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Interprofessional education in geriatric medicine: towards best practice. A controlled before-after study of medical and nursing students

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Key words: geriatric medicine, interprofessional education, medical and nursing students, older people

Word count: 4354

Abstract

Objectives To investigate nursing and medical students' readiness for interprofessional learning before and after implementing geriatric Interprofessional education (IPE), based on interactive case scenarios Problem Based Learning (PBL). To determine optimal number of geriatric IPE sessions, the size and the ratio of participants in the learner groups, the outcomes related to the Kirkpatrick four-level typology of learning evaluation, students' concerns about joint learning, perception of roles of the "other" profession and students choice of topic.

Design A controlled before-after study (2014/15, 2015/16) with data collected immediately before and after the intervention period. Study includes additional comparison of the results from the intervention with a control group of students. Outcomes were determined with a validated "Readiness for Inter-professional Learning" questionnaire, and a separate questionnaire with free comments, combining quantitative and qualitative research methods. The teaching sessions were facilitated by the mentors, so each group had both, a clinician (either geratology consultant or registrar) and a senior nurse.

Participants 300 medical, 150 nursing students

Setting Tertiary care university teaching hospital

Results

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4 Analysis of the returned forms in the intervention group had shown that nursing students
5 scored higher on teamwork and collaboration post-IPE (M=40.78, SD=4.05) than pre-
6 (M=34.59, SD=10.36) - statistically significant. On negative professional identity they scored
7 lower post-IPE (M=7.21, SD=4.2) than pre- (M=8.46, SD=4.1) - statistically significant. The
8 higher score on positive professional identity post-IPE (M=16.43, SD=2.76) than pre- (M=14.32,
9 SD=4.59) was also statistically significant. Likewise the lower score on roles and
10 responsibilities post-IPE (M=5.41, SD=1.63) than pre- (M=6.84, SD=2.75).
11 Medical students scored higher on teamwork and collaboration post-IPE (M=36.66, SD=5.1)
12 than pre- (M=32.68, SD=7.4) - statistically significant. Higher positive professional identity
13 post-IPE (M=14.3, SD=3.2) than pre- (M=13.1, SD=4.31) - statistically significant. The lower
14 negative professional identity post-IPE (M=7.6, SD=3.17) than pre- (M=8.36, SD=2.91) was not
15 statistically significant. Nor was the post-IPE difference over roles and responsibilities
16 (M=7.4, SD=1.85), pre-IPE (M=7.85, SD=2.1).
17 In the control group medical students scored higher for teamwork and collaboration post-IPE
18 (M=36.07, SD=3.8) than pre- (M=33.95, SD=3.37) - statistically significant, same for positive
19 professional identity post-IPE (M=13.74, SD=2.64), pre-IPE (M=12.8, SD=2.29), while negative
20 professional identity post-IPE (M=8.48, SD=2.52), pre IPE (M=9, SD=2.07), and roles and
21 responsibilities post-IPE (M=7.89, SD=1.69), pre-IPE (M=7.91, SD=1.51) shown no statistically
22 significant differences. Student concerns, enhanced understanding of collaboration and
23 readiness for future joint work were addressed, but not understanding of roles.
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28 **Conclusions** Educators with nursing and medical background delivered geriatric IPE
29 through case scenarios based PBL. The optimal learners group size were determined. The
30 equal numbers of participants from each profession for successful IPE is not necessary. The
31 IPE delivered by clinicians and senior nurses had the same impact on medical students
32 regardless if it was delivered to the mixed groups with nursing students, or to medical
33 students alone. Teaching successfully addressed students concerns about joint learning, but
34 had overall more positive impact on nursing students. Communication and ethics were most
35 commonly suggested topics.
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39 **Limitations and strength (summary)**

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41 The strength:

- 42 • This is a novel evidence regarding a good practice for geriatric undergraduate
- 43 Interprofessional education derived from a large unselected (inclusive) cohort of
- 44 medical and nursing students
- 45
- 46 • A controlled before-after study, with students randomly assigned to the intervention
- 47 and control groups, combining quantitative and qualitative research methods
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51 The limitations:

- 52 • The overall number of nursing students was smaller, so the control group consisted
- 53 of only medical students
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- 55 • The nursing students had more clinical experience than the medical students at the
- 56 time of the geriatric IPE
- 57
- 58 • Not all students returned the feedback forms, complaining that completing both
- 59 questionnaires was time-consuming
- 60

Introduction

The recommendations for Interprofessional education (IPE) from professional accreditation bodies for healthcare students (1, 2) relates closely to the specialty of Geriatrics, as being delivered by interprofessional teams. World Health Organisation (WHO) considers IPE to be “key to improving global health outcomes and to the global health workforce crisis”(3). Nevertheless, IPE in geriatric medicine still lacks established standards and best practice, for example regarding the optimal timing and delivery (4, 5, 8). As a step to meet this need at the undergraduate level, without compromising the integrity of uni-professional medical and nursing education (6), a controlled before-after study was designed and run in Oxford (Medical School, University Hospitals and Brookes University). Set in a tertiary care university-based teaching hospital during the 2014/15 and 2015/16 academic years, this study identified an effective way of delivering undergraduate geriatric IPE, including the number of sessions, the size of the learner group, the ratio of participants from each profession, the topics, and the outcomes related to the Kirkpatrick four-level typology of learning evaluation. The study also explored students’ concerns about joint learning and if geriatric IPE had any impact on these concerns.

Methods

The study was conducted as a controlled before-after study.

Student cohort

The workshops were delivered to medical students from Oxford University Medical School and Nursing students from The Oxford School of Nursing, Oxford Brookes University. Medical students from were at the beginning of their six-week clinical attachment (Year 4 of the six-year course; Year 2 of the four-year graduate entry course), preceding their clinical exposure to geriatrics-related problems, who also attended the introduction course to the

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3 geriatrics and a communication skills workshop, addressing dementia/delirium and
4 challenging behaviours in older patients during that teaching week (9). Nursing students
5 were recruited from Years 2 and 3 (due to the smaller yearly intake) of the three-year course.
6 They had already cared for older patients during previous clinical placements throughout
7 their course, their curriculum covering a life-span approach to theory and practice.
8 Medical students still outnumbered them and 80 medical students (40 from each academic
9 year) could not be matched with nursing students, so acted as the control group. All students
10 were randomly assigned to the intervention and control groups, this being determined by the
11 separate timetables from their respective institutions issued before this teaching.
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17 Workshops

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19 The sessions were based on Problem-Based Learning (PBL) with standardized case-scenarios
20 relevant to geriatric practice mapped to the learning objectives on the Joint Royal Colleges of
21 Physicians Training Board geriatric medicine curriculum (7) mirroring situations encountered
22 by clinicians/nurses, requiring an interprofessional collaborative approach (Supplementary
23 data 1). Each workshop comprised approximately one hour's introduction by a senior
24 clinician and nurse, followed by two hours of self-directed learning and a session facilitated
25 jointly by nurses and geriatricians, aiming to facilitate professional socialization (31) and
26 collaboration through constructive discussion about the skills required from each profession
27 when caring for older patients. It aimed to build higher-level skills (such as reflection by
28 students/facilitators) and co-operative learning (4) while problem-solving these cases. The
29 mixed groups could discuss the scenarios with the "other" profession during both sessions –
30 something that was possible for the control group during its final session with the facilitators.
31 There was emphasis on each profession's contribution/collaboration/role in the management
32 of given problems.
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37 Statistical analyses

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39 As no single robust method is yet available for assessing the learning outcomes of IPE (10, 6,
40 11), the assessment was carried out with mixed (quantitative and qualitative) methods (8, 10,
41 12), anonymously, on a voluntary basis. The quantitative analysis was conducted with a
42 validated questionnaire, "Readiness for Inter-professional Learning" (RIPL) which assesses
43 participants across four subscales (see Supplementary data) (13, 14). Additionally, we created
44 a simple questionnaire with free comments addressing students' perception of the roles of
45 nurses/doctors, their concerns about interprofessional working; curricular topic suggestions
46 for future IPE sessions; students' expectations, the type of experiences encountered, and the
47 impact of the workshop on their understanding of collaboration and their ability to work
48 together in future. Both questionnaires were administered before and after the workshop.
49 Data were transcribed by KM, KB, ST, HB, on a Microsoft Excel spreadsheet and the results
50 from RIPL were analysed with a Wilcoxon signed-rank test by LF. LF also analysed free text
51 responses. Qualitative data from the free text questionnaire was analysed using NVivo
52 (version 10). 300 medical and 150 nursing students participated.
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Results

In quantitative assessment we compared mean RIPL subscale scores with a Wilcoxon signed-rank test to determine if the IPE intervention had changed students' attitudes.

When all the results from all students are analysed for the intervention groups for the students who returned their forms (185 pre-intervention and 200 post-intervention), the statistically significant improvements post-IPE was found in all four RIPL subscales, due mainly to nursing students responses: teamwork and collaboration, positive professional identity, roles and responsibilities, and negative professional identity, Figure 1.

But, when T-test is applied to the forms from the nursing students only (pre-intervention 91, post-intervention 95 returned forms, Figure 2) it showed, on average, that participants scored higher on teamwork and collaboration post-IPE ($M=40.78$, $SD=4.05$) than pre-IPE ($M=34.59$, $SD=10.36$). This difference was statistically significant ($t(-5.32)=115.86$, $p=.000$). Participants scored lower on negative professional identity after IPE ($M=7.21$, $SD=4.2$) than before it ($M=8.46$, $SD=4.1$). This difference was statistically significant ($t(2.06)=183.94$, $p=.041$). Participants on average scored higher on positive professional identity ($M=16.43$, $SD=2.76$) post-IPE than prior to the IPE session ($M=14.32$, $SD=4.59$). This difference was statistically significant ($t(-3.78)=146.2$, $p=.000$). On average, participants scored lower on roles and responsibilities after IPE ($M=5.41$, $SD=1.63$) than before it ($M=6.84$, $SD=2.75$). This difference was statistically significant ($t(4.27)=145.14$, $p=.000$).

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As shown in Figure 3, the analysis of the returned forms from the medical students from the intervention group analysis (pre-intervention 94, post-intervention 105 returned forms) had revealed that they had scored higher on teamwork and collaboration post-IPE (M=36.66, SD=5.1), than pre-IPE (M=32.68, SD=7.4). This difference was statistically significant ($t(-4.36)=162.43, p=.000$). Also, these students on average scored higher on positive professional identity (M=14.3, SD=3.2) post-IPE than prior to the IPE session (M=13.1, SD=4.31). This difference was statistically significant ($t(-2.24)=197, p=.026$). However, these medical students scored lower on negative professional identity after IPE (M=7.6, SD=3.17) than before it (M=8.36, SD=2.91). This difference was *not* statistically significant ($t(1.69)=197, p=.092$), and there was little difference in post-IPE for roles and responsibilities after IPE (M=7.4, SD=1.85) than before it (M=7.85, SD=2.1). This difference was not statistically significant ($t(1.58)=197, p=.116$).

The results for the control group of students that returned the forms (pre-intervention 74, post-intervention 54) are shown in Figure 4. Post-IPE results had shown the significant improvements in the teamwork and collaboration (M=36.07, SD=3.8), than pre-IPE (M=33.95, SD=3.37). This difference was statistically significant ($t(-3.35)=126, p=.001$). The control group had scored higher on positive professional identity subscales (M=13.74, SD=2.64) post-IPE than prior to the IPE session (M=12.8, SD=2.29). This difference was statistically significant, ($t(-2.16)=126, p=.033$).

The control group scored slightly lower on negative professional identity after IPE (M=8.48, SD=2.52) than pre IPE (M=9, SD=2.07). This difference was *not* statistically significant, ($t(1.23)=100.42, p=.219$). They also on average differed little on roles and responsibilities (M=7.89, SD=1.69) pre (M=7.91, SD=1.51) than post-IPE. This difference was *not* statistically significant, ($t(.11)=126, p=.916$).

Unexpectedly, the results collected from all medical students show that both the intervention and control groups have the same outcome and this is illustrated in Figure 5.

All feedback forms were assessed for free-text comments.

Tables with free comments:

Qualitative Data Pre- and Post-IPE for the Intervention and Control Groups

Open-ended questions and results

Awareness of roles and responsibilities (Tables A, B, C)-In terms of the actual session, both groups enjoyed getting to know more about the other role's perspective and what they would do in different situations. They also enjoyed learning about how they could collaborate with one another. Medical students found IPE improved their understanding of nursing priorities and thinking, and also found that illustrated the differences in expertise/skills and roles between the two groups. Both groups enjoyed sharing their different experiences.

Nursing concerns (Tables A, B)-Prior to the session concerns about learning alongside medical students; they felt intimidated and feared there would be a hierarchy, but IPE appeared to be successful in removing these concerns, with nursing students finding the sessions very open and comfortable who also indicated that they found easy to contribute to the session, and they found the group to be very welcoming and respectful, and the session to be very relaxed. The results of this study also suggest that the nursing students became more confident as a result of the teaching; with some indicating that they would be happier to approach a doctor in the future or share information with them. It would appear that IPE resulted in boosting nursing confidence around their medical peers, and decreased concerns about feelings of inferiority/intimidation. Nursing students suggested that the teaching session highlighted the fact that medical students were not so different to nursing. It's also interesting that post-IPE nursing students appeared to be more specific in defining their own areas of expertise and in some way shifted nursing perspectives of their own expertise, describing more expertise than prior to IPE.

Medical students (Tables A, B) were concerned about working with nursing students being perceived as *arrogant, pretentious and condescending* prior to the session. During the session, they found it very easy to contribute, regardless of group (intervention or control) and both felt IPE had emphasized the importance of communication. Both professions also felt that teaching had improved their knowledge of the roles in the Multidisciplinary Team (MDT).

In terms of perceptions of each other's role pre- and post-IPE (*Tables A, B*) view of the doctors' role remained the same across both professional groups and teaching conditions (active vs. control). Everyone viewed this role as one focused on diagnosis and treatment, with some clinical decisions making. In terms of the nursing role, nursing students' perceptions also did not change much post-IPE, but more nursing students discussed the fact about the roles and responsibilities for working collaboratively for the best of the patient interests. This was not a common theme amongst the medical student responses in either the intervention or the control groups. Similar to role, both nursing and medical student perceptions of doctors' expertise did not change much post-IPE. Perceptions of the role very much focused on doctors' medical knowledge and knowledge of treating the patient. Medical student

descriptions of nursing expertise also didn't appear to change much across either groups or condition. However, as stated earlier, nursing student perceptions of nursing expertise were somewhat more extensive post-IPE.

Receptiveness to geriatric IPE-it was received generally in a positive light by both healthcare groups, but slightly more so by nursing students. It appears to have reinforced the importance of collaborative working, with a majority of students believing it had improved their ability to work collaboratively and most stating that they would be happy to participate again (Table C).

Expectations of IPE (Table C) varied amongst the students before the session, but post-IPE most students expressed positive views and felt that it was more useful than they had expected it to be. Out of both nursing and medical students, nursing students appeared more open to the overall concept of IPE, unlike medical students. Some medical students were unsure even after IPE, to whether it was an effective way of learning and as to whether it could be tailored to meet the learning objectives of both groups.

Understanding of inter-professional collaboration (Table C)-Both groups felt that the teaching enhanced their understanding of inter-professional collaboration and increased their ability to work collaboratively. Nursing students felt their ability had been enhanced through a better understanding of the roles in MDT and the doctor's perspective. Medical students believed their ability was improved through a better understanding of the nursing perspective and indicated they would value the views of other healthcare professionals. Only a minority of students felt it hadn't increased their understanding or ability.

Future IPE sessions-included comments about better organisation, that smaller groups were more effective and some preferred a shorter session. The list created initially pre-IPE by students for the future topics varied quite a bit, but post-IPE the most common topics suggested by both groups including case scenarios, communication, ethics, the deteriorating patient and emergency situations (Table A, C). What's even more interesting is the fact after teaching some of the control group suggested doctor/nursing roles as a topic for future teaching.

TABLE A

Qualitative Data Pre-IPE	Intervention Group		Control Group
	Nursing students	Medical students	Medical students
Role (of the "other")	Doctor: <ul style="list-style-type: none"> • Diagnosis and treatment of the patient 	Nurse: <ul style="list-style-type: none"> • Provides practical care • Provides support for the patient 	Nurse: <ul style="list-style-type: none"> • Provides practical care • Communicates patients' issues • Implements medical plans and working with doctors
Expertise	Doctor: <ul style="list-style-type: none"> • Clinical knowledge 	Nurse: <ul style="list-style-type: none"> • Patient care and monitoring • Medical knowledge • Safeguarding • Patient comfort • Patient concerns 	Nurse: <ul style="list-style-type: none"> • Knowledge of patient needs • Practical care and management • Communication skills

<p>Concerns about IPE</p>	<p>Concerns:</p> <ul style="list-style-type: none"> To have inadequate knowledge Being undermined Being intimidated Judged to be inferior Not being taken seriously by medical students Anticipation of a hierarchy within the group <p>Example comments: <i>"Nervous I will not have enough clinical knowledge to contribute effectively and they will judge"</i> <i>"Personally I am intimidated learning alongside medical students"</i></p>	<p>Concerns:</p> <ul style="list-style-type: none"> Tailoring learning to both student groups and its effectiveness Groups will have very different learning objectives, expectations and barriers Appearing proud or arrogant to their nursing student colleagues <p>Example comments: <i>"We need to learn different things"</i> <i>"Appearing arrogant, pretentious, condescending, proud"</i></p>	<p>Similar results to medical students in the intervention group</p>
<p>Curriculum Topics</p>	<ul style="list-style-type: none"> Communication Ethics Case based teaching Teamwork Clinical Skills Assessment and management of the acutely unwell patient 	<ul style="list-style-type: none"> Communication Ethics Case based teaching Assessment and management of the acutely unwell patient 	<ul style="list-style-type: none"> Communication Assessment and management of the complex patients and situations

TABLE B

Qualitative Data Post-IPE	Intervention Group		Control Group
	Nursing students	Medical students	Medical students
<p>Role (of the "other")</p> <p>No significant difference pre- and post-IPE groups for all</p>	<p>Doctor: Same as pre-IPE group. However, much more appreciation of working with doctors</p> <p>Example Comment: <i>"To support each other [to] benefit patient"</i></p>	<p>Nurse: Same as pre-IPE group. However, much more appreciation on the other nursing roles</p> <p>Example Comment: <i>"Patient care and monitoring, executing management plan,</i></p>	<p>Nurse: No significant difference pre- and post- IPE groups</p>

		<i>liaising with the doctors and other healthcare professionals"</i>	
Expertise No significant difference pre- and post-IPE groups for all	Doctor: However, more emphasis on doctors having much more in-depth knowledge of anatomy, physiology and treatments	Nurse: However, more emphasis on nurses' having more knowledge of the patient and what is key to their welfare	Nurse: No significant difference pre- and post-IPE groups
Concerns about IPE	Concerns: Most expressed they now had no concerns post-IPE A few students expressed ongoing concerns about difference in knowledge base Example Comments: "Not anymore (concerns)" "Knowledge difference"	Concerns: Overall less concerns than pre-IPE group Some still believed that students were starting at a different level of knowledge, so different focuses were needed for each group Example Comments: "Some differences in type of knowledge made it difficult to work together at points" "It feels like a bit of a waste of time, we have very different teaching usually with very different focuses"	Similar results to medical students from the intervention group
Curriculum Topics	No significant change between pre- and post-IPE groups.	No significant change between pre- and post-IPE groups.	<ul style="list-style-type: none"> • Communication • Ethics • Falls • Assessment and management of the acutely unwell patient

TABLE C

Post-intervention questions – Regarding Experience from IPE and from Interacting with Nursing/Medical student colleagues	Nursing Students	Medical Students
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<p>Ease of contribution/voicing opinion during IPE</p>	<p>1. Majority found contribution to the group easy/very easy. Some felt this was even easier in small groups</p> <p>2. Nursing students expressed feeling generally comfortable and respected. The group was friendly and listened</p> <p>3. A minority felt there were some individuals (profession of those individuals was not stated) that dominated the group</p> <p>Example Comments:</p> <p><i>"Very easy, relaxed, no judgement, we all learned"</i></p> <p><i>"Very easy, I felt everyone was interested in what everyone had to say"</i></p>	<p>1. Majority found contribution easy</p> <p>2. Smaller groups were helpful</p> <p>3. Groups were welcoming and the teaching relaxed</p> <p>Example Comments:</p> <p><i>"Very easy, relaxed and inclusive atmosphere"</i></p> <p><i>"Fine, good welcoming people who valued all opinions and we all gained valuable experience from each other"</i></p> <p><i>"Easy- small groups"</i></p>
<p>Expectations of IPE</p>	<p>1. Majority stated it was what they expected</p> <p>2. Few had expected to learn from scenarios, to learn about peers and about how to work well together</p> <p>3. Some did not expect it be so useful and many said it was better than they would have expected</p> <p>Example Comment: <i>"Better, I guessed I wouldn't have a say, but I learnt a lot"</i></p>	<p>1. Majority stated it was either as expected or better than expected</p> <p>2. Some expected to learn more about their peers role and their perspective</p> <p>3. Some expected smaller groups</p> <p>4. A minority did not find the feedback session as useful as expected</p> <p>Example Comment: <i>"Feedback did not target how to work together"</i></p>
<p>Taking part again</p>	<p>1. Majority would be happy to participate again but asked for better organisation, timings and more information in advance</p> <p>Example Comment:</p> <p><i>"Yes, found it interesting as different perspective, plus we'll all be working together in the future so good to get an understanding of each other's roles"</i></p>	<p>1. Majority would be happy to participate again, as it allowed them to learn about nursing responsibility role, experience and expertise</p> <p>2. A few wouldn't participate again. They felt sessions could have been better organised and structured. Some suggested shorter and more time efficient workshops, and changing the format of delivering the sessions</p> <p>Example Comments:</p> <p><i>"Yes, in principle, but on more balanced topics- I didn't find this very useful (large groups). Small groups were useful"</i></p> <p><i>"Yes, lovely to meet nursing students and learn what we do and can expect from each other professionally"</i></p>
<p>Enjoyment</p>	<p>1. Most enjoyed having the opportunity to understand a doctor's perspective and learning about the role of a doctor, in addition to sharing ideas, knowledge and different experiences</p> <p>2. Minority enjoyed thinking about collaboration between the two roles and becoming more self-confident as a result of the teaching session</p> <p>3. Some felt sessions were too long</p> <p>Example Comment:</p>	<p>1. Most enjoyed getting to understand the nursing perspective, learning more about the nursing role and hearing about different nursing experiences</p> <p>2. Some mentioned it was helpful to understand nursing priorities and others enjoyed thinking about collaboration between the two roles</p> <p>3. Some felt sessions were too long</p> <p>Example Comment:</p>

	<i>"Liaising about their point of view, being more confident around medical students"</i>	<i>"Seeing their point of view and experience"</i>
Learning	<p>1. IPE helped to define their strengths and what their area of expertise is. This included reinforcing for nursing students that medical students don't know everything and can have similar concerns to them</p> <p>2. Some indicated they had learnt more about how to collaborate with other HCPs and about differences in training</p> <p>Example Comments: <i>"Confidence in what I know and realising that medics don't know everything either"</i> <i>"Hearing they are also unsure/anxious to qualify"</i> <i>"Learnt more about what education is like for medical students"</i></p>	<p>1. Learning in terms of difference in expertise/skills and roles between the two</p> <p>2. The importance of communication with other healthcare professionals and the value of their views and the value of their views.</p> <p>3. Appreciated learning about aspects of healthcare that they didn't know about.</p> <p>Example Comments: <i>"[nurses] know much more about basic patient care"</i> <i>"Very useful to communicate with other health care professionals and their views are very useful"</i></p>
Understanding collaboration	<p>Most nursing and medical students felt positive about the IPE teaching session and felt it had improved their understanding of both roles and the knowledge that nurses hold and have emphasized the importance of communication. They also felt that teaching had improved their knowledge of the roles in the Multidisciplinary Team (MDT).</p> <p>Example Comments: <i>"Better understanding of each other's role and what we bring to MDT"</i> <i>"Given a perspective on what nurses are expected to know"</i> <i>"It's nice to hear the thought process of the student nurses, understand better their reasons to call FY1s!"</i> <i>"We can learn from nurses about practical areas that we have less knowledge"</i></p>	
Ability to work collaboratively	<p>Overall, nurses felt more confident about approaching or communicating with other healthcare professionals</p> <p>Example Comments: <i>"[teaching session] has made me more confident in interacting with other members of the healthcare team"</i></p> <p><i>Improved ability to work collaboratively by enhancing their understanding of their role in the MDT and an improved understanding of the "doctor's" perspective in different scenarios.</i></p> <p><i>"Helped me see the patient condition from their perspective and how they would manage the situation"</i></p>	<p>The majority stated it improved their ability through a better understanding of the nursing perspective and the role. A minority were unsure if it affected their ability</p> <p>Example Comments: <i>"Proven it is something I agree with; other medical professionals are essential to work along side with as soon as possible"</i> <i>"Helped me to see the patient condition from their perspective and how they would managed the situations"</i> <i>"Improved ability to hold constructive discussion with other professionals"</i></p>

Please note real Comments from students are in written in *Italics*

Discussion

This workshop was developed to promote interprofessional education, through better understanding of participants' own and others' professional roles (nursing/clinicians), through observation and exploration of participants' reciprocal perceptions, participating in cooperative learning (32) and collaborating practice between "old-timers and newcomers",

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3 where more skilled practitioners assist the learner's development beyond their competence
4 (4, 15, 33). The promotion of participants' responsibilities, joint working/decision-making,
5 interchanging interprofessional knowledge, problem-solving (16, 17, 18), mutual respect,
6 trust-development based on the knowledge of the role performance, behaviours, attitudes,
7 communication, coordination and negotiation, while working on common geriatric problems
8 that are relevant to both professions (4, 12, 19, 21, 22, 23, 24, 25), were encouraged. The
9 workshop also aimed to promote cooperative learning, positive interdependence, face-to-face
10 interaction, individual accountability, interpersonal and small-group skills and group
11 processing. The literature describes many methods for delivering IPE to health professionals,
12 regardless of specialty, including attending common courses, IP healthcare team activities,
13 patient simulations, and elective live-in placements (20, 24, 27), based on the assumption that
14 IPE-related general principles are applicable to education in geriatric medicine (8). Difficulties
15 encountered while setting up IPE in undergraduate geriatrics, included the lack of data for
16 selecting the following: optimal students level of clinical experience and education, best
17 teaching methods, most suitable curriculum topics for such teaching, optimal number of
18 students per teaching group, length and number of sessions. Also, other encountered
19 difficulties included the timetabling of large number of students/staff from three different
20 organisations, securing adequate teaching space and qualified teachers and how best to
21 evaluate the teaching.
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26 Our IPE sessions were based on geriatric case scenarios and allowed close contact between IP
27 tutors from both disciplines and students in small groups (26), who reflected on
28 cases/practice-reflection: a "prerequisite of professional caring" (4), including situated
29 learning (34). The emphasis was on promoting ethical practice, relationship-centred care,
30 collegiality, where coaching (learning together and also learning about each other) (35) and
31 narrative methods were used as well (20), all possibly also influencing hidden curriculum.
32 This teaching relied on theories that IPE is based on social, cooperative and collaborative
33 learning, the so-called group model, where learning is created in the
34 interaction/interrelationship with others, related to the formation of clinical judgment, that
35 the knowledge from IPE could be acquired from the faculty and peers, allowing students to
36 gain a view of "others' professions" by feeling, watching and thinking. The sessions complied
37 with levels 1, 2a, 2b and 3 of the Classification of Interprofessional Outcomes Behavioural
38 Changes (28).
39
40

41 Different disciplines and teamworking bring different philosophies, problem-solving styles
42 and systems issues, while working together on a given clinical problem/scenario as a context
43 for decision-making (29). Students work was combined with the input from senior
44 teachers/practitioners (the intervention groups had the advantage of participating twice with
45 "other" professionals). This teaching could not ensure that participants would *continue* to
46 function as "members of the teams"; it aimed to improve their ability to communicate while
47 emphasizing that each profession work is based on the mastery and utilization of distinct
48 types of expert information, the acquisition of the ability of one profession to understand the
49 judgment, meanings and recommendations of "others", the "mastery of differing cognitive
50 and normative maps of different professions" (29). Teaching pointed towards recognition of
51 the limits of one's own type of knowledge and skill set, and the recognition when to rely on
52 the "others" (29) as confirmed by student feedback.
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56 Our medical and nursing students showed gains in RIPLs domains, thereby supporting a true
57 benefit from the experience. The immediate outcomes included students' perception of
58 improved: ability to work collaboratively, the knowledge that the "others" hold and the
59 importance of communication. The majority enjoyed this learning experience. It had a more
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3 positive impact on nursing students, with statistically significant improvements across all
4 aspects of the questionnaire. We speculate that this was probably related to the later stages of
5 their education and having more clinical experience.
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8 The free text about nursing students' expectations of IPE before the sessions included
9 concerns about their inadequate knowledge, fear of being undermined, intimidated, judged
10 inferior and not being taken seriously by medical students. Medical students' concerns were
11 about the effectiveness of this learning, as well as that they might appear proud or arrogant to
12 the nursing students, confirming that participants arrived with various assumptions about
13 the other members of the team (19). After IPE, nursing students highlighted that medical
14 students were not so different and the majority of all students stated that they now had no
15 concerns about IPE. Few medical students still stated that the groups were starting from
16 different knowledge levels/backgrounds or that IPE was happening too early in their
17 training.
18

19
20 During the sessions, almost all found it easy to contribute regardless of group (intervention
21 or control) or profession; IPE matched students' expectations, they enjoyed getting to know
22 more about the other role's perspective, and what they would do in different situations. IPE
23 helped their understanding of interprofessional collaboration, ability to work together, of
24 differences in training and expertise/skills/roles.
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27 Some students (mainly from the control group) complained about "long sessions" and
28 organisation; certain number of these students would not participate further unless the
29 activities were better organised and nursing students did not participate.
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32 The majority stated that the workshop met their expectations; a few said that it was more
33 useful than expected. A minority asked for more specific teaching on interprofessional
34 collaboration. The most commonly suggested curricular topics for future IPE sessions were
35 teaching about communication and ethics in geriatrics.
36

37
38 Despite recommendations in the literature for equal numbers from each profession in the
39 participating groups, this proved impossible to achieve. Yet this did not affect the positive
40 outcomes of IPE. The optimal size of the IPE groups of learners is not known (8); our results
41 indicate that 10 should be the maximum number in each group, though a few students
42 thought this number was too high.
43

44
45 The unplanned benefits of this teaching included strengthened links between practice-based
46 and university educators (NHS/Universities) and an IPE geriatric faculty development with
47 the plans for further development of undergraduate geriatric IPE. This open and flexible
48 approach by two academic institutions in collaboration with NHS trust staff enabled "cutting
49 through disciplinary boundaries" (19), emphasising that it is possible and indeed practicable
50 to combine uni- and interprofessional discourses. The results from this teaching may be seen
51 as confirming that the outcomes of IPE delivery in geriatrics are positive, regardless of the
52 form it takes (8), possible also due to conveying to the students the skills, knowledge and
53 energy of the geriatric teams and their ability to solve problems (30).
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Limitations and strength

The limitation includes the lack of better quantitative and qualitative research instruments (validated) for evaluating IPE outcomes in pre-qualification health care professional students (10,11,13).

Statistical analysis was limited by the fact that not all students returned the feedback forms (possibly missing more negative views, but this is less likely as completion was anonymous). However, some students commented that completing both questionnaires was time-consuming, possibly contributing to the reduced rate of feedback. The overall number of nursing students was smaller owing to the nursing school size; the control group consisted of only medical students for the same reasons. The other limitation was students' unequal levels of clinical experience at the time of their IPE workshop, with the nursing students having more than the medical students at the time of the workshop.

The strength of the study is the inclusion of a larger number of participants from both disciplines, the inclusion of the control group and that this was a controlled before-after study.

Conclusion:

Our findings have several implications for the undergraduate education in geriatrics. They indicate that some aspects of geriatric medicine can be delivered effectively to nursing and medical students through PBL IPE, if facilitated by educators from both professions. Developing IP skills is difficult with traditional, lecture-based teaching; this project describes one alternative way of delivering such teaching, showing that IPE can significantly improve students' attitudes to working and learning with other professions. This easily replicable teaching method provides a simple means of reinforcing the importance of collaborative working when looking after older patients.

While IPE had a more positive impact on nursing students, medical students had still shown statistically significant improvements in two domains (teamwork and collaboration and positive professional identity), revealing identical results in the intervention and control groups, suggesting that the delivery of geriatric IPE could be simplified and still successfully delivered to the undergraduate students by a mixed group of educators to the uni-professional groups of learners, via PBL method, "enabling the professions to learn with, from and about each other" (36).

Overall, IPE appeared to be successful in addressing some cultural issues that may have acted as barriers to working together, and in allowing groups to understand each other's perspectives, emphasising the importance of each role in MDT. A majority of students (both professions, intervention and control groups) believed the experience had enhanced their understanding of collaboration and their ability to work together, particularly boosting

nursing students' confidence in their expertise around their medical peers. This program demonstrated a simple, easily implementable yet effective means of providing appropriate education in geriatric medicine through IPE to medical and nursing students, applicable in the UK and abroad.

Future research into IPE in geriatrics should investigate the impact if only nursing students act as control group; if it occurs later in medical students' education; if sessions are longer and repeated; if they incorporate exclusively the topics suggested by the majority of students. Future research should also investigate what would happen if such teaching were delivered to other professions.

Key points

- Effective undergraduate geriatric IPE could be delivered in one session to the group not bigger than 10 students, not requiring equal number of learners from each profession
- Mixed group of educators successfully delivered IPE to a uni-professional group of learners via PBL method, as intervention and control groups had improved RIPL scores in the same domains
- IPE had more positive impact on nursing students, probably attributable to their more extensive clinical experience before geriatric IPE
- Geriatric IPE helped resolve some students' concerns; nursing about inadequate knowledge, medical about being perceived as arrogant
- The most commonly suggested topics for future geriatric IPE sessions were about communication and ethics

- ❖ The additional data available online, Supplementary data: 4 case scenarios used for IPE (the authors confirm that all case scenarios were invented for education purpose by Dr S Thompson)
- ❖ Patient and Public Involvement: there was no patient and public involvement
- ❖ The approval for the study was obtained by the Research Ethics Committees (CUREC); the reference number for this project is MSD-IDREC-C1-2014-027

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11 **Contributorship statements:**
12

13 S Thompson and K Metcalfe designed the study, acquired data, designed analyses and wrote
14 the paper.

15 K Boncey acquired data, performed statistical analyses, contributed to the manuscript.

16 C Merriman designed the study, acquired data and contributed to the manuscript.

17 L. Flynn designed and performed the statistical analyses and contributed to the manuscript.

18 GS Alg led the workshops, acquired data and contributed to the manuscript.

19 L Wright, J Beale, L Puffet, C Forde-Johnston led the workshops and acquired data.
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21

22 **S Thompson is the guarantor.**
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- ❖ Competing interests – S Thompson, C Merriman and L Flynn were supported by the HETV grant
- ❖ Funding – Health Education Thames Valley gave a small grant to support and develop IPE course
- ❖ Data sharing statement All authors are in agreement for a data sharing statement for this original research article
- ❖ Patient and Public involvement

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For peer review only

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Figure 1

Results for all nursing and medical students showed post-IPE statistically significant improvements in all four RIPL subscales

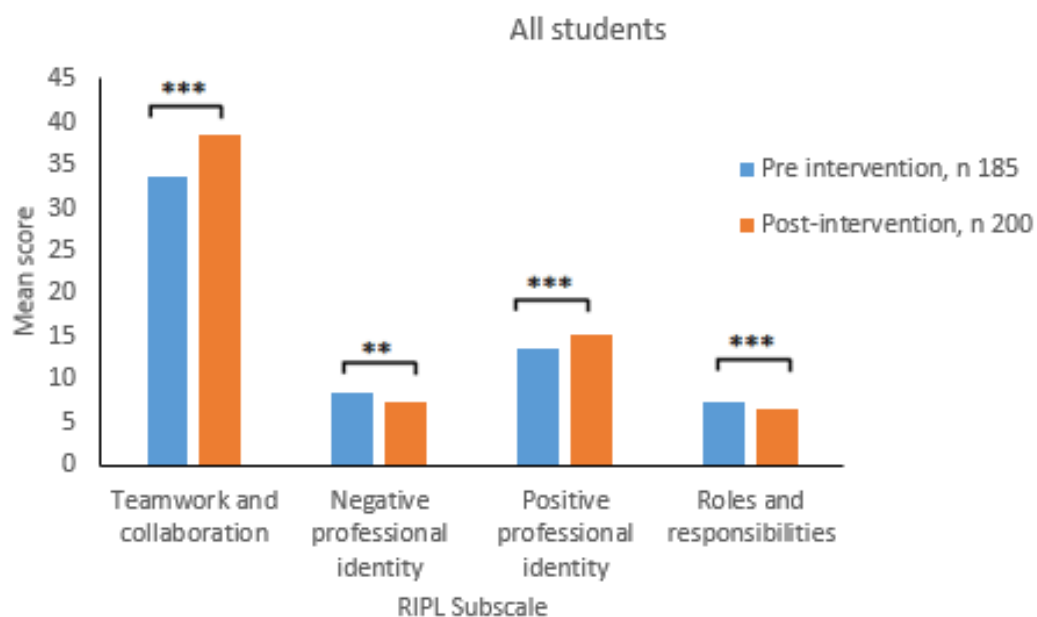


Figure 2

The nursing students in the intervention group showed post-IPE statistically significant improvements in all four RIPL subscales

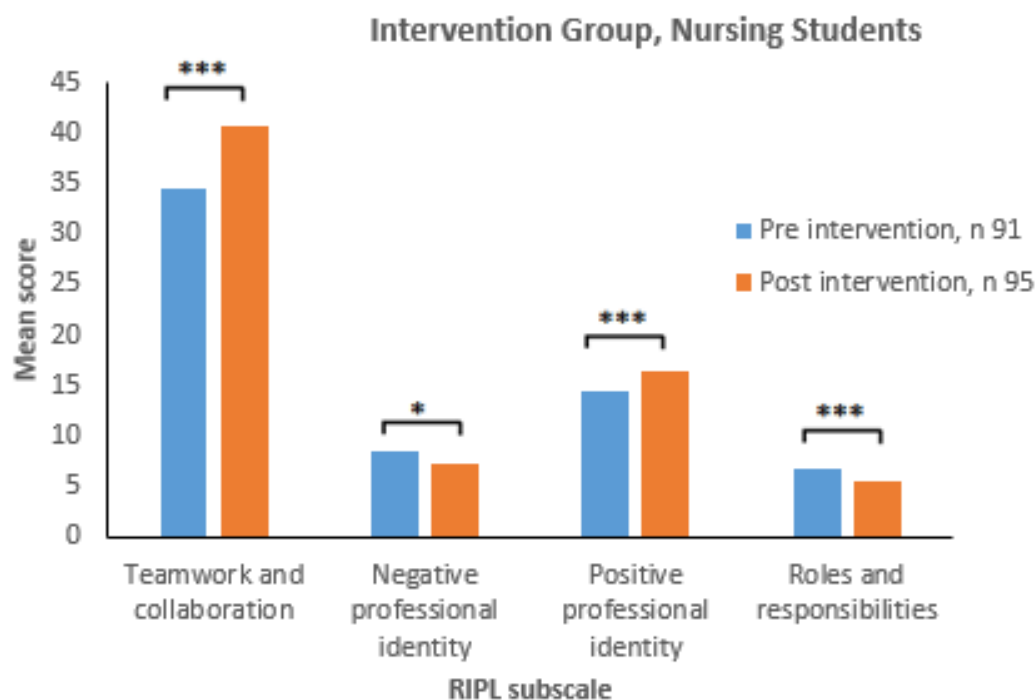


Figure 3

Post-IPE, the medical students in the intervention group showed statistically significant improvements in two RIPL subscales: teamwork and collaboration and positive professional identity

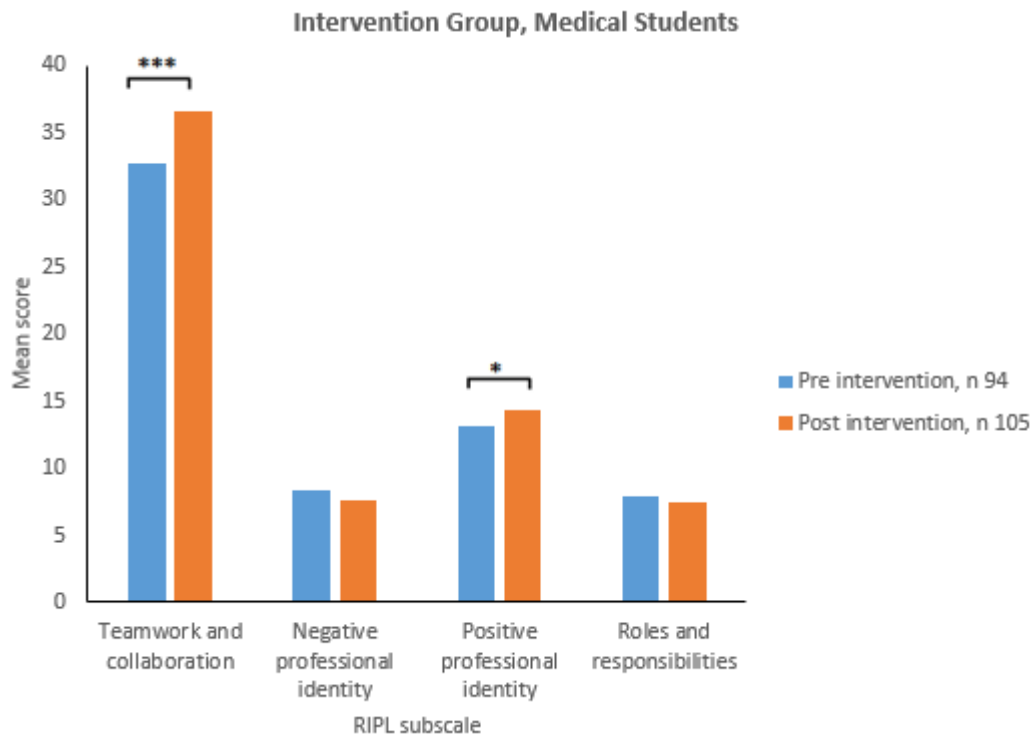


Figure 4

Post-IPE, the medical students in the control group showed statistically significant improvements in two RIPL subscales: teamwork and collaboration and positive professional identity.

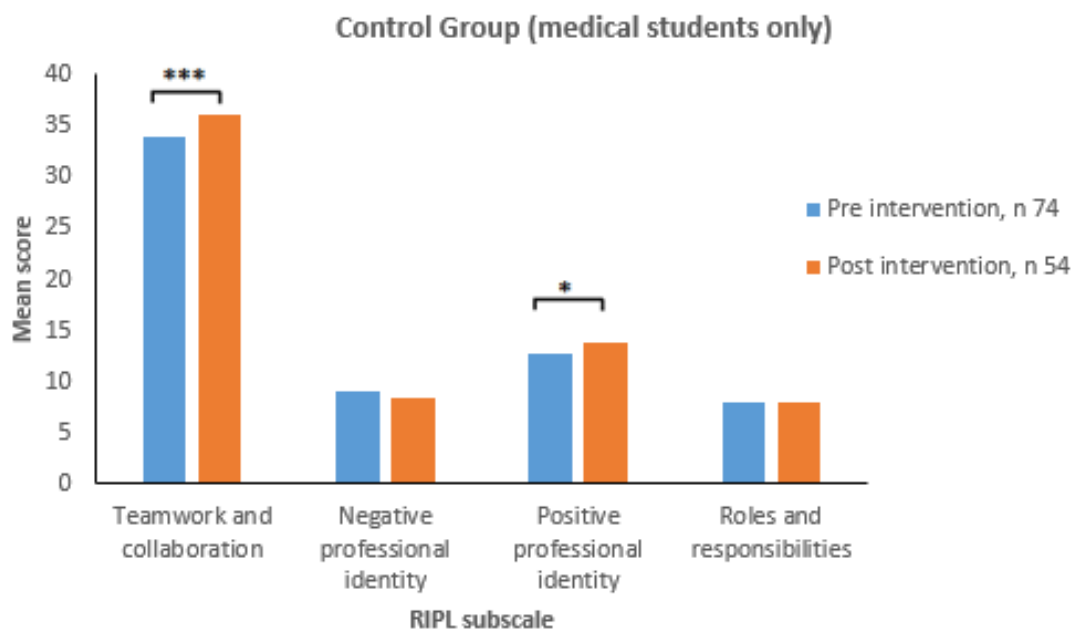
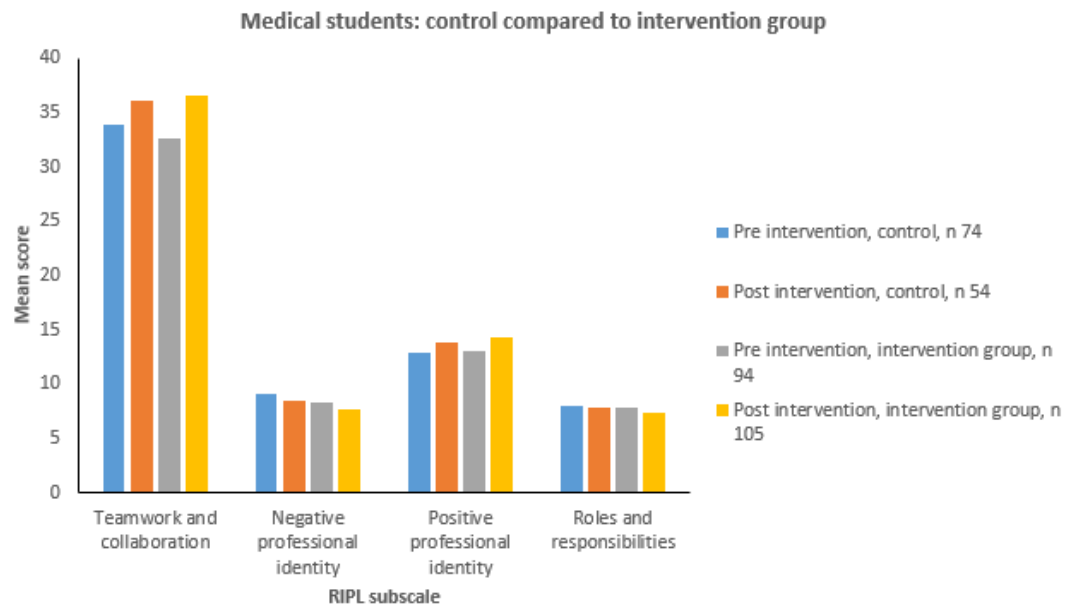


Figure 5

Post-IPE results show that medical students from the intervention and control groups had identical change in the RIPLS subscales.



Standard Information:

- You are expected to take the role of an FY1/staff nurse working in the Emergency Assessment Unit and in the Acute Geratology ward (you are **NOT** acting as a student here)
- You are not expected to undertake any examination

Case 1 (Acute deterioration)

An 84 year-old woman was admitted on the medical take with clinical signs and symptoms of pneumonia, which was confirmed on her chest x-ray and she was started on antibiotics and appeared to improve. She seemed well in the morning ward round, but later in the day, she became tachypnoeic (respiratory rate of 30 breaths per minute) and tachycardic (heart rate 135 per minute, regular). Whereas this morning she was talking normally, now she is confused and her conscious level seems to be deteriorating.

- 1) What are your priorities when dealing with a patient whose condition has acutely deteriorated?
- 2) How can such patients rapidly be identified before their condition becomes critical?
- 3) Please describe the role of nurse/doctor in such cases

Case 2 (Pressure Ulcers)

An 84 - year old woman is on the geratology ward being treated for a lower urinary tract infection. She has had a previous stroke and is known to have limited mobility. She experiences difficulty with activities such as feeding herself. She is found to have a pressure ulcer on her right heel.

- 1) What are the common sites for pressure ulcers and how are they identified?
- 2) What factors might contribute to development of pressure ulcers and how can they be prevented?
- 3) Please describe the role of nurse/doctor in such cases

Case 3 Assessing Mental Capacity for discharge from the hospital

A 76 year-old man is admitted onto the acute general ward. He presented to the Emergency Department last night after a fall. This morning he is distressed and confused. The staff nurse who was on duty overnight tells you he attempted to get out of bed several times and fell once during the night. He is insistent that there is nothing wrong with him and requests to be discharged. However when you speak to him further it is clear that he is still very confused and he is unable to tell you what happened the day before or where he lives.

- 1) How would you assess his capacity for the decision about his imminent discharge from the hospital?
- 2) How should you deal with a patient who lacks capacity to decide about the discharge and wants to leave hospital or if you need to perform a procedure that requires consent?
- 3) Please describe the role of nurse/doctor in such cases.

Case 4. Abuse?

Mr GL is a 78 year-old man who was admitted to the geratology ward after the referral from his GP, who was concerned by his swollen, painful and erythematous left leg, suspecting that he suffers from cellulitis. He has history of dementia for the past 2 years.

On examination he was found to have several circular burn marks on both forearms, bruising under the hairline, behind his ears and extensive bruising on both legs. He also appeared unkempt, with smelly clothes and traces of food all over his clothes.

1. What would be your initial steps in dealing with this discovery?
2. What are the risk factors for abuse in the older patients?
3. Please describe the role of nurse/doctor in such cases.

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Interprofessional education in geriatric medicine: towards best practice. A controlled before-after study of medical and nursing students

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Secondary Subject Heading:	Geriatric medicine, Medical education and training, Nursing
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Title page

Interprofessional education in geriatric medicine: towards best practice. A controlled before-after study of medical and nursing students

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Key words: geriatric medicine, interprofessional education (IPE), medical and nursing students, older people

Word count: 5986

Abstract

Objectives To investigate nursing and medical students' readiness for interprofessional learning before and after implementing geriatric Interprofessional Education (IPE), based on Problem Based Learning (PBL) case scenarios. To define the optimal number of geriatric IPE sessions, the size and the ratio of participants from each profession in the learner groups, the outcomes related to the Kirkpatrick four-level typology of learning evaluation, students' concerns about joint learning and impact of geriatric IPE on these concerns. The study looked at the perception of roles and expertise of the "other" profession in inter-professional teams, and students' choice of topics for future sessions. Students' expectations, experience, learning points and the influence on the understanding of IP collaboration, as well as their readiness to participate in such education again were investigated.

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3 **Design** A controlled before-after study (2014/15, 2015/16) with data collected immediately
4 before and after the intervention period. Study includes additional comparison of the results
5 from the intervention with a control group of students. Outcomes were determined with a
6 validated "Readiness for Inter-professional Learning" questionnaire, to which we added
7 questions with free comments, combining quantitative and qualitative research methods. The
8 teaching sessions were facilitated by experienced practitioners/educators, so each group had
9 both, a clinician (either geratology consultant or registrar) and a senior nurse.
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15 **Participants** 300 medical, 150 nursing students
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18 **Setting** Tertiary care university teaching hospital
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21 **Results**

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24 Analysis of the returned forms in the intervention group had shown that nursing students
25 scored higher on teamwork and collaboration post-IPE (M=40.78, SD=4.05) than pre-
26 (M=34.59, SD=10.36) - statistically significant. On negative professional identity they scored
27 lower post-IPE (M=7.21, SD=4.2) than pre- (M=8.46, SD=4.1) - statistically significant. The
28 higher score on positive professional identity post-IPE (M=16.43, SD=2.76) than pre-
29 (M=14.32, SD=4.59) was also statistically significant. Likewise the lower score on roles and
30 responsibilities post-IPE (M=5.41, SD=1.63) than pre- (M=6.84, SD=2.75).
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34 Medical students scored higher on teamwork and collaboration post-IPE (M=36.66, SD=5.1)
35 than pre- (M=32.68, SD=7.4) - statistically significant. Higher positive professional identity
36 post-IPE (M=14.3, SD=3.2) than pre- (M=13.1, SD=4.31) - statistically significant. The lower
37 negative professional identity post-IPE (M=7.6, SD=3.17) than pre- (M=8.36, SD=2.91) was
38 not statistically significant. Nor was the post-IPE difference over roles and responsibilities
39 (M=7.4, SD=1.85), pre-IPE (M=7.85, SD=2.1).
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43 In the control group medical students scored higher for teamwork and collaboration post-IPE
44 (M=36.07, SD=3.8) than pre- (M=33.95, SD=3.37) - statistically significant, same for positive
45 professional identity post-IPE (M=13.74, SD=2.64), pre-IPE (M=12.8, SD=2.29), while
46 negative professional identity post-IPE (M=8.48, SD=2.52), pre IPE (M=9, SD=2.07), and
47 roles and responsibilities post-IPE (M=7.89, SD=1.69), pre-IPE (M=7.91, SD=1.51) shown no
48 statistically significant differences. Student concerns, enhanced understanding of
49 collaboration and readiness for future joint work were addressed, but not understanding of
50 roles.
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3 **Conclusions** Educators with nursing and medical backgrounds delivered geriatric IPE through
4 case based PBL. The optimal learner group size was determined. The equal numbers of
5 participants from each profession for successful IPE is not necessary. The IPE delivered by
6 clinicians and senior nurses had an overall positive impact on all participants, but more
7 markedly on nursing students. Surprisingly, it had the same impact on medical students
8 regardless if it was delivered to the mixed groups with nursing students, or to medical
9 students alone. Teaching successfully addressed students' concerns about joint learning and
10 communication and ethics were most commonly suggested topics for the future.
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18 **Strength and limitations (summary)**

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21 The strengths:

- 22 • This is a novel evidence regarding good practice for geriatric undergraduate
23 Interprofessional Education derived from a large unselected (inclusive) cohort of
24 medical and nursing students
- 25 • A controlled before-after study, with students randomly assigned to the intervention
26 and control groups, combining quantitative and qualitative research methods
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33 The limitations:

- 34 • The number of nursing students was smaller, so the control group consisted of only
35 medical students
- 36 • The nursing students had more clinical experience than the medical students at the
37 time of the geriatric IPE
- 38 • Medical students were not divided by their entry level, they were mixed from
39 graduate-entry and standard-entry medicine course
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Introduction

The recommendations for Interprofessional education (IPE) from professional accreditation bodies for healthcare students (1, 2) relates closely to the specialty of Geriatrics, as being delivered by interprofessional teams. World Health Organisation (WHO) considers IPE to be “key to improving global health outcomes and to the global health workforce crisis”(3), the Institute of Medicine (IOM) recommends education in interprofessional team care for health professionals, while IP team-based practice is recognized as an essential model in health care (4, 5).

IPE is believed to prepare practitioners for effective teamwork, which is particularly important for the person-centered, “collaborative” geriatric care (6), with patients often presenting with complex issues, necessitating whole-team involvement in finding comprehensive solutions, as individual team members’ knowledge from the training of only one discipline is often not sufficient (7). This confirms the consensus among geriatricians (and other health care professionals), that the provision of good care

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3 for all older patients through only autonomous practice is not achievable (8). The theoretical basis for
4 IPE is well known (9). Nevertheless, IPE in geriatric medicine still lacks established standards and best
5 practice, for example regarding the optimal timing and delivery, or which IPE models are most
6 effective for addressing specific problems (10-14). It is well known that one of the difficult things to
7 learn in the healthcare provision process is the timing and the way of communication among healthcare
8 providers, both for teams and or individuals (8). Taking into consideration that professional identity
9 starts early in the training, the development and implementation of geriatric IPE modules are not
10 surprising (15, 16), however the literature on geriatrics IPE at undergraduate and postgraduate level is
11 still sparse. The geriatric IPE models address various problems regarding complex geriatric patients,
12 including problems in palliative geriatrics, comprehensive geriatric assessment, a clinic-based
13 consultation or a clarification of role confusion among members of the teams (16-19). Such education
14 is based on the presumption that skills for interprofessional care are not acquired “naturally” before
15 graduation, nor are they necessarily acquired with ongoing clinical experience (20). There are various
16 IPE models, even including some based on e-learning courses (21-23).

17 Previous work on IPE has shown that it can have advantages in improving staff morale and patient
18 outcomes and that the various interprofessional teams develop in different ways (e.g. differences in
19 surgical or geriatrics teams), the assumption is that certain teams in healthcare settings attract certain
20 personality types, but who share unique goals and values regarding care or specific issues in the
21 patients (12, 14). Some of the common core competencies outlined by the health professionals
22 (regardless of their specialty) being most important for the effective collaborative practice, are the role
23 understanding and communication (24).

24 As a step to meet the need for geriatric IPE at the undergraduate level, without compromising the
25 integrity of uni-professional medical and nursing education (25), a geriatric IPE was developed for
26 medical and nursing students and run as a controlled before-after study in Oxford (Medical School,
27 NHS Foundation Trust and Brookes University). Set in a tertiary care university-based teaching
28 hospital (John Radcliffe Hospital, NHS, Oxford University Hospitals), during the 2014/15 and 2015/16
29 academic years, a study aimed to identify an effective way of delivering undergraduate geriatric IPE.

32 **Methods**

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36 Data were obtained using mixed-methods (quantitative or qualitative), due to the complexity of
37 assessing IPE and possible confounding factors that could affect the validity of the results when
38 evaluating the impact of IPE (5). The study was conducted as a controlled before-after study, with data
39 collected immediately before and after the intervention period. It was decided at the planning stage that
40 a validated scale should be used for the evaluation. Use was made of the Readiness for
41 Interprofessional Learning Scale (RIPLS) (26) in a modified form, in order to assess the readiness of
42 healthcare students to engage in shared learning activities which consisted of four subscales:
43 Teamwork and Collaboration, Positive Professional Identity, Negative Professional Identity, and Roles
44 and Responsibilities (27). Students participating completed the modified RIPLS pre- and post-
45 intervention in both intervention and control groups, including a number of open-ended questions that
46 we added to the questionnaire to allow students to expand on their experiences in the teaching session
47 and to add to our understanding of the geriatric IPE (see Supplementary files 1 and 2).

48 ❖ Patient and Public Involvement: there was no patient and public involvement

52 **Student cohort**

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54 The workshops were delivered to medical students from Oxford University Medical School and
55 Nursing students from Oxford Brookes University. Medical students were at the beginning of their six-
56 week clinical attachment, mixed from Year 4 of the six-year course and Year 2 of the four-year
57 graduate entry course, preceding their clinical exposure to geriatrics-related problems. The researchers
58 did not know the medical students' affiliation. All medical students also attended the introduction
59 course to geriatrics and a communication skills workshop (addressing dementia/delirium and
60 challenging behaviours in older patients) during that teaching week (28). Nursing students were

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3 recruited from Years 2 and 3 (due to the significantly smaller number of nursing students in clinical
4 placements at the JR Hospital in Oxford, compared to medical students) of their three-year course. The
5 nursing students had already cared for older patients during previous clinical placements throughout
6 their course, their curriculum covering a life-span approach to theory and practice. None of the students
7 had any specific teaching in inter-professional collaboration prior to this session.
8 80 medical students (two groups of 40 from each academic year) could not be matched with nursing
9 students, so acted as the control group. The decision about the grouping of students to the intervention
10 and the control groups was determined exclusively by the number of students from both institutions
11 and their availability for clinical rotations (students allocations to the rotations was the routine
12 administration decision by both University organisations). So, all students were randomly
13 assigned to the intervention and control groups, this being determined by the separate timetables from
14 their respective institutions issued before this teaching. The formation of control groups was
15 determined by the available medical students who could not be matched with the nursing students on
16 the JR Hospital site due to their numbers.
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20 **Workshops**

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22 The sessions were based on Problem-Based Learning (PBL) with standardized case-scenarios relevant
23 to geriatric practice mapped to the learning objectives on the Joint Royal Colleges of Physicians
24 Training Board geriatric medicine curriculum (29) mirroring situations encountered by
25 clinicians/nurses, requiring an interprofessional collaborative approach (see Supplementary file 3).
26 The importance of the use of patients' narratives is well known to be fundamental for the development
27 of integrated patients assessment/management plans, allowing so called "layering" of the storyline by
28 different members of the team during IPE sessions, and enhancing the profession's own sense of
29 identity and uniqueness (14), leading to increased appreciation of the role of the "others" (30).
30 Each workshop comprised approximately 30 to 45 minutes of introduction by a senior clinician and a
31 nurse, followed by two hours of self-directed learning and a session facilitated jointly by nurses and
32 geriatricians, aiming to facilitate professional socialization (31) and collaboration through constructive
33 discussion about the skills required from each profession when caring for older patients. It aimed to
34 build higher-level skills (such as reflection by students/facilitators) and co-operative learning (4) while
35 problem-solving these cases. A short power point presentation contained several slides explaining the
36 venues, the structure of the sessions and the names of the facilitators designated for each group. The
37 presentation also included basic information about one case (as an example) that students will work on,
38 with few images related to the themes of the cases (e.g. patient's hands with severe psoriasis after
39 treatment refusal to illustrate self-neglect/abuse). Students were encouraged to discuss all cases in a
40 way they felt was important from their professional point, including the initial nursing and medical
41 management steps (e.g. patient hygiene, ABCD), main nursing and medical concerns in the
42 continuation of care for each case, how to approach the shared role needed in the management of these
43 patients – the complementary roles or how to plan early interdisciplinary involvement.

44 The group was then split to accommodate similar numbers of attendees according to their roles as
45 medic or nurse, to ensure an even spread of disciplines. Each IPE subgroup never had more than 10
46 members to aid discussion. Each student received a typed worksheet with all case scenarios and several
47 suggested questions to help discussion of each case, related to the problems relevant to both
48 professional groups. Students were allocated an hour to work through the case scenarios on their own,
49 without facilitators and were expected to complete most of the work themselves first. The groups had
50 another hour allocated afterwards with 2 lead facilitators from each profession (a geriatrician and a
51 senior nurse), in order to discuss these cases. The input from them was to encourage further discussion
52 about potential problems when managing these cases, about the roles of each professional and to hear
53 their experience with these or similar cases. Both facilitators reflected on their own experience of such
54 cases/situations. The mixed groups could discuss the scenarios with the "other" profession during both
55 sessions – something that was possible for the control group in its final session with the facilitators,
56 with the emphasis on each profession's contribution/ collaboration/ role in the management of given
57 cases.
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59 **Statistical analyses**

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3 The potential problems if using only a single quantitative or qualitative method for assessing the
4 learning outcomes of IPE are well known (12, 25, 32-34), so the assessment was carried out with
5 mixed (quantitative and qualitative) methods, anonymously, on a voluntary basis. The quantitative
6 analysis was conducted with a validated modified questionnaire, "Readiness for Inter-professional
7 Learning" (RIPL) which assesses participants across four subscales (Supplementary files 1 and 2) (26,
8 27, 32). Additionally, we created additional questions with free comments addressing students'
9 perception of the roles of nurses/doctors, their concerns about interprofessional working; curricular
10 topic suggestions for future IPE sessions; students' expectations, the type of experiences encountered,
11 and the impact of the workshop on their understanding of collaboration and their ability to work
12 together in future. The questionnaire was administered before and after the workshop.
13 Data were transcribed by KM, KB, ST, HB, on a Microsoft Excel spreadsheet and the results from
14 RIPL were analysed with a Wilcoxon signed-rank test by LF. For the open-ended questions, all
15 responses were transcribed by ST, HG to a spreadsheet and coded and analysed by LF. LF who is a
16 non-specialist from the wider team and experienced qualitative researcher analysed all free text
17 responses (35). Qualitative data from the free text questionnaire was analysed using NVivo (version
18 10). 300 medical and 150 nursing students participated.
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27 **Results**

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29 In quantitative assessment we compared mean RIPL subscale scores with a Wilcoxon signed-rank test
30 to determine if the IPE intervention had changed students' attitudes.
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32 When all the results from all students are analysed for the intervention groups for the students who
33 returned their forms (185 pre-intervention and 200 post-intervention), the statistically significant
34 improvements post-IPE was found in all four RIPL subscales, due mainly to nursing students
35 responses: teamwork and collaboration, positive professional identity, roles and responsibilities, and
36 negative professional identity, Figure 1.
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But, when a T-test is applied to the forms from the nursing students only (pre-intervention 91, post-intervention 95 returned forms, Figure 2) it showed, on average, that participants scored higher on teamwork and collaboration post-IPE (M=40.78, SD=4.05) than pre-IPE (M=34.59, SD=10.36). This difference was statistically significant ($t(-5.32)=115.86, p=.000$). Participants scored lower on negative professional identity after IPE (M=7.21, SD=4.2) than before it (M=8.46, SD=4.1). This difference was statistically significant ($t(2.06)=183.94, p=.041$). Participants on average scored higher on positive professional identity (M=16.43, SD=2.76) post-IPE than prior to the IPE session (M=14.32, SD=4.59). This difference was statistically significant ($t(-3.78)=146.2, p=.000$). On average, participants scored lower on roles and responsibilities after IPE (M=5.41, SD=1.63) than before it (M=6.84, SD=2.75). This difference was statistically significant ($t(4.27)=145.14, p=.000$).

As shown in Figure 3, the analysis of the returned forms from the medical students from the intervention group analysis (pre-intervention 94, post-intervention 105 returned forms) had revealed that they had scored higher on teamwork and collaboration post-IPE (M=36.66, SD=5.1), than pre-IPE (M=32.68, SD=7.4). This difference was statistically significant ($t(-4.36)=162.43, p=.000$). Also, these students on average scored higher on positive professional identity (M=14.3, SD=3.2) post-IPE than prior to the IPE session (M=13.1, SD=4.31). This difference was statistically significant ($t(-2.24)=197, p=.026$). However, these medical students scored lower on negative professional identity after IPE (M=7.6, SD=3.17) than before it (M=8.36, SD=2.91). This difference was *not* statistically significant ($t(1.69)=197, p=.092$), and there was little difference in post-IPE for roles and responsibilities after IPE (M=7.4, SD=1.85) than before it (M=7.85, SD=2.1). This difference was not statistically significant ($t(1.58)=197, p=.116$).

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The results for the control group of students that returned the forms (pre-intervention 74, post-intervention 54) are shown in Figure 4. Post-IPE results had shown the significant improvements in the teamwork and collaboration (M=36.07, SD=3.8), than pre-IPE (M=33.95, SD=3.37). This difference was statistically significant ($t(-3.35)=126, p=.001$). The control group had scored higher on positive professional identity subscales (M=13.74, SD=2.64) post-IPE than prior to the IPE session (M=12.8, SD=2.29). This difference was statistically significant, ($t(-2.16)=126, p=.033$).

The control group scored slightly lower on negative professional identity after IPE (M=8.48, SD=2.52) than pre IPE (M=9, SD=2.07). This difference was not statistically significant, ($t(1.23)=100.42, p=.219$). They also on average differed little on roles and responsibilities (M=7.89, SD=1.69) pre (M=7.91, SD=1.51) than post-IPE. This difference was not statistically significant, ($t(.11)=126, p=.916$).

Unexpectedly, the results collected from all medical students show that both the intervention and control groups have the same outcome and this is illustrated in Figure 5.

All feedback forms were assessed for free-text comments.

Tables with free comments:

Qualitative Data Pre- and Post-IPE for the Intervention and Control Groups

Open-ended questions and results

Awareness of roles, expertise and responsibilities (Tables A, B)-In terms of the actual session, both groups enjoyed getting to know more about the other role's perspective and what they would do in different situations. They also enjoyed learning about how they could collaborate with one another. Medical students found IPE improved their understanding of nursing priorities and thinking, and also found that illustrated the differences in expertise/skills and roles between the two groups. Both groups enjoyed sharing their different experiences.

Nursing students concerns about IPE (Tables A, B)-Prior to the session concerns about learning alongside medical students; they felt intimidated and feared there would be a hierarchy, but IPE appeared to be successful in removing these concerns, with nursing

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3 students finding the sessions very open and comfortable who also indicated that they found
4 easy to contribute to the session, and they found the group to be very welcoming and
5 respectful, and the session to be very relaxed. The results of this study also suggest that the
6 nursing students became more confident as a result of the teaching; with some indicating that
7 they would be happier to approach a doctor in the future or share information with them. It
8 would appear that IPE resulted in boosting nursing confidence around their medical peers,
9 and decreased concerns about feelings of inferiority/intimidation. Nursing students suggested
10 that the teaching session highlighted the fact that medical students were not so different to
11 nursing. It's also interesting that post-IPE nursing students appeared to be more specific in
12 defining their own areas of expertise and in some way shifted nursing perspectives of their
13 own expertise, describing more expertise than prior to IPE.
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21 *Medical students concerns about IPE (Tables A, B)* were about working with nursing students
22 being perceived as *arrogant, pretentious and condescending* prior to the session. During the
23 session, they found it very easy to contribute, regardless of group (intervention or control) and
24 both felt IPE had emphasized the importance of communication. Both professions also felt
25 that teaching had improved their knowledge of the roles in the Multidisciplinary Team (MDT).
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30 In terms of *perceptions* of each other's role pre- and post-IPE (*Tables A, B*) view of the
31 doctors' role remained the same across both professional groups and teaching conditions
32 (active vs. control). Everyone viewed this role as one focused on diagnosis and treatment,
33 with some clinical decisions making. In terms of the nursing role, nursing students'
34 perceptions also did not change much post-IPE, but more nursing students discussed the fact
35 about the roles and responsibilities for working collaboratively for the best of the patient
36 interests. This was not a common theme amongst the medical student responses in either the
37 intervention or the control groups. Similar to role, both nursing and medical student
38 perceptions of doctors' expertise did not change much post-IPE. Perceptions of the role very
39 much focused on doctors' medical knowledge and knowledge of treating the patient. Medical
40 student descriptions of nursing expertise also didn't appear to change much across either
41 groups or condition. However, as stated earlier, nursing student perceptions of nursing
42 expertise were somewhat more extensive post-IPE.
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52 *Curriculum topics* The list created initially pre-IPE by students for the future topics varied a bit,
53 but post-IPE the most common topics suggested by both groups included working on case
54 scenarios, communication, ethics, the deteriorating patient and emergency situations. What's
55 even more interesting is the fact after teaching some of the control group suggested
56 doctor/nursing roles as a topic for future teaching (*Tables A, B*).
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Receptiveness to geriatric IPE-it was received generally in a positive light by both healthcare groups, but slightly more so by nursing students. It appears to have reinforced the importance of collaborative working, with a majority of students believing it had improved their ability to work collaboratively and most stating that they would be happy to participate again (*Table C*).

Expectations of IPE (*Table C*) varied amongst the students before the session, but post-IPE most students expressed positive views and felt that it was more useful than they had expected it to be. Out of both nursing and medical students, nursing students appeared more open to the overall concept of IPE, unlike medical students. Some medical students had higher expectations from the feedback sessions and their learning about the nurses' role. Majority of students in both groups enjoyed this experience, found *contribution/voicing opinion during IPE* easy and would like to take part in IPE again (*Table C*).

Understanding of inter-professional collaboration (*Table C*)-Both groups felt that the teaching enhanced their understanding of inter-professional collaboration and increased their ability to work collaboratively. Nursing students felt their ability had been enhanced through a better understanding of the roles in MDT and the doctor's perspective. Medical students believed their ability was improved through a better understanding of the nursing perspective and indicated they would value the views of other healthcare professionals. Only a minority of students felt it hadn't increased their understanding or ability.

Future IPE sessions-included comments about better organisation, that smaller groups were more effective and some preferred a shorter session (*Table C*).

TABLE A

Qualitative Data Pre - IPE for the Intervention and Control Groups: *Awareness of roles, expertise and responsibilities; Nursing and medical students concerns about IPE, Curriculum topics*

Qualitative Data Pre-IPE	Intervention Group		Control Group
	Nursing students	Medical students	Medical students
Role (of the "other")	Doctor: <ul style="list-style-type: none"> • Diagnosis and treatment of the patient 	Nurse: <ul style="list-style-type: none"> • Provides practical care 	Nurse: <ul style="list-style-type: none"> • Provides practical care

		<ul style="list-style-type: none"> Provides support for the patient 	<ul style="list-style-type: none"> Communicates patients' issues Implements medical plans and working with doctors
Expertise	<p>Doctor:</p> <ul style="list-style-type: none"> Clinical knowledge 	<p>Nurse:</p> <ul style="list-style-type: none"> Patient care and monitoring Medical knowledge Safeguarding Patient comfort Patient concerns 	<p>Nurse:</p> <ul style="list-style-type: none"> Knowledge of patient needs Practical care and management Communication skills
Concerns about IPE	<p>Concerns:</p> <ul style="list-style-type: none"> To have inadequate knowledge Being undermined Being intimidated Judged to be inferior Not being taken seriously by medical students Anticipation of a hierarchy within the group <p>Example comments:</p> <p><i>"Nervous I will not have enough clinical knowledge to contribute effectively and they will judge"</i></p> <p><i>"Personally I am intimidated learning alongside medical students"</i></p>	<p>Concerns:</p> <ul style="list-style-type: none"> Tailoring learning to both student groups and its effectiveness Groups will have very different learning objectives, expectations and barriers Appearing proud or arrogant to their nursing student colleagues <p>Example comments:</p> <p><i>"We need to learn different things"</i></p> <p><i>"Appearing arrogant, pretentious, condescending, proud"</i></p>	Similar results to medical students in the intervention group
Curriculum Topics	<ul style="list-style-type: none"> Communication Ethics 	<ul style="list-style-type: none"> Communication Ethics 	<ul style="list-style-type: none"> Communication Assessment and management of the complex

	<ul style="list-style-type: none"> • Case based teaching • Teamwork • Clinical Skills • Assessment and management of the acutely unwell patient 	<ul style="list-style-type: none"> • Case based teaching • Assessment and management of the acutely unwell patient 	patients and situations
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TABLE B

Qualitative Data Post-IPE for the Intervention and Control Groups; Awareness of roles, expertise and responsibilities; Nursing and medical students concerns about IPE, Curriculum topics

Qualitative Data Post-IPE	Intervention Group		Control Group
	Nursing Students	Medical students	Medical students
<p>Role (of the "other")</p> <p>No significant difference pre- and post-IPE groups for all</p>	<p>Doctor:</p> <p>Same as pre-IPE group. However, much more appreciation of working with doctors</p> <p>Example Comment: "To support each</p>	<p>Nurse:</p> <p>Same as pre-IPE group. However, much more appreciation on the other nursing roles</p> <p>Example Comment: "Patient care and</p>	<p>Nurse:</p> <p>No significant difference pre- and post- IPE groups</p>

	<i>other [to] benefit patient"</i>	<i>monitoring, executing management plan, liaising with the doctors and other healthcare professionals"</i>	
Expertise No significant difference pre- and post-IPE groups for all	Doctor: However, more emphasis on doctors having much more in-depth knowledge of anatomy, physiology and treatments	Nurse: However, more emphasis on nurses' having more knowledge of the patient and what is key to their welfare	Nurse: No significant difference pre- and post-IPE groups
Concerns about IPE	Concerns: Most expressed they now had no concerns post-IPE A few students expressed ongoing concerns about difference in knowledge base Example Comments: <i>"Not anymore (concerns)"</i> <i>"Knowledge difference"</i>	Concerns: Overall less concerns than pre-IPE group Some still believed that students were starting at a different level of knowledge, so different focuses were needed for each group Example Comments: <i>"Some differences in type of knowledge made it difficult to work together at points"</i> <i>"It feels like a bit of a waste of time, we have very different teaching usually with very different focuses"</i>	Similar results to medical students from the intervention group
Curriculum Topics	No significant change between pre- and post-IPE groups.	No significant change between pre- and post-IPE groups.	<ul style="list-style-type: none"> • Communication • Ethics • Falls • Assessment and management of the acutely

			unwell patient
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TABLE C

Qualitative Data Post-IPE for the Intervention and Control Groups; *Ease of contribution/voicing opinion during IPE, Meeting the expectations from IPE, Participating in IPE again, Enjoyment in IPE, Learning points from IPE, Understanding collaboration, The impact of IPE on the ability to work collaboratively*

Post-intervention questions – Regarding Experience from IPE and from Interacting with Nursing/Medical student colleagues	Nursing Students	Medical Students
<p>Ease of contribution/voicing opinion during IPE</p>	<ul style="list-style-type: none"> Majority found contribution to the group easy/very easy. Some felt this was even easier in small groups Nursing students expressed feeling generally comfortable and respected. The group was friendly and listened A minority felt there were some individuals (profession of those individuals was not stated) that dominated the group <p>Example Comments:</p> <p><i>“Very easy, relaxed, no judgement, we all learned”</i></p> <p><i>“Very easy, I felt everyone was interested in what everyone had to say”</i></p>	<ul style="list-style-type: none"> Majority found contribution easy Smaller groups were helpful Groups were welcoming and the teaching relaxed <p>Example Comments:</p> <p><i>“Very easy, relaxed and inclusive atmosphere”</i></p> <p><i>“Fine, good welcoming people who valued all opinions and we all gained valuable experience from each other”</i></p> <p><i>“Easy- small groups”</i></p>
<p>Expectations of IPE</p>	<ul style="list-style-type: none"> Majority stated it was what they expected Few had expected to learn from scenarios, to learn about peers and about how to work well together Some did not expect it be so useful and many said it was better than they would have expected <p>Example Comment:</p>	<ul style="list-style-type: none"> Majority stated it was either as expected or better than expected Some expected to learn more about their peers role and their perspective Some expected smaller groups A minority did not find the feedback session as useful as expected <p>Example Comment:</p>

	<p><i>"Better, I guessed I wouldn't have a say, but I learnt a lot"</i></p>	<p><i>"Feedback did not target how to work together"</i></p>
<p>Taking part again</p>	<ul style="list-style-type: none"> Majority would be happy to participate again but asked for better organisation, timings and more information in advance <p>Example Comment: <i>"Yes, found it interesting as different perspective, plus we'll all be working together in the future so good to get an understanding of each other's roles"</i></p>	<ul style="list-style-type: none"> Majority would be happy to participate again, as it allowed them to learn about nursing responsibility role, experience and expertise A few wouldn't participate again. They felt sessions could have been better organised and structured. Some suggested shorter and more time efficient workshops, and changing the format of delivering the sessions <p>Example Comments: <i>"Yes, in principle, but on more balanced topics- I didn't find this very useful (large groups). Small groups were useful"</i></p> <p><i>"Yes, lovely to meet nursing students and learn what we do and can expect from each other professionally"</i></p>
<p>Enjoyment</p>	<ul style="list-style-type: none"> Most enjoyed having the opportunity to understand a doctor's perspective and learning about the role of a doctor, in addition to sharing ideas, knowledge and different experiences Minority enjoyed thinking about collaboration between the two roles and becoming more self-confident as a result of the teaching session Some felt sessions were too long <p>Example Comment: <i>"Liaising about their point of view, being more confident around medical students"</i></p>	<ul style="list-style-type: none"> Most enjoyed getting to understand the nursing perspective, learning more about the nursing role and hearing about different nursing experiences Some mentioned it was helpful to understand nursing priorities and others enjoyed thinking about collaboration between the two roles Some felt sessions were too long <p>Example Comment: <i>"Seeing their point of view and experience"</i></p>
<p>Learning</p>	<ul style="list-style-type: none"> IPE helped to define their strengths and what their area of expertise is. This included reinforcing for nursing students that medical students don't know everything and can have similar concerns to them Some indicated they had learnt more 	<ul style="list-style-type: none"> Learning in terms of difference in expertise/skills and roles between the two The importance of communication with other healthcare professionals and the value of their views and the value of their views. Appreciated learning about aspects of

	<p>about how to collaborate with other HCPs and about differences in training</p> <p>Example Comments:</p> <p><i>"Confidence in what I know and realising that medics don't know everything either"</i></p> <p><i>"Hearing they are also anxious to qualify"</i></p> <p><i>"Learnt more about what education is like for medical students"</i></p>	<p>healthcare that they didn't know about.</p> <p>Example Comments:</p> <p><i>"[nurses] know much more about basic patient care"</i></p> <p><i>"Very useful to communicate with other health care professionals and their views are very useful"</i></p>
<p>Understanding collaboration</p>	<p>Most nursing and medical students felt positive about the IPE teaching session and felt it had improved their understanding of both roles and the knowledge that nurses hold and have emphasized the importance of communication. They also felt that teaching had improved their knowledge of the roles in the Multidisciplinary Team (MDT).</p> <p>Example Comments:</p> <p><i>"Better understanding of each other's role and what we bring to MDT"</i></p> <p><i>"Given a perspective on what nurses are expected to know"</i></p> <p><i>"It's nice to hear the thought process of the student nurses, understand better their reasons to call FY1s!"</i></p> <p><i>"We can learn from nurses about practical areas that we have less knowledge"</i></p>	
<p>Ability to work collaboratively</p>	<p>Overall, nurses felt more confident about approaching or communicating with other healthcare professionals</p> <p>Example Comments:</p> <p><i>"[teaching session] has made me more confident in interacting with other members of the healthcare team"</i></p> <p><i>Improved ability to work collaboratively by enhancing their understanding of their role in the MDT and an improved understanding of the "doctor's" perspective in different scenarios.</i></p> <p><i>"Helped me see the patient condition from their perspective and how they would manage the situation"</i></p>	<p>The majority stated it improved their ability through a better understanding of the nursing perspective and the role. A minority were did not know if it affected their ability</p> <p>Example Comments:</p> <p><i>"Proven it is something I agree with; other medical professionals are essential to work along side with as soon as possible"</i></p> <p><i>"Helped me to see the patient condition from their perspective and how they would managed the situations"</i></p> <p><i>"Improved ability to hold constructive discussion with other professionals"</i></p>

Please note real Comments from students are in written in Italics

Discussion

This workshop was developed to promote interprofessional education, through better understanding of

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3 participants' own and others' professional roles (nursing/clinicians), through observation and
4 exploration of participants' reciprocal perceptions, participating in cooperative learning (36) and
5 collaborating practice between "old-timers and newcomers", where more skilled practitioners assist the
6 learner's development beyond their competence (10, 37, 38). The promotion of participants'
7 responsibilities, joint working/decision-making, interchanging interprofessional knowledge, problem-
8 solving (39, 40), mutual respect, trust-development based on the knowledge of the role performance,
9 behaviours, attitudes, communication, coordination and negotiation, while working on common
10 geriatric problems that are relevant to both professions (10, 14, 41-46), were encouraged.
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13 The workshop also aimed to promote cooperative learning, positive interdependence, face-to-face
14 interaction, individual accountability, interpersonal and small-group skills and group processing. This
15 group- and case-based IPE replaced the model where students learn exclusively from the instructor,
16 emphasising instead learning closer to real-world settings, based on cooperation, requiring students to
17 work collaboratively (14). However, it was assumed that IPE facilitators possess some key knowledge
18 and skills, such as the ability to manage diverse expectations and who were focused more on
19 encouraging students to ask the right questions in a group context (47).

20
21 The literature describes many methods for delivering IPE to health professionals, regardless of
22 specialty, including attending common courses, IP healthcare team activities, patient simulations, and
23 elective live-in placements (45, 46, 48, 49), based on the assumption that IPE-related general principles
24 are applicable to education in geriatric medicine (12). Difficulties encountered while setting up IPE in
25 undergraduate geriatrics, included the lack of data for selecting the following: optimal students level of
26 clinical experience and education, best teaching methods, most suitable curriculum topics for such
27 teaching, optimal number of students per teaching group, length and number of sessions. Also, other
28 encountered difficulties included the timetabling of large number of students/staff from three different
29 organisations, securing adequate teaching space and qualified teachers and how best to evaluate the
30 teaching.

31
32 Our IPE sessions were based on geriatric case scenarios and allowed close contact between IP tutors
33 from both disciplines and students in groups, who reflected on cases/practice-reflection: a "prerequisite
34 of professional caring" including situated learning (10, 42, 50, 51). The emphasis was on promoting
35 ethical practice, relationship-centred care, collegiality, learning together and also learning about each
36 other, communication including narrative methods (48, 52, 53), all possibly influencing hidden
37 curriculum. This teaching relied on theories that IPE is based on social, cooperative and collaborative
38 learning, the so-called group model, where learning is created in the interaction/interrelationship with
39 others, related to the formation of clinical judgment, that the knowledge from IPE could be acquired
40 from the faculty and peers, allowing students to gain a view of "others' professions" by feeling,
41 watching and thinking. The sessions complied with the level 1 and 2 of the Classification of
42 Interprofessional Outcomes Behavioural Changes (54). These results are in accordance with the results
43 of the IPE studies, showing positive reaction of learners to IPE, and improvements in
44 attitudes/perceptions and collaborative knowledge/skills. What is still needed is further research is the
45 evidence about geriatric IPE effect on behaviour, benefit to patients and longer-term outcomes (55).
46

47
48 Different disciplines and teamworking bring different philosophies, problem-solving styles and
49 systems issues, while working together on a given clinical problem/scenario as a context for decision-
50 making. Students work was combined with the input from senior teachers/practitioners (the
51 intervention groups had the advantage of participating twice with "other" professionals). This teaching
52 could not ensure that participants would continue to function as "members of the teams"; it aimed to
53 improve their ability to communicate while emphasizing that each profession work is based on the
54 mastery and utilization of distinct types of expert information, the acquisition of the ability of one
55 profession to understand the judgment, meanings and recommendations of "others", the "mastery of
56 differing cognitive and normative maps of different professions". Teaching pointed towards
57 recognition of the limits of one's own type of knowledge and skill set, and the recognition when to rely
58 on the "others" as confirmed by student feedback (36, 56, 57).

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60 Our medical and nursing students showed gains in RIPLs domains, thereby supporting that there was a
true benefit from the experience, correlating to the results from other IPE studies (17). The success of

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3 this teaching may be also attributed to the nature of geriatrics as a collaborative specialty, and to the
4 educators' collaborative approach (characteristic for geriatrics problem-solving) in all given cases,
5 contributing both to the students' positive attitude and to the positive results of the study. For it is well
6 known example that nursing-practitioner (NP) interactive communication with the team members was
7 commonly reported as enhancing team collaboration and its efficiency (58, 59).
8

9 Interestingly, the intervention and control groups with medical students only had similar
10 results with the improvements of the RIPL scores in the same domains, raising the possibility that
11 the group of geriatric educators when mixed from two different health professions, are capable together
12 to successfully deliver geriatric IPE to the uni-professional groups of learners via PBL method. This
13 can have important implications for the future practice making IPE delivery simpler. This teaching
14 allowed participants to reflect, correct each other's biases and to see the viewpoint different from their
15 own and for the control group this was also possible, as facilitators represented the "other discipline"
16 (14, 39, 40, 60). Further research is necessary to untangle the impact of geriatric speciality
17 itself from the impact of geriatric IPE, and to look what would happen if the same geriatric IPE
18 is delivered to the different profession (e.g. nursing students only), including what impact
19 would such IPE have, if geriatrics is replaced with a different speciality.
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24 IPE had a more positive impact on nursing students, with statistically significant improvements across
25 all aspects of the questionnaire. We speculate that this was probably due to their more extensive
26 clinical experience where they may have already encountered clinical situation needing collaboration
27 between members of the multidisciplinary teams influencing their perception of their and other
28 professions' roles, as well as their better and earlier integration when compared with medical students
29 in the uni-professional teams being less "observers", but more "workers" incorporated in their teams
30 (61,62).

31 The immediate outcomes included students' perception of improved: ability to work collaboratively,
32 the knowledge that the "others" hold and the importance of communication. The majority enjoyed this
33 learning experience.
34

35 The free text about nursing students' expectations of IPE before the sessions included concerns about
36 their inadequate knowledge, fear of being undermined, intimidated, judged inferior and not being taken
37 seriously by medical students. Medical students' concerns were about the effectiveness of this learning,
38 as well as that they might appear proud or arrogant to the nursing students, confirming that participants
39 arrived with various assumptions about the other members of the team (14). After IPE, nursing students
40 highlighted that medical students were not so different and the majority of all students stated that they
41 now had no concerns about IPE. Few medical students still stated that the groups were starting from
42 different knowledge levels/backgrounds or that IPE was happening too early in their training.
43

44 During the sessions, almost all found it easy to contribute regardless of group (intervention or control)
45 or profession; IPE matched students' expectations, they enjoyed getting to know more about the other
46 role's perspective, and what they would do in different situations. IPE helped their understanding of
47 interprofessional collaboration, ability to work together, of differences in training and
48 expertise/skills/roles.
49

50 Some students (mainly from the control group) complained about "long sessions" and organisation;
51 certain number of these students would not participate further unless the activities were better
52 organised and nursing students did not participate. This was understandable: they needed less time to
53 complete their tasks in the first place, as they were not paired with nursing students.
54

55 The majority stated that the workshop met their expectations; a few said that it was more useful than
56 expected. A minority asked for more specific teaching on interprofessional collaboration. The most
57 commonly suggested curricular topics for future IPE sessions were teaching about communication and
58 ethics in geriatrics.
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60 Despite recommendations in the literature for equal numbers from each profession in the participating
groups, we could not achieve it. Yet this did not affect the positive outcomes of IPE. The optimal size

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3 of the IPE groups of learners is not known (12): our results indicate that 10 should be the maximum
4 number in each group, though a few students thought this number was too high. From our experience
5 we learned that the groups should have 10 or less than 10 students, as better quality discussion is
6 achieved in smaller groups where every member had a voice that was not lost. A big challenge with
7 organising IPE was the logistics of finding appropriate space.
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9 The unplanned benefit of this teaching included strengthened links through joint work between
10 practice-based clinicians and university educators (NHS/Universities). Overall positive feedback from
11 the students had impact for the future teaching: the new plans for the further development of
12 undergraduate geriatric IPE will also include other students (paramedics and pharmacy) who will join
13 medical and nursing students in the future teaching sessions. The significant changes are to be
14 implemented, as the direct consequences of the results of this study are the inclusion of more clinically
15 experienced year 5 medical students, instead of year 4 in future geriatric IPE sessions.
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18 This open and flexible approach by two academic institutions in collaboration with NHS trust staff
19 enabled “cutting through disciplinary boundaries” (14), emphasising that it is possible and indeed
20 practicable to combine uni- and interprofessional discourses, so we would recommend this form of IPE
21 for geriatrics, with the expanding of the inclusion of other professions. The results from this teaching
22 may be seen as confirming that the outcomes of IPE delivery in geriatrics are positive, regardless of the
23 form it takes (12), possible also due to conveying to the students the skills, knowledge and energy of
24 the geriatric teams and their ability to solve problems (63).
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42 **Limitations and strength**

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45 The limitations include the use of RIPLS scale, and known concerns about it (27, 33, 64-66)
46 prompted the use of the modified scale. In the meantime further development and validation of
47 instruments to measure the variety of interprofessional competencies related to IPE continued, giving
48 more options to the researchers compared to the time of planning and conducting our study, and in
49 2017 a global consensus was reached on IP learning outcomes, as well as guidance on the purpose of
50 the assessments in IPE (34, 67).
51

52 Statistical analysis was limited by the fact that not all students returned the feedback forms (possibly
53 missing more negative views, but this is less likely as completion was anonymous). However, some
54 students commented that completing both questionnaires was time-consuming, possible contributing to
55 the reduced rate of feedback. The overall number of nursing students was smaller owing to the nursing
56 availability at the JR hospital site; the control group consisted of only medical students for the same
57 reasons. Other limitations are also not distinguishing between graduate and undergraduate entry
58 medical students, possible influencing the study results, as the age and maturity of students is well
59 recognised that can influence learning outcomes (68, 69). Also, students had unequal levels of clinical
60 experience at the time of their IPE workshops, with the nursing students having more than the medical

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3 students at the time of the workshop, as well as the lack of the involvement of patients and carers in the
4 development of this study (70). The study was conducted on the PBL case-scenarios, and future work
5 should expand to the clinical practice. The strength of the study is the inclusion of a larger number of
6 participants from both disciplines, the inclusion of the control group and that this was a controlled
7 before-after study.
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15 **Conclusion:**

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18 Our findings have several implications for the undergraduate education in geriatrics. They
19 indicate that some aspects of geriatric medicine can be delivered effectively to nursing and
20 medical students through PBL IPE, if facilitated by educators from both professions.
21 Developing IP skills is difficult with traditional, lecture-based teaching; this project describes
22 one alternative way of delivering such teaching, showing that IPE can significantly improve
23 students' attitudes to working and learning with other professions. This easily replicable
24 teaching method provides a simple means of reinforcing the importance of collaborative
25 working when looking after older patients.
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31 While IPE had a more positive impact on nursing students, medical students had still shown
32 statistically significant improvements in two domains (teamwork and collaboration and positive
33 professional identity), revealing identical results in the intervention and control groups, suggesting that
34 the delivery of geriatric IPE could be simplified and still successfully delivered to the undergraduate
35 students by a mixed group of educators, if they act as members of the IP team, to the uni-professional
36 groups of learners, via PBL method, "enabling the professions to learn with, from and about each other
37 " (71).
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41 Overall, IPE appeared to be successful in addressing some cultural issues that may have
42 acted as barriers to working together, and in allowing groups to understand each other's
43 perspectives, emphasising the importance of each role in MDT. A majority of students (both
44 professions, intervention and control groups) believed the experience had enhanced their
45 understanding of collaboration and their ability to work together, particularly boosting nursing
46 students' confidence in their expertise around their medical peers. This program
47 demonstrated a simple, easily implementable yet effective means of providing appropriate
48 education in geriatric medicine through IPE to medical and nursing students, applicable in the
49 UK and abroad.
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55 Future research into IPE in geriatrics should investigate the impact if only nursing students
56 act as control group; if it occurs later in medical students' education; if sessions are longer
57 and repeated; if they incorporate exclusively the topics suggested by the majority of students
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3 and if delivered in clinical setting. Future research should also investigate what would happen
4 if such teaching were delivered to other professions.
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18 Key points

- 19 • Effective undergraduate geriatric IPE could be delivered in one session to the group
20 not bigger than 10 students, not requiring equal number of learners from each
21 profession
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- 23 • Mixed group of educators successfully delivered IPE to uni-professional groups of
24 learners via PBL method, as intervention and control groups had improved RIPL
25 scores in the same domains
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- 27 • IPE had more positive impact on nursing students, probably attributable to their more
28 extensive clinical experience before geriatric IPE
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- 30 • Geriatric IPE helped resolve some students' concerns; nursing about inadequate
31 knowledge, medical about being perceived as arrogant
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- 33 • The most commonly suggested topics for future geriatric IPE sessions were about
34 communication and ethics
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4 Figure 1 *Results for all nursing and medical students showed post-IPE statistically significant*
5 *improvements in all four RIPL subscales*
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9 Figure 2 *The nursing students in the intervention group showed post-IPE statistically significant*
10 *improvements in all four RIPL subscales*
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13 Figure 3 *Post-IPE, the medical students in the intervention group showed statistically significant*
14 *improvements in two RIPL subscales: teamwork and collaboration and positive professional identity*
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19 Figure 4 *Post-IPE, the medical students in the control group showed statistically significant*
20 *improvements in two RIPL subscales: teamwork and collaboration and positive professional identity.*
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25 Figure 5 *Post-IPE results show that medical students from the intervention and control groups had*
26 *identical change in the RIPLS subscales.*
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34 Table A **Qualitative Data Pre - IPE for the Intervention and Control Groups; *Awareness of***
35 *roles, expertise and responsibilities; Nursing and medical students concerns about IPE,*
36 *Curriculum topics*
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41 Table B **Qualitative Data Post-IPE for the Intervention and Control Groups; *Awareness of***
42 *roles, expertise and responsibilities; Nursing and medical students concerns about IPE,*
43 *Curriculum topics*
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48 Table C **Qualitative Data Post-IPE for the Intervention and Control Groups; *Ease of***
49 *contribution/voicing opinion during IPE, Meeting the expectations from IPE, Participating in*
50 *IPE again, Enjoyment in IPE, Learning points from IPE, Understanding collaboration, The*
51 *impact of IPE on the ability to work collaboratively*
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25 **Contributorship statements:**
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27

28 S Thompson designed the study, acquired data, designed analyses, led the workshops and
29 wrote the paper.

30 K Metcalfe designed the study, acquired data, designed analyses, and wrote the paper.

31 K Boncey, H Bothwell and C Hardy acquired data, performed statistical analyses, led the
32 workshops.

33 C Merriman designed the study, acquired data, led the workshops and contributed to the
34 manuscript.

35 L Flyn designed and performed the statistical analyses and contributed to the manuscript.

36 GS Alg led the workshops, acquired data and contributed to the manuscript.

37 J Beale, E Puffet, C Forde-Johnston led the workshops and acquired data.

38 L Wright, helped with the organisation of the workshops and contributed to the curriculum
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47 **S Thompson is the guarantor**
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For peer review only

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11 ❖ Data Availability: Extra data can be accessed via the Dryad data repository at
12 <http://datadryad.org/> with the doi: 10.5061/dryad.zkh18935k
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14
15 ❖ Ethics: Students consented to participate in this study and had the right to withdraw at any point.
16 This study was approved by the Research Ethics Committees (CUREC); the reference number for
17 this project is MSD-IDREC-C1-2014-027
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19
20
21 ❖ Competing interests – S Thompson, C Merriman and L Flynn were supported by HETV
22 grant
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26
27 ❖ Funding – Health Education Thames Valley gave a small grant to support and develop
28 IPE course
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31
32 ❖ Patient and Public were not involved
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3 The case studies mentioned were created for teaching purposes and do not represent real
4 patients.
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Figure 1

Results for all nursing and medical students showed post-IPE statistically significant improvements in all four RIPL subscales

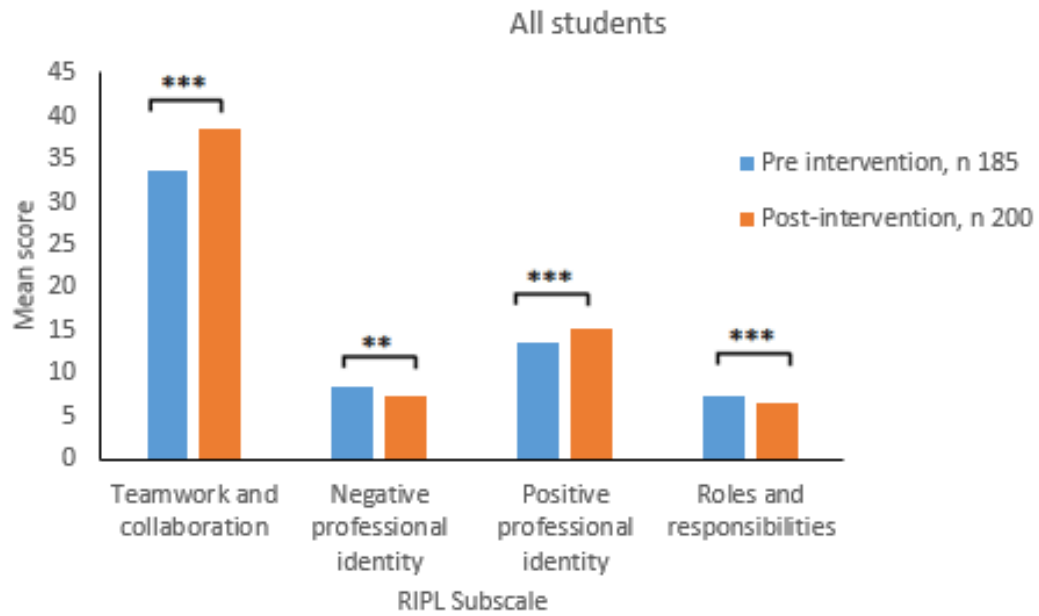


Figure 2

The nursing students in the intervention group showed post-IPE statistically significant improvements in all four RIPL subscales

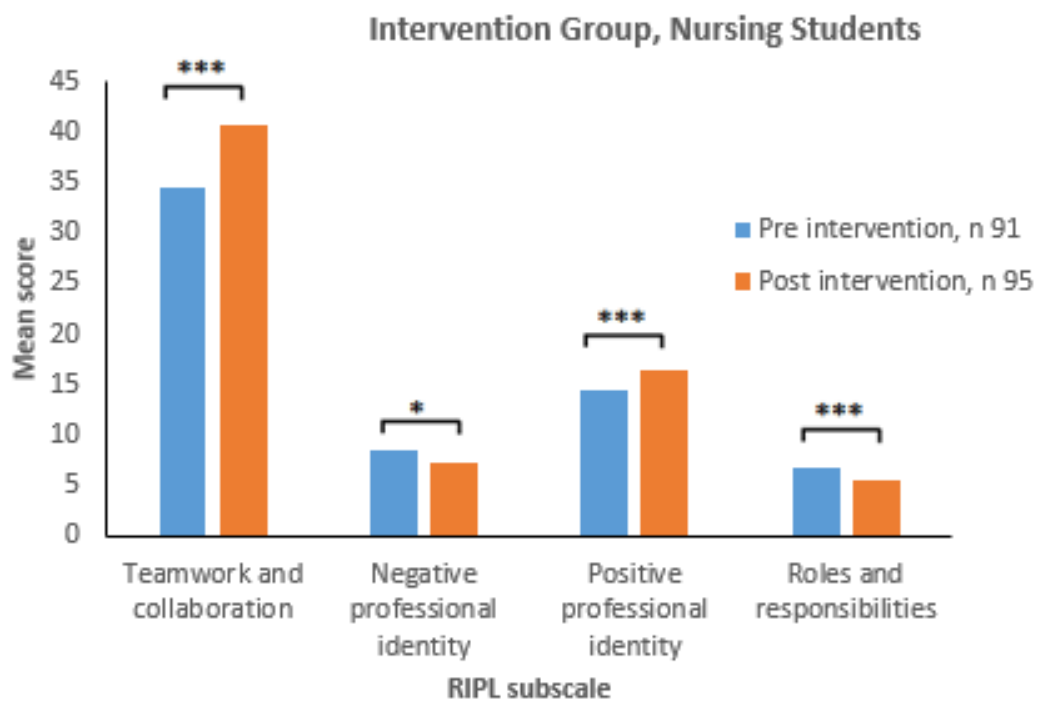


Figure 3
Post-IPE, the medical students in the intervention group showed statistically significant improvements in two RIPL subscales: teamwork and collaboration and positive professional identity

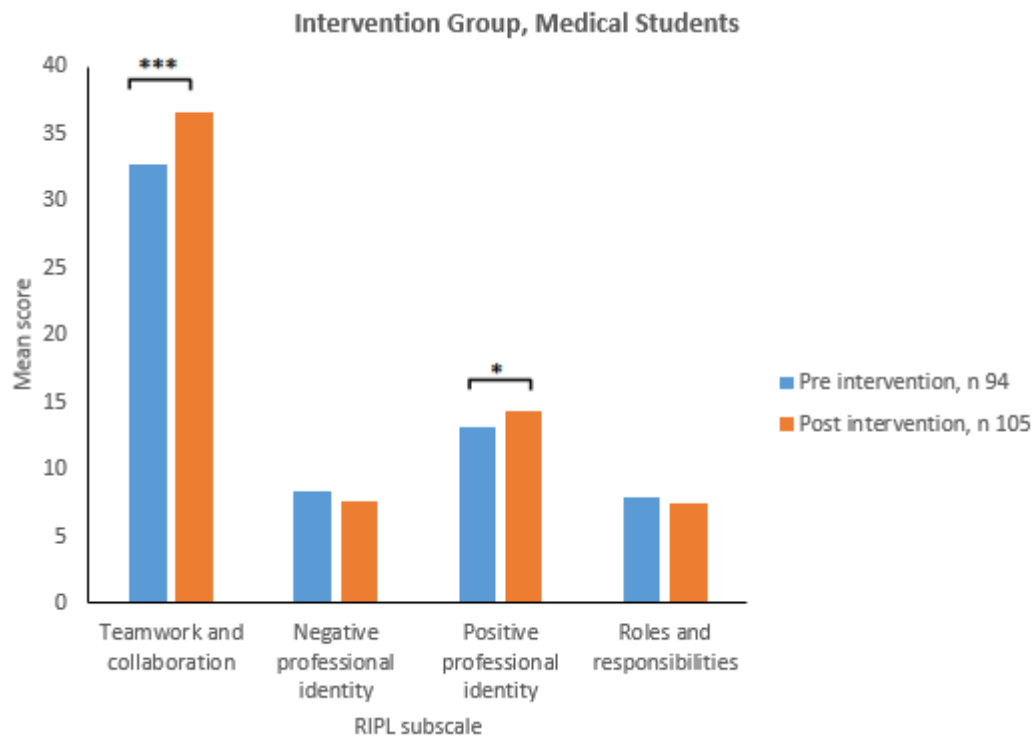
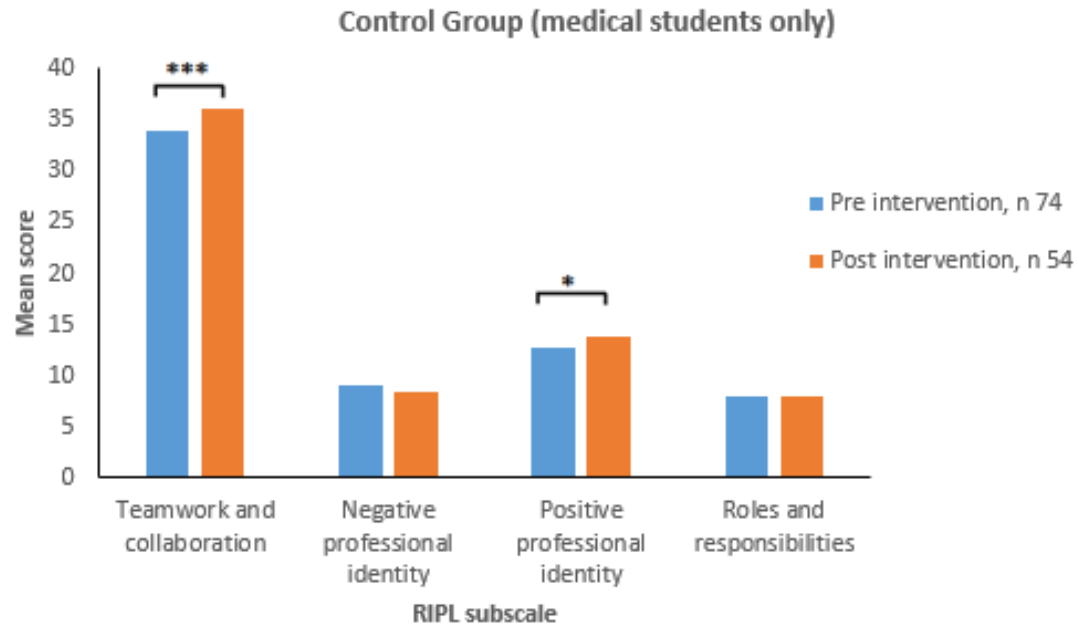


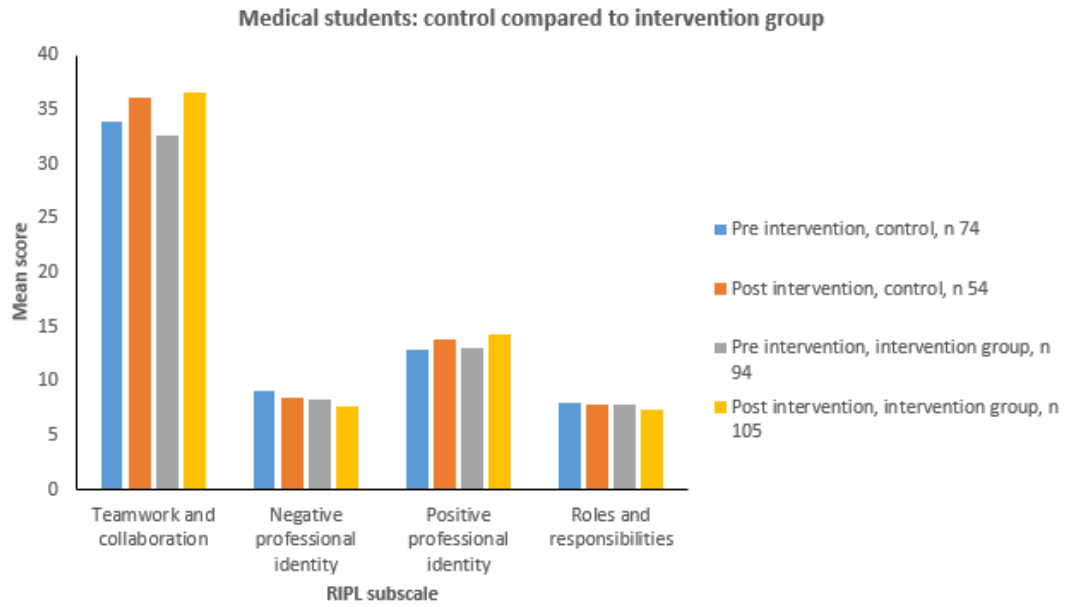
Figure 4
Post-IPE, the medical students in the control group showed statistically significant improvements in two RIPL subscales: teamwork and collaboration and positive professional identity.



view only

Figure 5

Post-IPE results show that medical students from the intervention and control groups had identical change in the RIPLS subscales.



Review only

Standard Information:

- You are expected to take the role of an FY1/staff nurse working in the Emergency Assessment Unit and in the Acute Geratology ward (you are **NOT** acting as a student here)
- You are not expected to undertake any examination

Case 1 (Acute deterioration)

An 84 year-old woman was admitted on the medical take with clinical signs and symptoms of pneumonia, which was confirmed on her chest x-ray and she was started on antibiotics and appeared to improve. She seemed well in the morning ward round, but later in the day, she became tachypnoeic (respiratory rate of 30 breaths per minute) and tachycardic (heart rate 135 per minute, regular). Whereas this morning she was talking normally, now she is confused and her conscious level seems to be deteriorating.

- 1) What are your priorities when dealing with a patient whose condition has acutely deteriorated?
- 2) How can such patients rapidly be identified before their condition becomes critical?
- 3) Please describe the role of nurse/doctor in such cases

Case 2 (Pressure Ulcers)

An 84 - year old woman is on the geratology ward being treated for a lower urinary tract infection. She has had a previous stroke and is known to have limited mobility. She experiences difficulty with activities such as feeding herself. She is found to have a pressure ulcer on her right heel.

- 1) What are the common sites for pressure ulcers and how are they identified?
- 2) What factors might contribute to development of pressure ulcers and how can they be prevented?
- 3) Please describe the role of nurse/doctor in such cases

Case 3 Assessing Mental Capacity for discharge from the hospital

A 76 year-old man is admitted onto the acute general ward. He presented to the Emergency Department last night after a fall. This morning he is distressed and confused. The staff nurse who was on duty overnight tells you he attempted to get out of bed several times and fell once during the night. He is insistent that there is nothing wrong with him and requests to be discharged. However when you speak to him further it is clear that he is still very confused and he is unable to tell you what happened the day before or where he lives.

- 1) How would you assess his capacity for the decision about his imminent discharge from the hospital?
- 2) How should you deal with a patient who lacks capacity to decide about the discharge and wants to leave hospital or if you need to perform a procedure that requires consent?
- 3) Please describe the role of nurse/doctor in such cases.

Case 4. Abuse?

A 78 year-old man who was admitted to the geratology ward after the referral from his GP, who was concerned by his swollen, painful and erythematous left leg, suspecting that he suffers from cellulitis. He has history of dementia for the past 2 years.

On examination he was found to have several circular burn marks on both forearms, bruising under the hairline, behind his ears and extensive bruising on both legs. He also appeared unkempt, with smelly clothes and traces of food all over his clothes.

1. What would be your initial steps in dealing with this discovery?
2. What are the risk factors for abuse in the older patients?
3. Please describe the role of nurse/doctor in such cases.

Inter-professional Learning Questionnaire (Pre)

Thank you for taking part in our trial of inter-professional learning. Please answer all questions honestly. There are no right or wrong answers. If you have any further questions please contact sanja.thompson@ouh.nhs.uk

Please tick the appropriate box below:

Medical student

Nursing student

Please indicate the degree to which you agree or disagree with the statement by drawing a circle around the response that best expresses your feeling.

1. Learning with other students will help me become a more effective member of a health care team

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

2. Patients would ultimately benefit if health-care students worked together to solve patient problems

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

3. Shared learning with other health-care students will increase my ability to understand clinical problems

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

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5 4. Learning with health-care students before qualification would improve relationships after
6 qualification
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8 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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15 5. Communication skills should be learned with other health-care students
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17 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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24 6. Shared learning will help me to think positively about other professionals
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26 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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33 7. For small group learning to work, students need to trust and respect each other
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35 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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42 8. Team-working skills are essential for all health care students to learn
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44 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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50 9. Shared learning will help me to understand my own limitations
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52 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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6 10. I don't want to waste my time learning with other health-care students

7 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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14 11. It is not necessary for undergraduate health-care students to learn together

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16 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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23 12. Clinical problem-solving skills can only be learned with students from my own department

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25 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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32 13. Shared learning with other health-care students will help me to communicate better with patients
33 and other professionals

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35 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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42 14. I would welcome the opportunity to work on small-group projects with other health-care students

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44 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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50 15. Shared learning will help to clarify the nature of patient problems

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52 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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8 16. Shared learning before qualification will help me become a better team worker

9 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*

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16 17. The function of nurses is mainly to provide support for doctors

17 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*

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25 18. I'm not sure what my professional role will be

26 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*

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35 19. I have to acquire much more knowledge and skills than other health-care students

36 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*

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43 ***The following are a number of open ended questions. Please answer as honestly as possible. There is
44 no right or wrong answer. (The answers are about the other professionals, not yours).***

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49 1. What is the role of a nurse/doctor in inter-professional team (answer for the "other" professional)

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8 2. What expertise does a nurse/doctor bring to inter-professional team? (the “other” professional)
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21 3. What concerns do you have about learning alongside nursing/medical students?
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33 4. What curricular topics would be best suited to inter-professional learning (nursing and medical
34 students)?
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51 ***Thank you for taking the time to complete this questionnaire. If you have any further feedback please***
52 ***contact sanja.thompson@ouh.nhs.uk (Consultant geriatrician, Honorary Senior Clinical Lecturer)***
53
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Inter-professional Learning Questionnaire (Post)

Thank you for taking part in our trial of inter-professional learning. Please answer all questions honestly. There are no right or wrong answers. If you have any questions please contact Sanja.thompson@ouh.nhs.uk

Please tick the appropriate box below:

Medical student

Nursing student

Please indicate the degree to which you agree or disagree with the statement by drawing a circle around the response that best expresses your feeling.

1. Learning with other students will help me become a more effective member of a health care team

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

2. Patients would ultimately benefit if health-care students worked together to solve patient problems

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

3. Shared learning with other health-care students will increase my ability to understand clinical problems

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly agree*

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3 4. Learning with health-care students before qualification would improve relationships after
4 qualification
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6 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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13 5. Communication skills should be learned with other health-care students
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15 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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22 6. Shared learning will help me to think positively about other professionals
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24 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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31 7. For small group learning to work, students need to trust and respect each other
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33 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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40 8. Team-working skills are essential for all health care students to learn
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42 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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49 9. Shared learning will help me to understand my own limitations
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51 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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3 10. I don't want to waste my time learning with other health-care students
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5 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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12 11. It is not necessary for undergraduate health-care students to learn together
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14 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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21 12. Clinical problem-solving skills can only be learned with students from my own department
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23 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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30 13. Shared learning with other health-care students will help me to communicate better with patients
31 and other professionals
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33 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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39 14. I would welcome the opportunity to work on small-group projects with other health-care students
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41 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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48 15. Shared learning will help to clarify the nature of patient problems
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50 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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3 16. Shared learning before qualification will help me become a better team worker
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5 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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11 17. The function of nurses is mainly to provide support for doctors
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13 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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20 18. I'm not sure what my professional role will be
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22 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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29 19. I have to acquire much more knowledge and skills than other health-care students
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31 *Strongly disagree* *Disagree* *Neutral* *Agree* *Strongly agree*
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38 ***The following are a number of open ended questions. Please answer as honestly as possible. There are***
39 ***no right or wrong answers. (Please note that first 3 questions are about the "other" profession, not***
40 ***yours)***
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45 1. What is the role of a nurse/doctor in inter-professional team?
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5 2. What expertise does a nurse/doctor bring to inter-professional team?
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17 3. What concerns do you have about learning alongside nursing/medical students?
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29 4. What curricular topics would be best suited to inter-professional learning (nursing and medical
30 students)?
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41 5. How easy did you find it to contribute/voice your opinion? (*Please specify why*)
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53 6. Was this experience what you expected it to be? (*Please specify why/why not*)
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6 7. Would you be happy to take part in this type of learning again? *(Please specify why/why not)*
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17 8. What did you enjoy most about learning with other healthcare students? *(Please specify why)*
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29 9. What did you least enjoy about learning with other healthcare students? *(Please specify why)*
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41 10. What did you learn from engaging in this type of learning with other healthcare students?
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53 11. How has this type of learning affected your understanding of inter-professional collaboration?
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8 12. How has this type of learning impacted your ability to work collaboratively with other
9 professionals?
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22 ***Thank you for taking the time to complete this questionnaire. If you have any further feedback please***
23 ***contact*** Sanja.thompson@ouh.nhs.uk ***(Consultant geriatrician, Honorary Senior Clinical Lecturer)***
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