PhD Thesis
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The Impact of Interprofessional Clinical Training in Mental Health Services

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List of papers

This thesis is based on the following papers:


List of abbreviations

AITCS = Assessment of Interprofessional Team Collaboration Scale
CI = Confidence Interval
CSQ-8 = Client Satisfaction Questionnaire
IPC = Interprofessional collaboration
IPE = Interprofessional education
K10 = Kessler Psychological Distress Scale
PBL = Problem based learning
RIPLS = Readiness for Interprofessional Learning Scale
SE = Standard Error
SF-36 = Short Form Health Survey
T1 = Time 1 (before measurement)
T2 = Time 2 (after measurement)

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Summary in English

Teamwork and collaboration are essential to prevent relapse and manage chronic conditions, especially in the care of patients with mental health problems. Their treatment requires participation from a diversity of healthcare professionals working together in dedicated teams. However, collaboration among team members continues to pose a challenge, with consequences for the quality of care in terms of poor service delivery, low patient satisfaction, and errors. Over the past decades, healthcare education has increasingly adopted interprofessional clinical training in an effort to enhance teamwork. In psychiatry, however, knowledge of the benefits of collaborative clinical training is sparse.

In order to optimize the care pathway for mental health patients and to further our knowledge of the effects of interprofessional education (IPE), an interprofessional training unit was established. We then conducted a systematic review of studies describing the effects of IPE on undergraduate healthcare students’ educational outcomes, compared to conventional clinical training in mental health. The decision to perform a systematic review was informed by the sustained growth in IPE activity, repeated policy calls – and the manifest dearth of evidence of its impact in the mental healthcare field.

The MEDLINE, CINAHL, PsychINFO, and EMBASE databases were searched for studies published between January 2001 and August 2017. Eight studies met the inclusion criteria; the applied IPE interventions, methods, and outcomes were, however, highly diverse. The study participants were students of the following professions: medicine, nursing, occupational therapy, physiotherapy, psychology, and social work. The results of the studies suggest that the students responded well to IPE in terms of more positive attitudes toward other professions and improvement in knowledge and collaborative skills. We found limited evidence of change in behavior and organizational practice or of benefits to patients, however.

The impact of interprofessional training in the psychiatric inpatient ward was assessed on 1) students’ readiness for interprofessional learning and collaboration, and 2) patient satisfaction and self-reported mental health status. The assessment was designed as a nonrandomized intervention study with a comparison group. The students’ readiness for interprofessional collaboration and patient outcomes were measured at two times, by the use of validated and culturally adapted questionnaires. The assessment of students’ learning outcomes was performed using the Readiness for Interprofessional Learning Scale (RIPLS) and the Assessment of
Interprofessional Team Collaboration Scale (AITCS). For patient outcomes we used the Short Form Health Survey (SF-36), the Kessler Psychological Distress Scale (K10), and the Client Satisfaction Questionnaire (CSQ-8).

Whatever scale was used, the students in the intervention group reported higher postintervention scores, compared to the students in the comparison group (overall sum scores). Improvement in readiness for interprofessional learning and team collaboration in the intervention group remained statistically significant after adjustment for baseline differences between the two groups.

The patients in the training unit reported better mental health compared to the patients in the standard ward. The former group likewise scored higher for satisfaction. No differences in mean scores of psychological distress (K10) were found between the two groups.

These positive findings add evidence to the growing body of literature supporting the claim that IPE training units are capable not only of creating unique and valuable environments for experiential IPE, but also of improving patient outcomes. However, few IPE interventions were conducted in a practice setting and even fewer have involved patients; further research into the processes and the long-term effects of IPE in mental healthcare is therefore needed. We furthermore recommend that patients be involved in the development, implementation and evaluation of IPE interventions in mental health for undergraduate healthcare students.
Siden 1990'erne har der været en stigende politisk interesse for tværfagligt samarbejde, da der er en stærk overbevisning om at interprofessionelt samarbejde kan forbedre behandlingen til psykiatriske patienter. I de seneste årtier er der også set en voksende evidens for at sådanne interprofessionelle teams forbedrer den koordinerende inddømning omkring patientforløbet og patienternes tilfredshed, dog primært indenfor andre specialer end psykiatrien. Sundhedsprofessionelles samarbejde er afgørende for at håndtere patienternes kompleks behov og især ved personer med psykiatriske lidelser har det vist at være hensigtsmæssigt at sundhedspersonale på tværs af professioner samarbejder i dedikerede teams. Sideløbende har der generelt i sundhedssektoren været en stigende interesse og anerkendelse af interprofessionel klinisk træning (IPE), som en nødvendighed for at styrke teamsamarbejdet både for studerende og professionelle. Der rapporteres imidlertid fortsat om udfordringer i teamsamarbejdet, især mellem professionerne, hvilket kan have konsekvenser for kvaliteten af behandlingen, forringet service og fejl.

For at optimere patientforløbene for psykiatriske patienter og for at øge viden om effekten af IPE blev der i 2015 etableret et interprofessionel studie-enhed i Psykiatrien, Slagelse.


Effekten af interprofessionel træning i det psykiatriske sengeafsnit (studie-enhed) blev undersøgt i form af: 1) studerendes parathed til interprofessionel læring og samarbejde, og 2) patienternes selvvurderede mentale helbred og tilfredshed med behandlingen. Designet var et ikke-randomiseret interventionsstudie med kontrolgruppe. Før- og eftermålinger blev gennemført ved brug af validerede spørgeskemaer. Måleinstrumenterne: Readiness for Interprofessional Learning Scale (RIPLS) og Assessment of Interprofessional Team Collaboration Scale (AITCS) blev anvendt til at vurdere de studerendes læringsudbytte. Tilsvarende anvendte vi følgende selvrapporterede spørgeskemaer til at måle effekten af patienternes forløb: Short Form Health
Survey (SF-36), Kessler Psychological Distress Scale (K10) og Client Satisfaction Questionnaire (CSQ-8).

Studerende i interventionsgruppen rapporterede højere total score ved eftermålingen (RIPLS og AITCS) sammenlignet med studerende i kontrolgruppen. Den forbedrede parathed til interprofessionel læring og teamsamarbejde i interventionsgruppen forblev statistisk signifikant efter justering af baseline-karakteristika mellem de to grupper. Ligeledes rapporterede patienterne i interventionsgruppen forbedret mental status (SF-36) og tilfredshed (CSQ-8) sammenlignet med patienterne i et standard-sengeafsnit. Der blev dog ikke fundet forskel i psykisk belastning (K10) mellem de to patientgrupper.

Disse positive resultater supplerer øvrige studier, der viser, at IPE studie-enheder er værdifulde uddannelsesmiljøer for de studerende, men samtidig også kan forbedre kliniske patientmål. Imidlertid er det kun få IPE-interventioner, som er foregået i klinisk praksis og endnu færre har involveret patienter. Der er derfor behov for yderligere forskning og især indenfor IPE i psykiatrien (både i forhold til proces- og langsigtede effektmål). Desuden anbefales det, at patienterne bliver involveret i implementering og evaluering af IPE-interventioner indenfor psykiatrien.
Background

Introduction
In mental health settings, interprofessional teamwork is considered necessary to prevent relapse and manage chronic conditions (1–4). The complexity of chronic mental illness requires a comprehensive response, because many patients are afflicted with both mental and physical problems (1,5). Teamwork allows a more holistic approach, thereby improving outcomes. Collaboration among team members and adequate knowledge of other professional roles are essential (2,6,7). However, collaboration among team members continues to pose a challenge, which may impinge on the quality of care in terms of poor service delivery, lack of continuity, low patient satisfaction, and errors (1,4,6,8).

Teamwork and interprofessional collaboration
Good teamwork is essential to the quality of healthcare (3). According to Xyrichis and Ream (2008), teamwork in healthcare is:

A dynamic process involving two or more health professionals with complementary backgrounds and skills, sharing common health goals and exercising concerted physical and mental effort in assessing, planning or evaluating patient care. This is accomplished through interdependent collaboration, open communication and shared decision-making (9).

According to the literature, teams generate better treatment outcomes and improve communication and partnership among professionals and patients (10,11), while patient satisfaction is also increased (12,13). However, the overall goal of collaborative practices should be improvement in health outcomes for the patients. According to the World Health Organization (WHO),

[interprofessional collaboration] occurs when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across settings (8).
Hughes et al. found that medical errors, especially those caused by communication failure, are a pervasive problem in today’s healthcare organizations (14). The lack of communication and cross-professional collaboration lead to errors and poorer patient outcomes (4,6). To remedy this, medical education is being transformed as new models for delivering clinical training stimulate collaboration among healthcare professionals. Traditionally, the different professions were responsible for the education of its recruits, with each profession training and instructing the students to develop the knowledge, skills, and attitudes considered necessary. However, professionals in healthcare are increasingly expected to work together in teams, and as a result, effective interprofessional collaboration is regularly invoked by policymakers as a key mechanism in tackling poor service delivery, reducing errors, minimizing the duplication of efforts, and the modernization of services (8).

**Mental health care delivery**

Since the 1980s mental healthcare services have changed from institutionally based models to community-based models of care. The primary focus of treatment has moved away from medication to a more person-centered care (2), while the awareness of patient empowerment has begun to manifest itself. Patients have increasingly claimed an active role in treatment and a wish to have their personal experiences contribute to the recovery (15). This has led to new opportunities and obligations for mental healthcare workers to develop a more patient-centered care that involves patients in the planning and delivery of care, a strategy that appears to be the more necessary in the light of the complexity and chronic conditions suffered by many mental health patients.

**Patient-centered care**

Patient-centered care is particularly important in the treatment of patients with chronic psychiatric disorders, in particular as active participation in own care is known to lead to better outcomes (16,17). Although research into this field is relatively sparse when compared to physical health, the evidence in favor of shared decision making to underpin mental health treatments is convincing (18,19). Involving the patients in the treatment of mental illness is vital, as they are in the best position to value treatment effectiveness, within the context of their personal preferences and needs. When assessing the quality of care, their views should be incorporated (10). Moreover, interventions based on interprofessional care and a patient-centered approach have been shown to improve patient-reported outcomes and satisfaction in mental healthcare (13,20).
The usefulness of interprofessional collaboration in mental healthcare is well recognized, due as well to its capacity to provide and coordinate a variety of responses to patients’ complex healthcare needs (2,21). Organizing interventions according to the patients’ needs is a prominent feature of teams of collaborating professionals (22).

According to the Institute of Medicine, the key aim of IPE is to aid healthcare professionals in delivering improved outcomes based on their concerted efforts to communicate effectively in their teams (23).

**Interprofessional education**

Interprofessional education (IPE) in the healthcare professions is widely encouraged as a means to improve healthcare services. Despite the strong evidence that team-based care sustains quality and safe healthcare outcomes (3,8), students’ opportunities to learn and practice team-based care are limited by the different organization of their educational programs, which tends to prevents them from spontaneous collaboration. Teamwork also faces the obstacle of insufficient knowledge of other team members’ roles (24). Conventional health education focuses on profession-specific learning outcomes rather than on collaborative skills, while in shared learning, students are enabled to acquire knowledge, skills, and attitudes essential to their future work (8). In a vision of interprofessional education (IPE) formulated by Barr et al. (2005), the different professions would be enabled to better understand each other and work more effectively together on improving the quality of care (25). The concept of interprofessionality has caused some confusion, as the meanings of the terms multiprofessional and interdisciplinary are sometimes conflated (26). In a generally accepted definition of interprofessional education, “(…) students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes” (27). The definition emphasizes interaction between professionals and includes the objectives of interprofessional education; i.e., improving both collaboration and the quality of care. Furthermore, it is commonly accepted that interprofessional education occurs when professions learn side by side (28), while multiprofessional is used to indicate the presence of more than one profession (26). Throughout the thesis, the term interprofessional is used.

**Organizing IPE**

The planning of IPE may be challenged by logistical factors, such as students’ different institutional backgrounds, their prior experiences with interprofessional collaboration, and the varying academic levels of their programs (21,26).
Acknowledging the difficulties involved in interprofessional collaboration, the WHO recommends that IPE begin at undergraduate level (8). Various IPE initiatives for undergraduates have been described (29–31). However, interprofessional clinical training remains largely confined to the later stages of education, with significantly fewer opportunities reported for undergraduate students (26). Below, a number of initiatives involving IPE for undergraduates are described, none of which, however, involve mental healthcare provision.

Training units in Sweden

In 1996 a training unit was established at Linköping University (31). The unit was based on a concept developed there, aiming to offer interprofessional teams of undergraduate students a supervised clinical practice placement in which they were trained in the planning and delivery of care. In an eight-bed clinical unit set up solely for this initiative, a course provided students of nursing, medicine, occupational therapy, physiotherapy, social welfare, and laboratory technology with a compulsory placement in which they worked together as an interprofessional team. The student teams were supervised throughout by nurse facilitators. To encourage collaboration on the patient’s needs, the educational approach was underpinned by problem-based learning theory (PBL).

To pass the program, students had to fulfill the following four learning aims:

- Acquiring skills for collaboration in a team
- Understanding of other professional roles
- Understanding of multiprofessional patient care
- Practical experience with medical care and rehabilitation (31).

The students were organized into three care teams, which worked either morning or afternoon shifts to provide care for patients. They likewise attended team sessions at the end of each morning shift to reflect on their individual and team performances.

In 1998, the training unit concept was introduced at Stockholm’s Karolinska Institute, where a two-week interprofessional training program for medical, nursing, physiotherapy, and occupational students was launched (32) to offer clinical training for student teams under the supervision of facilitators.
Training units in the UK

In 1999, a similar concept was tested in a 12-bed section of a 27-bed orthopedic and rheumatology ward at the Royal London Hospital, UK. In an study assessing the intervention, the students, their facilitators and the patients all reported positive views of the concept of IPE (33). The two key learning aims in the training unit were to develop the students’ individual professional competences and to promote interprofessional teamwork. During the intervention, six interprofessional teams of undergraduate students planned and delivered care for the patients under the supervision of professionals. Each team consisted of two medical students, two nursing students, one occupational therapy student, and one physiotherapy student. The IPE course was given over two weeks, with each team working morning and afternoon shifts. Facilitation was given in the form of team-oriented and profession-specific support (33).

Training units in Denmark

In 2004 an eight-bed section of an 30-bed orthopedic ward in Holstebro (34) was used as an interprofessional training unit. A two-week clinical training program was offered to groups of four to six nursing students, two occupational therapy students, two physiotherapy students, and one or two medical students. The goals of the training unit were to allow the students:

- To acquire interprofessional teamwork skills
- To strengthen their understanding of their uniprofessional roles
- To work in an organization in which different professions work closely together on providing care, training and rehabilitation for the patients and
- To create a learning environment in which new ways of coordinating and integrating clinical and theoretical interprofessional learning were developed and tested (34).

The students were followed throughout by a cross-professional team of clinical tutors responsible for the patients as they worked morning and afternoon shifts. The assessment shows that the goals were obtained, as the students strengthened their own professional roles while working together (34).

From 2007 to 2010, the Department of Orthopedic Surgery at Kolding Hospital established an interprofessional clinical training unit for students of nursing, medicine, physiotherapy, occupational therapy, laboratory technology, and radiography (35). A two-week clinical training
The program was developed for the students, who worked in the ward during the day and the evening. The objectives of the initiative were to enable students to:

- Enter into interprofessional collaboration to improve the treatment, care, and rehabilitation of patients
- Perform uniprofessional tasks and develop knowledge, attitudes, and skills according to their educational level
- Develop interprofessional and uniprofessional competences based on real patients’ health problems.

A facilitator team with representatives from each of the involved professions was responsible for the IPE program (35).

To summarize, the described Scandinavian and UK programs entailed two-week training courses devoted to interprofessional education. While clinical training units are increasingly being establishing (29–33), only initiatives involving somatic specialties have so far been described. The training units were based on a concept developed at the Medical School, Linköping (31). The didactic principles were informed primarily by theories of PBL and IPE (29). The interventions involved undergraduate students of up to six professions, with medicine, nursing, physiotherapy, and occupational therapy represented in all of them. The organization of the courses was challenged by the synchronization of schedules for the different study programs (36).

On the background of the growth in IPE activities, we found that a mapping of initiatives in mental health education was needed. This project thus contributes to the extremely sparse body of studies undertaken in the field of undergraduate IPE in clinical mental health.

**Interprofessional Training in Slagelse, Denmark**

In 2015, a new psychiatric hospital with four inpatient wards, an outpatient clinic, and an emergency ward was established in Slagelse, Denmark. One of the four inpatient wards was designated for interprofessional training of students of medicine, nursing, nursing assistants, pedagogy, physiotherapy, and social work. To offer a suitable challenge for students from all fields, the chosen training unit admitted adult patients suffering from psychiatric disorders such as schizophrenia, bipolar disorder, severe depression, and severe personality disorders. The
practical care, diagnosis, and treatment were assumed to be ideal tasks for the healthcare students. An 18-month project with continuous assessment was initiated.

The organization of the clinical training ward was inspired by the work of Nørgaard et al. (35) and aimed to create a new environment for learning to enable students to learn from each other and develop their competences in interprofessional collaboration and reflection (34,35). Reflection being a key strategy in IPE (6), the overall goals were for students to:

- Develop their own professional roles
- Enhance their understanding of other professionals’ roles
- Understand the importance of teamwork for quality in patient care
- Enhance their understanding of the patient’s role (“patient as a partner”).

**Toward an Interprofessional training unit**

The positive experiences gained from other specialties led to the idea of starting a specially designated unit in which students would work together with professionals in real-life teams in a clinical setting. The planning and implementation of the training unit took place in collaboration between Mental Health Services Slagelse and the University of Copenhagen and University College Absalon.

Students of medicine, nursing, nursing assistants, physiotherapy, pedagogy, and social work were included in the study. The choice of an inpatient ward was motivated by the fact that its patients’ complex pathology typically would require a complete care team to offer adequate treatment. The setting would likewise confront the students with medical, rehabilitative, and social aspects of care.

A team of facilitators were responsible for the students’ training. To prepare for the effort and train supervision tasks, all members of the unit’s staff participated in a one-day interactive workshop facilitating reflection and small-group work focusing on team-based and patient-centered care.

**Aims of thesis**

The studies supporting this thesis investigated the impact of IPE in a mental health service setting. The objectives were as follows:
• To provide a synthesis of the best available evidence for recommendations on future undergraduate IPE interventions in mental health
• To investigate the impact of interprofessional training on students’ readiness for interprofessional collaboration in a psychiatric ward (Slagelse)
• To investigate the impact of interprofessional training on patient satisfaction and the self-reported mental health status of psychiatric patients.

Methods

The two-part project entailed 1) a systematic review and 2) a nonrandomized intervention study with a comparison group. Data were collected by means of questionnaires and distributed to the two target populations (students and patients) at the beginning (T1) and at the conclusion of the intervention (T2). Table 1 provides an overview of the intervention study.

Table 1. Overview of intervention study

<table>
<thead>
<tr>
<th>Aim</th>
<th>Study design</th>
<th>Population</th>
<th>Included participants</th>
<th>Outcome measures</th>
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<tr>
<td>Impact of IPE on students’ interprofessional collaboration</td>
<td>Nonrandomized intervention study</td>
<td>Undergraduate students of medicine, nursing, nursing assistants, physiotherapy, pedagogy, and social work</td>
<td>195 students; 87 in intervention group, 108 in comparison group</td>
<td>Self-reported questionnaires: Readiness for Interprofessional Learning Scale (RIPLS); Assessment of Interprofessional Team Collaboration (AITCS)</td>
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<tr>
<td>Impact of IPE on patient satisfaction and mental health status</td>
<td>Nonrandomized intervention study</td>
<td>Inpatients aged 18 – 65 suffering from schizophrenia, psychosis, major depression, bipolar disorder, and severe personality disorder</td>
<td>552 inpatients: 281 in intervention group, 271 in comparison group</td>
<td>Self-reported questionnaires: Short Form Health Survey (SF-36); Kessler Psychological Distress Scale (K10); Client Satisfaction Questionnaire (CSQ-8)</td>
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Systematic review

A systematic review was conducted to shed light on the first stage of implementing IPE in mental health practice. In order to strengthen the conceptual design of the intervention, the MEDLINE, CINAHL, PsychINFO, and EMBASE databases were searched for studies published during the sixteen and a half years between January 2001 and August 2017. Using Kirkpatrick’s
model for analysis and synthesis of the included studies, all retrieved papers were assessed for methodological quality (21). This process involved an evaluation of the presented evidence in relation to methodology and educational outcomes as well as the clarity of the presented results. To evaluate the qualitative and cohort studies (37) we used the Critical Appraisal Skills Program (CASP) and the Mixed Methods Appraisal Tool (MMAT) to evaluate the mixed method studies (38). The reclassification of Kirkpatrick’s typology (39) of educational outcomes from four to six (40) was incorporated into our review to ensure a focused and unambiguous description of outcomes. The six levels are outlined below:

- Level 1 Reaction: Learners’ perspectives on the learning experience, its presentation, content, teaching methods, and the quality of teaching
- Level 2a Attitudes/perceptions: Outcomes related to changes in interprofessional attitudes or perceptions among participant groups, toward patients and their conditions, care, and treatment
- Level 2b Knowledge/skills: Knowledge of the acquisition of concepts, procedures, and principles of interprofessional collaboration. Skills relate to problem solving and collaboration
- Level 3 Behavioral change: Measurements relate to changes of behavior in the workplace
- Level 4a Organizational change: In relation to major changes in organizational policies or clinical pathways to promote interprofessional collaboration and communication
- Level 4b Benefits to patients: Improvements in the health and well-being of patients as a direct result of an IPE program. Such improvements include health status measurements, duration of hospital stay, complication rates, readmission rates, patient satisfaction, continuity of care, and costs (39).

In Papers II and III, the students’ attitudes (Kirkpatrick’s level 2a), their IPE-related knowledge and skills (Level 2b), and improvements in patient outcomes (Level 4b) were assessed.

**Intervention study**

We conducted a nonrandomized intervention study with a comparison group. From October 2016 to March 2018, we assessed students’ learning outcomes and patient outcomes in an interprofessional training unit, compared with those achieved in a conventional inpatient ward.
**Setting**

The intervention took place in (Adult) Mental Health Services, Slagelse, Denmark. The department has four inpatient wards, an outpatient clinic, and an emergency ward, serving a mixed urban and rural district. The 80-bed department discharges 1,995 patients and has 39,391 visits to the outpatient clinics per year (2017 figures, obtained from HR department, Mental Health Services, Slagelse).

**Piloting project**

In the 9 months leading up to the intervention, we conducted a pilot project to test the intervention and its measurements. The pilot furthermore aimed at strengthening and assessing the training unit concept. Three student teams were charged with a range of profession specific duties, such as the planning and delivery of patient care. The teams, consisting of between three and ten students each with professionals and students from medicine, nursing, nursing assistants, pedagogy, and social work, worked both morning and afternoon shifts. In addition to providing on-ward patient care, the students participated in reflection sessions facilitated by a training nurse.

To collect data on the pilot period, self-report questionnaires were administered to both the intervention group and the comparison group between July and September 2016, involving 31 students and 44 patients.

The intervention itself consisted of two types of activities: clinical care teamwork (mainly supervised by uniprofessional instructors) and interprofessional group tutorial sessions led by instructors with extensive experience in IPE.

**Intervention**

Work in the psychiatric ward was organized into three care teams, each with professionals and students from medicine, nursing, nursing assistants, pedagogy, physiotherapy and social work, supplemented by a patient. The training aimed at strengthening the students’ uniprofessional roles, their knowledge of other professionals’ roles, and supporting interprofessional collaboration. The facilitation team included representatives from all six professions.
Interprofessional group tutorials

To stimulate reflection on clinical practice (6) and to strengthen their knowledge of the patients’ treatment and care, all students met once a week for interprofessional group tutorials, where learning was based on patient cases. In the sessions each student presented a case to plenary, followed by a facilitator’s introduction to psychiatric diagnosis and treatment. Focus points included living with a psychiatric disorder, understanding the patients and their backgrounds, and the roles and responsibilities of each team member involved in the care. This would often lead to discussion, small-group work, or traditional study activities such as research article reading. Another key learning activity involved the students’ observation of a psychiatrist or psychologist interviewing a patient, followed by small interprofessional student group work to draw up a treatment plan for holistic care based on their observations and the group discussions. Learning in the group tutorials was ideally a circular action-cum-learning process involving experiences, reflection, planning, and action (41,42). The sessions were organized by a nurse facilitator.

Furthermore, to ensure that adjustments and implementation of the IPE concept progressed as planned, weekly facilitator team meetings were held between the head nurse, a nursing instructor, and a psychiatrist. The meetings were attended as well by the author of this thesis.

Clinical care teams

During the day shifts, the clinical training was organized in care teams of variable size (three to ten students), while in the evening, three or four students were assigned to each team. The patients’ active participation in the teamwork was a key feature of the intervention, which emphasized collaboration between patients and professionals/students in the development of patient-centered team care. To ensure the patients’ progress and to adjust treatment plans as needed (43), weekly team conferences were held.

The teams were originally planned to consist of three nursing students, two nursing assistants, one or two medical students, one or two physiotherapy students, one pedagogy student, and one social work student, depending on the number of students available. Representing as many professions as possible, a matching number of professionals were assigned to the teams, their function being to ensure the patients’ safety and the quality of care and to supervise the students. The profession-specific goals related mainly to practical skills. Each team was supported by a facilitator who worked closely with the team during their clinical placement. To develop the
students’ independent problem solving skills, the facilitators used questioning to help define the problem at hand and guide students toward their own solution. As day-to-day planning was a shared responsibility, the students and the professionals were forced to discuss decisions and assign duties. Questions and problems that arose through reflection, discussion, and analysis in the teams were also solved in this forum (6).

**Comparison**

The students in the comparison group received traditional uniprofessional training during their clinical placement, with no structured interprofessional training. Although students of healthcare all receive their practical/clinical education in the same wards, and are involved with the same patients, their programs are rarely coordinated. With each profession being responsible for the supervision and instruction of students for the development of profession-specific skills, training in the clinic is uniprofessionally organized, as opposed to the team organization used for the intervention group.

The patients in the comparison group were admitted to a standard psychiatric ward, where professionals from different backgrounds worked side by side, not necessarily engaging in collaborative treatment tasks such as interprofessional team conferences. The patient was assigned to a healthcare professional with responsibility for coherent treatment and providing information to the patients and their relatives according to protocol. This would typically be a psychiatrist, who also led traditional ward rounds, supported by nurses or nursing assistants. The ward rounds were planned for Mondays through Fridays, with highest priority given to acute patients.

**Participants and procedure**

**Paper II**

In Paper II, we report on the students’ clinical placement in psychiatric inpatient wards, which took place from October 2016 to March 2018. The study included students of medicine (in their 5th year), nursing (2nd or 3rd year), nursing assistants (2nd year), physiotherapy (3rd year), pedagogy (3rd year), and social work (2nd year), at a stage at which it could be assumed that they had developed a professional identity and were capable of contributing to interprofessional learning. A balanced allocation to either the intervention or the comparison group was performed by course administrators at their home institutions.
Paper III

The study reported in Paper III included inpatients (aged 18–65) admitted from October 2016 to March 2018. They suffered from psychiatric disorders such as schizophrenia, psychosis, major depression, bipolar disorder, and severe personality disorder. Self-report questionnaires were administered to both intervention and comparison group patients within the first 48 hours on their wards (T1) and on the day of discharge (T2). Patients who did not consent to participation or failed to complete the questionnaire at the beginning of their stay were excluded from the study, as were those hospitalized for less than a week.

Outcomes

Students

To assess the learning outcomes of the interprofessional training course, we conducted two surveys, using the Readiness for Interprofessional Learning Scale (RIPLS) and the Assessment of Interprofessional Team Collaboration Scale (AITCS).

Readiness for Interprofessional Learning

The RIPLS questionnaire was developed to assess healthcare students’ readiness for interprofessional learning (44). The original questionnaire consisted of 19 items, with 5-point Likert scale responses on three subscales:

- Teamwork and collaboration – students who share a strong belief that shared learning is beneficial in many ways. They believe in effective teamwork and the need to share knowledge and skills with other students.
- Professional identity – students with a strong conviction that a profession should be learned alongside students and professionals representing the same profession, and thereby strengthen professional identity and the power of professional cultures.
- Roles and responsibilities – students who believe that different professions should keep to their own tasks and responsibilities, including that one profession should be subservient to another (44).

We used a modified four-scale version prepared by McFadyen et al. (45), which has been found to have good internal consistency (46–48), dividing professional identity into positive and negative constructs. The Danish version with 29 items applied here has been validated and culturally adapted by Nørgaard et al. (48). On a Likert scale ranging from 1 (Strongly disagree)
to 5 (Strongly agree), the students were asked to rate their agreement with statements regarding shared learning activities among health science disciplines. The learning scale assesses Teamwork and collaboration, Negative professional identity, Positive professional identity, and Roles and responsibilities (49).

**Assessment of Interprofessional Team Collaboration**

The AITCS questionnaire was developed to help healthcare teams determine the quality of their collaboration (Orchard et al. 2012). It covers 47 items over four subscales (Partnership, Cooperation, Coordination, and Shared decision making) (50). Using the collapsed Danish version with 37 items distributed over three subscales (Partnership/shared decision making, Cooperation, and Coordination)(51), we asked the students to assess the level of collaboration on a five-point Likert scale ranging from 1 (Never) to 5 (Always). The following aspects were covered:

- **Partnership/shared decision making**: concerning recognition of and respect for patients’ and their families’ role in and contribution to their own care. The sharing of information between all parties, and whether the patient’s “expert opinion” is considered a requirement in the process of working toward agreement on treatment measures.

- **Cooperation**: concerning acknowledgement of and respect for the opinions and viewpoints of collaborators, while the willingness to examine and change personal beliefs and perspectives is maintained. Cooperation involves a group of health professionals working together in an environment where each person’s skills, knowledge, and expertise are valued and sought out to achieve the highest level of health outcomes.

- **Coordination**: concerning the ability to collaborate in teams on achieving mutual goals; effective communication among team members; availability of the necessary equipment, supplies, human resources, information, and technology (51).

**Patients**

Patient outcomes were assessed using the Short Form Health Survey (SF-36), the Kessler Psychological Distress Scale (K10), and the Client Satisfaction Questionnaire (CSQ-8).

**Short form health survey**

The patients’ physical and mental status was assessed using the standardized Short Form Health Survey (SF-36), first developed in the US by Ware and Sherbourne (1992;52). Its 36 items are grouped into eight domains/subscales:
- Physical functioning: rates the ability to perform daily life activities such as caring for individual needs, walking, and relaxation
- Role limitations: focus on role limitations due to physical problems
- Bodily pain: assesses the level of pain during the past four weeks and its interference with daily activities
- General health: assesses general health based on individual perceptions
- Vitality: concerns the feeling of agility and energy as well as tiredness
- Social functioning: focuses on the effect of physical and mental problems on social activities and relationships with family, friends, and other community members
- Role limitations: evaluates emotional factors that interfere with work or other activities
- Mental health: measures feelings of depression and anxiety.

The summed scores for each of the eight domains were plotted on a scale from 0 (worst) to 100 (best), with higher scores indicating better health (52). The scores were summarized into two general components (53) (the Physical Component Summary score and the Mental Component Summary score). We applied the acute version, with one-week recall.

**Kessler Psychological Distress Scale**

We assessed nonspecific psychological distress on the basis of the self-reported 10-item Kessler Psychological Distress Scale (K10) (54), using its Danish version, which has been validated and culturally adapted by Thelin et al. (55) to measure the experienced level of anxiety and depressive symptoms over the preceding four weeks. The K10 has previously showed satisfying psychometric properties and significant associations with anxiety and affective disorders in a sample of patients aged 18 or older (56). The scale is typically used for analytical purposes as a unidimensional scale with a score range from 10 to 50, higher scores indicating more anxiety and stronger depressive symptoms.

**Client Satisfaction Questionnaire**

The patients’ satisfaction with care was assessed using the eight-item version of the Client Satisfaction Questionnaire that has been validated in a Danish population (57) (CSQ-8) (58). Items were scored on a Likert scale from 1 (low satisfaction) to 4 (high satisfaction). The CSQ-8 has been found to have high internal consistency and concurrent validity in mental health settings (58). Total scores ranged from 8 to 32.
**Data analysis**

**Sample size**

The sample size used for the intervention study (Papers II and III) was calculated before recruitment. The study was powered at 80% ($\alpha = 0.05$) to detect an effect size of 0.4 (Cohen’s $d$), which we regard as adequate to detect educationally and clinically meaningful differences between intervention outcomes (59,60).

In Paper II (61), we used a standard eight-point deviation, based on findings from an intervention study (62) using the RIPLS (our primary outcome). Anticipating a withdrawal rate of 20%, 90 participants were allocated to each group. For the Paper III study, our power calculation indicated the need for 120 participants per group (63).

**Descriptive data**

The descriptive sections of Papers II and III report continuous data as means, standard deviations (SD), with confidence intervals (CI), and P-values.

The students’ gender and profession were described (in Paper II). Both the RIPLS and the AITCS employed a Likert scale format. As recommended in previous studies, scores were treated as intervals (64,65). We initially used unpaired t-test to assess mean score differences at baseline. Differences over time were explored using the paired sample t-test. Postintervention mean scores were compared between groups and over time, using linear mixed regression, with adjustment for gender, profession, and baseline scores (61).

The patients were described (in Paper III) in terms of gender, age, and baseline scores (SF-36 and K10). We applied unpaired t-tests to assess mean score differences at baseline, and chi-square tests for gender distribution. Differences over time were explored using paired sample t-tests. Linear mixed regression was used to assess differences in outcomes between groups.

**Ethical considerations**

Before participation, the students and the patients were informed of the project and its purpose, both verbally and in writing. Responding to a questionnaire constituted voluntary consent to participation. Data were entered into the online EasyTrial© system. All personal identifiers were removed or disguised during analysis to preclude personal identification. The study was approved by the Danish Data Protection Agency (2008-58-0020), thus requiring no further
ethical approval according to Danish legislation (16-000014). The study was registered on ClinicalTrials.gov: NCT03070977 (March 6 2017).

The facilitation team agreed with the steering group that supervisors should always be present when tasks were performed by students, although greater independence concerning care and teamwork was allowed toward the end of the program. It was also agreed that the quality of care provided in the training unit must never be lower than that given in the standard ward.

**Results**

The results of the systematic review of the literature and the intervention study involving students and patients are presented separately.

**Systematic review**

The systematic review aimed to inform the initial stage of our work on developing an interprofessional training course in the context of a unit for mental health inpatients. Our search strategy was based on the PRISMA guideline, with regard to participants, interventions, comparisons, outcomes, and study designs (66). Figure 1 provides an overview of the literature search process as a PRISMA four-phase flow diagram.
Only eight studies met the inclusion criteria of the systematic review. They were highly diverse in terms of the IPE interventions, methods, and outcomes they studied. The activities included group discussion, workshops, standardized patients, problem-based learning, and group reflection. A few studies reported on the patients’ perspectives on both IPE activities and outcomes (21). Our review revealed that students of mental health responded well to IPE, especially in terms of improved collaboration skills and more positive views of the contributions of other professions. However, we found limited evidence of changes in behavior, organizational practices, or benefits to patients. The quality of the eight studies varied considerably, with only one robust study using a longitudinal before-and-after design. Six studies were considered
acceptable, while one was poorly designed. The measures assessed and the outcomes of each study are presented in Paper I, along with a summary of the impact of learning outcomes (21).

**Intervention study**

**Population**

A summary of the intervention study is provided here. Further details are presented in Papers II and III.

**Flowchart of Study Participants (Paper II-III)**

Figure 2. Flowchart of study participants.
Here follows a description of the students and the patients included in the intervention study.

**Students**

All students attending the inpatient wards during the period October 2016–March 2018 participated in the study (n = 195). The baseline characteristics of the intervention and the comparison participants were comparable.

The distribution of the student population is shown in Table 2. As Figure 2 shows, 85 participants in the intervention group completed the baseline survey and 78 completed the follow-up; in the comparison group participants, these figures were 97 and 83, respectively. This corresponds to a 98% response rate in the intervention group for the baseline survey and a 90% response rate for both the baseline and the follow-up surveys. In the comparison group, 97% of the participants completed the baseline survey; 77% completed both the baseline and follow-up surveys (61).

**Patients**

During the study period, 281 patients were referred to the intervention group, while 271 patients were referred to the comparison group, creating groups of equivalent size. As Figure 2 shows, 164 patients completed the baseline survey and 129 completed the follow-up in the intervention group; in the comparison group, these figures were 148 and 123, respectively. The intervention group participants thus had a baseline response rate of 58%, while 46% completed both baseline and follow-up, whereas 55% of the comparison group participants completed baseline and 45% completed both baseline and follow-up. As Table 2 shows, baseline characteristics were comparable between the intervention and the comparison participants.
Table 2. Baseline characteristics of study participants: students and patients

<table>
<thead>
<tr>
<th>T1</th>
<th>Students (Paper II)</th>
<th>Intervention</th>
<th>Comparison</th>
<th>P\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 85</td>
<td>n = 97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td></td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (16.5)</td>
<td>12 (12.4)</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>71 (83.5)</td>
<td>85 (87.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>14 (16.5)</td>
<td>17 (17.5)</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Nursing</td>
<td>44 (51.8)</td>
<td>51 (52.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing assistants</td>
<td>20 (23.5)</td>
<td>29 (29.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other\textsuperscript{b}</td>
<td>7 (8.2)</td>
<td>0 (0.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients (Paper III)</th>
<th>Intervention</th>
<th>Comparison</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 164</td>
<td>n = 148</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>85 (51.8)</td>
<td>92 (63.0)</td>
<td>0.05\textsuperscript{a}</td>
</tr>
<tr>
<td>Female</td>
<td>79 (48.2)</td>
<td>54 (37.0)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>39.3</td>
<td>40.0</td>
<td>0.7\textsuperscript{c}</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Pearson's chi-square
\textsuperscript{b} Other = Students from Pedagogy, Physiotherapy, and Social work
\textsuperscript{c} Independent samples t-test

Impact of interprofessional clinical training on students (Paper II)

Irrespective of whether the RIPLS or AITCS was used, the students in the intervention group improved their (self-reported) readiness for interprofessional learning and team collaboration after completion of the interprofessional clinical training, as compared to the comparison group. The intervention group participants showed improvement in the subscales for teamwork and collaboration and for positive professional identity. No significant differences were found between the two groups in terms of negative professional identity or roles and responsibilities. Using the AITCS subscales, improvements were also found for partnership and shared decision-

32
making, cooperation, and coordination. On both scales, the intervention group’s mean scores were larger than those of the comparison group, although the difference was reduced after adjustment for gender, profession, and baseline scores (linear mixed regression; Table 3A). More details are presented in Paper II (61).

In contrast to the students in the intervention group, the students in the standard ward showed no improvement in readiness for interprofessional learning or collaboration across studies (Figure 3a). Students of pedagogy, physiotherapy, and social work showed stronger improvement than students of nursing, assistant nursing, and medicine (Figure 3b).

Figure 3a. Boxplot of differences between educational groups in total RIPLS score over time (standard ward)
Figure 3b. Boxplot of difference between educational groups in total RIPLS score over time (training unit)

Figure 4 shows minor improvements in the total RIPLS score in the intervention group after interprofessional clinical training. In contrast, the comparison group students’ readiness for interprofessional learning did not change, an outcome that is mirrored by the results of the other statistical analyses presented in Paper II (61).

Figure 4. Boxplot of differences between groups and over time in total RIPLS score
As seen in Figure 5, the intervention group students improved during their clinical training, while no improvement occurred in the comparison group.

Figure 5. Boxplot of differences between groups and over time in total AITCS score
The improvements in the scores of intervention group students are presented below:

Table 3A. Overview of students’ improvements in the intervention group a,b

<table>
<thead>
<tr>
<th>Students (Paper II)</th>
<th>Intervention n = 78 (mean; SE)</th>
<th>Between groups (mean differences)</th>
<th>CI (Difference-CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total RIPLS score</td>
<td>117.59; 0.65</td>
<td>2.99</td>
<td>0.82–5.16</td>
<td>0.007</td>
</tr>
<tr>
<td>Subscales:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teamwork</td>
<td>40.07; 0.37</td>
<td>1.76</td>
<td>0.74–2.78</td>
<td>0.001</td>
</tr>
<tr>
<td>Positive professional identity</td>
<td>17.26; 0.20</td>
<td>0.86</td>
<td>0.32–1.40</td>
<td>0.002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students (Paper II)</th>
<th>Intervention n = 69 (mean; SE)</th>
<th>Between groups (mean differences)</th>
<th>CI (Difference-CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total AITCS score</td>
<td>161.82; 1.92</td>
<td>8.11</td>
<td>2.92–13.30</td>
<td>0.002</td>
</tr>
<tr>
<td>Subscales:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partnership/decision making</td>
<td>83.27; 0.97</td>
<td>4.26</td>
<td>1.63–6.90</td>
<td>0.002</td>
</tr>
<tr>
<td>Cooperation</td>
<td>48.78; 0.67</td>
<td>2.30</td>
<td>0.49–4.10</td>
<td>0.01</td>
</tr>
<tr>
<td>Coordination</td>
<td>29.78; 0.43</td>
<td>1.55</td>
<td>0.37–2.72</td>
<td>0.01</td>
</tr>
</tbody>
</table>

a Linear mixed regression (with Bonferroni correction)
b Mean scores in comparison and intervention groups were adjusted for baseline scores, profession, and gender

RIPLS = Readiness for Interprofessional Learning Scale; SE = Standard error; AITCS = Assessment of Interprofessional Team Collaboration Scale

Investigation of the impact of the duration of clinical placement showed a nonsignificant difference (p = 0.07) between the two groups stratified by placement length (a group with more than six weeks of clinical placement compared to a group with less than six weeks of clinical placement). The six-week dichotomous variable was chosen as the mean of the clinical
placement period. Besides, no multicollinearity was found, since all variables exhibited variance inflation factors (VIF) between 1.0 and 1.2.

**Impact of Interprofessional clinical training on patients (Paper III)**

The patients in the training unit scored higher on the mental component summary (MCS) than the patients in the standard ward. Although baseline adjustment diminished the intervention group’s range of MCS scores, it was consistently broader than that of the comparison group, as seen in Table 3B. No significant differences were found between the two groups in terms of physical component summary (PCS) scores. Patients in the training unit reported greater satisfaction with their treatment than did patients in the standard ward (Table 3B). Linear mixed regression was used to adjust for gender, age, and baseline scores (Table 3A), after which the mean score differences between the two groups remained larger for the intervention group (in terms of patient satisfaction and mental health status). Further details are presented in Paper III. Table 3B shows the improvements in the intervention group patients:

<table>
<thead>
<tr>
<th>Patients (Paper III)</th>
<th>Intervention</th>
<th>Between groups</th>
<th>CI (Difference-CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 120</td>
<td>(mean; SE)</td>
<td>(mean difference)</td>
<td></td>
</tr>
<tr>
<td>MCS score (SF-36)</td>
<td>35.1; 0.9</td>
<td>5.30</td>
<td>-2.71–7.89</td>
<td>0.001&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Between group</th>
<th>CI (Difference-CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n =111)</td>
<td>(mean difference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total CSQ-8</td>
<td>25.2; 0.3</td>
<td>1.01</td>
<td>0.06–1.96</td>
</tr>
</tbody>
</table>

<sup>a</sup> Linear mixed regression. Mean scores in comparison and intervention groups adjusted for baseline scores, age, and gender
<sup>b</sup> Linear mixed regression. Mean scores in comparison and intervention groups adjusted for age and gender

SE = Standard error; CSQ-8 = Client Satisfaction Questionnaire; SF-36= Short Form Health Survey; MCS = mental component summary scores

Illustration of the medians and quartiles using boxplots shows that the mental health status of the intervention group patients improved considerably from admission to discharge, whereas no improvement was detected in the comparison group patients (Figure 6).
At the end of admission, we likewise found slightly improved satisfaction in the intervention group patients, compared with the standard ward patients, as shown in Figure 7.
In summary, the intervention group patients reported higher scores for mental health status and satisfaction than did the comparison group patients. Our further investigation into correlations between mental health status and satisfaction with treatment, however, failed to reveal any significant correlation in the total study population using Pearson’s correlation coefficient (p = 0.4). Similarly, no significant correlation was found after students were stratified into intervention and comparison groups (p = 0.09 and p = 0.5).

We also did not find any correlation between the patients’ MCS scores and the duration of hospital stay using Pearson’s correlation (p = 0.9), or any correlation between patient satisfaction and the duration of hospital stay (p = 0.2).

**Dropout analysis**

**Students**

The population of eligible students consisted of 195, with 16.9% medical students, 52.3% nursing students, 27.2% students of nursing assistance, and 3.6% students of pedagogy, physiotherapy, or social work. Overall, 86.7% were women, with a mean age of 29.2 years.

A comparison of the responders with the eligible population in terms of gender, mean age, and baseline scores showed no significant differences. The respondents’ mean age was 29.9 years (p = 0.8); 86.4% were women (p = 0.7). Their mean baseline RIPLS score was 116.05, compared with 117.15 (p = 0.2) for students that failed to complete the follow-up survey.

**Patients**

The population of eligible patients counted 552, with 47% women and a mean age of 40.8 years.

The responding patients’ mean age was 41.0 (p = 0.8); 42% were women (p = 0.02). The baseline MCS score of respondents was 28.0, compared to a baseline score of 30.0 among patients who completed only the baseline survey (p = 0.2).

**Discussion**

This project has demonstrated that students’ self-reported scores for readiness for interprofessional learning and team collaboration increased after interprofessional clinical training, as compared with students who received traditional training. The results of the intervention were consistent, whether the Readiness for Interprofessional Learning Scale (RIPLS) or the Assessment of Interprofessional Team Collaboration Scale (AITCS) was used. Our systematic review shows that undergraduate students of mental health respond well to IPE,
especially in terms of improved collaboration skills and more positive views of the contributions of other professions. No correlation was found between the duration of clinical placement and students’ readiness for interprofessional learning. The patients in the intervention group reported better satisfaction and mental health status than did those in the comparison group. However, the two patient group’s mean scores for psychological distress showed no difference. No correlations were found between the patients’ mental health status (or satisfaction) and the duration of their hospital stay, or between patients’ mental health status and their satisfaction with treatment.

Our systematic review has established that students of mental health respond well to IPE, especially in terms of readiness for interprofessional learning and collaboration. However, no substantial evidence of changes in behavior or organizational practices was found in the included studies (21). According to Reeves et al., this could reflect the complexity of IPE interventions and attitudinal differences toward IPE stemming from differences in work culture (6). Craven and Bland identified a number of factors with detrimental effects on teamwork, viz. differences in professional cultures, poor team leadership, unclear roles and responsibilities within and among professions (68).

The lack of association between undergraduate mental health IPE interventions and behavioral change corresponds with findings from other studies showing that outcomes tend to be noticeable only at Kirkpatrick’s levels 1 (learners’ reaction), 2a (attitudes), and 2b (knowledge and skills) (2,6,26,69). This underscores the need to apply an IPE perspective on the investigation of organizational support and impacts on patients. As emphasized by Reeves and Pauzé (2,70), undergraduate learners benefit greatly from the inclusion of users in IPE, as this creates meaningful roles for patients in the IPE intervention, in addition to helping ensure that interventions are patient-centered (2). This is corroborated by the findings of our systematic review (Paper I), which showed that the studies with patient involvement were successful in creating such patient-centered activities (21).

**IPE: impact on patients**

Our intervention study is one of only a few attempts to elicit the patients’ assessment of the impact of IPE in a mental health setting. The ultimate objective of IPE being to improve the quality of care through collaboration, we were encouraged to find improvement in the students’ scores for readiness for interprofessional learning and collaboration. It has thus been shown that mental health patients’ social functioning and life satisfaction improve after interprofessional clinical training (71). Teams of collaborating professionals are distinguished by the priority
given to the patients’ needs (72), and by involving patients in the treatment (2,11). Team-based care is a growing trend in mental healthcare delivery, where it is found to offer significant benefits for patients, ranging from better informed decision making to improved access and greater patient satisfaction (2,10,63). Our results are in keeping with previous findings (63,73) that team-based care is more efficient in improving patient satisfaction than is usual care. Similar results were obtained, for example, by Carpenter et al. in their longitudinal study of an IPE intervention in a community mental health service (2006), albeit the effect sizes were small to medium (19). Likewise, in their controlled trial investigating the clinical effectiveness of collaborative care for depression, Richards et al. showed comparable results (CSQ-8: 25.3) (63). Overall, the identified improvements in mental health status and patient satisfaction substantiate previous findings that interventions based on interprofessional care improve patient-reported outcomes and satisfaction in mental healthcare (63,74).

**IPE: impact on students**

While all intervention group students improved their readiness for interprofessional learning and collaboration, the students of pedagogy, physiotherapy, and social work showed the greatest improvement. This result should, however, be considered in light of two factors: at baseline, the scores of nursing and nursing assistant students for readiness for interprofessional learning were higher than those of the three aforementioned professions (pedagogy, physiotherapy, and social work). Further, the students of those professions were relatively few.

Our findings of readiness for interprofessional learning and collaboration corroborate the work of Priest et al. (26), whose survey of students of mental health nursing and psychology in an IPE activity increased their RIPLS scores, especially with regard to role clarification and practical collaboration (26). Barnett et al. reached similar results in their intervention study of interprofessional attitudes arising from shared learning in mental health provision (75). The baseline RIPLS scores for the students in our study were comparable to those found in a large Australian sample of paramedic and nursing students (76) and in a UK sample of nursing and psychology students (26). Wakely et al. (77) and Wellman et al. (78) obtained similar results for improvement after interprofessional clinical training; Wakely’s before and after RIPLS scores for the team work and collaboration subscale were 38.5/41.0, respectively, while Wellman obtained 37.91/39.91. Our intervention group RIPLS scores were 37.71 and 39.95, respectively. However, our knowledge of readiness for interprofessional learning among students in the field of mental health is sparse, as documented in Paper I (21), when compared to other medical specialties, such as orthopedics and rheumatology (30,35,36,79). Although various IPE
initiatives, some of which took place in clinical settings with students of different healthcare professions working together (30,36,79). Regarding improvement after clinical IPE, training units in other specialties have shown results similar to ours; e.g., Hallin et al. found that the students’ collaborative and professional competences improved when patients were involved in IPE interventions (80). In an assessment of clinical training in a nursing home, IPE was found to play a key role in the students’ experience of collaboration and knowledge about each other’s professions (81).

Organizing IPE

The findings of this project indicate that an organization with training units in a mental health setting improves students’ readiness for interprofessional learning, and is beneficial to patient care. The literature moreover suggests that experiments that incrementally increase the number of student groups are more successful, as compared to experiments that included all or most healthcare programs from the start (29,32).

Our strategy for implementation was based on this finding, as we enrolled only nursing and nursing assistant students in the pilot project period. It was only later, during the full scale implementation, that a larger number of professions (medicine, pedagogy, physiotherapy, and social work) were gradually involved. It also appears that a combination of profession specific training and training in collaborative practice is essential to the success of IPE (82).

Reflection is considered a key strategy in interprofessional training (6,35,83). The interaction and reflection with students of other professions in the group tutorials described in this project are thus vital to success, as is also testified by other IPE studies (6,34,81,84). To learn from each other, students must accept that the knowledge held by other students may be crucial and that everyone can contribute with information, skills, and attitudes (32). To succeed, the students need to face their preconceptions about other professions and suspend fixed ideas about roles, tasks, and hierarchies (8).

Furthermore, the team structure and the frequent face-to-face communication between students, professionals, and patients (before, during, and after team conferences) appear to have increased the students’ readiness for interprofessional collaboration, as well as having a beneficial effect on patients in terms of satisfaction and mental health status. These outcomes corroborate the findings of Hamilton et al. (84), and our project demonstrates that patient pathways and mutual understanding are enhanced when professionals meet across the established boundaries.
Methodological considerations

This project has presented an intervention study investigating the implementation of an interprofessional training course in a real-world context. Our project was hampered by local organizational changes; rather than establishing four similar inpatient wards, two were made into psychiatric intensive care units (“closed wards”). This increased the number of most ill and complex patients in the two wards. However, the changes affected the intervention and the comparison ward in equal measure, and took place only toward the very end of the data collection.

The project was strengthened by the standardized clinical training inspired by Nørgaard et al., as the skills learned in the training course were immediately applicable to clinical practice. This corroborates the work of Jacobsen et al. (34), and of other authors, who have found that interprofessional skills learned in a training environment are difficult to transfer into the clinical setting (34,35,85).

To ensure content validity, the questionnaires were pilot-tested on representative groups of 31 students and 44 patients. Cronbach’s alpha was used to evaluate the internal consistency of the questionnaires; the values found were 0.77 for the RIPLS and 0.97 for the AITCS. For overall reliability, Cronbach’s alpha was 0.88 in the CSQ-8, 0.90 for the K10, and 0.73 for the SF-36, values that are generally considered acceptable (86).

Limitations

The experimental design of the intervention study enabled a robust analysis of changes in students’ readiness for interprofessional learning and the impact on patients. The lower response rate in the comparison student group (77%), compared to the student intervention group (90%), should be noted, as it may have weakened the generalizability of our findings. It is reassuring, however, to find similar differences in response rates across students’ and patients’ intervention and comparison groups, indicating no bias due to missing follow-up data.

With regard to nonresponder rates, we note that results from previous research are unclear. While it has been argued that nonresponders tend to be less satisfied (87), Peytremann-Bridevaux et al. (88) have shown that this is not the case. The results of our dropout analyses support this, as we found no significant difference in response rates between responders and nonresponders. Our nonrandomized design with a comparison group, which was inspired by the approach taken in other IPE studies (46,63), is considered the most suitable for an IPE intervention in a real clinical setting.
Although not entirely random, the procedure for allocation to intervention or comparison group was independent of the study hypothesis. The referral from the emergency ward to the two inpatient wards did not introduce a selection bias as it was solely determined by the patient’s home address.

While the different duration of the student group’s clinical training periods could be considered a limitation, it is one that our study shares with comparable IPE studies (7,26,75). In terms of implementation fidelity, the facilitation of the team-based care and the initial training of the permanent staff ensured that the intervention was delivered as intended (89). Moreover, the results indicated that the intervention was implemented as intended; i.e., differences occurred only in the intervention group, whereas no differences were found in the comparison group (neither regarding students nor patients). The AITCS questionnaire was moreover originally developed by Orchard et al. (2012)(50) to assists practicing healthcare teams determine the quality of their collaboration, the increased AITCS scores thus reflect that the intervention was implemented as planned.

The use of self-reported questionnaires could be considered a methodological weakness of the intervention study. Some have found that self-reporting influences outcomes, either through overrating or underrating (90). To investigate for this, the data were tested for ceiling effects, which were confirmed. However, the used self-rating questionnaires were sufficiently sensitive to detect expected changes in the intervention group. Moreover, consistent results were found using both the RIPLS and the AITCS.

In addition, the original version of the RIPLS conceived by Parsell and Bligh was further investigated by McFadyen et al. to determine its construct validity (45) and internal consistency (47,48). The chosen instruments were moreover validated and culturally adapted by Nørgaard et al. & Hellman (48,51). Overall, the scales for measuring students’ readiness for interprofessional learning and team collaboration have previously been validated for use with healthcare students (48,50,51), and thus allow for comparison with similar studies (criterion validity). Furthermore, as reported elsewhere, similar results were found in other studies, which also indicates solid criterion validity. The correlation between these scales and clinical actual behavior or treatment outcome is nevertheless under-researched; which underscores the importance of this intervention study, adding as it does to the emerging international literature regarding interprofessional training and collaborative care. Although the changes in readiness for interprofessional learning and collaboration are significant, it is not known whether these changes are clinically meaningful.
The fact that the IPE intervention was provided to participants at the completion of their clinical training contributes to rendering the long-term effects of the intervention unclear. Moreover, self-reporting in patient surveys involves the risk that patients may be reluctant to offer criticism while they remain in care or hospitalized, as they may feel dependent on the professionals they are assessing (91). Satisfaction surveys may furthermore lack the necessary refinement to capture the complex needs of patient (92). However, studies similar to ours have found the chosen patient instruments relevant and usable (93).

**Implications for health professional education and future research**

The findings of this project show that interprofessional clinical training can be effective in fostering positive attitudes to working with other professions and to collaborative team practices. IPE learning in mental inpatient wards appear to enhance students’ learning and their ability to translate IPE principles into “real-world” thinking. Pollard et al. (85) found that students value practical interprofessional experience over what can be gained in simulated environments in university settings, and that they value that new skills are trained alongside experienced professionals, and with real patients in real contexts (85). Our study indicates the need to involve patients in the delivery and implementation of interprofessional care (21,61), as well as the feasibility of organizing interprofessional training units in a mental health setting that enables healthcare students to collaborate on the delivery of care. These tentative explanations require further exploration in studies using qualitative methodologies, as well as in prospective, long-term studies. Process evaluations of future IPE interventions may help identify those elements with the strongest impact on learning outcomes, so that these can be optimized, as suggested by our systematic review (21). Investigation of the impact of interprofessional training units on professionals in mental health is needed to examine the basis of a wider implementation.

**Conclusion**

This project has shown that interprofessional clinical training has a positive impact on both student learning outcomes and patient outcomes. The review of the literature indicated that IPE interventions in mental healthcare have a positive impact on undergraduate students’ readiness for interprofessional learning and on their knowledge and collaborative skills, as compared to conventional clinical training.
The intervention study demonstrated an improvement in mental healthcare students’ self-reported readiness for interprofessional learning and team collaboration after interprofessional clinical training. Intervention group patients likewise reported better outcomes for mental health status and satisfaction than did the comparison group patients. As undergraduate IPE interventions have rarely involved patients, and as only a few have taken place in practice settings, further research into both patient involvement and the long-term impacts of IPE in mental healthcare is needed.

**Perspectives**

This project adds to the emerging international literature regarding IPE training and collaborative care in mental health. This intervention study performed under real world conditions showed that IPE interventions appear to have an impact regarding readiness for interprofessional learning and collaborative practice. Furthermore, the majority of the existing literature shows that outcomes tend to be focusing on students’ or professionals’ attitudes, knowledge and skills. This highlights the need to apply an IPE perspective on the investigation of organizational support and impacts on patients’ perspectives. Further research is required to ensure implementation of IPE in mental health with a focus on the organizational processes associated with a successful interprofessional training unit. There is also a necessity to support the need for and benefit of involving patients in the planning, implementation and evaluation of IPE interventions in mental health entailing further research in professionals’ partnerships with mental health service users in interprofessional clinical training. Finally, large-scale studies would be essential to study the IPE implications in a larger organization.

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Appendices
Paper I: The Effects of Interprofessional Education in Mental Health Practice: Findings from a Systematic Review.
The Effects of Interprofessional Education in Mental Health Practice: Findings from a Systematic Review

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Abstract

Objective The aim of this study was to conduct a systematic review of studies describing the effects of interprofessional education (IPE) on undergraduate healthcare students’ educational outcomes, compared with conventional clinical training in mental health.

Methods MEDLINE, CINAHL, PsychINFO, and EMBASE were searched for studies published in January 2001–August 2017. All retrieved papers were assessed for methodological quality; Kirkpatrick’s model was employed to analyze and synthesize the included studies. The following search terms were used: undergraduate, interprofessional education, and educational outcomes.

Results The eight studies that met the inclusion criteria were highly diverse regarding the studied IPE interventions, methods, and outcomes. Participants included students receiving clinical training in mental health from the following professions: medicine, nursing, occupational therapy, physiotherapy, psychology, and social work. The results of the studies suggest that students respond well to IPE in terms of more positive attitudes toward other professions and improvement in knowledge and collaborative skills. Limited evidence of changes in behavior, organizational practice, and benefits to patients was found.

Conclusion Based on the eight included studies, IPE interventions appear to have an impact regarding positive attitudes toward other professions and increased knowledge of and skills in collaboration compared to conventional clinical training. However, further study of both the processes and the long-term impacts of undergraduate IPE in mental health is needed. The authors recommend that service users are involved in the implementation and evaluation of IPE interventions in mental health to undergraduate healthcare students.

Keywords Interprofessional education · Undergraduate education · Clinical training in mental health · Review

Persons with mental illness often have complex needs whose effective care requires participation from a diversity of healthcare professionals [1–3]. Interprofessional collaboration has been promoted as an effective avenue to enhance the delivery of patient care [4–6]. However, the challenges of ensuring collaboration among team members in mental health are well testified [3, 7]. Interprofessional collaboration in the field is thus hampered by strong uniprofessional cultures, a diversity of approaches to the care and treatment of patients, and conflict over leadership [3, 7–9]. Interprofessional education (IPE) nevertheless continues to be invoked by policymakers as an effective method to improve collaboration [4, 6], and calls for its wider implementation across educational and clinical settings are frequently heard [10–12]. The World Health Organization (WHO) defines IPE: “(…) students from two or more professions learn[ing] about, from and with each other to enable effective collaboration and improve health outcomes” [4]. Acknowledging the difficulties of achieving interprofessional collaboration, WHO recommends that IPE is fostered already at the undergraduate level [4]. It is encouraging to see how research into the effects of undergraduate IPE has found increasingly positive attitudes toward members from different professional groups [7, 13–15], improved role clarity [3, 16], and enhanced teamwork skills [1, 2, 13, 17]. However, in our search for effects of IPE in mental health, we found limited evidence to substantiate the benefits of IPE interventions. For example, the 16 studies identified in Pauzé et al.’s (2010) systematic review of IPE programs for postgraduate mental health staff reveal a lack of rigorous studies of the effects of IPE in mental health education [3]. There is growing evidence...
to suggest that undergraduate IPE has positive contributions to professional practice as well as to clinical outcomes [8]. With the continuous growth in IPE activities, we found that a systematic review of studies of mental health education was timely, not least to provide a synthesis of the best available evidence for recommendations for future undergraduate IPE interventions. Our search strategy was based on the PRISMA guideline with regard to participants, interventions, comparisons, outcomes, and study designs [18]. We present a systematic review of studies describing the effects of IPE interventions on undergraduate healthcare students’ educational outcomes, compared to those of conventional clinical training in mental health.

Methods

The review is structured in accordance with the Population, Intervention, Comparison, Outcome, and Study (PICOS) design framework [18], which was also used for the identification of key concepts for an effective search strategy. The electronic databases MEDLINE, CINAHL, PsychINFO, and EMBASE were searched. Our search terms were identified in collaboration with a research librarian in order to specifically address the aim of our review. Combinations of the following search terms were used: undergraduate, inter/multi-professional education, inter/multi-disciplinary education, mental health, and educational outcomes. The keywords were used in each electronic database to identify all types of IPE interventions in mental health education at the undergraduate level. We searched among papers published between January 2001 and August 2017 in English, German, or one of the Scandinavian languages. The studies present clinical IPE interventions with specific educational outcomes, preferably with a comparison group. We included only studies involving undergraduate students undertaking clinical training in mental health from the following professions: medicine, nursing, occupational therapy, pharmacy, physiotherapy, psychology, and social work. The mental health criterion was employed to identify adults (aged 18 years and over) with any form of mental health problem, except those relating to a primary diagnosis of learning disability, substance abuse, or dementia. Further information can be provided to readers by request.

Freeth et al. [19] reclassified Kirkpatrick’s [20] typology of educational outcomes from four to six outcomes of IPE was incorporated into the review to ensure a focused and unambiguous description of outcomes. The six levels of the model are outlined below:

- Level 2a—Attitudes/perceptions: outcomes related to changes in interprofessional attitudes or perceptions among participant groups, toward patients and their conditions, care, and treatment
- Level 2b—Knowledge/skills: knowledge relates to the acquisition of concepts, procedures, and principles of interprofessional collaboration. Skills relate to problem-solving and social skills relevant to collaboration
- Level 3—Behavioral change: measurements relate to changes of behavior in the workplace
- Level 4a—Organizational change: in relation to major changes in organizational policies or clinical pathways to promote interprofessional collaboration and communication
- Level 4b—Benefits to patients: improvements in the health and well-being of patients as a direct result of an IPE program. Such improvements include results of health status measures, duration of hospital stay, complication rates, readmission rates, patient satisfaction, continuity of care, and costs

Searching, Reviewing, and Abstracting

To capture the largest possible number of abstracts, we incorporated very broad search terms in the initial search of the four databases. The initial yield of 1246 titles was reduced to 943 after duplicates were removed. Our screening of the articles’ abstracts decimated their number to 43. The full texts of the 43 articles were then reviewed to assess their match with the selection criteria, leaving eight papers for inclusion in the study. Abstract screening and full-text reading to identify any which reported the use of IPE was done by the first author (MM). The included papers were reviewed by two authors (MM and SA) to ensure they met the agreed selection criteria. Problem over agreeing papers would be resolved by a third person (BN). Figure 1 provides an overview of the literature search process in a PRISMA four-phase flow diagram [21].

Quality Assessment

The evidence presented in the eight papers was assessed according to methodological approach, description of learner outcomes, and evaluation of the overall quality of the data reported. The methodological quality of each paper was judged by several criteria. Our assessment took into account the strength of the research design, whether specific outcomes were reported, the methods employed for data collection, and the sampling of participants. This process involved an evaluation of the presented evidence in relation to methodology and educational outcomes as well as the clarity of the presented results. The following guidelines were used in assessing the studies: (a) Critical Appraisal Skills Program (CASP) to evaluate the qualitative...
and cohort studies [22]; (b) the Mixed Methods Appraisal Tool (MMAT) to evaluate the mixed method studies [23]. In addition, the risk of bias in each study was judged using the Risk of Bias in Non-randomized Studies tool – of Interventions (ROBINS-I) [24]. Following Pauzé (2010), the reviewed papers were assigned to one of the following categories of evidence quality: “good,” “acceptable,” “poor,” or “unacceptable.”

Results

Our findings are presented in three sections dealing with (a) the characteristics of the included studies, the details given of the IPE interventions, and the study results; (b) the studies’ description of methodology and key information relating to the reported outcomes (PICOS); and (c) methodological considerations relating to the overall quality of the included studies.

Study Characteristics

Table 1 gives an overview of the characteristics and results of the included IPE studies, including their design, reported outcomes, intervention, duration of intervention, studied profession, and data collection.

Methodological Description

Population

The studied IPE interventions targeted a range of healthcare students from either medicine, nursing, occupational therapy, physiotherapy, psychology, or social work. The number of students involved in each intervention ranged from 19 [25] to 300 [1]. Between two and five different healthcare professions were represented in the interventions.

Five of the studies were published between 2008 and 2016. The preponderance of publications from this period may reflect the WHO’s repeated calls for improved collaboration among mental healthcare professionals and governmental policies over the preceding 10 years [4]. The same period also saw increasing evidence that collaborative mental healthcare is capable of improving the quality of services [3–5, 9].

Intervention

The included studies all concerned undergraduate clinical education in mental health. The duration of the IPE interventions varied from 1 day to training sessions conducted over a month.
<table>
<thead>
<tr>
<th>Study</th>
<th>Aim</th>
<th>Research design</th>
<th>Outcomes and measures</th>
<th>Reported outcomes according to Kirkpatrick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes et al. (2006)</td>
<td>To improve interpersonal skills; and to increase awareness of the working from a user’s perspective</td>
<td>Longitudinal, B/A with control group</td>
<td>To assess learners’ reactions to user-trainers as course members; changes in knowledge and skills; and changes in individual and organizational practice; quality of care; social function and quality of life</td>
<td>Attitudes; knowledge/skills; behavioral; practice; patients (2a, 2b, 3, 4a, 4b)</td>
</tr>
<tr>
<td>Barnett et al. (2015)</td>
<td>To investigate networking; collaboration and practiced supported student learning; organization’s strengths and opportunities regarding IPE and learning</td>
<td>Mixed methods</td>
<td>Readiness for interprofessional learning surveys (RIPLS); social network survey; role clarification activity; observation: participants working through a clinical case study</td>
<td>Attitudes, behavioral (2a, 3)</td>
</tr>
<tr>
<td>Curran et al. (2012)</td>
<td>To integrate IPE in collaborative mental health practice across the pre- and postlicensure continuum of education</td>
<td>Longitudinal, B/A</td>
<td>Participant satisfaction; attitudes toward teamwork; team work abilities; (quality of care)</td>
<td>Attitudes, knowledge/skills (2a, 2b)</td>
</tr>
<tr>
<td>Furness et al. (2011)</td>
<td>To develop sustainable models of IPE which would promote and facilitate the professional skills of students through collaborative working within the practice setting</td>
<td>Multiple case study</td>
<td>To evaluate two subsequent interprofessional practical learning sites. Questions were based on learners’ reaction; behavior change; facilitator role; impact upon practice</td>
<td>Attitudes, behavioral, practice, patients (2a, 3, 4a)</td>
</tr>
<tr>
<td>Kinnair et al. (2012)</td>
<td>To establish an existing interprofessional educational framework (the Leicester Model) into mental health practice (to undergraduates) in order to improve care</td>
<td>Mixed methods</td>
<td>To assess course-specific learning outcomes; attitudes; interprofessional patient-centered learning/knowledge; team working; role clarity; practice and facilitators’ role</td>
<td>Attitudes, knowledge/skills, practice (2a, 2b, 4a)</td>
</tr>
<tr>
<td>Priest et al. (2008)</td>
<td>To explore interprofessional attitudes arising from shared learning in mental health education (undergraduate level)</td>
<td>Longitudinal, B/A</td>
<td>To assess change over time in knowledge; awareness of interprofessional mental health; change in interprofessional attitudes; role clarity; team working (RIPLS)</td>
<td>Attitudes, knowledge/skills (2a, 2b)</td>
</tr>
<tr>
<td>Reeves et al. (2006)</td>
<td>To enhance collaborative practice in mental health teams and to explore the usefulness of the presage-process-product (3P) framework for analysis</td>
<td>Mixed methods, B/A</td>
<td>To assess perception of collaboration and roles; interprofessional knowledge and skills; reflection</td>
<td>Attitudes, knowledge/skills (2a, 2b)</td>
</tr>
<tr>
<td>Rolls et al. (2002)</td>
<td>To promote collaboration and to establish and 40-day interprofessional course in mental health practice</td>
<td>Mixed methods</td>
<td>To assess course-specific knowledge; interprofessional skills; attitudes toward other professions</td>
<td>Attitudes, knowledge/skills (2a, 2b)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of intervention</th>
<th>Duration</th>
<th>Type of students</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes et al. (2006)</td>
<td>Lectures by professional and service users, partnership with service users</td>
<td>1 day/week, 2 years</td>
<td>Nursing, social work, occupational therapy, psychology, medicine</td>
<td>Observation, interview, questionnaires</td>
</tr>
<tr>
<td>Barnett et al. (2015)</td>
<td>Workshops</td>
<td>2–3-h workshop</td>
<td>Nursing, social work, occupational therapist, psychology</td>
<td>Observation, interview, questionnaires</td>
</tr>
<tr>
<td>Curran et al. (2012)</td>
<td>Workshops, introduction to standardized patients (SP)</td>
<td>2 days</td>
<td>Nursing, allied health, medicine</td>
<td>Focus groups, interviews, questionnaires</td>
</tr>
<tr>
<td>Furness et al. (2011)</td>
<td>Presentation of service user &quot;stories&quot;, PBL sessions</td>
<td>4 weeks</td>
<td>Nursing, medicine, social work, occupational therapy</td>
<td>Focus groups, interviews</td>
</tr>
</tbody>
</table>
Table 1 (continued)

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<thead>
<tr>
<th>Study</th>
<th>Type of intervention</th>
<th>Duration</th>
<th>Type of students</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinnair et al. (2012)</td>
<td>CPA assessment with user perspective, shared reflection, feedback presentation, group discussion</td>
<td>1 year</td>
<td>Medicine, nursing, social work, occupational therapy, pharmacy</td>
<td>Focus groups, interviews, questionnaires</td>
</tr>
<tr>
<td>Priest et al. (2008)</td>
<td>IPE sessions with group activities and problem-based learning (PBL) with clinical vignettes</td>
<td>2 years</td>
<td>Nursing, psychology</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>Reeves et al. (2006)</td>
<td>IPE workshops, team discussion, shared reflection</td>
<td>3-, 2-h workshop</td>
<td>Medicine, social work, nursing, occupational therapy</td>
<td>Observation, focus groups, questionnaires</td>
</tr>
<tr>
<td>Rolls et al. (2002)</td>
<td>Modules on assessment, case management, and psychosocial interventions</td>
<td>40 days</td>
<td>Nursing, psychology, occupational therapy, social work</td>
<td>Interview, case study, questionnaires</td>
</tr>
</tbody>
</table>

B/A, before/after; IPE, interprofessional education; CPA, care program approach; CASP, Critical Appraisal Skills Program; MMAT, Mixed Methods Appraisal Tool.

The least extensive element lasted 6 h over 2 days [26], while the most extensive program appeared to be 40 days [27].

A variety of small group learning activities were reported, including group discussions [27], workshops [7, 13, 26], standardized patients [13], problem-based learning to enhance collaboration [1, 13, 14], and reflection [7]. Reeves et al. employed team discussion and shared reflection to enhance knowledge of selected issues related to effective collaboration and communication [7]. A few studies used didactic formats with service users [17, 28]. In their programs, Barnes et al. allotted service users a role as co-students as well as a management and teaching role. This had the dual aim of improving students’ interprofessional skills and raising their awareness of the importance of working from a service user’s perspective [17].

Outcomes

All but one study reported positive outcomes related to the studied IPE intervention; only Rolls et al. [25] failed to clearly report their results. Eight studies reported attitudes toward other professions (level 2a in Kirkpatrick’s models of evaluation). Six studies reported change in knowledge and skills [1, 7, 13, 14, 17, 26]; three studies reported behavior changes that enhanced collaboration [17, 25, 27]. Changes in organizational practice [1, 17, 27] were reported in three studies, while only two reported outcomes related to patients’ benefit [17, 27]. A description of outcomes and associated measures assessed in each study and summary of learning outcomes’ impact is presented in Tables 1 and 2.

Study Design

Four of the studies used a before and after design; three with longitudinal, before and after design [13, 14, 17]; one also with a control group in a comparable setting where no interprofessional training had taken place [17]. A cross-sectional approach was used in one study [26], while another was a case study [27].

Questionnaires were the principal method of data collection used in seven studies. Questionnaires, interviews, and observations were the most common techniques used by eight, five, and three of the studies, respectively. Other methods included focus group interviews and case studies (see Table 2).

Methodological Considerations

Bias Risk

In general, methodological issues were insufficiently discussed in the reviewed studies. Details regarding study limitations and data collection methods were sparse, with only three studies providing clear information on limitations [1, 13, 14]. Reported sources of bias related to the following: selection and detection [1, 13, 14], lack of comparison group [1, 13], findings primarily based on self-report [13], and dropout [14]. The risk of bias varied considerably across studies, four of which are judged to be at moderate risk [1, 7, 13, 17], as they provide sound evidence and few aspects prone to bias risk, such as the selection of the participants.

Two studies presented a serious risk of bias [25, 27], with problems concerning selection bias and insufficient information for several key areas. Caution should thus be taken with Rolls et al.’s [26] findings, as their study was judged to be at critical risk of bias.

As already mentioned, the overall quality of the evidence reported by the articles was determined by methodology, educational outcomes, and the clarity of the results presented.
Table 2 Summary of learning outcomes

<table>
<thead>
<tr>
<th>Outcome (Kirkpatrick’s levels)</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a. Attitudes/perceptions</td>
<td>• More positive attitudes toward collaboration with patients [1, 13, 14, 17, 24, 26]</td>
</tr>
<tr>
<td>2b. Knowledge/skills</td>
<td>• Improved role clarity and individual authority [1, 7, 13, 14, 17]</td>
</tr>
<tr>
<td>3. Behavioral change</td>
<td>• Increase in shared decision-making [17, 24]</td>
</tr>
<tr>
<td>4a. Changes in organizational practice</td>
<td>• Involving users in decision-making [17, 25]</td>
</tr>
<tr>
<td>4b. Benefits to patients</td>
<td>• Use of practice guidelines [1]</td>
</tr>
<tr>
<td></td>
<td>• Involving users in teaching [1]</td>
</tr>
<tr>
<td></td>
<td>• Improved social functioning and life satisfaction [17]</td>
</tr>
</tbody>
</table>

Only Barnes et al.’s study [17] was considered of “good quality.” Its rigorous research design (longitudinal, before and after design with control group) and the complexity of the assessment of educational outcome levels (e.g., levels 2, 3, and 4) stood out. In addition, the studied IPE interventions were concisely described, had clear learning objectives, and the reported interventions lasted more than a year.

Six studies provided an “acceptable quality” of evidence, viz. [1, 7, 13, 14, 25, 27]. While appropriate research designs were used, with logical progression from methods to outcomes, their discussion of methodological issues was insufficient. In addition, the studied IPE interventions were significantly shorter in duration.

The study by Rolls et al. [26] was considered to be of “poor quality,” primarily due to its unclear reporting of sample size and incomplete description of evaluation methods and outcomes. Its weak design was indicated by the absence of baseline data collection, which precludes a convincing account of change relating to the IPE interventions. A summary of the assessment of the included studies is presented in Table 3.

### Discussion

The included studies showed great variation with respect to the IPE interventions examined and assessment methods. The ambiguous results of the eight different IPE interventions, undertaken in eight different clinical settings, are thus unremarkable. The quality of the studies furthermore varied considerably. One study had a robust longitudinal, before and after design, with a well-defined control group. However, the overall quality of evidence was rated as poor.

Table 3 Summary of quality assessment (a synthesis of CASP/MMAT checklists + Risk of Bias)

<table>
<thead>
<tr>
<th>Study</th>
<th>Clear research question?</th>
<th>Collected data address the research question?</th>
<th>Appropriate research design?</th>
<th>Recruitment strategy appropriate?</th>
<th>Measurements appropriate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes et al. (2006)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Barnett et al. (2015)</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>No</td>
<td>Cannot tell</td>
<td>Yes</td>
</tr>
<tr>
<td>Curran et al. (2012)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Furness et al. (2011)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Kinnair et al. (2012)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>Yes</td>
</tr>
<tr>
<td>Priest et al. (2008)</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>Yes</td>
</tr>
<tr>
<td>Reeves et al. (2006)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Cannot tell</td>
<td>Yes</td>
</tr>
<tr>
<td>Rolls et al. (2002)</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>No</td>
<td>Cannot tell</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Outcome accurately measured?</th>
<th>Clear statement of findings?</th>
<th>Appropriate consideration given to limitations?</th>
<th>Risk of Bias (ROBINS-I)</th>
<th>Quality of evidence: overall rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes et al. (2006)</td>
<td>Yes</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>Moderate risk of bias</td>
<td>Good quality</td>
</tr>
<tr>
<td>Barnett et al. (2015)</td>
<td>Cannot tell</td>
<td>Yes</td>
<td>No</td>
<td>Serious risk of bias</td>
<td>Acceptable-poor quality</td>
</tr>
<tr>
<td>Curran et al. (2012)</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Yes</td>
<td>Moderate risk</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>Furness et al. (2011)</td>
<td>Yes</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Serious risk of bias</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>Kinnair et al. (2012)</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Yes</td>
<td>Moderate risk of bias</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>Priest et al. (2008)</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Yes</td>
<td>Moderate or serious risk of bias</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>Reeves et al. (2006)</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Moderate risk of bias</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>Rolls et al. (2002)</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Cannot tell</td>
<td>Critical risk of bias</td>
<td>Poor quality</td>
</tr>
</tbody>
</table>

CASP, Critical Appraisal Skills Program; MMAT, Mixed Methods Appraisal Tool; ROBINS-I, Risk of Bias in Non-randomized Studies of Interventions
after design, that included a control group [17]; six studies demonstrated adequate alignment between the objectives of the study and the reported outcomes, although their research designs were less rigorously described [1, 7, 13, 14, 25, 27].

Despite this heterogeneity, we found evidence that students of mental health responded well to IPE, especially in terms of more positive attitudes toward the contribution of other professions [1, 7, 13, 24, 17, 25] and increased knowledge of and skills in collaboration [1, 7, 13, 14, 17, 26]. However, we found no substantial evidence of changes in behavior or organizational practices, which possibly reflects the complexity of IPE interventions and attitudinal differences toward IPE stemming from differences in work culture, as has also been found by other review studies [3, 28–30].

The apparent lack of association between undergraduate mental health IPE interventions and behavioral change corresponds with findings from other studies that outcomes tend to be discernible only at Kirkpatrick's levels 1 (learners' reaction), 2a (attitudes), and 2b (knowledge and skills) [3, 7, 10, 27]. Thus, only two of the eight studies reviewed here [17, 27] reported outcomes related to patient care. Similarly, the literature in general reveals a lack of involvement of users in the undergraduate IPE interventions [1, 10, 28]. Such a patient-centered approach could be ensured by involving patients in the planning, delivery, and evaluation of IPE interventions [16, 17].

Two of the reviewed studies reported students' appreciation of the rare opportunity to learn directly from users [17, 27]. Reeves and Pauzé [3, 7] emphasize undergraduate learners' great benefit from the inclusion of users in IPE. Service user involvement in education was crucial to students' positive perceptions [27]. However, the traditional teacher and student relationship may be challenged by user participation, as indicated by several studies [1, 9, 17, 26, 27]. Some students feel unable to openly discuss questions or challenge professionals, or express criticism of users' views [17]. Conversely, another study highlights that preparation and support are particularly important for vulnerable mental health service users as they felt uneasy and tense telling their story to the students [1, 27].

Although only two of the included studies explicitly reported improvement in patients' conditions resulting from IPE [17, 27], it seems to be a reasonable conjecture that changes in students' behavior and organizational practices may have positively impacted patients. However, the effects of IPE remain unclear without direct evidence from patients' care. The reviewed studies moreover exhibit a number of shortfalls, such as insufficiencies in the reporting of methods and discussion of limitations [25–27], uncertainty as to whether the initial effects of IPE were maintained over time [1, 25–27], and poor descriptions of the evaluated IPE interventions [25, 26].

The use of questionnaires for data collection ensures the recording of outcomes but precludes the attainment of process measures, a shortfall that may have been resolved by collecting observational data. Three studies [7, 17, 25] thus provided a more robust understanding of processes and outcome data by combination of methods.

Baseline activities and longitudinal study of the IPE students were reported only in three studies [13, 14, 17]. For future study, research designs which include multi-method and longitudinal dimensions in order to understand both the processes and the impact of undergraduate IPE would be pertinent. For example, the initial impact of IPE is likely to diminish over time, especially where continued input to consolidate learning is absent.

The findings of the studies reviewed here suggest that, in comparison with standard clinical training, IPE in mental healthcare may improve educational outcomes, for example with regard to attitudes toward other professions and interprofessional skills.

Despite our adherence to PRISMA guidelines for systematic reviews, the findings of this study are limited by the selection of search terms and databases. Moreover, only studies published in an English, German, or Scandinavian language were included. As a result, potentially relevant IPE studies may have been excluded. We acknowledge the risk of publication bias, which may mean that studies reporting negative outcomes were not published and that such outcomes are underreported in the present studies [31].

Although the findings of this review corroborate those of Pauzé et al.'s [3], the heterogeneity of IPE interventions, study designs, and outcomes preclude us from offering unambiguous conclusions and recommendations regarding the effect of IPE in mental healthcare.

Except for one study of good quality, the strength of evidence presented by the studies is found to range from acceptable to poor. Future research would benefit from using a limited set of validated and reliable tools for the assessment of attitudes, knowledge, behavior, and organizational practices. Finally, in order that substantial evidence of undergraduate IPE in mental health can be provided, both the number and quality of studies need to increase.

**Recommendations for Future Interventions**

Based on our review, we recommend establishing preconditions for undergraduate IPE, and ensuring appropriate support, design, and evaluation of IPE interventions.

Although our recommendations target undergraduate IPE in mental healthcare, their general nature ensures their relevance for IPE throughout the healthcare services.

In summary, our systematic literature search identified eight studies of undergraduate IPE in mental health. The evaluation of the studies revealed inadequacies in the description of methods and incomplete information about the interventions. In a situation where policymakers continue to press
for the adoption of IPE in mental healthcare, there is an urgent need to remedy the lack of evidence into the effects of undergraduate IPE in mental health. The uncertainties regarding the impact of undergraduate IPE in mental health include the processes and the long-term impacts of IPE in mental health services. The lack of higher quality papers and the diversity of methodologies in the selected sample may suggest the need for further research. Finally, we recommend that service users are involved in the planning, implementation, and evaluation of future undergraduate IPE interventions in mental health.

Acknowledgments We would like to acknowledge our respective institutions for their support in completing the review.

Compliance with Ethical Standards

Ethical Considerations Not applicable, as no human participants were involved in the study.

Disclosures On behalf of all authors, the corresponding author states that there is no conflict of interest.

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References

Paper II: Interprofessional clinical training in mental health improves students’ readiness for interprofessional collaboration: a nonrandomized intervention study.
Interprofessional clinical training in mental health improves students’ readiness for interprofessional collaboration: a non-randomized intervention study

Michael Marcussen1*, Birgitte Nørgaard2, Karen Borgnakke3 and Sidse Arnfred1

Abstract

Background: Over the past decades, the health sector in general has increasingly acknowledged the effectiveness of interprofessional clinical training in enhancing teamwork. In psychiatry, however, knowledge of the benefits of collaborative clinical training is sparse. This study aimed to investigate the impact of interprofessional training on students’ readiness for interprofessional collaboration in a psychiatric ward.

Methods: An intervention study assessed interprofessional clinical training in a training ward. Undergraduate students from the disciplines of medicine, nursing, psychotherapy, pedagogy, and social work were allocated either to an intervention group receiving interprofessional training or to a comparison group receiving conventional clinical training. Outcomes were assessed using the Readiness for Interprofessional Learning Scale (RIPLS) and the Assessment of Interprofessional Team Collaboration Scale (AITCS). Linear mixed regression was used to compare differences in mean scores postintervention, adjusted for baseline score, gender, and profession.

Results: Mean postintervention scores were higher in the intervention group (n = 87) than in the comparison group (n = 108) for both scales (overall sum score). For the RIPLS, the mean difference was 2.99 (95% CI 0.82 to 5.16; p = 0.007); for the AITCS it was 8.11 (95% CI 2.92–13.30; p = 0.002). Improvement in readiness for interprofessional learning and team collaboration in the intervention group remained statistically significant after adjustment for baseline differences between the two groups.

Conclusion: Students’ self-reported readiness for interprofessional learning and their team collaboration were improved after interprofessional clinical training. Still, further studies of both the processes and the long-term effects of undergraduate IPE in mental healthcare are needed. The study was registered March 62,017 on ClinicalTrials.gov: NCT03070977 (Retrospectively registered).

Keywords: Interprofessional education, IPE, Team collaboration, Psychiatry

Background

Many professionals working in mental healthcare have insufficient skills to participate effectively in interprofessional teamwork [1], and collaboration among team members continues to pose a challenge [1–4]. This might be due to professional cultures and poor communication [1, 2], which has consequences for the quality of care (i.e. errors and poor service delivery). For that reason, collaborative practices are increasingly being introduced in wards, as they have shown their effectiveness for mentally ill people with complex needs [5–7]. Interprofessional education (IPE) continues to be proposed by policymakers in mental healthcare as a means of improving collaborative practices and patient care, i.e. teamwork is invoked as by policymakers as effective to prevent relapse and manage chronic conditions [5, 6]. IPE is assumed to be effective to enhance collaborative practice despite challenges to demonstrate its
effectiveness in clinical education in mental health [2, 4, 8, 9]. The World Health Organization (WHO) defines IPE as settings in which "(...) students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" [6]. However, previous studies have reported challenges attached to IPE, such as logistical barriers to plan IPE sessions, when students come from different programs and universities. Moreover, IPE sessions is challenged by different academic levels of the students and prior experiences to interprofessional collaboration [8, 9]. Acknowledging the difficulties involved in achieving interprofessional collaboration, WHO recommends that the fostering of IPE begin at undergraduate level [6]. Various IPE initiatives for undergraduates have been described, some of which have taken place in clinical settings where students from different healthcare professions work together [10–13]. Hospitals are increasingly establishing such clinical training wards [10, 12, 13] but, to date, only initiatives in other specialties have been described [10, 11, 14–16]. Interprofessional clinical training aims to improve students’ attitudes toward and awareness of other professions and their roles, and to advance teamwork and collaborative competencies. However, demonstrating change in interprofessional attitudes and behavior remains difficult and, in some settings—such as mental health education—IPE remains underresearched [1, 17]. Those studies that have been undertaken in mental health education contexts have produced limited results. Marcussen et al.’s (2018) systematic review of the effects of undergraduate IPE in mental health practice found only eight studies qualifying for inclusion [17]. This calls for intervention studies with more rigorous research designs and methods [1, 17]. Therefore, this study contributes to the sparse literature in the field of undergraduate IPE in clinical mental health. Additionally, Anderson et al. [18] proposed the role of questionnaires as establishing a baseline for regular assessment of change. We used a similar approach. Moreover, given the positive results gained in other specialties, we set out to investigate whether similar results could also be achieved in psychiatric wards.

Thus, we investigated the impact of interprofessional training on students’ readiness for interprofessional collaboration in a psychiatric ward. The study took place during 2016–2018 in the Department of Adult Psychiatry in Slagelse, Denmark. The department has four inpatient wards, an outpatient clinic, and an emergency ward, serving a mixed urban and rural district.

An interprofessional training ward was established in the department for students of medicine, nursing, pedagogy, physiotherapy, and social work. The organization of the clinical training ward was inspired by the work of Nørgaard et al. [19] and aimed to create a new environment for learning, to enable students learn from each other and develop their competences in interprofessional collaboration and reflection [20]. Reflection is considered a key strategy in interprofessional training [21, 22].

The intervention was studied in a prospective clinical trial, which enabled a robust comparison between those who had been exposed to the intervention and the comparison group. This paper describes the assessment and its results.

**Methods**

**Design**

We designed a prospective clinical trial with a comparison group, as shown in Fig. 1. The intervention followed the time of clinical placement. The students in the intervention group received interprofessional clinical training, while those in the comparison group received conventional clinical training. Data collection took place from October 2016 to March 2018. Self-report questionnaires were administered to both groups before and after clinical training. The design allowed us to determine the changes that occurred (by comparing the scores after clinical training (T2) with those from the baseline (T1))
Participants and setting
The study participants were students on clinical placements in psychiatric inpatient wards. The patients, who were aged 18 years and above, suffered from psychiatric disorders such as schizophrenia, psychosis, major depression, bipolar disorder, or severe personality disorder.

The 195 students who were eligible for participation were studying medicine (in the 5th year), nursing (2nd and 3rd years), physiotherapy (3rd year), social and healthcare (2nd year), pedagogy (3rd year), and social work (2nd year). Furthermore, the learning outcomes were discipline specific, however, the self-reported outcomes in this study were the same for both groups. Although the timing of interprofessional clinical training differed for the various professions, the students were assumed to have reached a stage in their education at which they had developed a professional identity and were capable of contributing to interprofessional learning.

The students from each of the professions were evenly allocated to the intervention and the comparison group by course administrators from their universities and colleges, with no involvement of the research team.

Intervention
In 2015, an interprofessional study unit was established with 17-beds. This psychiatric ward was organized in 3 clinical care teams including professionals from medicine, nursing, psychology, pedagogy, social work, and the patient, as well as students. A facilitator team was responsible for the interprofessional training. In medio 2016 the facilitation team completed a course facilitating interprofessional collaboration and training. The intervention involved the total staff participation in an initial workshop. The intervention consisted of two types of activities: clinical care teamwork (mainly supervised by instructors from each of the participating professions) and interprofessional group tutorial sessions led by instructors with extensive experience in delivering IPE. In addition to strengthening students’ own professional roles, the training aimed to increase their knowledge of other professionals’ roles and to develop interprofessional collaboration.

The students participated in a workshop with group discussions, small-group work, and PowerPoint presentations introducing the primary diagnoses found in the ward and the responsibilities of each of the health professions involved in care. These scenarios provided a basis for instructor-facilitated discussions related to living with a psychiatric disorder, understanding the patients and their backgrounds, and the roles of healthcare teams.

Interprofessional group tutorial
To improve their reflection on clinical practice [2] and to strengthen their knowledge of the patients’ treatment and care, all students met once a week for interprofessional group tutorial. Besides the IPE facilitation team responsible for planning the group tutorial, a nurse facilitator was present during all sessions.

The group tutorial required the students to prepare and deliver a presentation to their peers and instructors. The patient’s view of the condition, and how it was managed in the ward, were obligatory elements of the presentations, as was the presenter’s suggestions for improvements facilitated through interprofessional collaboration. In subsequent group discussions facilitated by the tutors, interprofessional practices and challenges in the care of patients with complex needs were highlighted. Every session was structured on real patients, i.e.: a patient suffering from severe mental disorders such as schizophrenia and co-occurring substance use disorders traditionally received treatments for their two disorders from two different sets of clinicians in parallel treatment systems.

Clinical care teams
In the training ward, the students’ clinical training was organized in care teams of between three and ten students [7, 13] alongside with the professionals. Weekly conferences were held with each team to ensure that the care and treatment were well planned and well coordinated. To further support this aim, the conferences were attended by permanent staff, the patient, and his or her family during hospitalization. The students were distributed between the care teams for supervision, which took place in collaboration with the IPE facilitators.

Comparison group
Students in the comparison group continued their usual discipline-specific training during their clinical placement, with no structured interprofessional training. Their clinical training was organized in a uniprofessional structure, as opposed to the team-organized structure used in the intervention group.

Outcome measures
Outcomes in both groups were measured at the beginning (T1) and at the end of the clinical placement (T2). The time between T1 and T2 varied due to differences in the duration of clinical training between professions (3–12 weeks).
Readiness for Interprofessional learning

Self-reported readiness for interprofessional learning were measured using the scale with the same name (RIPLS), as modified by McFadyen et al. [24], which has been found to have good internal consistency [25–27]. The Danish four-subscale version with 29 items applied here has been validated and culturally adapted by Nørgaard et al. [27]. The learning scale assesses Teamwork and Collaboration, Negative Professional Identity, Positive Professional identity, and Roles and Responsibilities [28] using a five-point Likert scale: (Strongly disagree (1), Disagree (2), Undecided (3), Agree (4), Strongly agree (5)).

Team collaboration

To gain insight into the students’ self-reported level of collaboration, we used the Assessment of Interprofessional Team Collaboration Scale (AITCS) of Orchard et al., with 47 items in four subscales (Partnership, Cooperation, Coordination, and Shared decision making), using a 5-point Likert scale [29]: (Never (1), Rarely (2), Occasionally (3), Most of the time (4), Always (5)). We employed the Danish version validated by Hellman et al. [30], with 37 items distributed on three subscales (Partnership/Shared decision making, Cooperation, and Coordination).

Ethical considerations

The students were informed of the project and its purpose immediately before participation. Responding to the questionnaire was considered to constitute voluntary consent to participation. Data were entered into the EasyTrial online Clinical Trial Management system. Data were labelled with unique identifiers, and all personal identifiers were removed or disguised during analysis to preclude personal identification. Raw data are available as supplementary files (Additional files 1 and 2). The study was approved by the Danish Data Protection Agency (2008-58-0020), and thus required no further ethical approval, according to Danish legislation (16-000014).

Analysis

The sample size was calculated on the basis of a type I error (α) of 5% and a type II error (β) of 20% (with a power of 80%). We used a standard deviation of eight points, based on findings from an intervention study [31] using the RIPLS (our primary outcome). Anticipating a withdrawal rate of 20%, we allocated 90 participants to each group.

The participants were described in terms of gender and profession. To investigate subscale assumptions, we conducted a confirmatory factor analysis at baseline on the full dataset of students. Internal consistency between items was assessed using Cronbach’s alpha. Both scales (RIPLS and AITCS) use a Likert scale. The scale scores were treated as interval as recommended in previous studies [32, 33]. We initially used unpaired t-tests to assess mean score differences at baseline. Differences over time were explored using the paired sample t-test. The postintervention mean scale scores were compared between groups and over time using linear mixed regression, and adjusted for gender, profession, and baseline scores. The Bonferroni test was used to correct the significance level when multiple comparisons were made. All statistical analyses were performed using SPSS (IBM Corp. Released 2018. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp).

Results

Population

In Fig. 2, we present the flow of participants through the study. A total of 87 students were allocated to the intervention group, with 108 in the comparison group. Baseline and postintervention data were collected for 78/87 intervention group participants (98%) and 83/108 for the comparison group participants (77%), respectively. As Table 1 shows, baseline characteristics were comparable between the intervention and the comparison participants.

On both scales, the baseline scores for the intervention group and the comparison group were comparable, as evident from the estimates and p-values (Table 2).

Both scales were tested for internal reliability, and Cronbach’s alpha was estimated at 0.77 (RIPLS) and 0.97 (AITCS) in overall reliability, which is considered acceptable [27].

Effect of interprofessional training

The mean scores (overall summed scores) on both scales increased for the students in the intervention group after completion of the interprofessional clinical training. As seen in Table 2, the pre- and post total RIPLS scores were 114.37–117.39 in the intervention group and 115.02–114.80 in the comparison group. This improvement for the intervention group was statistically significant (p = 0.001). Similarly, the pre- and post total AITCS scores were 154.80–162.33 in the intervention group and 153.49–153.27 in the comparison group, respectively. This improvement for the intervention group was also significant (p = 0.001).

Table 3 presents the differences in the mean scores over time for both groups, and for both scales. The mean postintervention scores on a five-point scale, adjusted for gender, profession, and baseline, were higher in the intervention group than in the comparison group. Linear mixed regression was used to adjust for
Fig. 2 Flow chart of study participants

Table 1 Gender and profession of responding students

<table>
<thead>
<tr>
<th></th>
<th>Respondents</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>T2</td>
<td>P*</td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td></td>
<td>Intervention (n = 85) n (%)</td>
<td>Comparison (n = 97) n (%)</td>
<td></td>
<td></td>
<td></td>
<td>Intervention (n = 78) n (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (16.5)</td>
<td>12 (12.4)</td>
<td>0.4</td>
<td></td>
<td>14 (18.0)</td>
<td>11 (13.3)</td>
</tr>
<tr>
<td>Female</td>
<td>71 (83.5)</td>
<td>85 (87.6)</td>
<td>66 (82.1)</td>
<td></td>
<td>72 (86.8)</td>
<td></td>
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<tr>
<td>Profession/Study</td>
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<tr>
<td>Nurse</td>
<td>44 (51.8)</td>
<td>51 (52.6)</td>
<td>0.09</td>
<td>38 (48.7)</td>
<td>43 (51.8)</td>
<td>0.1</td>
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<tr>
<td>Medical</td>
<td>14 (16.5)</td>
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<td>14 (18.0)</td>
<td></td>
<td>16 (19.3)</td>
<td></td>
</tr>
<tr>
<td>Social and healthcare</td>
<td>20 (23.5)</td>
<td>29 (29.9)</td>
<td></td>
<td>19 (24.4)</td>
<td>24 (28.9)</td>
<td></td>
</tr>
<tr>
<td>Otherb</td>
<td>7 (8.2)</td>
<td>0 (0.0)</td>
<td>7 (9.0)</td>
<td>0 (0.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T1 Time 1 (baseline) measurement, T2 Time 2 measurement (after clinical training). Social and healthcare = nursing assistant

*Chi-square test

bOther = Students from Pedagogy, Physiotherapy, and Social work
Table 2 Crude scores at baseline and postintervention

<table>
<thead>
<tr>
<th>Respondents</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention (n = 78)</td>
<td>Comparison (n = 83)</td>
</tr>
<tr>
<td>Total RILPS score</td>
<td>114.37; 8.92</td>
<td>115.02; 9.16</td>
</tr>
<tr>
<td>Teamwork and collaboration</td>
<td>37.71; 4.87</td>
<td>38.31; 3.95</td>
</tr>
<tr>
<td>Negative professional identity</td>
<td>12.51; 2.22</td>
<td>12.95; 2.08</td>
</tr>
<tr>
<td>Positive professional identity</td>
<td>16.80; 2.24</td>
<td>16.84; 2.41</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>47.36; 4.48</td>
<td>46.92; 4.52</td>
</tr>
<tr>
<td>Total AITCS score</td>
<td>154.80; 20.99</td>
<td>153.49; 18.98</td>
</tr>
<tr>
<td>AITCS subscales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partnership/shared decision making</td>
<td>80.02; 10.91</td>
<td>79.34; 9.84</td>
</tr>
<tr>
<td>Cooperation</td>
<td>46.67; 6.85</td>
<td>45.86; 6.38</td>
</tr>
<tr>
<td>Coordination</td>
<td>28.12; 5.28</td>
<td>28.29; 4.18</td>
</tr>
</tbody>
</table>

RILPS Readiness for Interprofessional Learning Scale, SD Standard deviation, AITCS Assessment of Interprofessional Team Collaboration Scale
aIndependent Samples t-test
bPaired t-test

The mean difference between the two groups was: 2.99 (95% CI 0.82 to 5.16; p = 0.007) in total RILPS score with an effect size, Cohen's d of 0.4. The improvement in the total score for the intervention group was statistically significant for the subscales as well: 1.76 (95% CI 0.74 to 2.78; p = 0.001) regarding teamwork and collaboration, plus 0.86 (95% CI 0.32 to 1.40; p = 0.002) for positive professional identity. No significant differences were found between the two groups in terms of negative professional identity, and roles and responsibilities. The mean difference in total AITCS score was 8.11 (95% CI 2.92–13.30; p = 0.002) with an effect size, Cohen’s d of 0.5, which is considered as a moderate effect [34, 35]. For partnership and shared decision-making, this was 4.26 (95% CI 1.63–6.90; p = 0.002); for cooperation, 2.30 (95% CI 0.49–4.10; p = 0.01); for coordination, 1.55 (95% CI 0.37–2.72; p = 0.01). Both scales showed that the mean score difference in the intervention group was larger than that of the comparison group, although adjustment (by gender, age and professions) minimized the difference (Table 3).

Discussion
This intervention study has found that interprofessional clinical training yield a moderate improvement in students' self-reported readiness for interprofessional learning. Likewise, moderate improvements were also found in the intervention group in terms of students' self-reported team collaboration, as compared to the comparison group. Consistent results were found using both the RILPS scale and the AITCS scale. We likewise found significant improvements in the professional identity of the intervention group students as team members. In terms of roles and responsibilities, no significant differences were identified between the groups—a lack of difference for which no clear explanation emerged. However, Barnett et al. found a similar result in their intervention study of interprofessional attitudes arising from shared learning in mental health [36]. Likewise, the systematic review of Marcussen et al. [17] concluded that students of mental health responded well to IPE, especially in terms of improved collaboration skills and more positive views of other professions' contributions.

The significantly improved RILPS and AITCS scores found after interprofessional training in our study corroborates the findings of previous studies showing that interventions using active training methods lead to higher RILPS scores and larger difference in mean score than interventions using passive methods [37]. Our study's use of active training methods seems to have had a moderate effect. Similarly, Pollard et al. [38] found that students value practical interprofessional experience over what can be gained in simulated environments in
Table 3 Estimates of RIPLS and AITCS over time and between groups

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n = 78) (mean; SE)</th>
<th>Comparison (n = 83) (mean; SE)</th>
<th>Between group (mean diff)</th>
<th>CI (Difference CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total RIPLS score</td>
<td>117.59; 0.65</td>
<td>114.60; 0.76</td>
<td>2.99</td>
<td>0.82–5.16</td>
<td>0.007</td>
</tr>
<tr>
<td>Subscales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teamwork</td>
<td>40.07; 0.37</td>
<td>38.32; 0.36</td>
<td>1.76</td>
<td>0.74–2.78</td>
<td>0.001</td>
</tr>
<tr>
<td>Negative professional identity</td>
<td>13.09; 0.18</td>
<td>12.61; 0.17</td>
<td>0.48</td>
<td>0.01–0.97</td>
<td>0.05</td>
</tr>
<tr>
<td>Positive professional identity</td>
<td>17.26; 0.20</td>
<td>16.41; 0.19</td>
<td>0.86</td>
<td>0.32–1.40</td>
<td>0.002</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>47.11; 0.38</td>
<td>47.33; 0.37</td>
<td>0.17</td>
<td>-1.28–0.83</td>
<td>0.7</td>
</tr>
<tr>
<td>Total AITCS score</td>
<td>161.82; 1.92</td>
<td>153.71; 1.79</td>
<td>8.11</td>
<td>2.92–13.30</td>
<td>0.002</td>
</tr>
<tr>
<td>Subscales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partnership/decision making</td>
<td>83.27; 0.97</td>
<td>79.01; 0.91</td>
<td>4.26</td>
<td>1.63–6.90</td>
<td>0.002</td>
</tr>
<tr>
<td>Cooperation</td>
<td>48.78; 0.67</td>
<td>46.48; 0.62</td>
<td>2.30</td>
<td>0.49–4.10</td>
<td>0.01</td>
</tr>
<tr>
<td>Coordination</td>
<td>29.78; 0.43</td>
<td>28.23; 0.41</td>
<td>1.55</td>
<td>0.37–2.72</td>
<td>0.01</td>
</tr>
</tbody>
</table>


*Linear mixed regression (with Bonferroni correction)

Mean scores in the comparison and intervention groups were adjusted for baseline scores, profession, and gender.

university settings. Moreover, they seem to appreciate training these skills alongside experienced professionals, and with real patients in real contexts [38]. Reeves and Pauzé [1, 4] have emphasized undergraduate learners’ benefit from the inclusion of real-world thinking in IPE.

With regard to the impact of IPE in mental health education, the quality of evidence is critical to advancing our understanding of ways of improving IPE. Studies undertaken in mental health contexts have so far produced limited or disappointing results. Barnett’s study [36] conducted in a youth mental health service has shown a strengthening of students’ positive attitudes toward other professions and interprofessional learning following participation in an IPE workshop. An IPE study in mental health by Priest et al. [8] has clarified roles and practical collaboration, although no change in professional identity was found. Many challenges were identified by Priest et al. [8], including some that arose from differences in academic levels among student groups, their previous experience, and assessment. Studying an in-service IPE initiative among community mental health teams, Reeves and Freeth [2] showed that while the educational input was well received, wider success was elusive, as already agreed plans for collaboration were not implemented. Our systematic review of the effects of interprofessional education in mental health practice found only eight studies qualifying for inclusion [17]. This calls for more rigorous research designs and methods [1, 4, 17]. However, despite these challenges, it remains important to offer collaboration with future colleagues as a foundation for effective teamwork in mental health treatment and care.

The baseline RIPLS scores for the participants in this study were almost identical to those found in a large Australian sample of undergraduate paramedic and nursing students [39] and in a UK sample of nursing and psychology students [8]. Both studies found benefits related to IPE; however, investigation of the effect of IPE in relation to more than two disciplines has been sparse and previous results may thus not be comparable with those published here.

Both Wakely et al. [40] and Wellmon et al. [41] found improvement after interprofessional clinical training similar to our findings: The pre- and post RIPLS scores for the subscale: teamwork and collaboration were in Wakely’s study 38.5–41.0 and in Wellmon’s study 37.91–39.91, respectively. As seen in Table 2 the pre- and post RIPLS scores in our study were 37.71–39.95 in the intervention group.

Also, when using the AITCS scale, we found statistically significant improvements in teamwork in the intervention group. We can thus corroborate the results of a Canadian study [42] that used the AITCS survey to investigate attitudes of interprofessional collaboration in an IPE unit (a 30-bed inpatient medical unit). However, our results and the Canadian results also indicate that many areas of teamwork still need to be addressed, such as the need for organizational support for teamwork. So far, only a few studies have substantiated the positive effects of educational outcomes within mental health educational research [1, 17]. This may be due to a
number of different factors, such as the challenges inherent in the measurement of outcome assessments, different objectives within teams, and differences in local contexts [2, 8].

**Strengths and limitations**
The interprofessional training approach was a strength of this study, which appears to have supported the students in gaining interprofessional skills. The experimental design enabled robust analysis of changes in students' attitudes in both the intervention group and comparison group. The lower response rate in the comparison group (77%) than in the intervention group (90%) should be noted, as it may have weakened the generalizability of these findings. It is reassuring, however, that the response rates were similar across the study groups (i.e., the future professions). Although allocation to intervention or comparison group was not random, the allocation procedure was completely independent of the study hypothesis. This is similar to the approach taken in previous IPE studies [43, 44]. No baseline differences were identified between intervention and comparison groups. Both the scales (RIPLS and AITCS) used here to measure readiness for interprofessional learning and team collaboration have previously been validated for use with healthcare students [27, 29, 30], and thus allow for comparison with similar studies. We identified weak internal consistency in the RIPLS subscale: Roles and Responsibilities (with a Cronbach’s alpha = 0.59). This is also reported in previous studies [26, 27, 45]. Although the difference in the length of the clinical training periods of the student groups is a limitation, it is one that our study shares with several previous IPE studies [7–9, 36, 46]. The findings are based on self-reported measures of readiness for interprofessional learning and team collaboration. Completion of the surveys was voluntary, and it is possible that the students self-reported views may not be representative of all participants in the inclusion period.

**Implications for mental health education**
The findings of this study indicate that training in interprofessional wards can meet its objectives, and that interprofessional clinical training can be effective in fostering positive attitudes toward working with other professions. Furthermore, it is possible that embedding IPE learning within the context of hospital wards and using a team-based approach may enhance students' learning and their ability to translate IPE principles into “real-world” thinking. These tentative explanations require further exploration in studies using qualitative methodologies, as well as in prospective, long-term studies [47]. Process evaluations of future IPE interventions may help clarify which elements have the strongest impact on learning outcomes, so that these can be optimized, as suggested by our systematic review of IPE in mental health to undergraduates [17]. In considering the outcomes of this study, it may be relevant to stress the benefits of having an established teaching team with excellent skills in facilitating the integration of students in interprofessional settings.

**Conclusion**
Students' self-reported readiness for interprofessional learning and their team collaboration were improved after interprofessional clinical training, as compared with clinical training as usual. The present study contributes key information to the planning of interventions in organizational settings. Nevertheless, further studies of both the processes and the long-term effects of undergraduate IPE in mental healthcare are needed.

**Additional files**

| Additional file 1: RIPLS Spreadsheet. Readiness for Interprofessional Learning Scale (RIPLS) dataset. (XLSX 57 kb) |
| Additional file 2: AITCS Spreadsheet. Assessment of Interprofessional Team Collaboration Scale (AITCS) dataset. (XLSX 46 kb) |

**Abbreviations**

- AITCS: Assessment of Interprofessional Team Collaboration Scale
- IPE: Interprofessional education
- RIPLS: Readiness for Interprofessional Learning Scale

**Acknowledgements**
The authors gratefully acknowledge the support of the respective departments, the students who participated, and the professionals who facilitated their recruitment.

**Availability of data materials**
All supporting data are included as additional files.

**Funding**
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**Authors' contributions**
All authors contributed to the design of the project. MM and SA were involved in the development of the intervention. MM performed the statistical analysis. MM, BN and SA wrote the first draft of the manuscript. All authors reviewed and revised the manuscript. All authors read and approved the final manuscript.

**Ethics approval and consent to participate**
The study was approved by the Danish Data Protection Agency (2008-58-0020), and thus required no further ethical approval, according to Danish legislation (16–000014).

**Consent for publication**
Not applicable.

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

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Abstract

Background

Collaborative interprofessional practices are essential in caring for people with complex mental health problems. Despite the difficulties of demonstrating positive impacts of IPE on patients, interprofessional education (IPE) is assumed to enhance interprofessional practices. We aimed to measure the impact of clinical IPE on patient satisfaction and self-reported mental health status in a psychiatric ward.

Methods

We conducted a nonrandomized intervention study with patient satisfaction, psychological distress, and health status as outcomes. Mental health inpatients were referred to either an interprofessional training unit (intervention group) or to a conventionally organized ward (comparison group). Outcomes were assessed using the Short Form Health Survey (SF-36), the Kessler Psychological Distress Scale (K10), and the Client Satisfaction Questionnaire (CSQ-8).

Results

The intervention group included 129 patients, the comparison group 123. The intervention group patients reported better mental health status compared with the comparison group patients. The postintervention mean difference between the two groups was 5.30 (95% CI 2.71–7.89; p = 0.001; SF-36). The intervention group patients also scored higher on satisfaction (mean difference 1.01 (95% CI 0.06–1.96; p = 0.04)). No differences were detected between the groups’ mean scores of psychological distress.

Conclusion

Our results support the hypothesized end user value of interprofessional mental healthcare: intervention group patients reported higher scores regarding mental health status and satisfaction than did comparison
group patients. As IPE interventions have rarely involved patients and few have taken place in practice settings, further research into both the processes and the long-term effects of IPE in mental healthcare is needed.

Keywords: *IPE *Patient care team *PRO *Medical education *Patient satisfaction *SF-36

Introduction

The importance of professional teamwork to prevent relapse and manage chronic conditions (1,2) in patients with severe mental health disorders is generally acknowledged. As all aspects of the patient’s life are affected (1–3), the treatment requires participation from a diversity of healthcare professionals working together in specialized teams (2,4,5). However, collaboration among team members is often fraught with problems, affecting the quality of care in terms of poor service delivery, low patient satisfaction, and errors (1,2,5,6). Since the 1990s interprofessional collaboration has been promoted and endorsed internationally as a means to improve mental healthcare (1). Interprofessional education (IPE) is assumed to enhance such collaborative practices, although the field has met challenges in demonstrating effects on mental health outcomes (2,7). Policymakers nevertheless continue to invoke IPE as a way to improve collaboration, and to call for its wider implementation across educational and clinical settings (1,6). According to the literature, teams generate better patient-outcomes (2,8), stimulate communication and partnership among professionals and patients (1,9). Improved patient satisfaction, an increasingly important and commonly used indicator for measuring the quality of care (10,11), is also reported (8,12).

Despite their obvious stake in healthcare outcomes and interest in participation in research aimed at improving practice (13), the patients’ perspectives have been sought by only a few IPE initiatives (14,15). The outcomes of mental health research have traditionally been assessed through objectively measured clinical information, such as relapse rates, hospitalization, and the degree of symptom reduction (16).
However, an increasing number of intervention studies include self-reported measures of well-being, focusing on the patients’ perceptions of their health-related quality of life or health status (17,18). Despite the proliferation of teamwork in mental health, its association with improved patient-reported outcomes, such as patient satisfaction, is poorly documented (19). Hence, we set out to investigate the impact of interprofessional training on patient satisfaction and self-reported mental health status.

An interprofessional clinical training unit was established in a psychiatric ward to cater to students from the following professions: medicine, nursing, pedagogy, physiotherapy, and social work. Inspired by the work of Nørgaard et al., the organization of the ward allowed the students to learn from each other while developing competences in interprofessional collaboration (20). Work in the unit followed IPE precepts, with students participating in team-based care (21,22). The team organization aimed to ensure coordinated treatment and care, and to accomplish shared treatment goals. It was hypothesized that the implementation of clinical IPE would improve patient-reported outcomes and satisfaction, when compared with conventional clinical practice.

Methods

Design

We designed a nonrandomized intervention study with an intervention group (in the interprofessional training unit) and a comparison group (in the conventional inpatient ward). Patients were recruited between October 2016 and March 2018. After initial admission to the emergency ward, the patients were referred to inpatient wards based on their home address. The two wards were comparable in terms of patients’ diagnoses, staffing, and physical layout (17 single-bed rooms). Questionnaires were administered to both groups at the beginning (T1) and at the end of hospitalization (T2). The design enabled the comparison of change over time. The study was registered March 6 2017 in ClinicalTrials.gov: NCT03070977 (Retrospectively registered) and aligned with CONSORT guidelines (23).
Setting

The study took place in the mental health services department in Slagelse, Denmark, which consists of four inpatient wards, an outpatient clinic, and an emergency ward serving a mixed urban and rural district. The Department of Psychiatry has 80 beds, and 1995 discharges, and 39,391 visits to its outpatient clinics per year. As part of the publicly funded hospital services, the mental health services are administered by Region Zealand, one of Denmark’s five regional health authorities, serving a population of 821,000.

Intervention

Interprofessional training unit

Established in 2015, the interprofessional training unit consisted of three clinical care teams, with professionals from medicine, nursing, physiotherapy, pedagogy, and social work. Each was charged with five or six patients. The students were assigned to one of the three teams. An interprofessional collaboration and training course was organized in mid-2016 by the facilitation team responsible for the interprofessional training. The intervention involved the entire staff in an initial one-day interactive workshop to facilitate reflection and small-group work focusing on team-based and patient-centered care. Two types of activities were involved in the course: clinical care teamwork (supervised by instructors from the participating professions) and interprofessional group tutorials planned by the facilitation team and led by instructors with extensive experience in delivering IPE.

Interprofessional group tutorials

To stimulate reflection on clinical practice (5) and to strengthen their knowledge of the patients’ treatment and care, all students met once a week for the interprofessional group tutorials. The students additionally participated in morning and evening shifts attended by supervisors from each of the participating professions to ensure patient safety and an optimal learning environment.
During the day shifts, the students’ clinical training was organized in clinical care teams of variable sizes (three to ten students), while in the evening, three or four students were assigned to each team.

**Clinical care team**

The patients’ active participation in the teamwork was a key feature of the intervention, which emphasized collaboration between patients and professionals/students in the development of patient-centered team care. At the start of the hospitalization, the goals of the treatment were thus agreed on by the patient and the team. To ensure the patients’ progress and, as needed, to adjust their treatment plans (22), weekly team conferences were held.

**Comparison**

The comparison group patients were admitted to a standard psychiatric ward that offered uniprofessional care, in which traditional rounds led by a psychiatrist and supported by Registered Nurses and nursing assistants were held.

**Participants and procedure**

The study included inpatients admitted from October 2016 to March 2018. Aged 18—65, the patients suffered from psychiatric disorders such as schizophrenia, psychosis, major depression, bipolar disorder, and severe personality disorder. Self-report questionnaires were administered to both patient groups within the first 48 hours of their stay in the ward (T1) and on the day of discharge (T2). Patients who did not consent to participation or failed to complete the questionnaire at the beginning of their stay were excluded from the study, as were those hospitalized for less than a week.
Outcome measures

Health status and psychological distress

The participants’ health status was assessed using the standardized Short Form Health Survey (SF-36), which is widely used to assess physical and mental health. We applied the acute version, with one-week recall (18). On the basis of the questionnaire’s 36 items, we calculated two summary scores; the physical component score and the mental component score (PCS and MCS, respectively) (24). All of the eight SF-36 scales contribute in different proportion to the scoring of both PCS and MCS measures. Scores range from 0 (zero) to 100, with higher scores indicating better health. We also assessed nonspecific psychological distress using the Danish version of the Kessler Psychological Distress Scale (K10) (25). Validated and culturally adapted by Thelin et al. (26), its 10 items measure the experienced level of anxiety and depressive symptoms over the preceding four weeks, with a score range from 10 to 50, higher scores indicating more anxiety and stronger depressive symptoms.

Patient satisfaction

The patients’ satisfaction was assessed using the 8-item version of the Client Satisfaction Questionnaire (CSQ-8). The questionnaire has been validated in a Danish population (27), and is widely used to measure satisfaction related to care (10). Items are scored on a Likert scale from 1 to 4, with descriptors for each response point. Total scores range from 8 to 32, with higher scores indicating greater satisfaction. The CSQ-8 has been found to have high internal consistency and concurrent validity in mental health settings (28).

Data analysis

The trial was powered at 80% (α=0.05) to detect an effect size of 0.4, which we regard as adequate to determine clinically meaningful differences between interventions. Based on the power calculation, 120 participants were needed per group (24). The participants were described in terms of gender, age, and baseline scores (SF-36 and K10). All scales were tested for internal reliability, and Cronbach’s alpha was
estimated at 0.88 (CSQ-8), 0.90 (K10), and 0.73 (SF-36) in overall reliability, which is generally considered acceptable (29). We applied unpaired t-tests to assess mean score differences at baseline, and chi-square tests for gender distribution. Differences over time were explored using paired sample t-tests. In order to assess differences in outcomes between groups, we employed linear mixed regression. Applying Cohen’s d, effect sizes were calculated as the ratio of adjusted mean differences (30). All statistical analyses were performed using SPSS (IBM Corp. Released 2018. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

Ethical considerations

Before participation the patients were informed of the project and its purpose, both verbally and in writing. Responding to the questionnaires constituted voluntary consent to participation. Data were entered into the EasyTrial © Online Clinical Trial Management system. All personal identifiers were removed or disguised during analysis to preclude personal identification. The study was approved by the Danish Data Protection Agency (2008-58-0020), and required no further ethical approval according to Danish legislation (16-000014).

Results

During the study period, 281 patients were referred to the intervention group, while 271 patients were referred to the comparison group. In Figure 1, we present the flow of participants through the study.

Figure 1. Flowchart of study participants.

The referrals to the training unit and the standard ward (based on patients’ home address) resulted in groups of equivalent size. As Table 1 shows, the baseline characteristics of the intervention and the comparison group participants were comparable.

Table 1. Gender, age, and baseline score (Health status and Psychological distress)
Health status and psychological distress

The training unit patients scored higher on the mental component summary (MCS) scores, compared with patients in the standard ward. As seen in Table 2, the pre- and post-MCS scores were 27.6–34.2 in the intervention group (p = 0.001) and 29.7–30.9 in the comparison group (p = 0.1). Although baseline adjustment diminished the intervention group’s range of MCS scores, it continued to be larger than that of the comparison group. The mean difference in MSC scores between the two groups was 5.30 (95% CI 2.71 to 7.89; p = 0.001), with an effect size of 0.24. The physical component summary (PCS) scores were 47.6–49.5 in the intervention group; 48.2–50.5 in the comparison group (Table 2). This difference was nonsignificant, and adjustments did not modify the results (Table 3).

The mean psychological distress scores (K10) decreased for both groups, as shown in Table 2: The mean pre- and post-K10 scores were 31.7–29.4 in the intervention group and 31.6–29.8 in the comparison group. This difference remained nonsignificant, even after adjustment for gender, age, and baseline scores. Details are displayed in Table 3.

Patient satisfaction

Patients in the training unit reported higher satisfaction with their treatment (CSQ-8; 25.2) than did patients in the standard ward (CSQ-8; 24.1) (p = 0.02). Table 2 gives detailed results. After adjustment, the mean score difference between the two groups was 1.01 (95% CI 0.06 to 1.96; p = 0.04), with an effect size of 0.31.

Table 2. Outcomes measures at beginning and end of admission

Table 3. Estimates of SF-36 and K10 over time and between groups; CSQ-8 between groups
Discussion

A comparison of mental health status and patient satisfaction in the two patient groups shows that the patients admitted to the training unit reported better improvement than did the patients in the standard ward, albeit with small to moderate effect sizes.

A patient-centered approach is particularly important in the care of patients with psychiatric disorders. Active participation in own care is moreover known to improve outcomes (31). Although research into this area is relatively sparse when compared with research into physical health, the evidence for the beneficial effects of shared decision-making underpinning mental health treatment decisions is convincing (32). Involving the patients in the treatment of mental illness is important, as they are in the best position to evaluate treatment effectiveness, goals, and side effects within the context of their personal preferences and needs. The usefulness of interprofessional collaboration in the field is well recognized, due to its capacity to provide and coordinate a variety of responses to patients’ complex healthcare needs (2). The decision by professionals to organize their interventions around the needs of patients is one of the main characteristics of teams of collaborating professionals (5).

Our finding of improved patient satisfaction corroborates the results of similar studies. In their longitudinal study of an IPE program in community mental health service, Carpenter et al. (2006) show similar results, albeit with small to medium effect sizes (33). Moreover, our satisfaction score was similar to the results of a cluster-randomized controlled trial (CSQ-8: 25.3) investigating the clinical effectiveness of collaborative care for depression in UK by Richards et al. (24). This controlled trial also found that patient satisfaction correlates positively with health status and the continuity of care offered (24).

Team-based care is a growing trend in mental healthcare delivery, where it is found to offer significant benefits for patients, ranging from more informed decision making for complex conditions to improved access and reduced costs (2,11). However, its impact remains under-researched; Wen and Schulman’s
(2014) systematic review of team-based care and patient satisfaction thus found inconsistent results as to the effectiveness of team-based care and patient satisfaction (11). Although we found improved patient satisfaction in the intervention group, the effect was smaller than expected. Yet, a Cochrane review (34) by Papageorgiou et al. (2017) investigating interprofessional communication skills training for professionals working with severely ill mental patients found no difference in satisfaction scores between the intervention group and the comparison group (using CSQ-8).

In terms of psychological distress (K10), we identified no significant differences between the groups. Carlier et al. (2014) found no significant differences in psychological distress among participants, when they compared an interdisciplinary re-employment program among persons with mental health problems with standard care (35). The pre- and post-K10 scores were slightly higher in our intervention group (31.5–29.4) than in Carlier’s intervention group (28.8 – 28.0), findings which we ascribe to the fact that their patients were primarily outpatients. Similar results were found in other studies assessing mixed groups of mental health inpatients and outpatients (26,36).

The quality of evidence is critical to advancing our understanding of ways of improving interprofessional collaboration and patient-centered care. However, studies undertaken in mental health contexts have so far produced limited results (2,7). Barnes et al. conducted a five-year evaluation of an IPE post-qualifying program in mental health in the UK, measuring the outcomes of partnerships with patients. Whereas the patients improved in terms of social functioning and life satisfaction, their mental health status was unaffected (15). Similarly, in their study of in-service IPE among community mental health teams, Reeves and Freeth (5) showed that while the educational input was well received, wider success was elusive, as already agreed plans for collaboration were not implemented. Moreover, no improvement in patient outcomes was reported.

Our study adds to the emerging international literature regarding interprofessional training and collaborative care. The documented improvements in mental health status and patient satisfaction
corroborate previous findings that interventions based on interprofessional care or a patient-centered approach improve patient-reported outcomes and satisfaction in mental healthcare (24,37).

Limitations

The study design enabled analysis of changes in patient-reported outcomes in both the intervention and the comparison group. However, some limitations should be acknowledged. As we did not observe the professionals or the students in interaction with patients, we are unable to conclude definitively on their actual behavior in the interprofessional collaboration process. In order to fully explore the dynamics of an interprofessional approach in future research, it may be useful to study already established interprofessional mental healthcare teams and conduct qualitative research. Owing to the nature of the study design, we were unable to randomize and blind patients to treatment groups. The referral from the emergency ward to the two wards was not deemed to introduce a selection bias as it was determined by patients’ home address, a procedure which was completely independent of the study hypothesis and standard for IPE studies of mental health patients (14,15,33). The response rates were similar across the two groups, and there is no evidence that findings were biased by missing follow-up data.

Implications for practice and future research

This study offers insight into the possibilities of integrating IPE in the provision of patient-centered care in mental health. There is growing evidence in support of the need for and benefit of involving all healthcare providers and patients in the planning, implementation, and evaluation of treatment (2,14,24). The interprofessional training unit is a notable arena for the delivery of interprofessional care and education allowing students of medicine, nursing, physiotherapy, and social care to collaborate on the delivery of care. It is already well established in other specialties and has increasing global appeal (38,39). Our findings indicate that an organization with training units in a mental health setting is feasible, that it improves students’ learning (21), and is beneficial to patient care. Although our study demonstrated positive effects, we cannot predict the long-term impact on patients. As the impact and sustainability of IPE initiatives in
clinical settings are important to all parties involved, we believe that a longitudinal design is amenable to
future exploration of such outcomes. We also recommend data collection strategies to provide insight into
how IPE leads to change in healthcare processes and patient outcomes as research to date has not
sufficiently addressed this critical issue.

In summary, the patients in the intervention group scored higher on mental health status and satisfaction
in comparison to the conventionally treated patients. No differences were found between the two groups
in terms of psychological distress.

These positive findings add to the growing evidence in support of the claim that IPE training units are
capable not only of creating unique and valuable environments for experiential IPE, but also of improving
patient outcomes. However, as only a few IPE interventions have involved patients, and even fewer have
taken place within the practice setting, further study of the processes as well as the long-term effects of IPE
in mental healthcare is needed.

Declarations

Competing interests

The authors report no conflicts of interest.

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Authors’ contributions

All authors contributed to the design of the project. MM and SA were involved in the development of the
intervention. MM performed the statistical analysis. MM, BN and SA wrote the first draft of the manuscript.
All authors reviewed and revised the manuscript. All authors read and approved the final manuscript.

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Figure Legends

1. Figure 1. Flowchart of study participants

Tables

| Table 1. Gender, age, and baseline scores (Health status and Psychological distress) |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | T1              |                  |                  |
| Intervention                   | Comparison      |                 |                  |
| (n = 164)                       | (n = 148)       |                 |                  |
| Gender                          |                 |                 |                  |
| Male                            | 85 (51.8)       | 92 (63.0)       | 0.05*           |
| Female                          | 79 (48.2)       | 54 (37.0)       |                  |
| Age                             | 39.3            | 40.0            | 0.7*            |
| Baseline scores                 |                 |                 |                  |
| K10                             | 31.7            | 31.6            | 0.9*            |
| SF-36 (PCS)                     | 47.6            | 48.2            | 0.6*            |
| SF-36 (MCS)                     | 27.6            | 29.7            | 0.2*            |

* Pearson's chi-square
* Independent samples t-test
T1 = Time 1 measurement (baseline); T2 = Time 2 measurement (end of admission); SF-36 = Short Form Health Survey; PCS = physical component summary scores; MCS = mental component summary scores; K10 = Kessler Psychological Distress Scale.
Table 2. Outcome measures at beginning and end of admission

<table>
<thead>
<tr>
<th></th>
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<tr>
<td></td>
<td>T1*</td>
<td>T2*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n = 164)</td>
<td>(n = 120)</td>
<td></td>
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<tr>
<td>(mean; SD)</td>
<td>(mean; SD)</td>
<td>(mean; SD)</td>
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<tr>
<td><strong>Intervention</strong></td>
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<tr>
<td><strong>Comparison</strong></td>
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<tr>
<td><strong>SF-36</strong></td>
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<td></td>
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</tr>
<tr>
<td><strong>PCS score</strong></td>
<td>47.6; 10.3</td>
<td>48.2; 10.8</td>
<td>49.5; 8.6</td>
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<tr>
<td></td>
<td>0.6</td>
<td>0.2</td>
<td>0.1</td>
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<tr>
<td><strong>MCS score</strong></td>
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<td>29.7; 15.1</td>
<td>34.2; 13.6</td>
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<tr>
<td></td>
<td>0.2</td>
<td>0.1</td>
<td>0.001</td>
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<tr>
<td></td>
<td>(n = 163)</td>
<td>(n = 126)</td>
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<td>(n = 146)</td>
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<tr>
<td>(mean; SD)</td>
<td>(mean; SD)</td>
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<tr>
<td><strong>K10 score</strong></td>
<td>31.7; 8.5</td>
<td>31.6; 8.9</td>
<td>29.4; 8.3</td>
</tr>
<tr>
<td></td>
<td>0.3</td>
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<tr>
<td>(n = 111)</td>
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<tr>
<td>(n = 104)</td>
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<tr>
<td><strong>CSQ-8 score</strong></td>
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<tr>
<td></td>
<td>25.2; 3.3</td>
<td>24.1; 3.7</td>
<td>0.02</td>
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* Independent samples t-test
* Paired t-test

SD = Standard deviation; CSQ-8 = Client Satisfaction Questionnaire, SF-36 = Short Form Health Survey; PCS = physical component summary scores; MCS = mental component summary scores; K10 = Kessler Psychological Distress Scale.
<table>
<thead>
<tr>
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<th>Intervention (n = 120)</th>
<th>Comparison (n = 101)</th>
<th>Between groups</th>
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<td>(mean; SE)</td>
<td>(mean diff.)</td>
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<tr>
<td><strong>SF-36</strong></td>
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<tr>
<td><strong>PCS score</strong></td>
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<td>49.7; 0.6</td>
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<td>-2.03–1.24</td>
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<td><strong>MCS score</strong></td>
<td>35.1; 0.9</td>
<td>28.8; 1.0</td>
<td>7.30</td>
<td>2.71–7.89</td>
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<tr>
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<td>(n = 125)</td>
<td>(n = 123)</td>
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<td></td>
<td></td>
<td>(mean diff.)</td>
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<tr>
<td><strong>K10 score</strong></td>
<td>29.40; 0.5</td>
<td>29.73; 0.6</td>
<td>0.33</td>
<td>-1.9–1.2</td>
<td>0.7*</td>
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<td>(n = 111)</td>
<td>(n = 104)</td>
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<td></td>
<td></td>
<td></td>
<td>(mean diff.)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Total CSQ-8</strong></td>
<td>25.2; 0.3</td>
<td>24.2; 0.3</td>
<td>1.01</td>
<td>0.96–1.96</td>
<td>0.04*</td>
</tr>
</tbody>
</table>

* Linear mixed regression. Mean scores in comparison and intervention groups adjusted for baseline scores, age, and gender

* Linear mixed regression. Mean scores in comparison and intervention groups adjusted for age and gender

SE = Standard error; CSQ-8 = Client Satisfaction Questionnaire; SF-36 = Short Form Health Survey; PCS = physical component summary scores; MCS = mental component summary scores; K10 = Kessler Psychological Distress Scale
Figure 1 Flowchart of study participants

Flowchart of study participants

552 referred inpatients in the period October 2016 – March 2018

281 (51%) in the intervention group
- 43 patients did not consent to participation
- 47 had a short hospitalization
- 27 patients were unable to complete questionnaires

164 (58%) completed baseline survey
- 35 patients discharged without having completed questionnaires

129 (46%) completed follow-up survey

271 (49%) in the comparison group
- 51 patients did not consent to participation
- 52 had a short hospitalization
- 20 patients were unable to complete questionnaires

148 (55%) completed baseline survey
- 25 patients discharged without having completed questionnaires

123 (45%) completed follow-up survey