






EMPIRICAL RESEARCH ARTICLES



Using simulation-based interprofessional education to change attitudes towards collaboration among higher specialty trainee physicians and registered nurses: a mixed methods pilot study

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ABSTRACT

Interprofessional collaboration (IPC) is important for delivering safe patient care and can be enhanced through interprofessional education (IPE). In postgraduate medical education, the most effective model for delivering IPE remains unclear. A multi-site non-randomized mixed methods study was undertaken to investigate the effectiveness of a simulation-based IPE (SB-IPE) intervention on changing attitudes among higher specialty trainee (HST) physicians in general internal medicine and registered nurses (RNs). The intervention, underpinned by intergroup contact theory, is comprised of paired participants (HSTs:RNs) undertaking six simulated scenarios. The Jefferson Scale of Attitudes toward Interprofessional Collaboration (JeffSATIC) was administered pre-and-post intervention. Focus groups were conducted to explore participants' perceptions of IPC and the SB-IPE intervention. Fifty-six participants attended the SB-IPE intervention and 37 completed focus group interviews. Overall, attitudes toward IPC changed positively ($p < .001$), with greater change among HSTs ($p = .001$) compared to RNs ($p = .12$). Attitudes to "working relationships" significantly increased for HSTs ($p < .001$) but not RNs ($p = .047$). Focus group analysis identified three processes by which SB-IPE led to attitudinal change: 1) Shared vulnerability, 2) Positive affirmation, and 3) Negotiating professional hierarchies, mainly through relationship building. Further research is needed to investigate the long-term impact of attitudinal change, including the extent to which benefits transfer into practice.

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Introduction

Interprofessional collaboration (IPC) is vital to modern health-care delivery (World Health Organization WHO, 2010). According to the Canadian Interprofessional Health Collaborative (CIHC, 2010, p. 8), IPC is "the process of developing and maintaining effective interprofessional working relationships with learners, practitioners, patients/clients/families and communities to enable optimal health outcomes." When healthcare professionals work collaboratively, they create a new shared understanding that could not have been achieved individually (WHO, 2010). In reality, conflict frequently occurs within healthcare teams, mostly precipitated by workplace hierarchy and a culture of physician dominance (Janss et al., 2012; Tang et al., 2018). Physicians often undervalue the expertise of other professionals (Zwarenstein et al., 2013) and have insufficient understanding of non-physician roles (Garth et al., 2018), which may perpetuate negative stereotypes and attitudes (Carpenter & Dickinson, 2016).

Interprofessional education (IPE) can help address these problems and occurs when "two or more professions learn about, from and with each other" (WHO, 2010, p. 7).

Simulation-based IPE (SB-IPE), in particular, has emerged as an instructional method that brings about opportunities for authentic interaction during IPE (Lee et al., 2018). That said, the most effective model for achieving IPE outcomes remains unclear (Paradis & Whitehead, 2018; Rutherford-Hemming & Lioce, 2018). Allport's (1954) intergroup contact theory (ICT) provides a useful framework to explore this further. ICT proposes four pre-requisites for creating positive inter-group contact: equal group status, common goals, intergroup cooperation, and authority support. Intergroup contact can change negative attitudes by reducing prejudice and developing friendships (Allport 1954; Pettigrew et al., 2011). However, further research is needed to understand the processes through which interprofessional contact affects attitudinal change in order to optimize outcomes from IPE interventions (Carpenter & Dickinson, 2016; Visser et al., 2017).

Background

Recent decades have seen a proliferation of IPE interventions; predominantly in undergraduates but increasingly in practice

(Herath et al., 2017; Pannick et al., 2015). There is some evidence that attitudes toward IPE/IPC may become less positive as doctors progress through training (Kempner et al., 2019), but, studies in this field mostly involve undergraduates or newly qualified professionals (Herath et al., 2017; McNaughton, 2017; Visser et al., 2017). Therefore, understanding how and when best to integrate IPC competencies into existing healthcare curriculum remains an area of interest. This is particularly pertinent for higher specialty trainee (HST) physicians in general internal medicine (GIM), where training remains predominantly uniprofessional (Quraishi et al., 2019), without clear attempts to outline specific competencies that require targeted IPE (Gantayet-Mathur et al., 2022; Thistlethwaite et al., 2014).

The aim of this research was to investigate the effectiveness of an SB-IPE intervention on changing attitudes among HSTs in GIM and registered nurses (RNs). The research objectives were to 1) measure changes in attitudes toward IPC following an SB-IPE intervention and 2) explore, through the lens of ICT, the ways in which the SB-IPE intervention influenced attitudes of participants toward IPC.

Design of the SB-IPE intervention

Based on the four pre-requisites of ICT, the SB-IPE intervention was designed to maximize the following aspects:

- (1) Equal group status: Scenarios were co-designed by nursing and physician educators to ensure equal contribution from both groups. Experienced RNs were targeted during recruitment in an attempt to maintain a more balanced power dynamic with HSTs.
- (2) Common goals: Scenarios included tasks that required the skills of both HSTs and RNs to complete successfully. The learning needs of both groups were carefully considered to ensure close alignment of competencies/professional standards based on the CIHC (2010) framework, Joint Royal Colleges of Physicians Training Board (JRCPTB, 2009), and Nursing and Midwifery Council (NMC, 2015; see Supplementary file 1).
- (3) Intergroup cooperation: Time was allocated at the start of scenarios for joint task planning. Participants were encouraged to work together, share information, and draw on their expertise to solve problems.
- (4) Authority support: The SB-IPE was formally recognized by postgraduate education leads which facilitated application for funding. Support was also received from GIM training program directors and nursing IPE leads, some of whom volunteered as faculty, further reinforcing the atmosphere of cooperation and securing participant “buy-in.”

The intervention commenced with a group pre-brief encouraging participants to emphasize their personal identities (rather than their professional groups or clinical specialty). To “set the stage” and provide assurances about their psychological safety, participants also received verbal introduction to

debriefing as outlined by Simon et al. (2012) in Debriefing Assessment for Simulation in Healthcare Instructor Version© (DASH-IV).

Delivery of the SB-IPE intervention

The SB-IPE was implemented in such a way that participants rotated through six scenarios (Figure 1). Scenarios were constructed to maximize opportunities for participants to demonstrate both clinical and collaborative competencies commensurate with their level of experience in a given interprofessional context (Table 1). To maximize intergroup contact, HSTs and RNs rotated in alternating 1:1 pairing until each participant had completed all six scenarios. Using this model, an individual HST would pair once with each RN (and vice versa) before forming a new HST:RN pairing at the next scenario. The six scenarios ran concurrently and each lasted 20 minutes.

Standardized patients (SPs) were recruited from a database of individuals who regularly participate in education of healthcare professionals. A training day was organized to familiarize SPs and faculty with the scenarios to ensure standardized SB-IPE delivery. Interprofessional faculty consisted of permanent simulation facilitators (from medical and nursing backgrounds), volunteer consultant physicians, and nursing educators, with experience ranging from 2 to 15 years. The study objectives, pre-allocated scenario scripts, and DASH-IV were emailed to faculty in advance.

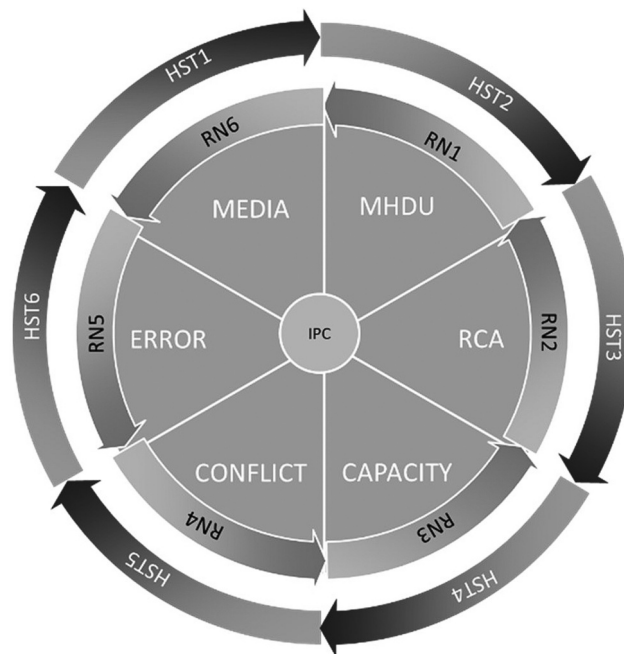


Figure 1. The simulation model. HST1-HST6 = Higher Specialty Trainee numbers 1–6; RN1-RN6 = Registered Nurse numbers 1–6. Arrows denotes direction of progression through scenarios; RNs rotated anticlockwise and HSTs rotated clockwise until each participant completed the sequential circuit of scenarios. The scenarios were interspersed by comfort breaks and lunch break. Key: MHDU = medical high dependency unit; RCA = root cause analysis; IPC = interprofessional collaboration.

Table 1. Overview of the six SB-IPE scenarios.

Scenario Title	Scenario Description [#] (Resource required)
MH DU	Pregnant patient with pulmonary embolism who needs thrombolysis and escalation to critical care. (Laerdal Sim Mom [®] mannikin)
RCA	Tabletop paper-based exercise to perform a root cause analysis on a local clinical incident. (Anonymized copy of medical records)
Capacity	Patient with acute schizophrenia sectioned under the mental health act. Admitted with neutropenic sepsis but refuses medical treatment. (Standardized patient)
Conflict	Discussion with a junior doctor who has repeatedly displayed unprofessional behavior at work. (Volunteer doctor below HST grade).
Error	Communication with a patient's relative about errors in medical and nursing care that led to significant patient harm. (Standardized patient)
Media	Participants engaged in a mock television interview about an infectious disease outbreak within a fictitious hospital. (Audiovisual recording equipment)

Key: MH DU = Medical High Dependency Unit, RCA = Root Cause Analysis, HST = Higher Specialty Trainee
[#]Full descriptions of scenarios can be provided on request.

Debriefing

Each scenario was immediately followed by a 20-minute debrief facilitated by an interprofessional faculty. The DASH-IV was used to promote a consistent approach during debriefing, but faculty were not required to rate their debriefing skills. Feedback was also solicited from SPs so “patient” perspectives was shared with participants. Alongside giving feedback about their clinical performance, the debrief explored how participants collaborated on tasks. Through this process, negative or inaccurate preconceptions held by HSTs about RNs (and vice versa) were unearthed and discussed from a learning perspective, rather than through the prism of blame or reprisal. Common goals were highlighted and reinforced. The exception was the RCA scenario, where participants worked through a local clinical incident for 40 minutes and learning points were discussed in a closing group discussion after all scenarios were completed. The entire SB-IPE was delivered over 8 hours.

Method

Setting, participants, and sampling

The research was conducted between March 2016 and January 2017 at two simulation centers in the UK: Nottingham University Hospitals (NUH) NHS Trust and Northampton General Hospital (NGH) NHS Trust. Participants were recruited using fixed purposive sampling. HSTs in GIM and RNs across acute Trusts in the East Midlands region of the UK were invited. HSTs in GIM (“medical registrars”) are senior internal medicine residents, with minimum 4 years post-licensure experience. HSTs were recruited using e-mail advertising via local postgraduate communication channels. Recruitment of RNs was coordinated through nursing IPE leads. Information about the research was also displayed on hospital wards. Participation was voluntary, and certificate of attendance was provided.

Study design

A pragmatic paradigm (Morgan, 2014) was adopted in this study to better understand the multiple viewpoints and experiences that shaped participants’ attitudes toward IPC. Relating and integrating qualitative and quantitative data were necessary for achieving the research aim; therefore, a mixed methods approach was used (Creswell, 2015). The qualitative and quantitative data were analyzed individually before a triangulation

protocol was implemented to draw insights across the data. In this study, four types of triangulation were undertaken including i) methodological triangulation, with the use of more than one data collection technique (questionnaire and focus groups); ii) data triangulation, with the use of multiple data sources (numbers and texts); iii) investigator triangulation using interprofessional investigators; and iv) theoretical triangulation. From a theoretical perspective, the notion of effectiveness was investigated by integrating assumptions from different paradigms such that both objective measures and subjective perceptions of participants were used to provide different sources of evidence for making that judgment.

Data collection

Using a convergent parallel design, quantitative and qualitative data were collected concurrently but analyzed separately before results were integrated and interpreted (Creswell, 2015). The Jefferson Scale of Attitudes Toward Interprofessional Collaboration (JeffSATIC) was administered immediately pre-and-post intervention, with permission from the authors (Hojat et al., 2015). JeffSATIC is a 20-item psychometrically validated instrument that consists of two constructs: “working relationships” (items 1–12) and “accountability” (items 13–20). Participant responses were graded on a 7-point Likert scale with higher scores indicative of more positive attitudes toward IPC (Hojat et al., 2015). Using a semi-structured guide (supplementary file 2), focus group interviews were undertaken at the end of each simulation.

Data analysis

Data from both sites were pooled because the SB-IPE delivery was standardized, and participation was not exclusive to staff at the respective sites. Quantitative data were analyzed using IBM SPSS 26. Pre-and-post intervention JeffSATIC responses were scored using the algorithm provided by the instrument authors. The data were negatively skewed, hence non-parametric related-samples Wilcoxon signed-rank test was performed for the total JeffSATIC and the two constructs. Comparisons between professions were analyzed using Mann-Whitney U tests. In both cases, we report standardized test statistics (Z) as a measure of effect size. Effects were considered significant based on an alpha level of .05, adjusted for multiple comparisons based on a Holm-Bonferroni correction.

Focus group data were transcribed verbatim and investigated using the six steps of reflexive thematic analysis outlined by Braun and Clarke (2006). All interviews and data transcriptions were conducted by the first author (PE) who was an HST working as a simulation fellow at the time of the study and known to some participants (HSTs and RNs). Although this provided valuable knowledge of HST postgraduate curriculum, the potential for researcher bias was evident therefore, a reflective diary was maintained. To further minimize bias and increase dependability, data were independently analyzed by a nursing member of the research team (AD). This ensured that perspectives from both professional groups fed into the generation of data labels and identification of relationships between the initial codes and emergent themes. The two sets of codes were compared and merged. Initial codes were reviewed by two participants from different focus groups (a male HST and a female RN), to sense check the credibility of the preliminary findings. For confirmability, an audit trail was maintained, codes and subthemes were refined over several meetings between PE, AD, and another member of the research team (NW) until final themes were agreed (see supplementary file 3).

Ethical considerations

Ethical approval was granted by the University of Nottingham Faculty of Medicine and Health Sciences Research Ethics Committee. Interested individuals were provided with information sheets, and written consent was obtained. Permission was specifically sought to digitally record the simulation (audiovisual) and focus group interviews (audio).

Results

Six SB-IPE days were conducted (four at NUH and two at NGH) and attended by HSTs and RNs from seven acute NHS Trusts across the East Midlands.

Table 2. Demographics of participants by gender, age, and number of years post-licensure.

Participant Demographics	HSTs n (%)	RNs n (%)
Gender		
Male	16 (50)	1 (4)
Female	16 (50)	22 (96)
Age (years)		
25–34	19 (59)	8 (35)
35–44	13 (41)	9 (39)
45–54	0 (0)	6 (26)
Years post-licensure		
≤4	1 (3)	2 (9)
5–9	15 (47)	8 (35)
10–14	9 (28)	4 (17)
15–19	7 (22)	5 (22)
≥20	0 (0)	4 (17)

HST (N = 32), RN (N = 23). Key: HST = Higher Specialty Trainees, RN = Registered Nurses.

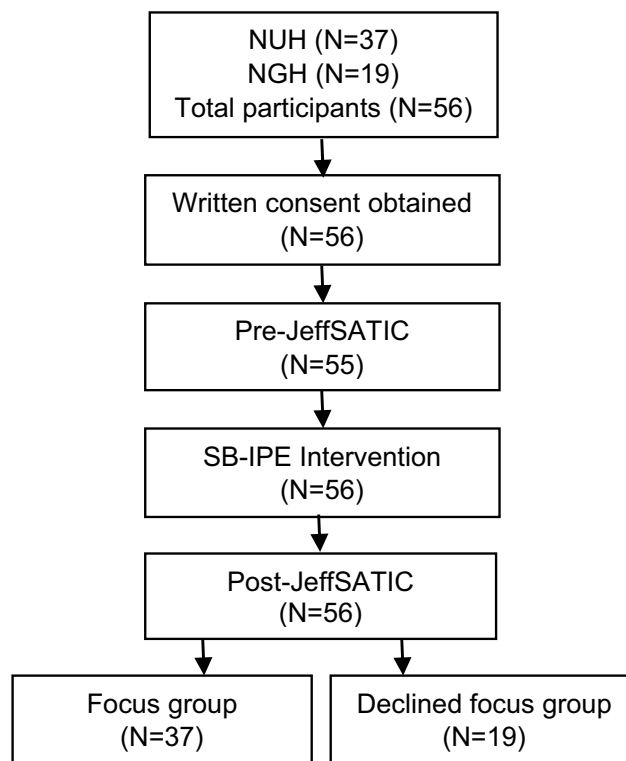


Figure 2. Study outline.

Demographics

A total of 56 participants (32 HSTs and 24 RNs) received the SB-IPE intervention, with 37 participating at the NUH site and 19 at NGH (Figure 2). One RN did not complete the pretest JeffSATIC and was excluded from further analysis.

Participant demographics are presented in Table 2. There was an equal gender balance among HSTs. All but one RN participants were female. Mean age of all participants was 36.5 years (SD = 6.88). RNs were significantly older than HSTs [mean (SD) = 39.8 (8.5) versus 34.2 (4.2) respectively], with a mean age difference of 5.56 years [U = 222.0, Z (N = 55) = 2.50, p = .013].

Similarly, the mean post-licensure experience of all participants was 11.6 years (SD = 6.07). RNs, on the average, had 3.25 more years of post-licensure experience compared to HSTs [mean (SD) = 13.6 (7.8) versus 10.3 (4.0) respectively], but this difference was not statistically significant [U = 282.5, Z (N = 55) = 1.46, p = .144]. The distribution of clinical subspecialties of participants is presented in Figure 3.

JeffSATIC ratings

Following the SB-IPE intervention, the total JeffSATIC ratings significantly increased [Z(N = 55) = 3.54, p < .001]. On comparing the pre-and-post intervention ratings of all participants (N = 55); 65% gave more positive ratings, 22% were negative and 13% neutral. While the change in scores was relatively small in magnitude, these findings do demonstrate that they were quite reliable, as most scores increased. Examining the data by profession, the JeffSATIC scores significantly increased for HSTs [Z (N = 32) = 3.31, p = .001] but not RNs [Z(N = 23) = 1.55, p = .12].

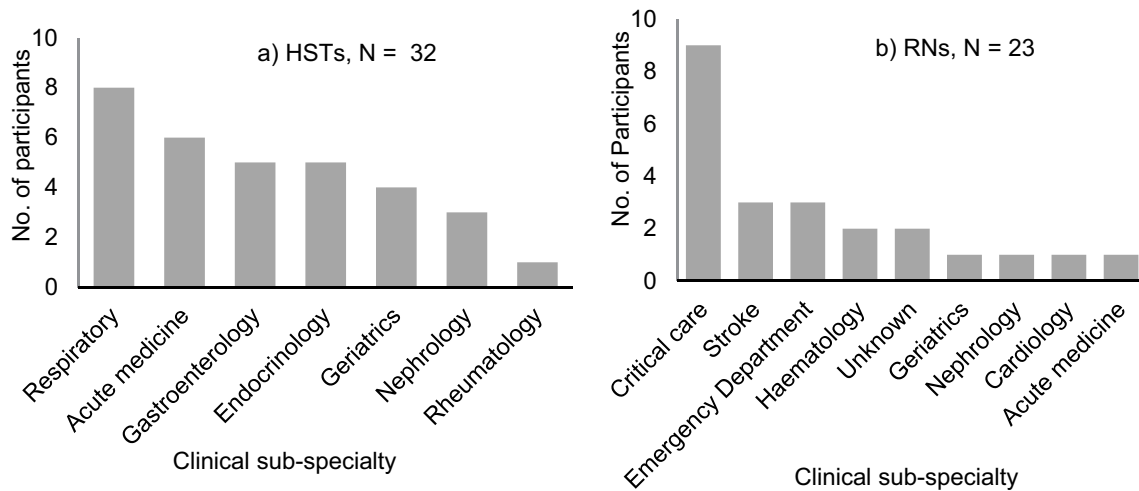


Figure 3. Distribution of participants according to clinical sub-specialty for (A) HSTs, Higher Specialty Trainees, and (B) RNs, Registered Nurses.

Similarly, as reported in Table 3, attitudes toward “working relationships” were significantly more positive following the SB-IPE for both the full sample and in HSTs, but attitudes toward “accountability” were unchanged. The change in RNs [Z(N = 23) = 1.99, p = .047] was not significant after the correction for multiple comparisons.

Focus group findings

Thirty-seven participants (P1-37) contributed to six focus group interviews (FG1-6). The mean length of interviews was 56 minutes and numbers ranged from five to nine participants. Through the lens of ICT, three themes emerged about the way

Table 3. Pre-and-post intervention scores for total JeffSATIC, “working relationships”, and “accountability” constructs.

JeffSATIC	Median (IQR)		Statistical Test
	Pre	Post	
Total JeffSATIC*			
All Participants	122 (116–128)	124 (119–132)	Z(N = 55) = 3.54, p <.001
Profession			
HSTs	121 (116–129)	124 (120–132)	Z(N = 32) = 3.31, p = .001
RNs	122 (117–128)	126 (117–132)	Z(N = 23) = 1.55, p = .12
Working Relationships#			
All Participants	75 (70–78)	77 (73–83)	Z(N = 55) = 3.99, p <.001
Profession			
HSTs	75 (70–78)	77 (73–83)	Z(N = 32) = 3.57, p <.001
RNs	75 (72–77)	78 (71–83)	Z(N = 23) = 1.99, p = .047
Accountability [§]			
All Participants	48 (44–51)	47 (45–51)	Z(N = 55) = 1.24, p = .22
Profession			
HSTs	48 (45–50)	47 (46–51)	Z(N = 32) = 1.26, p = .21
RNs	47 (44–51)	48 (44–52)	Z(N = 23) = 0.24, p = .81

The statistical test conducted in all cases was a related-samples Wilcoxon signed-rank test. Key: *Sum JeffSATIC score (Items 1–20) maximum = 140; #Sum working relationships score (Items 1–12) maximum = 84; §Sum accountability score (items 13–20) maximum = 56. HST = Higher Specialty Trainees, RN = Registered Nurses. HST (N = 32), RN (N = 23).

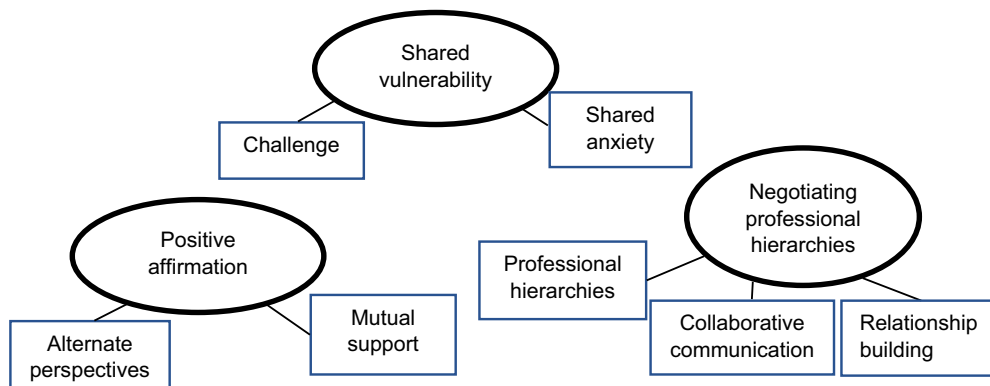


Figure 4. Subthemes and final themes from focus groups.

the SB-IPE intervention facilitated a change in participants' attitudes (Figure 4). Specifically, the SB-IPE enabled participants to develop a sense of 1) shared vulnerability; and 2) positive affirmation; but also, opportunities for 3) negotiating professional hierarchies.

Shared vulnerability

Scenarios within the SB-IPE that involved challenging tasks or generated a sense of anxiety appeared more likely to prompt collaboration between both professionals.

... scenarios where you don't know what the relatives gonna say ... you can't prepare for it; I found those ones much better from a collaborative point of view. I think we probably both got a bit more out of it. (P15,FemaleHST,FG3,NUH)

I went in thinking ... am alright ... then I read the scenario and thought ... I don't know what to do! So, we spoke about it before we went in. It didn't go according to plan, did it? We weren't expecting the relative to be quite as aggressive as he was [...] That way we could work together because we could pull on our experience but we'd never— both of us had never been in that [error scenario] so we worked together ... (P17,FemaleRN,FG3,NUH)

... it's quite reassuring to see ... other members of the team get nervous and ... you can begin to recognize 'Ok it's not just me that feels like that'. They might look brilliant ... but they probably still got those anxieties and fears ... In the feedback and debrief you can really learn from each other and actually you're not alone and yeah, you're not the only one who's paddling underneath. (P30,FemaleRN,FG5,NUH)

... you're actually all in the same boat. It brings people together and it does help kind of promote that collaboration. (P35, FemaleHST,FG6,NGH)

Conversely, participants appeared less likely to seek collaboration during predictable scenarios or situations that predominantly required the expertise of HSTs.

... I think the rest of them I could really see how we'd work together and then in the HDU one ... we were talking about erm thrombolysis ... it was very more medically focused. It's not that I didn't get anything out of it, just that it was more geared at the medic rather than the nurse ... (P17,FemaleRN,FG3,NUH)

I agree ... probably just having an acute medicine scenario is actually much less useful because most of us have done ALS [Advanced Life Support] ... I got a lot more out of all of the other scenarios ... working collaboratively [...] And, I think often critically unwell patients, you go through it's an ABCDE approach, everyone knows their role and you sort of go 'Am gonna do this, am gonna do that' and you just do it. (P15, FemaleHST,FG3,NUH)

Positive affirmation

There were multiple opportunities to receive feedback from different perspectives (peers and faculty), which strengthened participants' confidence in their abilities but also helped them understand each other's viewpoints.

It was nice to have somebody to talk to just the two of you. It's almost like having a mini debrief ... to have somebody from a different background ... kind of reaffirming each other ... (P8, FemaleHST,FG2,NUH)

... they see our difficulties and we see theirs (P7,FemaleHST,FG2,NUH)

The lack of assessment or peer observation enabled participants to feel comfortable in each other's presence and further engage with the scenarios.

... what is good in this simulation compared to other simulation is there's nobody ... looking at you, you just have the two [faculty] ... you feel more comfortable. (P9,FemaleHST,FG2,NUH)

I have done sim before ... the other person who's usually been a nurse is part of the faculty so they are not immersed in it in the same way you are. So, it's quite good to be both there not knowing what's happening [...] As soon as you said ... 'Everybody is not watching you', I immediately relaxed ... and thought 'Right I can just get on with ... interacting with the other person'. (P8, FemaleHST,FG2,NUH)

The SB-IPE encouraged participants to tackle tasks together and provide mutual support in the face of challenges.

I've found a new respect ... in the collaborative approach, in that if one didn't think of something, the other would ... I was kind of flabbergasted ... I have never seen that before and ... I would go back and use that again. (P33,FemaleRN,FG6,NGH)

It's been really nice today just to bounce ideas off each other ... you just appreciate each other a little bit more even when the actors are eyeballing you- you kind of look at each other and think 'we can do this'. So, it's nice just to be in that protected environment [with] support but you still supporting each other. (P3,FemaleRN,FG1,NUH)

Intergroup contact highlighted the value offered by RNs but also boosted their self-confidence.

The root cause analysis ... as a senior sister you may have done them before, but I hadn't ... and actually doing [it with] someone with a nursing perspective, going through notes was really valuable (P25,FemaleHST,FG4,NGH)

People might get along better because you realize, actually she [name of RN] can do all these things which I can't ... especially for doctors ... (P1,FemaleHST,FG1,NUH)

... this has affirmed to me that ... I have got the skills cos actually I have gained them ... from the experience that I've had. So, if we could have that in our training that would be great. (P17, FemaleRN,FG3,NUH)

Negotiating professional hierarchies

Participants engaged in discussions around professional hierarchies, specifically fear of doctors, and an acknowledgment of how this can be alleviated through IPE.

Nurses sometimes feel scared to approach senior members of the medical team ... so they'll speak to the ward sister and there's ... a lot of three-way conversations ... (P30,FemaleRN,FG5,NUH)

Yeah. And I think these types of courses will reduce that. (P31, FemaleRN,FG5,NUH)

It was nice to have done something like this as a junior nurse cos actually I don't think I said hello to a doctor for probably two years after I qualified (laughter) ... so I think if you do this from the get go then it would just be so much easier. (P3,FemaleRN,FG1,NUH)

I get what you mean it's why we don't escalate to our seniors ... (P5,FemaleHST,FG1,NUH)

The SB-IPE promoted an atmosphere of equality and provided a safe space for collaborative communication that enabled RNs and HSTs to address conflict in a less hierarchical setting.

... they [scenarios] all benefitted from you having equal authority ... slightly different roles perhaps but similar level of responsibility and authority ... (P14,FemaleRN,FG3,NUH)

... tools and structured interactions like the sim day are really vital because it gives people a method of actually breaking down the barriers ... , collaboration, that respect and recognition of other people's roles is a key part of it. (P25,FemaleHST,FG4,NGH)

I found the [conflict scenario] quite difficult because ... I wouldn't normally speak to a doctor to that level ... you wouldn't necessarily have that difficult conversation ... you know, the things that haven't gone well ... (P4,FemaleRN,FG1,NUH)

The SB-IPE enabled participants to develop better understanding of each other's capabilities which engendered respect and trust, but this viewpoint on SB-IPE was not universally shared.

... today has proven that even though, you've just met that person, you have to put that trust in that person ... and I think if you trust somebody, they will trust you back ... (P17,FemaleRN,FG3,NUH)

... if you are not aware of the skills they [RNs] have ... you're always going to be a little bit more dubious. So just educating people and doing courses like this to make sure people are aware of how they can work with them [...] Coming together and learning together is better overall. (P29,FemaleHST,FG5,NUH)

... I think as F1 [junior doctor] I didn't really appreciate ... how much more important everyone else is ... whereas now I have so much respect for everyone who I've worked with no matter what their role is. And I don't feel I need simulation to tell me that because I already feel I know ... (P1,FemaleHST,FG1,NUH)

Participants also built rapport and formed new interprofessional relationships which helped consolidate learning during subsequent pairings.

... the doctor and nurse worked well together and that was sort of from the back of the previous scenario ... so, what we learnt from that scenario we took forward to [error scenario] and the situation went a lot better ... (P31,FemaleRN,FG5,NUH)

Right. I had exactly the same experience ... and there was dramatic improvement in them because we just bonded. We understood each other a bit better. So, if that's ... taken back into practice ... that can only be positive surely. (P29,FemaleHST,FG5,NUH)

Although participants agreed on the need to flatten interprofessional hierarchies, they maintained that accountability for clinical decisions should remain with doctors.

I still think ... in difficult decision-making processes, the consultant has the ultimate yay or nay. (P4,FemaleRN,FG1,NUH)

... so, there is one guaranteed person to be accountable ... (P1, FemaleHST,FG1,NUH)

...the consultant makes the decision then the hierarchy starts setting in. (P24,MaleHST,FG4,NGH)

... along with shared decision-making there is also shared risk-taking ... the nurse wasn't prepared to take that risk. (P22, MaleHST,FG4,NGH)

Discussion

This research aimed to investigate the effectiveness of a novel SB-IPE intervention, underpinned by ICT, on changing attitudes toward IPC. Our results show a small but statistically significant positive change in attitudes toward IPC among HSTs but not RNs. This was mostly due to change in attitudes toward working relationships among HSTs, offering promise for educators wanting to address the problem of physician dominance and professional hierarchies in the clinical workplace.

Our results are consistent with findings from other studies suggesting doctors may start skeptical of IPE but are likely to benefit more compared to other professionals (Kashner et al., 2017; Seselja Perisin et al., 2019; Vazirani et al., 2005). The focus groups revealed a need for SB-IPE in postgraduate training and an intent to transfer learning to the workplace, but some participants perceived SB-IPE as more relevant to early postgraduate trainees. For HSTs, this supports existing data that physicians' perception of their collaborative abilities may not be aligned with that of nurses (Collette et al., 2017). Despite the widespread application of simulation in postgraduate training, opportunities to engage in formal SB-IPE remain limited, more so for doctors than nurses (Gantayet-Mathur et al., 2022; Straub et al., 2020). Research by Shrader et al. (2022) suggests that IPE can lead to collaborative working environments, which positively influences teamworking, workplace culture, and staff recruitment, but workplace pressures and lack of IPC training among senior doctors were identified barriers, hence the need for training to advance IPC specific competencies.

Our focus groups yielded some insights, which add to the understanding of how intergroup contact may lead to change in attitudes. Results suggest that the need for IPC was reinforced when participants were placed in situations of shared vulnerability. Whereas predictable scenarios or situations where one professional group (i.e. HSTs) had dominance of expertise appeared less likely to engender collaboration. This is probably because the former prompted mutual support between participants, while the latter reinforced traditional working models. Emotions such as vulnerability and anxiety have been described in the literature as "affective triggers" for cultivating IPC (McGrail et al., 2009). Similarly, others have proposed that SB-IPE should generate feelings of "inadequacy" in order to trigger reflection and learning (Stocker et al., 2014). This is relevant because healthcare professionals often find it difficult to reveal their vulnerabilities in educational settings, where disclosing vulnerability is generally good for learning, but also uncovers flaws which may negatively impact an individual's perceived credibility (Molloy & Bearman, 2019). Therefore, SB-IPE should be carefully crafted to ensure appropriate complexity/challenge for the respective groups while safeguarding the emotional wellbeing of participants.

The interprofessional pairings in this SB-IPE offered opportunities for RNs to showcase their expertise thereby correcting misconceptions, leading to positive affirmation by HSTs. This aligns with the "emancipatory discourse" of IPC (Haddara & Lingard, 2013) and other research which suggests that IPC can be improved by increasing nursing autonomy (Muller-Juge et al., 2014) and reducing physician dominance (Tang et al., 2018). Of

interest, the mutual intergroup differentiation theory (Hewstone et al., 1994), which advocates for group members to mutually acknowledge each other's strengths and deficiencies, may provide further insight into the positive affirmation of RNs. It may be that having identified their own limitations during scenarios, HSTs were more able to recognize the added value of RNs. This can potentially influence the outcomes of future SB-IPE in that scenarios demonstrating how the expertise of other healthcare professionals complement physician deficiencies may be effective at minimizing physician dominance.

Interprofessional hierarchy is a recognized source of conflict within healthcare teams, which is not always addressed during IPE (Paradis & Whitehead, 2018). Although some participants found it challenging, our SB-IPE presented opportunities for feedback on their communication techniques in conflict situations. Comparable with the literature (Collette et al., 2017; Karam et al., 2018), we identified mutual respect, trust, and relationship building as factors that influence how healthcare professionals negotiate professional hierarchies. Familiarity (through repeated interprofessional pairings) promoted trust among HSTs and empowered RNs to raise concerns with doctors, which could potentially encourage the flattening of interprofessional hierarchy. Of note, the RNs in our study had more post-licensure experience compared to HSTs therefore, any perceived empowerment could be attributed to nursing seniority, which may explain the non-significant change in RNs' post-JeffSATC scores.

Likewise, there was no improvement in accountability scores for participants, possibly because diagnostic decision-making predominantly rests with doctors (Gergerich et al., 2019; Muller-Juge et al., 2014). It is therefore unsurprising that a single SB-IPE intervention was unable to shift attitudes towards accountability, which in acute hospital settings are likely influenced by complex organizational factors (Collette et al., 2017), including physician hierarchy (Gergerich et al., 2019) and nurses' perception about their role boundaries (Pfaff et al., 2014). Our results are in contrast with that of Seselja Perisin et al. (2019) who noted significant increase in physicians' attitude toward "responsibility and accountability" after participating in case-based pharmacotherapy workshops. This difference may be explained by clearer role definitions between physician–pharmacist versus nurse–physician relationships, as alluded to by the authors.

Strengths

This study makes a valuable contribution to the IPE literature by providing deeper understanding into how ICT effects attitudinal change. To the best of our knowledge, this is the first SB-IPE intervention in the UK, aimed at senior physician trainees in GIM, with the explicit aim of improving collaboration using ICT. Participants had significant amount of post-licensure experience, which demonstrates that changing attitudes among individuals with greater likelihood of holding fixed beliefs is possible. Participants were recruited across seven hospitals, thereby increasing the diversity of representation from contrasting organizational cultures. Unlike conventional simulations where some participants learn through passive peer observation, our unique alternating pairing model maximizes contact opportunities,

provides repetitive practice, and replicates the transient inter-professional interactions characteristic of busy acute hospitals which is difficult to recreate in educational settings.

Limitations

The increase in post-JeffSATC score was small; some participants did not alter their attitudes toward IPC whilst others had negative change. Participant numbers were small; only 56 of the available 72 spaces were filled, which may have contributed to the small effect size. The SB-IPE was not part of mandatory training which made recruitment challenging, particularly with RNs, due to work pressures. Consequently, some participants completed scenarios individually. However, we believe any impact was minimized by the alternating pairing model which ensured 1:1 interprofessional pairings at other points. RNs were overwhelmingly female, hence male RN perspectives were less represented. Participants were from GIM settings, and data were not collected longitudinally; therefore, the extent to which findings generalize into practice is unknown.

Conclusion

The SB-IPE had a small but significant effect on changing attitudes of HSTs toward IPC. The focus groups provide valuable insights that may enhance the effectiveness of future SB-IPE by creating contact situations where interprofessional groups can share their vulnerabilities, positively affirm each other, and negotiate interprofessional hierarchies, to improve IPC. Scenarios that require expertise from predominantly one professional group may be less effective at stimulating IPC. Further research is required to investigate long-term outcomes of SB-IPE interventions, including the extent to which attitudes lead to behavioral change in practice.

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