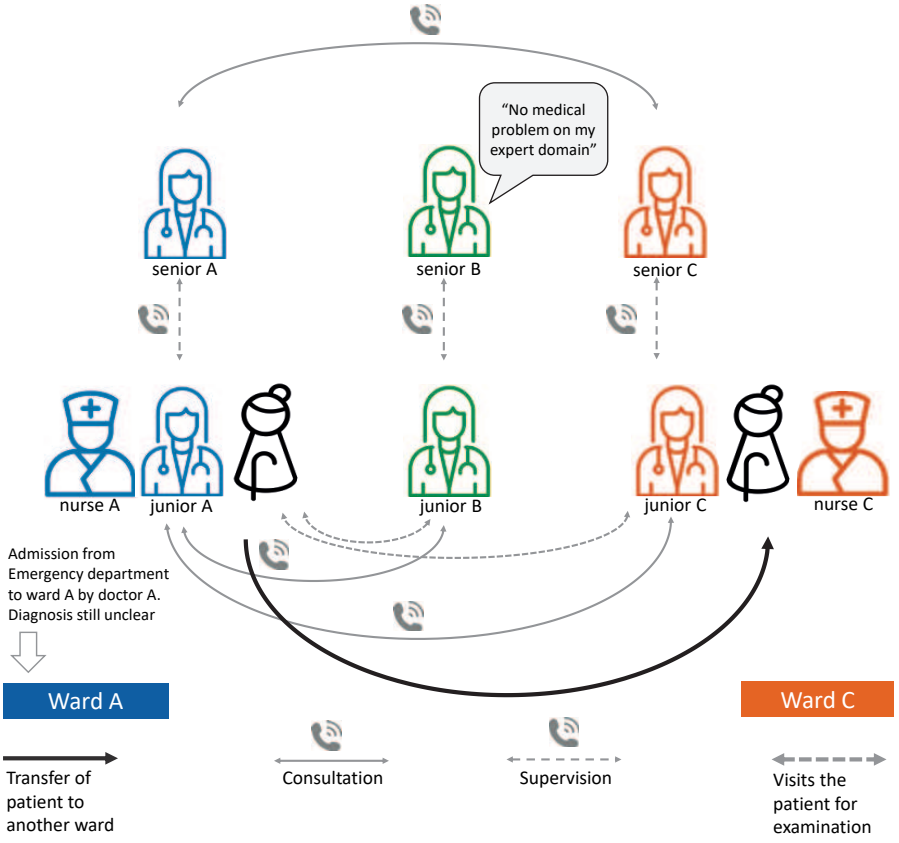
Patients with multiple health problems are at risk of fragmentation of care, defined as: "the delivery of care involving multiple providers and organizations with no effective coordination of different aspects of care".[7] This means that each specialty treats only the medical problem in its area of expertise, rather than the patient as a whole. In clinical practice, this can be recognised by language such as: "The patient is discharge ready for my specialty ".

The literature shows that fragmentation of care leads to poorer quality of care,[8] more medical errors,[10] more emergency department visits,[9] preventable hospitalisations,[7] and higher costs[4]. In addition, this fragmented care is inefficient and can be confusing for both patients and healthcare professionals, as shown in Figure 1. Patients often require multiple consultations and/or a transfer to a new ward.

There is an urgent need to tackle fragmentation and improve the quality of care, as increasing life expectancy also increases age-related multimorbidity and thus demand for health services.[1-4] In addition, a shortage of healthcare professionals is expected to put further pressure on the healthcare system.[5-6] These combinations of factors put the sustainability of the healthcare system at risk and call for a reform of the health care system.

Several agencies, such as the WHO, have proposed interprofessional collaboration as a promising healthcare reform.[12-14] However, studies of interprofessional collaboration show mixed results in terms of effectiveness and quality of care.[15-16]

Figure 1. The operating procedures on a regular care ward.



Terminology

There are various types of collaboration, and the terminology used in the literature is loose and often imprecise, as different concepts and definitions are still evolving. This can lead to ambiguity about the precise content of collaboration, its outcomes and their generalisability. An overview of the characteristics of different types of collaboration as described by Mitzkat et al.[17] can be found in Box 2 and Figure 2.

A consistent use of terminology has been chosen for this thesis, as explained in Box 2. To improve the readability of this thesis, we will not distinguish between interprofessional and intraprofessional collaboration and will refer to both as interprofessional collaboration, as we consider intraprofessional collaboration to be a subtype of interprofessional collaboration.[17-18]

Box 2. Definitions and characteristics of different types of collaboration, as described by Mitzkat et al.[17]

Interdisciplinary
Interdisciplinary teamwork involves professionals from different disciplines (e.g. economics and psychology) who share a team identity and work closely together in an integrated manner to solve complex care problems and deliver services.

Use in this thesis:
As defined.

Multiprofessional
Multiprofessional collaboration involves different health and social care professionals (e.g. medicine and nursing). These team members work alongside each other, in other words, they work in parallel rather than interactively. They do not necessarily provide an integrated solution or care plan, as is the case with interprofessional collaboration.

Use in this thesis:
See multidisciplinary.

Multidisciplinary
Multidisciplinary collaboration has the same concepts as multiprofessional collaboration, but involves different academic disciplines (e.g. economics and geography) rather than different health and social care professions (e.g. medicine and nursing).

Use in this thesis:
Contrary to the above definition, the medical literature consistently uses the term multidisciplinary to refer to collaboration between different health and social care professions (e.g. medicine and nursing) rather than the correct term multiprofessional. Therefore, in this thesis we will consistently use the term multidisciplinary to refer to different health and social care professions (e.g. medicine and nursing) to follow clinical practice in the use of this terminology.

Interprofessional
Interprofessional collaboration involves different health and social care professionals (e.g. medicine and nursing) who regularly come together to negotiate and agree how to solve complex care problems. They provide an integral care plan for their patient.

If they share a team identity, this is sometimes referred to as interprofessional teamwork.

Use in this thesis:
Studies by Reinders et al.[18] argue that a shared team identity is necessary to achieve high quality collaboration. Effective collaboration/teamwork therefore always requires a shared team identity, so this thesis does not differentiate between interprofessional collaboration or teamwork, but has chosen to refer to it all as interprofessional collaboration, which is also common in the current literature.

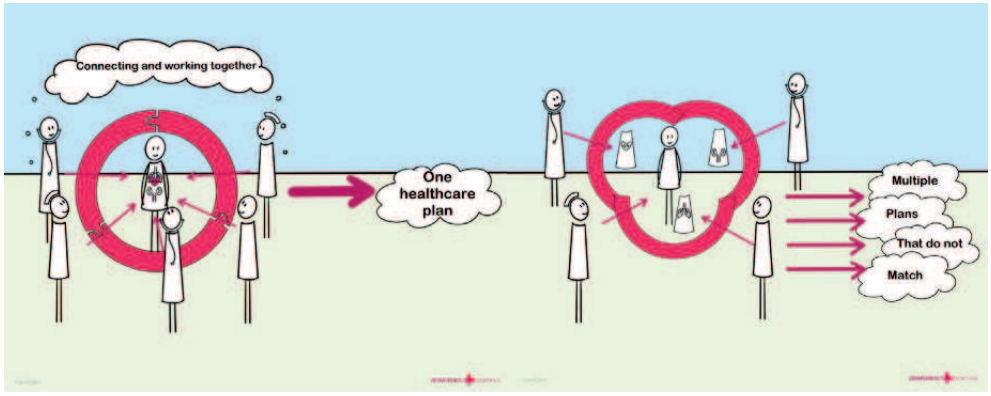
Intraprofessional
Intraprofessional collaboration has the same concepts as interprofessional collaboration, but is used when professionals have a common degree (e.g. medicine, for a cardiologist and a pulmonologist). This can be considered as a subtype of interprofessional collaboration.

Use in this thesis:
Intraprofessional collaboration can be seen as a subset of interprofessional collaboration. Therefore, this thesis does not distinguish between the two, but refers to interprofessional collaboration only.

A pandemic to highlight problems and opportunities

The healthcare system is expected to face major challenges in the future due to increasing age-related multimorbidity, higher demand for healthcare services, and a shortage of healthcare professionals.[1-6] The COVID-19 pandemic in 2020 provided a glimpse of what the future might look like. In March 2020, the COVID-19 pandemic was at its peak in the Netherlands, and specifically in the region of the Jeroen Bosch Hospital, with a shortage of healthcare workers and a great influx of patients with multiple health problems. In this time of need, interprofessional collaboration between healthcare professionals has emerged naturally.[13] In clinical practice with scarce resources of all kinds, the positive effects of interprofessional collaboration were demonstrated. This interprofessional collaboration was continued within the Jeroen Bosch Hospital and the Intensive Collaboration Ward was established.

Figure 2. The difference between interprofessional collaboration and multidisciplinary collaboration



The left panel shows interprofessional collaboration and the right panel shows multidisciplinary collaboration, as used for the studies in this thesis.

The Intensive Collaboration Ward (ICW)

In the current hospital care landscape, Mrs Johnson receives fragmented care. This is not only frustrating and confusing for Mrs Johnson, her family and the healthcare professionals, but also leads to poorer outcomes[7-10], higher costs[4] and inefficient use of resources[7-8]. The Jeroen Bosch Hospital in the Netherlands is committed to enhancing care for older patients with multiple health issues, aiming for the highest possible quality and actively working to achieve this goal. The positive lessons from the COVID-19 pandemic were the impetus for the creation of the ICW.

The ICW is a collaboration between the specialties of cardiology, geriatrics, internal medicine, respiratory medicine and hospital medicine, as well as nursing and allied health professionals, and was established to provide interprofessional care based on the following principles:

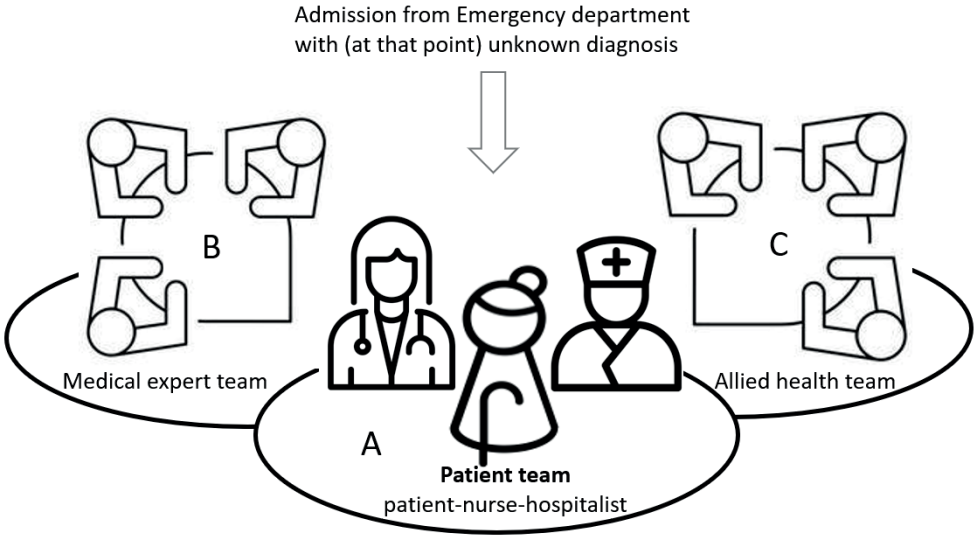
1) The patient has one coordinating physician: the hospitalist, who is a hospital generalist trained to evaluate the entirety of a patients' health problems.[19-20] A hospitalist is present six days a week, which means that the patient sees only two different doctors during the week.
2) There is a nursing team consisting of nurses from all the specialties involved, ensuring a diverse background. The coordinating nurse and hospitalist work closely together and are the persons of contact for the patient and their family.
3) To portray the medical perspective of care, there is a treatment team meeting (TTM) every morning, 6 days a week (not on Sunday). In this TTM, each patient's values and beliefs are introduced by the hospitalist as a starting point for the meeting. The

patient is then assessed by the hospitalist together with a cardiologist, geriatrician, internist, and pulmonologist. The conversation is centred around the patient's story. The medical specialists combine their expertise and all their visions come together to provide one tailor-made solution for the patient.

4) To portray other aspects of the patients' health, the hospitalist and nurse meet three times a week with a team of allied health professionals consisting of a physiotherapist, dietician, speech therapist, social worker, occupational therapist, and a liaison nurse. Specific professionals with a particular interest in the ICW per allied health specialty were assigned to ensure continuity and consistency of the team and meeting.

This interprofessional approach enables the team to evaluate and treat the entirety of a patient's health problems in an integrated manner. Figure 3 gives an overview of the ICW. In summary, the ICW provides extensive interprofessional care for older patients with multimorbidity. These patients are placed at the centre of the collaboration and tailor-made solutions are provided for the individual needs of the patient. In the literature, we found no model similar to the ICW that provides such extensive collaborative care.

Figure 3. The operating procedures of the ICW.



Quintuple Aim

The Quintuple Aim is a model which has evolved over the years and contains five goals to create a more sustainable healthcare system.[21] The Quintuple Aim can be used to evaluate if healthcare interventions achieve a genuine improvement for the entire healthcare system.

The Quintuple Aim has five aims:
1. Improved patient experience of care
2. Improved patient health outcomes
3. Reduced costs
4. Improved healthcare professional wellbeing
5. Improved health equity

The Quintuple Aim states that it is not effective to improve the outcomes of one aim while decreasing another, and that all aims must be achieved to constitute a true improvement in the quality of care. To illustrate, higher patient satisfaction at an enormous cost is not sustainable for future challenges, and better patient outcomes at a lower cost but with a large reduction in the wellbeing of health professionals is not a net improvement for the future either.

Aims of this thesis

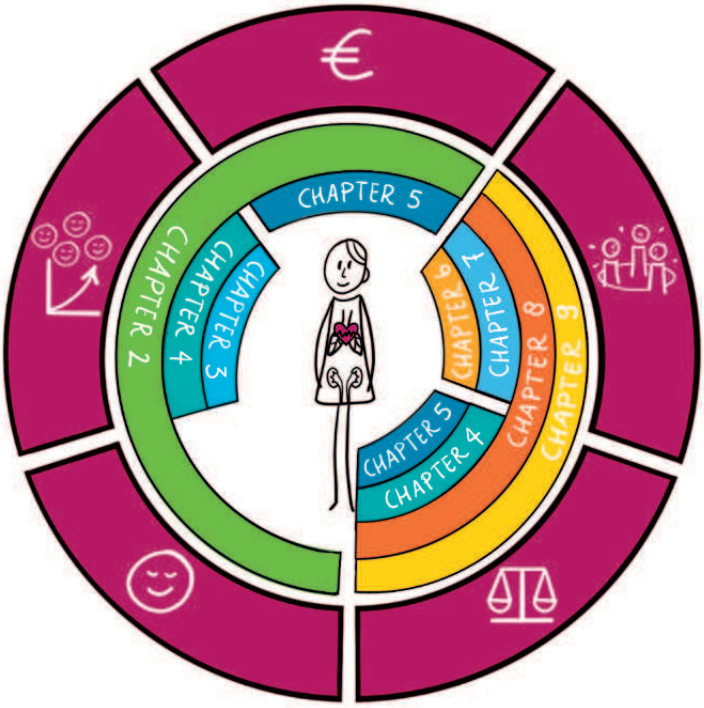
The ultimate aim is to improve the quality of care for older patients with multiple health problems. To do so, this thesis investigates whether the newly established ICW improves all aspects of the quality of care for older patients with multiple health problems and seeks to understand the underlying mechanisms of collaboration and their impact. This thesis investigates whether the ICW achieves all five aims of the Quintuple Aim.

Outline of this thesis

This thesis consists of five parts, each of which represents one of the Quintuple aims in order. Figure 4 gives an overview of the studies in this thesis. Most of the studies cover more than one of the Quintuple Aims, so they do not fit neatly into one part.

This thesis begins with a General Introduction (**Chapter 1)**.

Figure 4. An overview of the studies of this thesis in relation to the aims of the Quintuple Aim.



Part I covers the patient experience of care. **Chapter 2** investigates whether the patient experience of care improves (Aim 1) and also examines patient health outcomes (Aim 2) and the cost of care (Aim 3).

Part II covers the patient health outcomes. **Chapter 3** investigates the health outcomes of ICW patients compared to a historical cohort of similar patients receiving regular care (Aim 2). **Chapter 4** shows the outpatient clinic and emergency department visits after discharge from the hospital (Aim 2 and 5).

Part III covers the cost of care. **Chapter 5** provides an economic evaluation of the ICW, assessing costs (Aim 3) and health equity (Aim 5).

Part IV covers the healthcare professional wellbeing. **Chapter 6** investigates whether different concepts of healthcare professional wellbeing are related and whether scores on these concepts change over time when working interprofessionally (Aim 4). **Chapter 7** shows the results of real-life differences between multidisciplinary and interprofessional collaboration, captured by video and audio recordings (Aim 4).

Part V covers health equity, i.e. the use of (human) resources. **Chapter 8** investigates in-hospital medical consultations before and after implementation of the ICW (Aim 5), as a proxy for the learning effect of the ICW for medical specialists (Aim 4). **Chapter 9** is a scoping review of the facilitators and barriers to interprofessional collaboration and provides key factors for improving the quality and implementation of interprofessional collaboration (Aim 4 and 5).

Finally, **Chapter 10** contains a Summary and General Discussion on the implications of the results of this thesis.

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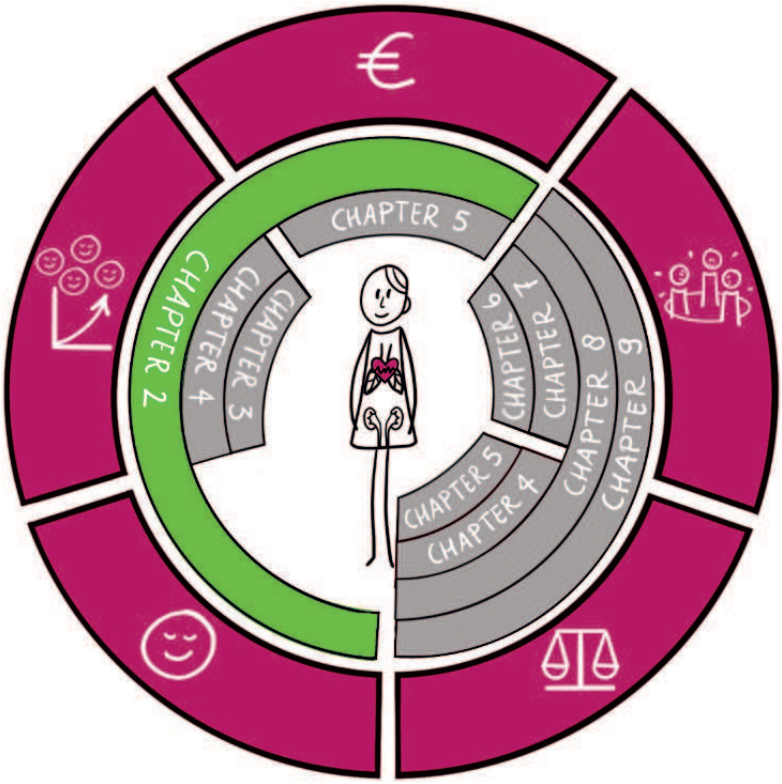
Part I:
Improved patient experience of care

“I have no special talents. I am only passionately curious”

- Einstein

CHAPTER 2

Combined interprofessional and intraprofessional clinical collaboration reduces length of stay and consultations: a retrospective cohort study on an intensive collaboration ward (ICW)



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Abstract

Introduction

Patients with multiple health problems are a growing population at high risk of receiving fragmented care, resulting in a poorer quality of care, preventable hospitalizations, and higher costs. Health agencies such as the World Health Organization (WHO) advocate the implementation of interprofessional care, which should lead to better patient care. This retrospective cohort study investigated the effect of combined interprofessional and intraprofessional collaboration on the management of mainly elderly patients with multiple health problems on an Intensive Collaboration Ward (ICW).

Methods

Patient health outcomes, patient experience, and the cost and value of care were assessed. 200 patients admitted to the ICW were compared with 51 control patients with an indication for the ICW who were admitted to a regular ward because of a shortage of ICW beds.

Results

Patients admitted to the ICW had a shorter length of hospital stay than control patients (median 5 vs 7 days, p=0.004) and had fewer in-hospital consultations (p=0.003). Patient satisfaction did not differ between the ICW and control patients (mean rating (1-10) 8.22 vs 8.75, p=0.060).

Conclusions

This study indicates that interprofessional and intraprofessional clinical collaboration reduces the length of hospital stay and the number of in-hospital consultations, without affecting patient satisfaction.

Introduction

The organization of hospital care is highly specialized,[1,2] with medical specialists and healthcare professionals tending to mainly treat specific health problems in their field of expertise.[3,4] Being treated by different specialists for each individual ailment increases the risk of fragmentation of care, defined as: "the delivery of care involving multiple providers and organizations with no effective coordination of different aspects of care."[5] Fragmentation of care leads to a poorer quality of care,[6] more medical errors,[3] emergency department visits,[7] preventable hospitalizations,[5] and higher costs.[3,5,6] Elderly patients, who often have multiple health problems, are likely to receive fragmented care.[8-11]

A solution to this undesirable situation is interprofessional collaborative practice,[12] as advised and defined by the World Health Organization (WHO): "interprofessional collaborative practice happens when multiple health workers from different professional backgrounds work together with patients, families, carers and communities to deliver the highest quality of care".[12] Such collaboration should improve the quality of care, which could be evaluated by the principle of the triple-aim: improved health outcomes, enhanced patient experience, and lower costs.[13] However, it has proven difficult to measure the benefit of interprofessional care. Two reviews of interprofessional care in a hospital or primary care setting found little evidence for the effectiveness of interprofessional care,[14,15] and no studies have investigated all the triple-aim outcomes in one study.[16]

We hypothesized that not only interprofessional collaboration improves the quality of care, but also intraprofessional collaboration, especially in patients with multiple health problems. However, we have not been able to find any studies of the effects of intraprofessional collaboration on the triple aim outcomes, or indeed of combined interprofessional and intraprofessional care on outcomes in patients with multiple health problems.

Background

During the first COVID-19 wave in 2020 the Jeroen Bosch Hospital in the Netherlands experienced the urgent need to work interprofessional and intraprofessional to provide good patient care. As an effect, this made health professionals want to further enhance this collaboration and proceed with this outside of the COVID-19 care, leading to the founding of the Intensive Collaboration Ward (ICW) which was operational very quick after the first COVID-19 wave, on the 15th of June 2020. This collaborative practice is expected to improve the efficacy of care delivered, resulting in improved patient health outcomes as also indicated by the WHO. Specific outcomes mentioned by the WHO are

appropriate use of specialist clinical resources, length of hospital stay, and hospital admission and mortality rates.[12] All outcomes measured are described in the methods section.

The aim of this study was to investigate whether combined interprofessional (e.g. nurses and doctors) and intraprofessional (e.g. doctors from different specialties) care at the ICW improves patient outcomes, patient experience, and healthcare costs in hospitalized elderly patients with multiple health problems.

Methods

Study design

This retrospective cohort study evaluated the effects of combined interprofessional and intraprofessional care provided on an intensive collaboration ward (ICW) on health outcomes, patient experience, and healthcare costs and value. Patients admitted to the ICW were compared with similar patients with an indication for the ICW who were admitted to a regular ward because of a shortage of ICW beds. The study period was from 15 June 2020, the opening of the ICW, to 31 October 2020.

Patients and setting

The study population consisted of patients who came to the emergency room (ER) of the Jeroen Bosch Hospital, a large teaching hospital in the Netherlands. Patients presenting with health problems covered by the specialties of cardiology, geriatrics, internal, or pulmonary medicine AND who had an indication for admission to the ICW, as determined by the main treating physician at the ER, were included in this study. Indications for admission to the ICW are, for example, a complex infectious problem or a combination of one or more of the following problems: dyspnea, pulmonary problems, cardiological problems, falls, or delirium.

The intervention: Intensive Collaboration Ward (ICW)

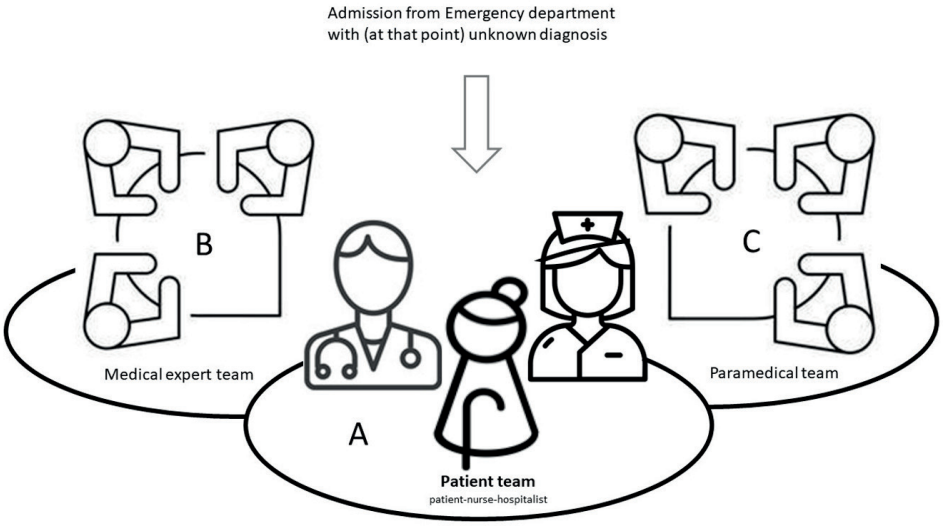
The ICW is designed to care for patients with multiple health problems. Most patients are of advanced age who require complex care and who could be at risk of receiving insufficient care for one or more of their health problems on a regular ward. To provide optimal care for these complex patients, the ICW has multiple working principles, of which an overview is presented in Figure 1. First, the patient has one coordinating physician: the hospitalist, who is a hospital generalist trained to evaluate the entirety of a patients' health problems.[17,18] This hospitalist is present six days a week, meaning the patient sees the same physician the entire week. Second, the nursing team consists of nurses from all non-surgical wards who have been specifically assigned to the ICW and therefore has a

diverse background. The nurses work closely together with the patient and hospitalist, with the nurses and hospitalist being the point of contact for the patient and their family. Third, to portray the medical perspective of care there is a treatment team meeting (TTM) every morning for 6 days a week (not on Sunday) in which the hospitalist introduces each patients values and believes as a starting point for the meeting, thereafter each patient is evaluated by the hospitalist and a geriatrician, internist, pulmonologist, and cardiologist. In this TTM the medical specialists combine their expertise and collectively provide solutions for the patient, the conversation of this meeting is centered around the patients story. Fourth, to portray other aspects of the patients' health the hospitalist and nurse meet three times a week with a paramedical team, consisting of a physical therapist, dietician, speech therapist, social worker, and an occupational therapist. In this paramedical meeting all professionals discuss with each other which additional care is needed to optimally treat the patient. Specific professionals with extra interest for the ICW per paramedical specialty were assigned, to ensure continuity and consistency of the paramedical team and meeting.

Above description of the TTM is in line with the definition of intraprofessional collaboration as described by Mitzkat et al. and Reinders et al.[19,20] It differs from multidisciplinary or multiprofessional teamwork since professionals on the ICW do not work parallel to each other, but work together and negotiate to provide an integral solution for the patient. The description of the paramedical meeting also meets the definition of interprofessional collaboration, since they work interactively and regularly come together.[19,20] The professionals do not deliver siloed care, they physically come together during the TMI and the paramedical meeting to discuss and provide an integral solution and treatment plan for the patient, which is completely different to usual care on regular wards.

This interprofessional and intraprofessional approach enables the team to evaluate and treat the entirety of a patient's health problems. Once a treatment plan had been drafted and implemented, the patient is transferred to a regular care ward.

Figure 1. An overview of the operating procedures of the ICW



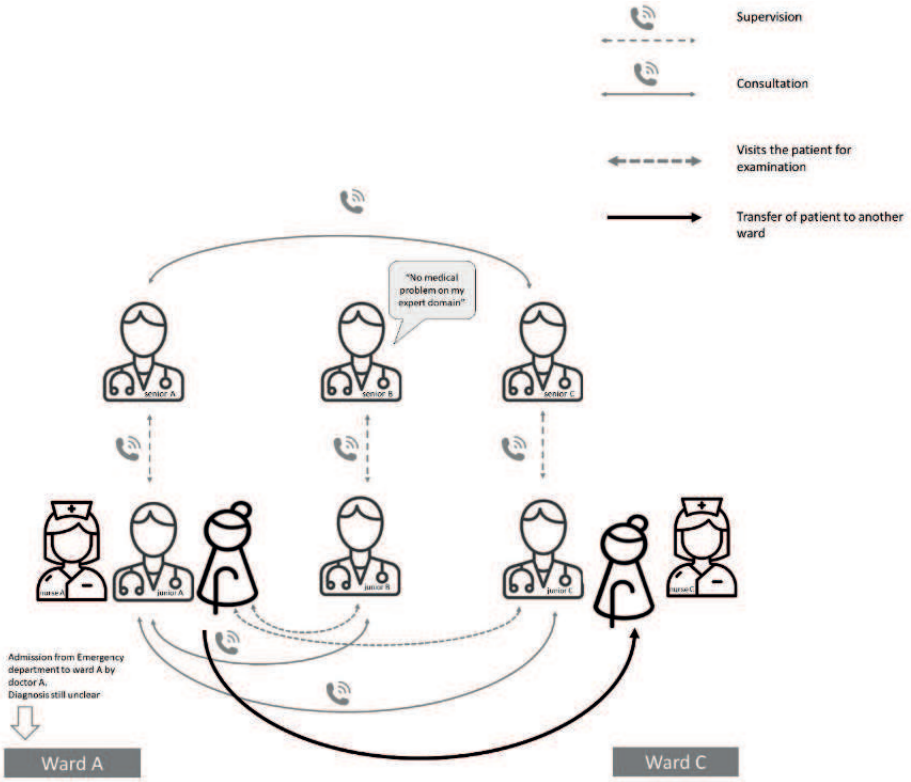
Organization of care during hospital admission, after admission to the ICW. The hospitalist is the coordinating physician and guides the patient through the hospital admission.
A: Patient team at the Intensive Collaboration Ward (ICW) consist of the patient, nurse and hospitalist. Central are the patients' values and clear communication for the patient.
B: Medical expert team consists of senior doctors from the specialties of internal, cardiology, pulmonary and geriatric medicine. Hospitalist presents the patient including the patients' values. Discussion until consensus is achieved about a tailormade plan. Patients receives the proposed treatment plan including different treatment options if available from the hospitalist, leading to shared decision making.
C: Paramedical team: nurse and hospitalist present the patient including the patients' values. Discussion until consensus is achieved. Patient receives proposed plan by nurse and/or hospitalist.

The control group: regular wards

Regular care wards, as they are currently present in hospitals in the Netherlands, are far different from the situation on the ICW as described above. On a regular ward a resident sees the patient and later in the morning or day consults with the supervisor, after this the treatment plan has to be discussed with the patient and/or consultations by other specialties need to be asked, making it a far less efficient process as is visualized in Figure 2. In addition, consulting residents need to discuss with their supervisor and then communicate this back to the primary treating specialty, this results in a lot of calls and separate deliberation. Because of these consultations, the patients see multiple doctors by their bed which can be really confusing for the patient. Also residents often alternate between departments on a day to day basis, resulting in the patient seeing a different face almost every day.

As described above, on regular wards the involved professionals operate alongside each other and not together, meaning they provide siloed care and are not physically together to confer with each other. In addition, they do not necessarily share the same goal of an integral outcome, but act on their own tasks and goals. That professionals act on their own goals can result in "bounce" and "turf" as described in the well-known book "The House of God". Medical specialists try to bounce patients to another specialty, which is not necessarily better for the patient, and further underlines that they do not share the same goal of an integral outcome.[21]

Figure 2. An overview of the operating procedure on a regular ward



Organization of care during hospital admission, after admission for one specialty. For better understanding of this, one could take an exemplary old lady with fever and pleural effusion admitted for the cardiologist in mind.

Patient is admitted from the ER to the ward of specialty A. Junior and senior doctor from specialty A ask consultation from doctor B. Junior doctor B examines patient and calls supervisor B, senior doctor B: "no medical problem on my expert domain". Junior doctor B calls junior doctor A to deliver this message. Junior doctor A calls supervisor A who advises then to call specialty C. Junior doctor A calls junior doctor C. Junior doctor C examines patient and calls supervisor C. They conclude that they take over the medical care for the patient. The patient is transferred to ward C: the patient now has a different team namely a new nurse and a new doctor. In addition, the patient has a different ward and room.

Patient groups

Patients admitted to the ICW were included in the ICW group and those eligible for ICW admission who were admitted to another ward because of unavailability of a bed on the ICW were included in the control group. Exclusion criteria were patients admitted via an outpatient clinic, not via the ER, and patients who needed to be transferred to the Coronary Care Unit or the Intensive Care Unit for more specialist/intensive care.

Data extraction and Outcomes

Patients eligible to enter the study were identified using CTcue (CTcue B.V., Amsterdam, https://ctcue.com/). CTcue is a data mining software system that searches through electronic medical dossiers and can identify patients based on selected search terms, such as "ISA" (=Dutch for ICW). After patient identification, data were manually extracted from the electronic medical records by the primary researcher, if questions arose they were conferred with another researcher of the research team.

Information on patient characteristics at baseline, such as age, sex, health problems, number of medications used, number of hospital admissions in the last 12 months, and admission specialty, was collected.

Three main outcomes were investigated. A) Patient health outcomes: length of stay; 30-day mortality rate; and 30-day hospital readmission rates (0, 1, ≥2). Appropriate use of specialist clinical resources was measured using several outcomes, namely in-hospital and ER consultation rates, whereby one physician requests another physician to examine a patient (0 or ≥1); the number of radiological investigations (0, 1, ≥2); the waiting time for radiological investigations; change in primary treating specialty; number of calls from the ER to specialists; and destination after discharge. B) Patient experience of care: patient satisfaction was measured using the validated Dutch Patient Reported Experience Measure (PREM) MSZ (7 questions, scored 1–10; multiple choice questions; see Appendix A), completed on the day of discharge or thereafter (by telephone).[22] C) Cost and value of care: a cost-analysis was performed in collaboration with the financial department and relevant managers. Included in the analysis were relevant patient health outcomes and personnel deployment (full-time equivalents, FTE).

Power calculation

Power calculations showed that to assess a difference in hospital stay of 1 day, we would require an estimated population of 134 patients (100 ICW patients, 34 controls; enrolment ratio 3:1 (based on clinical practice), α .0.05, β 0.2, M1 7±2 vs M2 6±2, effect size by Cohen D 0.5 (medium)).

Statistical analysis

All continuous variables were evaluated for normality distribution, and due to the large difference in group sizes, variance and number of outliers were compared between groups. Lacking normal distribution, but with comparable variance and limited number of outliers a Mann-Whitney U test was performed. Variables with a large portion of outliers and incomparable variance were evaluated using a median test for k-samples. The baseline variable age was evaluated using a median test for k-samples, the variable number medications at admission was evaluated using an t-test. All other baseline characteristics were categorial and evaluated using a Chi-square test. A) Patient health outcome variable length of stay was compared using the median test for k-samples, since the groups' variances and number and size of outliers were substantially different. Waiting time for radiological investigations was compared using the Mann-Whitney U test. Other patient health outcomes were categorical and evaluated using a Chi-square test. B) Patient experience of care. Continuous variables were analyzed as previously described. Due to low numbers in some categories of the question "How would you describe your overall health at this moment?", the results were categorized as two groups, namely "excellent, very well and well" and "moderate and poor" and analyzed using a Chi-square test.

On some days residents staffed the ICW instead of a hospitalist, so a correlation analysis was performed to evaluate whether the proportion of days on which there was a hospitalist influenced the length of stay. A significance cut-off of $p<0.05$ was used for all variables tested. All analyses were performed using SPSS version 22.0.

Ethical considerations

The regional ethical review board METC Brabant declared that this study falls outside the scope of the Dutch Medical Research Involving Human Subjects Act, METC-number NW2020-82. The ICW was set up to improve patient care and not for research purposes, all data used was already available in the patients' medical file. Informed consent was not asked from the participants in accordance to the Dutch law WGBO, article 458. Because of the high number of participants included, taking informed consent was considered not reasonably possible, and above that selection bias could be included by taking informed consent as an undesirable side effect. However, patients who had previously objected to their information being used for scientific research, by hospital opt-out procedure, were excluded. We used already existing data and patients and family were not approached for any additional data. Contacting the patient by telephone after admission to fill in the PREM was part of standard care evaluation in de hospital and not a research intervention, therefor no informed consent was needed with approval of the METC. The psychical and psychological integrity of the patients were not harmed by this study in any way. The study was carried out according to the principles of the Declaration of Helsinki.

Results

Patient characteristics

The data of 200 ICW and 51 control patients were eligible for analysis (Table 1). Patient characteristics were similar in both groups, except that there were more patients with cognitive disorders in the control group than in the ICW group (24% versus 12%, p=0.036).

Table 1. Characteristics of patients on the intensive collaboration ward (ICW) and control ward

BASELINE CHARACTERISTICS			
	ICW patients	**Control patients**	**p-value**
Total patients (n)	200	51	
Age (median in years)	81.5	79	0.085¥
Female (%)	53	55	0.759*
Admission specialty (%)			0.635*
Internal medicine	32	24	
Pulmonary medicine	26	31	
Geriatric medicine	37	37	
Cardiology	6	8	
n° medications at admission (mean)	9	6	0.861†
n° admissions past 12 months (%)			0.801*
0	62	57	
1	20	22	
≥2	18	22	
Medical history (%)			
Internal medicine	59	55	0.642*
Diabetes mellitus	29	31	0.687*
Hematological disease	3	4	-
Kidney disease	16	8	0.138*
Auto-immune disease	1	2	-
Other	33	31	0.825*
Pulmonary medicine	50	51	0.901*
COPD/asthma	29	31	0.687*
Malignancy	3	6	-
Other	32	35	0.654*
Geriatric medicine	35	41	0.413*
Cognitive/neurodegenerative	12	24	**0.036***
CVA	23	22	0.828*
Hip fracture	5	8	-
Other	1	0	-

BASELINE CHARACTERISTICS			
	ICW patients	**Control patients**	**p-value**
Cardiology	75	73	0.720*
ACS	29	28	0.827*
Heart failure	18	14	0.519*
AP stable	7	2	-
Artery disease	15	14	0.819*
CVRM	45	39	0.497*
Other	37	33	0.628*

COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; ACS = acute coronary syndrome; AP = angina pectoris, CVRM = cardiovascular risk management
- The expected count in the Chi-square test was too low to interpret the p-value
* Chi-square test
† Independent sample t-test
¥ Median test for k samples

Table 2. Outcomes of patients on the intensive collaboration ward (ICW) or the control ward

Outcomes			
	ICW patients	**Control patients**	**p-value**
Total patients (n)	200	51	
Length of stay (median days)	5	7	**0.004¥**
Number of in-hospital consultations (% ≥1)			
During admission	21	41	**0.003***
Emergency department	8	4	-
Number of ER calls to specialists (%)			-
0	5	6	
1	81	90	
≥2	15	4	
Number of radiological procedures (%)			0.967*
0	53	51	
1	28	28	
≥2	20	22	
Waiting time radiological investigations (median hours)	5	6	0.130‡
Change in primary treating specialty (% Yes)	16	6	0.073*
Destination after discharge (%)			0.509*
Home with care	30	22	
Home without care	39	49	

Outcomes			
	ICW patients	**Control patients**	**p-value**
Care institution	21	22	
Mortality and palliative care	11	8	
30-day Mortality rate (%)	18	8	0.089*
30-day Readmission rate (%)	14	12	0.677*
Patient satisfaction:			
Rating questions (1-10)			
Overall rating; mean (range)	8.22 (4-10)	8.75 (7-10)	0.060†
Explanation by personnel; mean (range)	8.01 (3-10)	8.21 (6-10)	0.515†
Trust in personnel; mean (range)	8.15 (5-10)	8.09 (6-10)	0.815†
Listening to the patient; median (range)	8 (1-10)	8 (7-10)	0.962¥
Benefits explained; median (range)	8 (1-10)	7 (6-10)	X
Co-decision; median (range)	8 (1-10)	8 (6-10)	X
Teamwork in the hospital; median (range)	8 (2-10)	8 (6-10)	0.870¥
Recommend the nursing ward (% Yes)	91.3	100	-
Health wellbeing at discharge			0.897*
Excellent, very well or well	47	46	
Moderate or poor	53	54	

(-) The expected count in The Chi-square test was too low to interpret the p-value
(X) There were >30% non-respondents, which causes a high chance of selection bias, therefore no statistical analysis has been performed
* Chi-square test
‡ Mann-Whitney U test
† Independent sample t-test
¥ Median test for k samples

Health outcomes

ICW patients had a significantly shorter length of hospital stay (median=5 days, range 1-26) than the control patients (median=7 days, range 0-44) (p=0.004) (Table 2). Moreover, they had significantly fewer in-hospital consultations than the control patients: 21% vs 41% had 1 or more in-hospital consultations (p=0.003). Thirty-day mortality or readmission rates, number of radiological procedures, destination after discharge, number of changes in primary treating specialty, and total waiting time for radiological investigations were not significantly different between the two groups. There were too few ER consultations or ER calls to specialists to allow between-group analyses. The percentage of days during which a hospitalist was the treating physician was not associated with the length of stay (Pearson correlation 0.05, p=0.483).

Patient experience

Overall patient ratings were not statistically different between the two groups (8.22 in ICW patients versus 8.75 in control patients, p=0.060). Of the ICW patients, 91.3% would recommend the ward to another patient, as would 100% of the control patients. Self-reported health wellbeing at discharge did not differ significantly between the two groups (p=0.897). ICW patients were most positive about the staff (they were friendly, helpful, and took time for the patient) and openness (clear explanations were given). Control patients were most positive about the staff (they were friendly and listened carefully). Of aspects that could be improved (most patients considered everything to be satisfactory), the ICW patients mentioned the ward (it was too busy, so that patients did not get enough rest) and the response time to patient calls (could be quicker), whereas the control patients mentioned the nurses (some were not considered friendly) and cleanliness (not enough time for cleaning).

Costs and value

Table 3 gives an overview of the costs and value of the ICW. Costs: the employment of a hospitalist on the ICW for 6 days/week (1.33 FTE) increased costs, but the deployment of paramedical services for ICW patients did not generate extra costs. However, the three weekly paramedical meetings cost 0.25 FTE. The switching of nurses and medical specialists from other wards to the ICW did not increase costs.

Value: The ICW reduced the length of stay and the number of in-hospital consultations, thereby reducing healthcare costs. Although the employment of hospitalists to run the ICW involved extra cost, hospitalists require less supervision from consultants and can handle a higher workload than residents. If the ICW had been run by residents, 2.66 FTE residents would have been needed, so these costs were saved by employing a hospitalist.

Table 3. An overview of the advantages and disadvantages of an intensive collaboration ward (ICW) outcomes

Finding	Costs	Value*
Shorter length of stay, -2 days	Reduction of costs	**Patient** - Recovers faster and is discharged to an appropriate care setting sooner - With a shorter length of stay, the hospital can treat more patients over the same time period
Less in hospital consults, 21 vs 41% ≥1 consult	Reduction of costs	**Patient** - The patient gets unambiguous information from the sole coordinating physician: the hospitalist **Professional** - Consultants are more focused because of fewer disturbances
Less residents needed, -2.66 FTE	Reduction of costs	**Professional** - This saves time for the doctors who normally have to train the new residents
Hospitalist, +1.33 FTE	1.33 FTE extra cost	**Patient** - One coordinating physician, giving unambiguous information **Professional** - The treatment team gets a total overview of the patient from the hospitalist, allowing them to provide tailored care - A hospitalist needs less supervision by a consultant, reducing the number of times the consultant is consulted
Paramedical meetings, +0.25 FTE	+0.25 FTE extra costs	**Patient** - The patient gets appropriate paramedical care as a result of the paramedical meeting

* The perceived value of the ICW. This has not been objectively measured in this study, but is derived from study findings.

Discussion

We found that patients admitted to an ICW had a shorter hospital stay and fewer specialist consultations than control patients, but there were no differences in 30-day mortality and readmission rates. There were too few events to evaluate the ER consultation rates. Patient experiences were similar in the two groups. There was evidence to suggest that an ICW would be cost effective.

We found that the ICW decreased the hospital stay by 2 days. In a systematic review (2017) of interprofessional interventions, one study reported that interprofessional ward rounds decreased the average length of stay by 0.6 days, whereas another study found no such decrease.[14] To the best of our knowledge, this is the first study to report a 2-day

reduction. This could be explained by the ICW being an interprofessional and intraprofessional collaborative practice, which may provide more extensive care than interprofessional care alone. There is a difference between the ICW and control group regarding cognitive or neurodegenerative disorders in the medical history. However, the statistical analysis does not allow for adjustment for possible confounders, we tested if patients with a cognitive or neurodegenerative disorder have a different length of stay. This was not the case (p=0.453), therefore we conclude that the difference found between ICW and control group was not due to this baseline difference in medical history. We also found that ICW patients had a significantly lower in-hospital consultation rate, which is probably due to the intraprofessional collaboration between medical specialists. Previous studies did not report on the number of in-hospital consultations, ER consultations, mortality, or readmission rates.[14,15] We did not find a difference in ER consultations, mortality, or readmission rates, but we had a relatively short follow-up of 30 days.

It is difficult to compare our cost data with those of other studies. We found a decreased length of stay and fewer in-hospital consultations, which would reduce costs. We would also expect that fewer residents would need to be employed because a hospitalist requires less supervision by a consultant and can handle a higher workload, which would further reduce costs. However, operating the ICW engenders costs, namely, employing a hospitalist and holding paramedical meetings. Although cost calculations are often ambiguous, we would expect the ICW to be cost effective in the long term. Other studies have reported that healthcare fragmentation leads to increased care costs,[3,9,10] so it can be expected that reducing fragmentation by providing interprofessional and intraprofessional care would reduce costs. However, evidence for this claim is lacking and further research is required.

This study is one of the first to report on the effect of combined interprofessional and intraprofessional collaboration on health outcomes, patient experiences, and costs. However, our findings should be interpreted in the light of some limitations. The design of the ICW could have been more theoretically underlaid in the founding process. However, there was a practice based urgency and momentum after the first wave, and in retrospect many underlaying principles can be identified. Several studies show design principles that can be identified on the ICW, for example Looman's principles of intraprofessional collaboration and power dynamics,[23-34] Uhlig's description of a powershift,[25] and one geographical location as described by Reinders.[26] In literature it was even acknowledged that a great body of knowledge on collaboration was recently uncovered by the COVID-19 crisis. Collaborative practice is becoming rapidly more important and many new theories are described.[27-30] Thoroughly understanding the theoretical foundation of the ICW is important and needs to be studied further.

This was a retrospective cohort study and not a randomized control trial (RCT), which makes the interpretation of cause and effect more difficult than with an RCT design. However, in practice it is hard, if not impossible, to randomize a complex intervention. This sort of change in clinical practice does not happen overnight and interprofessional collaboration is a long-term process,[24] making immediate implementation and assessment very difficult. Also, staff do not work exclusively on the ICW or regular nursing ward, which makes adequate blinding and randomization of staff virtually impossible. Moreover, it is possible that the knowledge of staff on both wards increased during the study, due to the better collaboration between staff, which means that the benefit of the interprofessional and intraprofessional care may have been underestimated. The patients in the control group should have been admitted to the ICW but could not because of a shortage of beds. This might explain the lack of difference in ER consultation rates between the intervention and control groups. While the limited number of patients eligible for analysis, 200 ICW and 51 control patients, might have influenced findings, we included a sufficient number of patients to meet the required power for the length of hospital stay outcome, although the study was probably underpowered for the mortality and readmission outcomes. Most patients completed the PREM 3-9 months after discharge, instead of directly at hospital discharge, which was the preferred moment. This could lead to selection and recall bias, because some patients may have died or may not have remembered the admission adequately. The interprofessional and intraprofessional collaboration in this study is a very complex intervention and highly dependent on individuals and organizational structures. Replication studies have not yet been performed.

Even when taking these limitations into account, we still found the interprofessional and intraprofessional collaboration to improve certain patient outcomes and costs, without affecting patient satisfaction.[16]

Conclusions

We found that the combined interprofessional and intraprofessional collaboration on an ICW led to better patient outcomes, namely, a shorter length of stay and fewer in-hospital consultations, without affecting patient satisfaction. Whether the ICW reduces healthcare costs in the long term requires further study, as does the generalization of these findings to other settings. Further study is required to fully understand the theoretical foundation the ICW operates on.

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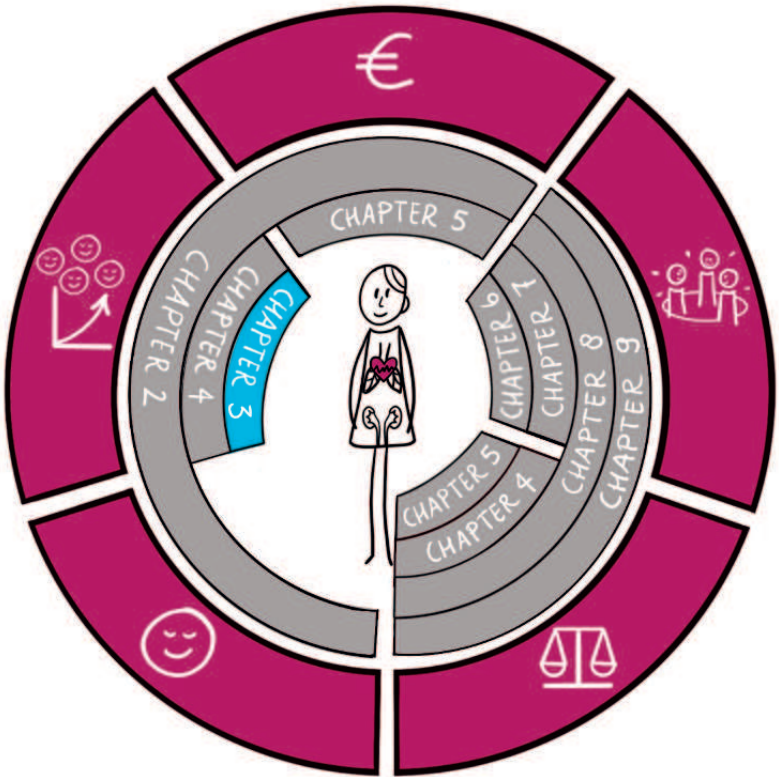
Part II:
Improved patient health outcomes

“Everything we hear is an opinion, not a fact. Everything we see is a perspective, not the truth”

- Marcus Aurelius

CHAPTER 3

Effect of interprofessional and intraprofessional clinical collaboration on patient related outcomes in multimorbid older patients – a retrospective cohort study on the Intensive Collaboration Ward



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Abstract

Introduction

The management and care of older patients with multiple health problems is demanding and complex. Interprofessional and intraprofessional collaboration has the potential to improve both the efficiency and the quality of care for these patients. However, it has proven difficult to demonstrate the efficacy of this approach in terms of objective patient-related outcomes. Recently, a care model with interprofessional and intraprofessional care was started, the Intensive Collaboration Ward (ICW). This ward combines *inter*professional care and *intra*professional care for older patients with multiple health problems. The aim of this study was to evaluate the effects of ICW care in older patients with multiple health problems.

Methods

This retrospective cohort study evaluated the effects on patients outcomes. This was done by comparing patients of the new model, the ICW (ICW group), to a historical cohort of comparable patients who would have been eligible for the ICW (control group). Outcomes were medical consultations, allied health professional consultations, radiological procedures, waiting time for radiological procedures, change in primary treating specialty, length of hospital stay, readmission rate, and mortality rate. Linear and logistic regression analyses were performed, adjusted for baseline differences.

Results

The ICW group required significantly fewer medical consultations than the control group. Calls to specialists from the emergency room decreased significantly, but there was no change in in-person consultations on the ER. 51% of control patients had ≥1 in-hospital consultation compared to 21% of ICW patients ($p<0.05$). Patients in the ICW group received significantly more consultations with allied health professionals and more often had a change in primary treating specialty.

Conclusions

Interprofessional and intraprofessional clinical collaboration on the ICW reduced in-hospital consultations and increased allied health professionals' consultations. This approach may decrease fragmentation of care and provide more integrated, efficient and patient centered care. This may improve the overall care of older patients with multiple health problems.

Introduction

Life expectancy is increasing and this increases the demand for health services, because of increased age-related multimorbidity.[1-2] Health care utilization is high among patients with multimorbidity,[3-5] multimorbidity is defined by the WHO as the coexistence of two or more health conditions in the same individual.[6] Such patients are at risk of receiving fragmented care, which leads to more emergency department visits,[7] preventable hospitalizations,[8] and higher costs.[4-5] There is an urgent need to improve the efficiency and quality of care for older patients with multimorbidity, which may necessitate a change in how hospital care is provided; for example, the WHO advises interprofessional collaborative practice.[9]

Interprofessional collaboration has the potential to improve the care of older patients with multimorbidity, making more efficient use of resources. Many interprofessional care models have been proposed, and although most clinical care workers believe in their efficacy,[10-11] the few studies investigating this have failed to detect major improvements in objective patient-related outcomes.[12-14] The more intensive collaboration models have yielded better results, reducing the length of stay and in-hospital mortality.[15] An example of such an intensive collaboration model is the Intensive Collaboration Ward (ICW), which was set up in the Jeroen Bosch Hospital in the Netherlands to provide combined interprofessional and intraprofessional care for older patients with multimorbidity. Interprofessional collaboration is defined as healthcare professionals from different professions working together, e.g. nurse and physical therapist. Intraprofessional collaboration is defined as healthcare professionals from different disciplines working together, e.g. a cardiologist and a pulmonologist.

The ICW has been shown to be effective in decreasing the length of stay and number of in-hospital consultations compared with regular wards.[16] However, some efficacy parameters still need to be investigated. Therefore, the aim of this study is to assess the efficacy of health care provided on an ICW, expressed as the number of medical consultations in the emergency room (ER) and on the ward, the number of radiological procedures, waiting time for radiological procedures, change in primary treating specialty, length of hospital stay, readmission rate, and mortality rate.

Methods

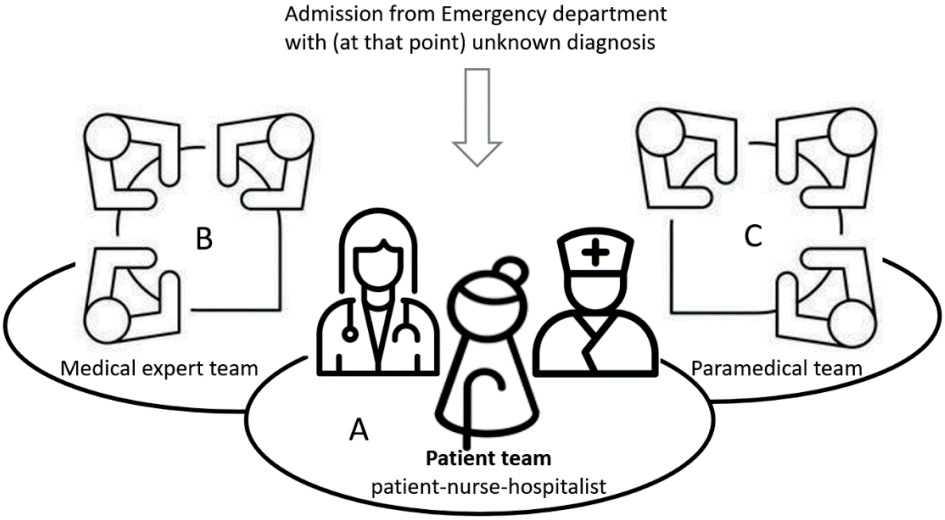
Study design

This retrospective cohort study evaluated the effects of combined *inter*professional (healthcare professionals from different professions working together, e.g. nurse and physical therapist) and *intra*professional (healthcare professionals from different disciplines working together, e.g. a cardiologist and a pulmonologist) care on the ICW on the health outcomes of patients with multimorbidity.

Intensive Collaboration Ward (ICW)

The ICW was set up to provide *inter*professional and *intra*professional care for older patients with multimorbidity. To care for these complex patients the ICW has several operating procedures, which have previously been described by de Gans et al.[16] The operating procedures are visualized in Figure 1. The first principle is that ICW patients have one coordinating physician: the hospitalist. The hospitalist is a generalist who is specifically trained to evaluate the entirety of a patients' health problems.[17-18] A hospitalist is present 6 days a week, meaning the patient primarily sees one doctor on the ward. Second, there is a nursing team consisting of nurses from all involved specialties assuring a diverse background. The nurse and hospitalist work closely together and are the persons of contact for the patient and their family. Third, there is a Treatment Team Meeting (TTM) every morning at 9 am Monday to Saturday to represent the medical perspective of care. In this TTM each patient's values and believes are introduced by the hospitalist as a starting point for the meeting. Subsequently, the patient is evaluated by the hospitalist together with a cardiologist, geriatrician, internist, and pulmonologist. The conversation is centered around the patient's story. The medical specialists combine their expertise and all visions come together to collectively provide tailormade solutions for the patient. Fourth, the nurse and hospitalist meet three times a week with a team of allied health professionals to portray other aspects of the patients' health. The involved allied health professionals are specifically assigned to the ICW and are a physical therapist, dietitian, speech therapist, occupational therapist, and liaison nurse. The ICW is an example of combined interprofessional and intraprofessional collaboration since these professionals work together, and regularly come together and negotiate to provide an integral solution for the patient. This is different from multidisciplinary or multiprofessional teamwork where professionals work parallel to each other and not necessarily negotiate an integral solution.[19-20] In clinical practice, the definitions of multidisciplinary and interprofessional are often used inconsistently. For example, multidisciplinary teams in ICU also negotiate to provide an integral solution for the patient and could be described as interprofessional. For the purposes of this paper, the definitions used are as described in the literature.

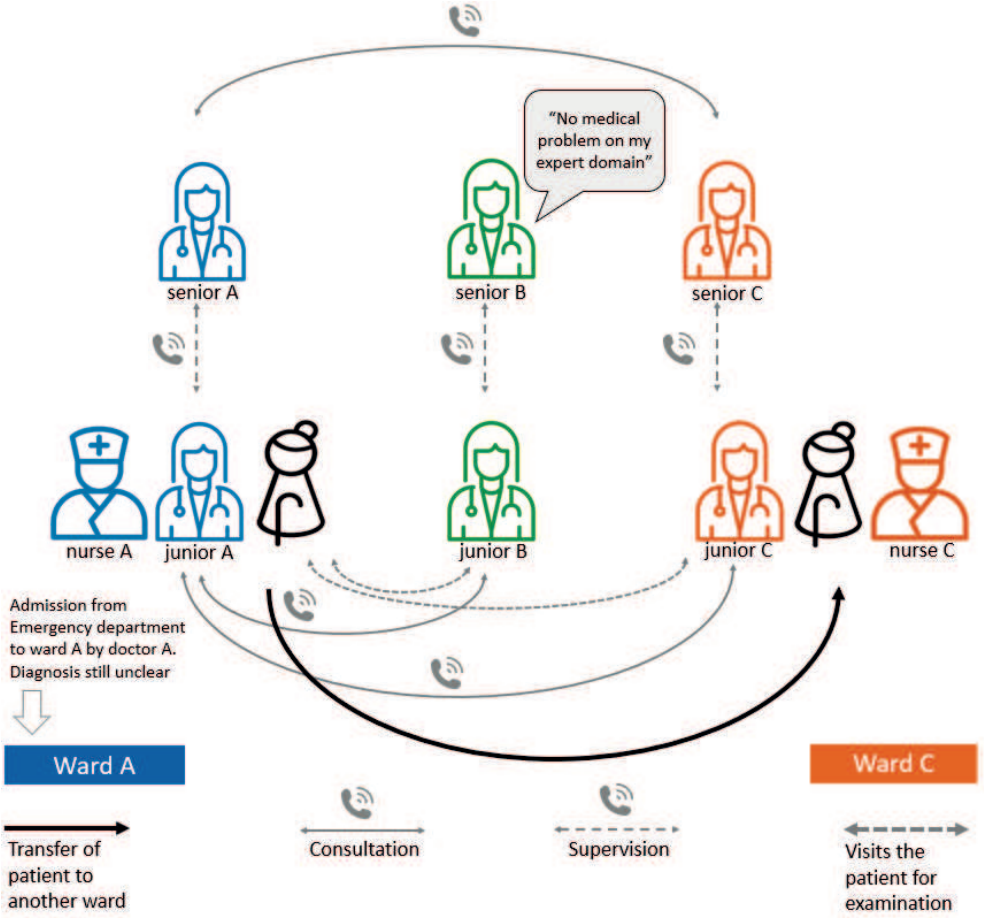
Figure 1. The operating procedures on the Intensive Collaboration Ward



The patient team, consisting of the patient, nurse and hospitalist, is central. The nurse and the hospitalist are the contacts for the patient and their family.
The medical expert team consists of the hospitalist, and a geriatrician, internist, pulmonologist and cardiologist and are present at the Treatment Team Meeting every morning.
The paramedical team consist of the hospitalist and nurse, and a psychical therapist, dietitian, speech therapist, occupational therapist, and liaison nurse. They come together 3 times a week.
All teams work together to provide the best patient care for the older multimorbid patient

The care on regular wards in the Netherlands is very different, as visualized in Figure 2. There is a lot of separate deliberation between residents, supervisors, and consultants making it a less efficient process. Because of multiple consultations, the patient sees multiple doctors by their bed which can be confusing. In addition, residents may alternate between departments on a day to day basis, causing the patient to see even more different faces during their admission, which can add to the confusion. Patients often need to be transferred to a different ward, meaning they are placed in a completely new environment which can further increase confusion for the patient.

Figure 2. The operating procedures on a regular care ward



As shown above, organization of care on a regular care ward is very chaotic for the older patient with multiple health problems. There are often multiple consultations and a transfer to a new ward. This can lead to confusion for the patient and their family.

Study population and setting

The study was conducted at the Jeroen Bosch Hospital, a large teaching hospital in the Netherlands, where the ICW has been operating since 15 June 2020. The ICW group consisted of patients admitted to the ICW between 15 June 2020 and 31 October 2020, with the indication for the ICW being determined by the main treating specialist in the ER. The indication for ICW admission is a combination of health problems covered by the specialties involved and/or uncertainty as to which specialty should be responsible, e.g. dyspnea of unknown origin, and indication for hospital admission.

The control group consisted of a historical cohort of comparable patients treated in regular wards in 2019, as there was no ICW in 2019. Selection was as follow: patients presenting between 15 June 2019 and 31 October 2019 to the ER were retrospectively screened for an ICW indication, to determine if they would have been admitted to the ICW if there had been one in 2019. This was determined by a specialist (cardiologist, internist, geriatrician, or pulmonologist) based on the ER correspondence, to mimic the similar procedure followed for ICW admission. The specialist were asked: "Would you or would you not admit the patient to the ICW based on the emergency department's conclusions?" without knowing the patient's outcome. Exclusion criteria for both groups were: 1) patients admitted through an outpatient clinic and, 2) patients who had to be transferred to a coronary care unit or intensive care unit during admission, as patient outcomes could no longer be influenced by the collaborative practice being studied.

Data collection

Data were retrospectively extracted from the patients' electronic medical records, using the data mining software system CTcue (CTcue BV, Amsterdam, https://ctcue.com/) and the in-hospital health information management department. All data was electronically retrieved except for the medical history, this was manually retrieved from the letter from the ER visit.

Variables

Baseline variables were age, sex, medical history, number of medications used at the time of ER visit, number of hospital admissions in the last 12 months, and admission specialty.

Outcomes were the number of medical consultations in the ER (both calls and in-person visits), medical in-hospital consultations, allied health professional consultations, number of radiological procedures, waiting time for radiological procedures, change in primary treating specialty, length of hospital stay, readmission rates, and mortality rates. A medical consultation is defined as a doctor who visits or is called about the patient for examination to provide advice about the diagnosis or treatment at the request of the primary treating specialist. An allied health professional consultation on the other hand, is defined as an allied health professional visiting a patient on the ward to provide health-promoting or supportive services at the request of the primary treating specialist. The included allied health professionals were physical therapist, dietitian, speech therapist, occupational therapist, and liaison nurse. The number of consultations in the ER and in-hospital, the number of allied health professional consultations, and radiological procedures were presented in two ways. First, as the average number of consultations or procedures per patient because of its clinical relevance and for the sake of readability. Second, the most methodologically correct presentation, as the data are highly skewed and this ordinal presentation also allows for the correction of confounders. The catego-

ries were as follows: 0, 1, 2 and ≥3 for specialists consultations, and 0, 1, 2, 3 and ≥4 for allied health professionals. Readmission rates were cumulatively evaluated for 30 days, 3 months, and 12 months after the primary admission. Mortality rates were cumulatively evaluated for in-hospital deaths, and after 30 days, 3 months, and 12 months.

Statistical analysis

Continuous baseline variables were evaluated for normality distribution. The variable "medications at admission" was normally distributed and was evaluated using an independent sample t-test. The variable "age" was skewed and contained outliers, and was therefore evaluated using Mood's median test since this test is more robust against outliers than the Mann-Whitney U test. All other baseline variables were evaluated using a Chi-Square test. Baseline differences between groups were added as covariates to the main analysis to adjust for potential confounding.

First the outcomes ER, in-hospital and allied health consultations, and the number of radiological procedures were presented descriptively (Figure 3). Second all outcomes were analyzed by either linear, logistic binary, or logistic multinomial regression models, where appropriate. All regression analyses were carried out with adjustment for baseline differences. All analyses were carried out using SPSS (IBM SPSS Statistics for Windows, Version 25.0. Released 2017. Armonk, NY: IBM Corp), with two-sided p-value <0.05 denoting statistical significance.

In addition, we conducted a sensitivity analysis for the length of hospital stay, since we expected this to be affected by two external factors. One factor is the waiting time for post-hospital rehabilitation, which may have differed between the control group and the ICW group because of the COVID-19 pandemic in 2020 which may affect the availability of rehabilitation facilities. Patients were considered "waiting" if they were discharged to an institution they had not been staying previously, as this may give rise to a waiting period. For example, a patient who has been living at home but has been discharged to a nursing home after a hospital stay may have to wait for a bed to become available. Another factor is the shared decision to start providing palliative care, which may either prolong or reduce the length of hospital stay in either study group. For the sensitivity analysis, patients who had to wait for post-hospital care or who received palliative care were excluded, and group differences in length of hospital stay were again analyzed using linear regression.

Results

Patient characteristics

A total of 200 ICW and 239 control patients were included in the study. There were six patients who were in both the ICW and in the control group. Patient characteristics were similar in both groups, except for the distribution in admission specialty (Table 1). Age was bordering statistically different (p=0.052) and was identified as a potential confounder. Both admission specialty and age influenced the crude outcome >10% and therefore outcomes were adjusted for both.

Table 1. Baseline characteristics of patients in the Intensive Collaboration Ward (ICW) and control group

	ICW n=200	**Control** n=239	
	Descriptives		**Statistics**
	n (%)	**n (%)**	**p-value**
Age median (IQR)†	81.5 (14)	79 (17)	0.052
Female ‡	105 (52.5)	115 (48.1)	0.360
Admission specialty ‡			<0.001*
Internal medicine	64 (32.0)	108 (45.2)	
Pulmonary medicine	51 (25.5)	79 (33.1)	
Geriatric medicine	73 (36.5)	42 (17.6)	
Cardiology	12 (6.0)	10 (4.2)	
Medications at admission mean (SD)§	9.2 (5.0)	8.4 (4.6)	0.099
Admissions past 12 months ‡			0.750
0	123 (61.5)	142 (59.4)	
1	41 (20.5)	54 (22.6)	
2	18 (9.0)	22 (9.2)	
3	5 (2.5)	10 (4.2)	
≥4	13 (6.5)	11 (4.6)	
Medical history			
Internal medicine ‡	117 (58.5)	141 (59.0)	0.916
Diabetes mellitus	57 (28.5)	62 (25.9)	0.548
Hematological disease	6 (3.0)	12 (5.0)	0.288
Kidney disease	32 (16.0)	34 (14.2)	0.604
Auto-immune disease	1 (0.5)	7 (2.9)	-
Other	66 (33.0)	81 (33.9)	0.844
Pulmonary medicine ‡	100 (50.0)	133 (55.6)	0.238
COPD/asthma	57 (28.5)	76 (31.8)	0.454
Malignancy	6 (3.0)	17 (7.1)	0.054
Other	64 (32.0)	94 (39.3)	0.111

Table 1. Baseline characteristics of patients in the Intensive Collaboration Ward (ICW) and control group (*continued*)

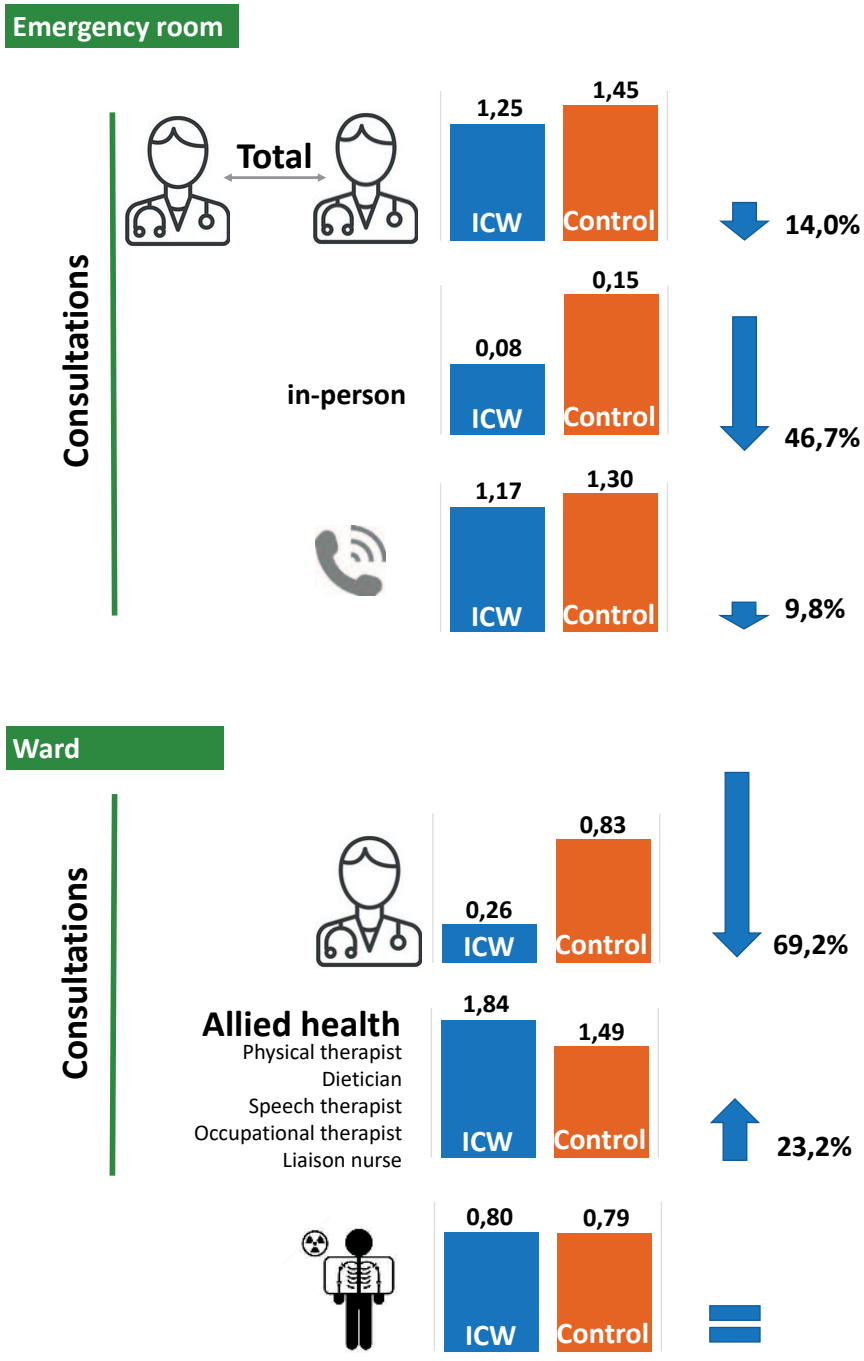
	ICW n=200	**Control** n=239	
	Descriptives		**Statistics**
	n (%)	**n (%)**	**p-value**
Geriatric medicine †	70 (35.0)	75 (31.4)	0.422
Cognitive/neurodegenerative	24 (12.0)	30 (12.6)	0.861
CVA	46 (23.0)	48 (20.1)	0.458
Hip fracture	10 (5.0)	6 (2.5)	0.166
Other	1 (0.5)	1 (0.4)	-
Cardiology †	150 (75.0)	174 (72.8)	0.602
ACS	58 (29.0)	63 (26.4)	0.538
Heart failure	35 (17.5)	42 (17.6)	0.984
AP stable	13 (6.5)	13 (5.4)	0.630
Artery disease	30 (15.0)	31 (13.0)	0.540
CVRM	89 (44.5)	96 (40.2)	0.360
Other	74 (37.0)	84 (35.1)	0.687

COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; ACS = acute coronary syndrome; AP = angina pectoris; CVRM = cardiovascular risk management
- The expected count in the Chi-square test was too low to interpret the p-value
* Significant difference $p<0.05$
† Median test for k samples
‡ Chi-square test
§ Independent sample t-test

Main results

Descriptive analysis showed that in the emergency room ICW patients required less consultations from other specialties than the control patients (-14%), both in person (-47%) as per phone (-10%) (Figure 3). When admitted to the ward, this difference is even larger: a decrease from an average of 0.83 consultations per patients to 0.26 per patient on the ICW (-69%). We saw an increase in number of consultations by allied health professionals on the ICW (+23%). The average number of radiological tests per patient did not change.

Figure 3. Results of ICW care: Clinical relevance



An arrow indicates a relevant difference. An "=" indicates there is no relevant difference.

A more in dept analysis of the outcomes, adjusted for baseline differences, showed similar findings: ICW patients required significant fewer ER consultations than the control group: 25.0% and 37.3% of patients, respectively, had two or more ER consultations (Table 2). The in-person consultations did decrease, but did not reach statistical significance. In both groups, at least one call was made to a specialist for most patients, these calls often being made by residents to their supervisors. However, a second call to a specialist was required less often for patients in the ICW group than for patients in the control group: 15.5% versus 24.7%, a significant decrease compared to the control group (OR 0.14, CI 0.03-0.54). ICW patients required significantly fewer in-hospital consultations in each category (1, 2, or ≥3) than control patients (respective ORs 0.34 (CI 0.21-0.55), 0.11 (CI 0.04-0.29), and 0.07 (CI 0.02-0.33)).

ICW patients significantly less often had 1 allied health professional consultation (OR 0.53, CI 0.30-0.91), but significantly more often had 4 or more consultations (OR 2.03, CI 1.02-4.04). The primary treating specialty was changed significantly more often among ICW patients than among control patients (15.5% vs 4.6%, respectively; OR 4.50, CI 2.16-9.40).

Length of hospital stay, readmission and mortality rates, and the number of and waiting time for radiological procedures did not differ statistically significant between the two groups.

Table 2. Outcomes of patients in the Intensive Collaboration Ward (ICW) compared to the control group

	ICW n=200	**Control** n=239	**Adjusted for baseline differences**	
			OR	**95% CI**
Number of emergency room consultations†				
0	10 (5.0)	2 (0.8)	*Reference category*	
1	140 (70.0)	148 (61.9)	0.16*	0.03-0.74
2	43 (21.5)	74 (31.0)	0.10*	0.02-0.50
≥3	7 (3.5)	15 (6.3)	0.08*	0.01-0.47
Of which in person consultations‡				
0	185 (92.5)	208 (87.0)	*Reference category*	
≥1	15 (7.5)	31 (13.0)	0.53	0.27-1.02
Of which calls to specialists†				
0	10 (5.0)	3 (1.3)	*Reference category*	
1	153 (76.5)	170 (71.1)	0.22*	0.06-0.83
2	31 (15.5)	59 (24.7)	0.14*	0.03-0.54
≥3	6 (3.0)	7 (2.9)	0.23	0.04-1.27

Table 2. Outcomes of patients in the Intensive Collaboration Ward (ICW) compared to the control group (*continued*)

	ICW n=200	**Control** n=239	**Adjusted for baseline differences**	
Number of in-hospital consultations†				
0	158 (79.0)	118 (49.4)	*Reference category*	
1	35 (17.5)	72 (30.1)	0.34*	0.21-0.55
2	5 (2.5)	31 (13.0)	0.11*	0.04-0.29
≥3	2 (1.0)	18 (7.5)	0.07*	0.02-0.33
Number of allied health professional consultations†				
0	51 (25.5)	62 (25.9)	*Reference category*	
1	41 (20.5)	84 (35.1)	0.53*	0.30-0.91
2	43 (21.5)	39 (16.3)	1.21	0.67-2.19
3	27 (13.5)	34 (14.2)	0.83	0.43-1.60
≥4	38 (19.0)	20 (8.3)	2.03*	1.02-4.04
Number of radiological procedures†				
0	112 (56.0)	150 (62.8)	*Reference category*	
1	49 (24.5)	41 (17.2)	1.38	0.84-2.26
2	21 (10.5)	22 (9.2)	1.19	0.61-2.30
≥3	18 (9.0)	26 (10.9)	0.95	0.49-1.83
Change in primary treating specialty‡				
	31 (15.5)	11 (4.6)	4.50*	2.16-9.40
Readmission rate† (cumulative)				
30-day	27 (13.5)	25 (10.5)	1.47	0.81-2.66
3-month	42 (21.0)	55 (23.0)	0.93	0.58-1.47
12-month	72 (36.0)	83 (34.7)	1.06	0.71-1.58
Mortality rate† (cumulative)				
In hospital	17 (8.5)	24 (10.0)	0.73	0.37-1.45
30-day	35 (17.5)	36 (15.1)	1.04	0.61-1.79
3-month	52 (26.0)	47 (19.7)	1.28	0.80-2.06
12-month	80 (40.0)	77 (32.2)	1.22	0.80-1.85
	median (IQR)	**median (IQR)**	**B**	**95% CI (B)**
Waiting time for radiological procedures in hours§				
	5 (19)	3 (20)	0.09	-1.45-9.28
Length of hospital stay in days§				
	5 (5)	5 (5)	-0.02	-1.36-0.83

* Significant difference p<0.05
† Multinomial logistic regression
‡ Binary logistic regression
§ Linear regression

Sensitivity analysis

Significantly more ICW patients (15.5%) than control patients (9.2%) had to wait for post-hospital rehabilitation or care. Palliative care was started in a similar proportion of patients in the two groups (ICW 6.0% and control 6.7%). After exclusion of these patients, we re-evaluated a total of 157 ICW and 202 control patients in the sensitivity analysis. Length of hospital stay was reduced to a median of 4 days in both groups, which was not significantly different.

Discussion

This study demonstrated that providing care centered around a multimorbid patient on an ICW resulted in a clinically relevant and statistically significant decrease in consultations, compared to standard monodisciplinary care. Fewer medical consultations were needed for ICW patients in the ER and also while in the ward. ICW patients were seen more often by allied health professionals. ICW patients primary treating specialty was changed more often, but this does not lead to changing of a ward as it is centered in the ICW. There were no differences in the number of, and waiting time for, radiological procedures, length of hospital stay, readmission rates, and mortality rates.

We concluded that patients in the ICW group required significantly fewer in-hospital consultations than the patients in the control group (no consultation in 79.0% and 49.4%, respectively). Previous studies and systematic reviews done by Reeves, Gougeon, Pannick, Shakib, and Puelle did not report on the number of consultations with medical specialists other than those involved in the collaboration.[12-14, 21-22] The results of our study suggest that care was less fragmented in the ICW group than in the control group. In addition, patients in the ICW group required significantly fewer ER consultations, mainly due to a reduction in the number of consultations with specialists other than the patient's own consultant. This may be clinically relevant when taking into account the effect of being disturbed during other duties, which is the case with unscheduled consultation requests. Research shows that being disturbed increases the likelihood of errors being made[23-24] and it takes a person at least 15 minutes to re-concentrate on what they were doing before being disturbed.[25-26] The daily scheduled treatment team meetings are probably the reason for the decrease in consultations when admitted to the ICW. ER consultations probably decreased because a patient does not have to be admitted to a specific specialty ward and thus does not require consultations by different specialties to decide where a patient should be admitted. The difference in in-person consultations in the ER was not significant, which is most probably due to the low incidence of in-person consultations (7.5% in the ICW and 13.0% in the control group). It is difficult to compare our data with those of other studies because of the heterogeneity of studies.[12-13] The cohort study by

Puelle et al. found that interprofessional collaboration between geriatricians and a hospitalist increased geriatric consultations by 2.3 absolute percentage points.[22] However, the aim of the intervention was to increase geriatric consultations and the authors did not report on medical consultations outside of their collaboration, whereas we focused on all consultations.

Patients in the ICW group were seen significantly more often by allied health professionals than patients in the control group (an average of 1.84 versus 1.49 involved professionals per patient). This could be explained by the collaborative practice with frequent interprofessional and intraprofessional evaluation of the patient, resulting in more attention for the entirety of a patient's health problems and wellbeing, which is in line with the concept of positive health.[27] Allied health professionals provide a wide range of services to help patients achieve optimal wellbeing, in addition to implementing treatment prescribed by medical specialists. To the best of our knowledge, we are the first to report allied health professional consultations as an outcome instead as a part of the intervention. Other studies did not focus on the number of allied health professional consultations.[12-14, 21-22] Allied health professional consultations were not standard for all patients admitted to the ICW, but were implemented based on the needs of the patient and were thus a result of patient-centered care.

The primary treating specialty was changed more often on the ICW. This is probably because it is difficult to establish the main problem in patients with multiple health disorders. We suggest that the intraprofessional patient meetings on the ICW helped clarify the situation, often leading to a change in the primary treating specialty. This, in turn, may have also contributed to the decrease in medical consultations, if similar control patients were admitted to the "wrong" specialty ward and needed to be seen by different medical specialists to establish the primary health problem. The ICW appears to provide the right care in the right place, with clear communication from one doctor, as shown in Figures 1 and 2. This can be seen as a better quality of care. Also, for the ICW group, a change in primary specialty does not result in the patient being moved and having to adjust to a new ward. This makes it logistically easier for the ICW group to change their primary specialty without any negative impact on the patient.

We found no significant difference in length of stay (LOS). Previous studies have also reported on the LOS when interprofessional collaboration is implemented. Reeves et al. reported one study with a reduced LOS of 0.6 days, but also one study with no difference in LOS. Gougeon et al. and Shakib et al. also found no difference in the LOS. Pannick et al. found that 70% of the interprofessional interventions studied did not improve the length of stay, and those that did reduced the length of stay by less than 0.5 days. However, in an earlier study, the ICW was found to reduce the length of hospital stay by two days.[16]

We carried out a sensitivity analysis for two factors that are known to influence hospital stay: waiting time for post-hospital rehabilitation or care and the shared decision to start providing palliative care. Although significantly more ICW patients had to wait for post-hospital rehabilitation or care, probably because of shortage of appropriate beds in 2020 because of the SARS-CoV-19 pandemic, there was still no significant difference between the ICW and the control group: the length of hospital stay was reduced in both groups to a median of 4 days. A possible explanation for the lack of difference in the length of stay may be because we studied two different time periods whereas the previous study compared groups in the same time period, thereby eliminating all factors that influence the length of stay. The same time period method is the preferred study design for the length of hospital stay, such as a previous study on the ICW in which a within time period analyses did show a decrease in length of stay namely from median 7 days to median 5 days.[16]

This study had some limitations. First, patients that were part of the control group were admitted a year prior to the opening of the ICW, which makes comparisons difficult because of potential differences such as waiting time for post-hospital care, as described above. On the other hand, this design eliminated the risk of 'contamination of knowledge' which occurs when comparing groups within one time period. In a within one time period design, specialists can gain knowledge from the ICW collaboration and apply it in the regular care ward, which generates contamination of knowledge and can influence outcomes such as the number of consultations. In this between time period design this is not possible. Second, there was a significant difference in the baseline variable 'admission specialty', the results were adjusted for this accordingly. Third, it is possible that the knowledge of staff working on the ICW and the degree of collaboration increased over time, which may have led to an underestimation of the effect of the interprofessional and intraprofessional care in the ICW group. Fourth, some patients were included in the intervention group and control group, but a sub-analysis of this group was not possible due to the limited number of these patients. However, because of the limited number, we would not expect them to have a significant effect on study outcomes. Lastly, the control group was selected based on the ER letter by a single specialist of the corresponding specialty, so in total four specialists included patients. This might generate selection bias since the specialists screened the ER letters with the study aim in mind. However, the specialists were provided with the least possible information to prevent bias. They were asked: "if there was a ICW in 2019, would you admit this patient to the ICW or not, based on the ER conclusions for each patient". In addition, they did not have any insight into the patients' outcomes, and were not involved in the data collection or analysis. The involved specialists were involved in the data interpretation and writing of the manuscript.

Conclusions

While recognizing the limitations of our study, and adjusting for them where possible, we can conclude that the interprofessional and intraprofessional collaborative practice on the ICW reduced the number of medical consultations needed, which might be an important sign of defragmentation of care and more integrated and efficient care. Combining these between-time period results with the results of the within one time period study of De Gans et al,[16] we believe the ICW has a clinically relevant positive effect on the efficiency of care and patient-centered care. It would be interesting to study the experiences and opinions of patients and healthcare providers about the care provided on the ICW. Further research is required to evaluate interprofessional and intraprofessional collaboration in terms of the quadruple-aim: improved health outcomes, enhanced patient experience, improved work life of healthcare providers, and lower costs.[28]

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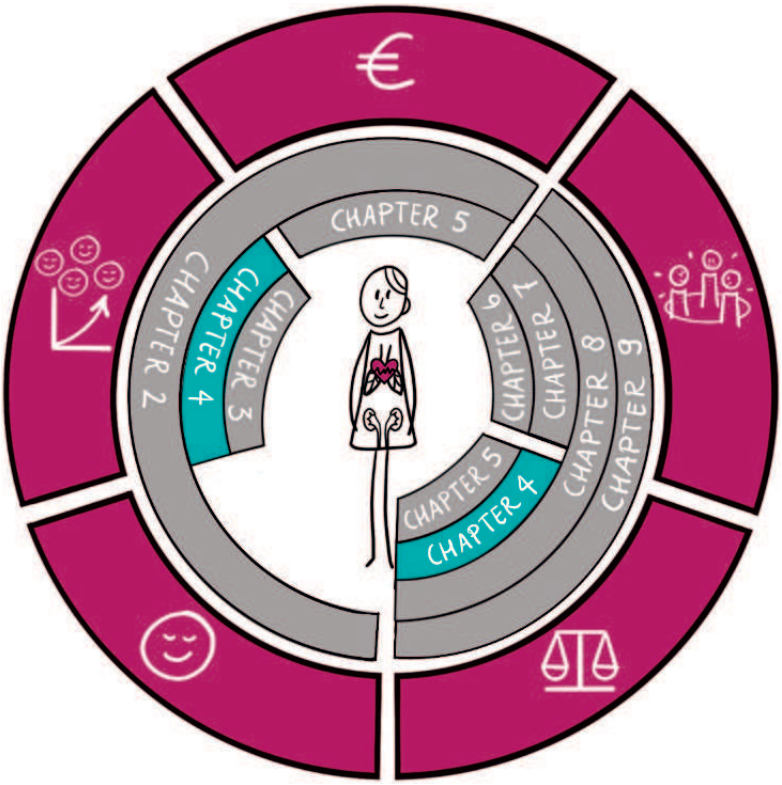
“No one is so brave that he is not disturbed
by something unexpected”

- Julius Caesar

CHAPTER 4

Fewer ER Visits for Older Multimorbid Patients Through Interprofessional Collaboration: Insights from the Intensive Collaboration Ward (ICW)



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Submitted

Abstract

Introduction

The WHO has proposed interprofessional collaboration (IPC) as a promising health care reform to adapt to future healthcare challenges. Among these challenges are a shortage of healthcare professionals, patients becoming more complex due to multimorbidity, and increased use of emergency department services, which could become a bottleneck. Studies investigating the effect of IPC on patient outcomes show mixed results. One promising collaborative practice is the Intensive Collaboration Ward (ICW): which has previously shown promising patient-related outcomes during hospital stay such as shorter length of hospital stay and fewer medical consultations.

Methods

This retrospective cohort study, studies the effects after hospital stay, and included patients from two previous studies on the ICW and acquired follow-up data on one ICW group and two control groups. The primary outcome was the number of emergency department visits within six months of discharge. The secondary outcome was the number of outpatient clinic visits within six months of discharge. Outcomes were analysed using a negative binomial regression.

Results

Patients in the ICW group had significantly less emergency department (0.41 vs 0.16) and outpatient clinic visits (1.67 vs 0.82) compared to the control group.

Conclusions

This study provides further evidence of the potential positive impact of IPC on future healthcare challenges, namely reducing the emergency department use and outpatient clinic visits.

Introduction

The World Health Organization (WHO) has proposed interprofessional collaboration (IPC) as a promising health care reform to adapt to future healthcare challenges.[1] One of the challenges is that the management and care of patients is becoming increasingly more complex. As life expectancy increases, so does the prevalence of multimorbidity. Patients with multimorbidity require care from multiple providers, putting them at risk of fragmented care.[2] This can lead to more emergency department visits[3], preventable hospitalisations[2], and higher costs[4]. A second challenge is the increasing crowding and waiting times in emergency departments, which threaten the accessibility of emergency department care.[5] In addition, the sustainability of healthcare is under pressure from rising costs and a shortage of healthcare professionals.[6-7] In short, fewer healthcare professionals are delivering more and more complex care. These challenges call for healthcare reform.

IPC could help with these challenges, as it involves different healthcare professionals who regularly convene to negotiate and agree on how to solve complex care problems or provide services. Many studies have investigated the effects of a wide variety of IPC practices, with some showing a reduced length of stay and in-hospital mortality.[8] However, a large proportion of studies failed to detect differences in patient-related outcomes.[8]

One promising example of an IPC practice is the Intensive Collaboration Ward (ICW) at the Jeroen Bosch Hospital in the Netherlands. This is an extensive IPC practice for elderly multimorbid patients. Two previous studies on the ICW have shown fewer emergency department medical consultations at primary presentation (-14%), and during admission reduced length of hospital stay (-2 days), fewer medical consultations (-69%), more allied health professional consultations (+23%) and high patient satisfaction (8.22 out of 10).[9-10] Follow-up data showed similar mortality and readmission rates. [9-10]

The aim of this study was to obtain additional follow-up data on patients' use of care after discharge from the hospital. This study aimed to investigate whether the number of emergency department and outpatient clinic visits after discharge differed between ICW and control patients.

Methods

Study design

This retrospective cohort study evaluated the effects of interprofessional collaboration (IPC) on the Intensive Collaboration Ward (ICW) at the Jeroen Bosch Hospital, a large teaching hospital in the Netherlands. The aim was to evaluate the use of healthcare after discharge from an IPC ward, measured by the number of emergency department and outpatient clinic visits after discharge.

This study was conducted and reported in accordance with the STROBE guideline.

Setting

The intervention of interest was the ICW. This is a ward designed to provide care for patients with multiple health problems, after presentation to the emergency department. Multimorbid patients were eligible for admission to the ICW if they presented to the emergency department with acute problems affecting more than one organ system.

During admission there is extensive collaboration in the medical, nursing, and allied health domain. These healthcare professionals participate in intensive interprofessional collaboration to provide a single patient-centred treatment plan for these complex patients and improve the quality of care. A full description of the ICW and its operating procedures can be found in the previous ICW studies.[9-10] At the heart of the collaboration is the patient-nurse-hospitalist triangle. To represent the medical perspective of care, there is collaboration between a hospitalist, cardiologist, geriatrician, internist, and pulmonologist who meet every morning to assess the patient. To represent the allied health domain, there is collaboration between a nurse, hospitalist, dietician, speech therapist, occupational therapist, and liaison nurse who meet three times a week to assess the patient.

Participants

To study the health outcomes of patients on the ICW, one group of ICW patients were compared with two control groups:

- The ICW group consists of patients admitted to the ICW between 15 June 2020 and 31 October 2020. These patients received extensive interprofessional care.
- Control group A is a cohort of comparable patients who met the criteria for admission to the ICW but were admitted to regular geriatric, cardiology, internal medicine and pulmonary wards between 15 June 2020 and 31 October 2020 due to a lack of beds at the ICW. This is a within-timeframe control group.
- Control group B is a historical cohort of comparable patients that were retrospectively identified. These patients were admitted to regular geriatric, cardiology, internal

medicine and pulmonary wards between 15 June 2019 and 31 October 2019. This is a between-timeframe control group, as the ICW did not exist in 2019.

These three patient groups have already been identified in two previous studies of the ICW. [9-10]

The COVID-19 pandemic broke out in the Netherlands in March 2020. However, during the study period from 15 June 2020 to 31 October 2020, there were almost no COVID-19 patients at the Jeroen Bosch Hospital,[11] so this did not affect the comparability of the study groups.

Variables

Baseline characteristics were already available for all patients from the two previous ICW studies and are presented in Table 1. The primary outcome was the number of emergency department visits within six months of discharge from the hospital. The secondary outcome was the number of outpatient clinic visits within six months of discharge from the hospital. Data were extracted manually from the patients' electronic medical records. Outpatient clinic visits were only included if they related to the reason of admission.

Statistics

Negative binominal regressions were performed on the outcome variables, which were right skewed count variables with an overdispersion of zeros. The analyses were corrected for baseline differences.

Ethics

The Ethics Review Board METC Brabant (reference id: NW2020-82 and NW2021-24) declared that this study does not fall under the scope of the Dutch Medical Research Involving Human Subjects Act. This study was carried out according to the principles of the Declaration of Helsinki.

Results

Follow-up data were extracted for ICW patients (n=200), control group A patients (n=51) and control group B patients (n=239). Table 1 summarizes the patients characteristics.

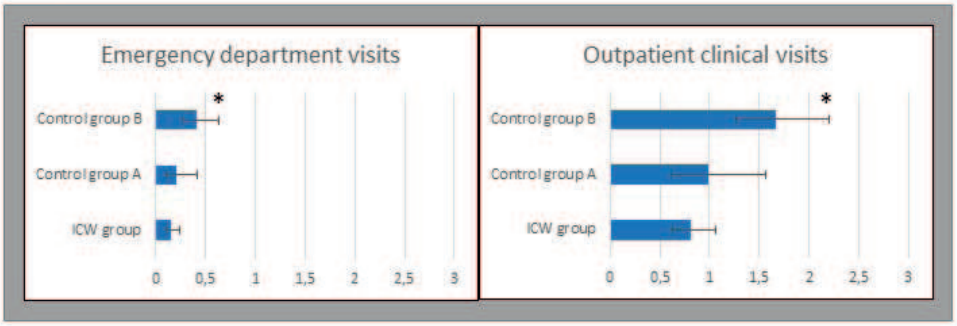
Patients in the ICW group had significantly fewer emergency department visits (0.16 (95%-CI 0.10-0.25) vs 0.41 (95%-CI 0.27-0.63)) in the six months after discharge, compared to patients in control group B (figure 1). Patients in the ICW group also had significantly fewer outpatient clinic visits than control group B (0.82 (95%-CI 0.62-1.07) vs 1.67 (95%-CI 1.27-2.20).

Table 1. Baseline characteristics of patients.

	ICW group	Control group A	Control group B
Total patients (n)	200	51	239
Age (median years)	81.5	79	79
Female (%)	53	55	48
Admission specialty (%)			
Internal medicine	32	24	45*
Pulmonary medicine	26	31	33
Geriatric medicine	37	37	18
Cardiology	6	8	4
No. of medication at admission (mean)	9	6	8
No. of admissions past 12 months (%)			
0	62	57	59
1	20	22	23
≥2	18	22	18
Medical history (%)			
Internal medicine	59	55	59
Diabetes mellitus	29	31	26
Haematological disease	3	4	5
Kidney disease	16	8	14
Auto-immune disease	1	2	3
Other	33	31	34
Pulmonary medicine	50	51	56
COPD/asthma	29	31	32
Malignancy	3	6	7
Other	32	35	39
Geriatric medicine	35	41	31
Cognitive/neurodegenerative	12	24*	13
CVA	23	22	20
Hip fracture	5	8	3
Other	1	0	0
Cardiology	75	73	73
ACS	29	28	26
Heart failure	18	14	18
AP stable	7	2	5
Artery disease	15	14	13
CVRM	45	39	40
Other	37	33	35

* Indicates a statistically significant difference compared to the ICW group.

Figure 1. An overview of healthcare usage within 6 months after discharge from the hospital



On the x-axis is the number of events per patient with the 95% confidence interval. An * indicates a significant difference at p<0.001.

Discussion

This study showed that patients admitted to an interprofessional collaborative practice, namely the Intensive Collaboration Ward (ICW), had reduced healthcare use within six months of discharge, namely fewer emergency department visits and outpatient clinic visits.

This study showed that ICW patients had 60% fewer emergency department visits within six months of discharge. Previous studies investigating interprofessional collaboration in primary care also reported reduced emergency department visits.[12-13] However, studies investigating secondary care settings did not study the number of emergency department visits after discharge.[14] In the current healthcare system the emergency department is a critical bottleneck in the delivery of care, so reducing its use is very positive.

To the best of our knowledge, this is the first study to investigate the number of outpatient clinic visits after discharge from an IPC practice and to report that these were significantly reduced by 50% within six months of discharge.

Clinical implications

To translate these results into clinical practice, the ICW currently treats 545 patients per year. A reduction in emergency department visits from 0.41 to 0.16 (-0.25, 95% CI -0.16 to -0.39) per 6 months implies a minimum reduction of 45 to 105 visits every 6 months. In addition, an emergency department visit can have a major impact on the patient, so reducing visits can have a positive impact on the patient. A reduction in outpatient clinic visits from 1.67 to 0.82 (-0.85, 95% CI -0.65 to -1.13) per 6 months would mean a minimum

reduction of 176 to 309 visits per 6 months. Given the shortage of healthcare professionals and waiting lists for outpatient clinics, this is an important finding.

Strengths and limitations

This study should be seen in light of some limitations. First, this is a single-centre study with a specific interprofessional collaborative practice, making generalisability to other settings difficult. Second, this ICW has been implemented in the Netherlands. It is uncertain whether this care model can be implemented in other countries with similar results. However, tailored modifications could be made to improve implementation. Third, the ICW is specifically designed for older patients with multimorbidity and involves collaboration between a hospitalist, cardiologist, geriatrician, internist, and pulmonologist. It is unknown whether a comprehensive interprofessional collaborative practice such as the ICW can be effective in treating other patient groups.

This study also has some strengths to be noted. The ICW is a unique IPC practice which was set up by healthcare professionals from clinical practice. The ICW has been shown to improve patient-related outcomes.[9-10]

Conclusions

This study shows that patients admitted to the ICW require significantly fewer emergency department and outpatient clinic visits after discharge. This is further evidence of the potential positive impact of interprofessional collaboration on the future challenges of caring for more complex patients with fewer healthcare professionals.

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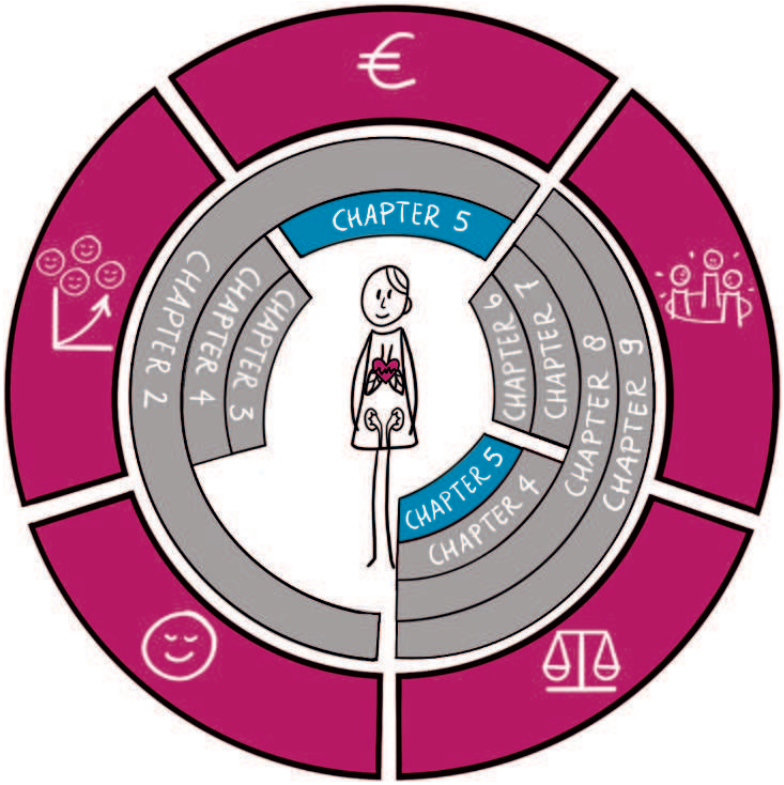
Part III:
Reduced costs

“Niet alles van waarde is meetbaar en niet alles
wat meetbaar is, is van waarde”

- Einstein

CHAPTER 5

Improved Care, Similar Costs, and Improved Health Equity by Interprofessional Collaboration: An Economic Evaluation



Simon T. de Gans, Babette C. van der Zwaard, Renske E.M. Labordus-van Helvoirt, E. Cornegé-Blokland, Eddy M Adang, Marjolein H.J. van de Pol, Carolina J.P.W. Keijsers

Journal of the American Medical Directors Association. 2024; 25(10), 105200.

Introduction

The affordability of healthcare is under pressure due to rising healthcare costs and increased care demands.[1-2] Additionally, a shortage of healthcare professionals is expected to put further pressure on the healthcare system.[3-4] These two factors put the sustainability of the healthcare system at risk, and a reform of the healthcare system is required.

The World Health Organization (WHO) has proposed interprofessional collaboration (IPC) as promising healthcare reform.[5] However, two recent reviews investigating IPC showed mixed results on patients outcomes and that not a single study evaluated the costs of interprofessional care.[6-7] It is not sensible to widely implement a healthcare reform without knowing the associated costs.

To date, the Jeroen Bosch Hospital has a dedicated IPC practice: the Intensive Collaboration Ward (ICW) in which interprofessional care is provided to patients with multimorbidity. Two studies of the ICW showed high patient satisfaction and improved patient-related outcomes, but did not evaluate the financial implications.[8-9] The aim of this study is to perform a cost-consequence analysis that 1) presents the patient-related outcomes of the two previous studies, 2) performs a cost analysis, 3) describes the associated implications for primary and secondary care.

Methods

This study conducted a trial based cost-consequence analysis of the ICW using a healthcare perspective. To do so, this study presents patient-related outcome data from one intervention group (ICW) compared to two control groups: (A) within time frame,[8] (B) historical.[9] This study was conducted at the Jeroen Bosch Hospital, the Netherlands. A detailed description of the study groups can be found in previous ICW publications.[8-9]

The ICW is an interprofessional collaboration between the specialties of geriatrics, cardiology, internal medicine, pulmonology, and hospital medicine. The ICW was set up to provide care for older patients with multimorbidity. Every morning there is a treatment meeting with a medical specialist from each specialty to provide an integrated treatment plan for the patient. In addition, a hospitalist, nurses, and allied health professionals meet three times a week to discuss the patient in the broadest sense and develop a treatment plan. A more detailed description can be found in the previous ICW publications.[8-9]

Table 1 summarises the data used as input for the cost analysis. All patient-related outcomes were used in the analysis. The ICW required additional time spent by profes-

sionals, namely the employment of a hospitalist (1.33 FTE) and the time spent by allied health professionals for the three weekly meetings (0.25 FTE in total).[8] These additional personnel costs were divided equally among all ICW patients and added to their total cost. The daily treatment meeting with the medical specialist was determined to be a shift in time spent, as the number of patients in the hospital did not change, so there was no additional costs because of this. Apart from these additional staff costs, the operating procedures of the ICW did not generate any additional costs. Three sources were used for cost prices, all of which were adjusted for inflation: National Health Institute (ZIN) guideline for economic evaluations,[10-11] if not specified, a cost price was calculated from internal hospital data, and health professional costs were calculated using the collective labour agreement. The total cost of care per patient per admission was then calculated. The total costs distribution was rightly skewed and analysed by GLM Gamma regression. Baseline differences, namely admission specialty and cognitive impairment, were taken into account.

To explore the implications for primary care, an interview with open questions to reflect on the results was conducted with Dr Marjolein van de Pol, a general practitioner, director of medical education at Radboud University Medical Centre, and professor of student wellbeing. For secondary care, a similar interview was conducted with Esther Cornegé-Blokland, a geriatrician and chair of the Medical Specialist 2035 programme of the Dutch Association of Medical Specialists. After the analysis, they were both shown the results of this study and openly asked what the implications of these results were, with follow-up questions.

The Ethics Review Board METC Brabant (reference id: NW2020-82 and NW2021-24) declared that the previous two ICW studies fell outside the scope of the Dutch Medical Research Involving Human Subjects Act.

Results

Table 1 shows an overview of the patient-related outcomes used in this study. To summarize: ICW patients had a shorter length of hospital stay, received more allied health professional consultations, and required less in-hospital and emergency department in-person consultations. After discharge, patients required fewer emergency department and outpatient clinic visits. In addition, the patients' experience of care did not differ.

Cost of care did not differ between groups. The cost of one admission was €3756 (3285-4295) for the ICW group, €3842 (3065-4823) for control group A, and €3790 (3290-4365) for control group B. Compared to the ICW group, control group A did not have a statisti-

Table 1. Overview of the patient-related outcomes included in this study and their implications.

	Control group A Within-timeframe	**Control group B** Historical	**ICW**	**-ICW implementation-** Implications of the results for employees and the healthcare system	
	n=51	n=239	n=200	Primary care (GP)	Secondary care
Length of hospital stay	↑	=	Reference	-	More patients can be treated More workload Beds could be closed, reducing personnel needed
In-hospital consults	↑	↑		-	Less workload
Emergency department in-person consults	X	↑		-	Faster ER turnover Less workload More patients can be treated
Allied health professional consults	↓	↓		-	More workload
Emergency department visits	=	↑		Less acute care and workload	Less workload Shorter waiting time More patients can be treated
Outpatient clinic visits	=	↑		More follow-up	Less workload Shorter waiting time More patients can be treated
Mortality rates	=	=		-	-
Readmission rates	=	=		-	-
Patient experience	=	N/A		-	More efficient care while maintaining patient satisfaction

=indicates no difference between groups. ↑ indicates a higher value than in the ICW group. ↓ indicates a lower value than in the ICW group
X indicates no statistics were computed due to low numbers.
N/A indicates this variable was not available for this group.

cally significant difference in costs (B=0.023, p=0.842), nor did control group B (B=0.009, p=0.904).

Implications for primary and secondary care are summarized in table 1. They show that health equity may improve. In addition, acute care disrupts a GP's workflow and has a major impact, so reducing this burden is an important finding. For secondary care the most important conclusion is that more patients can be treated with the same amount of staff, while maintaining high patient satisfaction.

Discussion

This study showed that an interprofessional collaborative practice, specifically the Intensive Collaboration Ward (ICW) has similar patient satisfaction, improved patient outcomes, and similar costs compared to usual care. In addition, this study reported the implications for primary and secondary care which show that health equity may improve.

Nowadays, the evaluation of health care is often carried out according to the Triple or even Quintuple Aim,[12-13] which describes several objectives: (1) patient satisfaction, (2) patient outcomes, (3) cost of care, (4) health professionals well-being, (5) health equality. No previous study has reported (positively) on all the first three (Triple Aim) outcomes of an interprofessional collaborative practice.[6] Therefore, this study is the first to demonstrate this. Furthermore, this study reports implications that describe that health equity could improve by freeing up beds, reducing workload, and decreasing the number of required staff. When looking at all results one might conclude that ICW is a cost-effective modality. This further endorses the positive impact of an interprofessional collaborative practice in the Dutch healthcare system.

There is growing interest in this topic, with several protocol papers aimed at investigating the cost-effectiveness of IPC.[14-15] In today's healthcare challenges, gathering this evidence is becoming increasingly important.[5]

This study should be seen in light of some limitations. First, the complex nature of the intervention complicates generalizability to other settings. Second a previous study suggested the ICW would reduce the number of required residents (doctors training to become medical specialists) by 2.66 FTE.[8] However, this reduction has not been achieved as of yet, and was therefore not included in the analysis. In contrast, the ICW did also not increase the number of required residents which is beneficial given the growing shortage of healthcare workers.[3-4]

Conclusions and implications

This study shows that interprofessional care on the Intensive Collaboration Ward (ICW) has positive results on the goals of the Quintuple Aim: similar patient satisfaction, improved patient outcomes, similar cost, and indications for improved health equity compared to usual care. It would also be interesting to investigate staff satisfaction, the fourth aim of the Quintuple aim, when working interprofessional.

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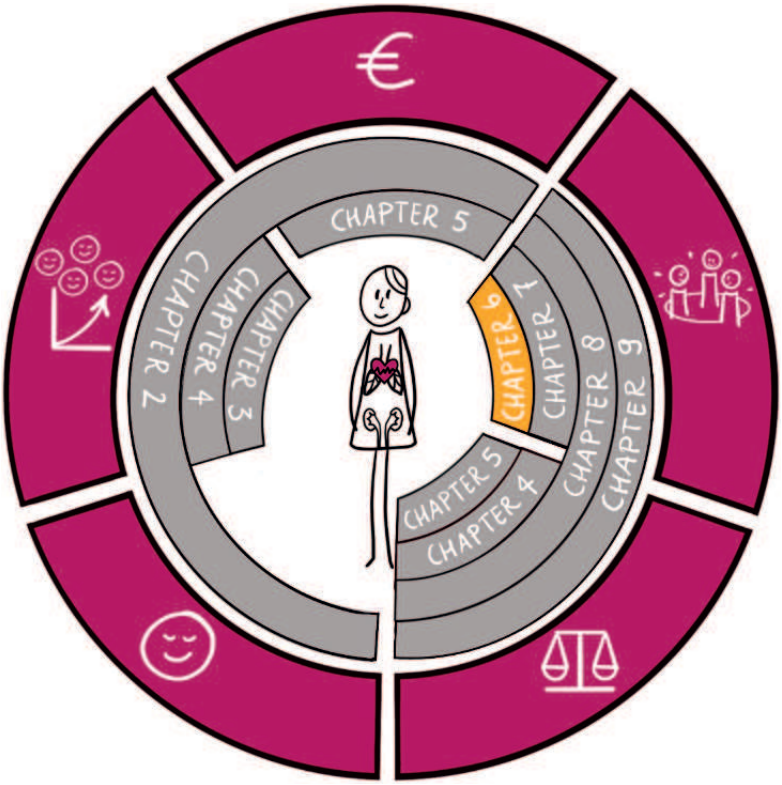
Part IV:
Improved healthcare professional wellbeing

“You cannot be lonely if you like the person
you’re alone with”

- Wayne Dyer

CHAPTER 6

Work engagement, culture of care, and interprofessional identity of healthcare professionals in an interprofessional collaborative practice: A survey study on the Intensive Collaboration Ward (ICW)



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Submitted

Abstract

Introduction

Healthcare professionals' wellbeing plays a key role in the delivery of high quality healthcare, and poor wellbeing is associated with poorer patient health outcomes. Interprofessional collaboration has been shown to improve patient health outcomes, but its relationship with healthcare professionals' wellbeing remains unclear.

Methods

This single-centre, longitudinal, repeated measures survey study investigated whether constructs related to healthcare professionals' wellbeing were interrelated and if scores on these constructs changed over time when working interprofessionally. Wellbeing was measured using the constructs of work engagement, culture of care, and interprofessional identity through online surveys. The interprofessional collaborative practice in this study was the Intensive Collaboration Ward (ICW). Correlations between constructs were analysed using the non-parametric Spearman's correlation. The change in scores over time within constructs was evaluated pairwise using the Wilcoxon signed-rank test.

Results

A correlation was found between the constructs of work engagement and culture of care (r 0.48, $p<0.001$), and between culture of care and interprofessional identity (r 0.30, $p=0.017$). Multiple correlations were seen on the subscales. There was no change in constructs over time.

Conclusions

This study shows that constructs related to healthcare professionals' wellbeing are interrelated. The causal relationship between these constructs on healthcare professionals' wellbeing needs to be further explored.

Introduction

Healthcare professionals play a key role in the delivery of healthcare. Caring for healthcare professionals is essential for the quality of healthcare.[1,2] Different aspects of healthcare can be assessed using the Quadruple Aim, which has 4 domains: improving patient satisfaction, improving patient health comes, reducing costs, and improving the wellbeing of healthcare professionals.[2] The Quadruple aim recognises the healthcare professionals' wellbeing as a prerequisite for good patient care.[2] Poor wellbeing and dissatisfaction of healthcare professionals are associated with lower patient satisfaction[3,4], negative clinical outcomes[5-7], and inappropriate use of resources resulting in increased costs[8,9]. With the challenges of workforce shortages and increasing care demands due to ageing and multimorbidity, promoting the wellbeing of healthcare professionals is becoming increasingly important.[10-13]

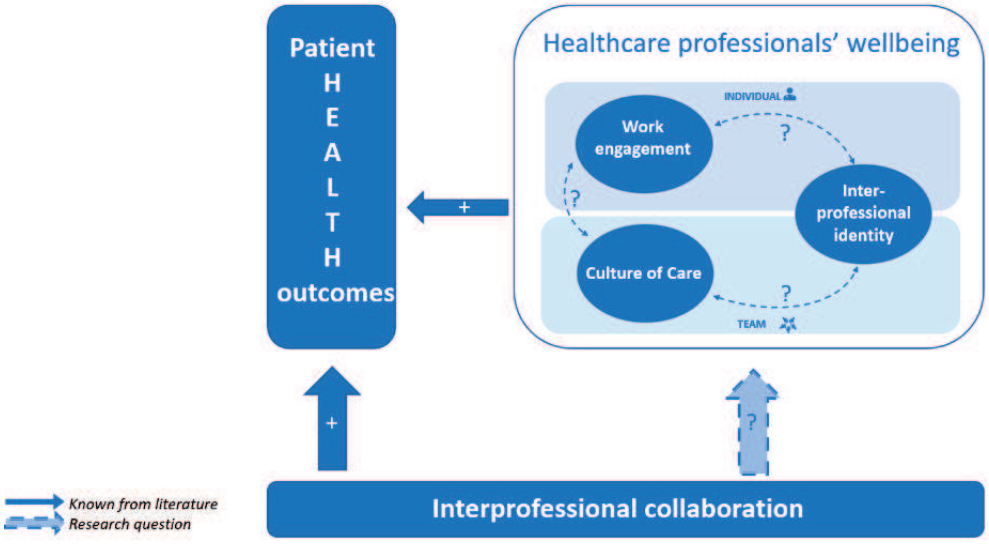
Interprofessional collaboration (IPC) may be a successful strategy to improve healthcare professionals' wellbeing. Studies have shown that IPC may reduce burnout and intention to leave the workplace,[14] and increase satisfaction.[15] Other studies suggest that collaboration in general is associated with the wellbeing of healthcare professionals, but the findings are based on teamwork within one profession rather than IPC.[16,17] There is no all-encompassing definition of healthcare professionals' wellbeing and many aspects have yet to be explored.

In the absence of an all-encompassing definition of healthcare professionals' wellbeing and its relation with IPC, three aspects are already known to influence IPC: individual aspects, team aspects, and interprofessional aspects. There are constructs that measure these aspects and are known to influence the experience of healthcare professionals: work engagement, culture of care, and interprofessional identity.

Work engagement, briefly defined as a positive, fulfilling, work-related state of mind[18], is valued as the totality of an individual's experience resulting from work, including, for example, job satisfaction which addresses the valuation of job conditions or characteristics.[19] Moreover, work engagement is sometimes presented as the antithesis of burnout[18] and as a positive predictor of the quality of care.[20] Culture of care is defined as 'shared beliefs, norms and routines, to gauge the different attributes of caring environments'.[21] This relates to the culture of the main care team to which the individual belongs. This is important as healthcare professionals often rate the working environment and collegial relationships as most important to their wellbeing.[22,23] Interprofessional identity is a part of the healthcare professional's self-concept that reflects her/his belonging, commitment and beliefs related to a perceived membership of an interprofessional group or community.[24,25] This is believed to be a crucial driver of IPC.[25-29] So far, the literature has

reported that work engagement as an indicator of satisfaction, culture of care as visible in the work environment, and interprofessional identity as a source of motivation are each positively associated with patient health outcomes, but their mutual association has not been studied yet.[20,30-32] A recent study examined the culture of care using the Culture of Care Barometer (CoCB) and investigated whether 3 subscales of the CoCB were associated with work engagement and found a moderate positive correlation.[33] However, this study did not examine the relationship between all subscales of the CoCB and work engagement, nor did it examine the relationship between the total CoCB score and work engagement. In addition, it did not examine the interprofessional identity of healthcare professionals. Therefore, it is not known whether work engagement, culture of care, and interprofessional identity are interrelated. Figure 1 provides an overview of what is currently known and unknown.

Figure 1. An overview of the known relationships between, interprofessional collaboration, patient health outcomes, work engagement, interprofessional identity, and culture of care.



We hypothesise that individual aspects, team aspects, and interprofessional aspects, and thus the constructs of work engagement, culture of care, and interprofessional identity are related to each other and to wellbeing. However, as there is almost no literature investigating the relation of these constructs, we cannot provide detailed hypothesis about the specific relation, their magnitude, or an explanation of the hypothesised relation. The aims of this explorative survey study are therefore to 1) explore the relationship between work engagement, culture of care, and interprofessional identity and (2) examine if these constructs change during IPC as part of the healthcare professionals' wellbeing.

Methods

Study design

This single-centre, longitudinal, repeated measures exploratory survey study examined whether individual aspects, team aspects, and interprofessional aspects of healthcare professionals' wellbeing as measured by the constructs of work engagement, culture of care, and interprofessional identity as a measure of healthcare professionals' wellbeing, were related and whether these changed over time. To do so, work engagement, culture of care, and interprofessional identity of healthcare professionals were assessed in an online survey before and after working in an interprofessional collaborative practice: the Intensive Collaboration Ward (ICW) in Hospital Gelderse Vallei, Ede, the Netherlands. This study was conducted and reported with respect to the Consensus-Based Checklist for Reporting of Survey Studies (CROSS).[34]

Participants

All healthcare professionals working at the interprofessional collaborative practice (the ICW) were eligible to participate in this study. The involved healthcare professionals include medical specialists, residents, nurses, and allied health professionals of the involved departments: cardiology, internal medicine, pulmonology, and geriatric medicine. There were no exclusion criteria.

Setting

This study took place at the ICW in Hospital Gelderse Vallei, Ede, the Netherlands. The ICW was operational from April to December 2022. The ICW is an interprofessional collaborative practice designed to care for older patients with multimorbidity, based on the design of the ICW at the Jeroen Bosch Hospital, which is described in detail elsewhere.[35,36] The ICW is an example of an interprofessional collaborative practice in hospital care, where healthcare professionals work together, regularly come together and negotiate to provide an integral solution for patients. This differs from multidisciplinary or multiprofessional teamwork where professionals work parallel to each other and not necessarily work holistically towards an integral solution.[28,37]

The ICW at Hospital Gelderse Vallei has several operating procedures. There is one coordinating physician, a resident, which is slightly different from the ICW at the Jeroen Bosch Hospital, where a hospitalist is the coordinating physician. The coordinating physician works closely together with the bedside nurse and together they form the contact team for the patient and their family. The nursing team consists of nurses from all involved specialties ensuring a diverse background. Every morning there is a Treatment Team Meeting (TTM) to discuss the medical perspective of care. In this TTM, each patients' values and

believes are introduced by the resident as a starting point for the meeting. Subsequently, the patient is evaluated by the resident together with a cardiologist, geriatrician, internist, and pulmonologist. The medical specialists combine their expertise, and all visions integrate into tailor-made solutions for each patient. Additionally, the nurse and resident meet three times a week with a team of allied health professionals to discuss other aspects of the patients' health. This team involves a physical therapist, dietitian, speech therapist, occupational therapist, and liaison nurse.

Measurement instruments

The primary study outcome is the relation between work engagement, culture of care, and interprofessional identity. The secondary outcome is the change in scores on these constructs over time within a healthcare professional when working in an interprofessional collaborative practice. These results were obtained through an online survey.

Table 1 provides a brief overview of the instruments used. The survey measures the three constructs using validated questionnaires, which respectively are the Utrecht Work Engagement Scale (UWES-9)[18], Culture of Care Barometer (CoCB),[33] and Extended Professional Identity Scale (EPIS)[24]. For all three questionnaires, a Dutch version was available and used. In addition, questions on personal data (age, gender, and job title) were included.

Data collection procedure

Online surveys were sent to all involved healthcare professionals, one week before the start of the ICW on April 4th 2022 and five months later. Potential participants were approached through their work e-mail address with a link to the online survey using the online tool Enalyzer.[38] On each assessment moment, a reminder was sent 1-2 weeks after the first approach. Within the completed surveys, there were no missing data, as the survey could not be completed without answering all questions except for the baseline characteristics.

Participation was voluntary. Results were electronically coded by the unique employee number enabling longitudinal linking while preventing duplicates within one timepoint. The employee number has no meaning except for those with access to the database for employee numbers and personal files. The raw data were not shared with people who have access to this database. Therefore, the coding guaranteed that the results could not lead to an individual or the other way around.

Table 1: A short overview of instruments used in this study

Scale		**Questions**			**Clinimetrics**	
Description	Construct and subscales	Number of questions	Answer options	Example question	Reliability (α*)	Validity
UWES	**Work engagement**	**9**	Multiple choice 7-point Likert scale		0.93	Confirmatory factor analyses: 3 factors
Scope: Individual healthcare professional Language: Dutch	Vigor	3		*When I get up in the morning, I feel like going to work*	0.84	
	Dedication	3		*My job inspires me*	0.89	
	Absorption	3		*I get carried away when I'm working*	0.79	
Culture of care barometer	**Culture of care**	**30**	Multiple choice 5-point Likert scale		N/A	Confirmatory factor analyses: 5 factor model
Scope: Individuals view on their team Language: Dutch	Organizational support	6		*I have the resources I need to do a good job*	0.79	
	Leadership	7		*I am kept well informed about what is going on in our team*	0.84	
	Collegiality and teamwork	6		*When things get difficult, I can rely on my colleagues*	0.83	
	Relationship with manager	5		*I feel well supported by my line manager*	0.88	
	Employee influence and development	6		*I am able to influence how things are done in the organization*	0.85	
EPIS	**Interprofessional identity**	**12**	Multiple choice 5-point Likert scale		0.89	Confirmatory factor analyses: 3 factors
Scope: Individual as member of an interprofessional team Language: Dutch	Belonging	4		*I like meeting and getting to know people from other health professions.*	0.79	
	Commitment	4		*I prefer working with others in an interprofessional team*	0.81	
	Beliefs	4		*Joint clinical decision-making should be an important part of interprofessional collaboration.*	0.80	

* internal consistency measured as Cronbach's alfa (α)
N/A means this was not available

Statistical analysis

Descriptive baseline characteristics were reported. Mean scores of the UWES-9, CoCB, and EPIS were calculated per completed survey for the total questionnaire and for the subscales.

To assess whether the total scores and subscale scores of work engagement (UWES-9), culture of care (CoCB), and interprofessional identity (EPIS) were related, a correlation analysis was conducted between the corresponding questionnaires. Data from all respondents at both assessment moments were used. Correlation analysis was first carried out between total questionnaire scores and then between subscale scores. In the absence of a normal distribution, the non-parametric 2-tailed Spearman's correlation was used. After Bonferroni correction for multiple testing, significance was set at $p<0.05$ for total scores and $p<0.01$ for subscale scores. For significant correlation coefficients, the effect size *r* was interpreted as small (<0.30), medium (0.30-0.50) or large (>0.50).[39]

In order to assess whether the levels of work engagement, culture of care, and interprofessional identity changed over time, a within-subject analysis was conducted using data from the matched pairs. As the distribution of the scores was skewed, medians were calculated per questionnaire per assessment moment. The differences in scores between the assessment moments were analysed using the non-parametric Wilcoxon signed-rank test. Significance was set at $p<0.05$. All analyses were carried out using SPSS (IBM SPSS Statistics for Windows, Version 27.0. Released 2017. Armonk, NY: IBM Corp).

Ethical considerations

This study does not fall under the scope of the WMO, as was declared by the Medical Ethics Review Committee (METC) Oost-Nederland (dossier number 2021-13149). All participants were given explanation on the goal of the study and its voluntary nature of participation within the survey. In addition, participants were explained that the data will be coded, stored safely, and not used for other purposes than research. The study was carried out according to the principles of the Declaration of Helsinki.

Results

In total, 44 of the 115 (38%) healthcare professionals contacted completed the survey. A total of 62 surveys were completed, 35 in the pre-measure (April-2022) and 27 in the post-measure (September-2022), with 18 matched pairs of respondents completing both moments. Most respondents were medical specialists, followed by nurses (Table 2).

Table 2. Baseline characteristics of respondents

	Pre-measure n=35	Post-measure n=27	Matched pairs of both moments n=18
Age (mean in years with SD)	37.6 (10.8)	41.3 (11.4)	40.4 (11.3)
Female (n with %)	23 (66)	19 (70)	14 (78)
Job function (n with %)			
Medical specialist	15 (43)	14 (52)	9 (50)
Resident	6 (17)	3 (11)	2 (11)
Nurse	10 (29)	7 (26)	6 (33)
Allied health professional	4 (11)	3 (11)	1 (1)
Years of working in this hospital (median in years)	7.0	9.0	8.5

Primary outcome: Correlation

Table 3 shows the outcomes of the correlation analyses. The Spearman's correlation was performed on all 62 surveys. On total questionnaire scores a significant correlation was found between both the UWES-9 and the CoCB (r 0.48, p<.001), and between the EPIS and the CoCB (r 0.30 p=0.017). The correlation coefficients indicated a medium effect size for both the correlations.

When looking at subscale analyses, no significant correlation was found between the UWES-9 and EPIS. UWES-9 subscales were found to correlated with several CoCB subscales. The CoCB subscales "organisational support" and "collegiality and teamwork" were significantly correlated with the EPIS subscale "beliefs".

Table 3. Results of the Spearman's correlation test on total and subscale test scores of the instruments UWES-9, CoCB and EPIS.

	UWES-9 total	1	2	3	CoCB total	4	5	6	7	8	EPIS total	9	10	11
UWES-9 total	1													
1	**0.86**	1												
2	**0.87**	**0.69**	1											
3	**0.86**	**0.57**	**0.61**	1										
CoCB total	**0.48**	**0.37**	**0.49**	**0.39**	1									
4	**0.36**	**0.37**	**0.51**	0.12	**0.71**	1								
5	**0.36**	0.30	0.30	0.31	**0.85**	**0.50**	1							
6	**0.41**	**0.38**	**0.47**	0.26	**0.67**	**0.52**	**0.51**	1						
7	**0.45**	**0.33**	**0.35**	**0.46**	**0.66**	**0.35**	**0.45**	**0.34**	1					
8	0.26	0.12	0.23	0.25	**0.77**	**0.46**	**0.78**	**0.50**	0.30	1				
EPIS total	0.15	0.16	0.18	0.07	**0.30**	0.30	0.15	0.26	0.23	0.13	1			
9	0.04	0.12	0.05	0.04	0.19	0.22	0.03	0.15	0,16	0.03	**0.85**	1		
10	0.07	0.02	0.08	0.08	0.24	0.19	0.12	0.03	0.28	0.13	**0.82**	**0.59**	1	
11	0.20	0.21	0.26	0.09	**0.40**	**0.37**	0.32	**0.44**	0.17	0.24	**0.72**	**0.45**	**0.39**	1

1=vigor, 2=dedication, 3=absorption, 4=organisational support, 5=leadership, 6=collegiality and teamwork, 7=relationship with manager, 8=employee influence and development, 9=belonging, 10=commitment, 11=beliefs.

A significant correlation is indicated in bold. Significance was set at $p<0.05$ for total questionnaire scores and at $p<0.01$ for subscale scores after Bonferroni correction.

Secondary outcome: Change in scores over time

Of the 18 matched pairs, all of the corresponding 36 surveys were included. Descriptive analysis showed similar scores for the two assessment moments. There were no significant differences between the pre- and post-measure scores for either questionnaire (Table 4).

Table 4. Results of the within-subject analysis before and after working on a interprofessional collaborative practice

	MEDIAN (range)		WILCOXON SIGNED-RANK TEST
CONSTRUCT	Pre-measure n=18	Post-measure n=18	Significance (p-value)
Work engagement (UWES-9)	4.33 (2.78-5.22)	4.12 (2.89-5.22)	0.585
Vigor	4.00 (2.33-5.00)	4.00 (3.00-5.33)	0.556
Dedication	4.67 (3.00-5.67)	4.33 (3.00-5.67)	0.821
Absorption	4.33 (2.33-5.33)	4.00 (2.33-5.00)	0.500
Culture of care (CoCB)	3.78 (1.83-4.97)	3.80 (2.03-4.90)	0.419
Organizational support	3.75 (1.83-4.83)	3.83 (1.17-4.83)	0.345
Leadership	3.64 (1.71-5.00)	3.64 (2.43-4.71)	0.611
Collegiality and teamwork	4.08 (2.17-5.00)	4.08 (3.50-5.00)	0.565
Relationship with manager	3.80 (1.80-5.00)	4.00 (1.60-5.00)	0.090
Employee influence and development	3.83 (1.67-5.00)	3.83 (1.33-5.00)	0.782
Interprofessional identity (EPIS)	3.92 (1.67-4.58)	3.92 (3.58-5.00)	0.199
Belonging	4.25 (2.00-5.00)	4.00 (3.75-5.00)	0.716
Commitment	3.75 (2.00-4.75)	3.75 (3.25-5.00)	0.088
Beliefs	4.00 (1.00-4.75)	4.00 (3.50-5.00)	0.070

Discussion

This survey study investigated the coherence of three constructs associated with healthcare professionals' wellbeing on the individual level, team level and interprofessional level, measured with respectively the work engagement, culture of care and interprofessional identity. This study found a significant correlation with a medium effect size between total and subscale scores of work engagement and culture of care, and between culture of care and interprofessional identity. There was no correlation between work engagement and interprofessional identity. We found no significant change over time in the levels of work engagement, culture of care, or interprofessional identity when working in an interprofessional collaborative practice, namely the Intensive Collaboration Ward (ICW) at Hospital Gelderse Vallei.

The importance of healthcare professionals' wellbeing and the potential of collaboration to ensure wellbeing has been recognised in the literature, and this wellbeing has been integrated into the Quadruple Aim as a prerequisite for good patient care.[2] To date, studies have mainly focused on collaboration within one profession or cooperation rather than on IPC, or have focused only on individual-based constructs of wellbeing.[17,40] To the best

of our knowledge, this is the first study to assess the wellbeing of healthcare professionals in the context of an interprofessional collaborative practice, and therefore an exploratory approach was chosen. We assessed the wellbeing of healthcare professionals in an interprofessional collaborative practice, and found that the team-based construct of culture of care correlates with the individual constructs of work engagement and interprofessional identity with a medium effect size.

First, the relation between the individual construct of work engagement and the team-based construct of culture of care will be discussed. Recent studies among nurses reported an association between work environment and work engagement.[41,42] These studies used a different construct, the work environment, which is described as 'the *organizational characteristics* of a work setting that facilitate or constrain professional nursing practice'.[43] We aimed to capture a broader range of experiences of all healthcare professionals in an interprofessional context and therefore assessed the culture of care, defined as 'shared beliefs, norms and routines, to gauge the different attributes of caring environments'.[21] A study by Maasen et al. used the same constructs of work engagement (UWES-9) and culture of care (CoCB) as our study and found a significant correlation between the total UEWS-9 scores and the CoCB subscales 'collegiality & teamwork', 'relationship with manager', and 'employee influence and development' with respective correlation coefficients of 0.46, 0.41, and 0.46.[40] Our study also found a significant correlation for the first two, respectively 0.41 and 0.45, but not for the latter (correlation 0.26, not significant). However, Maassen et al.[33] only looked at the UWES-9 total score and three CoCB subscales, whereas we looked at all subscales of both questionnaires. Moreover, the correlation we found between the work engagement and culture of care is important because healthcare professionals value the working environment and team relationships as the most important for their wellbeing,[22,23] and an environment that promotes staff wellbeing has been shown to be positively associated with patient safety.[7]

Secondly, the relation between the team-based construct of culture of care (CoCB) and the interprofessional construct of interprofessional identity (EPIS) will be discussed. A medium correlation of 0.30 was found between the CoCB and the EPIS. There was a significant correlation between the subscale "beliefs" and the subscales "organisational support" and "collegiality and teamwork". These three subscales all focus on team aspects and this correlation would have been expected.

Surprisingly, we did not find a correlation between the individual construct of work engagement and the interprofessional construct of interprofessional identity. We hypothesise that people can also be engaged in their work when they are working alone. This hypothesis is supported by our findings, but further research is needed.

In addition to the correlation on total questionnaire scores, we also investigated the correlation on subscale scores of these same three constructs. We found nine significant correlations between the subscales of the three constructs. Most interestingly, relatively large correlations were found between dedication and organisational support (0.511); dedication and collegiality & teamwork (0.474); absorption and relationship with manager (0.462); and collegiality & teamwork and beliefs (0.444). The strongest correlation with a coefficient of 0.511 is between organisational support and dedication, which indicates that individuals who experience organisational support tend to be more dedicated to their work. The correlation between collegiality & teamwork and beliefs is also interesting to note, as this could indicate that individuals who can rely on their team find shared decision making important. These subscales with a rather large correlation may be interesting for organisations to intervene on, as increasing one may also increase the other resulting in greater healthcare professionals' wellbeing.

As this was an exploratory study, we did not aim to gain a deeper understanding of the relationship between the three constructs, but only to explore whether there was a relationship. Further research is needed to gain an understanding of the underlying mechanisms as to why these constructs are related. This is important because improving the wellbeing of healthcare professionals may also improve the quality of care.

When aiming to enhance the wellbeing of healthcare professionals, we hypothesised a role for IPC. However, we did not find a significant change in the work engagement, culture of care, or interprofessional identity when working in an interprofessional collaborative practice. The main reason why this study did not show a change could be that the ICW at Hospital Gelderse Vallei was still in the starting phase, with a small number of patients admitted to the ward. Involved professionals still collaborated, but to a smaller extent than intended. This may have influenced the effect on the interprofessional identity, as interprofessional identity is known to be related to the extent of IPC.[28] More research is required to investigate whether the constructs of work engagement, culture of care, and interprofessional identity change over time when working in an interprofessional collaborative practice for longer periods of time or with greater intensity. The COVID-19 pandemic may also have affected the collaboration. Because of COVID-19, the ICW had difficulties in the starting phase, which may have also affected the level of collaboration. The importance of IPC on healthcare professionals' wellbeing has been suggested before in an editorial paper.[44] A large meta-analysis in the health and social sector found a moderately positive association between collaboration and work engagement.[17] Our study focused on one specific interprofessional collaborative practice and over a shorter period of time, and more research is needed to confirm this association in specific IPC practices. Another study investigated the effects of IPC on the attitude of staff towards interprofessional learning and professional identity and found no alterations,[45] which is in line

with our results. A study conducted at municipal human services that investigated the correlation between work engagement and the extent to which individuals participated in IPC found no relation.[46] These studies show that there is no strong evidence on the relationship between work engagement, culture of care, and interprofessional identity, and changes in these constructs during IPC. More research is needed in this area.

The results of this study could be used in clinical practice to improve healthcare professionals' wellbeing. In order to improve the individual wellbeing (work engagement), one could try to improve the culture of care as these two constructs are related. In order to improve interprofessional teams, one could try to improve the interprofessional identity by improving the culture of care, as these two constructs are related. Taken together, we hypothesise a central role for the culture of care in improving the wellbeing of healthcare professionals, as this construct is related to both work engagement and interprofessional identity. We hypothesise that the better the workplace, the more engaged individuals will be and the better the interprofessional identity will be.

This is the first study in a hospital setting to examine the effect of IPC on these three constructs over time, but our study should be seen in light of some limitations. First, due to an electronic error, the questions of the UWES-9 lacked the answer option 'never', forcing the participants to choose an answer on a scale from 'almost never' to 'always'. This may have resulted in higher overall scores on the UWES-9. However, as this was consistent across all participants and at both assessment moments, the measure is not valid but still reliable, without affecting the correlation or potential change in scores over time. Second, the sample size of the study was small due to a low response rate (38%), despite reminders. The invitation to the survey may have introduced a non-response bias.[47] For example, healthcare professionals with a strong opinion on the topic (either positive or negative) are more likely to complete the questionnaire. Since we used a within-subject design to examine relative change in scores between the assessment moments rather than absolute scores, this will not have affected the results. Furthermore, it is not relevant for the correlation analysis. Third, an important limitation of this study is the unsuccessful permanent implementation of the ICW in Hospital Gelderse Vallei. As mentioned earlier there were difficulties in selecting suitable patients, hampering the extent of the collaboration. Nevertheless, the Treatment Team Meeting took place every morning as planned and the professionals collaborated. The challenges faced in implementing the ICW will not have had a major impact on the correlation analysis, as this correlation is measured with all data regardless of the assessment moment. However, for the within-subject analysis, the results are likely to be affected as the collaboration was not as extensive as planned and may have had less influence on the professionals. This leaves some questions unanswered, and we suggest further research to investigate the impact of IPC on healthcare professionals' wellbeing. Moreover, it would be interesting to investigate

which factors influence the implementation and successfulness of an interprofessional collaborative practice in hospital care.

Conclusions

This study found that in everyday practice there is a medium correlation between the constructs of work engagement and culture of care, and between culture of care and interprofessional identity. These constructs are related to the wellbeing of healthcare professionals, which is essential for the provision of quality healthcare. Working in an interprofessional collaborative practice did not change the levels of these three constructs over time. However, as these findings are based on a partially unsuccessful implementation, we suggest further research into the potential effects of interprofessional collaboration on healthcare professionals' wellbeing. This also highlights the complexity of the subject and more research is needed on how to successfully implement an interprofessional collaborative practice.

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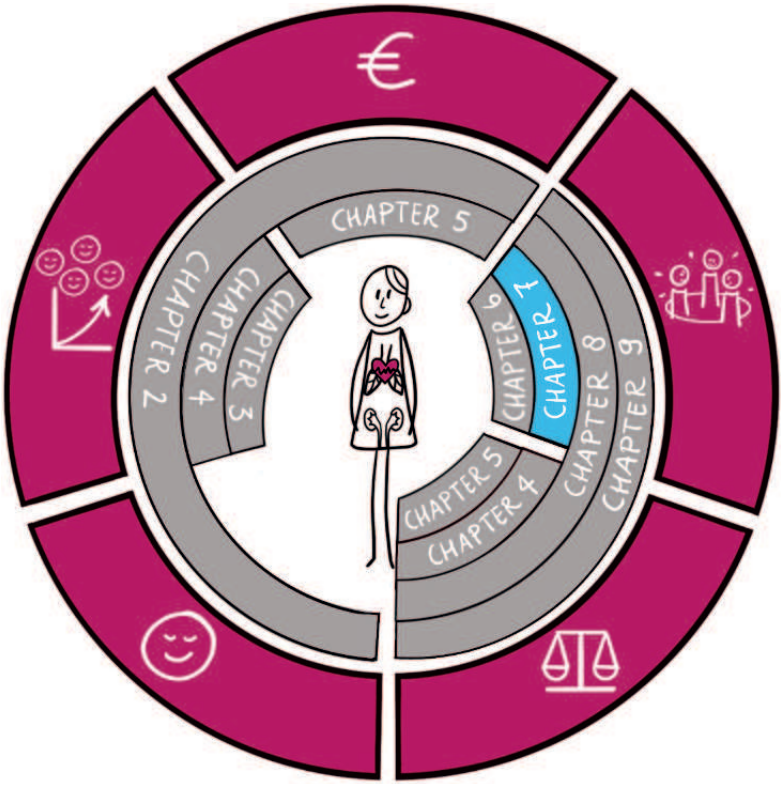
“The single biggest problem with communication is the illusion that it had taken place”

- George Bernard Shaw

CHAPTER 7

Nine keys for successful interprofessional collaboration. Based on observing facilitators and barriers during different types of treatment meetings



Simon T. de Gans & Renee C.M.A. Raijmann, Meike F. Huijbers, Natasja Looman, Marjolein van de Pol, Babette C. van der Zwaard, Huiberdina L. Koek, Marielle H. Emmelot-Vonk, Carolina J.P.W. Keijsers

Submitted

Abstract

Introduction

The increasing prevalence of multimorbidity requires effective collaboration between health professionals. Both interprofessional (IP) and multidisciplinary (MD) collaboration can be used for this purpose. This study aims to evaluate and compare both types of collaboration and develop recommendations for successful collaboration for patients with multimorbidity.

Methods

This is a qualitative study using a rapid ethnographic non-participatory approach. We observed IP and MD treatment meetings using video and audio recordings. Data were analysed iteratively by several researchers using a thematic and conventional content analysis.

Results

There were clear differences between the two meeting types. Five participants attended both settings. These participants contributed more to the discussion and interprofessional learning in the IP meetings than in the MD meetings.

Conclusions

This study showed many factors that influence collaboration and participants' behaviour at the level of active participation, learning, and patient-centred care. These factors were translated into nine-keys for optimizing collaboration, which could improve collaborative practice.

Introduction

Optimal collaboration between healthcare professionals is of the utmost importance for delivering the highest quality of care. Nowadays, effective collaboration is even more urgent due to the increasing life expectancy and the prevalence of multimorbidity.[1-2] These patients with multimorbidity are often treated by multiple different medical specialists. As the number of healthcare professionals involved increases, so does the complexity of coordinating care, putting multimorbid patients at risk of receiving fragmented care.[3-4] Fragmentation of care can lead to poorer quality of care, avoidable hospitalizations and higher costs.[5] In contrast, effective collaboration can ensure the coherence and quality of care and thus prevent care fragmentation.[6] To achieve effective collaboration, the WHO recommends interprofessional collaboration between healthcare professionals.[7]

Although the terminology of different types of collaboration is not used consistently in the literature and may vary between countries,[8] two different types of collaboration are well known, namely interprofessional and multidisciplinary. Figure 1 illustrates the similarities and differences.

Figure 1. differences between interprofessional and multidisciplinary forms of collaboration.

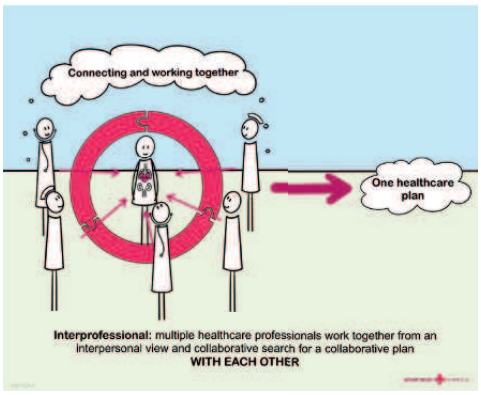


Figure 1a. Interprofessional collaboration

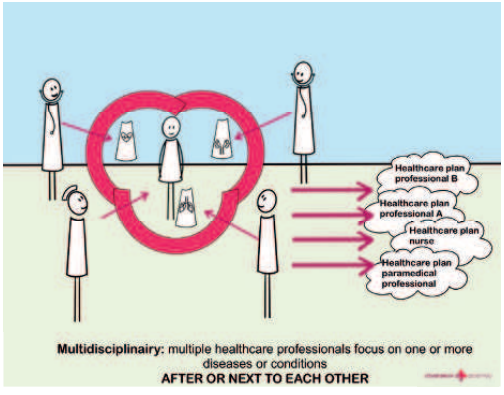


Figure 1b. Multidisciplinary collaboration

Interprofessional collaboration' is the term used internationally to describe collaboration between different healthcare professionals who contribute knowledge and skills and work together as an effective team to provide patient-centred care,[7,9] see Figure 1a. The result of interprofessional care is a single patient-centred treatment plan, in which all perspectives are considered and weighted in terms of the person, not just the organ or disease. Another commonly used term is 'intraprofessional collaboration', which can be seen as a subset of interprofessional collaboration.[10] Intraprofessional collaboration refers

to individuals from different disciplines within a single profession working together (e.g. different doctors such as cardiologists and pulmonologists), whereas interprofessional collaboration refers to individuals from different professions working together (e.g. nurses and doctors).[11] This study will only use the term interprofessional collaboration, as both interprofessional and intraprofessional collaboration could be used interchangeably.

In contrast, the term multidisciplinary collaboration refers to a widely used approach in which professionals from different disciplines work alongside each other, focusing mainly on their own specific specialty and/or organ of interest, and may not consider the entirety of the patient's wellbeing.[7,9] As a result, unlike interprofessional collaboration, multidisciplinary collaboration does not always result in a unified treatment plan, see Figure 1b.[9,12] Instead, it may result in several different organ-specific plans, with the combined recommendations not always leading to the best outcome for the patient. For example, the nephrologist may recommend increased fluid intake to support renal function, whereas the cardiologist may recommend fluid restriction to optimise the cardiac condition in the same patient.

Many studies have investigated which factors influence the efficacy of interprofessional and multidisciplinary collaboration and have identified facilitators and barriers. Factors that facilitate collaboration encompass well-defined professional rolls, a collaborative goal, trust, mutual respect and a safe learning environment.[13-19] Conversely, potential barriers to effective collaboration include power dynamics, hierarchy, disrespect, current or past conflict, poor communication and distractions.[13-16] Previous research has shown that successful collaborations can lead to improvements in patient care, such as a reduction in the length of hospital stay.[16,20]

While interprofessional and multidisciplinary collaboration have been studied individually, there is limited literature directly comparing the facilitators and barriers to collaboration in interprofessional versus multidisciplinary meetings. Therefore, the aim of this study is to identify and compare the facilitators and barriers to collaboration during interprofessional and multidisciplinary meetings. Based on these factors, this study aims to develop recommendations that could promote future strategies for collaboration between health professionals.

Methods

Design

We carried out a qualitative study using a non-participatory rapid ethnographic research approach to examine and compare interprofessional (IP) and multidisciplinary (MD) meetings in a general hospital, where patients are discussed by several professionals from different specialties. Figure 1 shows the definition of these types of meetings. To study these, we observed IP and MD meetings using video and audio recordings to describe and compare factors that might influence collaboration between healthcare professionals in clinical practice. By adopting a social constructivist research paradigm, we could investigate the relationships and social interactions between participants by observing their interactions and individual behaviours.[21] This approach enabled researchers to gain insights into the social phenomena and socio-cultural dimensions of different forms of collaboration during treatment meetings where patients are discussed.[22] Ethnographic methods offer an efficient means of gathering data within a limited timeframe through the use of triangulation.[23] In this study, we collected data through video and audio recordings of treatment meetings between 15 June 2023 and 1 August 2023.

Setting and study population

This study was conducted at the Jeroen Bosch Hospital, a large Dutch teaching hospital. We identified one IP meeting and one MD meeting according to the definitions described in the introduction section. The selected IP meeting was the Intensive Collaboration Ward (ICW) treatment meeting, and the MD meeting was the endocarditis treatment meeting. These meetings were also selected for their comparability: they had similar case complexity, and some patients were even discussed at both meetings. In addition, the team consisted of similar participants, with some healthcare professionals attending both types of meeting. It should be noted that treatment meetings for similar categories of patients in other hospitals may be either IP or MD, depending on their specific characteristics.

The ICW treatment meeting was regarded as an interprofessional meeting because the ICW is a ward dedicated to older patients with multimorbidity who require care from multiple specialists and benefit from patient-centred care facilitated by intensive interprofessional collaboration. The outcome is a single patient-centred treatment plan. At the ICW, a team of professionals work together, with the hospitalist as the leader and point of contact for the patient. More detailed information regarding the procedures of the ICW has been described in previous publications.[20,24] The ICW meetings are interprofessional meetings and are held daily to determine treatment plans for all patients admitted to the ICW. The ICW meeting participants consist of one internal medicine specialist, geriatrician, pulmonologist, cardiologist and is always lead by a hospitalist. Sometimes trainees

such as residents, pharmacists or nurse specialists attend these meetings for educational purposes.

The endocarditis meeting, was considered to be an MD meeting because professionals work alongside each other and mainly focus on their own speciality/organ. The endocarditis meeting discusses patients suspected of having endocarditis or being treated for endocarditis and is held on a weekly basis to formulate a treatment plan. The meeting usually consists of at least one infectious disease medical specialist, one microbiologist, several cardiologists, and several residents and medical students.

Data collection procedure

Data was collected by video and audio recording, allowing researchers to assess and observe individual behaviours and interactions in a natural environment without direct physical intrusion.[25] A researcher (RR) set up the recording equipment in the room before to the meetings to limit the impact of the observations. Immediately after the meeting was recorded, the recording was anonymized by placing a 'beep' over any data that could identify participants or patients. After anonymisation, the recordings were transcribed verbatim by an independent typist who was not part of the study group. Raw transcripts were read and, in cases of ambiguity, the original video and audio observations were used to correct and complete the transcripts by MH, RR and SdG.

Data analysis

Before further analysis of the transcripts from the audio and video observations, general characteristics of the meetings and participants were summarised, see Table 1, and the setting was visualised in Figure 2.

Then, to collect the qualitative research results, the audio and video recordings were analysed in several steps. The method to do so was an inductive conventional content analysis combined with thematic analysis.[26] Conventional content analyses is an inductive method in which themes are created from textual data instead of from pre-existing theories.[27] With conventional content analysis, patterns can be identified. Subsequently, a thematic analysis was used to identify themes within the data.[28] To take all these steps, all documents were uploaded into Atlas TI, a software programme for computer assisted analyses in qualitive research.

In the first step, an initial observational focus and framework was developed by five researchers (SdG, RR, MH, CK, NL) based on Spradley's nine observation dimensions,[29] see Appendix B. In the second step, this observation focus was validated by the five researchers who independently observed the first two video recordings and then discussed

the results together. In the third step, three researchers (SdG, RR, MH) independently observed the other video recordings and took fieldnotes using the observation focus.

In the fourth step, the first transcript was analysed by CK, SdG and MH together, resulting in an initial coding template. In the fifth step, all transcripts and fieldnotes were coded using an open coding approach followed by axial coding. All transcripts and fieldnotes were coded by at least two researchers (SdG, RR, MH) to reduce observer bias. In case of discrepancies between codes, the researchers discussed and resolved these differences together. Data saturation was reached after a total of 10 meetings, 5 of each type of meeting. In the sixth step, themes were developed and discussed with the research team. In this session, facilitators and barriers to effective collaboration were identified and recommendations for improving collaboration were developed.

Finally, to provide an additional perspective, the meeting performance was assessed by three researchers (SdG, RR, MH) using the validated MDT-OARS (Multidisciplinary Team - Observational Assessment Rating Scale), as found in the literature.[30-31] The MDT-OARS scores 15 areas of meeting performance in four categories. The scores range from 1 to 4, very poor to very good, and are based on whether predefined criteria were met or not. Mean scores were calculated for each type of meeting. Appendix C shows the MDT-OARS pre-defined criteria in detail. The MDT-OARS score was considered to be the most appropriate as it best represents the facilitators and barriers to effective collaboration identified in previous literature.

Reflexivity

The research team consisted of members from a range of backgrounds to include different perspectives. All team members have experience of interprofessional collaboration and/or research. CK is a geriatrician, clinical pharmacologist, dean of interprofessional education and one of the co-founders of the ICW. She attends some of the ICW meetings. NL is a psychologist with experience in interprofessional collaboration and education. SdG and RR are PhD students and doctors with work experience in a geriatric unit, SdG also represented the patient perspective as he has a chronic illness. MH is a medical student. SdG and RR's supervising teams were also involved, consisting of two geriatricians (HK, ME), a general practitioner who is also a professor of medical education (MvdP), and a clinical epidemiologist (BvdZ).

Ethics

Healthcare professionals were observed in their daily working environment without any intervention other than recording. The physical and psychological integrity of the participants and the patients discussed was maintained throughout this research. The local Medical Ethical Review Board (METC) declared this study to be outside the scope of the

Medical Research Involving Human Subjects Act (WMO) (METC number NW2023-01). Informed consent was obtained from all participants before recording. They were allowed to withdraw from the study at any time. This study was conducted in accordance with the tenets of the Declaration of Helsinki.

Results

General results and observed participants

Five multidisciplinary (MD) meetings and five interprofessional (IP) meetings were recorded between June and August 2023. The characteristics of both types of meeting are described in Table 1. Notably, more professionals attended the MD meetings than the IP meetings. There was more variability between specialty types in the IP meetings. Five participants attended both types of meeting (1 infectious disease medical specialist, 3 cardiologists, 1 cardiology resident). The average length of discussion per patient was similar in both types of meeting.

Table 1. Details of the treatment meetings and participants

	INTERPROFESSIONAL (IP) Intensive Collaboration Ward	***MULTIDISCIPLINARY (MD)*** Endocarditis meeting
Number of observed meetings	5	5
Mean number of patients discussed per meeting (range)	6 (2-8)	4 (3-6)
Mean duration of meeting in minutes (range)	28:54 (08:08-41:42)	19:37 (14:40-27:36)
Mean discussion time per patient in minutes	4:38	4:39
Number of professionals per meeting*		
Number of professionals per meeting (range)	5-7	12-15
Internal medicine/ infectious disease	1	0-1
Geriatrics	1	0
Hospitalist	1	0
Cardiologist	1	1-5
Pulmonologist	1	0
Microbiologist	0	1
Residents**	0-1	4-8
Medical student	0	1-3
Participant characteristics		
Mean age	40 (28-55)	35 (23-57)
Sex per meeting (m/v)	1-4/2-6	3-5/8-11

* 1 Internal Medicine Specialist, 3 Cardiologists, 1 Cardiology Resident attended both meetings.
** At multiple IP meetings, a nurse specialist and a pharmacist attended for educational purposes.

The themes

Based on our analysis, four main themes have been identified: 1. Setting and surrounding, 2. Patient perspective, 3. Interaction between healthcare professionals, 4. Contribution of individual healthcare professionals. From the analysis of the themes and sub-themes, nine recommendations were formulated, which will be referred to as the nine keys to successful collaboration. The themes, sub-themes and coding template are available in Appendix D.

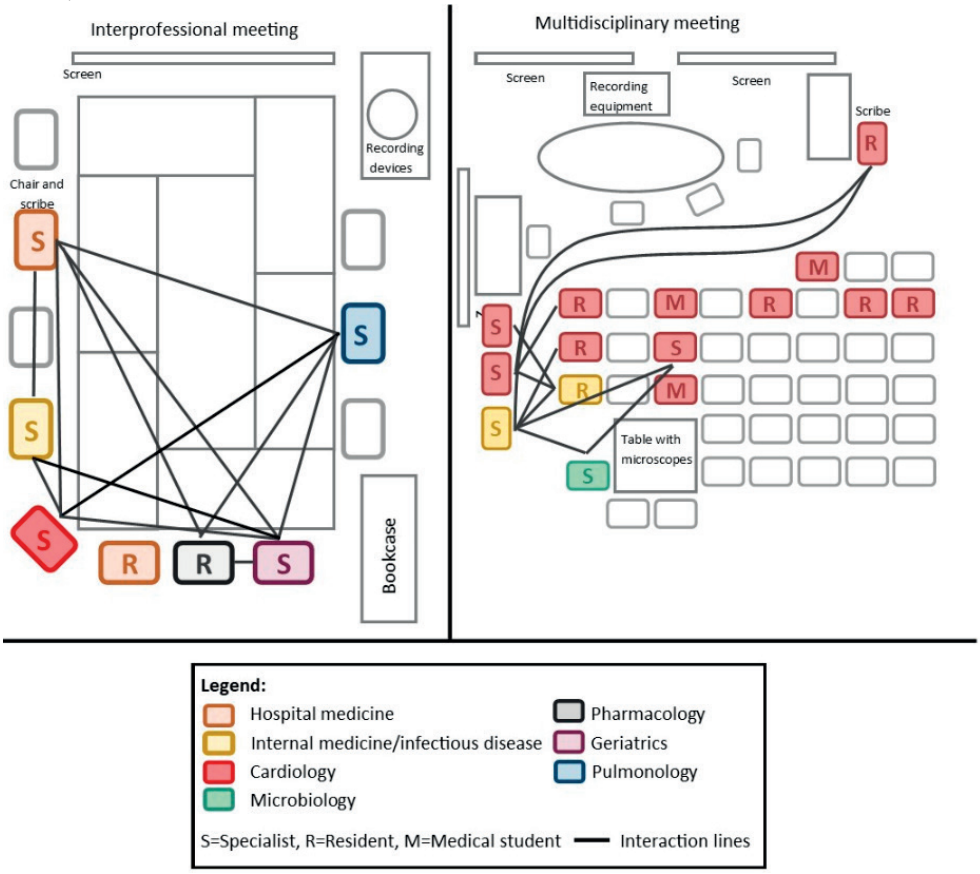
1. Setting and surrounding

1.1 Seating arrangements

Figure 2 illustrates the different seating arrangements of the two meeting types: the MD meeting used a theatre arrangement with participants facing each other's backs, while the IP meeting used a round table arrangement. The large theatre arrangement allowed participants to leave chairs empty between each other, resulting in a greater physical distance between participants. Furthermore, participants seemed to cluster according to specialty and background. Infectious disease and microbiology physicians sat in the back, cardiologists sat on the side of the room, and residents and medical students filled the front rows. There was no particular seating arrangement during the IP meetings.

These differences seemed to affect the individual engagement of participants. In the MD meetings, the percentage of participants who engaged in the central discussion ranged from 50-79%, whereas in the IP meetings this ranged from 86-100%. We observed that in the MD meetings, most of the discussion took place between the cardiologists and the infectious disease medical specialist, who sat at the back and left of the room. Participants in the front rows were often not involved in the central discussion. They mostly looked at the screen in front of them while the discussion took place behind them. They also yawned, looked out of the window or whispered to each other during the central discussion. During the IP meetings, we observed that participants were more likely to face each other rather than look at the central screen, and that participants who contributed less verbal information regularly took notes. These dynamics are illustrated in Figure 2.

Figure 2. Seating arrangement and interaction diagrams in Interprofessional and multidisciplinary meetings



1.2 External distractions

In both types of meeting, distractions seemed to hinder the effectiveness of the discussion by preventing one or more meeting participants from engaging in the central discussion. The amount of external distraction was similar in both meeting types. These distractions mostly consisted of mobile phone alerts, participants either rejecting the call or leaving the meeting. During one of the MD meetings, participants were distracted by workers outside the window.

2. Patient perspective

2.1 Patient centeredness

In the IP meetings, the patient was at the centre of the discussion, with emphasis on the patients' perspective, social context, and functional abilities. These aspects were typi-

cally introduced by the hospitalist, who had direct knowledge of the patient's perspective through regular face-to-face interactions. The following quote highlights the hospitalist's familiarity with the patient's functional abilities and social environment.

> *IP Hospitalist: "…. Also this man is in need of care, as in: part of the instrumental daily activities have been taken over by his daughters [and] he receives homecare twice a day for helping with putting on and taking off his compression socks. Well, socially; [he has] fifteen rabbits. I always copy it [information on social context from the emergency notes] and extract relevant things, but this [having 15 rabbits] I found relevant (laughter)."*

In contrast, the MD meetings focused mainly on medical information and often lacked information about the patient's context or perspective. The following quote shows how patients are introduced in the MD meeting:

> *MD infectious disease resident: ".. has a history of mitral valve replacement, a bioprosthetic and a tricuspid valveplasty and in 2022 a VVI pacemaker implantation. He is admitted with a culture negative endocarditis. …"*

During the IP meetings, the patients' prognosis was explicitly discussed seven times. During the MD meetings, prognosis was discussed once. Below is a quote from a discussion of prognosis during the IP meeting.

> *IP Cardiologist: Yes but for the short term the prognosis is determined by the wobbly under/over fluid status. He probably has a severe aortic valve stenosis for which we have no treatment options. Therefore, I am a bit pessimistic [about his prognosis] .*

a) Proportionality of care

In the IP meetings, participants anticipated possible test results and discussed whether new findings might affect the treatment plan. In the MD meeting, diagnostic tests were sometimes performed (e.g. an echocardiogram), but regardless of the results, the treatment plan was often most influenced by the patient's clinical well-being. Box 1 illustrates two discussions on the value of diagnostics from the IP and MD meetings.

Box 1. Discussion on value of diagnostics

IP meeting:

Geriatrician: *I think an ultrasound is definitely indicated with such levels of gamma-glutamyltransferase and alkaline phosphatase.*

Internist: *With the consequence that if a cholecystitis is conformed he needs the right antibiotics, but if we want to know if there is an [bileduct] obstruction that he needs desobstruction.*

Geriatrician: *I think that if the [potential] obstruction looks like a stone or like a tumor there are different courses of action. He might be fit enough for a stone desobstruction but if there is a malignancy with potential more [future] crisis, you could question…. [how this impacts current treatment options]."*

Situational description:

Before ordering an additional test (ultrasound) participants evaluate whether the result of the test would affect treatment choices.

MD meeting:

Cardiologist while evaluating frames of a transthoracic echocardiogram:

'Well, this is no super quality. But, at least we don't see any leakages on this level and the valves look, as far as it is assessable, normal. Go to the apical frames. If you…. Exactly. This is very poor [image quality] Yes. This is really… Yes very poor image quality. So this echocardiogram, you can barely call it diagnostics.'

Cardiac resident: *'That is what we expected beforehand.'*

Cardiologist: *'Well you can say, no irregularities, however the image quality is so poor… And what did we plan to do' [if the quality was so poor]?*

Cardiac resident: *'That we would not perform a transoesophageal echocardiogram, because actually…'[the probability of endocarditis was low]*

Cardiologist: *'so this is it?'*

Cardiac resident: *'yes and the patient is clinically improving.'*

Situational description:

After stating the results of the performed diagnostic test (transthoracic echocardiography) were not reliable, the decision was made to not perform another more reliable test (transesophageal echocardiography) because the pretest probability for endocarditis was low anyway and the patient improved clinically. So in hindsight the performed transthoracic echocardiogram served no purpose.

b) Discharge planning

In the IP meetings, discharge planning was discussed mainly from the patient's perspective. In the MD meetings, discharge planning was mainly about dividing tasks and practical planning. Below is a quote from the MD and IP meetings about planning follow-up appointments. In the MD meeting, the logistical challenges from the doctor's point of view are highlighted.

> *MD infectious disease specialist: 'Yes. I think you have to organize this well. Perhaps… Is that something you would want to take a leading role in? Or are you unavailable for it in the coming time?'*
> *MD infectious disease resident: Well, this is my final week as a consultant, after that I have a week of night shifts and then I will be back for only one week. For me it is not convenient, I won't be around much.*

In contrast, in the IP meeting, doctors try to limit the number of future appointments with different doctors to accommodate the patient's perspective, as the following quote shows.

> *IP geriatrician to pulmonologist: 'Do you want to see her again? Since you also listen to the lungs, if you hear any fluid there, maybe you can adjust the diuretics [cardiac medication] before she ends up in three places. We will wrap up the cognition [analysis] before discharge so she doesn't need an appointment with us.'*

So instead of having an appointment with a pulmonologist, cardiologist and geriatrician, the patient now only has an appointment with the pulmonologist.

3. Interaction between healthcare professionals.

3.1 Team composition and individual roles

We observed that an unbalanced team composition may affect individual contributions to the central discussion. As described in Table 1, the IP team was smaller (average number of participants 5-7) and each specialty was represented by one or two doctors. All participants had a role in the discussion, namely to contribute information from their respective specialty. No two participants had the same role. This seemed to encourage individual contributions from the participants, as specific information could only be contributed by one participant.

In contrast, the MD team was larger (average number of participants 12-15) and consisted mainly of cardiologists. Cardiologists outnumbered infectious disease and microbiology physicians by a ratio of 3:1 to 2:1. The cardiologists all had similar roles, which resulted in

some cardiologists contributing more to the discussion and others leaning back. In addition, the proportion of residents and medical students was higher in the MD meeting than in the IP meeting. Only a small proportion of the residents and medical students had a role in the discussion, such as presenting the patients or interpreting the echocardiogram. A large proportion of the participants did not have an active role in the discussion, we observed that they were less involved and did not contribute to the discussion or ask educational questions.

3.2 Predesignated tasks: chair, patient introductions and scribe

The effectiveness of the treatment discussion seemed to improve when there was a pre-determined chair. It also seemed to be beneficial when the person who introduced the patient also formulated a central point of discussion. In the IP meetings, the chair was always the same person, the hospitalist. They introduced the patient in a standard format and ended with a central discussion point. In the MD meetings, there was no pre-determined chair, and the discussion was led by the person introducing the patient (a cardiology or internal medicine resident) or the specialist most familiar with the case. Sometimes no doctor was prepared to present the patient, resulting in less coherent patient presentations without a clear point of discussion. The following quote confirms this observation.

MD cardiologist to resident internal medicine: 'It's nice that you introduce all of our patients…'
Resident internal medicine: 'Yes, … but if we don't know who the [treating] physician is, I'll share what I know and then we will see what else you all know.'

Using the MDT-OARS scores, we found that the conclusion was more clearly stated in the IP meetings compared to the MD meetings. In the IP meeting, the conclusion was summarized at the end of the discussion by the hospitalist or another participant, while the hospitalist documented it in the patient's record. In the MD meeting, however, the conclusion was only summarized for the scribe if specifically requested. As the scribe was a cardiac resident sitting at the other end of the room, he often had to interrupt the discussion to ask what he should write in the medical record. The frequent interruptions seemed to lead to inefficient discussions.

3.3 Atmosphere

Our observations showed that a positive atmosphere seemed to foster non-hierarchical communication and increase individual engagement.

The IP meetings were characterized by a relaxed atmosphere, with open interaction, humour, laughter, and compliments. Almost all participants, regardless of their role or

background, actively contributed to the discussion. Occasional redirection was necessary to keep the focus on the patient and to manage the time effectively. The average length of discussion per patient was similar in both types of meeting (see Table 1).

The atmosphere at the MD meetings was not as relaxed and the interaction exhibited a more hierarchical style. Trainees and residents from the cardiology department often did not contribute to the meeting. Sometimes the atmosphere felt tense and participants seemed to disagree more often and there were fewer jokes. The following quote shows a specialist correcting a resident during the main discussion, without clear reasoning or explanation. At this moment, the researchers observed a tense atmosphere, which is documented in the observation notes.

MD Specialist internal medicine to resident cardiology: '…So, we really did execute the work-up well, that's important to mention. It doesn't actually seem like it now.'
Resident cardiology: 'No, no, no, there was nothing to see on all the tests.'
Specialist internal medicine: 'No, but that's important to mention.'

After treatment discussions, tasks were generally divided between participants. In the IP meetings, the division of tasks was more often formulated as a question and the communication felt non-hierarchical. The following quote illustrates how a cardiac resident is encouraged to carry out the outpatient follow-up of a frail elderly heart failure patient during one of the IP meetings.

IP hospitalist to a cardiac resident: 'Will he come back to you for follow up?'
Cardiac resident: 'Well, I will be doing outpatient clinic, so I could do the follow up.'
IP Cardiologist: 'Yeah just do it!'
IP Geriatrician: 'Yes nice!... If that isn't intensive collaboration ward-like!'
Cardiac resident: 'Yea right! This patient was made for me.'

In contrast, in the MD meetings, tasks were formulated as assignments given by specialists to residents. Communication seemed to be more hierarchical. In addition, residents sometimes seemed surprised or uncomfortable after receiving an order from their supervisor. However, they did not explicitly express their discomfort. In the following quote from an MD meeting, a resident is asked to call a patient to the emergency department, although the resident does not feel comfortable doing this, the cardiologist insists that he does it anyway.

MD cardiologist to resident cardiology: 'I think someone needs to invite him to the Emergency Department…'

Resident cardiology: 'The way this is going seems a bit odd to me, because the man hasn't raised any alarm himself. Should I call him, hearing indirectly that he's feeling a bit short of breath?' … 'I don't know the man at all…'
Cardiologist: 'That doesn't matter.'

At both meetings, participants expressed feelings of insecurity, doubt and concern for the patient. They also showed their vulnerability by admitting a mistake or lack of knowledge. The next two quotes from both types of meeting illustrate expressions of vulnerability.

MD microbiologist: 'The point is, and that's apparently my own negligence, but he isn't getting enough amoxicillin.'
IP hospitalist: 'They wanted him at home. I feel… Did I do something wrong, did I let him go home too early?'

Participants in the IP meetings showed trust in each other, even when it came to their own specialty. For example, the geriatrician, who is a specialist in cognitive diagnostics, tells the hospitalist that it is up to the hospitalist's clinical judgement whether a cognitive screening test (a Montreal Cognitive Assessment (MOCA)) is indicated.

IP geriatrician to hospitalist: 'Very good. [You can] evaluate if you still need a MOCA.'

3.4 Interprofessional learning

There are three levels of IP learning: learning with, from and about each other.[32] Our data showed that all three levels of IP learning took place during the IP meetings. We observed that all participants in the IP meetings, regardless of specialty or function, asked questions about topics outside their specialty and spontaneously shared knowledge. The following quote illustrates a moment during the IP meeting when participants learn from each other.

IP geriatrician to pulmonologist: 'What do you see at first glance?' After this question, the pulmonologist explained how to read a spirometry.

Participants in the IP meeting also learned with each other. The following quote shows one participant reminding the others that they must remain critical and also evaluate the indication and benefit of a lipid lowering drug (statin) in an older patient population.

IP specialist internal medicine to hospitalist: 'But this is the ICW (IP meeting), we stop, we don't prescribe statins?'

The next quote from the IP meeting illustrates a moment of reflexivity and empathy with the previous doctor who had apparently missed a diagnosis, but also a moment when participants could learn from and about each other.

IP geriatrician: 'If we go back all the way to the beginning of the story, looking backward it's always easy to judge, but there's a man with a lot of back pain, so much pain that he had to go to the rehabilitation centre. Back pain is not a diagnosis right?'

In contrast, learning with, from and about each other seemed to occur less frequently in the MD meetings. There were fewer educational questions and less spontaneous knowledge sharing in these meetings. Although the MD meetings should also function as an educational moment for residents and medical students. In addition, in the MD meetings the residents sometimes seemed hesitant to ask a question and even apologized in advance. This was not observed in the IP meeting. This first quote illustrates a resident's hesitation to ask an educational question.

MD resident internal medicine: 'Probably a stupid question, but just so I know…'

The next quote illustrates how a resident is trying to introduce a learning opportunity for himself and others, but the consultant is postponing this teaching moment because the specialist found that it was not the right time.

MD resident internal medicine on differential diagnosis of a culture negative endocarditis:
'We have completed all the diagnostics. However, I did research some tests of which I thought [maybe we should consider them], but…'
MD infectious disease specialist: 'You can ask me later'

3.5 Listening

Our observations showed different levels of listening: bad-, pretend-, selective-, attentive- and empathic listening. Attentive listening occurred in both types of meeting, but was more present in the IP meetings. The IP meetings showed several examples of empathic listening, where participants seemed to really try to understand the other participant's point of view. On the contrary, selective listening and bad listening were more present in the MD meetings. The following quote illustrates how two specialists talk through each other about different topics without listening to each other.

MD Specialist internal medicine: 'But you could discuss adding doxycycline empirically while waiting on further diagnostic tests, I think...'
MD Cardiologist: 'I think we need to look at the echo.'

4. Contribution of individual healthcare professionals

4.1 Active participation and stepping outside one's own specialty
We found differences in the participation of individual healthcare professionals between IP and MD meetings. In the IP meetings, all professionals participated actively, contributing their expertise to the discussion, asking questions outside of their own specialty, and trying to argue and explain their thoughts. Even if they were the specialist on the topic, they asked for input from others.

On the other hand, in the MD meetings, a significant part of the team, especially medical students and residents, were not actively involved. Also, there was often someone who left early, whereas no one left at the IP meetings. In addition, specialists tended to stay within their own specialty and were less likely to ask questions outside their own specialty. The following quote illustrates a pulmonologist sharing a thought on the differential diagnosis of renal decline.

IP Pulmonologist: 'Can you get a septic embolism with endocarditis as the cause of the [decline of] kidney function?'

The following quote illustrates a participant asking a question about his own area of expertise as a form of teaching.

IP Cardiologist: 'What are we going to prescribe for her rate control?'

4.2 Behavioural differences of participants that participated in both meeting types.
In total, five doctors participated in both the MD and IP meetings. We observed a distinct variation in the behaviour of doctors who participated in both meetings. At the MD meetings, all five participants asked fewer questions about the patient's perspective and did not engage in interprofessional learning. Conversely, at the IP meetings, the same participants spontaneously provided information or asked questions for educational purposes. They actively participated in discussions and stepped outside their specialty. In particular, one cardiology resident did not ask any questions, only looked at the screen in front of her and did not participate verbally or non-verbally in the discussion throughout the MD meeting. During the IP meeting, she actively participated by asking educational questions and contributed to a positive atmosphere by laughing and making jokes. Here are some quotes that support these observations from the IP meeting.

Quote 1: *IP cardiac resident about a patient with cholangitis: 'Isn't this someone that if he does not improve he could benefit from ERCP (endoscopic retrospective cholangiopancreatography)?'*

Quote 2: *IP geriatrician about a heart failure patient: 'And, to patients with HFpEF (heart failure with preserved ejection fraction) you give diuretics and ace inhibitors right?*
IP cardiac resident: '[You give] an SGLT2-inhibitor. (Sodium-Glucose-transportprotein 2 inhibitor = heart failure medication)'

Team performance by MDT-OARS assessment tool

Beside above themes, the team performance of the meetings were scored by a validated scoring system to measure team performance. The mean MDT-OARS for each type of meeting are shown in Table 2. IP meetings had higher mean scores than MD meetings for the categories 'teamworking and culture' (20 (19-20) vs 12 (10-14)) and 'clinical decision making' (6 vs 3 (2-5)). Other categories had similar scores.

The category 'teamworking and culture' includes the inclusion of team members, team sociability, mutual respect, and tension and conflict. The category 'clinical decision making' includes patient-centred care and treatment plans.

Table 2. Meeting performance as measured by MDT-OARS mean scores and range per domain.

MDT-OARS categories	***INTERPROFESSIONAL*** Intensive Collaboration Ward Mean (range)	***MULTIDISCIPLINAIR*** Endocarditis meeting Mean (range)
The team		
Attendance	 (3-4)	 (1-4)
Leadership: chairing of meeting	 (2-3)	 (1-2)
Teamworking and culture		
a) Inclusion of team members	 (4)	 (2-3)
b) Team sociability	 (4)	 (1-3)
c) Mutual respect	 (2-4)	 (1-3)
d) Tension and conflict*	 (0)	 (-2-0)
Personal development	 (2-3)	 (2)
Category total	**20 (19-20)**	**12 (10-14)**
Infrastructure for meetings		
Meeting venue	 (4)	 (3)
Technology & equipment	 (4)	 (4)
Category total	**8**	**7**
Meeting organization and logistics		
Preparation prior to meeting		
a) Agenda	 (2)	 (2)
b) Prioritization of complex cases (1-4)	 (3-4)	 (2-4)
Organization/admin during meetings		
a) Patient notes	 (4)	 (4)
b) Case presentation	 (3)	 (2-3)
Category Total	**12 (11-12)**	**12 (10-13)**
Clinical decision making		
Patient centred care (1-4)	 (4)	 (1-2)
Treatment plans (1-4)	 (2)	 (2)
Category Total	**6**	**3 (2-5)**
Total score	**46 (44-47)**	**36 (34-38)**

Legend:

1 = Very poor 

2 = Poor

3 = Good

4 = Very good

* "Tension and conflict" is rated on a different scale, -4 to 0, ranging from "severe and sustained conflict" to "no tension": -4 = Severe and sustained conflict; -3 = Overt conflict un-sustained; -2 = Tension sustained; -1 = Tension un-sustained; 0 = No tension

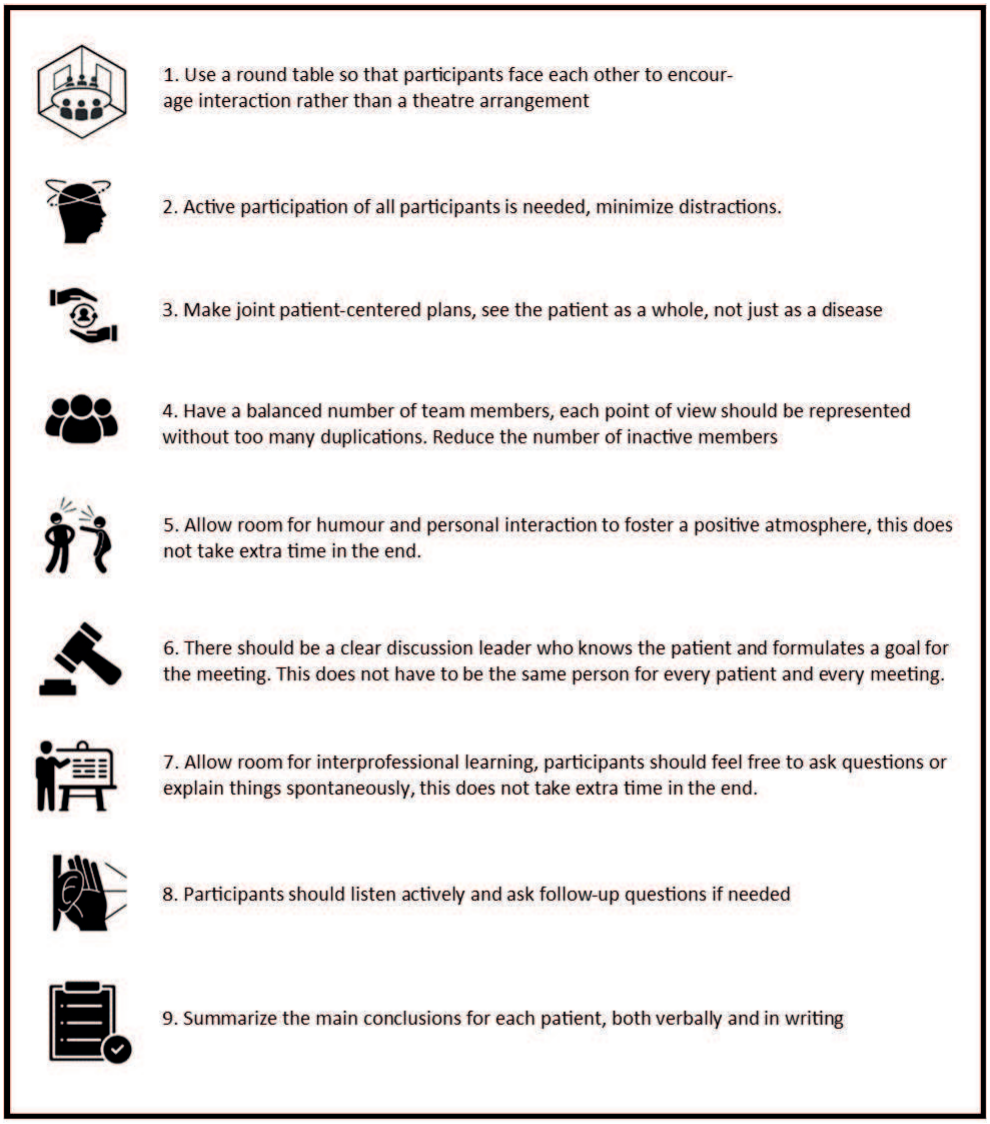
Discussion

This study aimed to investigate the differences between interprofessional (IP) and multidisciplinary (MD) meetings by observing two types of meetings with comparable case complexity and similar participating specialties. Four key themes emerged, each demonstrating distinct differences: 1. Setting and surrounding, 2. Patient perspective, 3. Interaction between healthcare professionals, 4. Contribution of individual healthcare professionals. Our findings showed that IP meetings were more patient-centred, fostered a more relaxed and positive atmosphere, and provided a better environment for interprofessional learning. Based on our data, we formulated nine keys to effective collaboration, see Figure 3.

The behaviour of individuals and the interactions between individuals were different in the two meeting types, as illustrated in Figure 2. In the MD meeting, participants generally contributed less to the treatment discussion, asked fewer educational questions, and the atmosphere seemed more tense. In the IP meetings, the opposite appeared to be true. In fact, among the participants who attended both meetings, even those who did not engage during the MD meeting exhibited a high level of interaction during the IP meeting. One of the factors that might explain this phenomenon is power dynamics. In the MD meeting, the cardiology physicians outnumbered the infectious disease and microbiology specialists. There was also a more predominant hierarchical structure, with medical specialists speaking more than residents and sometimes even interrupting them. These two factors, the overdominance of one specialty and the strong hierarchical structure, are known to limit the participation of healthcare professionals.[33] When designing treatment meetings, it is important to make these implicit factors explicit (e.g. by talking about them) in order to create a culture that encourages active participation. Hierarchy can be functional for (interprofessional) collaboration and learning, but one should be aware that it can also quickly become dysfunctional. Another factor that can influence the interactions and behaviour of individuals is the setting. For example, the IP meetings used a round-table setting where participants could see each other, which encouraged interaction. The MD meetings used a theatre setting where participants could not see each other, which could hinder interactions and change individuals' behaviour (Figure 2). This should be taken into account when designing a collaboration.

Unconstructive power dynamics can also negatively influence learning.[34] This is supported by the results of this study, which show minimal IP learning in the MD meeting and extensive IP learning in the IP meeting. Workplace learning is essential for residents and medical students (learners), and designing treatment meetings to promote IP workplace learning enables learners to develop. Then learners and professionals can learn with, from and about each other every day in their daily work.

Figure 3. Nine keys to successful collaboration



The positive atmosphere of the IP meetings fosters individual participation and learning, and it stimulates jokes and detours. Our research shows that humour and jokes do not lead to longer, inefficient meetings, as the discussion time per patient is similar between the two types of meeting. Previous research already established that laughing together can have a positive impact on the wellbeing of participants and the team climate, and it promotes the delivery of team-based care.[35] This may explain why IP participants more frequently listen to each other attentively, which enhances the effectiveness of communication during the meeting. Participants in MD meetings listen more selectively or not

good at all, and they disagree with each other more often, which can be time consuming.[36]

The preliminary results of this study were presented to more than 60 healthcare professionals, including medical specialists, residents and educationalists, at a major national scientific congress in the Netherlands. They agreed with the findings of our study and recognised them from their own clinical practice, with some professionals already implementing some of the key messages. For example, one professional noted that they were currently implementing round-table settings. One participant questioned whether certain behaviours were inherent to certain individuals. When conducting the research we had the same presumption, however, our findings demonstrated that five participants exhibited completely different behaviours in the two different meetings. The reactions of the professionals at the congress further confirmed our findings. In addition, the findings of our study were presented to the cardiologists of the MD meeting investigated in this study. They had already recognised the need for improvement, but did not know in which specific areas and how to do it. An educationalist is currently helping them to implement improvements.

Strengths and limitations

To the best of our knowledge, this is the first study to compare IP meetings with MD meetings and to identify the facilitators and barriers to collaboration in both settings. Although many facilitators and barriers to collaboration have been documented in the literature, these have focused on one type of meeting only. By comparing two meetings with similar participants and patient cases, a direct comparison can be made and key differences highlighted. This study has several strengths. First, the triangulation of the research group; this study brought together an interprofessional research group with different professional and personal backgrounds and training, which provided different insights into the observations and analysis of the data. Second, this study provides practical advice for improving patient care meetings that is widely applicable and transferrable to different types of meetings.

This study also has limitations that should be taken into account. First, the IP and MD meetings we observed may not be representative of all IP and MD meetings that occur. Therefore, our findings regarding the occurrence of facilitators and barriers to collaboration may not be generalizable to all IP and MD meetings. However, the formulated keys to effective collaboration are not specific to one type of meeting, but are generalizable to all treatment meetings involving older multimorbid patients. Second, observer bias could affect the objectivity of the researchers. To minimize this bias, three researchers independently observed and analysed the data. In addition, the use of the observation focus improved inter-rater reliability. Third, participants' awareness of the observations

could influence their behaviour, so we chose non-participant observations. In addition, to minimize participants' awareness of being filmed, the cameras used to film the sessions were pre-existing cameras integrated into the main screen. Finally, the study relies solely on audio and video observations, which limits insight into participants' thoughts or behaviour. Future research should consider using interviews or focus groups to gain insight into participants' thoughts or behaviour.

Conclusions

This study demonstrated that various factors influence collaboration and participants' behaviour regarding active participation, learning, and patient-centred care in both interprofessional (IP) and multidisciplinary (MD) meetings. Factors such as a round-table setting, a designated chair, discussions centred around a common patient-focused goal, active participants, and a relaxed atmosphere appeared to facilitate team collaboration and interprofessional learning. Furthermore, the observed differences in the behaviour of the same participants across the two meetings underline the impact of these factors on their behaviour. These factors were distilled into nine key strategies for optimising collaboration that could improve collaborative practice.

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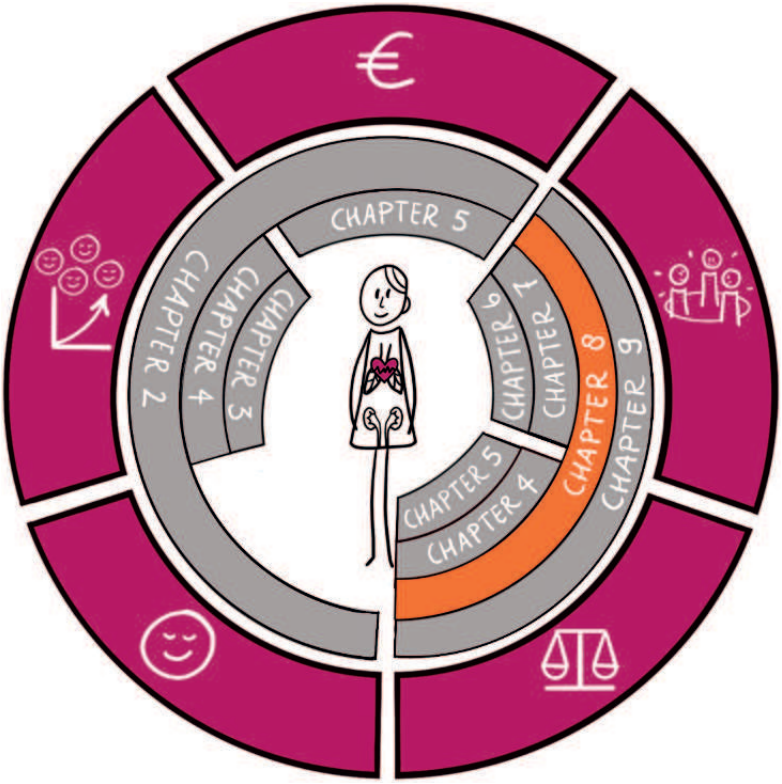
Part V:
Improved health equity

“It is better to solve the right problem approximately than to solve the wrong problem exactly”

- John Tukey

CHAPTER 8

The positive side-effect of interprofessional collaboration: is there a learning effect from working together, measured by changes in patient care?



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Submitted

Abstract

Introduction

During interprofessional collaborations professionals can learn with, from and about each other, also called interprofessional workplace learning. Several theories support this such as the situated learning theory, social cognitive theory, and Allport's contact theory. Previous studies only investigated the learning effect after educational interventions (learn to work together), which achieved level 2 (increased knowledge and skills) of Kirckpatricks model. The aim of this study is to investigate whether there is also learning from working together measured by patient outcomes (level 4) in patients beyond the collaborative practice itself.

Methods

In a collaborative ward for patients with multimorbidity, the Intensive Collaboration Ward (ICW), a retrospective cohort study spanning three years was performed. Measure points were one year before the start of the ICW, and two years of follow up. Outcome measure was the number of intercollegial consultations (a) medical e.g. between pulmonologist and cardiologist and (b) allied health professional e.g. physical therapist. This was measured in patient care beyond the collaborative practice itself, indicating that the knowledge of professionals has increased and was transferred and applied elsewhere. We used a negative binomial regression with propensity score matching to measure this over time, with adjustments for confounding.

Results

The number of medical consultations decreased over time with a rate ratio (RR) of 0.83 (95% CI 0.76 - 0.90, -16.9%) in year 1 and 0.81 (0.74 - 0.88, -19.3%) in year 2. The number of allied health professional consultations increased, RR 1.20 (1.14 - 1.27, +20%) in year 1 and 1.09 (1.03 - 1.16, +9.4%) in year 2.

Conclusions

After the start of an interprofessional collaborative practice, the behaviour of professionals changed, with fewer medical consultations, e.g. between a pulmonologist and a cardiologist, and more allied health professional consultations. This implies that healthcare professionals learn from interprofessional collaboration and are able to transfer and apply this knowledge outside the interprofessional collaboration to patient care outside the collaboration.

Introduction

Effective collaboration between healthcare professionals is important with the increasing life expectancy and prevalence of multimorbidity.[1-2] Patients are otherwise at risk for fragmentation of care, leading to suboptimal health outcomes.[3-5] The WHO advises interprofessional collaboration for this purpose.[6]

During interprofessional collaboration it is possible for professionals to learn with, from and about each other, this is called interprofessional workplace learning (IPL). There are several theories from the field of education that provide a theoretical basis for IPL, which we will briefly describe. The social learning theory describes that social interactions can support learning, face-to-face contact is essential.[7] This is also recognised in Alport's contact theory, which states that face-to-face contact reduces prejudice between groups and can therefore improve learning and collaboration.[8] The social cognitive theory describes how an individual can directly acquire new knowledge by observing others; people learn by observing others.[9] This is further emphasised by the situated learning theory, which states that an authentic context with social interactions enhances learning and that new behaviours can be acquired by observing and imitating others.[10] The theory of planned behaviour describes that individuals are more likely to perform a behaviour if they have a favourable attitude (perception of the consequences of the behaviour), a subjective norm (perception of others' approval) towards the behaviour, and a high degree of perceived control (perception of the difficulty of performing the behaviour).[11] This theory also states that the harder individuals try to perform a behaviour, the more likely they are to succeed. In summary, all the above theories emphasise that working together can lead to learning with, from and about each other, when professionals work together in an interprofessional collaborative practice. If that is truth, professionals learn *from working in* an interprofessional practice.

However, previous studies have a major focus on learning *to work in* an interprofessional practice, for example through educational interventions to improve the collaborations skills. These studies have shown that interprofessional learning can improve interprofessional knowledge and skills, and lead to positive changes in attitudes towards interprofessional collaboration. However, these results were mainly based on self-reported outcomes following educational interventions to improve interprofessional collaboration.[12-13] In Kirkpatrick's model of evaluation these only achieved level 2 (participants acquired knowledge, skills, attitudes) out of the 4 levels of outcomes.[14] Since it is unclear whether increased knowledge actually improves patient care, the holy grail of medical education is to achieve level 4b of Kirkpatrick's model: benefit to patients.[14-15] However, no previous studies have shown that this level has been achieved.

We hypothesise that even without an educational intervention or curriculum, professionals will learn *from* interprofessional collaboration and transfer and apply this knowledge to all of their patients, through learning by doing, based on the above theories. This then could be a positive side-effect of interprofessional collaboration. Specifically, we hypothesise that this learning effect will result in fewer medical consultations of the collaborating specialties due to increased and broader medical knowledge of the physicians, which would then be measurable in all of their patients, including those outside of the interprofessional practice. If true, this would reach level 4b of Kirkpatrick's evaluation model (benefit to patients), which, to our knowledge, has never been achieved before.[15]

This study investigates whether professionals learn *from* an interprofessional collaborative practice, and can transfer and apply this knowledge to other patients measured by patient outcomes beyond the collaborative practice itself, with changes in patient care as a result.

Methods

Study design and study period

This retrospective cohort study investigated whether professionals learn *from* participating in an interprofessional collaborative practice, namely the Intensive Collaboration Ward (ICW)[16,17]. If knowledge can be transferred and applied beyond this collaborative practice, then this will be visible and measurable. To do so, medical consultations (e.g. a pulmonologist asking a geriatrician for help) of the collaborating specialties and allied health professional consultations was set as a measurable proxy for the learning effect. The study period was divided into three periods: one year before the opening of the collaborative practice, and two years of follow-up. The ICW was opened on 15 June 2020 and the study period was therefor set from 15 June 2019 to 15 June 2022.

Setting

The study setting is the ICW, an interprofessional collaborative practice for multimorbid older patients, admitted to the Jeroen Bosch Hospital, a large teaching hospital in the Netherlands. This ward is a collaboration between physicians from the specialties of geriatrics, internal medicine, pulmonary medicine, cardiology, and hospital medicine. Nursing and allied health professionals are also heavily involved. This means that both interprofessional collaboration between physicians (also called intraprofessional) and between different health professionals were represented in this collaborative practice.[18] A more detailed description of the ICW and its working principles are described in previous publications.[16-17]

Participants who learn

Physicians from the specialties of geriatrics, internal medicine, pulmonary medicine, and cardiology work in this collaborative practice (the ICW), but in other parts of the hospital, such as on their own wards, e.g. the geriatric ward. In the ICW, they work together as a team, focusing on the patient as a whole. In the rest of the hospital, however, they work as consultants, focusing on the organ of interest, and if they have a lack of knowledge in an area, they ask for intercollegiate consultation. For example, internal medicine may ask the geriatrician for help with delirium, or the cardiologist may ask the pulmonologist for help with a lung infection.

Patients endpoint as proxy of learning

The number of medical and allied health professional consultations was counted for hospital patients outside the collaborative practice, i.e. on the other ward, e.g. the cardiology ward.

Patients from the specialties of geriatrics, internal medicine, pulmonary medicine, cardiology were considered eligible if they were admitted to the hospital in the study period. Patients were excluded if they were admitted for planned medical one-day treatment, such as dialysis. Patients were also excluded if they were admitted to the ICW, as by design all four specialties are already involved, and the patients beyond this ward are of interest for this study. All hospital admissions of a patient were eligible for this study, which means that a patient can be included more than once.

Data collection procedure

All patient admitted to the hospital in the study period were considered eligible. The patients were identified retrospectively using the in-hospital Team Management and Information system (TMI). TMI then automatically extracted all outcome variables from the electronic medical record using pre-defined criteria. Patients who had previously centrally withdrawn permission for their information to be used for research purposes were excluded.

Variables

The following baseline variables were collected from the patients: age, sex, number of hospital admissions in the previous five years, admission specialty, type of home residency on admission, and diagnosed comorbidities.

The primary outcome was the number of medical consultations between the four specialties (geriatrics, internal medicine, pulmonary medicine and cardiology). Consultations with specialists outside these four specialties, such as a surgeon, were not included

because they cannot be influenced by the learning effect of the ICW. The secondary outcome variable was the number of allied health professionals' consultations.

Statistical analysis

The number of intercollegial consultations in patients of the two years after inception of the ICW were compared to the pre-ICW year separately to study whether they decrease as a result of learning. To do so we used a negative binomial regression with propensity score matching to measure this over time, with adjustments for confounding.

This analysis was chosen for one main reason, namely the risk for selection bias by opening a new ward. Prior to the opening of the ward, multimorbid patients were admitted to other parts of the hospital, such as the pulmonary unit. After the opening, these patients were admitted to the ICW. This could lead to issues due to selection bias. To correct for this possibility of selection bias between the two follow-up and the pre-ICW cohorts, inverse probability weights based on propensity scores were modelled using the baseline patient characteristics that proxy the multimorbidity of the ICW patients.

Propensity scores were estimated using logistic regression, and standardized mean differences (SMD) were used to assess balance, with a threshold of <0.1 indicating acceptable balance using the cobalt package in R. Stabilized weights were applied in weighted negative binomial regression models for all outcome measures: number of consultations of ICW-participating specialties (geriatric medicine, internal medicine, pulmonary, cardiology) and number of allied health professional consultations. Both the logistic and negative binomial regression were conducted using the lme4 package in R.

When comparing the pre-ICW and first year follow-up, one variable remained unbalanced (having had pneumonia: SMD = 0.1105). When comparing the pre-ICW and second year follow-up, two variables remained unbalanced (having had pneumonia: SMD = 0.1052 or a malignancy: SMD = 0.1230). Subsequently, each outcome was evaluated thrice: weighted using all variables, weighted without the unbalanced variables, and weighted with the unbalanced variables added as separate confounders. The outcomes only differed slightly (<5%) between the analyses, therefore results of the weighted analyses with the separately added unbalanced confounders are presented.

Ethical considerations

The Ethical Review Board METC Brabant declared that this study (reference id: NW2022-95) does not fall under the scope of the Dutch Medical Research Involving Human Subjects Act (WMO). The data used for this study were already available in the patients' medical records, and the patients and/or their relatives were not contacted for additional

data. This research did not compromise the physical or mental integrity of the patients. The study was conducted in accordance with the tenets of the Declaration of Helsinki.

Informed consent was not obtained from the patients in accordance with the Dutch WGBO article 458. Due to the large number of participants enrolled, obtaining informed consent was not considered reasonably possible, and in addition, selection bias could be introduced by obtaining informed consent as an unwanted side-effect. However, patients who had previously objected to their data being used for scientific research through the hospital opt-out procedure were excluded.

Results

Participants

The learning effect of all cardiologists (n=13), internists (n=7) geriatricians (n=10) and pulmonologists (n=7) was indirectly included by measuring their patient care. At the Jeroen Bosch Hospital, all of them work in the collaborative practice (called the ICW) and all of them work outside of this ward.

Patient characteristics

A total of 22,054 patients admitted to the Jeroen Bosch Hospital for the specialties of geriatric, cardiologic, pulmonary and internal medicine were identified. All patient baseline characteristics are shown in Table 1.

Table 1. Baseline characteristics of multimorbid patients admitted to hospital for the specialties of geriatrics, cardiology, pulmonology and internal medicine

	One year pre-ICW	First year After-ICW	Second year After-ICW
n	7843	7272	6939
Age, mean (SD)	69 (15)	69 (15)	69 (15)
Sex, %female	43.5	43	44.5
Admissions past 5 years, median (IQR)	1 (3)	1 (2)	1 (2)
Admission specialty, %			
Internal medicine	33.9	35.9	32.4
Pulmonary medicine	21.8	19.6	20
Geriatric medicine	11.3	13	13.8
Cardiology	33	31.5	33.7

Table 1. Baseline characteristics of multimorbid patients admitted to hospital for the specialties of geriatrics, cardiology, pulmonology and internal medicine (*continued*)

	One year pre-ICW	First year After-ICW	Second year After-ICW
Origin upon admission, %			
Own home	91.1	91.4	90.7
Care residency	2.1	2.4	2.2
Another hospital	4.9	4.7	5.6
Outpatient clinic	2	1.6	1.5
Diagnosed comorbidities, n (%)			
Internal medicine			
MDS	90 (1.1)	97 (1.3)	71 (1.0)
Malignancy	2235 (28.5)	1869 (25.7)	1588 (22.9)
Kidney failure	65 (0.8)	70 (1.0)	48 (0.7)
Diabetes mellitus	1736 (22.1)	1609 (22.1)	1371 (19.8)
Hypothyroidism	399 (5.1)	374 (5.1)	317 (4.6)
Hyperthyroidism	135 (1.7)	105 (1.4)	123 (1.8)
Sepsis	691 (8.8)	525 (7.2)	458 (6.6)
Pulmonary medicine			
Asthma	774 (9.9)	690 (9.5)	673 (9.7)
COPD	1476 (18.8)	1118 (15.4)	1167 (16.8)
COVID-19	2204 (28.1)	2083 (28.6)	1711 (24.7)
Pneumonia	1780 (22.7)	1290 (17.7)	1248 (18.0)
Lung cancer	464 (5.9)	330 (4.5)	377 (5.4)
Pulmonary embolism	527 (6.7)	500 (6.9)	368 (5.3)
Geriatric medicine			
Dementia	553 (7.1)	492 (6.8)	435 (6.3)
MCI	278 (3.5)	252 (3.5)	205 (3.0)
Delirium	530 (6.8)	458 (6.3)	388 (5.6)
Parkinson's disease	160 (2.0)	124 (1.7)	105 (1.5)
CVA	741 (9.4)	605 (8.3)	484 (7.0)
TIA	795 (10.1)	743 (10.2)	627 (9.0)
Cardiology			
Atrial fibrillation	1651 (21.1)	1435 (19.7)	1352 (19.5)
CABG	860 (11.0)	764 (10.5)	742 (10.7)
Angina pectoris	1205 (15.4)	1062 (14.6)	836 (12.0)
Myocardial infarction	857 (10.9)	824 (11.3)	802 (11.6)
Heart failure	1599 (20.4)	1355 (18.6)	1160 (16.7)
TAVI	137 (1.7)	123 (1.7)	99 (1.4)
Hypertension	3017 (38.5)	2678 (36.8)	2337 (33.7)
Artery disease	694 (8.8)	688 (9.5)	546 (7.9)

Table 1. Baseline characteristics of multimorbid patients admitted to hospital for the specialties of geriatrics, cardiology, pulmonology and internal medicine (*continued*)

	One year pre-ICW	First year After-ICW	Second year After-ICW
Thrombosis	410 (5.2)	379 (5.2)	275 (4.0)

ICW = Intensive Collaboration Ward, a collaborative practice ward starting 15 June 2020
MDS = myelodysplastic syndrome, COPD = chronic obstructive pulmonary disease, MCI = mild cognitive impairment, CVA = cerebrovascular accident, TIA = transient ischaemic attack, CABG = coronary artery bypass surgery, TAVI = transcatheter aortic valve implantation.

Study outcomes

Figure 1 visualises the results. When comparing the pre-ICW year to the first year follow-up, a rate ratio (RR) of 0.83 (95% CI 0.76 - 0.90) was seen for the number of medical consultations from one of the four collaborating specialties. When comparing the pre-ICW year to the second year follow-up, an RR of 0.81 (0.74 - 0.88) was seen.

Adjusted for confounding, this was a decrease of respectively 16.9% (23.6% - 9.7%) and 19.3% (25.9 - 12.1%) in medical consultations. Figure 1a shows the decrease based on the average number of 0.186 medical consultations during the pre-ICW year.

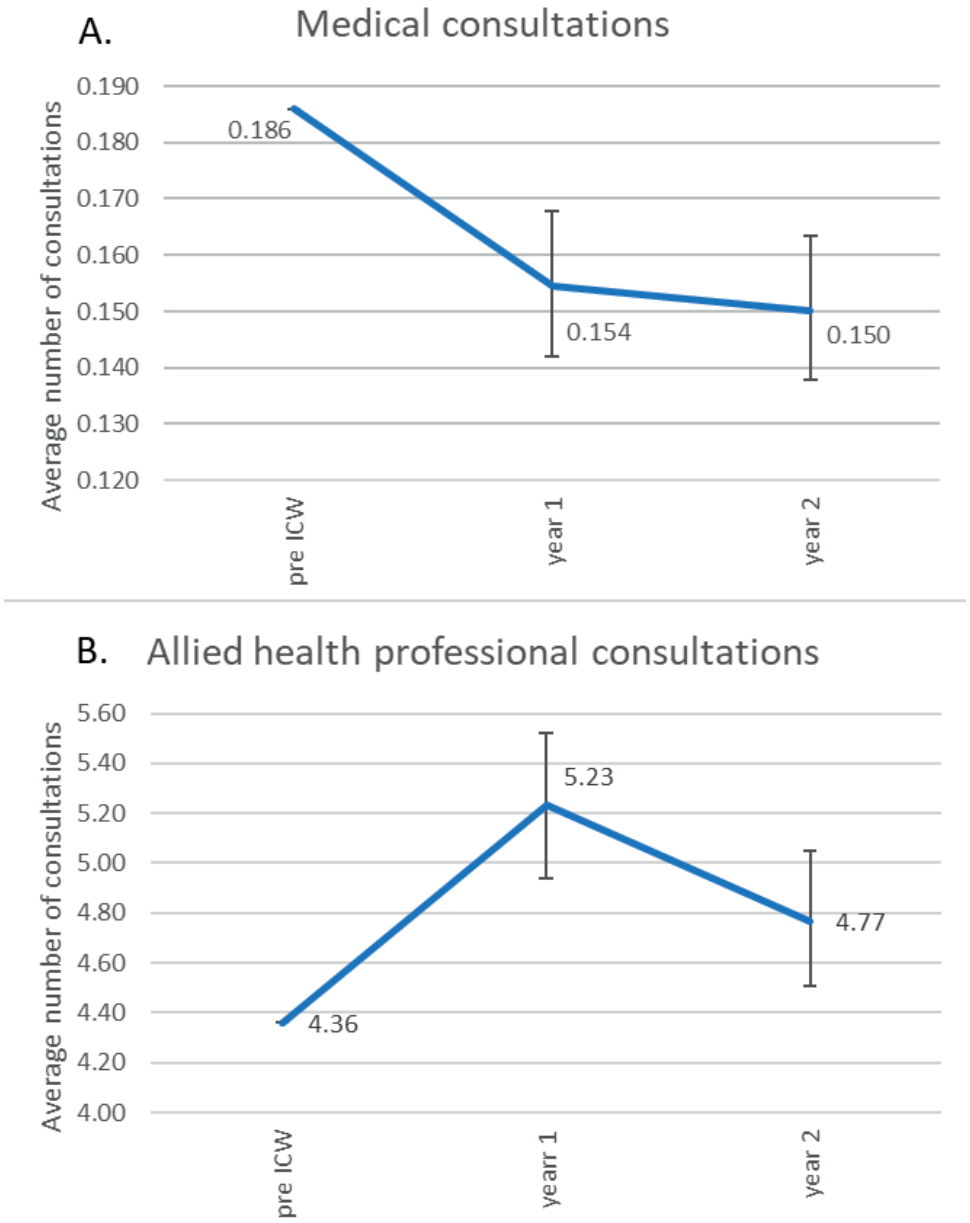
The allied health professionals' consultations (AHC) increased during the first- and second-year follow-up, respectively RR 1.20 (1.14 - 1.27) and 1.09 (1.03 - 1.16). Thus, an increase of 20% (13.7 - 26.7%) and 9.4% (3.4 - 15.8%) compared to the pre-ICW year. Figure 1b shows the increase based on the average number of 4.36 AHC's during the pre-ICW year.

Practical implications

There was an average decrease of 0.032 (-16.9%) and 0.036 (-19.3%) medical consultations per patient for follow-up year 1 and 2 respectively, compared to the pre-ICW year. On a yearly basis, an average of 7352 patients were admitted. This means a decrease of 235 to 265 medical consultations per year.

There was an average increase of 0.87 (+20%) and 0.41 (+9.4%) allied health professional consultations per patient, compared to the pre-ICW year. On a yearly basis, an average of 7352 patients were admitted. This means an increase of 6396 to 3014 allied health professional consultations per year.

Figure 1. Differences in medical and allied health professional consultations for patients in the pre-ICW year compared with the first and second follow-up years.



Panel A (top figure) shows the number of medical consultations, in the pre-ICW year and in the two follow-up years. Panel B shows the number of allied health professional consultations.

Discussion

This study investigates whether professionals learn *from* an interprofessional collaborative practice, and can transfer and apply this knowledge to other patients measured by patient outcomes beyond the collaborative practice itself, with changes in patient care as a result. This study found a significant decrease in the number of medical consultations and an increase in the number of allied health professional consultations.

We hypothesised that professionals learned *from* interprofessional collaboration and that they would apply this knowledge to patients in their general care ward. We hypothesised that this increased knowledge would reduce the need for other medical specialties to be involved, and thus the number of medical consultations of the collaborating specialties would decrease as a proxy for this learning effect. This hypothesis was confirmed by the results of our study. With this result, we achieved level 4b (benefit to patients) of Kirkpatrick's model of evaluation.[14-15] To the best of our knowledge, we are the first to do so.

Extensive research has been conducted on the learning outcomes of interprofessional education, consistently showing positive results.[19-20] This entails research where professionals learn *about* interprofessional collaboration, and not *from* interprofessional collaboration. Research on interprofessional workplace learning also indicates that participants experience an increase in knowledge.[12] However, these studies on interprofessional workplace learning relied completely on self-reported outcomes, achieving only level 2 of Kirkpatrick's model of evaluation. We did not implement an educational intervention but looked at interprofessional collaboration directly. Based on our understanding of the literature, this is the first study to evaluate the learning impact *from* interprofessional collaboration and its direct effect on patient outcomes. It is recognised that knowledge can be lost by the principle of "use it or lose it", an estimated halftime of 2 years if not used or rehearsed.[21] This interprofessional practice could offer opportunities for rehearsal and use of knowledge to remain (and even regain) knowledge.[21] Other research has shown that interprofessional collaboration reduces the number of medical consultations, but it only looked at the number of consultations within the collaborative practice.[22-25] This is the first study to look at the number of medical consultations beyond the collaborative practice, in patients on the regular care ward, and illustrates that the mechanism of reduction is likely to be the professionals' knowledge. As a result, this reduction in medical consultations could lead to a reduced workload for health professionals, which is important in view of the increasing prevalence of multimorbidity, increased health care utilisation and shortage of health professionals.

This study also found an increase in the number of allied health professional consultations on general care wards after the ICW was established. A previous study on the ICW

showed that the number of allied health professional consultations also increased in the ICW.[17] To the best of our understanding, no other studies have examined allied health professional consultations as an outcome, but only as part of the intervention. The rise in allied health professional consultations observed in the regular care wards may be attributed to the enhanced interprofessional interactions between allied health and medical professionals within the ICW, which were then sustained in the regular care wards. This could be explained by several factors, and can be summarized as *to learn about* each other. Because of the collaboration on the ICW: prejudices between groups were reduced (Alport's contact theory)[8]; new behaviours were acquired by observing others (situated learning theory)[10]; professionals have a more favourable attitude towards collaboration (theory of planned behaviour)[11]; all of this could have led to better collaboration between allied health professionals, which they transferred to the regular care wards.

Strengths and limitations

This study has several strengths. First, the data were automatically generated from the electronic medical record, which reduces the risk of error from manual extraction. Second, we used a large dataset of diverse patients, which improves generalisability.

This study also has some limitations that should be taken into account. First, because this is a retrospective cohort study spanning three years, there may be selection bias within the different years. Patients on the ICW are complex, multimorbid patients who often require medical consultations. These complex patients were cared for on the regular care wards during the pre-ICW year, as there was no ICW and therefore no ICW patients. These ICW patients were not present in the two follow-up groups as such patients were now admitted to the ICW and not the regular care wards. Therefore, the decrease in medical consultations on the regular care wards during the two follow-up years after the ICW was established, may be partly explained by the fact that the patients were not entirely equal. However, as we anticipated this possible selection bias, we corrected for this as best we could by using inverse probability weights based on propensity scores using patient characteristics. This means that we used robust statistical methods to improve the comparability of the study groups. Therefore, we believe that the reduction in consultations found in this study is largely due to the learning effect of the ICW. Second, we used a proxy for the learning effect of health professionals, the number of medical consultations. However, this is the first study to look at real-world patient outcome data rather than self-assessed outcomes, and improving patient care is the highest possible outcome of working and learning together.[14-15]

Conclusions

This study implies that healthcare professionals learn *from* interprofessional collaboration and apply this knowledge outside of the collaboration on their regular care ward. This leads to a decrease in the number of medical consultations on the regular care wards outside of the collaboration. Next, this study implies that professionals learn *about* each other, which leads to an increase in the number of allied health professional consultations. This indicates that some of the theoretical mechanisms of interprofessional learning, namely to learn from and about each other, are likely to occur in a hospital collaborative practice, and if so, this could have important clinical implications.

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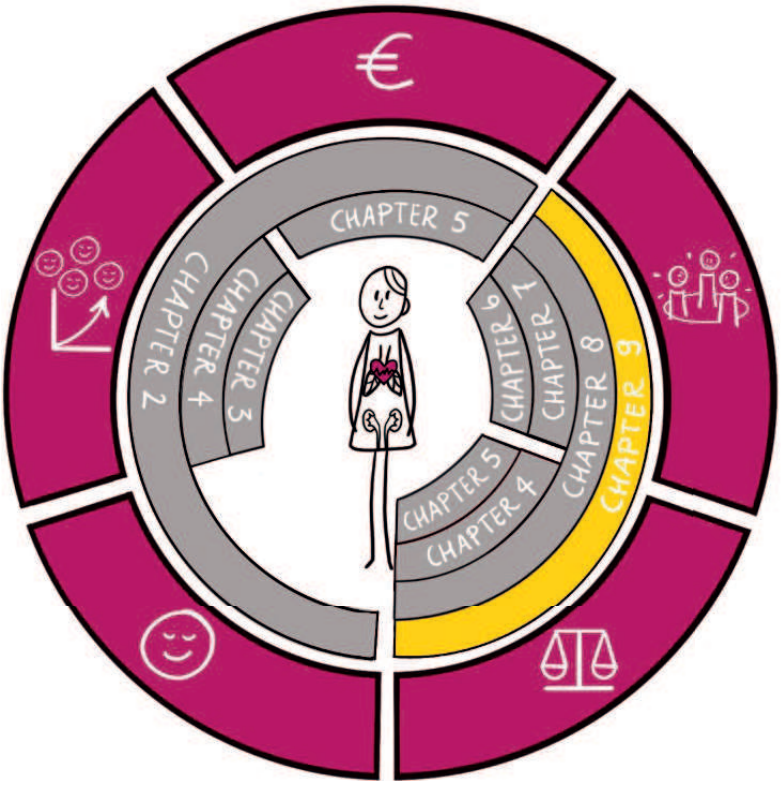
"I claim not to have controlled events, but confess plainly
that events have controlled me"

- Lincoln (1864)

CHAPTER 9

Facilitators and barriers to interprofessional collaboration in the hospital setting: a scoping review



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Submitted

Abstract

Introduction

Successful interprofessional collaboration (IPC) will lead to improvement of health outcomes, as stated by the WHO. However, the IPC initiatives that have been undertaken in hospitals show mixed results in terms of both the success of the implementation and the health outcomes. Knowledge of facilitators and barriers of IPC is essential for successful implementation in health systems. The aim of this scoping review is to identify facilitators and barriers to effective IPC in the hospital setting.

Methods

Three major databases (Medline, CINAHL, Embase) were systematically searched from 2010 to 7 November 2023. Studies were included if they explicitly reported on IPC, included factors in the hospital setting, and were published after the 2010 WHO framework on IPC. Studies were excluded if they focused on education or research. A thematic synthesis was conducted to identify facilitators and barriers.

Results

Fifty-two reports were included. 43 studies describe facilitators, while 46 studies mention barriers. Factors were categorised as relational, organisational, processual or contextual, following the framework for interprofessional teamwork. Relational factors are, by far, the most frequently and extensively described. Most factors are complementary (e.g. familiarity a facilitator, lack of familiarity a barrier). However, some factors were only described as barriers: legal responsibility, workload/other tasks, and gender. Interestingly, studies in other fields have found that gender diversity leads to better team performance and occupational well-being, which is different from the findings in IPC.

Conclusions

This scoping review provided a comprehensive overview of facilitators and barriers to IPC. Many facilitators and barriers were found, most of which were different sides of the same coin. Key factors for effective IPC include: obtaining a shared goal; facilitating interprofessional identity; reducing dysfunctional hierarchies; reducing medical dominance; overcoming personal differences such as gender and race. These factors should be taken into account when designing IPC.

Introduction

The need for collaboration between healthcare professionals has never been more imperative in the current landscape of hospital care, with frequent super specialization of providers and a high prevalence of patients with multiple health conditions.[1] There are many forms of collaboration, with different structures and varying degrees of intensity. To meet today's health challenges, the World Health Organization (WHO) has emphasised interprofessional collaboration: multiple healthcare providers from different professional backgrounds working together.[2] Many interprofessional collaboration initiatives have been undertaken, with mixed results in quality of care and costs.[3-5] According to the statement of the WHO, health outcomes will improve in the case of *effective* interprofessional collaboration.[2] Yet, it is not clear which variables affect interprofessional collaboration and its effectiveness.

Interprofessional collaboration is a complex process. To guide approaches to understanding this process, Reeves et al. proposed the 'conceptual framework for interprofessional teamwork'.[6] This framework proposes four types of factors that might influence collaboration: relational, organisational, processual, and contextual factors. Other attempts to capture the process of interprofessional collaboration have been made by studies investigating healthcare professionals' perceptions or thoughts about interprofessional collaboration.[7-9] However, most of the articles surveyed professionals who do not truly practice interprofessional collaboration and therefore provide only theoretical and no practical insights. In addition to the four factors in Reeve et al.'s framework, it is also possible that these factors differ between settings and types of health professionals, but no studies have investigated this. There are various interprofessional care models that have been implemented in clinical practice, focusing mainly on patient health outcomes.[10-11] Fewer studies focus on the factors that influenced the successful implementation of these interprofessional collaboration initiatives, combining theory and practice. A few reviews mention factors influencing interprofessional collaboration in secondary care, however they include only other reviews,[12] quantitative survey studies,[13] or focus on communication rather than collaboration.[14]

The varying results of interprofessional collaboration described in the literature raise the question how to achieve *effective* interprofessional collaboration. Knowledge on facilitators and barriers is essential to enable health systems to successfully implement interprofessional collaboration. The aim of this scoping review is therefore to identify facilitators and barriers to effective interprofessional collaboration in the hospital setting.

Methods

Protocol and registration

We adopted a scoping review approach to capture the complex and heterogeneous body of evidence on interprofessional collaboration and the barriers and facilitators of this collaboration in practice.

This scoping review was conducted and reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[15] The study protocol was registered in advance in the Open Science Framework register (https://doi.org/10.17605/OSF.IO/MBN9Z).

Eligibility criteria

We searched for and reviewed articles that examined interprofessional collaboration in the hospital setting. We included studies that explicitly reported on interprofessional collaboration in the hospital setting and associated factors influencing this collaboration. Studies were eligible if: (1) it described an interprofessional, including intraprofessional, collaborative practice in healthcare, (2) took place in a hospital setting, and (3) investigated at least one factor affecting the collaboration. To specify the first criterium: a collaboration was considered as interprofessional when it involved different health and social care professionals who come together regularly to negotiate and agree upon care plans, following the terminology stated by Reeves and Mitzkat.[6,16] If these professionals have a common degree (e.g. medicine), this is sometimes called intraprofessional collaboration rather than interprofessional collaboration.[17-18] In this review, intraprofessional collaboration was considered as a subtype of interprofessional collaboration and also included.[19] We did not distinguish between interprofessional and intraprofessional collaboration in the inclusion of articles or in the synthesis of results. The procedure to find the eligible articles by search strategy and screening based on exclusion criteria are clarified in further detail below.

Search strategy and information resources

Identification of the studies was performed by searching three electronic bibliographic databases (MEDLINE, Embase and CINAHL). The search strategy was designed in collaboration with a professional research librarian and employed terms for the concepts 'interprofessional collaboration' and 'hospital care'. Filters were set on language (Dutch, English) and publication date ≥2010. The publication date of ≥2010 was chosen because the WHO framework on interprofessional collaboration was published in 2010, with important implications for the field, and the definition of interprofessional collaboration was established in that year by Reeves et al.[6] The search domain for the terms addressing

'interprofessional' was narrowed to the title, since a pilot search yielded >15.000 results including many non-relevant records. This narrow strategy with title term was validated by the following procedure: screening the title, abstract and key words of the first 1% of the original broad search on relevance, then checking whether the relevant results were included in the final search; this was confirmed. The final search was conducted on the 7th of November 2023. A summary of the search is shown in Figure 1, the full search string per database can be found in Appendix E.

Figure 1. Summary of the search strategy

1. ("Interprofessional"[ti] OR "interdisciplinary"[ti] OR "multidisciplinary"[ti] OR "cross disciplinary"[ti] OR "intraprofessional"[ti] OR "intersectoral"[ti] OR "IPC")
2. ("communicat*"[tiab] OR "collaborat*"[tiab] OR "team*"[tiab] OR "ward*"[tiab] OR "cooperat*"[tiab])
3. ("secondary care"[MeSH Terms] OR "hospitals"[MeSH Terms] OR "secondary care*"[tiab] OR "secondary healthcare*"[tiab] OR "secondary health care*"[tiab] OR "secondary referral*"[tiab] OR "hospital*"[tiab])
4. From 2010 – 2023
5. 1 AND 2 AND 3 AND 4

Selection of eligible articles by screening procedure

All articles retrieved from the search were collected and uploaded into Rayyan, a software programme used to collect, screen, and organise potentially eligible articles.[20] Figure 2 shows the steps: identification by search strategy, removing duplicates, screening of articles by exclusion criteria, which leads to inclusion of eligible articles. The following exclusion criteria were used in the screening of articles, first by title and abstract screening: (1) studies not focusing on the process of interprofessional collaboration, (2) wrong domain (e.g. education rather than clinical practice), (3) publication type that was not peer-reviewed (e.g. opinion papers), or (4) full-text not available. Next, for the full-text screening phase the following exclusion criteria were used: (1) studies not thoroughly describing the process of interprofessional collaboration, (2) not a secondary care hospital setting, (3) publication type that was not peer-reviewed (e.g. opinion papers), and (4) no information on factors affecting the collaboration. The final optimisation of the search was carried out using a snowball search: the references of all included articles were checked for possible eligible articles, screened based on the above-mentioned criteria, and included if eligible.

To establish the inter-rater reliability of the screening, GM screened titles and abstracts, and 5% were cross-checked in a blinded fashion by SdG. In case of conflicting decisions (11 times), authors discussed upon the agreement in order to unify the screening method e.g. how to interpret certain things. In case of remaining doubt articles were included and further screening took place in the more detailed full-text screening phase. The full-text screening phase was performed by GM, with consultation of SdG in cases of doubt.

Critical appraisal

Quality of the included studies was assessed by evaluation with the validated Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research.[21] Studies were considered of poor quality if ≥2 questions were answered with 'no', if ≥1 question was answered with 'no' and ≥2 with 'unclear' or if ≥3 questions were answered with 'unclear'. Studies were considered of medium quality if 1 question was answered with 'no' or if 2 questions were answered with 'unclear'. Studies were considered of high quality if all questions were answered with 'yes' or if a maximum of 1 question was answered with 'unclear'. The appraisal tool was used to moderate the findings in terms of rigor and quality, and was not used to exclude studies from further analysis.

Data collection procedure and data items

Data were extracted from the included studies using a pre-established form which was developed by the authors based on the purpose of this review. The data extraction form included information on: author, year of publication, country, study design, study aim, description of IPC intervention and context, involved health professionals, facilitators, and barriers. GM extracted the data from all included studies.

Synthesis of results

The results were first summarized. Then results were organized by a) the framework for interprofessional teamwork as developed by Reeves et al.: contextual, organisational, processual, and relational factors.[6] Two additional viewpoints were reported, namely b) setting and c) health professional perspective, to add further depth to the analysis and interpretation of the results.

All authors were involved in these syntheses by discussion within the research team to ensure a common understanding. To optimise this discussion the data extraction form with predefined items was used to structure the discussion. Data were presented using a schematic figure and thematic analyses.

Ethical considerations

This research did not involve human subjects and therefore fell outside the scope of the Dutch Medical Research Involving Human Subjects Act. Therefore, no formal approval

by the Ethics Committee was required. This study was conducted in accordance with the tenets of the Declaration of Helsinki.

Results

Search results

Figure 2 shows the results of the study selection. The database search identified 7151 articles, of which 3444 duplicates were removed. Of the remaining 3707 articles, after screening and snowballing a total of 52 studies were included.

Critical appraisal

Appendix F shows the assessment of risk of bias in detail, of which the summary is visualized in Table 1. Of the studies 20 were considered high, 13 moderate, and 19 as poor quality. Main weaknesses were lack of either statements regarding the background and influence of the researcher(s) or adequate representation of the participants. For the data syntheses all were included, as described above.

Study characteristics

A summary of all the studies is given in Table 1 and more detailed descriptions are given in Appendix G. Of the included studies, 44% were conducted in hospitals in the United States or Canada. While the specific study aims varied, the majority (96.2%) used qualitative or mixed methods to explore interprofessional collaboration, using observations and interviews or focus groups. Two studies used cross-sectional quantitative survey methods.[22-23] There were five pairs of studies with (partially) overlapping datasets (Alexanian[24] & Kendall-Gallagher[25]; Etherington a[26] & Etherington b[27]; Goldman[28] & Goldman[29]; Looman[30] & Looman[31]; Paradis[32] & Reeves[33]). Due to differences in both aim/angle and methods, the results were not identical and it was decided to retain all studies separate.

Figure 2. PRISMA Flow diagram of records in the selection process

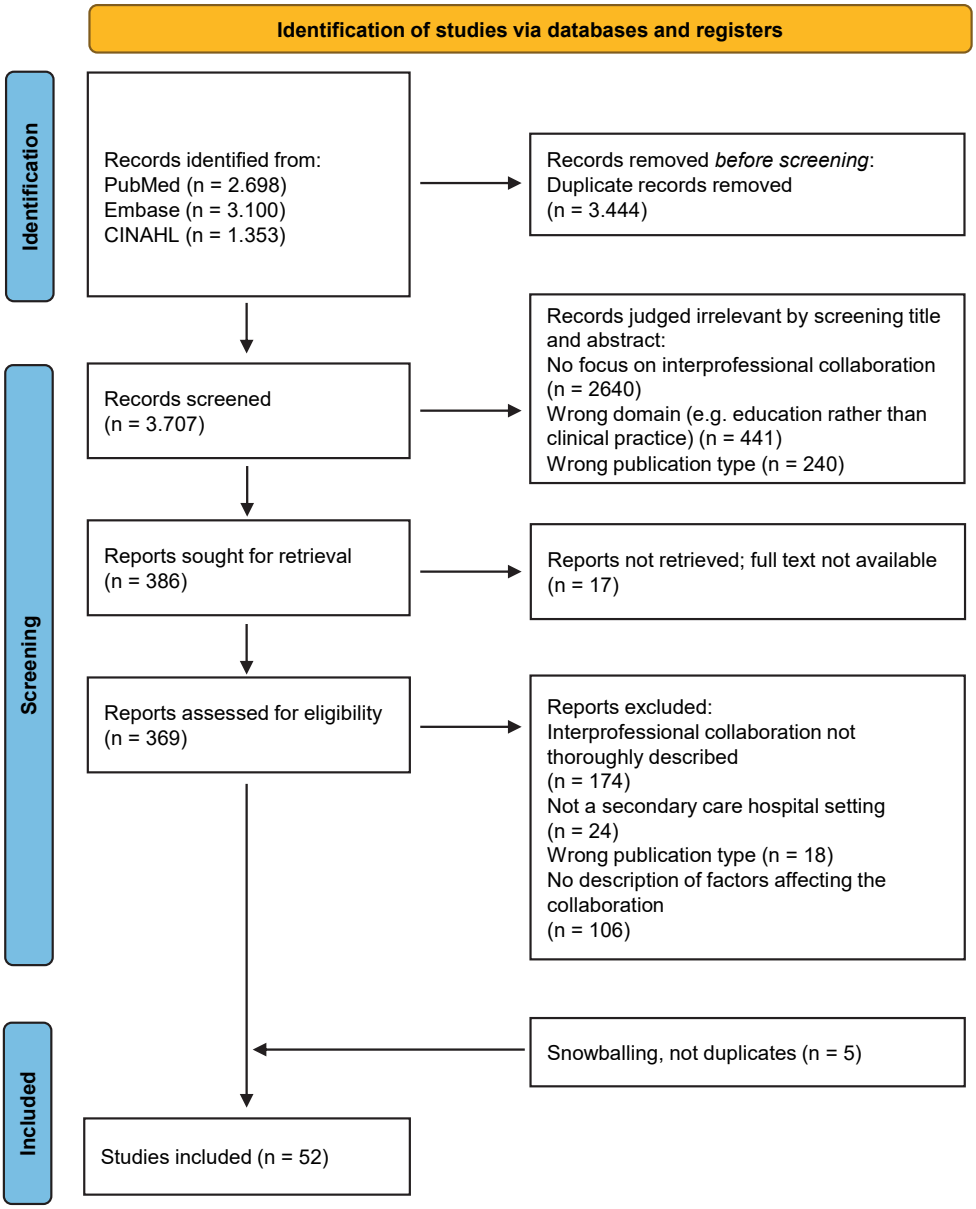


Table 1. Summary of characteristics of the included studies.

Legend: ? = not described in the article. A more detailed description of the quality assessment can be found in Appendix 2.

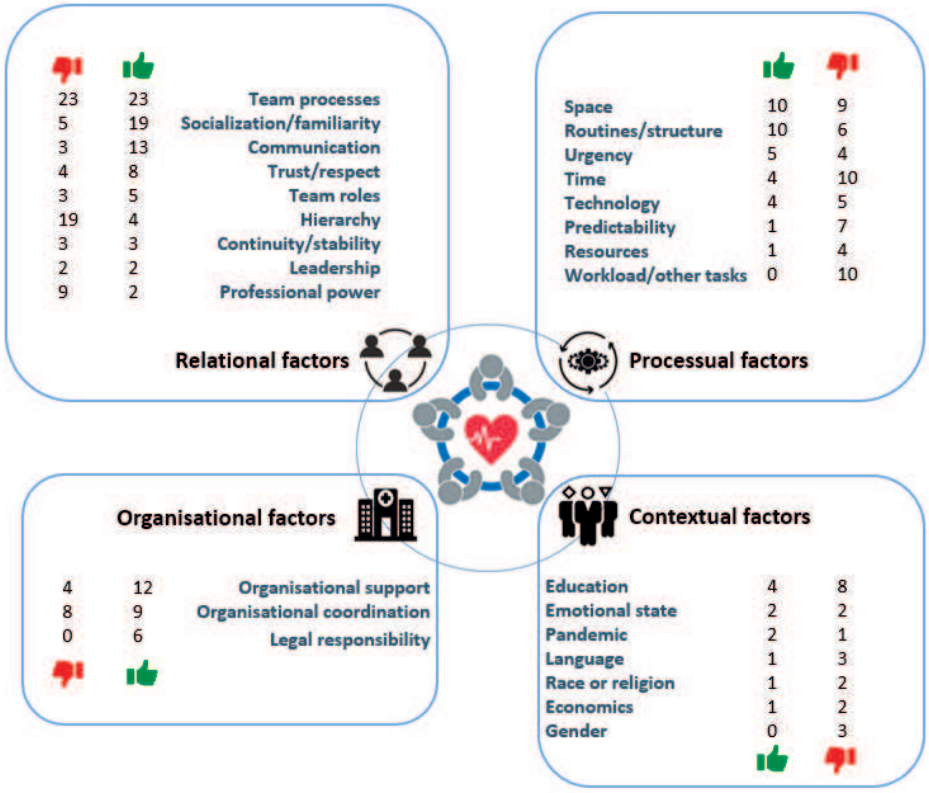
Article First author, year	**Quality assessment** = poor quality = medium quality = high quality	**Setting** = ward round or care in general = intensive care = operation room = specific meeting or other	**Healthcare perspectives** = nurse = physician = allied health professional	**Type of factor** = relational = processual = contextual = organizational
Alexanian, 2015				
Anselmann, 2023				
Askelin, 2023				
Assafi, 2022				
Aveling, 2018				
Baik, 2019				
Bjurling-Sjöberg 2017				
Boltey, 2023				
Borgstrom, 2021				
Bus, 2022				
Carroll, 2021				
Chew, 2019				
Chua, 2022				
Clark, 2013				
Costa, 2014				
Ding, 2020				
Etherington, 2021				
Etherington, 2021				
Goldman, 2015				
Goldman, 2016				
Gonzalo, 2014				
Gum, 2020			?	
Haines, 2018				
Heiden, 2023				
Hendricks, 2017				
Jayasuriya-Illesinghe, 2016				
Jones, 2011				
Källén, 2022				
Kendall-Gallagher, 2017				
Keshet, 2013				
Lewin, 2011				
Liberati, 2016				
Lin, 2022				
Looman, 2020				
Looman, 2022				
Menefee, 2014				
Merriman, 2024				
Milton, 2023				
Nicholas, 2010			?	
Paradis, 2016			?	
Prystajecky, 2017				
Reeves, 2015				
Rice, 2010				
Shohani, 2017				
Teheux, 2023				
Van Schaik, 2014				
Vestergaard, 2018				
Walmsley, 2021				
Walraven, 2023				
Walton, 2019				
Whitney, 2023				
Ylitörmänen, 2023				

Synthesis of results

a) Summarized by conceptual framework of interprofessional teamwork[6]

Figure 3 shows the findings integrated in the 'conceptual framework for interprofessional teamwork' of Reeves et al. The selected studies depict relational, organisational, processual, and/or contextual factors important for practicing interprofessional collaboration. 43 studies described facilitators of interprofessional collaboration, while 46 studies described barriers. Importantly, most factors are complementary (e.g. familiarity as a facilitator, lack of familiarity as a barrier); some exceptions to this rule are highlighted below. The descriptive analysis shows that relational factors are the most frequently described, almost three times as often as other factors.

Figure 3. Adaptation of Reeves' framework for interprofessional teamwork, with the frequency of each factor being described as barrier or facilitator in the studies included in this scoping review.



A thumbs up indicates a facilitator, a thumbs down indicates a barrier. Each number represents the number of articles in which the factor was described as a facilitator/barrier.

a.1 Relational factors

Factors relating to interpersonal and intrateam relations are by far the most often and extensively described in studies of interprofessional collaboration. Many studies indicate the facilitating role of socialization or familiarity and team processes such as shared goals and mutual commitment.[25-27,30-31,34-55] Communication, trust, respect, and leadership are other frequently mentioned facilitators.[26,31,34,35,37,38,40,50,52-60] On the contrary, issues such as conflicting professional norms, inconsistencies, and a negative or unsafe work culture are team processes that pose barriers to interprofessional collaboration.[25,26,28,31,46,49,50,52,56,61-64] Etherington et al. describe that professional norms can conflict: "I think everyone has the same global objective, but people might have different attributes of what they think makes an effective team".[26] Hierarchy, mostly medical dominance, and professional power are also major barriers.[24,26,27,29,30-32,36,44,46,47,52,56,59,60,65-67] Less hierarchy is deemed facilitative.[68] Lack of trust and respect or lack of stability are also mentioned as barriers.[24,41,50,60,64] For the factors communication and leadership, professionals seemed to value quality over quantity/intensity, as they used adjectives that emphasised this (e.g. 'positive leadership' instead of 'degree of presence'). Källén et al. describe this: "Clear clinical leadership that is conducted in a trusting environment can be used as a tool to facilitate IPC by a synergy effect grounded in differences.".[58] Clear and open communication is considered positive, as is positive and correct leadership.[26,34,40,54,56-58,69]

There were some discrepancies in the complementary facilitators/barriers. Although most studies consider hierarchy purely as a barrier, one study also mentioned the facilitative abilities of hierarchy: "Hierarchy is useful as it clarifies roles and responsibility". Nevertheless, too much hierarchy can have a hindering effect.[30] Another study associated familiarity with a negative effect: "An atmosphere that is too informal is also seen as a barrier, as it can lead to inefficiency".[60]

a.2 Organisational factors

Factors relating to the organisation of the hospital are referred to as facilitators or barriers in a complementary way. Organisational support, including clear expectations, and congruent processes between different healthcare professionals are facilitating factors.[30,35,41,47- 49,52,53,57,64,70] Interprofessional collaboration requires support from several levels within an organisation, as described by Nicholas et al. "IPC development appears to be linked with executive-level support, within an interpersonal environment and a conducive organizational culture.".[49] The stated barriers are a lack of support, no coordination, and parallel processes.[28,30,41,43,45,51,53,67,68,71] An example of a hindering organizational structure is the need of referrals for involving allied health professionals.[29] A factor that is only described as a barrier is an asymmetric legal responsibility: to illustrate this, in most collaborations the accountability for the decisions lies with the physicians, which was negative for the involvement of other members of the team.[24,28,32,46,47,72]

a.3 Processual factors

Processual factors are mainly barriers to interprofessional collaboration: both time and space constraints and a high workload or other demanding tasks appear to be frequent barriers.[22,23,29,30,32,33,36,38,41,43-45,49,51,54-56,60-62,64,67,68] As to time and space, not only is scarcity mentioned, but also varying meeting times, physical separation, and seating arrangements in a room. Other barriers include problems with technology, unplanned events, and a lack of routine or structure in the collaboration.[22,28,33,34,36,46,56,58,60-62] On the other hand, the presence of routines and structure is a facilitator of interprofessional collaboration, as does the physical sharing of workspace.[25,30,34,35,37,41,46,51-56,60,62]

As for routines/structure and urgency, the combination facilitator-barrier was not always corresponding. Although working routinely was most often referred to as facilitator, one study in the acute care setting found that the fast pace of work reduced the opportunities for routine interprofessional interactions between professionals.[66] Opinions on urgency in healthcare delivery were very variable: an urgent situation such as a resuscitation or acutely ill patient was frequently seen as conducive for interprofessional collaboration, however almost just as often it was posed as a barrier.[26,33,36,47,51,73]

a.4 Contextual factors

The influence of the context on interprofessional collaboration is mainly perceived as negative: differences in gender, race, religion, or first language were considered barriers.[26,27,44,59,63] The few contextual facilitators mentioned are positive personal experiences and religious motivation. Religion can be a facilitator, instilling a belief that helping each other is necessary to provide good patient care.[71] In terms of constraints, the most important was the clashing priority of collaboration or education, which were often seen as competing interests.[32,42,43,49,58,66] Regarding education, there were two predominant constraints: discontent with current curricula/training not concentrating on learning interprofessional collaboration, and the fear that interprofessional collaboration would diminish educational opportunities.[32,36,39,42,51,66] However, joint education or training in collaboration was also frequently mentioned as incentives, revealing the contradictory thoughts on education as facilitator or barrier.[51,53,64] Another discrepancy was seen in two studies addressing interprofessional collaboration in the context of the COVID-19-pandemic: one study describes the facilitating effect, while the other study emphasizes both the facilitating and hindering influence.[39,73]

In addition to the framework for interprofessional teamwork,[6] two other perspectives were analysed: the setting perspective and the health professional perspective. These are presented below.

b) Setting

Interprofessional collaboration is performed in many different settings. Most studies on interprofessional collaboration are performed in care in general or at (bedside) ward rounds. Interprofessional collaboration is also widely practiced in intensive care units and in the operating theatre. Other forms of interprofessional collaboration, mostly specific meetings, are also described.

Although the exact way of working together differs per setting, most factors that play a role in these collaborations are quite similar. In all forms, relational factors are most often found to be of influence, both positively and negatively. Notable was the granted negative effect of contextual factors such as gender, race, or emotions in the operating theatre: all four studies in the operating theatre mentioned these types of factors,[26,27,36,44] whereas none of the six studies on specific meetings did.[38,40,41,60,61,72] Meanwhile, only one of the operating theatre studies describes an organisational factor, with both a positive (structured time to share information as facilitator for IPC) and a negative note (organisational issues as barrier to IPC).[36]

c) Healthcare professional perspective

As per the definition of interprofessional collaboration, it involves different healthcare professionals. In 57.1% of the studies, the collaboration included both nurses, physicians, and allied health professionals. Overall, allied health professionals were less represented (59%) than nurses (84%) and physicians (88%). Three studies did not provide information upon the involved healthcare professionals. There were no clear differences seen between different healthcare professionals. All different types of factors were mentioned by all types of healthcare professionals, and all healthcare professionals predominantly pointed out relational factors for IPC. Total separation of different groups of professionals could not be managed since some of the included studies anonymized the opinions, and other studies drew conclusions based on joint focus groups.

Discussion

This systematic scoping review synthesised the facilitators and barriers to interprofessional collaboration in the hospital setting from 52 included papers using the framework for interprofessional collaboration supplemented with two additional viewpoints, namely setting and health professional perspective.[6] Although these facilitators and barriers did not differ substantially between settings and healthcare professionals, in the operating theatre contextual factors seem to have a more dominant effect. Overall, it is notable that the studies that described barriers to interprofessional collaboration did not describe

how to influence these and improve interprofessional collaboration. This remains unclear from this review and more research into this subject is needed.

We expected to find facilitators and barriers that were unrelated. However, this review showed that facilitators and barriers were mainly complementary and could be described as different sides of the same coin. Interestingly, there are some factors that were only described as barriers, but no factors that were only described as facilitators. Factors that were only described as barriers were asymmetric legal responsibility (organisational factor),[24,28,32,46,47,72] high workload or other demanding tasks (processual factor),[29,41,43,45,49,51,55,56,62,68] and differences in gender (contextual factor).[26,27,44] While asymmetric legal responsibility and a high workload are obvious barriers, gender differences are less obvious. On the contrary, the literature suggests that gender diversity in the workplace could lead to better team performance and occupational well-being, which are positive effects of gender diversity.[74] It may be that the findings of gender as a barrier are a proxy for the negative influence of hierarchy, as historically women and non-white staff have been lower in the medical hierarchy. However, this was not described in the studies of interprofessional collaboration included in this review.

Next, the results will be viewed in the light of other fields of research to better understand whether the facilitators and barriers found in this study are specific to interprofessional collaboration or are applicable to other settings.

Relational factors (a.1) are relevant not only to interprofessional collaboration but also to other settings and types of collaboration. Studies in anaesthesia, cardiac surgery and aviation show that facilitating relational factors improves productivity and performance.[75-77]

Organisational factors (a.2) are very present and essential to the whole of healthcare, with for example standard operating procedures, and therefore also to interprofessional collaboration.

Processual factors (a.3) are relevant to the whole of healthcare, but are even more important in interprofessional collaboration. Professionals need to regularly come together, which requires adequate time, space, routine and structure. What is considered 'adequate' for these factors varies between different interprofessional collaborations and tailor-made solutions need to be found. In addition, socialisation (getting to know each other) is an important step in creating an interprofessional identity to further enhance collaboration. This can be facilitated, for example, by sharing a workspace.[18,78]

Contextual factors (a.4) are relevant to the whole of healthcare, but are even more important in interprofessional collaboration. Contextual factors such as language and

education may differ between professions and their combination may cause problems. This should be taken into account when designing interprofessional collaboration.[44,63,79,80]

Limitations and strengths

Although this review summarises the evidence on facilitators and barriers, the findings should be seen in light of some limitations. In terms of search strategy, we had to narrow the search to title screening for the term interprofessional as a broader search yielded >15,000 results. This may have had the disadvantage of missing relevant articles. To minimise this effect, the broad search was performed and 1% of the articles retrieved were validated in the narrow search and no relevant articles were missed. However, it cannot be completely excluded that no articles were missed. One might have expected a non-reporting bias, with positive results of interprofessional collaboration being published with facilitators and less negative results with barriers. However, this review found that the number and frequency of facilitators and barriers were almost equal, making this reporting bias less likely. Finally, the syntheses of results did not provide clear tips on how to overcome barriers.

This study also has several strengths. This study is the first to provide a comprehensive overview of the facilitators and barriers to interprofessional collaboration. This broad overview can be used by a wide range of professionals to further improve interprofessional collaboration. The literature search and analysis were carried out to a high standard to ensure the validity and reliability of the findings.

Conclusions and implications

This scoping review provided a comprehensive overview of facilitators and barriers to interprofessional collaboration and found that most factors were different sides of the same coin, with the presence of a factor being a facilitator and its absence a barrier, or vice versa. Key factors for effective interprofessional collaboration include: obtaining a shared goal; facilitating interprofessional identity; reducing dysfunctional hierarchies; reducing medical dominance; overcoming personal differences such as gender and race. With the rapid growth of knowledge about interprofessional collaboration, future research should provide further insight into mechanisms for optimising collaboration.

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“We can see only a short distance ahead, but we can see that much remains to be done”

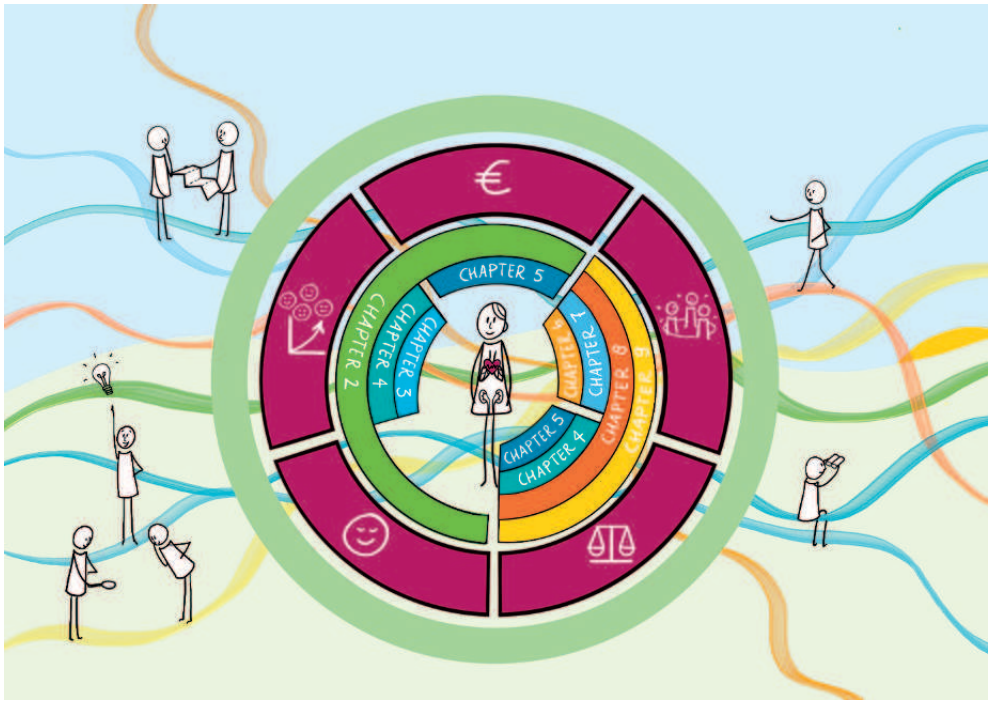
- Alan Turing (1950)

CHAPTER 10

Summary and General Discussion

The ultimate aim of the studies in this thesis is to improve the quality of care for older patients with multiple health problems. To do so, I examined whether the newly established Intensive Collaboration Ward (ICW) at the Jeroen Bosch Hospital improved all aspects of the quality of care according to the Quintuple Aim, and sought to understand the underlying mechanisms of collaboration and their impact. This final chapter summarises the main findings of the previous chapters. I will then reflect on the implications for clinical practice and the challenges and opportunities for the future of healthcare. Many different perspectives could have been chosen for this general discussion, as visualised in Figure 1. However, only a limited number can be explored in depth in this section and therefore I made a selection based upon the most striking results and their impact. Firstly, to achieve a sustainable healthcare system for the future, changes need to be made, therefore I will discuss the theories and concepts that help to achieve organisational change. Secondly, as a young doctor and researcher at the beginning of his career, the future of healthcare is of utmost importance to me, which is why I have chosen to share my vision on this future. Thirdly, I will reflect on the strengths and limitations of this thesis.

Figure 1. Visual representation of the different perspectives around this research.



Overview of main findings

In this thesis, we have explored all the aims of the Quintuple Aim, as illustrated in Figure 1. **Chapter 2** focused on the first three aims, demonstrating that ICW patients rated their quality of care highly (8.22 out of 10) and experienced better health outcomes, such as a shorter length of stay (-2 days) and fewer in-hospital medical consultations (-49%). An overview of the costs and benefits of the ICW has been provided, but whether this leads to cost-effective care required further study, which is undertaken in **Chapter 5**.

In **Chapter 3** we examined the impact of interprofessional collaboration within the ICW on patient health outcomes. This study assessed a similar set of patient health outcomes as in **Chapter 2**, but a different and larger cohort of control group patients was acquired to provide more robust results for certain outcomes and to expand the outcomes. ICW patients required fewer in-hospital and emergency department medical consultations (-69% and -14%, respectively), while receiving more allied health professional consultations (+23%). The findings provide further evidence for the positive impact of interprofessional collaboration on older patients with multimorbidity.

In **Chapter 4**, we proceeded to collect follow-up data from the patient groups that were examined in **Chapters 2 and 3**. The analysis of this follow-up data indicated that ICW patients experienced a significant reduction in the number of emergency department visits (-61%) and outpatient clinic visits (-51%) during the initial six months following their discharge from ICW.

In **Chapter 5**, an economic evaluation was conducted to investigate the ICW's impact on healthcare costs, the third aim of the Quintuple Aim. The ICW improved health outcomes, thereby reduced costs; however, the ICW necessitated increased staffing, which in turn increased costs. Combining all factors, the ICW proved to be cost neutral. While the ICW may even be cost-effective when looking at the outcomes (such as reduced length of stay and medical consultations), further investigation is required to substantiate this claim, particularly in relation to a more general health outcome such as quality of life. Additionally, **Chapter 4** identified a reduction in emergency department and outpatient clinic visits, which were not incorporated in the present economic evaluation. However, this is another cost-saving factor in favour of the ICW. In **Chapter 5**, we also examined health equity, the fifth aim of the Quintuple Aim. The analysis suggests that the ICW may improve health equity by reducing the workload, freeing up beds and reducing the workload on staff. This finding is particularly relevant given the current and future challenges posed by staff shortages. We consulted with stakeholders to reflect on the findings of this study, which enhanced the validity of these results.

In **Chapter 6** an ICW was implemented in another hospital in the Netherlands. The aim was to investigate healthcare professional wellbeing, the fourth aim of the Quintuple Aim. During the implementation, we explored whether different concepts of healthcare professional wellbeing are related and whether the scores on these concepts changed over time when collaborating interprofessionally. We showed a positive correlation between the concepts of work engagement and culture of care (r 0.48), and the concepts of culture of care and interprofessional identity (r 0.30). The wellbeing of healthcare professionals remained stable over time when collaborating interprofessionally. However, it is important to note that the implementation of this ICW was only partially successful, which limits the reliability of the results. Further studies are necessary to investigate whether healthcare professional wellbeing changes over time when successfully working interprofessionally.

In **Chapter 7** we investigated the interactions among healthcare professionals in various types of patient treatment meetings. To accomplish this, we made video and audio recordings of multidisciplinary and interprofessional treatment meetings. The analyses yielded several key factors influencing healthcare professionals' behaviour in terms of participation, learning, and patient-centred care. We formulated nine key strategies to optimise collaboration. Furthermore, it was observed that five healthcare professionals participated in both types of meeting and displayed significantly different behaviours. This finding emphasises the substantial impact of the derived factors and key strategies in demonstrating the dynamics of healthcare professionals' behaviour during treatment meetings.

In **Chapter 8**, the learning effect of interprofessional collaboration was examined, hypothesising that professionals would learn from interprofessional collaboration on the ICW without an educational intervention, and can transfer and apply this knowledge to other patients beyond the collaboration. The ultimate result from learning is to actually change patient outcomes. We therefore investigated whether the number of medical consultations (learning *from* each other) and allied health professional consultations (learning *about* each other) changed for patients outside of the collaborative practice. We found a significant decrease of 16.9-19.3% in the number of medical consultations and a significant increase of 9.4-20% in the number of allied health professional consultations. This implies that healthcare professionals learn *from* interprofessional collaboration and are able to transfer and apply this knowledge outside the interprofessional collaboration to patient care outside the collaboration.

In **Chapter 9** we conducted a scoping review of the facilitators and barriers to interprofessional collaboration. A large number of studies have investigated which factors influence the success of interprofessional collaboration, which relates to health equity, the fifth aim

of the Quintuple Aim. This scoping review included 52 studies, 43 of which described facilitators and 46 of which described barriers. The majority of factors were found to be complementary (e.g. familiarity a facilitator, lack of familiarity a barrier). Key factors for effective interprofessional collaboration include: obtaining a shared goal; facilitating interprofessional identity; reducing dysfunctional hierarchies; reducing medical dominance; overcoming personal differences such as gender and race. This scoping review provided a comprehensive overview of facilitators and barriers to interprofessional collaboration that should be considered when designing interprofessional collaboration.

The findings of all these chapters demonstrate that interprofessional collaboration in the ICW performs effectively on all five aims of the Quintuple Aim. This suggests that the ICW, if successfully implemented and taking into account the relevant facilitators and barriers, could be a promising healthcare reform to address the current and future challenges of caring for older patients with multimorbidity.

Which insights does this thesis provide: organisational change (point of view 1)

This thesis has shown that interprofessional collaboration on the Intensive Collaboration Ward (ICW) provides high quality healthcare in all aspects of to the Quintuple Aim. But, how can a healthcare institution implement such a complex interprofessional collaborative practice? An attempt to answer this question requires a more detailed knowledge of the origins of the ICW.

For multiple years, studies have shown that patients are getting older and more complex due to multimorbidity.[1-2] Many medical specialists observed this issue and recognized that these patients were not receiving comprehensive and appropriate care, sometimes leading to negative health outcomes.[3-6] In recent years, various attempts have been made to address this problem, but none have gained significant traction.

There is a Dutch proverb that adequately describes this situation from the patient point-of-view: "to fall between the ship and the dock" ("tussen wal en schip vallen"), or an English equivalent: "to slip through the cracks". This implies that patients do not fit into the 'single medical issue' boxes of the healthcare system and therefore receive inappropriate care.

In early 2020, the world encountered the rapid emergence of a severe and dangerous pandemic: the COVID-19 pandemic. The Netherlands was no exception. In March 2020, the Jeroen Bosch Hospital was overwhelmed with patients with this virus.[7] The sheer

number of patients could not be treated by pulmonary and internal medicine departments alone, necessitating the involvement of specialists from all medical disciplines. This unprecedented situation fostered remarkable collaboration between residents and specialists across various hospital departments, with seamless teamwork established within just days to weeks.

Some specialties appreciated the collaboration so much that they wanted to continue it and identified a category of patients that required improved collaboration. In merely six weeks, the specialties of cardiology, geriatrics, internal medicine, pulmonary medicine and hospital medicine, together with nurses, allied health professionals and all support and managerial departments, successfully achieved this. The Intensive Collaboration Ward (ICW) was fully established and operational within this brief timeframe.

How was this immense change in workflow and collaboration achieved? There are several theories in the field of organisational change management that can help answer this question.

First, the COVID-19 pandemic created an urgent need to transform the existing workflow. This is the first step in Kotter's change management model.[8] Without this step you cannot move forward. This sense of urgency was present in all healthcare professionals and was carried over into the design of the ICW.

Second, the professionals took the lead. This ensured that professionals motivated to drive change were leading the effort. Innovators and early adopters spontaneously emerged and formed a leading coalition. The necessity for innovators and early adopters in change management is described in the diffusion of innovation theory, while the need to establish a leading coalition is outlined in Kotter's model (step 2).[8-9]

Third, the patient was placed at the centre of the innovation. Patient needs were used as the starting point for creating a vision for change (Kotter's model, step 3).[8] In contrast to many other organisational changes, management had a supportive role rather than a leading role, ensuring that the actual needs of both patients and professionals were met. This approach facilitated a model of care that was tailored to this complex group of patients and ensured that health professionals were motivated to participate in this model of care.

Fourth, despite the initial enthusiasm and successes of the ICW, this innovation also had its setbacks, as described in Zunin and Myers' phases of disaster model.[10] However, the dedicated professionals persevered, adapted and made the ward a lasting success.

Fifth, all professionals who were motivated to change the organisation of care were involved, regardless of their job description or experience. A study by Penturij-Kloks et al.[11] demonstrated that the level of readiness to change did not differ clinically significantly between different job types in the hospital, and that readiness for change and work engagement were positively correlated. This suggests that every healthcare professional is a potential "change agent" and should be given the opportunity to participate in organisational change. The findings of this study indicate that managers and team leaders do not necessarily possess a greater capacity to lead the innovation, as evidence suggests they do not possess a higher level of readiness for change.[11] In the process of designing and implementing innovations, professionals should not be selected based on their functions, but rather on the basis of their ideas and their engagement with innovation.[11]

The scoping review in **Chapter 9** revealed that there are many facilitators and barriers to the success of an interprofessional collaborative practice. Looking back on the successful implementation of our ICW, we can see that all the key factors identified in **Chapter 9** were taken into account and were necessary to achieve a successful interprofessional collaborative practice. But is collaboration truly necessary? The WHO asserts that it is.[12]

The urgency to change the organisation of healthcare is also felt by healthcare professionals throughout the Netherlands.[13] In the next paragraphs I will describe the future of health care. This future is of personal significance to me. As a healthcare professional under the age of 30, I will most likely have to work for at least another 40 years, preferably in healthcare. Therefore, it is important to change the organisation of healthcare to meet the challenges of the future and to make it easier for me to remain engaged in my work.

The future of healthcare (point of view 2)

The future of healthcare is a highly discussed topic, with a special working group tasked with creating a vision and plan for the future of healthcare in the Netherlands. This group is known as the Medical Specialist 2035 working group of the Federation of Medical Specialists (FMS).[14] This FMS working group has visited healthcare institutions in all regions of the Netherlands to meet with healthcare professionals and collaboratively create a vision for the future. They have developed several scenarios for the future of healthcare: worst case, medium case and best case.[15] The global COVID-19 pandemic showed us a moment of tremendous scarcity in healthcare, where though choices had to be made.[16] The research undertaken for this thesis has revealed that interprofessional collaboration can be a suitable model of care, with the potential to deliver more efficient and higher quality care to complex patients. If the future looks anything like the COVID-19 pandemic in terms of scarcity and choices to be made, then interprofessional collaboration may be

an appropriate model of care for the future of healthcare. In the following paragraphs, I will present some extracts from the worst-case scenario, accompanied by several additions of my own, and then describe my vision of a positive future, with recommendations on how to achieve it, as supported by the findings of this thesis and other literature.

A worst-case scenario future

The year is 2035. The healthcare system is facing an influx of refugees from climate disasters and wars, accompanied by new diseases and war-related injuries on top of the influx of more and more older patients with multimorbidity. This has exacerbated the strain on already limited staff and resources. The burden on acute care services has intensified. Ambulances are queuing outside overcrowded emergency departments, where wards are staffed with only one nurse for every 8 to 10 patients.

Social welfare systems have been severely cut, rendering the state of care for the elderly and mental health services unsustainable. Preventive measures, once seen as the cornerstone of a healthier society, now reach only a select few, further widening the gap in life expectancy and quality of life between social classes.

Disparities between social classes have not only widened, but have also led to serious health inequalities within the population. What began as a small difference in quality of life has now become a significant gap, with the higher social classes enjoying exclusive access to essential healthcare, while the lower strata of society are left without immediate and adequate medical care.

Extreme weather conditions, from heat waves to flooding, are putting immense pressure on healthcare infrastructures. Rising sea levels put parts of the Netherlands at risk of flooding.

Older patients with multimorbidity receive even more fragmented care. There is a lack of funding across the healthcare system, so professionals focus on their own specialty and agenda, leaving no room for collaboration. Because specialists rarely work together, patients with multimorbidity have to visit the hospital more and more often. New innovations in healthcare do not emerge because there is no time or money to facilitate them.

The shortage of healthcare professionals and the increase in the number of patients and patients with multimorbidity are putting further strain on the wellbeing of healthcare professionals. Their job satisfaction and work engagement are declining, further affecting patient health outcomes.

Scarcity forces hard choices; not all care can be provided. At the moment, we are privileged to be able to look at the individual patient rather than the population as a whole. This was also seen during the COVID-19 pandemic in 2020, where there was scarcity and not all patients could go to the intensive care unit.

The above situations are only examples to illustrate the difficult choices that need to be made for the future of healthcare. We need a clear vision and strong policies on what healthcare should look like in the future.

A positive future

In contrast to the previous paragraphs, I personally have a more positive outlook on the future. I recognise the challenges, but I also hope that we can overcome them. This hope is strengthened by all the scientific knowledge that we already have. I also want to describe this hope with a quote from one of the greatest fantasy book series ever written:

> *"When the gods created mankind, Asarte (god of love and mercy) gave them form, Soltar (god of souls) gave them wisdom, Boron (god of righteousness) gave them honor, but the Nameless god (god of chaos and destruction) gave them doubt, fear, and hatred. The other gods were displeased with the Nameless god, because they wanted to give mankind something good. However, Nerton (Godfather, god of wisdom) was there to keep the balance, and he gave mankind one last gift: hope."*
>
> – Richard Schwartz, Die Zweite Legion (Das Geheimnis von Askir, #2), 2011, page 36-37.

For me, this quote has a symbolic value for collaborating and facing the challenges of the future; despite all our differences and disagreements, we should have hope for a better future and there is always a way to achieve it, even if it does not seem so at first. Hope is the greatest quality of mankind.

In the following paragraphs I will write as if we were already in the year 2035.

The shortage of healthcare workers and the increase in the number of patients could not be prevented. However, steps have been taken to minimise the impact on healthcare.

Healthcare professionals have a high level of work engagement and are motivated to improve care for their patients.[11] As work engagement is related to culture of care (**Chapter 6**), organisations made efforts to improve levels of both concepts, one positively impacting the other. The culture of care was improved by, among other things: providing sufficient time and resources; creating a safe working environment where unacceptable

behaviour is tackled, staff feel free to ask for help and are supported by managers; celebrating successes; providing adequate training and development opportunities.[17] The work engagement of professionals was improved by: making employees proud of the work that they do, inspiring them, and helping them to keep fit.[18] The concepts of work engagement and culture of care are part of healthcare professionals wellbeing, improving this may also lead to improved patient outcomes since poor wellbeing leads to worse patient health outcomes.[19-22]

These engaged healthcare professionals were in the lead for designing collaborative models and felt the urgency to do so.[8] They first build a relational basis with each other by familiarisation, earning trust and respect, and aligning team roles.[23] Processual factors such as the setting, structure and timing were overcome with each other to create a smooth working process. The organisation supported the collaboration and helped coordinate. Difficulties in contextual factors such as language and gender were overcome to create a safe and equal working environment with room for interprofessional learning. These factors were adapted from **Chapter 7 and Chapter 9**.

Professionals used to dismiss bad behaviour during collaboration because "that's just the way he is", but **Chapter 7** showed that this is not the case. Professionals therefore altered factors such as the setting, balance in team members and structure to positively influence the behaviour of participants.

By building on a relational basis, healthcare professionals also worked on their interprofessional identity. This interprofessional identity enables professionals to work together effectively.[23] The organisations' efforts to improve the culture of care, as described above, have also increased the interprofessional identity of healthcare professionals, as **Chapter 6** has shown that the concepts of culture of care and interprofessional identity are positively related. This has further enhanced collaborative practice.

The application of all these factors and principles has had a positive impact on the success and effectiveness of the collaborations. A good example is the ICW, this comprehensive ward yielded better patient outcomes (**Chapter 2-3-4**) than other interprofessional collaborative practices by 2020.[24-25] The successful collaborative models that have followed the ICW have also improved patient health outcomes, such as a shorter length of hospital stay, fewer medical consultations, and fewer emergency department and outpatient clinic visits (**Chapter 2-3-4)**.

Rather than a one-size-fits-all model of collaboration for each complex patient population, each population receives a tailored plan. These innovations are supported by

management, but they are led by committed professionals who are willing to lead and implement change.[8]

Rising health care costs have been a concern for many years, and it was feared that the increased use of collaborative practice would add to these costs by increasing the number of staff. However, improved health outcomes have reduced costs, resulting in cost neutrality or even cost savings (**Chapter 5**). In addition, the improved efficiency of care has reduced the workload of healthcare professionals (**Chapter 5**) and, as a result, waiting lists for care (**Chapter 4**). Healthcare professionals have also found the work very fulfilling, with fewer leaving the healthcare sector.

Institutions share their innovations and models of collaboration so that successful innovations are readily available. Not every institution has to reinvent the wheel, but can build on the successes of others. Up to 2024, the Jeroen Bosch Hospital has already had several other Dutch hospitals visit the ICW and experience its working principles. The results of all the studies in this thesis are openly shared with others, even those that are still in draft form, so that other organisations can recreate the ICW when preferred.

Patients experience better coordination through improved collaboration and care models. They are seen as an individual, not an organ or medical problem, and treated according to their values and beliefs.[26] For some this means fighting to the end, but for others it means focusing on comfort rather than curation. Old-fashioned metrics such as survival may be falling, but quality of life has never been higher across all ages and populations.[27]

Doctors and researchers have become more involved in politics and health policy. Major campaigns have been launched to inform patients that not every treatment or drug can be used. A treatment may be beneficial for a patient's specific situation, but it may not be feasible for the population as a whole. Thanks to these major campaigns and local collaborations, patients have understood this and compared it to the national taxes they pay, which are not pleasant but necessary.[28]

Not only patients treated in the interprofessional collaborative wards have improved health outcomes, but so have patients treated outside of the collaborative wards. Healthcare professionals learn with, from and about each other when collaborating. This has long been hypothesised in many theories, describing that social interactions support learning (social learning theory[29]), that face-to-face contact is essential for reducing prejudice (Alport's contact theory[30]), and that individuals learn by observing and imitating others (social cognitive theory[31] and situated learning theory[32]). However, it was not until **Chapter 8** that it was objectively measured in terms of altered patient outcomes, that patients on regular wards required fewer medical consultations, reducing the confu-

sion and burden of multiple doctors visiting each day, as interprofessional collaboration grew exponentially, so did the number of professionals learning. This further improved the health outcomes for all patients requiring care, and reinforced the positive impact of interprofessional collaboration beyond the specific collaborative practice.

The above vision of a positive future shows how the findings, principles, and key factors of all the studies in this thesis, and those in the previous literature can be used to improve the organisation of healthcare and its outcomes according to the Quintuple Aim. This can be applied not only to the patient population of interest in this thesis, but to all populations that can benefit from improved collaboration.

When the lessons outlined in this thesis are taken into account and combined with other research and healthcare initiatives, a beautiful collaboration and innovation in healthcare can take flight: the Intensive Collaboration Ward (ICW). The ICW has a positive impact on all the aims of the Quintuple Aim. This gives me hope that the necessary changes for the rest of the healthcare system can also be successfully implemented.

Strengths and limitations

This thesis has several strengths and some limitations that should be taken into account.

A major strength of this thesis is the extent to which it explored an interprofessional collaborative practice: namely, we have investigated all the aims of the Quintuple Aim, providing a wide range of evidence and a comprehensive picture of the collaborative practice. No previous collection of studies has investigated an interprofessional collaborative practice to this extent, a review showed that no study had even investigated all previous Triple Aim outcomes in a single interprofessional collaborative practice.[33]

We used a wide range of research methods and techniques including quantitative and qualitative methods, to address all the aims of the Quintuple Aim. This not only demonstrated the versatility of the research team, but also provided the most robust results possible for such a complex care innovation.

This thesis has shown that complex interprofessional collaborative practice can be implemented and successfully sustained over a number of years, overcoming difficulties along the way. This can provide hope and an example to other healthcare institutions that it is indeed possible to achieve this if committed professionals set out to do it. This is important for the future of healthcare, where there is a need to change the organisation of care.

We advocate interprofessional collaboration not only in clinical practice but also in research. We also believe in practising what we preach. Our research team was an interdisciplinary and interprofessional group of professionals from a wide range of professions and specialties. The professionals involved have expertise in clinical practice, finance, psychology, management, research, epidemiology, education, communication, nursing and (of course) collaboration. This has allowed us to align different perspectives and visions within our research and to create a meaningful integration of our expertise to further improve care for the growing group of older patients with multimorbidity. A visual representation of the diversity of professionals involved is presented on the cover of this thesis and in the "Facts about this thesis" section.

This thesis also has several limitations that should be acknowledged.

Although this thesis demonstrated great results of an interprofessional collaborative practice on all aims of the Quintuple Aim, this practice is only operational in the Jeroen Bosch Hospital. The ICW has not been successfully implemented in other hospitals and it is therefore unknown to which extent it is possible to replicate the findings. In **Chapter 6**, we implemented the ICW in another hospital, but this implementation partially failed and the ICW was eventually closed in this hospital. This raises the question of whether the ICW is only possible in the Jeroen Bosch Hospital. However, we believe that it is possible to implement the ICW in other hospitals. The facilitators to be promoted and the barriers to be overcome, as described in **Chapter 9**, could be used as a guideline to achieve implementation, accompanied by engaged professionals who are ready for change. Further research is needed to test this assumption.

Another limitation is that many of the studies were retrospective. Therefore, only patient-related outcomes that were available in the electronic medical record could be studied. Outcomes such as quality of life could therefore not be investigated in this thesis. It would be interesting for future research to carry out more prospective studies using, for example, quality of life as a primary outcome. This would also facilitate an even more robust economic evaluation.

We explored the wellbeing of healthcare professionals through surveys (**Chapter 6**) and observation through audio and video recordings (**Chapter 7**). However, we did not conduct interviews about their thoughts and feelings about the ICW to gain a deeper insight. It would be interesting to conduct these in future research.

Final remarks

The ultimate aim of the studies included in this thesis is to enhance the quality of care for older patients with multiple health problems. The Intensive Collaboration Ward (ICW) is a comprehensive interprofessional collaboration that has been implemented in the Jeroen Bosch Hospital. Looking back on this thesis, I would like to conclude that it is possible to successfully implement a complex and extensive interprofessional collaborative practice (the ICW) and that this ICW has indeed enhanced the quality of care for older patients with multimorbidity. This has been demonstrated by examining all the aims of the Quintuple Aim, which is unique. It is important to acknowledge that there is still work to be done: the ICW has not been implemented in other hospitals, and future work should aim to address this, while using and studying the factors that contributed to success or failure. As previously mentioned in the discussion section, the ICW is a promising initiative with the potential to address the future challenges of healthcare. However, the ICW is not a solution to all problems and may only be applicable to a limited number of problems. Healthcare professionals should continue to pursue initiatives to improve the quality of healthcare and to meet future challenges, without being discouraged along the way. This thesis can serve as an example that it is possible to achieve sustainable change in healthcare organisation to improve the quality of care.

Box 1. Looking back at the patient case.

It is regrettable that Mrs Johnson did not survive until 2035; she would have been 105 years old at that point. Her daughter, Mrs Smith-Johnson, has now almost reached the same age her mother had in 2025. Mrs Smith-Johnson recollects how the care was organised for her mother and is very pleased to experience a more coordinated care system, with all the advantages that this brings.

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“No man ever steps in the same river twice. For it is not the same man, and not the same river”

- Heraclitus (~6th century BC)

APPENDICES

Appendices

Appendix belonging to this thesis

Appendix A (Chapter 2) The Dutch Patient Reported Experience Measure (PREM) Medisch Specialistische Zorg (MSZ; or in English: Medical Specialist Care)

The formulation of the questions was slightly altered to reflect that the questionnaire is about the intensive collaboration ward (ICW) and not the hospital in general.

This is a Dutch questionnaire and was translated into English for this supplement. The questionnaire was completed, in Dutch, by patients proficient in Dutch.

Overall assessment.

How do you rate the care and service on the Intensive Collaboration Ward (ICW)? 1 meaning: very bad. 10 meaning: excellent

What are you most positive about?
"Open answer"

What could be better or have you missed?
"Open answer"

During your stay on the ICW

Please score the following statements on a scale from 1 (not at all) to 10 (Yes, completely).

Did the healthcare provider listen carefully to you?
Was the explanation by the healthcare provider understandable?
Did you trust in the healthcare providers competence?
Were the benefits and disadvantages of the treatment or surgery explained to you?
Did you decide with the healthcare provider about which care or treatment you received?
Was there a good collaboration between all healthcare providers in the hospital or clinic?
Would you like to elucidate your answer on one or multiple of the questions above?
"Open answer"

Would you recommend the stay on the ICW to others with the same condition or health issue?
"Yes or no answer"

How would you describe your overall health at this moment?

Excellent	Very well	Well	Moderate	Poor

Appendix B (Chapter 7) Observation focus, based on Spradley's nine observational dimensions

Dimensions	Descriptor	Example of questions	Video observation	Audio transcriptions
Space	Physical layout of the place	How would you describe the environment?	X	
Actor	Participant characteristics	Who collaborates with whom? Which actors are positive and negative role models and why?	X	
Activity	A set of related activities that occur	What are the critical factors influencing the actors? What activities take place during the meeting?	X	X
Object	The physical things that are present	What do the actors see? Do actors and observer see the same physical things?	X	
Act	Single actions people undertake	What are the actions of the actors? What are actors participating in? What would actors like to do?	X	X
Event	Activities that people carry out	How do actors address interprofessional aspects during the meeting?	X	
Time	The sequencing of events that occur	What happens first, what happens after, etc. When do moments of collaboration arise in the meeting? Do actors explicitly label interactions as collaborative?	X	X
Goal	Things that people are trying to accomplish	Have common goals been established among the actors? Are the goals aligned with one another?	X	X
Feeling	Emotions felt and expressed	Have actors expressed emotions? Are there situations where actors are individually addressed regarding their professional roles?	X	X
Observer	Emotions of the observer	What emotions does the observer experience during the meeting?	X	X

An X indicates if this dimension was reported on using the video observation and/or audio transcription

Appendix C (Chapter 7) MDT-OARS

Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)			
		Very Poor	**Poor**	**Good**	**Very Good**
The Team					
Attendance	Presence of relevant core team members at the meeting	at least one core team member (and their deputy) is not present for the whole meeting	at least one core team member (and deputy) is absent for most of the meeting (≥3 cases)	at least one core team member (and deputy) is absent for part of the meeting (≤ 2 cases)	all core team members (or deputy) present for whole meeting
		(1)	(2)	(3)	(4)
Leadership: chairing of meeting	· Keeps meeting to agenda (i.e. moves onto next case)	Satisfies none of criteria	Only satisfies 1–2 of criteria	Satisfies 3 of criteria	Evidence of all of the criteria
	· Encourages overall participation				
	· Encourages focussed discussion				
	· Articulates recommendation	(1)	(2)	(3)	(4)
Teamworking & culture					
a) Inclusion of relevant team members	· All relevant core members are actively and appropriately involved	Satisfies 1/none of criteria	Satisfies 2–4 of criteria	Satisfies *"all relevant core members are actively and appropriately involved"* and at least 3 other criteria	Satisfies all of the criteria
	· Meeting not dominated by 1-2 people				
	· Input/questions volunteered and encouraged				

Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)			
		Very Poor	**Poor**	**Good**	**Very Good**
	· Contributions facilitate decision-making and/or inform discussion				
	· Consensus of decision-making	(1)	(2)	(3)	(4)
b) Team Sociability	· Evidence of humour	Satisfies none of the criteria	Satisfies 1 of criteria	Satisfies 2–3 of criteria	Satisfies all of criteria
	· Team appear relaxed with each other				
	· Warm and supportive team environment				
	· Friendly and cooperative communicative style	(1)	(2)	(3)	(4)
c) Mutual respect	· Focussed attention	Only satisfies 1 or none of	Satisfies 2–3 of criteria	Evidence of respect,	Strong evidence of
	· Respect for speaker	criteria		evidence of at least 4	respect in all/almost all
	· No concurrent discussions			criteria	cases
	· Asking and valuing relevant contributions				
	· General sense of politeness/ courtesy (inc mobile phone etiquette)	(1)	(2)	(3)	(4)
d) tension and conflict		*Not rated on the same scale – see bottom of table*			
Personal development & training	Observable communication of research evidence and/or instances of learning	No observable communication of research evidence or instances of learning	Minimal communication of research evidence or instances of learning		Structured presentation of research evidence and/or learning through formal discussion (e.g. of audit findings

Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)			
		Very Poor	**Poor**	**Good**	**Very Good**
		(1)	(2)		(3)
Infrastructure for meetings					
Meeting venue	· Room size appropriate for number of team members	Satisfies only 1 or none of criteria	Satisfies 2 of the criteria	Satisfies 3 of the criteria	Satisfies all of the criteria
	· Layout of chairs enables accessible viewing of diagnostics				
	· Layout of room allows accessible viewing of other team members				
	· All members seated on a chair				
	· Suitable venue in terms of location, temperature, lighting etc	(1)	(2)	(3)	(4)
Technology & equipment	Availability of diagnostic equipment to view and share images and pathology with the team.	No radiology imaging facilities	Light box available with hard copy film	Current images available digitally with facilities for projecting/viewing images	Current images available digitally with facilities for projecting/viewing images and capability of accessing retrospective images (e.g. use of PACS)
	Availability of multiple screens scores extra 1 point. Score out of possible 9 is then standardised onto 1-4 scale to give overall rating.				
		(1)	(2)	(3)	(4)

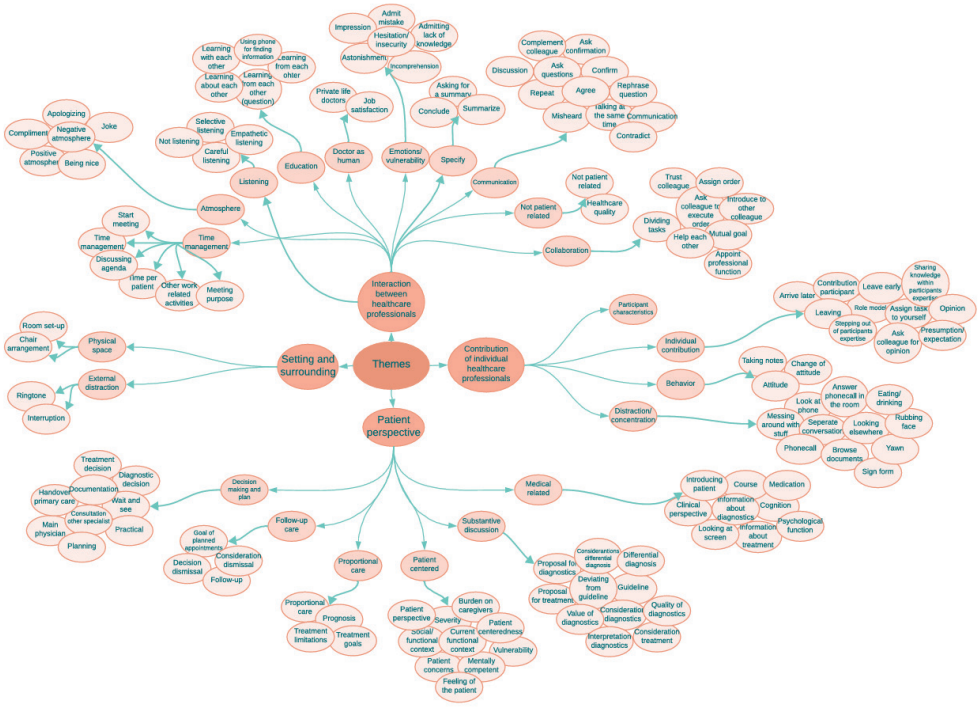
Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)			
		Very Poor	**Poor**	**Good**	**Very Good**
		No histopathology facilities	Microscope	Microscope with facilities for projecting/viewing specimen/biopsy	Microscope with facilities for projecting and viewing specimen/biopsy and accessing retrospective data
		(1)	(2)	(3)	(4)
Meeting organisation and logistics					
Preparation prior to meetings:					
a) agenda	Availability and content of agenda	No available agenda	Agenda, but limited info		Comprehensive agenda
		(1)	(2)		(3)
b) prioritisation of complex cases	Prioritisation of complex cases on agenda to enable sufficient time for their discussion	No attempt is made to order cases in terms of complexity and an inappropriate amount of time is spent on cases (i.e. too much or too little)	Some attempt is made to order cases in terms of complexity but an inappropriate amount of time is spent discussing some of the cases	Patient cases are discussed in a clear order but time is used inappropriately in some cases	Patient cases are discussed in a clear order and an appropriate amount of time is spent discussing each case
		(1)	(2)	(3)	(4)
Organisation/ admin during meetings:					
a) patient notes	Availability of patient notes	No patient records available at meeting	Some required past/current reports not available	Hardcopy and all necessary past/current reports available	Electronic access to patient notes and all necessary past/ current reports available
		(1)	(2)	(3)	(4)

Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)			
		Very Poor	**Poor**	**Good**	**Very Good**
b) case presentation	Comprehensiveness and coherence of case presentation	Rambling; entirely reading from notes; does not seem familiar with patient	Some evidence of familiarity with patient and info presented in reasonable fashion		Comprehensive succinct coherent presentation (evidence of familiarity with patient and findings)
		(1)	(2)		(3)
Clinical decision making					
Patient centred care	Includes mention of patient-based information (e.g. demography; co-morbidities; psycho-social or supportive needs; patient wishes/family preferences)	Patient-centred factors sufficiently acknowledged in less than 20% cases	Patient-centred factors sufficiently acknowledged in less than 50% cases	Patient-centred factors sufficiently acknowledged in 50% + cases (but not all cases)	Patient-centred factors sufficiently acknowledged in all cases
		(1)	(2)	(3)	(4)
Treatment plans	Clarity of treatment plan	Treatment plan not discernable	Treatment plan communicated verbally	Treatment plan communicated verbally and recorded	Treatment plan communicated verbally, recorded with a clearly articulated plan regarding the next steps.
		(1)	(2)	(3)	(4)

Characteristic of Effective MDT-working	**Quality Criteria**	**Quality of team-working (score in brackets)**				
Teamworking & culture		**severe and sustained conflict**	**overt conflict un-sustained**	**tension sustained**	**tension un-sustained**	**no tension**
		(−4)	**(−3)**	**(−2)**	**(−1)**	**(0)**

Characteristic of effective MDT working	Quality Criteria	Quality of team working (score in brackets)				
		Very Poor	Poor	Good	Very Good	
d) tension/conflict	Extent of tension and/or conflict observable in the team	≥1clear example of conflict observed which persists throughout meeting	≥1clear example of conflict observed does not persist throughout meeting	≥1 instance of tension observed which persists throughout meeting	≥1 instance of tension observed but does not persist throughout meeting	No tension

Appendix D: Final coding template (Chapter 7)



Appendix E: Complete search string (Chapter 9)

PubMed

(((“interprofessional”[ti] OR “interdisciplinary”[ti] OR “multidisciplinary”[ti] OR “cross disciplinary”[ti] OR “intraprofessional”[ti] OR “intersectoral”[ti] OR “IPC”[ti] OR ((“intercollegiate”[ti] OR “team*”[ti]) AND dynamic*[ti])) AND (“communicat*”[tiab] OR “collaborat*”[tiab] OR “team*”[tiab] OR “ward*”[tiab] OR “cooperat*”[tiab]))) AND ((“secondary care”[MeSH Terms] OR “hospitals”[MeSH Terms] OR “secondary care*”[tiab] OR “secondary healthcare*”[tiab] OR “secondary health care*”[tiab] OR “secondary referral*”[tiab] OR “hospital*”[tiab]))

Filters: Dutch, English, from 2010/1/1 - 3000/12/12

Embase

((‘interprofessional’:ti OR ‘interdisciplinary’:ti OR ‘multidisciplinary’:ti OR ‘cross disciplinary’:ti OR ‘intraprofessional’:ti OR ‘intersectoral’:ti OR ‘ipc’:ti OR ((‘intercollegiate’:ti OR ‘team*’:ti) AND (‘dynamic*’:ti))) AND (‘communicat*’:ti,ab,kw OR ‘collaborat*’:ti,ab,kw OR ‘team*’:ti,ab,kw OR ‘ward*’:ti,ab,kw OR ‘cooperat*’:ti,ab,kw)) AND ((‘secondary health care’/exp OR ‘hospital’/exp) OR (‘secondary care*’ OR ‘secondary healthcare*’ OR ‘secondary health care*’ OR ‘secondary care referral*’ OR ‘hospital*’):ti,ab,kw) AND ([article]/lim OR [article in press]/lim OR [review]/lim) AND ([dutch]/lim OR [english]/lim) AND [2010-2023]/py

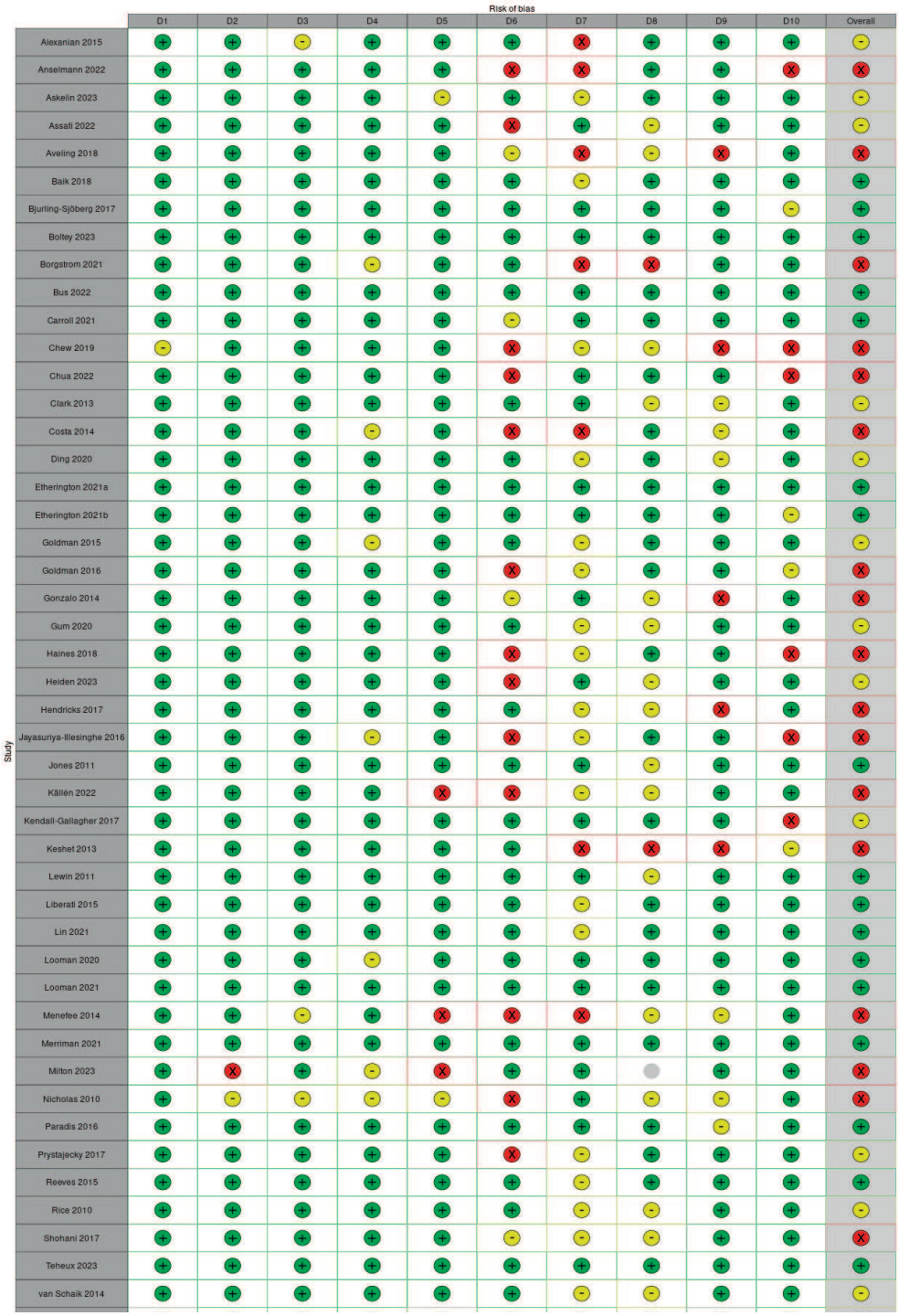
CINAHL

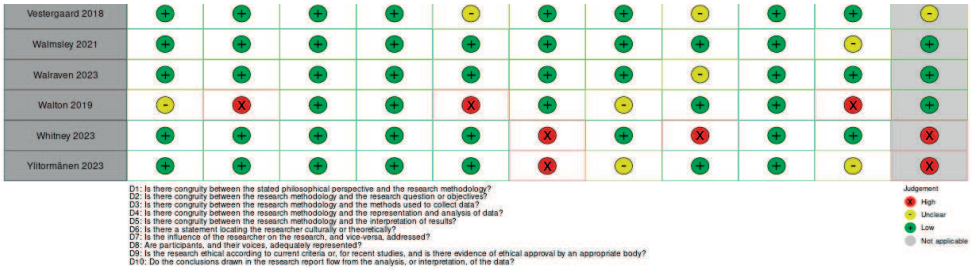
(TI (interprofessional OR interdisciplinary OR multidisciplinary OR “cross disciplinary” OR intraprofessional OR intersectoral OR IPC OR ((intercollegiate OR team*) AND dynamic*)) AND (TI (relation* OR communication* OR collaborat* OR team* OR ward* OR cooperat*) OR AB (relation* OR communication* OR collaborat* OR team* OR ward* OR cooperat*)) AND ((MH “Secondary Health Care”) OR (MH “Hospitals”) OR (TI (“secondary care*” OR “secondary health care*” OR “secondary healthcare*” OR “secondary referral*” OR “hospital*”)) OR (AB (“secondary care*” OR “secondary health care*” OR “secondary healthcare*” OR “secondary referral*” OR “hospital*”)))

Limiters - Publication Year: 2010-; English Language; Peer Reviewed; Language: English

Search modes - Boolean/Phrase

Appendix F: Risk of bias assessment (Chapter 9)




Vestergaard 2018
Walmsley 2021
Walraven 2023
Walton 2019
Whitney 2023
Yliörmänen 2023
D1: Is there congruity between the stated philosophical perspective and the research methodology?
D2: Is there congruity between the research methodology and the research question or objectives?
D3: Is there congruity between the research methodology and the methods used to collect data?
D4: Is there congruity between the research methodology and the representation and analysis of data?
D5: Is there congruity between the research methodology and the interpretation of results?
D6: Is there a statement locating the researcher culturally or theoretically?
D7: Is the influence of the researcher on the research, and vice-versa, addressed?
D8: Are participants, and their voices, adequately represented?
D9: Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?
D10: Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?
Judgement
High
Unclear
Low
Not applicable


Judgement
High
Unclear
Low
Not applicable

D1: Is there congruity between the stated philosophical perspective and the research methodology?
D2: Is there congruity between the research methodology and the research question or objectives?
D3: Is there congruity between the research methodology and the methods used to collect data?
D4: Is there congruity between the research methodology and the representation and analysis of data?
D5: Is there congruity between the research methodology and the interpretation of results?
D6: Is there a statement locating the researcher culturally or theoretically?
D7: Is the influence of the researcher on the research, and vice-versa, addressed?
D8: Are participants, and their voices, adequately represented?
D9: Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?
D10: Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

Risk of bias of the included studies assessed with the JBI Critical Appraisal Checklist for Qualitative Research

Legenda:
- Studies were considered of poor quality if ≥ 2 questions were answered with 'no', if ≥ 1 question was answered with 'no' and ≥ 2 with 'unclear' or if ≥ 3 questions were answered with 'unclear'.
- Studies were considered of medium quality if 1 question was answered with 'no' or if 2 questions were answered with 'unclear'.
- Studies were considered of high quality if all questions were answered with 'yes' or if a maximum of 1 question was answered with 'unclear'

Appendix G: Characteristics of included studies (Chapter 9)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
1	Alexanian	2015	North America (US and Canada)	Qualitative (observation and interviews)	Does 'teamwork' structure how work is carried out in the ICU setting?	Intensive Care Unit	Nurses (10), medical trainees and intensivists (13), allied health professionals (13)	Interprofessional work in ICUs
2	Ansel-mann	2023	Germany	Qualitative (interviews)	To gain insight into how nurses describe team learning activities and influencing factors	Care in general	Nurses (10)	Work in an interprofessional team, which is characterized by the collaborative work of professionals from different fields
3	Askelin	2023	Australia	Qualitative (interviews)	To understand the clinical decision-making process among the MDT	Multidisciplinary team meeting uro-oncology	Nurses (3), medical consultants (2)	Weekly MDT with participation and input from all health disciplines present (urology, radiology, cancer specialist nurse and coordinator, pathology, oncology, surgeon)
4	Assafi	2022	Denmark	Qualitative (interviews)	To explore interprofessional collaboration using mobilization as case study	Care in general on surgical care unit	Nurses (11), physicians (3), allied health professionals (9), other (4)	Interdependent actions that involve regular interprofessional negotiations and interactions to achieve shared goals

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
5	Aveling	2018	United States	Qualitative (interviews and observation?)	To investigate the mental models of ideal teamwork and contextual factors shaping those and team dynamics	Operating room	Surgeons (15), anaesthetists (3), nurses (8), perfusionists (4) and physician assistants (4)	Team dynamics in cardiac surgery OR
6	Baik	2019	United States	Qualitative (interviews)	To explore nurses' experiences following the IP team intervention (including the implementation of SIBR)	Structured interprofessional bedside round on an AHF unit	Nurses (10)	Every weekday with all healthcare providers (nurse, physician, PA, pharmacist, social worker, allied health prof) with a structured format, "a team-based approach rather than physician-led rounds"
7	Bjurling-Sjöberg	2017	Sweden	Qualitative (grounded theory approach; theoretical sampling based on focus groups)	To explain teamwork and factors that influence team processes.	Intensive Care Unit	Nurses (33), physicians (4), physiotherapist (1)	Everyday practice in an ICU
8	Boltey	2023	United States	Qualitative (observation, shadowing, interviews)	Capture the nature of IPC in which there are components that occur to yield the intended outcome	Intensive Care Unit	Nurses (5), physicians (4), respiratory therapists (5)	Interprofessional medical team led by a intensivist

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
9	Borg-strom	2021	United Kingdom	Qualitative (observation)	To provide insight into how MDTMs are structured and operate	Multidisciplinary team meetings in hospital- and community-based palliative care	Medical, nursing, occupational therapy, physiotherapy, social work and spiritual care	Weekly MDTMs attended by all healthcare staff members to discuss complex cases together
10	Bus	2022	Nether-lands	Qualitative (interviews)	To gain insight into the adaptability and intraPC workplace learning of residents during COVID19	COVID or ICU departments	Residents (9) and supervisors or other doctors (7)	Intraprofessional collaboration among doctors from different disciplines
11	Carroll	2021	United States	Qualitative (video-reflexive ethnography)	To examine the interprofessional team communications that construct the safe and highly successful aspects of care	Collaboration between the operation room and pathology departments	Members of the teams: surgeon, assistants and surgical technologist & pathologist, assistant, histo-technologists, reporting specialist) (57)	Collaborative relationship between surgery and pathology: two disciplines with shared accountability and interdependence, with no need for a shared identity
12	Chew	2019	Singapore	Cross-sectional assessment (survey)	To examine the collaboration between nurses and physicians and their perceived barriers to IBRs	Interprofessional beside rounds on general wards	Nurses (292), physicians (79)	IBRs that bring together physicians and nurses to discuss patients' plans of care

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
13	Chua	2022	Singapore	Qualitative (interviews)	To explore collaboration experiences between nurses in recognising and responding to clinical deterioration	General ward	Enrolled (12) and registered (11) nurses	Intraprofessional collaboration among enrolled and registered nurses
14	Clark	2013	United States	Qualitative (interviews)	To identify themes characterizing collaboration by clinicians in complementary leadership roles	Leaders on intensive and medical surgical care units	Nurse unit directors (10), medical directors (8)	Nurse and medical leaders were partnered as a strategy to improve leadership collaboration
15	Costa	2014	United States	Qualitative (interviews)	To examine how a variety of clinicians view IPC, and identify elements that facilitate IPC.	Intensive Care Unit	Nurses (31), physicians (7), respiratory therapists (15), clinical pharmacists (5), dietician (6)	Daily interprofessional rounds on the ICU
16	Ding	2020	United States	Qualitative (interviews)	To explore medical learner perspectives of educational experiences in an IPCP environment	Care in general on General Medicine teaching services	Medical students (12), interns (7) and residents (5)	Collaborative Care with alignment of workflows, interprofessional bedside rounds, and reflecting together

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
17	Ethering-ton	2021a	Canada	Qualitative and quantitative (interviews)	To identify factors that facilitate or impede OR teamwork from an interprofessional perspective	Operating room	Nurses (21), anaesthetists (17), surgeons (26), perfusionists (2)	Professionals of different disciplines, educational backgrounds and experiences work interdependently in a dynamic environment
18	Ethering-ton	2021b	Canada	Qualitative (interviews)	To explore how gender and related social factors shape teamwork	Operating room	Nurses (21), anaesthetists (17), surgeons (26), perfusionists (2)	Interprofessional teamwork in the OR
19	Goldman	2015	Canada	Qualitative (observation, interviews)	To explore interprofessional interactions in relation to the discharge process	Care in general on a general internal medicine clinical teaching unit	Nurses (5), physicians (5), allied health professionals (6), other (4)	Every weekday structured interprofessional care rounds organized to improve patient flow and discharge
20	Goldman	2016	Canada	Qualitative (observation, interviews)	To understand the interplay of structural factors in the interprofessional interactions in discharge	Care in general on a general internal medicine clinical teaching unit	Nurses (5), physicians (5), allied health professionals (6), other (4)	Every weekday structured interprofessional care rounds organized to improve patient flow and discharge

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
21	Gonzalo	2014	United States	Cross-sectional assessment (survey)	Evaluate perceptions of care providers regarding the benefits and barriers to BIRs	Bedside interprofessional rounds (BIR) on internal medicine units in academic hospital	Nurses (58), residents (85) and attending physicians (28)	Encounters that include the team of providers (at least 2 physicians and 1 nurse or other care provider) discussing the case at patient bedside
22	Gum	2020	Australia	Qualitative (observation, interviews, researcher reflections)	To explore how work-based IPE might influence collaborative practice	Care in general in a rural hospital (operating under a general practice service model)	?	Rural health professionals potentially engaging in collaborative practice and who were offered IPE interventions
23	Haines	2018	United Kingdom	Qualitative (observation, interviews, documentary analysis)	To explore team functioning and MDT decision making within forensic settings for a "reformed	Multidisciplinary team meetings within a medium secure forensic hospital	Nurses (6), psychiatrists (4), allied health professionals (7), other (3)	MDTs conducted with structured agendas led by an independent chair with equal input from key professionals and involvement from service users
24	Heiden	2023	Denmark	Qualitative (interviews)	To learn more about how being in the frontline of COVID-19 affected learning and IPC among HCP	Care in general on COVID-specific hospital wards	Nurses (8), physicians (6), allied health professionals (6), other (2)	Interprofessional collaboration during the pandemic

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
25	Hendricks	2017	United States	Qualitative (observation, interviews)	To describe the barriers and facilitators for interprofessional patient-centred rounding	Interprofessional patient-centred rounding across 4 acute care units in a large urban hospital	Nurses, physicians, pharmacists, assistants, care managers, social workers (12)	Interprofessional rounds: a team of professionals meet (sometimes at the bedside) to discuss care
26	Jaya-suriya-Illesinghe	2016	Sri Lanka	Qualitative (interviews)	To describe the nature of interprofessional work and the factors that influence it	Operating room teams	Surgeons (15)	Interprofessional work, appeared to be in the form of collaboration
27	Jones	2011	United Kingdom	Qualitative (observation, interviews)	To explore how teamworking practices developed and how the processes introduced affected their teamworking	Care in general on a hospital rehabilitation ward	Nurses (5), consultant (1), allied health professionals (6)	An improvement program aimed at achieving better interprofessional teamworking with consultant-led daily ward rounds and weekly team meetings
28	Källén	2022	Sweden	Qualitative (observation)	To describe the content and structure of ward rounds focusing on IPC towards patient safety	Sitting rounds and team rounds on an internal medicine ward at a university hospital	Nurses, physicians, other health professionals (AHP)	Sitting round: nurses and physician share information and discuss plan & team round: AHP share information and discuss interprofessional treatment

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
29	Kendall-Gallagher	2017	North America (US and Canada)	Qualitative (secondary analysis of interviews)	Report on nurses' perspective of factors that enhance or impede IPC	Intensive Care Unit	Nurses (15)	Interprofessional work in ICUs
30	Keshet	2013	Israel	Qualitative (observation, interviews)	To examine the means and mechanisms that facilitate IPC and bridge communication gaps between conventional + complementary care providers	Care in general in a recently established integrative medicine setting in a surgical department	Nurses (5), surgeons (4), allied health professionals (4), other (2)	CM-biomedicine collaboration in a integrative healthcare environment
31	Lewin	2011	United Kingdom	Qualitative (observation, interviews)	To understand the nature of interprofessional relations in acute care settings and how such interactions differ according to the context	Care in general, including MDT meetings, on a general and emergency directorate of a teaching hospital	Doctors, nurses, physiotherapists, occupational therapists, pharmacists, social workers and care coordinators (49)	Interprofessional collaboration defined as activities in which staff with different professional training came together to discuss or deliver care
32	Liberati	2016	Italy	Qualitative (observation)	To examine how interdisciplinary working unfolds through everyday care practice in a newly created MDT	Care in general of a multidisciplinary team on a newly created stroke unit of a large public hospital	Nurses (20) and neurologists, intensivists and surgeons (22)	Interdisciplinary work: effective collaboration towards the delivery of integrated patient care -> intra- & interprofessional

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
33	Lin	2021	Singapore	Qualitative (interviews)	To explore the experiences of IPC in managing resuscitations	Intensive Care Unit	Nurses (10), physicians (2), respiratory therapists (4)	Interprofessional team during resuscitations
34	Looman	2020	Nether-lands	Qualitative (observation and interviews)	To gain insight into the potential of hospital placements for learning intraPC	Geriatric and emergency departments	MS (14) and PC (14) residents and MS supervisors (14)	Learning intraprofessional collaboration
35	Looman	2022	Nether-lands	Qualitative (interviews and fieldnotes)	To explore power dynamics and their impact on intraPC learning	Geriatric and emergency departments	MS and PC residents and MS supervisors (42)	Learning intraprofessional collaboration
36	Menefee	2014	United States	Qualitative (observation, interviews)	An observation plan was designed to assess the presence of rounds and level of team collaboration	Interdisciplinary team-based health care	Nurses (3), physicians (2), physical and respiratory therapist, care manager, pharmacist, dietician (5)	Menefee Model: interdisciplinary plan of care is developed and used by all team members and coordinates the daily rounds
37	Merriman	2024	England	Appreciative Inquiry (dialogue and both qualitative and quantitative analysis)	To explore the conditions supporting effective interaction between nurses and consultants	Interprofessional ward rounds on the Intensive Care Unit	Nurses (35), physicians (5), pharmacist (1) and physiotherapist (1)	Daily interprofessional ward rounds (consultant, nurse, trainees and pharmacist) in an ICU

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
38	Milton	2023	Sweden	Qualitative (observation)	To describe IPC in the ED and evaluate the factors that influence communication before and after an intervention	Care in general on an ED at a university hospital	Nurses (assistants), physicians, administrative staff	Changes with the goal of improving interprofessional teamwork: intensive team-training program with management and HCP together
39	Nicholas	2010	Canada	Case study (qualitative)	?	Care in general, including wards and operating room, in a children's hospital	?	Varied IPC initiatives within and across teams: streamlining coordination, communication strategies, peer support and IPC education
40	Paradis	2016	United States	Qualitative (observation, interviews)	What are factors influencing the conduct of rounds and their ability to enable collaborative care?	Intensive Care Unit	Not described	Interprofessional rounds in ICUs; heterogeneous groups of clinical professionals discuss care plans

(*continued*)

N	First author	Year of publi-cation	Country	Study design	Study aim	Setting	Involved health profes-sionals (in numbers)	Description of IPC
41	Prysta-jecky	2017	Canada	Case study (focus groups)	To explore the goals of HCP attending IP rounds and the challenges encountered	Interprofes-sional rounds on an internal medicine clini-cal teaching unit	Nurses (8), physicians (5), allied health profession-als (9), other (4)	Daily interprofes-sional rounds: meetings in which diverse profes-sionals exchange information, make joint decisions, etc
42	Reeves	2015	United States	Qualitative (obser-vation, interviews)	To explore the culture of collaboration and family member involvement	Intensive Care Unit	Nurses, physicians, phar-macists, social workers and family members	Interprofessional collaboration in the ICU
43	Rice	2010	Canada	Qualitative (obser-vation, interviews) in comparison	To report on the findings of an intervention to improve interprofes-sional communication and collaboration	Care in general on a general internal medi-cine ward in an urban teaching hospital	Nurses, physicians, allied health professionals	Different health professionals share information and elicit feedback on all interactions outside of the structured rounds
44	Shohani	2017	Iran	Qualitative (inter-views)	To investigate factors that exert either positive or negative impact on intraPC	Care in general	Nurses (23)	Intraprofessional nursing relation-ships and collabo-rations
45	Teheux	2023	Nether-lands	Qualitative (inter-views and focus groups)	To advance understand-ing of intraprofessional workplace learning	Care in general in children's hospital	Residents (8) and super-visors (6)	Intraprofessional learning activities

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
46	Van Schaik	2014	United States	Qualitative (observation, interviews)	To explore the construct underlying IP teamwork in low acuity setting and essential attributes and behaviour	Care in general on two inpatient paediatric teams in the children's hospital and two outpatient clinics	Nurses, physicians, allied health professionals, other	Collaborative interaction between health professionals meeting regularly with all members
47	Vester-gaard	2018	Denmark	Qualitative (focus groups)	Evaluation of an implementation process focusing on IPC, with recommendation for the future	Care in general on diverse wards in a regional hospital	Nurses (10), physicians (7), allied health professionals (8), other staff (7)	Initiatives to improve IPC, with regular team meetings with all relevant professionals
48	Walmsley	2021	Australia	Qualitative (interviews)	To explore ideas about IPC, like understanding, experiences, and recommendation	Care in general in rural hospitals	Nurses (4), medical officer (3), allied health professionals (6)	Interprofessional collaboration (as defined by Reeves)
49	Walraven	2023	Nether-lands	Qualitative (interviews)	To identify what facilitating and hindering factors are for the performance of an efficient, competent and high-quality MDTM	Multidisciplinary team meeting	Residents (19) and medical specialists (16)	Regular/weekly oncological MDTM integrated care, to discuss patient and treatment plan with medical specialists -> intra-professional

(*continued*)

N	First author	Year of publication	Country	Study design	Study aim	Setting	Involved health professionals (in numbers)	Description of IPC
50	Walton	2019	Australia	Qualitative (survey with open questions)	Uncover professional's understanding and practice of IBRs and implications of these on care coordination	Interdisciplinary ward round on acute medicine and rehabilitation services in a teaching hospital	Nurses (46), medical officer (11), allied health professionals (20)	IBR, meant as a collaborative approach to care delivery. IBR were not routinely undertaken within either specialty.
51	Whitney	2023	Canada	Qualitative (focus groups)	To explore attitudes of residents towards IPC and identify barriers and facilitators of IPC during the rotations	Care in general on a Geriatric Medicine Unit in an academic tertiary care-hospital	Residents (23)	Intervention: video, discussion, and rotation of four weeks at the core geriatric team, with physicians, nurses, social workers, physiotherapists, pharmacists, etc.
52	Ylitor-mänen	2023	Finland and Norway	Qualitative (interviews)	What are nurses' experiences on nurse-nurse collaboration?	Care in general	Nurses (29)	Intraprofessional collaboration as defined by Reeves

Nederlandse samenvatting

Mensen worden steeds ouder en multimorbiditeit (het hebben van meerdere aandoeningen) komt vaker voor. Dit zorgt voor een verhoogd gebruik van gezondheidszorg, hogere kosten en een tekort aan zorgmedewerkers. In de huidige organisatie van zorg kijken medisch specialisten vooral naar hun eigen vakgebied/orgaan. Hierdoor lopen oudere multimorbide patiënten het risico op fragmentatie van zorg, wat leidt tot slechtere gezondheidsuitkomsten. Dit maakt dat de gezondheidszorg voor grote uitdagingen staat in de komende jaren, de noodzaak tot samenwerken is nog nooit zo hoog geweest.

Het Jeroen Bosch Ziekenhuis (JBZ) zag de noodzaak tot verbetering van zorg en was er van overtuigd dat het JBZ de zorg voor ouderen met multimorbiditeit kond verbeteren. Hiertoe heeft het JBZ de Intensieve Samenwerking Afdeling (ISA) opgericht waar de cardiologie, geriatrie, interne geneeskunde, longgeneeskunde en ziekenhuisgeneeskunde interprofessioneel samenwerken met verpleegkundigen en paramedici om de hoogst mogelijke kwaliteit van zorg te leveren.

Het doel van deze thesis was om te onderzoeken of de kwaliteit van zorg voor oudere patiënten met multimorbiditeit echt verbeterd werd door de ISA. De kwaliteit van zorg kan worden opgedeeld in vijf categorieën volgens de Quintuple Aim:

1. Betere patiënttevredenheid van zorg
2. Betere gezondheidsuitkomsten
3. Lagere kosten
4. Verhoogd medewerker welzijn
5. Betere inzet van mensen en middelen

Deze thesis is opgebouwd volgens de structuur van de Quintuple Aim waarbij al deze aspecten onderzocht zijn.

In **Deel 1** wordt gekeken naar de patiënttevredenheid van zorg. In **Hoofdstuk 2** is gekeken naar de eerste 3 categorieën van de Quintuple Aim. Er werden uitkomsten verzameld van 200 patiënten die op de ISA behandeld zijn en van 51 vergelijkbare patiënten die op de reguliere verpleegafdelingen behandeld zijn (controle groep). In deze studie werd aangetoond dat er een hoge patiënttevredenheid is op de ISA, met een rapportcijfer 8,22 van de 10. Daarnaast hadden ISA patiënten betere gezondheidsuitkomsten zoals een kortere opnameduur (-2 dagen) en minder medisch consulten op de afdeling (-49%). Er werd een overzicht van de kosten en baten van de ISA gegeven, maar of dit leidt tot kosteneffectiviteit vereist verder onderzoek. Dit onderzoek is uitgevoerd in bij **Deel 3** in **Hoofdstuk 5**.

In **Deel 2** wordt gekeken naar de gezondheidsuitkomsten van patiënten. In **Hoofdstuk 3** hebben we gekeken of gezondheidsuitkomsten van patiënten verbeterden door de interprofessionele samenwerking op de ISA. Hierbij is voor het grootste deel naar dezelfde uitkomsten gekeken als in **Hoofstuk 2**, maar is er een andere groep controle patiënten vervaardigd om robuustere uitkomsten te krijgen voor bepaalde gezondheidsuitkomsten. ISA patiënten hadden minder medisch consulten op de verpleegafdeling en de SEH nodig (respectievelijk -69% en -14%), en kregen meer paramedische zorg (+23%). Deze resultaten laten meer bewijs zien voor de positieve effecten van interprofessioneel samenwerken voor ouderen met multimorbiditeit.

In **Hoofdstuk 4** hebben we follow-up data verzameld van de patiënten uit **Hoofdstuk 2** en **Hoofstuk 3**. Deze data laten zien dat patiënten die behandeld zijn op de ISA in de zes maanden na ontslag minder vaak op de SEH belanden (-61%) en minder polikliniek bezoeken nodig hebben (-51%).

In **Deel 3** wordt gekeken naar de kosten van zorg. In **Hoofdstuk 5** hebben we een economische evaluatie uitgevoerd om te beoordelen of de ISA zorgt voor lagere kosten, de derde categorie van de Quintuple Aim. De ISA zorgde voor betere gezondheidsuitkomsten wat leidt tot lagere kosten, maar er was ook meer personele inzet op de ISA wat zorgde voor meer kosten. Alle factoren samen lieten zien dat de ISA kostenneutraal is. De ISA is mogelijk zelfs kosteneffectief wanneer je kijkt naar de uitkomsten, maar een generiekere uitkomstmaat zoals kwaliteit van leven is nodig om deze claim te onderbouwen. De ISA zorgde niet voor lagere kosten, maar zorgde desalniettemin voor betere gezondheidsuitkomsten tegen dezelfde kosten. In deze studie hebben we ook gekeken naar de inzet van mensen en middelen, de vijfde categorie van de Quintuple Aim. De ISA kan dit verbeteren door het vrijmaken van bedden, minder werklast voor personeel, en er is minder personeel nodig. Deze verbeterde inzet van mensen en middelen is belangrijk gezien de huidige en toekomstige uitdagingen van medewerkerstekorten.

In **Deel 4** wordt gekeken naar het welzijn van medewerkers. In **Hoofdstuk 6** hebben we de ISA geïmplementeerd in een ander ziekenhuis in Nederland. Het doel was om het welzijn van medewerkers te onderzoeken, de vierde categorie van de Quintuple Aim. Hierbij hebben we gekeken of verschillende concepten van medewerkerswelzijn met elkaar gerelateerd zijn, en of de scores op deze concepten over de tijd veranderen tijdens interprofessioneel samenwerken. We hebben in deze studie laten zien dat de concepten "work engagement" en "culture of care" (r 0,48) en de concepten "culture of care" en "interprofessional identity" (r 0,30) gerelateerd zijn. Het welzijn van medewerkers veranderde niet over de tijd bij het interprofessioneel samenwerken. Dit laatste resultaat is wel minder betrouwbaar gezien de implementatie van de ISA maar gedeeltelijk succesvol was.

Nieuwe studies zouden moeten onderzoeken of het welzijn van medewerkers verandert door interprofessioneel samenwerken.

In **Hoofdstuk 7** hebben we onderzocht hoe medewerkers met elkaar interacteren in verschillende soorten patiëntbesprekingen. Hiervoor hebben we video- en audio opnames gemaakt van multidisciplinaire en interprofessionele patiëntbesprekingen. We concludeerden dat meerdere factoren het gedrag van medewerkers beïnvloeden op het niveau van participatie, leren, en patiëntgerichte zorg. We hebben negen belangrijke strategieën geformuleerd om samenwerken te optimaliseren. Daarnaast hebben we 5 medewerkers geobserveerd die participeerden in beide type patiëntbesprekingen en zij lieten compleet ander gedrag zien. Dit onderstreept de invloed van de gevonden factoren en strategieën op het gedrag van medewerkers tijdens patiëntbesprekingen.

In **Deel 5** wordt gekeken naar de inzet van mensen en middelen. In **Hoofdstuk 8** hebben we het leereffect van interprofessioneel samenwerken onderzocht. Hierbij werd gehypothetiseerd dat professionals met, van en over elkaar leren gedurende samenwerking, zonder dat je hierbij een onderwijskundige interventie hoeft te doen. Waarbij zij deze toegenomen kennis vervolgens toepassen op hun eigen verpleegafdeling. De hoogst mogelijke uitkomst van leren is dat dit daadwerkelijk de gezondheidsuitkomsten van patiënten verandert. Daarom hebben wij onderzocht of het aantal medisch en paramedisch consulten veranderde op de reguliere verpleegafdelingen van de specialismen die betrokken waren bij de ISA. We toonden een significante afname aan van 16,9-19,3% voor het aantal medisch consulten, en een toename van 9,4-20% voor het aantal paramedisch consulten. Deze uitkomsten suggereren dat professionals een substantieel leereffect hebben ondervonden van het interprofessioneel samenwerken op de ISA, wat zorgt voor een toegenomen kwaliteit van patiëntenzorg.

In **Hoofdstuk 9** hebben we een scoping review uitgevoerd naar de bevorderende en belemmerende factoren voor interprofessioneel samenwerken. Veel studies hebben onderzocht welke factoren het succes van interprofessioneel samenwerken beïnvloeden, dit is gerelateerd aan de inzet van mensen en middelen, de vijfde categorie van de Quintuple Aim. Onze scoping review includeerde 52 studies, hiervan beschreven 43 studies bevorderende factoren en 46 studies beschreven belemmerende factoren. De meeste factoren waren complementair (b.v. vertrouwdheid als een bevorderende factor, ontbreken van vertrouwdheid als een belemmerende factor). Belangrijke factoren voor effectief interprofessioneel samenwerken zijn onder andere: het bereiken van een gezamenlijk doel; het faciliteren van een interprofessionele identiteit; het verminderen van disfunctionele hiërarchieën; het verminderen van medische dominantie; het overwinnen van persoonlijke verschillen zoals geslacht en ras. Deze scoping review geeft een uitgebreid overzicht van de bevorderende en belemmerende factoren voor interprofessioneel samenwerken,

hier moet je rekening mee houden bij het ontwerpen van interprofessioneel samenwerken.

In **Hoofdstuk 10** volgt tenslotte een samenvatting en discussie van alle studies, waarbij dit proefschrift in perspectief geplaatst wordt tot de klinische praktijk en de toekomst van de gezondheidszorg.

De bevindingen van al deze hoofdstukken laten zien dat interprofessioneel samenwerken op de ISA goed scoort op alle 5 categorieën van de Quintuple Aim. Dit suggereert dat de ISA een veelbelovende hervorming voor de gezondheidszorg kan zijn om de huidige en toekomstige uitdagingen te adresseren van zorgen voor oudere patiënten met multimorbiditeit.

Research data management statement

Ethics and privacy

This thesis used patient data which was retrospectively identified from the electronic medical record. Patients were included in Chapters 2, 3, 4, 5, and 8. The Regional Ethical Review Board METC Brabant declared that these studies do not fall under the scope of the Dutch Medical Research Involving Human Subjects Act (WMO), METC numbers respectively: NW2020-82; NW202124; Chapters 4 and 5 fall under the previous two METC declarations; NW2022-95.

Informed consent was not obtained from the participants in accordance with the Dutch law WGBO, article 458. Due to of the large number of participants enrolled, obtaining informed consent was not considered reasonably possible, and furthermore, selection bias could be introduced by obtaining informed consent as an unwanted side-effect. However, patients who had previously objected to their data being used for scientific research through the hospital opt-out procedure were excluded.

Participants (healthcare professionals) were included for questionnaires (Chapter 6) and for video and audio recordings (Chapter 7). The METC Oost-Nederland declared that Chapter 6 did not fall under the WMO, METC number 2021-13149. The METC Brabant declared that Chapter 7 did not fall under the WMO, METC number NW2023-01.

Participation in these studies was voluntary. Written informed consent was obtained from all participants before the start of the studies. Participants were allowed to withdraw from the study at any time. Participants' privacy was protected by the use of pseudonymisation. The pseudonymidation key was stored on a secure network drive that was only accessible to members of the project who needed access to it for their role in the project.

All research protocols were approved by the Research Board of the Jeroen Bosch Hospital. For Chapter 6, the research protocol was approved by the Research Board of Hospital Gelderse Vallei, as the research was conducted there.

All studies were conducted in accordance with the Declaration of Helsinki and the Dutch Code of Conduct for Research Integrity.

Data collection and storage

Original data were collected for all studies in this thesis. All patient data was collected from the electronic medical records.

Two methods were used to collect data from participants. For Chapter 6, the tool Enalyzer was used to send out questionnaires. This data was then stored on a secure hospital drive and analysed using SPSS. For Chapter 7, audio and video recordings were made. This data was then stored and analysed using Atlas.ti.

Chapter 9 is a scoping review using existing research articles. These articles were retrieved from MEDLINE, Embase and CINAHL.

All data used in this thesis was stored on a secure drive at the Jeroen Bosch Hospital and will be saved for the legally required period (15 years). The data was only accessible to members of the project who needed access to it due to their role within the project.

Paper data, such as the informed consent of the participants, will be stored in a locked cabinet in the geriatric department of the Jeroen Bosch Hospital and will be kept for 15 years.

Data sharing

All pseudonymised patient data will be made available upon reasonable request to the corresponding author. If access is granted, the SPSS file will be released along with the corresponding syntax and a detailed description of the analysis performed.

Participant data from Chapters 6 and 7 are not publicly available as participants did not provide informed consent to do this.

Data from the scoping review in Chapter 9 are available upon reasonable request to the corresponding author.

Publications

Publications related to this thesis

de Gans, S., Penturij-Kloks, M., Scheele, F., van de Pol, M., van der Zwaard, B., & Keijsers, C. (2023). Combined inter professional and intra professional clinical collaboration reduces length of stay and consultations: a retrospective cohort study on an intensive collaboration ward (ICW). Journal of Interprofessional Care, 37(4), 523-531.

de Gans, S. **T.**, Maessen, G. C., van de Pol, M. H., van Apeldoorn, M. J., van Ingen-Stokbroekx, M. A., van der Sloot, N., ... & van der Zwaard, B. C. (2023). Effect of interprofessional and intraprofessional clinical collaboration on patient related outcomes in multimorbid older patients–a retrospective cohort study on the Intensive Collaboration Ward. *BMC geriatrics*, *23*(1), 519.

de Gans, S. T., van der Zwaard, B. C., Labordus-van Helvoirt, R. E., Cornegé-Blokland, E., Adang, E. M., van de Pol, M. H., & Keijsers, C. J. (2024). Improved Care, Similar Costs, and Improved Health Equity by Interprofessional Collaboration: An Economic Evaluation. Journal of the American Medical Directors Association, 25(10), 105200.

Other publications

Penturij-Kloks, M. M., **de Gans, S. T**., van Liempt, M., de Vries, E., Scheele, F., & Keijsers, C. J. (2023). Pandemic Lessons for Future Nursing Shortage: A Prospective Cohort Study of Nurses' Work Engagement before and during 16 Months of COVID-19. Journal of Nursing Management, 2023(1), 6576550.

Penturij-Kloks, M., Keijsers, C. J., Enting, M., **de Gans, S. T**., Kilroy, S., Scheele, F., & Joosen, M. (2024). Work engagement of hospital workers in times of pressure: do nonclinical hospital workers react differently from their well-studied clinical colleagues?. Journal of Health Organization and Management.

PhD portfolio of Simon de Gans

Department: **Primary and community care**
PhD period: **01/02/2021 – 01/05/2025**
PhD Supervisor(s): **Prof. dr. M.H.J. van de Pol**
PhD Co-supervisor(s): **Dr C.J.P.W. Keijsers, Dr. B.C. van der Zwaard**

Training activities	Hours
Courses	
- Academic writing (2022)	32.00
- Course epidemiology and statistics (2023)	44.00
- Radboudumc - eBROK course (2024)	42.00
- Radboudumc - In the lead - Radboudumc introduction for PhD candidates (2024)	12.00
- Radboudumc - Scientific integrity (2024)	20.00
Seminars	
- Scientific evening JBZ with poster presentation (2021)	5.00
- Scientific evening JBZ with poster presentation (2022)	5.00
- Scientific evening JBZ with poster presentation (2023)	5.00
- Course ChatGPT and AI (2024) Scientific department - JBZ	2.00
- Scientific evening JBZ with poster presentation (2024)	5.00
Conferences	
- Geriatriedagen with oral seminar (2022) NVKG	30.00
- EuGMS congress 2024 with poster presentation (2024)	32.00
- MMV congres FMS with oral seminar (2024)	20.00
Other	
- JBZ Stipendium commission (2023)	8.00
- Radboudumc - General Radboudumc introduction for research personnel (2024)	9.00
- Award internship ICW (2024)	2.00
Teaching activities	
Lecturing	
Supervision of internships / other	
- Designing internship ICW (2021)	40.00
- Supervisor of a student (2022)	20.00
- In hospital presentation (2022)	2.00
- In hospital presentation (2022)	2.00
- Supervisor of a student (2023)	30.00
- Supervisor of a student (2024)	40.00
- Supervisor of a student (2024)	40.00
- Presentation patients' association JBZ (2024)	8.00
- Teaching residents geriatrics (2024)	10.00
- In-hospital presentation (2025)	2.00
Total	**467.00**

Over de auteur

Simon de Gans werd geboren op 12 oktober 1998 in 's-Hertogenbosch en groeide hier op. In 2017 behaalde hij zijn VWO diploma aan het Ds. Pierson college in 's-Hertogenbosch, waarna hij aansluitend begon met de studie geneeskunde aan de Radboud Universiteit Nijmegen. In de wachttijd voor zijn coschappen van de master geneeskunde deed Simon in 2020 een onderzoeksstage naar de Intensieve Samenwerking Afdeling (ISA) in het Jeroen Bosch Ziekenhuis (JBZ) in 's-Hertogenbosch. Deze onderzoeksstage werd gevolgd door een keuzecoschap onderwijs, waarin hij mee heeft geholpen aan het opzetten van het verdiepingscoschap ISA voor master studenten geneeskunde van de Radboud Universiteit. Deze twee stages op de ISA wakkerde het enthousiasme van Simon aan voor het interprofessionele samenwerken, waarna hij begon met promotieonderzoek op deze afdeling. Dit promotieonderzoek heeft hij gedurende de rest van zijn master geneeskunde voortgezet. In 2023 behaalde Simon zijn artsexamen cum laude, waarna hij ging werken als arts-assistent (ANIOS) op de geriatrie in het JBZ. Hij combineerde dit werk als arts-assistent met zijn promotieonderzoek. Na een jaar op de geriatrie heeft hij bij de kindergeneeskunde in het JBZ gewerkt. In maart 2025 is Simon gestart met de vervolgopleiding tot huisarts aan de Maastricht Universiteit. Simon is verloofd met Femke Emmen, zij wonen samen in Oirschot.

About the author

Simon de Gans was born on October 12, 1998 in 's-Hertogenbosch, the Netherlands, where he also grew up. In 2017 he graduated from secondary school (VWO) at the Ds. Pierson College in 's-Hertogenbosch and then began his medical studies at Radboud University Nijmegen. While waiting to start his Master of Medicine, Simon did a research internship at the Intensive Collaboration Ward (ICW) of the Jeroen Bosch Hospital (JBH) in 's-Hertogenbosch. This research internship was followed by an educational internship where he helped set up a clinical internship on the ICW for Master of Medicine students from Radboud University. These two internships fuelled Simon's enthusiasm for interprofessional collaboration on the ICW and he started his PhD research on this ward. He continued this research during the rest of his Master of Medicine. He obtained his Master of Medicine in 2023, graduating cum laude. He started working as a resident in the geriatrics department at the JBH. He combined his work as a resident with his PhD research. After a year in the geriatric department, he worked in the paediatric ward at the JBH. In March 2025 Simon has started his training as a general practitioner at Maastricht University. Simon is engaged to Femke Emmen and they live together in Oirschot.

Facts about this thesis

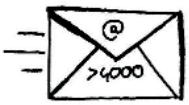
This thesis is about interprofessional collaboration. As the saying goes "practice what you preach", we believe that research on this topic should also be carried out by an interprofessional research team, or in our case, an interdisciplinary and interprofessional research team. A visualisation of the people involved in this thesis can be found on the cover. Here are some more facts.

76 people

7 institutions

41 job titles

17 co-authors



>4000 email

Dankwoord

Dit promotietraject was mij nooit alleen gelukt. Voor de start van mijn onderzoeksstage had ik niet gedacht een onderzoeker te worden. Echter, vanaf mijn eerste echte aanraking met wetenschap hier in het JBZ heeft de bevlogenheid van alle mensen waarmee ik heb mogen samenwerken mijn enthousiasme voor onderzoek doen ontbranden. Hiervoor ben ik al deze mensen onwijs dankbaar en dit promotietraject heeft mij niet alleen als professional maar ook als mens verrijkt. Zoals zorgen voor complexe patiënten niet alleen kan, geldt dit ook voor promoveren. Door de steun en inzet van iedereen om mij heen is dit proefschrift tot wording gekomen.

Mijn promotieteam wil ik als geheel ontzettend bedanken. Als team werkten wij samen zoals we dat in het onderzoek predikten: non-hiërarchisch, ieder in zijn kracht, en een fijne sfeer met humor en persoonlijkheid. Ik mocht uiteindelijk (bijna) altijd de definitieve beslissing maken. De sky was de limit, maar ik bepaalde hoe snel en hoe hoog, ook al was dat maar 3 verdiepingen. Ik heb veel promovendi gesproken en niemand had mijns inziens een beter team: jullie hebben dit traject onvergetelijk gemaakt.

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Beste Karen, inmiddels ken ik je al lang: van wetenschappelijk stagiair naar coassistent, promovendus en ANIOS. In bijna alle vlakken van mijn medische studie heb jij mij begeleid en verrijkt. Ik had me geen betere begeleider kunnen wensen. Er zijn twee uitspraken van jou die ik wil belichten, ten eerste "We maken er een dun boekje van en doen er een strik om", daar is toch iets mis gegaan. En ten tweede, zoals jij ooit zei "Simon, je weet op de een of andere manier altijd tussen mijn agenda te komen" en hier ben ik juist jou dankbaar voor, want ondanks die joekel van een agenda was er altijd een plekje voor mij.

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De afgelopen jaren heb ik met vele bevlogen onderzoekers mogen werken, die mij allen weer iets anders hebben geleerd. Ik wil hen niet onderbelicht laten.

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Beste Renske Labordus-van Helvoirt, de ISA kan niet zonder ziekenhuisartsen en het onderzoek naar deze mooie afdeling natuurlijk ook niet. Dankjewel voor jouw betrokkenheid bij het onderzoek.

Beste Eddy Adang, als expert vanuit het Radboudumc ingevlogen voor de economische evaluatie. Jouw bijdrage heeft het stuk naar een hoger niveau getild, alsmede ook mijn kennis.

Helaas kan ik niet alle mensen bedanken die de afgelopen jaren in meer of mindere mate betrokken zijn geweest tijdens dit traject, het zijn er simpelweg te veel, zoals gevisualiseerd op de kaft van dit boekje. Ik wil nog speciale dank tonen aan een aantal mensen

die vol enthousiasme hun expertise hebben gedeeld zonder auteur te worden op een artikel. Bedankt Eric Smits, Joost Cleven, Marcel Linssen, Thom de Bruijn, Monique (Mo) Verhoeckx.

Samenwerken zorgt ook voor samen leren. Terwijl ik aan het leren was, mocht ik dit direct overdragen aan de volgende generatie onderzoekers. Dankjewel Niki Maessen dat ik jou zelfs bij twee stages heb mogen begeleiden, je hebt feeling voor wetenschap en was niet bang jouw begeleiders kritische vragen te stellen, je bent altijd welkom om (nogmaals) terug te komen. Dankjewel Meike Huijbers voor jouw enthousiasme en gezelligheid, ik kende je al goed en dat maakte de samenwerking des te makkelijker. Dankjewel Susan van Maren voor jouw inzet tijdens je stage, je hebt veel doorzettingsvermogen getoond. Jullie hebben allemaal een mooie bijdrage geleverd aan dit boekje.

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"Sometimes you're so focused on the future that you don't realize you're in the middle of what you used to pray for"

- Barney Stinson
(from the tv series "how I met your mother")