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Teaching undergraduate medical students virtual consultation skills. A mixed methods interventional before-and-after study.

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Contributorship statement

As lead author, I confirm that all contributing authors meet the four ICMJE criteria for authorship as per BMJ requirements. Contributions are as follows. Edie Booth: project design and conception; acquisition, analysis and interpretation of results; initial draft write up. Kate McFetridge: acquisition, analysis and interpretation of results; critical revision of the initial draft. Evelyn Ferguson: project design and conception; critical revision of the initial draft. Catherine Paton: project design and conception; critical revision of the initial draft. All authors were involved in approval of the final submission and agree to be accountable for all aspects of the work.

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Data sharing statement

All data relevant to the study are included in the article or uploaded as supplementary information.

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None declared. All authors declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Transparency statement

As lead author, I affirm that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

Patient and public involvement statement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Ethics approval

This study was conducted in accordance with the Declaration of Helsinki. The study was reviewed and deemed exempt from ethical approval requirements without amendments by the University of Glasgow Ethics Committee. No ID number was given.

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Abstract

Objectives

To evaluate the impact and transferability of a novel teaching method on virtual communication skills for final year medical students on their Obstetrics and Gynaecology (O&G) placement.

Design

Mixed-methods, interventional before-and-after study.

Setting

NHS Lanarkshire, Scotland.

Participants

21 final year medical students on their O&G placement from September to December 2020.

Interventions

A two-part teaching session on virtual communication skills.

Main outcome measures

Students self-reported confidence in conducting consultations pre and post-teaching, exposure to virtual consultations on placement, usefulness of teaching and transferability to primary care. Data was collected using pre- and post-teaching evaluation tools and an online survey.

Results

Of 21 participants, one student did not attend the second session so was excluded from post-teaching evaluation results and the online survey. Pre-teaching results were collected from 21 participants and post-teaching results from 20. Mean confidence scores increased across all domains post-teaching. Mean confidence in opening the consultation increased from 2.67 (95% confidence interval 2.21 to 3.13) to 4.70 (4.50 to 4.90); history-taking from 3.38 (3.07 to 3.69) to 4.45 (4.19 to 4.71); decision-making and forming a management plan from 2.62 (2.28 to 2.96) to 3.90 (3.66 to 4.14); and closing the consultation from 2.81 (2.45 to 3.17) to 4.60 (4.38-4.81). There was no change in exposure to virtual consultations during O&G placement. 16 (80%) participants responded to the online survey; 14 (87.5%) rated the sessions “very useful” and all 16 considered them worthwhile continuing. 12 (75%) had the opportunity to practise virtual consultations on GP, mostly via telephone.

Conclusions

We found that teaching students virtual consultation skills improved short term confidence and was transferable to primary care where virtual consultations are part of students’ placements. Future research is suggested to assess this teaching model following adaptation and incorporation into medical education and training across specialties and grades.

Strengths and limitations of this study

- This study has developed and evaluated a novel teaching method to keep pace with the recent increasing use of new technologies within medical education.
- Virtual consultation skills taught on a secondary care Obstetrics and Gynaecology (O&G) placement were also transferrable to primary care,

increasing the likelihood that this teaching method could be adapted for other specialties.

- A limitation of this study is the small participant number which may reduce reliability and validity of the findings, it would be beneficial to study a larger population in future.
- We could not exclude the impact of ongoing clinical placement and increasing knowledge of the specialty on student's confidence in conduction consultations.
- One participant did not attend both sessions and was excluded from post-teaching results but could not be excluded from pre-teaching results due to anonymity of the study.

1. Introduction

In response to the covid-19 pandemic there has been a transformation in the format of both primary and secondary care clinics[1]. Specifically, an increase in virtual clinics and the use of telemedicine[2-4]. Virtual clinics are now an important part of the medical professional workload and it appears that this shift is likely to remain following resolution of the pandemic[5]. With the integration of telemedicine into routine practice, clinicians have had to adapt and learn new skills on the job. As outlined in the GMC[6] Good Medical Practice guide to duties of a doctor, it is important that medical students and clinicians are equipped with up to date knowledge and skills required to avoid the potential for patient harm. This includes new technological and communication skills used for virtual consultations. Consequently, there has been a surge in publications on the practicalities of conducting virtual consultations [1, 3, 7, 8]. However, these have focussed on tips for current trainees and consultants rather than teaching students for future practice. Despite recent literature on postgraduate virtual consultation skills and longstanding research on general undergraduate communication skills [9, 10], we identified a gap on teaching undergraduate medical students specific virtual consultation skills.

In addition to the effect of the pandemic on new consultation technologies, we have also seen a change in teaching technologies amongst medical educators[11, 12]. Medical student clinical placements and in-person teaching were suspended globally to help reduce spread of the virus[11-13]. Instead, distance learning platforms and online teaching became the norm, enabling continued learning despite restrictions of the pandemic. Interfaces such as Microsoft Teams, YouTube and Zoom have been used for delivering live and pre-recorded lectures, small group tutorials and online modules[12-14]. Students

have since returned to clinical areas but with virtual clinics and social distancing measures in place they have had a reduction in patient exposure. Consequently, UK medical students have reported concerns regarding clinical competence[12] and reduced preparedness for foundation training[14]. We considered how we could adapt our teaching using these new technologies to increase students' confidence in patient-facing skills in a safe environment without compromising learning.

With the increasing use of virtual clinics and new technologies in both primary and secondary care, we believe it is integral to teach undergraduates these skills. Additionally, the pandemic has given us a unique opportunity to develop and evaluate creative, new teaching methods using enhanced technologies. This research aimed to evaluate the effects of a novel teaching session on virtual consultation skills for final year medical students. We have used the Obstetrics and Gynaecology (O&G) setting, our aim is that these teaching methods could be replicated across and within specialties.

2. Methods

2.1 Participants and ethical considerations

Participants were final year medical students studying at the University of Glasgow on their O&G placement at University Hospital Wishaw (UHW). The study ran from September–December 2020 and included all 21 students on O&G placement during this period. As part of the University of Glasgow medical degree, final year students spend four weeks on O&G at UHW in groups of five or six. Detailed demographic data was not collected from the participants, but included a mix of male and female, British and international students.

All 21 participants attended the initial teaching session however one student did not attend the second session. Due to study anonymity their pre-teaching results could not be identified and therefore could not be excluded from the study. Consequently, 21 students made up the initial pre-teaching results whereas post-teaching results were collected from 20 students.

As this study involved human subjects, work was conducted in accordance with the Declaration of Helsinki, including guaranteeing the anonymity of participants and obtaining informed consent. The University of Glasgow ethics board reviewed the research proposal and the study was deemed exempt from ethical approval requirements without amendments.

2.2 Study Design

We designed a two-part teaching session on virtual consultation skills. Teaching was divided into two sessions and delivered in weeks two and four of their four week O&G placement during students' regular twice weekly tutorials.

2.2.1 Initial Session

The first session comprised a PowerPoint presentation on virtual consultation skills, individual practise consultations, and group debrief and discussion including peer feedback. The PowerPoint presentation was developed following literature review and informal discussion with clinicians at UHW [1, 8, 15, 16]. The presentation included: an introduction to the topic; its relevance with regard to primary and secondary care; benefits and challenges of virtual consultations; general do's and don'ts; and specific tips on opening the consult, history-taking, decision making and forming a management plan, and closing the consult. Students were encouraged to participate in discussion and ask questions throughout.

Following the presentation students took it in turn to conduct a practise virtual consultation. Each student was provided with an individual information sheet (Figure 1) prior to the consultation which detailed the clinic setting; patient details; a brief background to the consult; visual cues which couldn't be demonstrated by the patient actor; and an instruction for the student. Scenarios were designed by the researchers and linked to the University of Glasgow Intended Learning Outcomes for O&G including: post-menopausal bleed; heavy menstrual bleeding; ectopic pregnancy; pelvic inflammatory disease; post-natal sepsis; and urinary tract infection in pregnancy[17]. Students had ten minutes to conduct a consultation with a virtual patient actor over Microsoft Teams. The patient actor was a clinical teaching fellow who was not known to the students. This consultation was performed in front of the rest of the group with the patient actor projected onto a large screen so that the rest of the group could observe.

Once the consultation came to an end, students regrouped and the session leader facilitated a group debrief based on the Debriefing Assessment for Simulation in Healthcare (DASH) handbook[18] and Objective Structured Assessment of Debriefing (OSAD) tool[19]. Students conducting the consultation were encouraged to explore their reactions and feelings, overall performance, and any key learning points or areas identified for improvement. Observing students provided peer feedback on aspects they thought went well and any aspects they would have found challenging or done differently. Group discussion and feedback was repeated for each student.

2.2.2 Second Session

A second session was run with the same group two weeks after the initial tutorial. The PowerPoint presentation was omitted in this session but the virtual consultations and group debrief were repeated in the same manner as the first. The same set of scenarios were used but each student was given a different case to before. This gave them the chance to practise a different history and apply their feedback from last time to another setting. Again, peer feedback and group discussion followed the practise consultations.

2.2.3 Timeline

The sessions were delivered in weeks two and four of the block for two reasons. Firstly, we intended to evaluate improvement in virtual consultation skills rather than clinical knowledge. Therefore, ensuring students had at least a week of clinical experience prior to the first tutorial aimed to provide them with a baseline of O&G knowledge. Additionally, we wanted to allow enough time between the two sessions so that we did not simply measure recall and regurgitation of previous feedback. Two weeks was considered an adequate length in keeping with the students' timetables.

2.3 Study Analysis

The purpose of this study was to evaluate the short term effects of a teaching programme on virtual consultation skills as well as the longer term application and transferability to students' primary care placements. Results were gathered using pre- and post-teaching evaluation tools to explore short term changes, and an online survey to evaluate longer term impact.

2.3.1 Teaching evaluation tools

Data was collected using identical pre- and post-teaching evaluation tools. The tools consisted of a confidence questionnaire and a section on students' exposure to virtual consultations outside of teaching.

Confidence questionnaires measured students' confidence in four aspects of the consultation before and after the sessions. The pre-teaching questionnaire was completed at the beginning of the initial session, before the PowerPoint presentation. The post-teaching questionnaire was completed at the end of the second session two weeks later. The questionnaires used a simple self-reported 5-point Likert scale; 1 being not confident at all and 5 being fully confident. Participants ranked how confident they felt in each of the following aspects of a virtual consultation: opening the consult; conducting a history; coming to a decision and forming a management plan; and finally

closing the consultation. Results were entered onto an Excel spreadsheet and data analysed to determine the mean confidence scores, standard deviation and 95% confidence interval (CI) pre- and post-teaching. These results were used to calculate the mean difference between the two to assess any changes in confidence following teaching.

Teaching evaluation tools also asked participants whether they had any experience either observing or conducting virtual consultations and if so what format these were in. This was used to evaluate whether students gained any experience of virtual consultations during their O&G placement, separate to our teaching.

2.3.2 Online survey

An online survey was sent out to all 20 participants who had attended both teaching sessions, four weeks after the second session. This followed completion of their GP placement to evaluate the usefulness of virtual consultation teaching for primary care. The survey was created using JISC online survey tool and sent to participants' student email addresses.

Participants were asked whether they had the opportunity to perform virtual consultations whilst on GP placement and, if so, roughly how many per week and in what format. These results were compared with the teaching evaluation tools from their O&G placement. The survey also asked how useful they considered the teaching in preparing them for GP placement, if they thought the sessions should be continued for other students and any suggestions for improvement.

3. Results

3.1 Teaching evaluation tools

All 21 study participants completed the pre-teaching evaluation tool. However, one student did not attend the second teaching session and was excluded from the post-teaching results.

3.1.1 Virtual consultation experience

Pre-teaching, 19 students had seen a virtual consultation and two had not. There was no change in experience post-teaching with two students still not having seen a virtual consultation. There was also no change in the number of students having conducted a virtual consultation in a clinical setting pre- and post-teaching (only one student).

3.1.2 Confidence scores

Table 1 demonstrates the mean confidence scores pre- and post-teaching for each area of the consultation: opening, history taking, decision making and management, and closing the consult. The mean difference and percentage change for each area are also shown, demonstrating an increase in confidence in all areas studied. This is shown in Figure 2 below.

Area of consultation	Mean pre-teaching score (95%CI)	Mean post-teaching score (95%CI)	Mean difference (mean % change)
Opening	2.67 (2.21 to 3.13)	4.70 (4.50 to 4.90)	+2.03 (+40.6%)
History taking	3.38 (3.07 to 3.69)	4.45 (4.19 to 4.71)	+1.07 (+21.4%)
Decision/management	2.62 (2.28 to 2.96)	3.90 (3.66 to 4.14)	+1.28 (+25.6%)
Closing	2.81 (2.45 to 3.17)	4.60 (4.38 to 4.81)	+1.79 (+35.8%)

Table 1: Mean confidence scores (ranging 1-5) pre and post teaching, 95% confidence interval (CI), mean difference and percentage (%) change in confidence for each area of the consultation studied.

3.2 Online survey

The online survey was sent out to the 20 students who attended both teaching sessions, with an 80% response rate. Results show that 12 of the 16 respondents (75%) had the opportunity to perform virtual consultations on their GP placement ranging from 1-2 to >9 per week. These were mostly conducted via telephone with only one student given the opportunity to conduct video consultations as well. With regards to how useful the session was for their GP placements, 14 respondents (87.5%) ranked it as “very useful”, two ranked as “somewhat useful” and no student selected “not useful at all”. Free-text explanations for these rankings are detailed in table 2.

Student free-text feedback
Virtual consultations were a novel concept for me so it was very useful to have some training on how to conduct these.
Familiarity

This was the only formal teaching we have ever received on remote consultations, it was really useful to be able to practice these in a teaching setting to realise common mistakes. It was definitely beneficial to my GP block!
Useful to have a structure to approaching telephone consultations and made the experience less daunting
It was good to experience using the format in a simulation before undertaking genuine consultations
It was good to practice techniques before speaking to patients
Not specifically to my GP placement, but in preparing me for the many virtual consultations i will have in the future it was useful to get some guidance. I enjoyed the sessions they were fun to participate in.
Good preparation for virtual consultation, especially in terms of eliciting a clear history and deciding whether the patient needed seen face to face
Good skills
It was helpful to have a go at a virtual consultation in a supportive environment
Great idea for teaching sessions! Good practice and made me feel more confident in conducting telephone consultations
Many transferrable skills taught that could be used in telephone consultations.
Good to go over key points important in a virtual consultation but it is quite intuitive and dont feel it differs significantly to how you would handle a face to face consultation
It was very useful but all the video training aspects were meaningless as I didn't do any video consultations
Even though I didn't have any virtual consultations, the skills gained were useful in face to face scenarios.
Good practice for virtual consultations

Table 2: Student rationale behind ranking of how useful the teaching session was for GP placement.

All 16 respondents answered "yes" they considered it worthwhile continuing these teaching sessions for students in the future. Whilst nine students had no suggestions for improvement, other suggestions included running more sessions, practising telephone consultations or using translator services. One student commented that they considered

one teaching session enough as the second felt a little repetitive. These responses are listed in table 3.

Student free-text feedback
No, it worked really well
Try telephone consultation in addition to video consultation as it may be more difficult since unable to see patients but is more likely to be done in actual practice
Maybe including some tips for phone consultations, this was primarily the method used at my GP
Perhaps only having the one session is enough. Two session of virtual consultations seemed a little repetitive
No. It was well run and the scenarios were realistic. The performance of the hosts was good enough so no actors are necessary. Possibly try to simulate the use of an over the phone translation service?
Nothing
No - I liked the sessions as they ran.
More sessions! Very good practice
Maybe phone call sessions too
N/A
No
No - just continue these sessions! Thank you.
No
No
No it was all great thanks
No, was a really comprehensive session

Table 3: Student responses to whether they had any suggestions for improvement of the virtual communication skills teaching session.

Discussion

Our study demonstrates the potential use of new technologies for the future of medical education. As discussed, the pandemic has led to change in practice with increasing use of online interfaces for patient, student and colleague interactions[1, 13-14]. Following this, we aimed to create a teaching session which embraced these new technologies as well as providing students with virtual consultation skills. We found that our session had two main benefits.

Firstly, our results show that students considered teaching on virtual consultation skills a useful topic. The online survey demonstrated positive free-text feedback. Students highlighted that skills learnt were transferrable to primary care where virtual consultations are part of their placement. It is also encouraging that all respondents considered the sessions worthwhile continuing and the majority rated them as "very useful". These findings were also reflected in the pre- and post-teaching evaluation tool results. We found an increase in confidence in all aspects of the consultation studied: opening; history-taking; decision and management; and closing. It has been acknowledged that virtual consultations are likely to remain following resolution of the pandemic[5]. Until now, teaching on this topic has mostly been aimed at clinicians but we believe it is an important skill to teach students early on [1, 3, 7, 8].

Secondly, we have shown that there is scope to use virtual platforms in novel, creative ways for education purposes. Online interfaces have mostly been used in medical education for delivering large lectures and small group tutorials[14]. However, novel techniques such as telesimulation have been introduced for delivering quality distance learning[20]. Using Microsoft Teams in a small group session we were able to provide useful communication skills teaching despite clinical restrictions. Students have had limited patient exposure during the pandemic due to social distancing, cancellation of placements and reductions in clinics[11-13]. This has resulted in students feeling less prepared for foundation training as well as a lack of clinical competence, particularly in patient-facing skills[13, 14]. With over a year of disruption to medical education, we believe it is our responsibility as educators to adapt accordingly and produce new teaching methods to help improve student confidence and preparedness for the future.

Despite these encouraging findings, one of the main limitations of this study was the small sample size (n=21). This study was conducted in the O&G setting in NHS Lanarkshire and therefore results may not be generalizable across the board. However, this pilot study to evaluate a novel teaching method has shown positive initial results with transferability to primary care. Whilst our study setting was specific to O&G, the general skills taught were intended to be applicable to virtual outpatient clinics from any

department. It is hoped that other specialties will incorporate and adapt this method. This would allow for future research evaluating the impact of teaching on a larger scale and in different settings.

Another important consideration is whether students' ongoing placements influenced our findings. The sessions were delivered two weeks apart, during which time students were still attending O&G placement and therefore expanding their clinical knowledge and experience of the specialty. This may have influenced the results with an increase in confidence related to exposure rather than teaching. Whilst it was not possible to eliminate this factor, we attempted to minimise its impact by altering the scenarios each student conducted. We also ran the first session in week two of the placement to ensure participants had some prior O&G exposure and knowledge. Our results show the greatest increases in confidence were in the areas most specific to virtual consultations - opening and closing. The literature on virtual clinics focusses on tips for these areas rather than history-taking and forming management plans, which are similar to a traditional face-to-face consult. This highlights that opening and closing virtual consultations are novel skills for clinicians and students[1, 15, 16, 21]. Additionally, there was no increase in the number of students performing virtual consultations in the post-teaching questionnaire, showing that they are not being given the opportunity to do so as part of their O&G placement. Consequently, we believe that whilst placement exposure may have had some influence on results, the increases in confidence seen is more likely attributable to teaching. However, these factors cannot be excluded and results should be considered in the study setting.

Conclusion

Our research found that a two-part teaching session on virtual communication skills improved final year medical students' confidence in four key aspects of the consultation. Furthermore, these skills were transferable from O&G to primary care where virtual consultations are part of students' placements. It is important that medical education keeps pace with evolving clinical practice to ensure we continue to produce doctors with the skills required to work effectively and safely. The pandemic has provided the opportunity to explore new teaching methods which, if used effectively, can be continued in the future. Considering recent changes, we believe that teaching medical students virtual consultation skills should be incorporated into undergraduate medical education and training.

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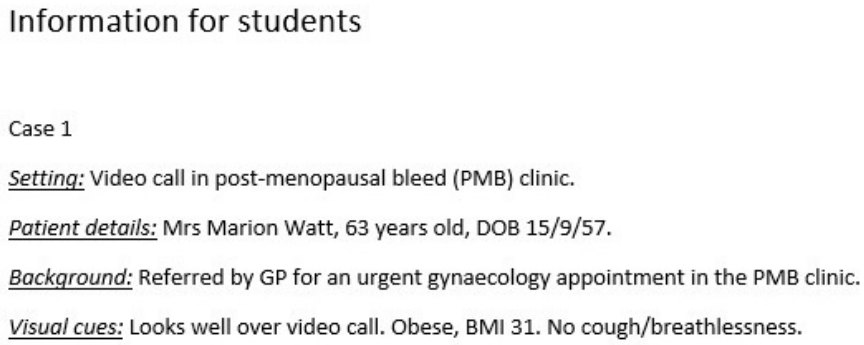

Figure 1: An example information sheet given to the students prior to their practise virtual consultation

159x80mm (96 x 96 DPI)

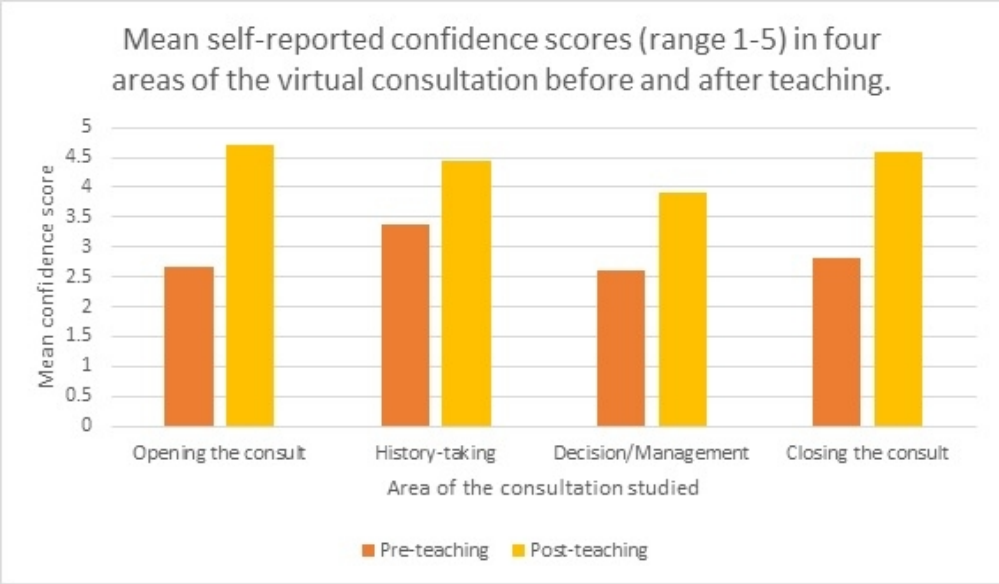

Figure 2: Mean confidence scores (ranging 1-5) pre and post teaching, for each area of the consultation studied.

149x87mm (96 x 96 DPI)

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Title: Teaching undergraduate medical students virtual consultation skills. A mixed methods interventional before-and-after study.

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Contributorship statement

As lead author, I confirm that all contributing authors meet the four ICMJE criteria for authorship as per BMJ requirements. Contributions are as follows. Edie Booth: project design and conception; acquisition, analysis and interpretation of results; initial draft write up. Kate McFetridge: acquisition, analysis and interpretation of results; critical revision of the initial draft. Evelyn Ferguson: project design and conception; critical revision of the initial draft. Catherine Paton: project design and conception; critical revision of the initial draft. All authors were involved in approval of the final submission and agree to be accountable for all aspects of the work.

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Data sharing statement

All data relevant to the study are included in the article or uploaded as supplementary information.

Competing interest statement

None declared. All authors declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Transparency statement

As lead author, I affirm that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

Ethics approval

This study was conducted in accordance with the Declaration of Helsinki. The study was reviewed and deemed exempt from ethical approval requirements without amendments by the University of Glasgow Ethics Committee. No ID number was given.

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Abstract

Objectives

To evaluate the impact and transferability of a novel teaching method on virtual communication skills for final year medical students.

Design

Mixed-methods, interventional before-and-after study.

Setting

NHS Lanarkshire, Scotland.

Participants

21 final year medical students on their Obstetrics and Gynaecology placement from September to December 2020.

Interventions

A two-part teaching session on virtual communication skills.

Main outcome measures

Self-reported confidence in conducting consultations pre and post-teaching, exposure to virtual consultations, usefulness of teaching and transferability to primary care. Data was collected using pre- and post-teaching evaluation tools and an online survey.

Results

Of 21 participants, one student did not attend the second session so was excluded from post-teaching evaluation results and the online survey. Pre-teaching results were collected from 21 participants and post-teaching results from 20. Mean confidence scores increased across all domains post-teaching. Mean confidence in opening the consultation increased from 2.67 (95% confidence interval 2.21 to 3.13) to 4.70 (4.50 to 4.90); history-taking from 3.38 (3.07 to 3.69) to 4.45 (4.19 to 4.71); decision-making and forming a management plan from 2.62 (2.28 to 2.96) to 3.90 (3.66 to 4.14); and closing the consultation from 2.81 (2.45 to 3.17) to 4.60 (4.38-4.81). There was no change in exposure to virtual consultations during O&G placement. 16 (80%) participants responded to the online survey; 14 (87.5%) rated the sessions “very useful” and all 16 considered them worthwhile continuing. 12 (75%) had the opportunity to practise virtual consultations on GP, mostly via telephone.

Conclusions

We found that teaching students virtual consultation skills improved short term confidence and were transferable to primary care placements. Future research is suggested to assess this teaching model following adaptation and incorporation into medical education and training across specialties and grades. It would be useful to evaluate the impact on competence post intervention through observed skills.

Strengths and limitations of this study

- We have developed and evaluated a novel teaching method to keep pace with the increasing use of new technologies within medical education.
- Virtual consultation skills taught on a secondary care Obstetrics and Gynaecology (O&G) placement were also transferable to primary care, increasing the likelihood that this teaching method could be adapted for other specialties.

- A limitation is the small participant number which may reduce reliability and validity of the findings, it would be beneficial to study a larger population in future.
- We could not exclude the impact of ongoing clinical placement and increasing knowledge of the specialty on student's confidence in conducting consultations.
- One participant did not attend both sessions and was excluded from post-teaching results but could not be excluded from pre-teaching results due to study anonymity.

1. Introduction

In response to the covid-19 pandemic there has been a transformation in the format of both primary and secondary care clinics[1]. Specifically, an increase in virtual (or remote) clinics and the use of telemedicine[2-4]. This includes telephone or video consultations alongside online messaging interfaces. This paper will use the term "virtual" consultations rather than "remote" or "telemedicine" but terms may be used interchangeably elsewhere. Virtual clinics are now an important part of the medical professional workload and it appears that this is likely to remain following resolution of the pandemic[5].

With the integration of these consultation methods into routine practice, clinicians have had to adapt and learn new skills on the job. As outlined in the GMC Good Medical Practice guide to duties of a doctor, it is important that medical students and clinicians are equipped with up-to-date knowledge and skills to avoid the potential for patient harm[6]. This includes new technological and communication skills used for telephone or video consultations. Due to different clinical settings and equipment used, successful virtual consultations require a unique skill set alongside generic communication skills to provide safe care and maintain patient confidence[7]. Telephone and video consultations follow a similar structure, content and duration as well as equal limitations of data protection, confidentiality and technical issues[1]. The main difference between the two is the lack of visual cues over the telephone[8, 9]. This lack of visual feedback for both patient and clinician can limit communication, interpreting emotions and understanding, and excludes physical examination. However, video consultations require greater digital skill and therefore are not always appropriate. In a study comparing students' experiences communicating with a patient face-to-face, an in-person patient actor or a virtual patient, students reported that the virtual communication was the most challenging[10]. Specific

barriers to virtual clinics include: use of technology, ensuring security and confidentiality, demonstrating non-verbal skills, computer or telephone etiquette and physical examination[2, 7]. Consequently, there has been a surge in publications on the practicalities of conducting virtual consultations[1, 3, 11, 12]. However, these have focussed on tips for current trainees and consultants rather than teaching students for future practice. Despite recent literature on postgraduate virtual consultation skills and longstanding research on general undergraduate communication skills[7, 13, 14], we identified a gap in teaching undergraduate medical students specific virtual consultation skills.

In addition to the effect of the pandemic on new consultation technologies, we have also seen a change in teaching technologies amongst medical educators[15, 16]. Medical student clinical placements and in-person teaching were suspended globally to help reduce spread of the virus[15-17]. Instead, distance learning platforms and online teaching became the norm, enabling continued learning despite restrictions of the pandemic. Interfaces such as Microsoft Teams, YouTube and Zoom have been used for delivering live and pre-recorded lectures, small group tutorials and online modules[16-18]. Students have since returned to clinical areas but with virtual clinics and social distancing measures in place they have had a reduction in patient exposure. Consequently, UK medical students have reported concerns regarding clinical competence[16] and reduced preparedness for foundation training[18]. We considered how we could adapt our teaching using these new technologies to increase students' confidence in patient-facing skills in a safe environment without compromising learning.

With the increasing use of virtual clinics and new technologies in both primary and secondary care, we believe it is integral to teach undergraduates these skills. The pandemic has given us a unique opportunity to develop and evaluate creative, new teaching methods using enhanced technologies. This research aimed to evaluate the effects of a novel teaching session on virtual consultation skills for final year medical students. We have used the Obstetrics and Gynaecology (O&G) setting but believe that these teaching methods could be replicated across and within specialties.

2. Methods

2.1 Patient and public involvement statement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

2.2 Participants and ethical considerations

Participants were final year medical students studying at the University of Glasgow (UoG) on their O&G placement at University Hospital Wishaw (UHW). We included all 21 students on O&G placement from September–December 2020. As part of the UoG medical degree, final year students spend four weeks on O&G at UHW in groups of five or six. Participant demographics consisted of five male and sixteen female students, aged between 22 and 26, including four mature students and one international student.

All 21 participants attended the initial teaching session however one student did not attend the second session. Due to study anonymity their pre-teaching results could not be identified and therefore not excluded from the study. Consequently, 21 students made up the initial pre-teaching results whereas post-teaching results were collected from 20 students.

As this study involved human subjects, work was conducted in accordance with the Declaration of Helsinki, including guaranteeing the anonymity of participants and obtaining informed consent. The UoG ethics board reviewed the research proposal and the study was deemed exempt from ethical approval requirements without amendments.

2.3 Study Design

We designed a two-part teaching session on virtual consultation skills. Teaching was delivered in weeks two and four of their four week O&G placement during students' regular twice weekly tutorials.

2.3.1 Current Communication Skills Curriculum

The UoG outlines its communication skills curriculum within the vocational skills section of the course. In the first two years of the degree students have a weekly 3-hour session on communication skills, ethics, Hospital and GP visits, personal and professional development and community health. In third year this is furthered by an "Introduction to Communication Skills" session and five small group sessions with a tutor. In the final two years communication skills are assessed during the students' GP placements where they receive formal feedback[19]. The current curriculum does not include virtual communication skills.

2.3.2 Initial Session

The first session comprised an in-person PowerPoint presentation on virtual consultation skills, individual practise consultations, and group debrief and discussion including peer feedback (Appendix 1). The PowerPoint presentation was developed following literature review and informal discussion with clinicians at UHW[1, 12, 20, 21]. The presentation

included: introduction to the topic; relevance to primary and secondary care; benefits and challenges of virtual consultations; general do's and don'ts; and tips on opening the consult, history-taking, decision making and forming a management plan, and closing the consult. Teaching covered both telephone and video consultations. Students were encouraged to participate in discussion and ask questions throughout.

Following the presentation, all students took it in turn to practise a virtual consultation in video format. Each student was provided with an individual information sheet (Figure 1) prior to the consultation detailing the clinic setting; patient details; brief background to the consultation; visual cues which couldn't be demonstrated by the patient actor e.g. body mass index; and an instruction for the student. Scenarios were designed by the researchers and linked to the UoG Intended Learning Outcomes for O&G including: post-menopausal bleed; heavy menstrual bleeding; ectopic pregnancy; pelvic inflammatory disease; post-natal sepsis; and urinary tract infection in pregnancy[22]. Students had ten minutes to conduct a consultation with a virtual patient actor over Microsoft Teams. The patient actor was a clinical teaching fellow who was not known to the students. This consultation was performed in front of the rest of the group with the patient actor projected onto a large screen so that the group could observe.

Following the consultation, students regrouped and the session leader facilitated a group debrief based on the Debriefing Assessment for Simulation in Healthcare (DASH) handbook[23] and Objective Structured Assessment of Debriefing (OSAD) tool[24]. Debrief lasted ten minutes per student and they were encouraged to explore their reactions and feelings, overall performance, and any key learning points or areas identified for improvement. Observing students provided peer feedback on what they thought went well and any aspects they would have found challenging or done differently. Group discussion and feedback was repeated for each student. Overall duration of the sessions was 120-180 minutes.

2.3.3 Second Session

A second session was run with the same group two weeks after the initial tutorial. The PowerPoint presentation was omitted in this session but the video consultations and group debrief were repeated in the same manner as the first. The same set of scenarios were used but students were given a different case to before. This gave them the chance to practise a different history and apply their previous feedback to another scenario. Again, peer feedback and group discussion followed the practise consultations.

The same model was used for each of the five groups.

2.3.4 Timeline

The sessions were delivered in weeks two and four of the block for two reasons. Firstly, we intended to evaluate improvement in virtual consultation skills rather than clinical knowledge. Therefore, ensuring students had at least a week of clinical experience prior to the first tutorial aimed to provide them with baseline O&G knowledge. Additionally, we wanted to allow enough time between the two sessions that we did not simply measure recall and regurgitation of their previous experience and feedback. We could not find literature on the timeframe required to ensure learning rather than recall of skills specific to virtual consultations, however other studies assessing performance and confidence following simulation based education have used timelines between one week and three months[8, 25, 26]. As this study evaluated confidence rather than formally assessing the skills, two weeks was considered an adequate length in keeping with the students' timetables and was furthered by the online survey six weeks later.

2.4 Study Analysis

The purpose of this study was to evaluate the short term effects of a teaching programme on virtual consultation skills as well as longer term application and transferability to students' primary care placements. Results were gathered using pre- and post-teaching evaluation tools to explore short term changes, and an online survey to evaluate longer term impact.

2.4.1 Teaching evaluation tools

Data was collected using identical pre- and post-teaching evaluation tools. The tools consisted of a confidence questionnaire and a section on students' exposure to virtual consultations outside of teaching.

Confidence questionnaires measured students' confidence in four key aspects of the consultation (opening, history taking, decision making and management, and closing) before and after the teaching sessions. The questionnaires were self-developed by the researchers to match the session content and therefore evaluate each area taught. The four areas evaluated were decided when designing the teaching session as they were identified in the literature as key components of virtual consultations[12], requiring specific virtual communication skills[2, 7]. The pre-teaching questionnaire was completed at the beginning of the initial session, before the PowerPoint presentation. The post-teaching questionnaire was completed at the end of the second session two weeks later. The questionnaires used a simple self-reported 5-point Likert scale; 1 being not confident at all and 5 being fully confident. Participants ranked how confident they felt in each of the

following aspects: opening the consult; history taking; coming to a decision and forming a management plan; and finally closing the consultation. Results were entered onto an Excel spreadsheet and data analysed to determine the mean confidence scores, standard deviation and 95% confidence interval (CI) pre- and post-teaching. These results were used to calculate the mean difference between the two sessions to assess any changes in confidence following teaching.

Teaching evaluation tools also asked participants whether they had any experience either observing or conducting virtual consultations and if so what format these were in. This was used to evaluate whether students gained any experience of virtual consultations during their O&G placement, separate to our teaching.

2.4.2 Online survey

An online survey was sent out to all 20 participants who attended both teaching sessions, four weeks after the second session. This followed completion of their GP placement to evaluate the usefulness of virtual consultation teaching for primary care. The survey was created using JISC online survey tool and sent to participants' student email addresses.

Participants were asked whether they had the opportunity to perform virtual consultations whilst on GP placement and, if so, roughly how many per week and in what format. These results were compared with the teaching evaluation tools from their O&G placement. The survey also asked how useful they considered the teaching in preparing them for GP placement, if they thought the sessions should be continued for other students and any suggestions for improvement.

3. Results

3.1 Teaching evaluation tools

All 21 participants completed the pre-teaching evaluation tool. However, one student did not attend the second teaching session and was excluded from post-teaching results.

3.1.1 Virtual consultation experience

Pre-teaching, 19 students had seen a virtual consultation and two had not. There was no change in experience post-teaching with two students still not having seen a virtual consultation. There was also no change in the number of students having conducted a virtual consultation in a clinical setting pre- and post-teaching (only one student).

3.1.2 Confidence scores

Table 1 demonstrates the mean confidence scores pre- and post-teaching for each area of the consultation as well as the mean difference and percentage change for each area. These results are also shown in Figure 2, demonstrating an increase in confidence in all areas studied.

Area of consultation	Mean pre-teaching score (95%CI)	Mean post-teaching score (95%CI)	Mean difference (mean % change)
Opening	2.67 (2.21 to 3.13)	4.70 (4.50 to 4.90)	+2.03 (+40.6%)
History taking	3.38 (3.07 to 3.69)	4.45 (4.19 to 4.71)	+1.07 (+21.4%)
Decision/management	2.62 (2.28 to 2.96)	3.90 (3.66 to 4.14)	+1.28 (+25.6%)
Closing	2.81 (2.45 to 3.17)	4.60 (4.38 to 4.81)	+1.79 (+35.8%)

Table 1: Mean confidence scores (ranging 1-5) pre and post teaching, 95% confidence interval (CI), mean difference and percentage (%) change in confidence for each area of the consultation studied.

3.2 Online survey

The online survey was sent to the 20 students who attended both teaching sessions, with an 80% response rate. Results show that 12 of the 16 respondents (75%) had the opportunity to perform virtual consultations on their GP placement ranging from 1-2 to >9 per week. These were mostly conducted via telephone with only one student given the opportunity to practise video consultations. With regards to how useful the session was for their GP placements, 14 respondents (87.5%) ranked “very useful”, two selected “somewhat useful” and no student chose “not useful at all”. Free-text explanations for these rankings are detailed in table 2. Whilst formal thematic analysis was not undertaken due to the small participant number, interrogation of the data suggests two key themes. Firstly, the usefulness of authentically practising virtual consultations. Secondly, increased confidence in ability to conduct a video consultation including transferring these skills to telephone or face-to-face settings.

Student free-text feedback
Virtual consultations were a novel concept for me so it was very useful to have some training on how to conduct these.
Familiarity
This was the only formal teaching we have ever received on remote consultations, it was really useful to be able to practice these in a teaching setting to realise common mistakes. It was definitely beneficial to my GP block!

Useful to have a structure to approaching telephone consultations and made the experience less daunting
It was good to experience using the format in a simulation before undertaking genuine consultations
It was good to practice techniques before speaking to patients
Not specifically to my GP placement, but in preparing me for the many virtual consultations i will have in the future it was useful to get some guidance. I enjoyed the sessions they were fun to participate in.
Good preparation for virtual consultation, especially in terms of eliciting a clear history and deciding whether the patient needed seen face to face
Good skills
It was helpful to have a go at a virtual consultation in a supportive environment
Great idea for teaching sessions! Good practice and made me feel more confident in conducting telephone consultations
Many transferrable skills taught that could be used in telephone consultations.
Good to go over key points important in a virtual consultation but it is quite intuitive and dont feel it differs significantly to how you would handle a face to face consultation
It was very useful but all the video training aspects were meaningless as I didn't do any video consultations
Even though I didn't have any virtual consultations, the skills gained were useful in face to face scenarios.
Good practice for virtual consultations

Table 2: Student rationale behind ranking of how useful the teaching session was for GP placement.

All 16 respondents answered "yes" they considered it worthwhile continuing this teaching for future students. Whilst nine students had no suggestions for improvement, other suggestions included running more sessions, practising telephone consultations or using translator services. One student commented that they considered one teaching session enough as the second felt a little repetitive. These responses are listed in table 3.

Student free-text feedback
No, it worked really well
Try telephone consultation in addition to video consultation as it may be more difficult since unable to see patients but is more likely to be done in actual practice
Maybe including some tips for phone consultations, this was primarily the method used at my GP
Perhaps only having the one session is enough. Two session of virtual consultations seemed a little repetitive
No. It was well run and the scenarios were realistic. The performance of the hosts was good enough so no actors are necessary. Possibly try to simulate the use of an over the phone translation service?

Nothing
No - I liked the sessions as they ran.
More sessions! Very good practice
Maybe phone call sessions too
N/A
No
No - just continue these sessions! Thank you.
No
No
No it was all great thanks
No, was a really comprehensive session

Table 3: Student responses to whether they had any suggestions for improvement of the virtual communication skills teaching session.

4. Discussion

Our study demonstrates the potential use of new technologies for the future of medical education. As discussed, the pandemic has led to a change in practice with increasing use of online interfaces for patient, student and colleague interactions[1, 17-18]. This has brought with it unique barriers and the need for clinicians to adapt and learn new techniques alongside generic communication skills[2, 7]. Following this, we aimed to create a teaching session which embraced these technologies and provided students with virtual consultation skills. We found that our session had two main benefits.

Firstly, our results show that students considered teaching on virtual consultation skills a useful topic. The online survey demonstrated positive free-text feedback. Students highlighted that skills learnt were transferable to primary care where virtual consultations are part of their placement. It is also encouraging that all respondents considered the sessions worthwhile continuing and the majority rated them as “very useful”. These findings were reflected in the pre- and post-teaching evaluation tool results with an increase in confidence in all aspects of the consultation studied. Reviewing our free-text feedback we note that students' GP experience of virtual consultations was mostly via telephone (table 2) and this was also seen in their suggestions for improvement (table 3). Whilst our teaching session covered both elements in the PowerPoint presentation, students only practised video consultations. Video and telephone consultations have been found to be similar in content, structure and duration with the main difference being lack of visual cues over the telephone[1, 8, 9]. It was therefore interesting to see that

students considered the sessions useful and skills transferable to GP despite a change in medium. If considered beneficial, our teaching structure could be adapted to include telephone consultations as the practical element. Thus far, teaching on virtual consultations has mostly been aimed at clinicians[1, 3, 11, 12]. However, as they are likely to remain following the pandemic[5], we believe it is an important skill to teach students early on.

Secondly, we have shown that there is scope to use virtual platforms in novel, creative ways for educational purposes. Online interfaces have mostly been used in medical education for delivering large lectures and small group tutorials[18]. However, techniques such as telesimulation have been introduced for delivering quality distance learning including formative and summative Objective Structured Clinical Examinations (OSCE)[27, 28]. Using Microsoft Teams in small group sessions we were able to provide useful communication skills teaching despite clinical restrictions. Students have had limited patient exposure during the pandemic due to social distancing, cancellation of placements and reductions in clinics[15-17]. This has resulted in students feeling less prepared for foundation training as well as a lack of clinical competence, particularly in patient-facing skills[17, 18, 29]. With over a year of disruption to medical education, we believe it is our responsibility as educators to adapt accordingly and produce new teaching methods to help improve student confidence and preparedness for the future.

Despite these encouraging findings, one main limitation of this study was the small sample size (n=21). This study was conducted in the O&G setting in NHS Lanarkshire and therefore results may not be generalizable across the board. However, this pilot study to evaluate a novel teaching method has shown positive initial results with transferability to primary care. Whilst our study setting was specific to O&G, the general skills taught were intended to be applicable to virtual outpatient clinics from any department. It is hoped that other specialties will incorporate and adapt this method or that universities may consider including it in the curriculum as a specific communication skill. For example, this could potentially be included within the already established UoG 4th and 5th year communication sessions whilst on GP placement. This would allow for future research evaluating the impact of teaching on a larger scale in different settings.

In particular, it would be useful in further studies to assess the impact of intervention on competence. Our study evaluated the teaching methods by measuring changes in student confidence, however the link between self-reported confidence and proficient knowledge or skill is complex[30]. When using confidence questionnaires there is the possibility of increased confidence with an unmatched increase in skill[31]. The literature

demonstrates mixed results with some studies showing correlation between performance and confidence[32], particularly post-training[30], but others finding that teaching can lead to inappropriate over-confidence[25, 31]. Consequently, it would be important to assess teaching using objective performance indicators to ensure self-reported confidence correlates with skills learned. One way competence and performance could be evaluated is through OSCE style observation of the skill pre and post teaching to increase objectivity of results. This has already been explored by one group in New York who have developed an assessment tool to evaluate both core communication and virtual specific skills in a video consultation OSCE station[7]. We did not assess competency but instead used the online questionnaire free-text feedback to further support and validate our findings from changes in confidence.

Another important consideration is whether students' ongoing placements influenced results. The sessions were delivered two weeks apart, during which time students were still attending O&G placement and therefore expanding their clinical knowledge and experience of the specialty. This may have influenced the findings with an increase in confidence related to exposure rather than teaching. Whilst it was not possible to eliminate this factor, we attempted to minimise its impact by altering the scenarios students conducted. We also ran the first session in week two of the placement to ensure participants had some prior O&G exposure and knowledge. Our results show the greatest increases in confidence were in the areas most specific to virtual consultations - opening and closing. The literature on virtual clinics focusses on tips for these areas rather than history-taking and forming management plans, which are similar to a traditional face-to-face consultation. This highlights that opening and closing virtual consultations are novel skills for clinicians and students[1, 19, 20, 33]. Additionally, there was no increase in the number of students performing virtual consultations in the post-teaching questionnaire, showing that they were not being given the opportunity to do so as part of their O&G placement. Consequently, we believe that whilst placement exposure may have had some influence on results, the increases in confidence seen are more likely attributable to teaching. However, these factors cannot be excluded and results should be considered in the study setting.

5. Conclusion

Our research found that a two-part teaching session on virtual communication skills improved final year medical students' confidence in four key aspects of the consultation. Furthermore, these skills were transferable from O&G to primary care where virtual

consultations are part of students' placements. It is important that medical education keeps pace with evolving clinical practice to ensure we continue to produce doctors with the skills required to work effectively and safely. The pandemic has provided the opportunity to explore new teaching methods which, if used effectively, can be continued in the future. Considering recent changes, we believe that teaching medical students virtual consultation skills should be incorporated into undergraduate medical education and training. Further research is suggested to explore the effects of our teaching model on competence.

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Figure captions

Figure 1: An example information sheet given to the students prior to their practise virtual consultation

Figure 2: Mean confidence scores (ranging 1-5) pre and post teaching, for each area of the consultation studied.

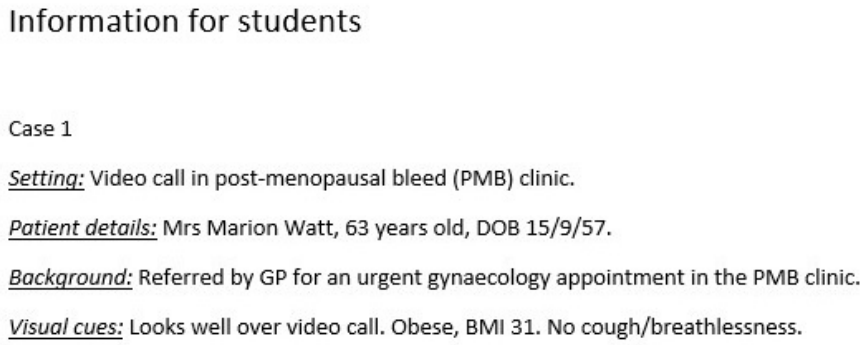

Figure 1: An example information sheet given to the students prior to their practise virtual consultation

159x80mm (96 x 96 DPI)

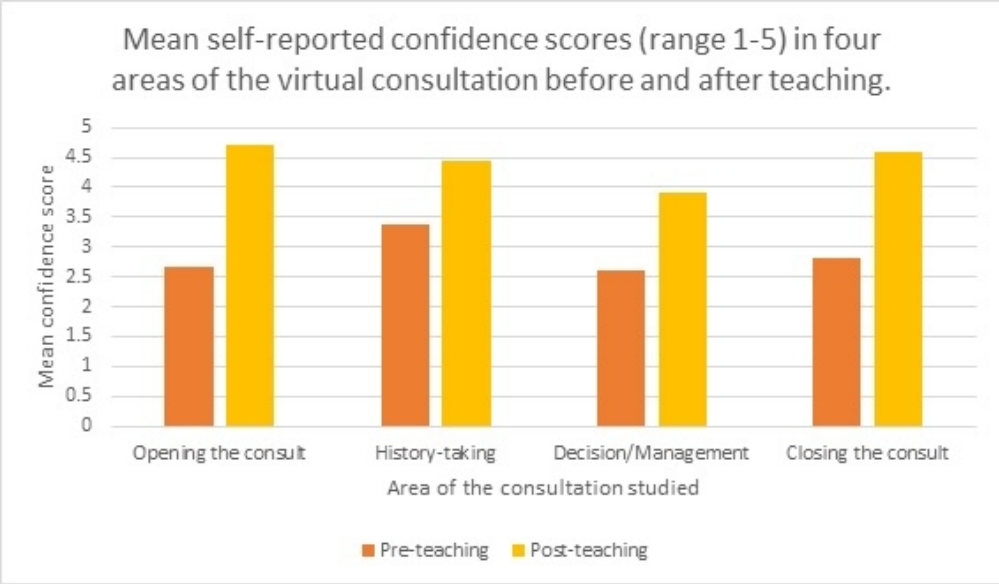

Figure 2: Mean confidence scores (ranging 1-5) pre and post teaching, for each area of the consultation studied.

149x87mm (96 x 96 DPI)

Appendix 1

Lesson plan and summary of taught content during the initial teaching session. The second session started from level 6. This lesson plan was modelled on Gagne's events of instruction structure[1] and developed from literature review and personal professional experiences of the authors.

Level and timings	Activity
1. Gaining attention (5mins)	Title slide of presentation on the board. Introductions between teacher and learners. Start the session with a pre-teaching confidence questionnaire which covers: previous experience; confidence conducting virtual consultation (opening, discussion, decision making, and closing).
2. Informing learner of objectives (5mins)	Learning objectives: - Discuss why virtual consultations are important. - Identify the challenges and benefits of virtual consults. - Be able to select an appropriate virtual format for consultation. - Outline how to conduct a video consultation including setting up, opening the consultation, discussion and body language, decision making and directing patients for follow up, closing the consultation. - Have the opportunity to practice conducting a virtual consultation. - Provide useful peer feedback. As this session uses practice scenarios and simulation type consultation, at this point establish ground rules with the students e.g. what is said in the room stays in the room, confidentiality, ensure constructive feedback, can take a time out if finding it too stressful.
3. Stimulate recall of prior learning (5-10mins)	Discussion on previous experience observing or conducting a virtual consultation, in what manner and how they found it. - Outline different methods used (e.g. phone, video, messaging). - What did the students take away from that experience, what were the challenges and benefits? - Discuss what they know about where and why virtual consults are used. Learner prerequisites for the lesson are: - To be able to conduct a basic patient history to the level expected to have passed fourth year. - Knowledge of common O&G presentations. - Can outline basic first-line investigations and management for common O&G presentations.
4. Presenting stimulus (20mins)	PowerPoint presentation on how to conduct a virtual consultation. - How to choose a mode (e.g. telephone vs video), setting up/testing and what to prepare prior to starting (confidential setting, imaging/results/letters/previous notes to hand). - Opening the consultation (consent, identifying, safeguarding, confidentiality) and agreeing a back-up alternative e.g. phone call instead of video). - Carrying out a history including appropriate body language and note-taking.

	- Making a decision and informing the patient of next steps including further management or follow up options (to attend emergency department, face to face clinic, remote prescribing, follow up virtual clinic, discharge). - Finally how to close the consultation: summarising, signposting/worsening advice, final questions, an ending sentence and hanging up.
5. Providing learning guidance (5mins)	Students watch an example clip of a video consultation[2] between a general practitioner and a patient and critique what they think went well or not, discuss what things they think they would have done differently. Here they can ask any questions they have from the video.
6. Eliciting performance (50mins)	Students take it in turns to call a patient actor (fellow clinical teaching fellow) via Microsoft teams whilst the rest of the group observe and make notes for feedback. Students are given an "OSCE-style" information sheet with patient details and background on the call including setting and relevant history (Figure 1). They are also given instructions on what they are expected to do e.g. "you have 10 minutes to take a full history and outline any further investigations or follow up for the patient.". The facilitator will remind the students of the ground rules we had established as a group at the beginning prior to starting the simulation consults. The computer is connected to a smartboard projector so that observing students can see the patient actor on the large screen.
7. Providing feedback (50mins)	Throughout the presentation students have the opportunity to ask questions. After each student has conducted their practice scenario, the tutor facilitates a debrief asking the student how they felt it went and dealing with any questions/concerns the student has. - Teacher and the group provide constructive feedback to the student verbally. - Written feedback form from the teacher. - General discussion about the case e.g. ectopic pregnancy/post-menopausal bleeding. - Students can identify any further learning needs they have.
8. Assessing performance (done in second 2 hour session)	The students have a second session for virtual consultations two weeks after the initial session where they are given a different scenario to their previous one. The teacher will provide feedback again and can assess whether they have met their previous learning points. Following the second session they are given a post-teaching confidence questionnaire (similar to the pre-teaching one) which assesses any change in their confidence for each part of the consultation.
9. Enhancing retention and transfer (5mins in session, to continue throughout	Recap learning objectives and cover main "take home messages" from the debriefing/feedback. Students are on a four week block with the opportunity to go to clinics, some of which are virtual. They should practise history taking with patients in virtual clinics if possible. Following their obstetrics and gynaecology block they have their GP rotation where they are given further opportunity to practise virtual consultation skills.

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